



Modernizing North Carolina's Infrastructure
Through Sustainable and Diversified Revenue Streams

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2020 Report

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A well-funded transportation network means recovery, resiliency, and security for North Carolina’s economy and the people whose jobs depend on it. To secure the investments we need, our ultimate destination must be a modernized, diversified transportation revenue stream. This report gives us the roadmap we need to get started.

-KELLY FULLER, PRESIDENT | NC CHAMBER FOUNDATION



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Source: NCDOT

Executive Summary

In 2015, *Diversifying Revenues to Improve Commerce and Economic Prosperity*, identified 16 possible options for generating revenue for transportation in North Carolina. At the time of the report release, the long-term viability of the motor fuels tax as a primary funding mechanism for transportation was questioned across the United States and within North Carolina. Vehicle fuel economy improvements, coinciding with substantive real purchasing power losses of the federal motor fuels tax (the federal tax rate has not been adjusted for inflation since 1993), were creating uncertainty about how the motor fuels tax could sustainably finance our transportation system needs.

North Carolina's current transportation funding structure has not materially changed since our first report. The Department of Transportation faces historical revenue shortfalls, and important parts of our infrastructure require maintenance to maintain or improve their conditions. Despite some adjustments to our motor fuel tax formula in 2017, the existing revenues are not adequate to maintain, let alone improve, our deteriorating system.

North Carolina currently invests approximately \$5 billion annually in its transportation system. This investment enables the state to achieve an overall infrastructure rating of mediocre (ASCE, 2017). In this condition, our state is facing serious challenges

affecting driver safety and economic productivity. Currently, North Carolina ranks nineteenth in the nation for percentage of interstate bridges that are structurally deficient or in poor condition (TRIP, 2020); it ranks twenty-seventh in commute time (U.S. News, 2018); and the state ranks third in the nation for the net increase in vehicle miles traveled (VMT) on interstate highways from 2000 to 2018 (TRIP, 2020).

With that backdrop, the NC Chamber Foundation commissioned this second report to assess 1) the most viable funding mechanisms and implementation strategies, 2) economic impact of infrastructure investment, and 3) the impacts of COVID-19 on driver behavior, transportation revenue, business supply chains, and other considerations.

Our economic analysis demonstrated that highway construction projects lead to immediate positive economic impacts in as few as two years after project completion. One key finding illustrated that the number of businesses within one mile of NC highway projects increased by 73 percent, a rate that is 48 percent higher than the growth of business establishments within one mile of unimproved NC highways. Other studies have shown that the time to make capital investments, such as infrastructure, often has the most value in times of recession (CRS, 2018) with increased spending and job creation.

Summary of Findings

- State and local communities quickly realize significant economic benefits after infrastructure investment. From 2001 to 2016, **locations within proximity to NC highways experienced a 35 percent increase in employment**, 16 percent more than other NC highways that were not improved.
- North Carolina's existing **motor fuels tax does not yield sufficient revenue** in the current environment of changing driving behaviors and the increased use of fuel-efficient vehicles.
- Current and projected future trends in transportation use and innovation require **strategic and structural changes** to our state's funding mechanisms.
- **Revenue diversification is critical** to fund necessary transportation operation, maintenance, and modernization projects. Recommendations include:
 1. Implement a road user charge program
 2. Phase out the motor fuels tax
 3. Adjust the highway use tax to a competitive rate
 4. Dedicate a fraction of the statewide sales tax to transportation investment



Source: NCDOT

Introduction

The release of the 2015 report, *Diversifying Revenues to Improve Commerce and Economic Prosperity*, brought to light systemic transportation funding issues that exist in North Carolina. It helped spur our state's leadership into action, and North Carolina's General Assembly revised the motor fuels tax formula to better align with the state's transportation system needs (implemented January 1, 2017). Though effective as a stop-gap measure, vehicle fuel economy improvements and the increasing use of alternative fuels continue to challenge the efficacy of the motor fuels tax, even with its revised form.

A cohort of NCDOT staff, state leadership, and key stakeholders are keenly aware of the state's transportation funding challenges. In March 2019, former Transportation Secretary Jim Trogdon created the NC First Commission to utilize national and international research to devise a sustainable long-range transportation investment strategy. The commission aims to establish guidance, recommendations, and plans that assist with building and maintaining North Carolina's transportation system to ensure the state's economic vitality and competitiveness in the future.

In addition to the systemic transportation financing issues the NC First Commission is seeking to address, a series of weather-related events created a short-term

expenditure shock for NCDOT. Hurricane Florence resulted in the closure of over 600 roads (Stradling, 2020), many of which resulted in repair and cleanup costs. Dealing with Florence and other weather events, NCDOT spent approximately \$400 million on storm-related cleanup costs over a period of 16 months, compared to a long-term average of \$66 million per year (Stradling, 2020). These events led to short-term NCDOT budget austerity measures, resulting in the suspension of 900 projects statewide (Stradling, 2020).

During NCDOT's financial recovery, the onset of COVID-19 has created a historical "first-of-its-kind" impact on the state's transportation system. North Carolina's traffic volumes have fallen dramatically throughout the COVID-19 period, with a decrease of approximately 38 percent during the periods of greatest caution (Shuman, 2020). COVID-19 travel reductions have led to a sharp decline in revenue, such that NCDOT has fallen below its statutorily mandated cash floor of \$293 million (NCDOT, 2020). According to state law, once the department dips below the cash floor, it can no longer enter into new transportation project contracts (NCDOT, 2020).

These fiscal issues directly affect North Carolina's drivers. With project delays and the absence of sustained funding, North Carolina's infrastructure and mobility conditions are likely to worsen.



Source: UNC Charlotte

While North Carolina’s funding situation is more acute than many states across the country, we are not alone. As a result of COVID-19, America’s transportation agencies are facing a projected \$35-\$50 billion shortfall due to a drop in motor fuels tax revenue (AASHTO, 2020; Duncan, 2020). Traffic has rebounded on the nation’s roads over the last month; however, vehicle miles traveled remain well below normal levels (Duncan, 2020). The prospect of continued funding disruptions through the pandemic, vehicle fuel efficiency improvements, and federal tax policy challenges (the federal motor fuels tax rate has not been adjusted for inflation since 1993), raises questions about the future viability of the motor fuels tax as a primary funding mechanism.

The convergence of systemic transportation financing issues and external shocks have placed North Carolina in an even more challenging fiscal environment than when the *Diversifying Revenues to Improve Commerce and Economic Prosperity* report was released in 2015. That report focused primarily on revenue options that were available to support the state’s transportation funding needs. This updated report aims to narrow the field of potential revenue generation options and provide implementation strategies to achieve a more sustainable portfolio of transportation funding mechanisms. Though the focus of this report is on opportunities for revenue generation, as opposed to

Figure 1: System Condition per Level of Investment

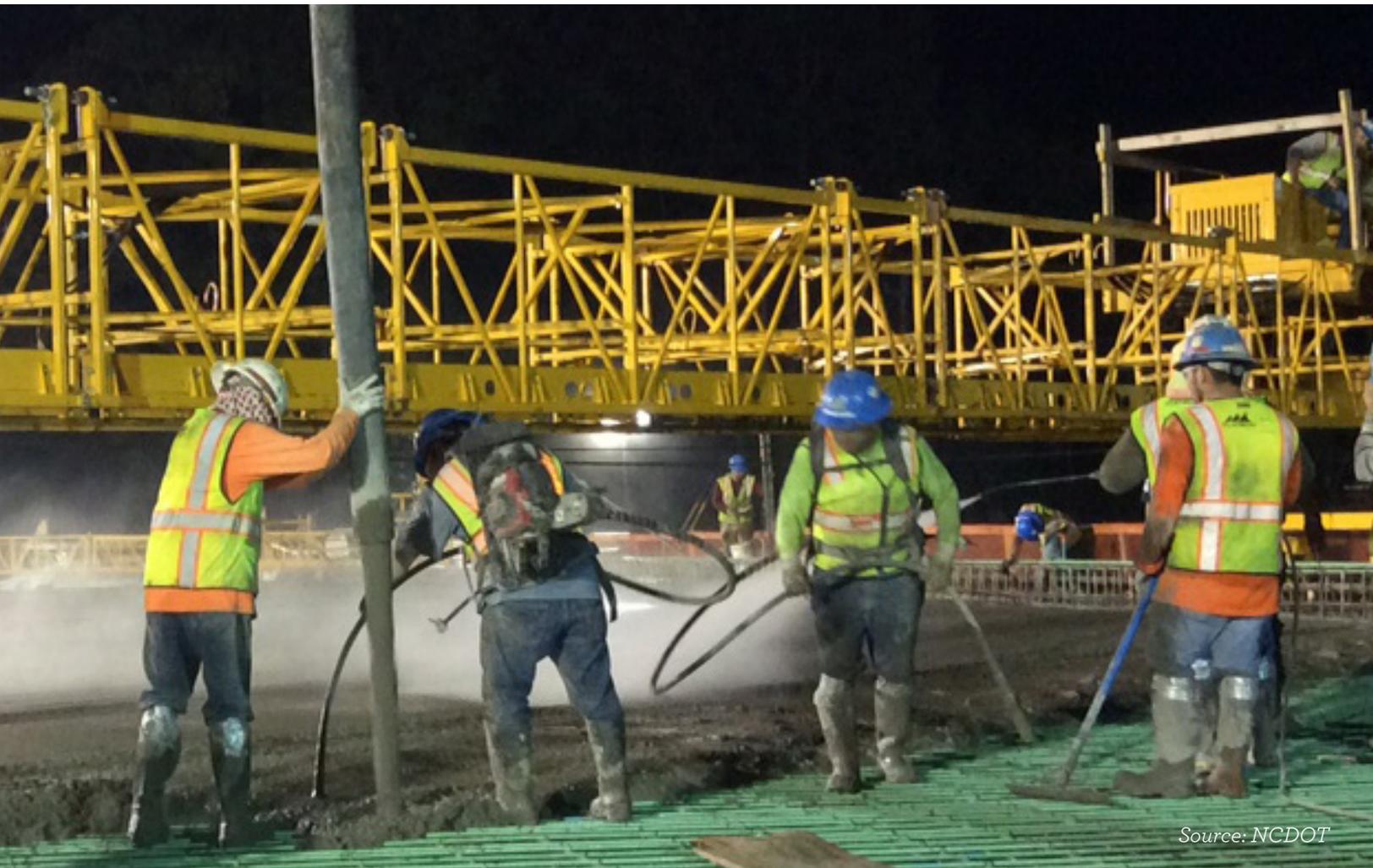
Infrastructure Condition	Annual System Needs in \$ Billions
Very Poor (F)	<\$3.8
Poor (D)	\$3.8-\$4.8
Mediocre (C)	\$4.8-6.3
Good (B)	\$6.3-8.2
Excellent (A)	>\$8.2

Source: ITRE Analysis

Caption: The North Carolina Department of Transportation’s operating budget is approximately \$5.0 billion annually. This investment enables the state to achieve an overall infrastructure rating of mediocre. For more information about transportation system needs and infrastructure conditions see the “Implementation Recommendations” section of the report.

transportation financing through debt service, it may be worth exploring financing options as well.

This report also provides an analysis of land use changes and economic development outcomes associated with highway investments occurring from 2001 to 2016 in North Carolina. Additionally, a discussion regarding the impacts of COVID-19 on driver behavior, transportation revenue, business supply chains, and other considerations is included in Appendix A3.



Source: NCDOT

Economic Importance of Infrastructure Investment

When roads are built, improved, or widened, regional markets expand to new groups of people, potentially spurring additional development, which results in further economic impacts on the surrounding communities. New roads create valuable real estate for commercial businesses, provide the necessary infrastructure and connection for industry, and connect commuters with access to further employment centers, prompting residential development. All of these types of development create jobs, economic contributions, and tax revenues for the region where the road is located. Historical data demonstrates that every \$1 billion of transportation investment in North Carolina generates 14,300 jobs, \$10.3 billion in wages, and \$10.8 billion in gross state product (ITRE, 2015).

For this research, our team developed a methodology to quantify the development surrounding road projects that occurred within the state of North Carolina over the time period of 2001 to 2016 and compared that to the developments surrounding roads that had not been built or improved over that time period. The research team utilized the road classification system maintained by the North Carolina Department of Transportation (NCDOT), to isolate the impacts of different types of roads on development. The analysis included three roadway types - interstates, US routes, and NC highways.



Methodology. To quantify the development surrounding road projects in North Carolina, the research team utilized land use data from the National Land Cover Database (NLCD), ESRI's Business Analyst as well as geospatial analysis capabilities provided by ESRI's ArcGIS. ESRI's Business Analyst is a dataset maintained by ESRI using InfoUSA data that provides the point location, as well as, business specific information for a significant portion of businesses in the United States. The dataset provides the NAICS code, the number of employees, an estimated annual revenue for the location, and the street address for each business point location. These two datasets, combined with the geospatial analysis techniques made possible by ESRI's ArcGIS, were the tools used to quantify the development that occurred around road projects within North Carolina between 2001 and 2016.

For our analysis, development was classified as two distinct measures, the percentage of growth in the number of businesses and jobs within a one-mile buffer of the road project between 2001 and 2016, gathered from the ESRI Business Analyst data, and the square footage of land that developed within a one-mile buffer of a road project between 2001 and 2016. Both measures were included since the number of businesses and jobs provides a direct economic impact created by the road project, and the change in land use development provides an estimate of the total amount of development that occurred, including residential developments, in addition to providing an estimate of the size of the developments that occurred. Using both of these

measures, it is possible to gain an understanding of the type and scale of development that occurred around road projects in the state.

Identifying Road Projects. The research team identified roads that had either been built, widened, or had some form of major road improvement over the time period of 2001 to 2016. For example, the 2001 to 2016 land cover changes for the area surrounding the I-87 and I-440 interchange east of Raleigh are shown in *Figure 2*. Areas shaded in red indicate development, with the darker the shade indicating a higher intensity of development. In 2001, before the I-87 was connected to I-440, the area where I-87 would be located is still green, indicating a mostly forested, undeveloped area. By 2016, this area is now a dark shade of red, and looking at the full picture, it can be seen that the dark red is showing the path of I-87. To identify roads that had been built, widened, or had some form of major road improvement over the period of 2001 to 2016, such as the I-87 and I-440 interchange, the research team identified points in the land cover dataset that were undeveloped in 2001 and then developed in 2016 (from some other color to red). Since land development is not isolated to only road projects, the research team used a buffer analysis, in which the buffer width was the width of a typical road to isolate only the points associated with a road project that was longer than one-fourth of a mile.

Increase in the Number of Businesses and Employment. To determine the percentage increase in the number of businesses and jobs between 2001 and 2016 associated



with road projects in the state, the research team created one-mile buffers around each road project. A one-mile buffer was chosen in an attempt to fully capture any development that may be resulting from a road project, but also to avoid picking up non-related development locations such as city centers.

For comparison purposes, a one-mile buffer was also created for all other road segments in the state that were not built or improved between 2001 and 2016 to show the differences between development resulting from a road project and simply development resulting from being located near a road.

Land Development Area. The research team also quantified the square footage of land that was transformed from some form of undeveloped land cover to developed land associated with road projects within the timeframe of 2001 to 2016 with a one-mile buffer of the roadways.

Findings. Across roadway types, the road projects led to a significant increase in the surrounding development. NC highway road projects had the greatest impact on development, including the following changes from 2001 to 2016:

- The **number of businesses** within one mile of an NC highway project **increased by 73 percent, 48 percent more than unimproved NC highways.**
- The **number of jobs** within one mile of an NC highway project **increased by 35 percent, 16 percent more than unimproved NC highways.**

Figure 2: Land Cover Changes from 2001 to 2016 for I-87 and I-440 Interchanges

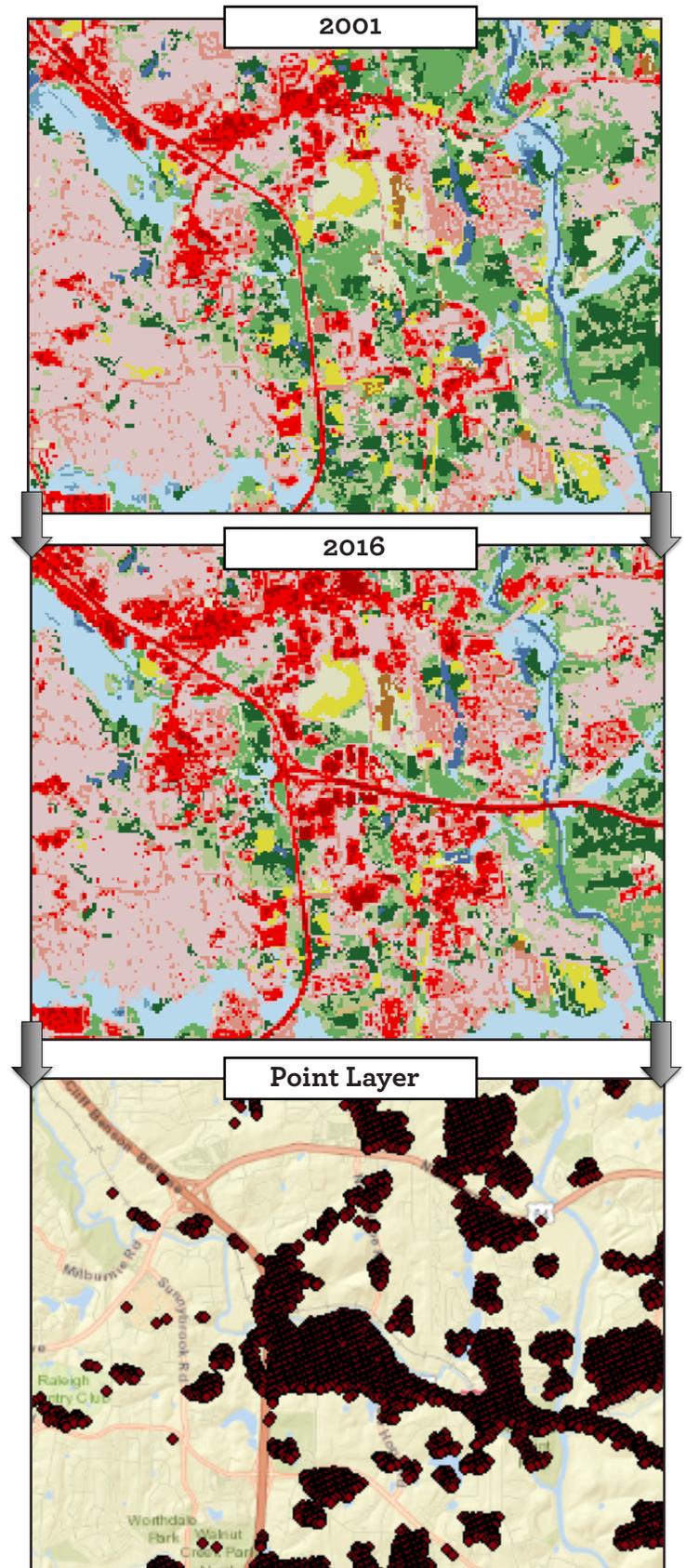


Figure 3: Land Cover Classification Legend

Figure 3 shows land use classifications shown in the first two images of the sequence portrayed in Figure 2. Classifications are consistent with those provided by the National Land Cover Database.

11	Open Water
12	Perennial Ice/ Snow
21	Developed, Open Space
22	Developed, Low Intensity
23	Developed, Medium Intensity
24	Developed, High Intensity
31	Barren Land (Rock/Sand/Clay)
41	Deciduous Forest
42	Evergreen Forest
43	Mixed Forest
51	Dwarf Scrub*
52	Shrub/Scrub
71	Grassland/Herbaceous
72	Sedge/Herbaceous*
73	Lichens*
74	Moss*
81	Pasture/Hay
82	Cultivated Crops
90	Woody Wetlands
95	Emergent Herbaceous Wetlands

Source: ITRE Analysis, 2020

Source: ITRE Analysis, 2020



Figure 4: Change in firms, jobs, and land development within one mile of road projects (2001-2016)

Impact Factor	Interstates	US Highways	NC Highways
Increase in the number of businesses within one mile of the road	3,560 to 6,050 (+69%)	17,250 to 24,250 (+41%)	15,950 to 27,520 (+73%)
Increase in the number of jobs within one mile of the road	47,700 to 84,100 (+76%)	195,000 to 251,400 (+29%)	231,000 to 313,000 (+35%)
Square footage of development within one mile of the road (per mile of road)	2,335,000	4,649,000	7,888,000

Source: ITRE Analysis, 2020

Figure 5: Change in firms, jobs, and land development within one mile of roads without projects (2001-2016)

Impact Factor	Interstates	US Highways	NC Highways
Increase in the number of businesses within one mile of the road	79,700 to 113,700 (+42%)	185,000 to 236,400 (+28%)	165,100 to 205,900 (+25%)
Increase in the number of jobs within one mile of the road	1,096,000 to 1,418,000 (+29%)	2,119,000 to 2,555,000 (+21%)	1,786,000 to 2,122,000 (+19%)
Square footage of development within one mile of the road (per mile of road)	788,000	496,000	441,000

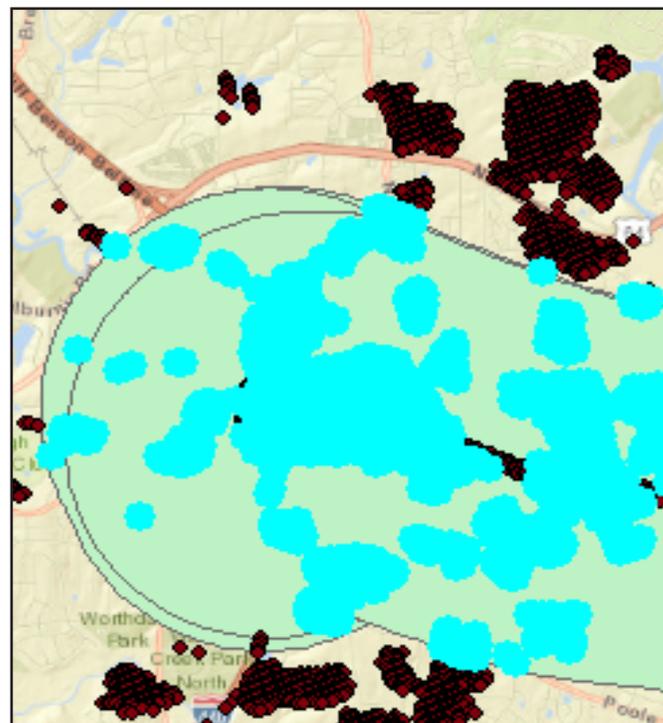
Source: ITRE Analysis, 2020

- **NC highway projects also led to an increase of 7.8 million square feet of development per mile of road, more than 17 times the amount of development associated with unimproved NC highway road segments.**

The magnitude of the impact of NC highways likely has to do with the amount of street front business property associated with NC highways. Interstates had the least nominal amount of square footage of development within one mile compared to the other road classifications, which is likely due to the limited access nature of most interstates. Despite being the least nominally developed, interstate segments with road projects still developed more than three times the amount of square footage than non-road project interstate segments, showing that the construction or improvement of an interstate segment has significant impacts on surrounding development.

Road improvements help catalyze economic activity by providing greater access between and within communities. New construction, road widening, and other improvements can also spur contingent development. Road projects in North Carolina have led to significant amounts of both new business establishments and square footage of development in their surrounding areas compared to similar locations without nearby road projects.

Figure 6: Development within Project Buffer



Source: ITRE Analysis, 2020



Source: Google Street View



Economic Case Studies

Introduction. Across the nation, studies have supported the assertion that transportation infrastructure investment generates economic activity. Economic research from the Federal Reserve Bank demonstrates that every \$1 invested in highway infrastructure gives rise to up to \$3.00 in economic output. Meanwhile, a Congressional Research Services study found that an incremental increase of 1 percent in transportation infrastructure increases private-sector economic output by 0.131 percent in the short term and 0.170 percent in the long term (Stupak, 2018). From providing access to jobs, education, and healthcare, to moving the goods and services relied on by residents and businesses, a high-functioning transportation system is needed to create opportunities that maintain and expand economic development.

In North Carolina, economic development is a component of its transportation funding process. The magnitude of a project's economic potential is a key determinant of whether a project will receive funding.

The recent establishment of the NC First commission has created a renewed focus on transportation investment. Ultimately, the commission is tasked to ensure the state's economic vitality and competitiveness

is upheld through transportation investment. As the state's leadership continues to evaluate the value of infrastructure investment, it has become increasingly important to be able to quantify the economic importance of individual transportation projects. As part of this research, case study projects were selected to study the economic impacts of transportation investment and provide context to how transportation projects support the North Carolina economy. These projects are discussed in detail in the sections that follow.



Economic Development Case Study R-2635D: Veridea Parkway

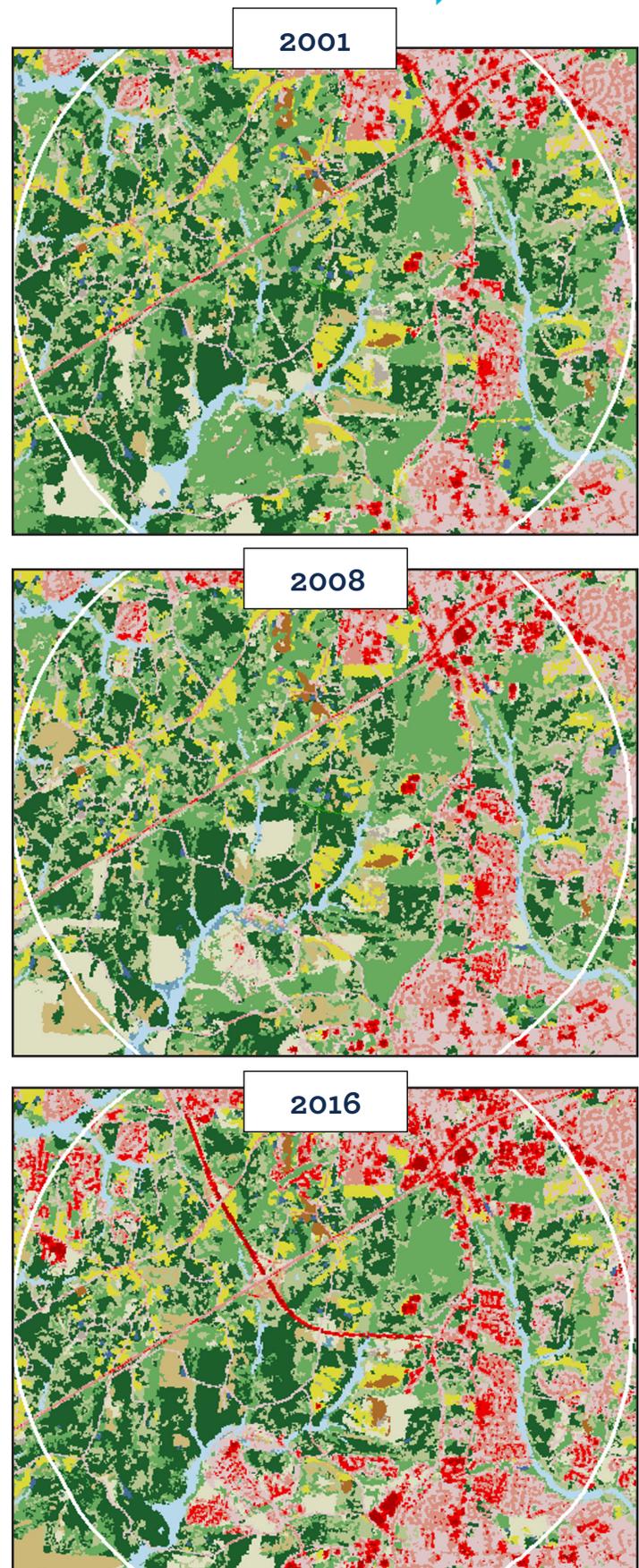
Economic Context. Programmed as part of the 2015 State Transportation Improvement Program (STIP), R-2635D was completed in April 2017. It offers an opportunity to evaluate the economic context of a recently completed infrastructure investment. R-2635D resulted in the addition of a new interchange located between US-1 and NC-55 at Veridea Parkway (formerly known as Old Holly Springs-Apex Road) as well as

another new interchange connecting to the Morrisville Parkway extension. The completed project now provides motorists with additional connectivity to the Western Wake Freeway (I-540) from Holly Springs and reduces travel time to the airport, among other destinations. According to NCDOT estimates, 1,900 vehicles per day traversed Veridea Parkway in 2010; however, that number is projected to increase more than 18 times to nearly 35,000 vehicles per day by 2035 (TBJ, 2017).

Economic Analysis. Economic activities within the R-2635D project area were studied. Economic conditions before-and-after the project was completed were reviewed to explore the economic effects that may be associated with the project. Geospatial and economic analyses were conducted using data from the 2015 NCDOT STIP, ESRI's Business Analyst dataset, and IMPLAN's input/output economic modeling platform. The results are shown in *Figure 7*.

Land Use. Using the National Land Cover Database (NLCD) from the Multi-Resolution Land Characteristics Consortium, the research team analyzed the changes in land use between 2001 and 2016 within a buffer area of 3 miles surrounding the R-2635D project. In 2001, 23.6 percent of the land within three miles of R-2635D was developed. In 2011, the land for I-540 and the Old Holly Springs-Apex Road interchange was cleared, and neighborhoods and developments began showing up in the buffer area, with the percentage of developed land reaching 31.1 percent. By 2016, months before the completion of the Old Holly Springs-Apex Road interchange, the percentage of developed land within the buffer area had reached 36.1 percent, an increase of 12.5 percent over a 15-year period.

Project Area Assessment. Using ESRI's Business Analyst dataset from Infographics USA, the research team analyzed changes in economic activity within proximity of the R-2635D interchange project. In 2014, there were approximately 1,170 firms employing 11,800 workers within three miles of the R-2635D build site. These firms directly supported \$1.8 billion in annual business sales at their companies.



Source: National Land Cover Database



Figure 7: Change in Direct Economic Activity Within Three Miles of R-2635D from 2014 to 2018

Year	Jobs	Employee Earnings	Economic Output
2014	11,800	\$578,300,000	\$1,806,400,000
2018	12,700	\$627,900,000	\$2,217,700,000
Net Difference	900	\$49,600,000	\$411,300,000
Percent Change	7.6%	8.6%	22.7%

Source: IMPLAN, ITRE Analysis

Figure 8: Economic Activity Facilitated by R-2635D Project Expenditures

Year	Project Construction Effects			
	Direct	Indirect	Induced	Total
Jobs	200	60	80	330
Employee Earnings	\$11,300,000	\$3,200,000	\$3,600,000	\$18,100,000
Economic Output	\$18,400,000	\$10,100,000	\$11,600,000	\$40,100,000
State and Local Tax Revenue				\$1,700,000

Source: IMPLAN, ITRE Analysis

Altogether, the direct economic activity originating in the project area, in 2014, supported a total of:

- 11,800 jobs
- \$578.3 million in employee earnings
- \$1.8 million in economic output

In 2018, there were approximately 1,200 firms employing 12,700 workers within three miles of the R-2635D build site. These firms directly supported \$2.2 billion in annual business sales for their organizations.

Altogether the direct economic activities originating in the project area contributed to a total of:

- 12,700 jobs
- \$627.9 million in employee earnings
- \$2.2 billion in economic output

From 2014 to 2018, direct employment grew 7.3 percent within the project area. Comparatively, employment grew in the state of North Carolina at a rate of 6.3 percent over this time period. It's important to note that project R-2635D has only been in operation for two years. The economic effects associated with highway interchange projects may take decades to fully materialize.

Construction Impacts. In addition to making the area within the R-2635D project vicinity more suitable for firm site-selection, the construction of R-2635 supports the improvement of North Carolina's capital stock and supports employment in engineering, construction, and planning firms. The transportation investment of \$18.4 million supports a total of 330 jobs, \$40.1 million in economic output, and generates \$1.7 million in local and state tax revenue, during the R-2635 project period. *Figure 8* provides a breakout of the direct, indirect, and induced effects associated with the construction of this project.



Source: AA Roads

Economic Development Case Study US-70: Goldsboro Bypass

Economic Context. United States Route 70 Bypass at Goldsboro, also known as the Goldsboro Bypass, was built from 2011 to 2016. The 21.7-mile route splits from US-70 just west of Goldsboro, forming a bypass around the city before it merges back into US-70 near La Grange, NC. This road offers an opportunity to evaluate the economic context of a recently completed infrastructure investment. According to NCDOT's annual average daily traffic maps, around 20,000 vehicles per day traversed the Goldsboro Bypass in 2018.

Economic Analysis. Economic activities within the US-70 Bypass area were studied. Economic conditions before-and-after the project was completed were reviewed to explore the economic effects that may be associated with the project. Geospatial and economic analyses were conducted using data from ESRI's Business Analyst dataset and IMPLAN's input/output economic modeling platform. The results are shown in *Figure 9*.

Land Use. Using the National Land Cover Database (NLCD) from the Multi-Resolution Land Characteristics Consortium, the research team analyzed the changes in land use between 2001 and 2016 within a buffer area of 3 miles surrounding the US-70 Bypass. In 2001, 15.9 percent of the land within three miles of the US-70 Bypass was developed. By 2016, the same year that the road was completed, the percentage of developed land within the buffer area had reached 18.8 percent, an increase of 2.9 percent over a 15-year period. This percentage is expected to continue to increase as it can take years for the full impact of road projects to materialize.

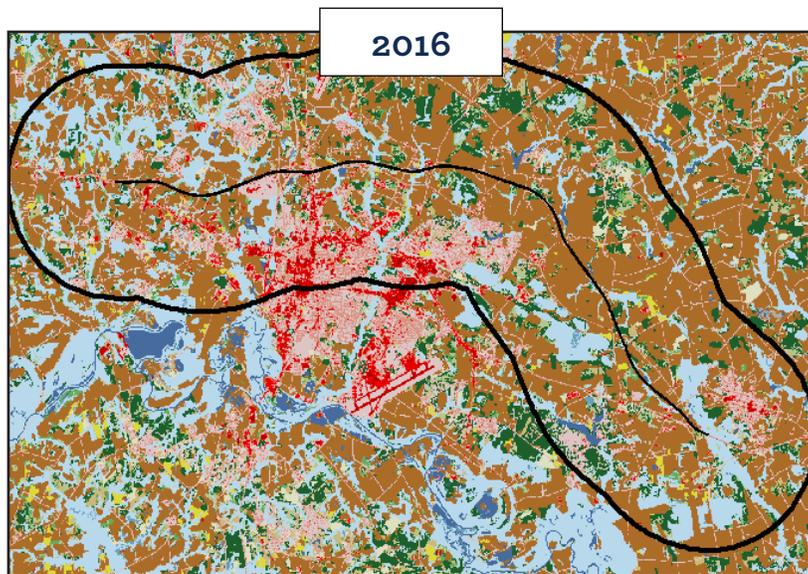
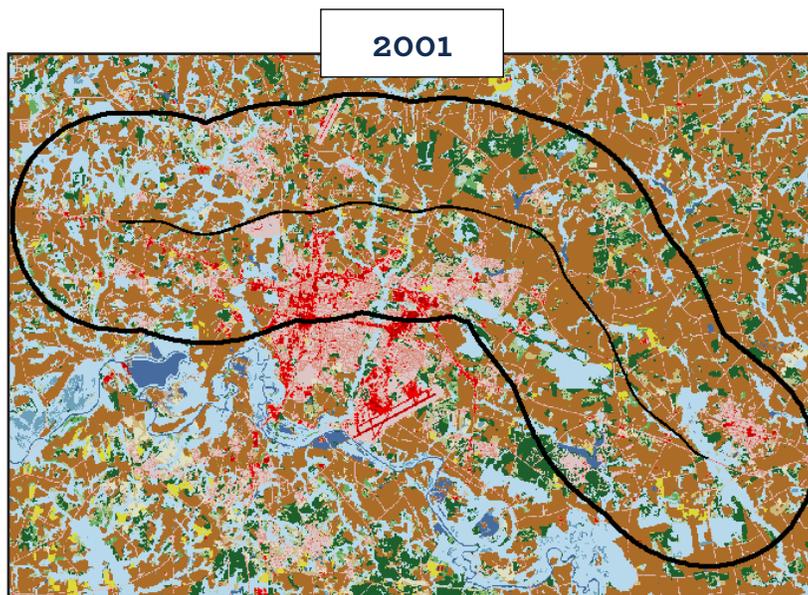
Project Area Assessment. Using ESRI's Business Analyst dataset from Infographics USA, the research team analyzed changes in economic activity within proximity of the US-70 Bypass interchange project. In 2008, a few years before the construction of the bypass had begun, there were approximately 2,233 firms employing 29,700 workers within three miles of the US-70 Bypass. These firms directly supported \$5.7 billion in annual business sales at their companies.



Figure 9: Change in Direct Economic Activity Within Three Miles of US-70 Bypass from 2008 to 2018

Year	Jobs	Employee Earnings	Economic Output
2008	29,700	\$1,666,300,000	\$5,761,100,000
2018	33,200	\$1,758,900,000	\$5,884,200,000
Net Difference	3,500	\$92,600,000	\$123,100,000
Percent Change	11.7%	5.6%	2.1%

Source: IMPLAN, ITRE Analysis



Source: National Land Cover Database

Altogether, the direct economic activity originating in the project area, in 2008, resulted in a total of:

- 29,700 jobs
- \$1.6 billion in employee earnings
- \$5.7 billion in economic output

In 2018, there were approximately 2,476 firms employing 33,200 workers within three miles of the US-70 Bypass. These firms directly supported \$5.8 billion in annual business sales for their organizations.

Altogether, the direct economic activity originating in the project area, in 2018, resulted in a total of:

- 33,200 jobs
- \$1.7 billion in employee earnings
- \$5.8 billion in economic output

From 2008 to 2018, direct employment grew 11.7 percent, direct employee earnings grew 5.6 percent, direct economic output grew 2.1%, and direct state and local tax revenue fell 5.9% within the project area. It's important to note that the US-70 Bypass has only been in operation for four years. The economic effects associated with road projects may take decades to fully materialize.



Source: Google Streetview



Economic Development Case Study NC-148: C.F. Harvey Parkway

Economic Context. North Carolina Highway 148, also known as C.F. Harvey Parkway, was built in stages starting in 2002 and finishing in 2014. The 8.7 mile route connects NC-58 to US-70 in Kinston North Carolina and provides access to both the North Carolina Global TransPark and the Kinston Regional Jetport while also creating a bypass around the town of Kinston to reach US-70. By linking the airport, Global TransPark, and the highway, NC-148 provides a valuable intermodal connection. This road offers an opportunity to evaluate the economic context of a recently completed infrastructure investment. According to NCDOT's annual average daily traffic maps, 5,800 vehicles per day traversed NC-148 in 2018. That number has more than doubled since 2009, when 1,860 vehicles per day traversed the road.

Economic Analysis. Economic activities within the NC-148 project area were studied. Economic conditions before-and-after the project was completed were reviewed to explore the economic effects that may be associated

with the project. Geospatial and economic analyses were conducted using data from ESRI's Business Analyst dataset and IMPLAN's input/output economic modeling platform. The results are shown in *Figure 10*.

Land Use. Using the National Land Cover Database (NLCD) from the Multi-Resolution Land Characteristics Consortium, the research team analyzed the changes in land use between 2001 and 2016 within a buffer area of 3 miles surrounding the NC-148. In 2001, 15.0 percent of the land within three miles of NC-148 was developed. By 2016, two years after the completion of NC-148, the percentage of developed land within the buffer area had reached 16.8 percent, an increase of 1.8 percent over a 15-year period.

Project Area Assessment. Using ESRI's Business Analyst dataset from Infographics USA, the research team analyzed changes in economic activity within proximity of NC-148. In 2001, there were approximately 882 firms employing 13,780 workers within three miles of where NC-148 would be built a few years in the future. These firms directly supported \$2.7 billion in annual business sales at their companies.



Altogether, the direct economic activity originating in the project area, in 2001, resulted in a total of:

- 13,780 jobs
- \$756.8 million in employee earnings
- \$2.7 billion in economic output

In 2018, there were approximately 1,060 firms employing 14,850 workers within three miles of NC-148. These firms directly supported \$2.9 billion in annual business sales for their organizations.

Altogether, the direct economic activity originating in the project area, in 2018, resulted in a total of:

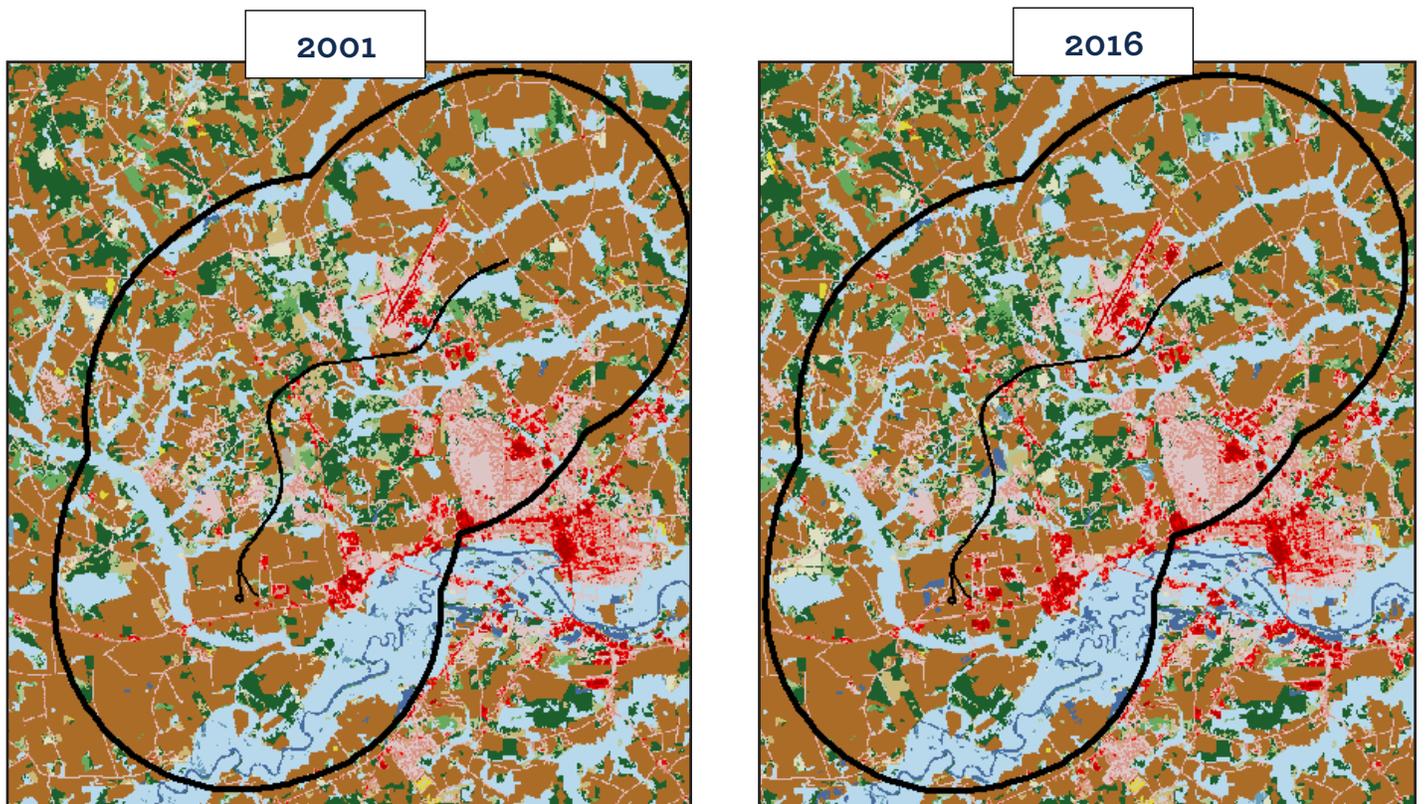
- 28,400 jobs
- \$883.3 million in employee earnings
- \$2.9 billion in economic output

From 2001 to 2018, direct employment grew 8.0 percent, direct employee earnings grew 16.8 percent, direct economic output grew 7.2%, and direct state and local tax revenue grew 105% within the project area. It's important to note that project NC-148 has only been in operation for six years. The economic effects associated with road projects may take decades to fully materialize.

Figure 10: Change in Direct Economic Activity Within Three Miles of NC-148 from 2001 to 2018

Year	Jobs	Employee Earnings	Economic Output
2001	13,700	\$756,400,000	\$2,750,300,000
2018	14,800	\$883,300,000	\$2,949,100,000
Net Difference	1,100	\$126,900,000	\$198,800,000
Percent Change	8.0%	16.8%	7.2%

Source: IMPLAN, ITRE Analysis



Source: National Land Cover Database



Source: Google Streetview



Economic Development Case Study NC-16: Lincoln County

Economic Context. North Carolina Route 16 in Lincoln County is a primary North/South corridor. It connects Denver and Lowesville to Charlotte, NC and I-85 in the South to I-40 in the North. In the mid to late 2000s, NC-16 in Lincoln County was rebuilt parallel to the historical route 16 and was constructed to be a limited access four-lane road. This new larger route has provided sufficient road capacity for new residential, commercial, and industrial development to occur in the region, providing quick, consistent access to both the large metro area of Charlotte as well as two major interstates. According to NCDOT's annual average daily traffic maps, 33,000 vehicles per day traversed NC-16 in Lincoln County in 2018. That number has almost doubled since 2012, shortly after the new route opened, when 17,000 vehicles per day traversed the road.

Economic Analysis. Economic activities within the NC-16 project area were studied. Economic conditions before-and-after the project was completed were reviewed to explore the economic effects that may be associated

with the project. Geospatial and economic analyses were conducted using data from ESRI's Business Analyst dataset and IMPLAN's input/output economic modeling platform. Results are shown in *Figure 11*.

Land Use. Using the National Land Cover Database (NLCD) from the Multi-Resolution Land Characteristics Consortium, the research team analyzed the changes in land use between 2001 and 2016 within a buffer area of 3 miles surrounding the NC-16 in Lincoln County. In 2001, 14.6 percent of the land within three miles of NC-16 was developed. By 2016, four years after the completion of NC-16 in Lincoln County, the percentage of developed land within the buffer area had reached 19.6 percent, an increase of 5 percent over a 15-year period.

Project Area Assessment. Using ESRI's Business Analyst dataset from Infographics USA, the research team analyzed changes in economic activity within proximity of NC-16. In 2001, there were approximately 795 firms employing 5,735 workers within three miles of where NC-16 would be built 11 years in the future. These firms directly supported \$1.1 billion in annual business sales at their companies.



Altogether, the direct economic activity originating in the project area, in 2001, resulted in a total of:

- 5,735 jobs
- \$329.4 million in employee earnings
- \$1.1 billion in economic output

In 2018, there were approximately 1,390 firms employing 10,618 workers within three miles of NC-16 in Lincoln County. These firms directly supported \$1.6 billion in annual business sales for their organizations.

Altogether, the direct economic activity originating in the project area, in 2018, resulted in a total of:

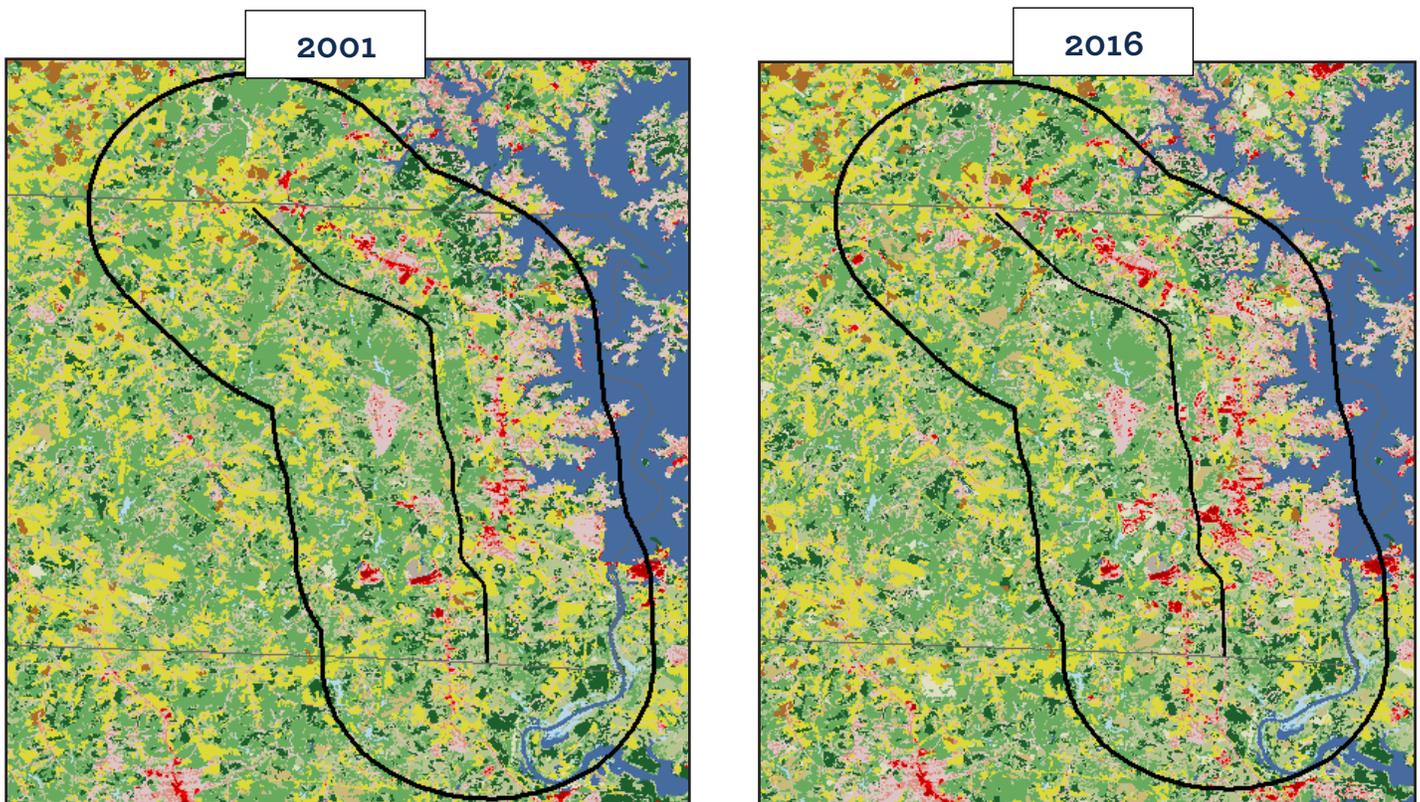
- 10,618 jobs
- \$660.5 million in employee earnings
- \$1.6 billion in economic output

From 2001 to 2018, direct employment grew 85.1 percent, direct employee earnings grew 100.5 percent, direct economic output grew 38.1%, and direct state and local tax revenue grew 46.9% within the project area. It's important to note that project NC-16 has only been in operation for eight years. The economic effects associated with road projects may take decades to fully materialize.

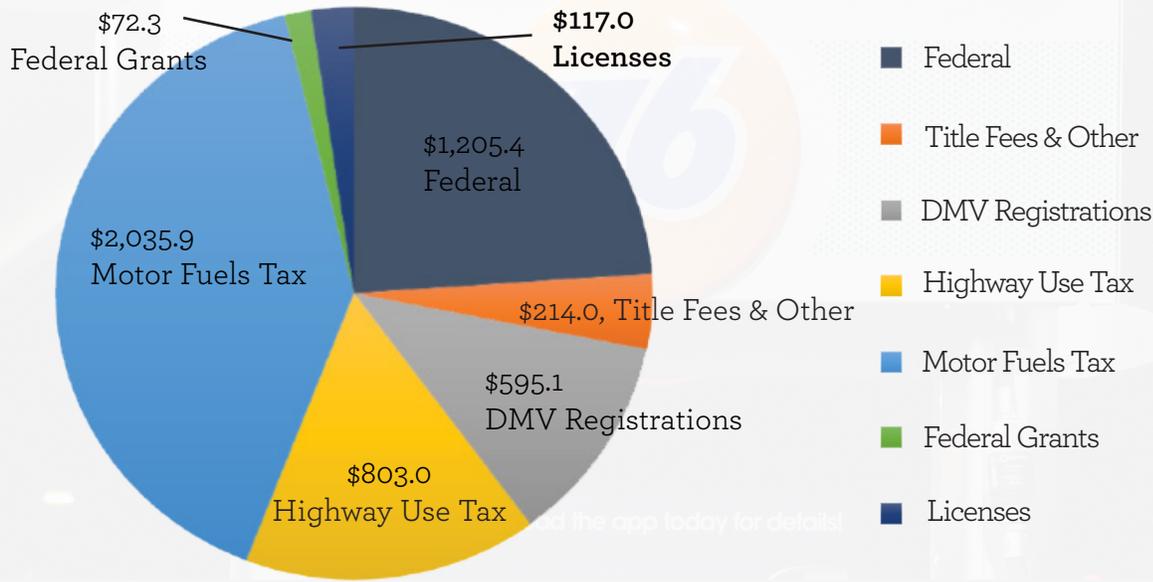
Figure 11: Change in Direct Economic Activity Within Three Miles of NC-16 from 2001 to 2018

Year	Jobs	Employee Earnings	Economic Output
2001	5,735	\$329,400,000	\$1,171,100,000
2018	10,618	\$660,500,000	\$1,617,600,000
Net Difference	4,883	\$331,100,000	\$446,500,000
Percent Change	85.1%	100.5%	38.1%

Source: IMPLAN, ITRE Analysis



Source: National Land Cover Database

Figure 12: NCDOT Revenue Sources in \$ Millions (State Fiscal Year 2019)

Revenue Generation Options

Existing Revenue Mechanisms. North Carolina currently relies heavily on user fees to fund the construction, maintenance, and operation of the state's transportation system. User fees, in which fees are derived from the use of the transportation network to then fund it, serve as a primary method for transportation funding. In fiscal year 2019, NCDOT collected a total of \$5.0 billion in revenue--most of which was derived from user-based sources such as the state gas tax and vehicle registration fees. Specifically, the state collected \$2 billion in state motor fuel tax, \$800 million in highway use tax, \$600 million in vehicle registrations, \$100 million in license fees, \$200 million in vehicle title fees. The state also received \$1.2 billion from federal funding sources (which are also derived from user-based methods such as the 18.4-cents per gallon federal gas tax.) Finally, in 2019, the state also received \$72.3 million in federal grants (NCDOT, 2019a). North Carolina uses these sources of funding to support a wide variety of uses--most of which are dedicated toward the construction and maintenance of the state's highway network.

According to the uses of 2018-2019 NCDOT appropriations, more than half (50.5 percent or \$2.5 billion) goes toward construction activities, whereas \$1.3 billion supports roadway maintenance. Other appropriations of transportation funding include

transfers to other state agencies (\$207.3 million), debt service (\$194.6 million), administration, and other uses (\$364.5 million). As is the case with many other states, a relatively small amount of funding, approximately 7.2 percent, supports non-highway modes (e.g., aviation, rail, public transit, ferry service, and bike and pedestrian services (NCDOT, 2019b).

Leading Revenue Options for North Carolina.

In 2015, *Diversifying Revenues to Improve Commerce and Economic Prosperity*, identified 16 possible options for generating revenue for transportation in North Carolina. Those revenue options were evaluated based on six criteria, including: yield adequacy, stability, implementation and administration, equity, economic efficiency, and public acceptance. Additional information on these criteria can be found in Appendix 1 of this report.

Of the mechanisms evaluated, four options demonstrate the most promise for new or revised use in North Carolina: the road user charge, the state motor fuels tax, the statewide sales tax, and the highway use tax. This report will focus on these four revenue options. The other 12 mechanisms can be referenced in Appendix 2 of this report.

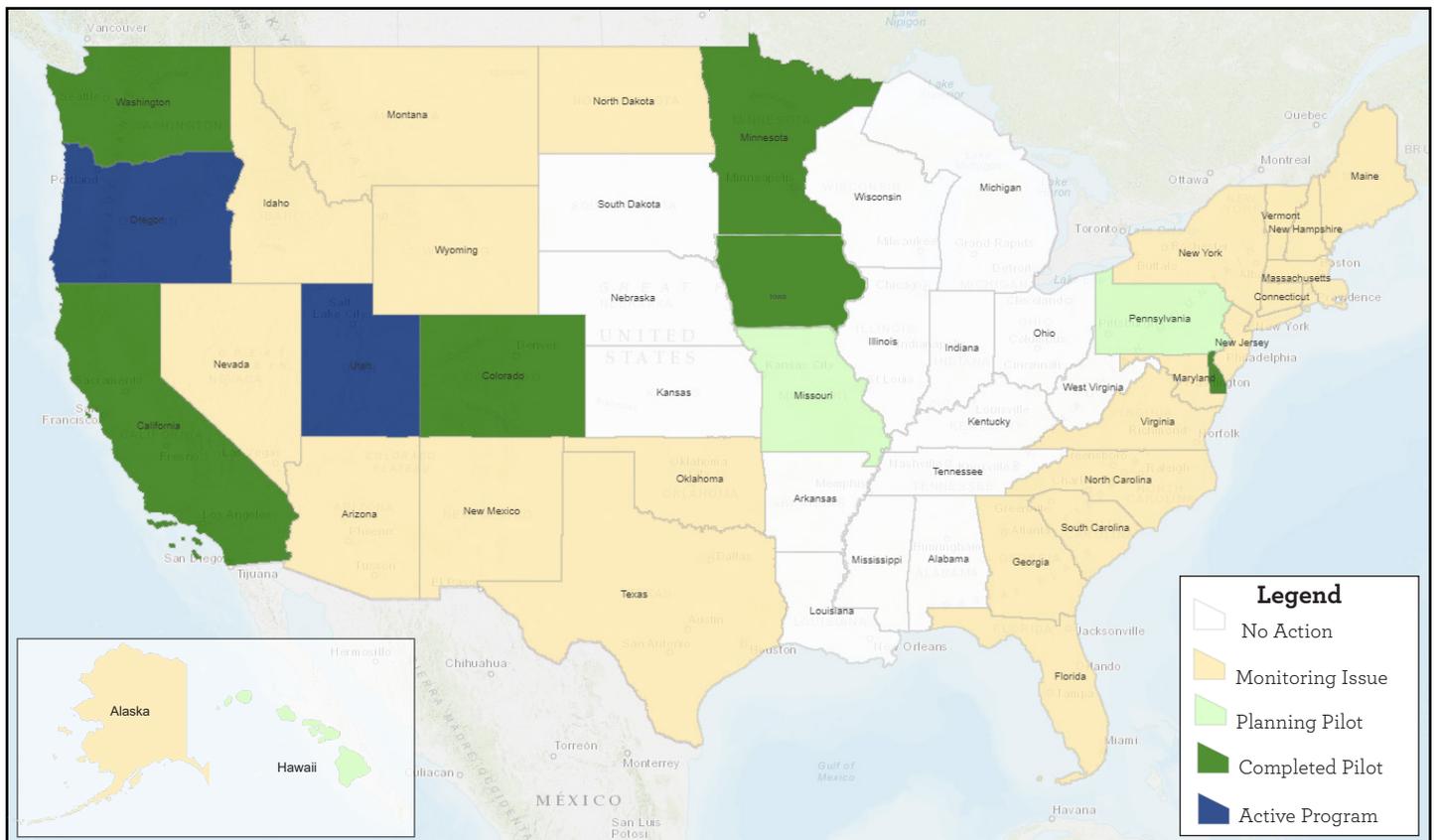


Road User Charge Considerations

A road user charge (RUC), also frequently referred to as a vehicle miles traveled (VMT) tax, VMT fee, or mileage-based user fee (MUBF), is a policy of charging motorists based on how many miles they have traveled. Instead of using a tax on fuel consumption as a way of financing transportation infrastructure, motorists are charged based on their road usage measured in mileage. **These charges can be either a flat fee** (e.g., a fixed number of cents per mile, regardless of where or when the travel occurs) **or a variable fee** based on considerations such as time of travel, congestion levels on a facility, type of road, type and weight of the vehicle, vehicle emission levels, and the owner’s ability to pay. **Or it can be a combination of flat and variable fees.**

In the U.S., 24 states are actively monitoring road user charge policies and programs, eight have either completed or are in the process of planning an RUC pilot program, and two states have active road user charge programs (ODOT, 2020). Comparing that to 2015, at the time of release of the *Diversifying Revenues to Improve Commerce and Economic Prosperity* report, nine states were actively monitoring and two states were engaged in RUC planning or

Figure 13: Road User Charge Activities by State



Source: ODOT, 2020



Road User Charge: By the Numbers

2 States have **active** RUC programs

3 States **are planning** RUC pilot programs

1.8 - 2.4

Range of per mile fees in cents being assessed on drivers participating active RUC programs or pilots

8 States **have completed** RUC pilot programs

24 States **actively monitoring** RUC programs



pilot programs (ITRE, 2015). In five years, there has been a three-fold increase in RUC interest and program enactment in the United States.

National Leaders. The Oregon Department of Transportation may be furthest along among states. According to ITRE correspondence with ODOT staff, Oregon's Road User Fee Task Force met in June to discuss options about introducing legislation that would make statewide RUCs mandatory at some point in the future (Bert, Odom, Bock, and Godfrey, 2020). Currently, ODOT has implemented a voluntary RUC program, which charges its users 1.8 cents per mile (value adjusts annually with inflation) for its RUC program. This rate was chosen to fully offset Oregon's state motor fuels tax rate of 36 cents per gallon (ODOT, 2020).

The Utah Department of Transportation (UDOT) tested administrative challenges associated with RUC implementation by instituting a demonstration program. In their efforts, the state formed the Road User Charge Advisory Committee made up of legislators, researchers, and industry leaders during the development of the demonstration (Utah Code, 2019). Utah Code 72-1-213 establishes the legislative framework for the formation of the committee, its expectations for reporting to legislators, and the establishment of the road user charge as an alternative to the flat registration fee for alternative fuel vehicles.

From an international perspective, countries such as, Germany, Austria, Slovakia, the Czech Republic, Poland, Hungary, Belgium, Russia, Switzerland, and New Zealand have implemented various forms of road user charge fees, which are mostly limited to trucks. Bulgaria has a truck-based system under development.

The relative novelty of road user charges has brought a need to address public trust and agency implementation concerns. Pilot studies are proving to be an effective way to both engage the public and overcome administrative or implementation barriers (Atkinson, 2019). Road user charges are continuing to be implemented and evaluated in different states, primarily within the coastal states (NCSL, 2020). In 2015, Oregon became the first state with a fully operational road usage charge (RUC) program (ODOT, 2020). After analyzing options in pilot studies, Oregon now offers mileage reporting device options to the drivers of the 675 currently active vehicles in the program (ODOT, 2020).

Washington's more recent pilot program spanned a year with 2,000 volunteer participants (MyNorthwest, 2020). In 2016, California also completed a pilot study over nine months with 5,000 volunteer drivers to find that ultimately, about 91 percent of the drivers would participate in another pilot (National Road, 2020).

On the east coast, the Eastern Transportation Coalition is working to increase safety and transportation system efficiency. The coalition has launched an RUC pilot program coinciding with an information gathering campaign on the eastern seaboard. The primary purpose of this effort is to explore the feasibility of replacing the fuel tax with a road user charge across a multi-state environment. In 2018 and 2019, phases 1 and 2 of the pilot were implemented in Delaware and Pennsylvania to better understand road user charges and to hear insights from the general public on the east coast (I95, 2020). Phase 3 is expected to reach North Carolina, New Jersey, and Virginia during the summer of 2020. During this phase, information will be gathered from North Carolina residents regarding the implementation of an RUC program along the east coast (I95, 2020).

Finally, it is worth noting that four states have implemented mandatory road user charges, which apply only to commercial trucks: Kentucky, New Mexico, New York, and Oregon. Seven other states had truck RUCs in the past but repealed them—in some cases, at least partly because evasion rates were estimated at 25 percent or more. Kentucky charges a flat rate of about 3 cents per mile; the other three states charge rates that vary by truck's weight, ranging from 1 to 29 cents per mile. Oregon has the highest rates, but vehicles subject to the tax are generally exempt from the state's fuel tax (CBO, 2019). Two states have more limited programs of road-user charges for trucks. Illinois has a voluntary road user charge tax program for trucks operating within the state. Participants pay a lower annual registration fee and are charged rates ranging from about 3 cents to 28 cents for each mile in excess of a yearly allotment. Of 10,690 participants in 2018, only 1,285, or 12 percent, exceeded their allotment in 2018. Rhode Island has begun a program to collect tolls from combination trucks—those with at least one trailer or semitrailer—at 12 locations, mostly on interstate highways; the program acts like a road user charge tax for through traffic using the tolled roads (CBO, 2019).

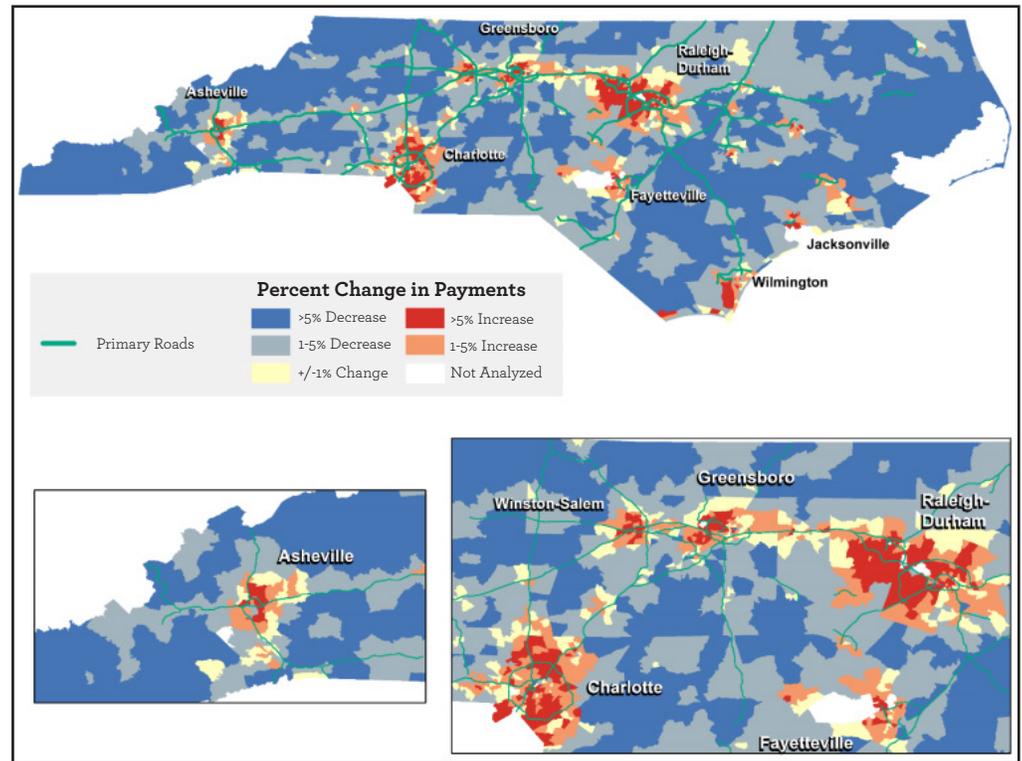


Public Perceptions on RUC Fairness.

Many North Carolinian drivers perceive an RUC as unfair to rural residents. According to recent research, 81 percent of residents felt that an RUC would be unfair to them, whereas 59 percent of urban residents felt this would be the case (DHM Research, 2020). However, contrary to this perception, an RUC system would actually save money for the average rural household. It is estimated that the average rural household pays \$343 annually in motor fuels taxes, but would pay \$326 under a revenue neutral RUC program (\$17 less annually; EBP 2020). This is due to several reasons, but one primary reason is that rural residents already pay a disproportionately higher amount of taxes in the form of more gas taxes per the miles driven. This is because vehicle fuel efficiency tends to be lower in rural counties, with vehicle fuel efficiency almost 14 percent higher in large metro urban areas than compared to rural areas.

Urban residents generally drive less and spend approximately \$217-\$253 in annual motor fuels taxes, depending on the size of the urban area (EBP, 2020). Under a revenue-neutral RUC program, urban households would spend slightly more, ranging from an additional \$1-\$17 annually (EBP, 2020). Though urban residents would pay slightly more, their annual motor fuels tax burden would still be notably less than rural households.

Figure 14: Household Spending Changes Between the Gas Tax and an RUC



Source: EBP, 2020

Figure 15: Annual Change per Household Under an RUC Program

Geography	Average Annual Fuel Tax per Household	Annual Change Per Household
Large Metro Urban	\$217	\$17
Large Metro Suburban	\$253	\$10
Small Urban	\$234	\$1
Mixed	\$358	-\$8
Rural	\$343	-\$17
All Urban	\$243	\$10
Statewide	\$297	\$0

Source: EBP, 2020

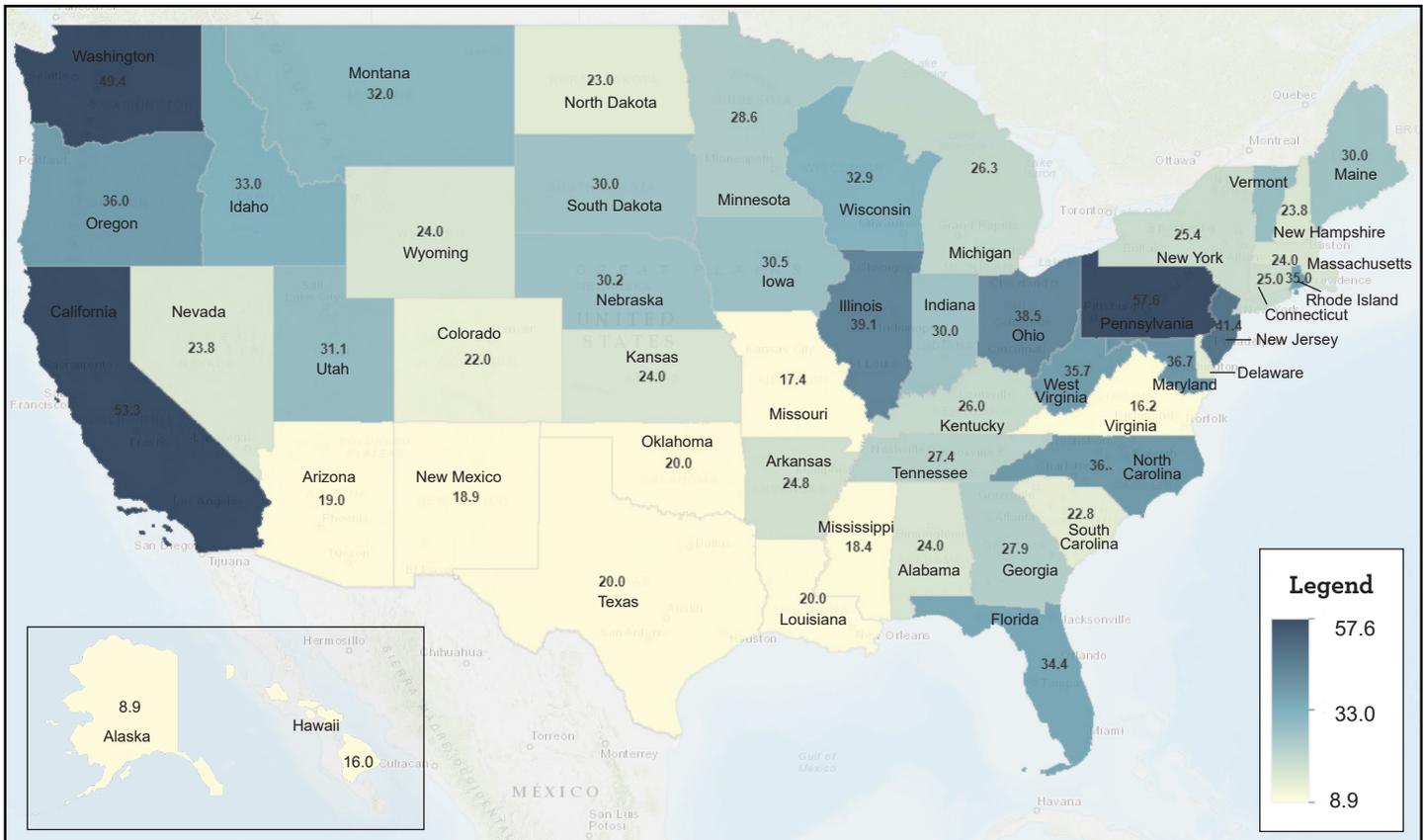
State Motor Fuels Tax Considerations

A fuel tax is an excise tax imposed on the sale of fuel. In most countries, the fuel tax is imposed on fuels that are intended for transportation. Fuels used to power agricultural vehicles and/or home heating oil, which is similar to diesel, are taxed at a different, usually lower rate. Every state imposes its own tax on gas (shown in *Figure 17*). As of January 2020, drivers pay an average of 28.5 cents in state taxes on every gallon of gasoline, plus the federal fuel tax – adding up to an average 46.9 cents in total taxes on every gallon.

Currently, we are heavily dependent on our state motor fuels tax. North Carolina charges a 36.2-cent tax on each gallon of motor fuel (gasoline and diesel) purchased. Gas tax revenues are NCDOT’s largest funding source, and the law requires these revenues to be used only for transportation purposes.

Tax rates for diesel and gasoline vary by state, but California and Pennsylvania have the highest rates for both categories (State MFT, 2020). North Carolina has a gasoline and diesel motor fuel tax near the national average,

Figure 16: State Motor Fuels Tax Rates by State (Cents per Gallon)



Source: Federation of Tax Administrators, 2020

State Motor Fuels Tax Rates: By the Numbers

36.2 North Carolina’s **motor fuels tax rate** in cents per gallon

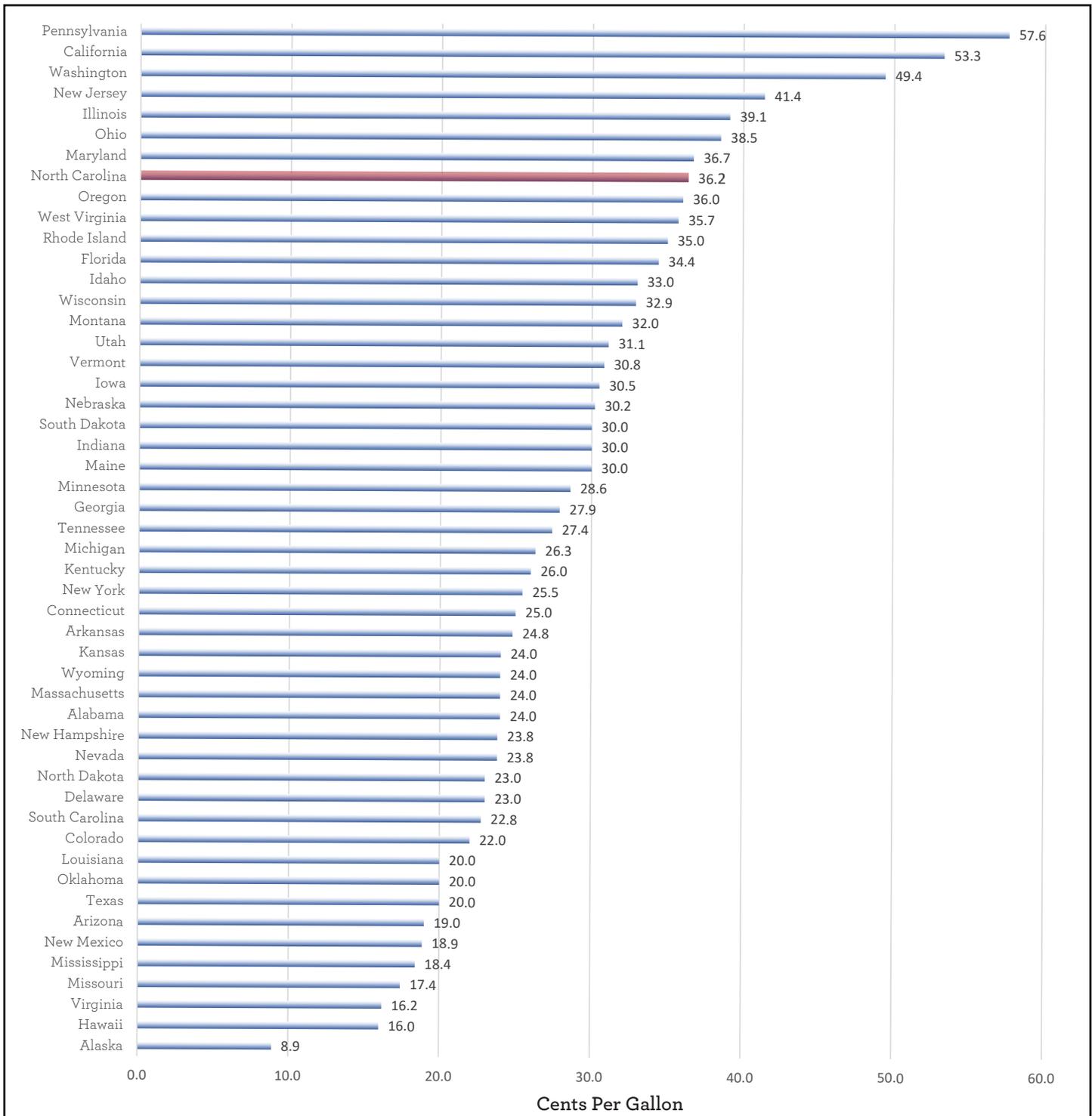
57.6 **Highest** state motor fuels rate in cents per gallon, found in Pennsylvania

7 Number of states that charge a **more expensive gas tax** rate than NC

40.4 **Percent of North Carolina’s transportation budget** composed of the the state motor fuels tax



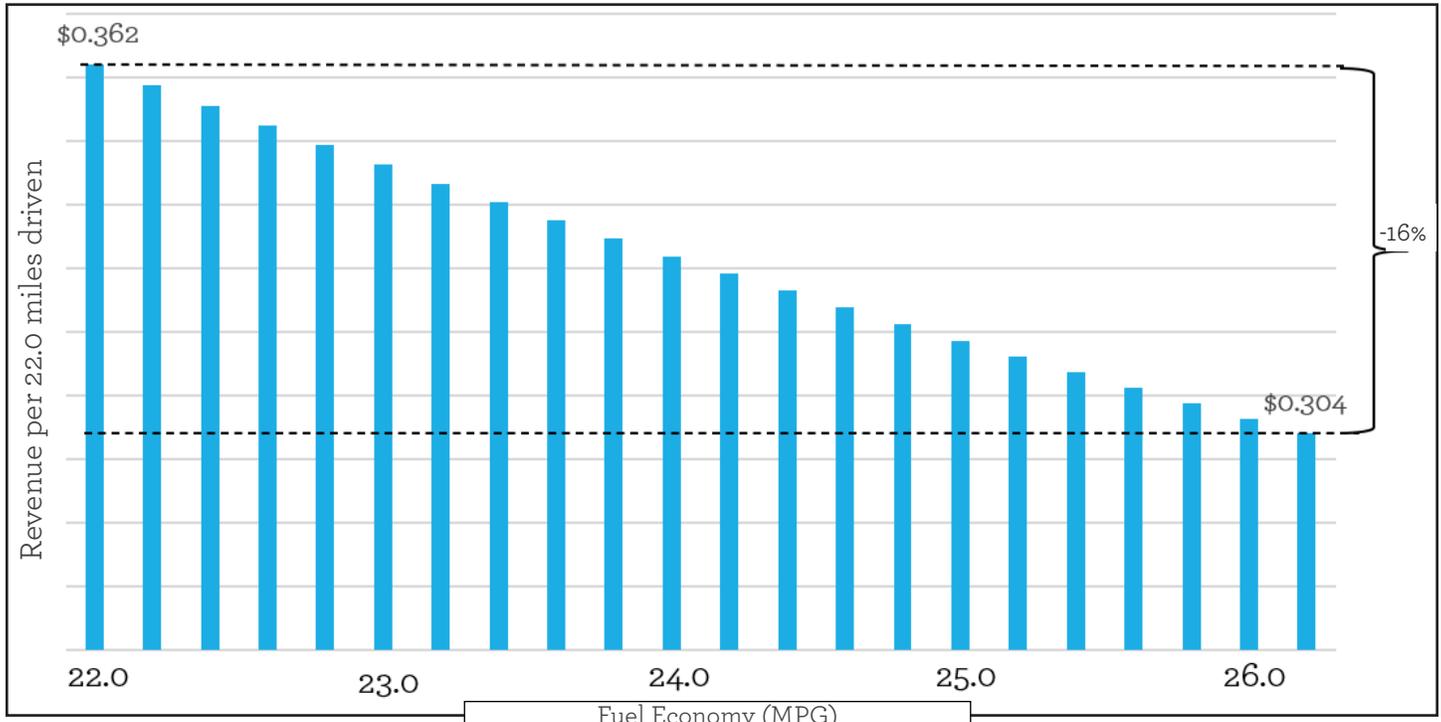
Figure 17: State Motor Fuels Tax Rates by State



Source: Federation of Tax Administrators, 2020



Figure 18: Incremental Revenue Losses from Fuel Economy Improvements

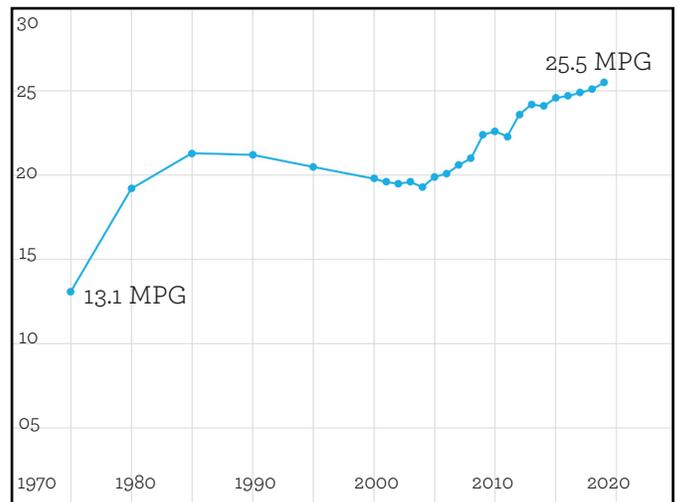


but approximately 8 cents higher per gallon (State MFT, 2020). The state ranks eighth in the nation for the highest motor fuels tax rate (Federation of Tax Administrators, 2020).

The existing gas tax in North Carolina is not accumulating enough revenue to compete with driving behaviors and the increased rate at which fuel efficient vehicles are being purchased (NC FIRST Commission, 2019). Every year the U.S. vehicle fleet travels 0.2 miles farther per gallon of gasoline purchased (EPA, 2019). In 2019, the average NC motorist achieved a vehicle fuel economy of 22.0 miles per gallon and is projected to obtain a fuel efficiency of 26.2 miles per gallon in 2040 (NC First Commission, 2020; EPA, 2019).

As vehicles become more fuel efficient and electric vehicles replace their petroleum counterparts, the motor fuels tax becomes less effective at accumulating the revenue necessary to support the system. In 2019, for every 22.0 miles driven, North Carolina collected \$0.362 in motor fuels revenue from the average driver. If our average fuel economy improved to 26.2 mpg (projected NC fuel economy in 2040), the state would collect \$0.310 for every 22.0 miles driven. This is equivalent to a 16 percent loss in revenue due to fuel economy improvements.

Figure 19: Actual U.S. Fuel Economies Over Time



Source: EPA 2019

A number of states are implementing or attempting to implement motor fuels tax measures to combat decreasing fuels tax rates. Montana is raising the gas and diesel tax incrementally by 6 and 2 cents per gallon, respectively, through 2023 (NCSL, 2019). Pennsylvania took another approach and replaced its cents-per-gallon fuel tax with a change in the oil company franchise tax (NCSL, 2019). Some states like West Virginia and Virginia have a variable or percentage-based tax rate on the wholesale price of fuel (NCSL, 2019). Thus, there are many options for states to implement a motor fuels tax.



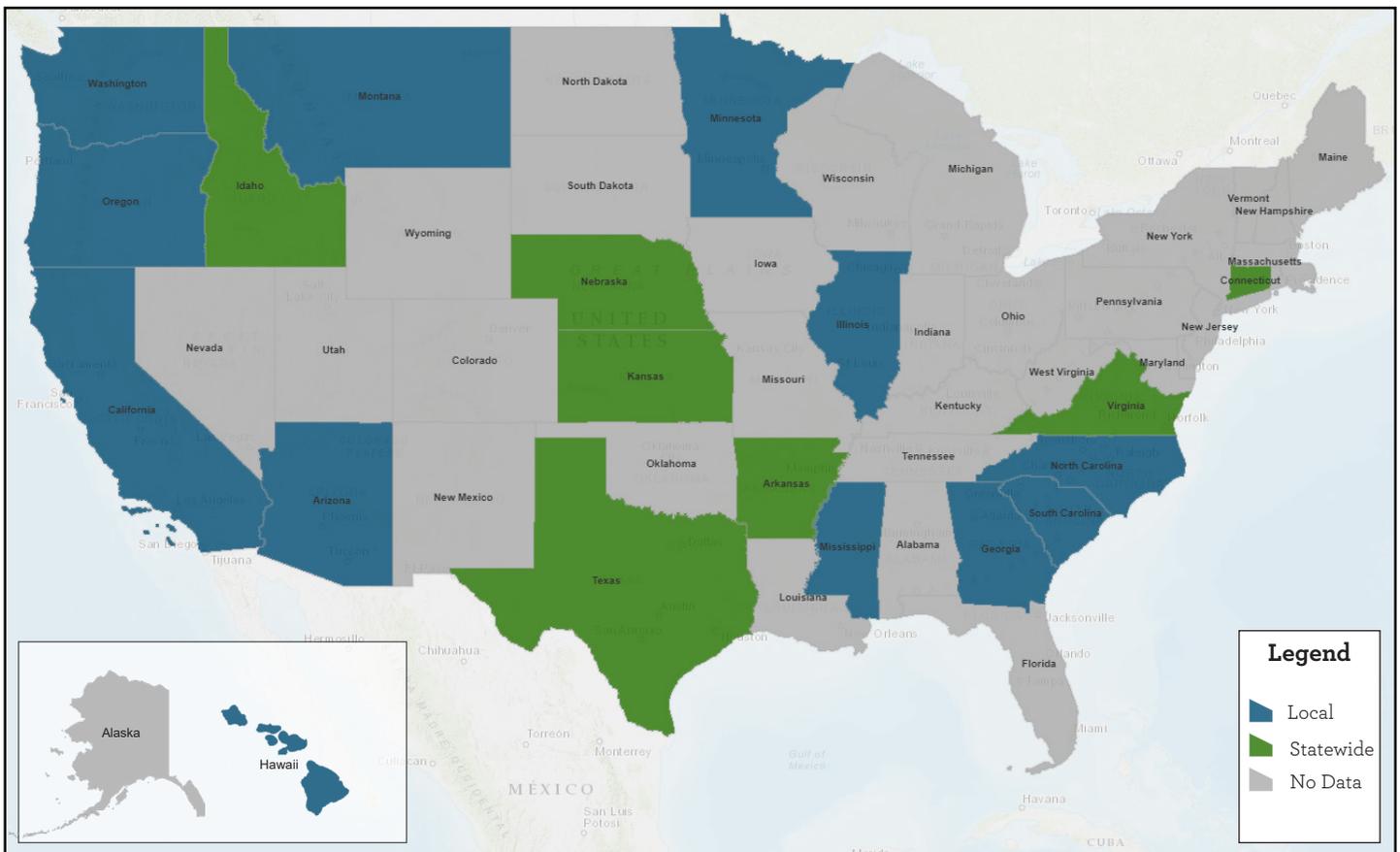
Dedicated Sales Tax Considerations

Sales taxes apply to the sale or lease of most goods and some services. States may also levy selective sales taxes that are used to finance their transportation systems. This may include granting local governments the authority to impose additional tax increments for transportation purposes.

North Carolina has a state-levied sales tax of 4.75 percent, effective July 1, 2011, with most counties adding a 2 percent tax, for a total tax of 6.75 percent in 72 of the 100 counties. The state does allow counties to impose a 0.5 percent sales tax to support public transit, decided by popular vote (NC Code Ch. 105 Art. 43). Durham, Mecklenburg, and Wake counties levy an additional 0.5 percent tax, which is directed towards funding their respective transit systems.

From 2013 to 2020, a total of 26 bills related to the use of sales taxes for transportation system funding have been enacted (NCSL, 2020). All states using the state sales tax method employ other methods to fund transportation

Figure 20: States That Have Implemented Transportation-Specific Uses of Sales Tax



Source: ITRE Analysis, 2020



Sales Tax for Transportation: By the Numbers

12 States with **local sales tax options** devoted to transportation

1.75 Percent of **Virginia's sales tax receipts** dedicated to transportation funding

7 States **with statewide sales tax revenue** directed to transportation projects

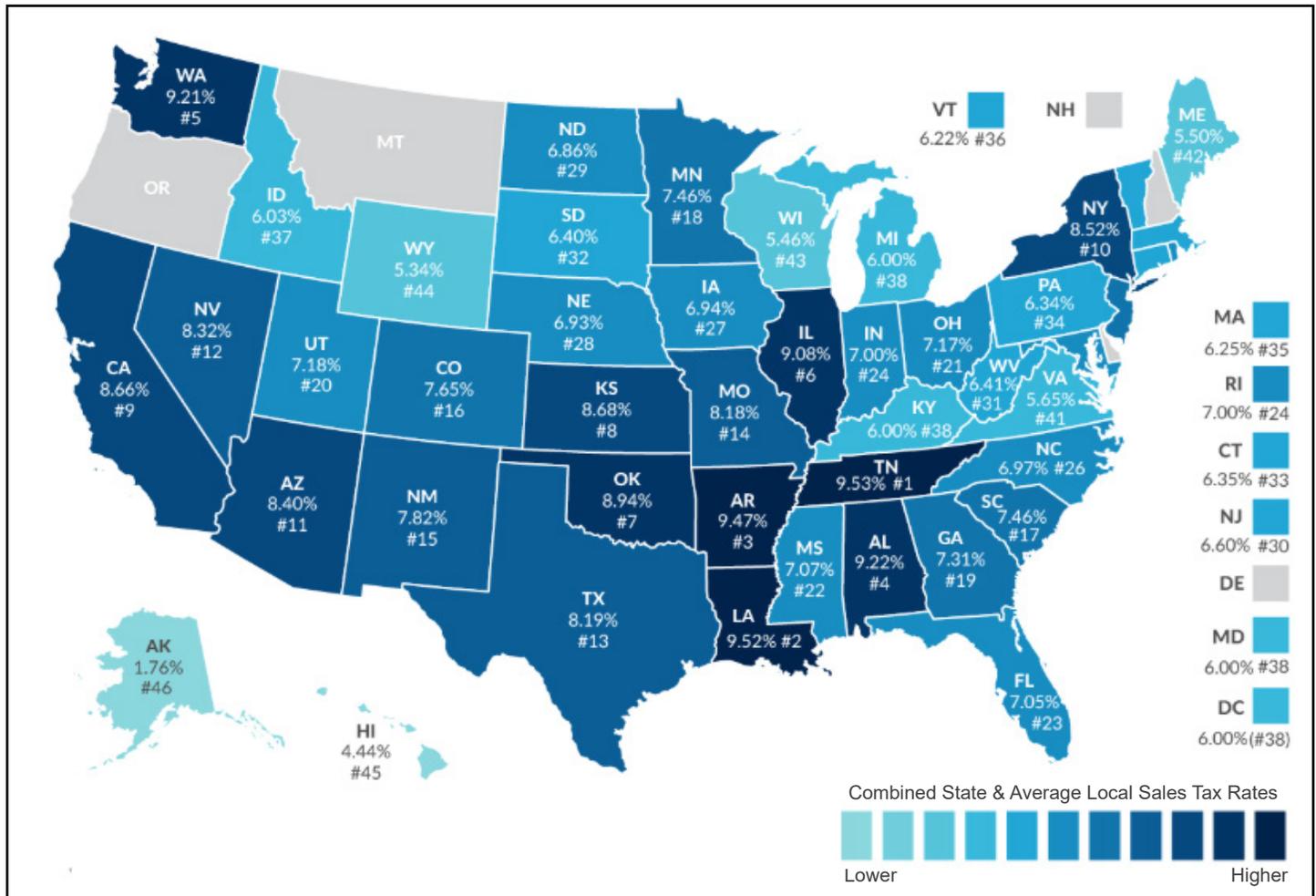
2.5 **Billions of dollars in sales tax revenue** that will be diverted to transportation purposes in Texas

Figure 21: Dedicated Transportation Uses of State and Local Sales Taxes

State	Purpose	Tax Rate
Arizona	Proposition 400 was passed by voters for a 20-year half-cent sales tax for transportation projects in Maricopa County. Sales tax revenues will be used for freeways, major arterial streets, and public transportation systems on the State Highway System.	0.5%
Arkansas	Arkansas diverts 0.5% of its sales tax is to fund the state's four-lane highway system, country roads, and city streets.	0.50%
California	Sales tax revenue is directed to the Local Transportation Fund (LTF). It includes financing for all transportation services, including transit services.	0.25%
Connecticut	The sales tax dedicated to transportation funding is for former Governor Dannel Malloy's transportation plan. The plan will take place over 30 years with \$100 billion to repair the state's aging transportation network.	0.50%
Georgia	The city of Atlanta to levies a retail sales and use tax to provide public transportation in the metropolitan area.	1.00%
Hawaii	The 0.5% sales tax was established as a dedicated funding source for Hawaii transportation (rail) projects, beginning with the Honolulu High-Capacity Transit Corridor Project.	0.50%
Idaho	A 1% sales tax would be dedicated to transportation projects. An additional one percent is being discussed.	1.00%
Illinois	Illinois law authorizes the Regional Transit Authority (RTA) to impose a sales tax throughout the six-county Northeastern Illinois region. In Cook County, the RTA imposes a 1.25% sales tax, whereas in DuPage, Kane, Lake, McHenry, and Will Counties the rate is 0.5%. The RTA sales tax is expected to generate approximately \$1.3 billion in 2020.	0.5-1.25%
Kansas	The State Highway Fund controls the transportation projects that are funded. Approximately \$533 million of Kansas DOT's \$1.8 billion annual budget is funded through sales taxes.	(no data)
Minnesota	On March 21, 2017, the County Board imposed a 0.25% transit sales tax to help fund road, bridge and transportation-related projects within Olmsted County. This 0.25% transit sales tax will be used for projects identified in the 2017-2041 Transportation Capital Improvement Plan, as well as bonded debt issued in the past for transportation projects.	0.25%
Mississippi	Mississippi authorizes a portion of sales tax revenue to be diverted for redevelopment projects under the Tax Increment Financing Act. Sales tax diversion only occurs if the county has issued bonds to finance all or a portion of such redevelopment project.	(no data)
Montana	A resort and local option tax collects revenue from residents in small Montana communities to support transportation services for seniors and people with disabilities.	Portion of general sales and use tax
Nebraska	Sales tax receipts are dedicated to the expansion of the Expressway System, federally designated High Priority Corridors, and preservation of the existing transportation system.	0.25 - 0.5%
North Carolina	The state does allow counties to impose a 0.5 percent sales tax to support public transit, decided by popular vote (NC Code Ch. 105 Art. 43). Durham, Mecklenburg, and Wake counties levy an additional 0.5% tax, which is directed towards funding their respective transit systems.	0.5%
Oregon	The transit tax goes into the Statewide Transportation Improvement Fund for all transportation service improvements other than those involving light rail.	0.1%
South Carolina	South Carolina allows counties to impose a 1 percent sales tax for approved capital projects. This is intended for use in counties with a demand for infrastructure with commercial hubs.	1.00%
Texas	An allotment of \$2.5 billion of the state sales tax revenue will be reserved for transportation, so long as overall sales tax receipts are at least \$28 billion.	(no data)
Virginia	1.75% of the sales tax revenue would be directed to transportation. In Northern Virginia, the funds can be used on road and transit projects. Hampton Roads' funding is restricted to road, bridge, and tunnel projects.	0.70%
Washington	Sound Transit may impose a 0.4% sales tax, and/or a property tax of 25 cents per thousand dollars by referendum for the creation of passenger ferry funding districts.	0.40%

Source: ITRE Analysis

Figure 22: Sales Tax Rates by State



Source: Tax Foundation, 2020

projects. These tax levies are intended to provide supplemental revenue for transportation projects. Based on findings from NCSL and an in-depth review of state tax policies, it was found that at least 19 states have enacted statewide or local tax options to support transportation funding (see Figure 20). North Carolina does not collect sales tax to fund transportation projects, though it offers a local sales tax option for counties. The sales tax rates dedicated to transportation funding vary by state and can either be collected as a percentage or a flat rate (see Figure 21).

In January 2020, the Tax Foundation evaluated the combined state and average local sales tax rates for the fifty states. North Carolina is ranked 26 of 50 for its combined sales tax rate (a rank of 50 equates to the lowest tax rate), see Figure 22.

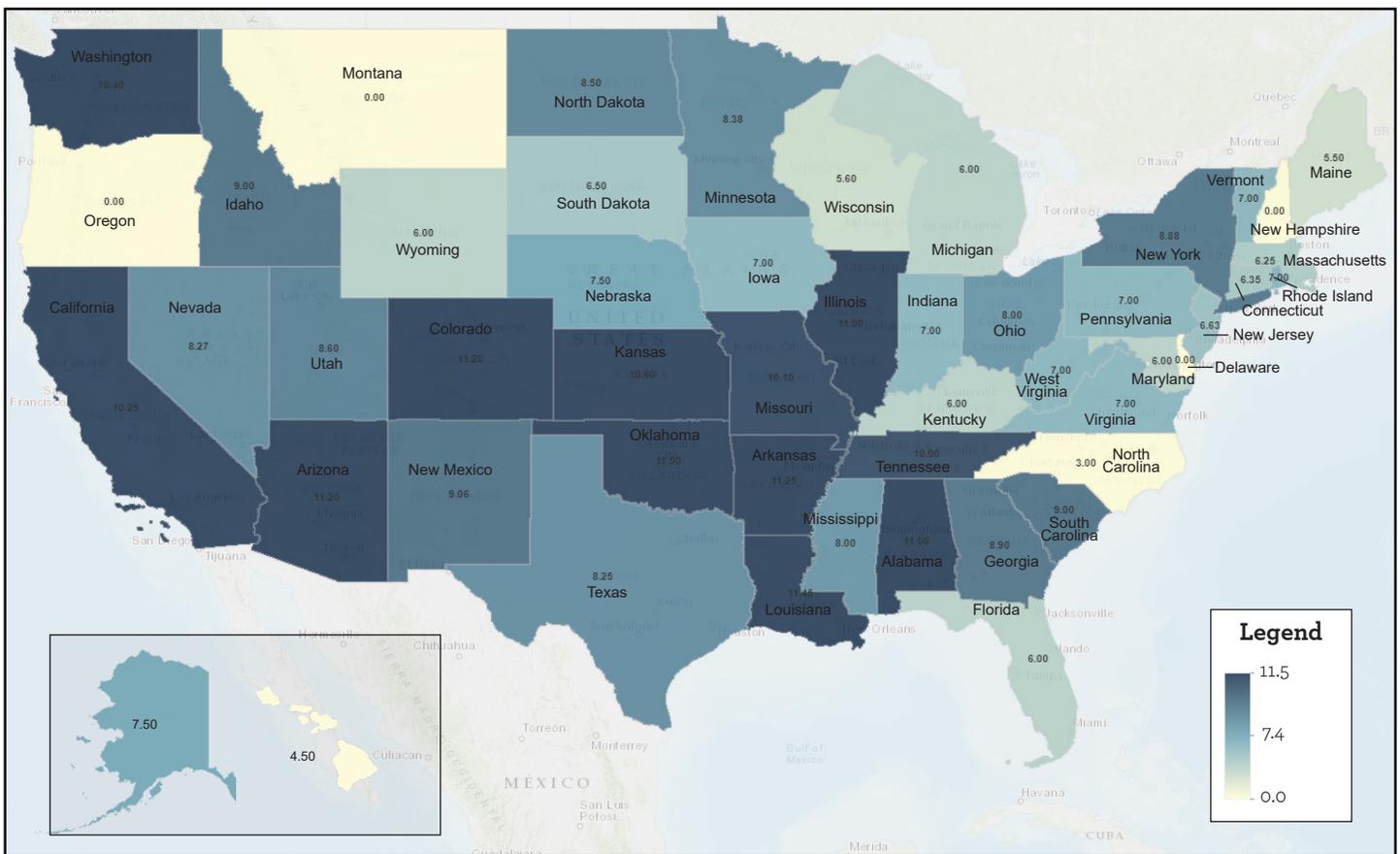
Noteworthy Sales Tax Uses. Virginia, Kansas, Texas, Arkansas, and Idaho are national leaders in their use of sales tax revenue for transportation projects. Virginia directs 1.75 percent of its sales tax receipts to transportation, which equated to approximately \$833.5 million in transportation revenue in fiscal year 2019 (VDOT, 2019). Kansas directed \$533 million in sales tax receipts to its state highway fund in FY2019 (KDOT, 2019). Meanwhile, Texas sets aside sales tax revenue to fund highways. Specifically, \$2.5 billion of the state sales tax revenue will be reserved for transportation, so long as overall sales tax receipts are at least \$28 billion (Transportation for America, 2017). Arkansas uses the sales tax revenue for the state's largest, most comprehensive highway funding plan (Ballotpedia, 2020). Idaho imposes a 1 percent state sales tax to support transportation revenue (Goble, 2020). This rate may increase to 2 percent, if the Idaho General Assembly can gain the support of the governor (Idaho Legislature, 2020).



Highway Use Tax Considerations

In 1989, the state switched from a sales tax on vehicle purchases to the Highway Use Tax (HUT). Today, whenever a vehicle title is transferred in North Carolina, the buyer is charged a one-time, 3 percent HUT on the vehicle’s purchase price, less any trade-in value if the vehicle was purchased at a dealership (NC First Commission, 2019). A primary motivation for this change was direct revenues associated with vehicle purchases into North Carolina’s Highway Trust Fund. North Carolina’s HUT functions similarly to a vehicle sales tax or a sales and use tax, which are the mechanisms predominantly used in other states to direct sales tax revenue from vehicle sales into a transportation fund. Some states impose vehicle specific taxes in lieu of a state sales tax, while other states direct a portion of their vehicle sales tax revenue into transportation accounts. In North Carolina, a highway use tax (HUT) is a tax collected in lieu of a sales tax at the title transfer of a vehicle (North Carolina Department of Transportation 2020).

Figure 23: Vehicle Sales Tax Rates by State



Source: ODOT, 2020

Highway Use Tax: By the Numbers

372 Average HUT revenue generated in dollars from a car purchase in **North Carolina**

16 **Percentage** of NCDOT’s budget funded by the HUT*
*Includes both state and federal revenue sources

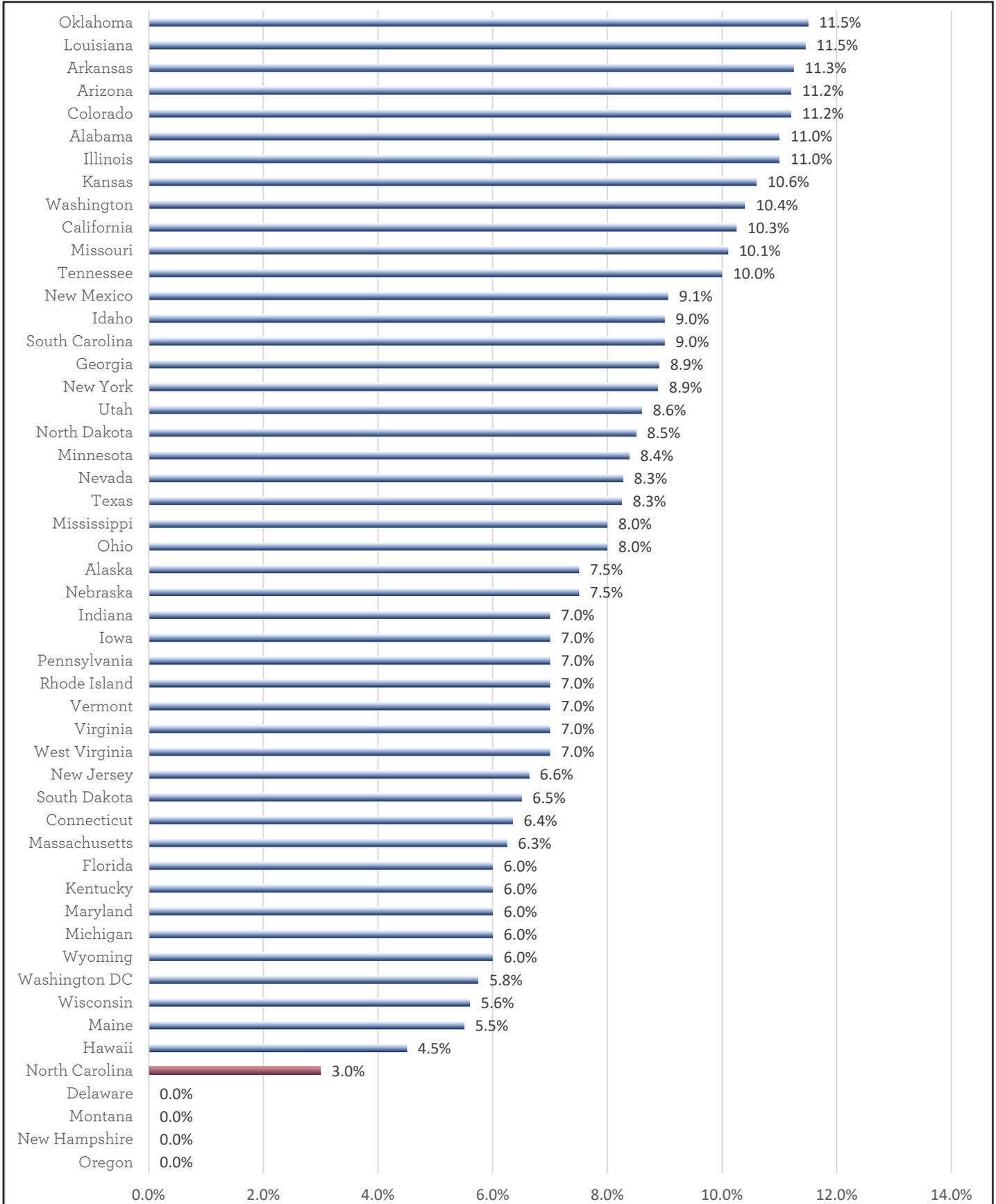
275 **Millions of dollars in additional revenue** NC would generate annually if it raised its HUT from 3 to 4 percent

868 Average sales tax revenue generated in dollars from a car purchase in **Tennessee** or **Georgia**

2nd **Lowest effective vehicle sales tax rate** in the U.S.



Figure 24: Effective Motor Vehicle Sales Tax Rates by State



Source: World Population Review, 2020



Figure 25: Tax Revenue per Average Vehicle Sale

State	Revenue ¹
North Carolina	\$372
Georgia	\$868
South Carolina	\$500
Tennessee	\$868
Virginia	\$515

¹Based on the purchase of a \$16,400 vehicle
 Source: NC First Commission, 2020

For North Carolina drivers who rent or lease a vehicle, they are imposed what is called an Alternative Highway Use Tax (AHUT). For this tax, a long-term lease or rental is charged a 3 percent rate on gross receipts. Revenues from the long-term AHUT are deposited into the state’s transportation account. Short-term lease or rentals are charged 8 percent on gross revenues. Currently, \$10 million of short-term lease revenues are annually transferred to fund airport improvements—the remainder is deposited into the state’s General Fund.

In 2019, North Carolina’s gross tax collections for short-term leases and rentals were \$84,437,685 (NCDOR, 2020). If the AHUT were entirely

allocated to NCDOT’s highway fund, this would have enabled an additional \$74.4 million to be invested in North Carolina’s transportation system.

The Highway Use Tax was created with a number of caveats that apply to commercial vehicles, mobile homes, special mobile equipment, and vehicles purchased outside of North Carolina. Maximum tax caps for commercial vehicles (\$2,000), mobile homes (\$350), and out-of-state vehicles (\$250) have been instituted. Meanwhile, there is no sales tax maximum for special mobile equipment if it is purchased from a person or firm engaged in the business of selling, leasing, or renting special mobile equipment; however, the HUT is assessed by the county (NCDOT 2020).

North Carolina’s vehicle sales tax rate is substantially less than other states. It has the lowest effective tax rate among all its neighboring states and has the second lowest rate in the nation (NC First Commission 2020; World Population Review 2020). For example, a vehicle with a value of \$16,400 generates \$372 in transportation tax revenue in North Carolina or \$868 in revenue in Tennessee (NC First Commission, 2020).

Despite its low tax rate, North Carolina’s transportation system is highly dependent on the HUT. In fiscal year 2019, approximately \$803 million in HUT revenues were collected, or 16.0 percent of the state’s total revenues for transportation investments (NCDOT, 2020).

Figure 24: Highway Use Collections Over Time

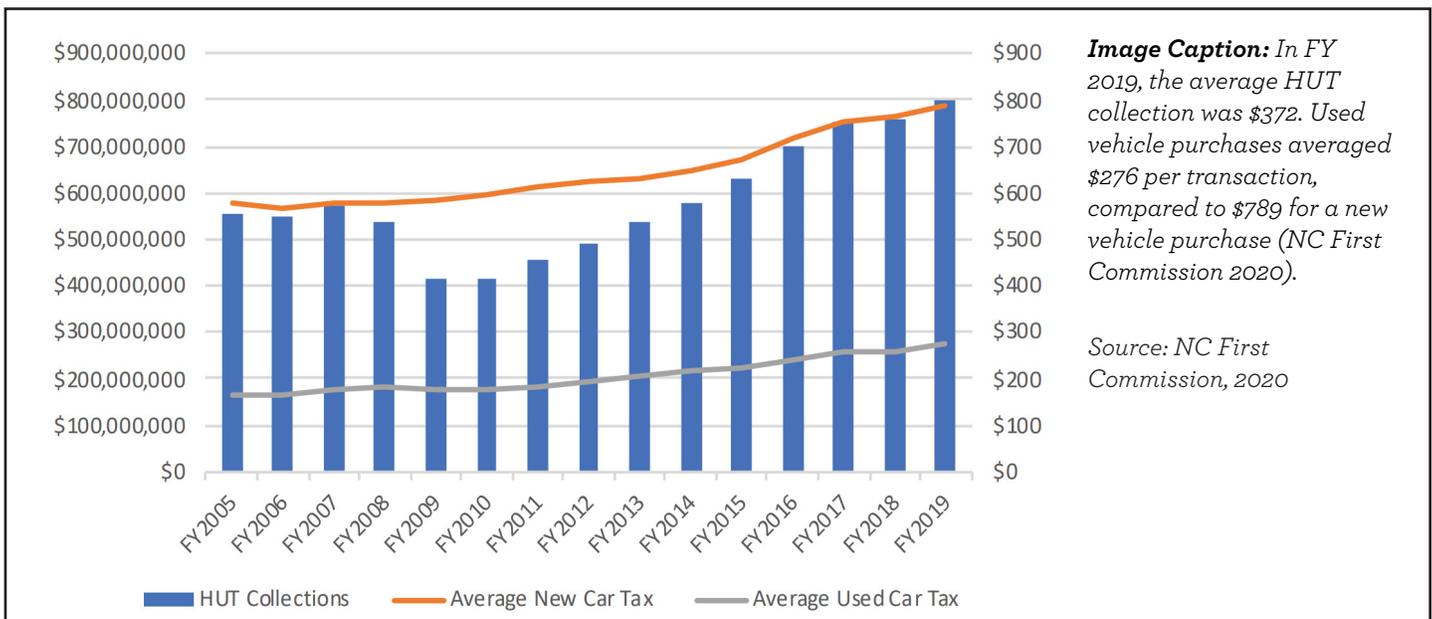


Image Caption: In FY 2019, the average HUT collection was \$372. Used vehicle purchases averaged \$276 per transaction, compared to \$789 for a new vehicle purchase (NC First Commission 2020).

Source: NC First Commission, 2020



Source: Clay Banks

Implementation Recommendations

Transportation infrastructure is deeply connected with economic development in North Carolina. From providing access to jobs, education, and healthcare, to moving the goods and services relied on by North Carolina residents and businesses, a high-functioning transportation system is needed to create opportunities that grow our economy.

Systemic transportation financing issues and external shocks from severe weather events and COVID-19 have placed North Carolina in an exceedingly difficult position to finance its transportation system needs. Looking into the future, per capita motor fuels tax receipts are expected to decline in real terms as a result of vehicle fuel economy improvements and flat-lining federal appropriations. Approximately 64.3 percent of North Carolina's budget is financed through motor fuels tax receipts with the largest funding share coming from the state motor fuels tax (40.4 percent) and the second largest coming from the federal motor fuels tax (23.9 percent) (NCDOT, 2020). In 2015, the *Diversifying Revenues to Improve Commerce and Economic Prosperity* report called into question the long-term viability of the motor fuels tax for funding North Carolina's transportation system needs. Five years later,

the motor fuels tax continues to operate as our primary funding mechanism, despite its loss in efficacy.

Across the nation, other innovative states are diversifying their transportation revenue streams to achieve healthy and sustainable portfolios. Oregon and Utah have established permanent road user charge programs, which charge road users who have registered in the program by the mile instead of by the gallon. Eight states have completed RUC pilot programs and three are developing RUC programs.

Seven states have implemented statewide sales tax measures that ensure a portion of sales tax revenues is dedicated for transportation funding projects. Virginia and Kansas received upwards of \$530 million in sales tax revenue for transportation projects in FY2019 (VDOT, 2020; KDOT, 2020).

Forty-six states tax the sale of motor vehicles. North Carolina issues a 3 percent rate through its Highway Use Tax. Of all the states that assess a tax, North Carolina has the lowest effective rate. Four states (Delaware, New Hampshire, Montana, Oregon) do not have a sales tax on vehicles (World Population Review, 2020).



At a rate of 36.2 cents per gallon, North Carolina has the eighth highest motor fuels tax rate in the nation, which may make adjusting the gas tax challenging. However, this rate is not substantially greater than the national average (although it is higher than North Carolina’s neighboring states). Conversely, road user charges and statewide sales taxes measures have gained traction in the last decade to become established revenue options in the states that have implemented them.

North Carolina’s Highway Use Tax is responsible for approximately 16 percent of North Carolina’s transportation budget; however, a notable portion of its yield is not allocated to transportation uses. In 2019, \$74.4 million in tax receipts from short-term leases and rentals were diverted to the North Carolina General Fund (NCDOR, 2020). Generating additional revenue is a necessity for modernizing North Carolina’s transportation system and supporting the state’s economy. As North Carolina charges the lowest effective vehicle sales tax rate of the 46 states that assess a fee, adjusting the HUT and directing all of its revenue to transportation purposes could be a good starting place.

Modernizing our Transportation Infrastructure.

The North Carolina Department of Transportation is currently conducting its NC Moves 2050 Plan, a strategic transportation plan that identifies transportation needs and projected revenues available to meet those needs through the year 2050. Though the plan has yet to be released, the draft projection of transportation revenues and needs through 2050 indicated that North Carolina’s transportation funding gap (the difference between projected revenue income and projected infrastructure costs) could be as high as \$45 billion from 2020 to 2050. This report’s draft findings, in conjunction with the NCDOT 2040 Plan and the American Society of Civil Engineer’s infrastructure report card update, were used to estimate the level of investment required to obtain excellent, good, mediocre, poor, and very poor infrastructure rankings.

Figure 26 demonstrates the infrastructure condition that is forecasted to exist based on its associated level of annual investment in 2019 dollars. North Carolina currently invests approximately \$5 billion annually in its transportation system, which enables the state to achieve an overall infrastructure rating of mediocre.

Figure 26: System Condition per Level of Investment

Infrastructure Condition	Annual System Needs in \$ Billions
Very Poor (F)	<\$3.8
Poor (D)	\$3.8-\$4.8
Mediocre (C)	\$4.8-6.3
Good (B)	\$6.3-8.2
Excellent (A)	>\$8.2

Source: ITRE Analysis

Figure 27: Investment Relative to Public Road Miles

Agency	Budget (\$ billions)	System Length (Miles)*	Investment (\$/mile)
NCDOT	\$5.0	107,643	\$46,450
FDOT	\$9.9	123,099	\$80,423
TxDOT	\$18.1	314,648	\$57,525

Sources: FHWA, 2019; FDOT, 2019; TxDOT, 2019

*Denotes total system miles, including state, county, municipal, federal, and other jurisdictions.

Meanwhile, Figure 28 (on the following page) illustrates a hypothetical level of revenue required to replace the motor fuels tax at various infrastructure conditions. A menu of revenue mechanisms that can be used to modernize North Carolina’s transportation infrastructure can be found in Figure 34 on page 41.

It should be noted that North Carolina is falling behind its peers in levels of transportation system investment. The Florida Department of Transportation (FDOT) has an operating budget of \$9.9 billion relative to the 123,000 miles of public roads in the state (FDOT, 2019; FHWA, 2019). Meanwhile the Texas Department of Transportation has an operating budget of \$18.1 billion for its 314,648 system miles (TxDOT, 2018; TxDOT, 2019). When comparing NCDOT’s operating budget of \$5 billion, relative to the 108,000 lane miles of public roads it maintains, it can be seen that NCDOT invests \$33,800 less than FDOT and \$10,900 less than TxDOT per mile of public road.

The following pages provide recommendations that can be undertaken collectively, or individually, to transition away from the motor fuels tax and establish a sustainable portfolio for transportation investment in North Carolina.


Figure 28: Schedule of Rates, Revenues, and Motor Fuels Tax Replacement Scenarios

Mechanism	Mechanism Rate	Annual Revenue (\$millions)	Total Annual Revenue (with other NCDOT sources)
Motor Fuels Tax (MFT)	(cents per gallon)	(\$millions)	(\$millions)
Existing Rate	36.1	\$2,036	\$5,042
Rate to achieve Poor	14.1	\$794	\$3,800
Rate to achieve Mediocre	31.8	\$1,794	\$4,800
Rate to achieve Good	58.4	\$3,294	\$6,300
Rate to achieve Excellent	92.1	\$5,194	\$8,200
Road User Charge (RUC)	(cents per mile)	(\$millions)	(\$millions)
Rate to Replace 2019 MFT	\$0.018	\$2,036	\$5,042
Rate to Replace the MFT - Poor	\$0.007	\$794	\$3,800
Rate to Replace the MFT - Mediocre	\$0.016	\$1,794	\$4,800
Rate to Replace the MFT - Good	\$0.030	\$3,294	\$6,300
Rate to Replace the MFT - Excellent	\$0.047	\$5,194	\$8,200
General Sales Tax for Transportation Uses	% of Taxable Sales & Purchases	(\$millions)	(\$millions)
Rate to Replace 2019 MFT	1.3%	\$2,036	\$5,042
Rate to Replace the MFT - Poor	0.5%	\$794	\$3,800
Rate to Replace the MFT - Mediocre	1.1%	\$1,794	\$4,800
Rate to Replace the MFT - Good	2.1%	\$3,294	\$6,300
Rate to Replace the MFT - Excellent	3.3%	\$5,194	\$8,200
Highway Use Tax (HUT)	% of Vehicle Cost - Trade in Value	(\$millions)	(\$millions)
Existing Rate	3.0%	\$793	---
Rate to Replace 2019 MFT	10.7%	\$2,839	\$5,042
Rate to Replace the MFT - Poor	5.7%	\$1,512	\$3,800
Rate to Replace the MFT - Mediocre	9.5%	\$2,512	\$4,800
Rate to Replace the MFT - Good	15.2%	\$4,012	\$6,300
Rate to Replace the MFT - Excellent	22.4%	\$5,912	\$8,200
Highway Use Tax (Close Diversions)	% of short-term lease or rental	(\$millions)	(\$millions)
Existing Rate	8.0%	\$10	---
Existing Rate (No Diversions)	8.0%	\$84	---
Rate to Replace the 2019 MFTA	276.1%	\$2,913	\$5,042
Rate to Replace the MFT - Poor	158.4%	\$1,671	\$3,800
Rate to Replace the MFT - Mediocre	253.2%	\$2,671	\$4,800
Rate to Replace the MFT - Good	395.3%	\$4,171	\$6,300
Rate to Replace the MFT - Excellent	575.4%	\$6,071	\$8,200
Other NCDOT Revenue Mechanisms	(varied)	(\$millions)	(\$millions)
Federal Allocation	---	\$1,277	\$5,042
Title Fees & Other	---	\$214	\$5,042
Licenses	---	\$117	\$5,042
DMV Registrations	---	\$595	\$5,042
All Other Total	---	\$2,204	\$5,042



Source: Nathan Anderson

Recommendation 1

Road User Charge Pilot Program Assess a rate of 2.0-4.0 cents per mile

In 2019, North Carolinians drove 121.1 billion miles, consumed 5.5 billion gallons of gasoline, and generated \$2.0 billion in state gas tax receipts (NCDOR 2020; NCDOT, 2020). In order to offset the revenue generated by the state motor fuels tax, a 1.8 cents per-mile-fee would need to be assessed to each driver. This 1.8 cent fee does not yet account for administrative expenses, which are more involved for a Road User Charge program (see “Administrative Processes”). Assuming an administrative cost of 10 percent, the minimum per-mile-fee to offset North Carolina’s existing motor fuels tax revenues would need to be 1.98 cents-per-mile (\$290 annually for the average driver).

Maintaining existing transportation income is not currently sufficient to meet the state’s economic development goals. North Carolina’s highway infrastructure received a grade level C from the American Society of Civil Engineers (2019). **North Carolina would require an additional \$1.5 billion to \$3.0 billion annually to obtain grade levels B or A,**

which would enable the state to notably improve its transportation system (NCDOT 2040 Plan, NCDOT 2050 Plan). Unaccommodated by other measures, this would require a 3.0-5.0 cents-per-mile charge (\$417-\$695 annually for the average driver).

To understand how a road user charge program might be implemented in North Carolina, best practices from RUC pioneer states were reviewed (Oregon, Utah, California, Washington, Colorado, Minnesota, and Delaware). It became apparent that for an RUC program to be successful, an RUC pilot to overcome administrative, technological, and privacy concerns was essential. Interstate travel and pricing policies were also found to be important considerations to address.

Administrative Processes. The administration of a road user charge program will require a different mechanism to maintain the system. Most programs utilize an open market where private contractors manage the accounting of mileage and taxation. Much like fuel companies act in this regard, these account managers will collect data by delivering applications, sending invoices, and receiving payments from drivers. The government will oversee the rules and regulations for which the account managers would be audited through a report structure (I-95, 2019).

Figure 29: Road User Charge Mileage Reporting Options

Mileage Reporting > Methods (MRMs)	Mileage Permit	Odometer Reading	Smartphone App (MileMapper)	Plug-in Device (with GPS)	Plug-in Device (no GPS)
Service Providers	2	2	1	2	1
Manual or Automated	Manual	Manual	Automated	Automated	Automated
Prepay or Post-pay	Prepay (upon acquisition)	Post-pay (quarterly)	Post-pay (quarterly)	Post-pay (monthly)	Post-pay (monthly)
Vehicle or Equipment Required	Smartphone (iPhone/Android) or camera phone with internet browser	Smartphone (iPhone/Android) or camera phone with internet browser	iPhone (iOS and higher)	Vehicles after 1996 Limited number of EVs	Vehicles after 1996
In-person Support	Vehicle Licensing Offices	Vehicle Licensing Offices			

Source: Washington State RUC Pilot Program, 2019

Oregon identified that participants want the ability to choose tracking and payment options. Therefore, the state developed the foundation of a road user charge market (ODOT, 2017). This encouraged private businesses to develop technological solutions and removed some of the operational burden for implementing a state-funded platform. Similar markets were developed in California, Washington, and Colorado.

The Oregon Department of Transportation road user charge program, OReGo, was initially developed by the Road User Fee Task Force. The task force presented to the Oregon General Assembly a per-mile fee to generate revenue for the state in 2003 (ODOT, 2017). Since then, Oregon became the first state to institute a volunteer state-wide program.

The road user charge program regularly met with several bodies for oversight. This ensured transparency and effective administration. The administrative hierarchy included the Road User Fee Task Force, the Road User Charge Executive Board, the Road Usage Charge Administrative System Project Steering Committee, the Department of Administrative Services Office of the State Chief Information Officer, and the Legislative Fiscal Office. A third-party company, Public Knowledge, LLC oversaw the quality assurance aspect for the technology used during the program (ODOT, 2017). Similar governance structures were developed in California, Washington, and Colorado.

Technology. Experiences in RUC pioneer states demonstrated that user choice for per-mile fee collection technologies is essential for public buy-in. Implementing a road user charge would depend largely on the technology used. For example, does the road user charge collection rely on Geospatial Positioning System (GPS) technology, whereby drivers are charged based on the amount of driving they travel, or is it based on regular vehicle odometer readings? The use of GPS technology has several advantages, including the ability to implement a different fee based on jurisdiction. However, this would likely mean that GPS technology would be required in all vehicles—a difficult policy to both administer and enforce. The use of GPS technology also raises issues of equity and privacy. Will a one-time charge for such a device be affordable for low income households? At what threshold should GPS technology be supplied for communities that cannot afford it?

While several states have focused on more complex RUC programs, one relatively straight-forward option is an odometer-based RUC system. This approach relies on assessing a fee based on the number of miles driven that year. In North Carolina, odometer readings could be assessed as part of the vehicle registration process. In North Carolina, most vehicles must renew their registration annually. About 60 days before a vehicle’s registration expires, the N.C. Division of Motor Vehicles mails to the address on record a renewal notice that

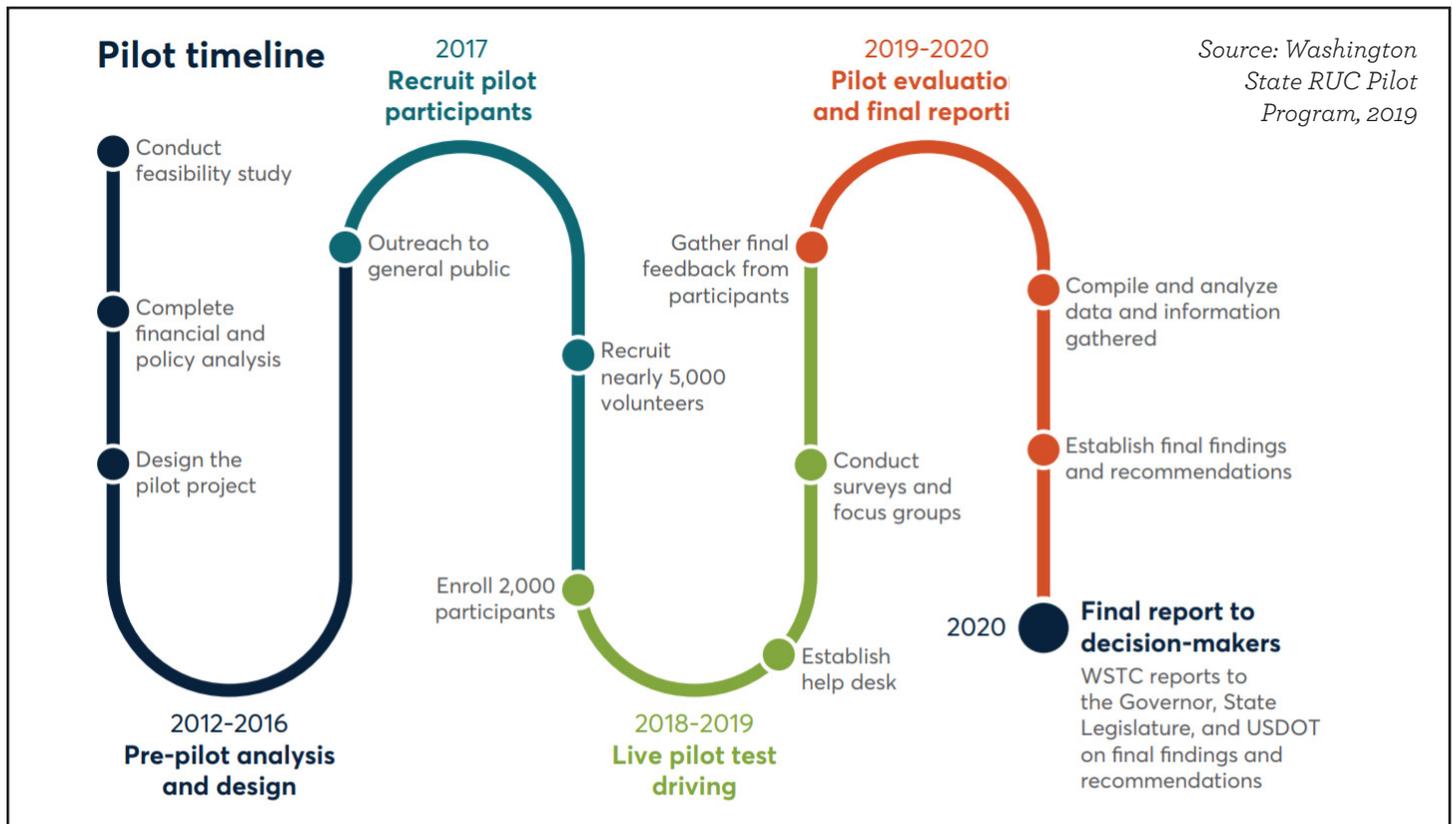
Figure 30: Major Milestones in the Washington State Road User Charge Pilot Program

Image Caption: Washington state created an eight-year plan for its RUC program initiatives. This plan includes implementing a pilot program and then transitioning into a post-pilot phase, in which a permanent RUC program may be established.

lists the vehicle's registration renewal as well as any vehicle property taxes due. North Carolina's Tag and Tax Together program combines the billing of annual vehicle registration fees and vehicle property taxes so that they can be paid together. To complete the vehicle registration process, vehicle owners must receive a vehicle inspection from a qualified vehicle inspection station. During the vehicle inspection process, odometer readings could be recorded and reported to NCDMV.

An RUC pilot program could be established that allows North Carolina drivers to “opt-in” to pay a fee based on the number of miles incurred on that vehicle since the last time that vehicle was inspected.

Vehicle owners could then receive a reimbursement on the estimated amount of state motor fuels tax paid that year. Relying on odometer readings is much easier to enforce; however, it does have its drawbacks. For example, it would be difficult to ascertain where that driving occurred, whether in North Carolina or a neighboring state, resulting in an imperfect method for measuring miles driven in North Carolina. Many

of these questions have similarly been addressed in the OreGo pilot program.

Privacy and Public Buy-In. The states which completed RUC pilots had to overcome privacy concerns to garner public support. Privacy issues centered around the uncertainty of how individual driver's mileage would be tracked. In a pre-pilot survey in Washington state, 83 percent of respondents ranked privacy as the top issue of its pilot program (Washington State Transportation Commission 2020). Privacy is addressed through the administration of private industry and government oversight. Companies are already collecting information about people.

Privacy laws in states have evolved to address this level of collection. Big data fuels the business models for companies like Google, Verizon, Uber, and Facebook (I-95, 2019). Privacy protection may require federal regulation, much like the European Union has done, giving users the right to dictate how their data is used (I-95, 2019).

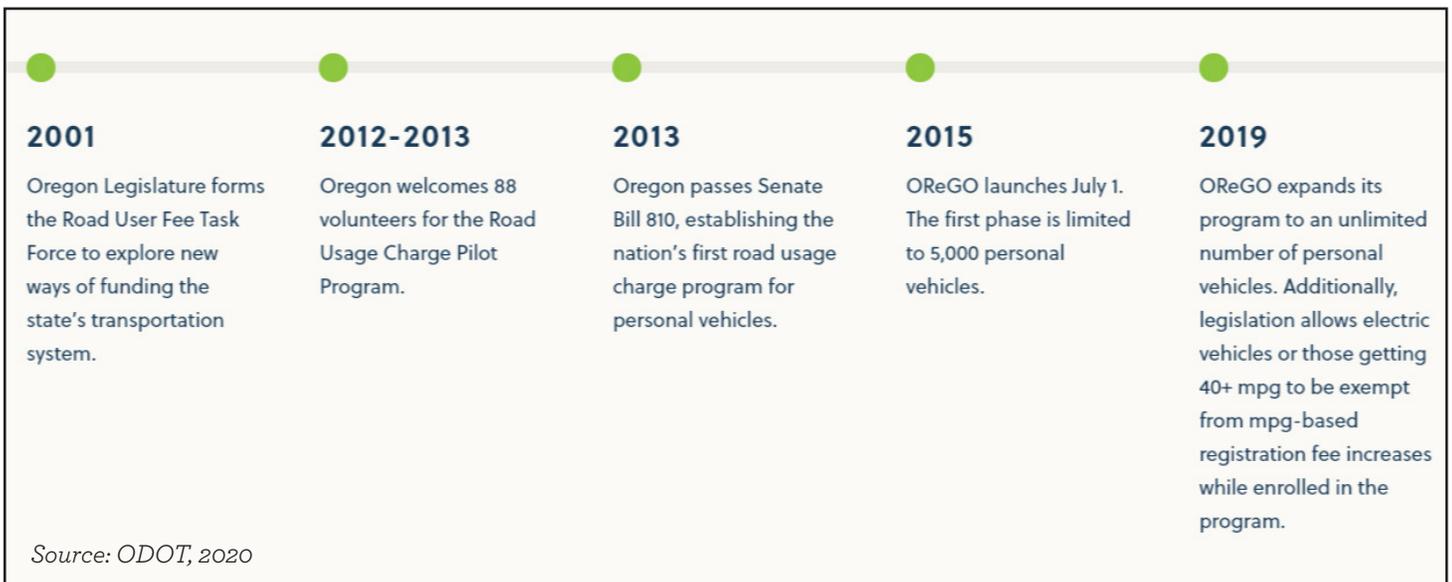
Figure 31: Major Milestones in the OReGO Road User Charge Program

Image Caption: For more than 18 years, Oregon has been working to establish per-mile fees. The OReGO program was the first permanent RUC programs in the nation. It serves as a guidepost for transportation agencies across the country.

Interstate Travel. There are two interstate projects reviewing the implementation of a national road user charge program: RUC West and the Eastern Transportation Coalition. RUC West is composed of 15 states on the west coast, all of which are in varying stages of implementation (RUC West, 2020). The Eastern Transportation Coalition is a forum for state agencies, transportation organizations, and toll agencies to collaborate and develop transportation initiatives on the east coast (I-95, 2020). The coalition has developed a diverse set of resources for addressing many of the barriers to the implementation of a road user charge program.

Interstate travel considerations will be important for a North Carolina RUC program. Approximately 2.5 percent of North Carolina residents work in another state, and about 2.6 percent of non-residents work in North Carolina (I-95, 2019).

Pilot Plan for North Carolina. North Carolina can leverage the best practices from other states to implement a road user charge pilot program. Its road user charge pilot can be used to distribute costs more equitably among road users. Currently, older and less fuel-efficient vehicles pay a larger share of motor fuels taxes. These vehicles are often driven by those who cannot afford to pay for electric vehicles

and fuel-efficient alternatives. On average, drivers pay \$23.00 per month on motor fuels taxes for low-efficiency vehicles. Meanwhile, fuel-efficient vehicles achieving 45 miles-per-gallon cost drivers \$6.57 per month in motor fuels taxes and electric vehicle drivers pay \$0.00 (I-95, 2019).

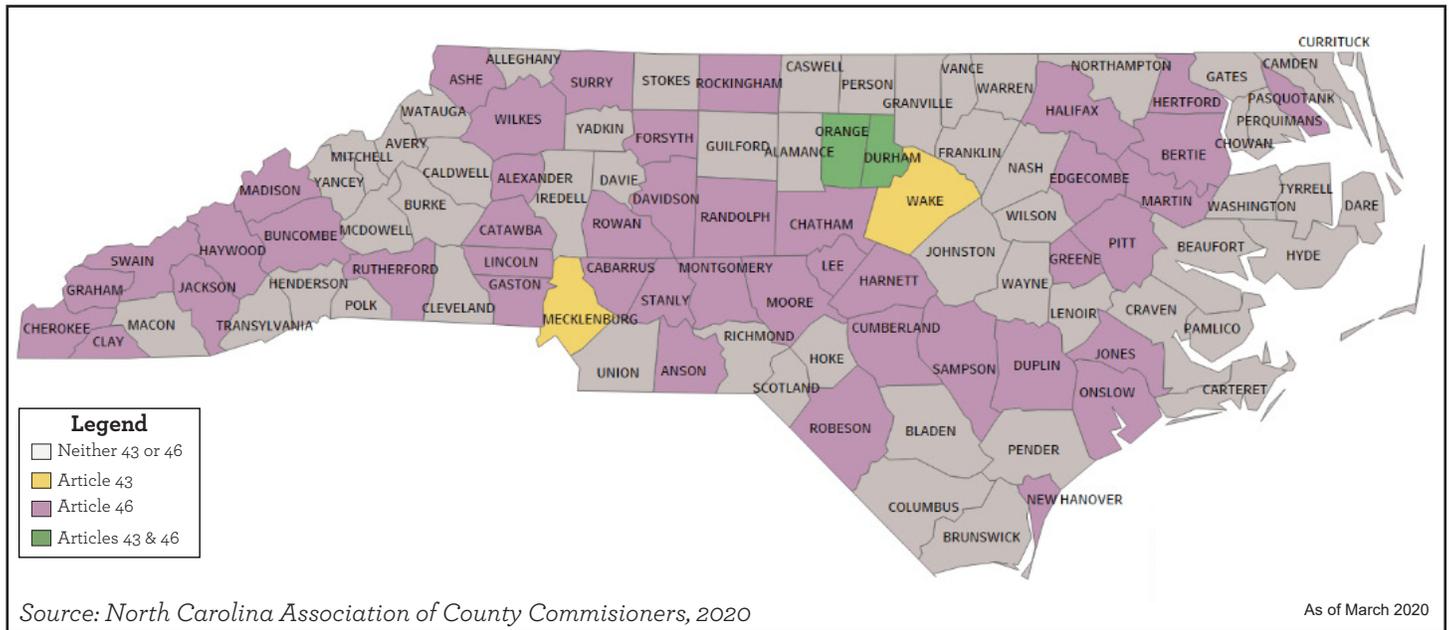
North Carolina should begin working to establish an RUC Fee Task Force. It can develop a grass roots base similar to the contexts of Oregon, Washington State, and California. An RUC task force can help build buy-in from the public and work to develop the administrative requirements for a successful program.

The OReGO program utilizes the support of a volunteer coordinator and vendors to develop marketing strategies that reach volunteers from varying backgrounds. ODOT chose to target residents, businesses, and governments who operated vehicles at different miles per gallon categories.

The California government took a thoughtful approach to determine if a road user charge would be acceptable to its residents (CSTA, 2017). From the onset of the planning stage, the state legislature included provisions to ensure personal information was protected. Tracking mileage was done by using vendors from the private sector to stimulate innovation and diversity for applications (CSTA, 2017).



Figure 32: North Carolina Counties Levying Article 43, Article 46, or Both



Source: North Carolina Association of County Commissioners, 2020

As of March 2020

Image Caption: This map reflects the counties that passed a referendum to levy the half-cent Article 43 local option sales and use tax, which is dedicated to financing public transportation; the quarter-cent Article 46 tax, which is general purpose use; or both.

Recommendation 2

Adjust the Statewide Sales Tax Dedicate 0.5-1.0% for Transportation Funding

From 2013 to 2020, a total of 26 bills related to the use of sales taxes for transportation system funding have been enacted (NCSL, 2020). At least 19 states have implemented statewide or local tax options to support transportation funding, including North Carolina (ITRE, 2020). Figure 32 shows the counties within the state that have exercised their option to enact Article 43 and Article 46. Counties that pass a referendum for Article 43, levy a half-cent sales and use tax, which is dedicated to financing public transportation. The quarter-cent Article 46 tax is general purpose and can be used for transportation.

These local tax options are great mechanisms for funding local initiatives that are generally transit focused. However, multi-county projects that support statewide economic development require additional resources. It is recommended that North Carolina increase its statewide sales tax by 0.5 to 1.0 percent and dedicate these revenues for transportation purposes.

This would align North Carolina with other states who are leaders in statewide sales tax implementation. It is anticipated that a 0.5 percent sales tax increase would generate an additional \$782.7 million in transportation revenue and a 1.0 percent increase would raise \$1.5 billion (ITRE Analysis sourced from NCDOR Annual State Sales and Use Tax Statistics 2019).

Virginia, Kansas, Texas, and Idaho are national leaders in their use of sales tax revenue for transportation projects. Virginia directs 1.75 percent of its sales tax receipts to transportation, which equated to approximately \$833.5 million in transportation revenue in fiscal year 2019 (VDOT, 2019). Kansas directed \$533 million in sales tax receipts to its state highway fund in fiscal year 2019 (KDOT, 2019). Meanwhile, Texas sets aside sales tax revenue to fund highways. Specifically, \$2.5 billion of the state sales tax revenue will be reserved for transportation, so long as overall sales tax receipts are at least \$28 billion (Transportation for America 2017). Idaho imposes a 1 percent state sales tax to support transportation revenue (Goble, 2020). This rate may increase to 2 percent, if the Idaho General Assembly can gain the support of the governor (Idaho Legislature 2020).



Source: NCDOT

Recommendation 3

Improve the Highway Use Tax Adjust to 4% and direct short-term rentals

In October 2019, an issue brief was released on behalf of the NC First Commission entitled, “The North Carolina Highway Use Tax.” It documented the history of North Carolina’s HUT and discussed expanding its revenue capacity. The brief demonstrated that vehicle buyers in North Carolina pay significantly less tax on vehicle sales than in all neighboring states. For example, the typical North Carolinian car buyer pays \$372 in highway use tax, while car buyers in neighboring states are assessed \$500 to \$868 (NC First Commission, 2019). Upon examination of other states, North Carolina assesses the second-lowest effective tax rate on vehicles (World Population Review, 2020).

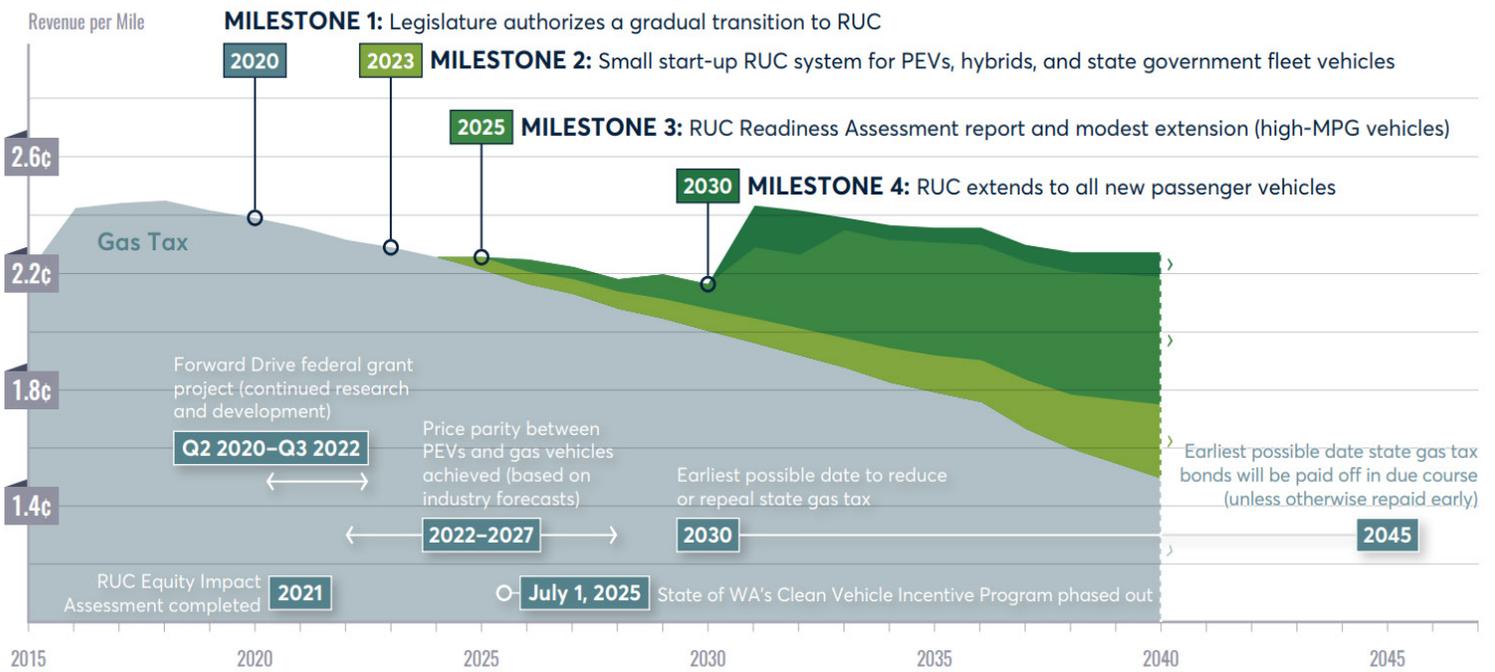
Consistent with the issue brief for the NC First Commission, it is recommended that North Carolina raise its Highway Use Tax from 3 to 4 percent. This would generate approximately \$275 million in additional transportation revenue (NC First

Commission, 2019). There are also tax revenue redirects that could be implemented within the framework of an HUT adjustment, which would benefit North Carolina’s transportation system. For example, lawmakers may consider eliminating or raising the \$2,000 cap on recreational vehicles and commercial vehicles. Additionally, if all the proceeds from short-term vehicle leases were directed to the Highway Fund, this would increase revenues by approximately \$74 million annually (NCDOR, 2020). Currently, approximately \$10 million is dedicated for transportation uses.

From a legislative perspective, changes to Chapter 105, Article 5A: North Carolina Highway Use Tax would be required, as well as the possibility of other legislative changes elsewhere. Policymakers could decide to levy more money from the highway use tax by simply increasing the highway use tax percentage, or by implementing a scaling method of different tax rates by weight. Such change would require relatively few administrative changes in how the tax is collected since the collection process itself (i.e., collection of revenue at the time a vehicle is registered) would remain the same.



Figure 33: Specific Milestones in a Road User Charge Transition Period



Source: Washington State RUC Pilot Program, 2019

Recommendation 4



Phase-Out of the Gas Tax To coincide with a permanent RUC program

Increasing the state’s gas tax rate, either on a per-gallon basis or changing how it is indexed, could be one option for policymakers to consider as a temporary measure to generate additional transportation revenue. However, at a rate of 36.2 cents per gallon, North Carolina has the eighth highest motor fuels tax rate in the nation, which may make raising the gas tax a significant challenge (Federation of Tax Administrators, 2020). North Carolina’s motor fuels tax rate is well-positioned compared to other states, largely due to an adjustment in the motor fuels tax rate formula.

In 2017, policymakers made key changes to update the state’s motor fuels tax rate. As documented in North Carolina General Statute 105.449.80, the new rate is calculated by multiplying the gas tax rate of the preceding calendar year by the percentage change in the state’s population for the applicable year (75 percent of the total formula.) The other 25 percent of the formula is derived by assessing the percentage change in the Consumer Price Index for energy goods

(NCGS 105-449.80.) Instead of raising the motor fuels tax it is recommended that a series of strategic steps are implemented to slowly replace the motor fuels tax with more sustainable revenue options.

It is recommended that North Carolina supplements its motor fuels tax revenue with a statewide sales tax increase of 0.5 to 1.0 percent. This would align North Carolina with states that have implemented sales taxes measures for transportation funding, including Virginia, Kansas, Nebraska, Connecticut, Texas, Idaho, and Arkansas. It is also recommended that North Carolina increase its Highway Use Tax from 3 to 4 percent to better align with what other states charge for vehicle sales taxes.

Sales tax and highway use tax recommendations can alleviate the short- to medium-term financial needs of North Carolina’s transportation system. Meanwhile, an RUC pilot program is essential for laying the groundwork for the long-term stability of North Carolina’s transportation system. *Figure 33* demonstrates Washington State’s transition plan away from a motor fuels tax and toward a fully-operational RUC program. Building on the experience of other RUC states, North Carolina could establish a much quicker timeline to phase out the motor fuels tax.

Figure 34: Schedule of Rates and Revenues That Can Be Implemented to Replace the Motor Fuels Tax

Revenue Policy	Level D ¹		Level C ²		Existing ³		Level B ⁴		Level A ⁵	
	Rate	(\$millions)	Rate	(\$millions)	Rate	(\$millions)	Rate	(\$millions)	Rate	(\$millions)
Replace Motor Fuels Tax	---	---	---	---	---	---	---	---	---	---
Implement Road User Charge (cents per mile)	0.5	\$441	1.1	\$1,050	1.3	\$1,292	2.1	\$2,159	3.7	\$3,667
Allocate General Sales Tax Revenue for Transportation	---	---	0.25%	\$391	0.25%	\$391	0.50%	\$783	0.75%	\$1,174
Adjust the Highway Use Tax	4.00%	\$1,071	4.00%	\$1,071	4.00%	\$1,071	4.00%	\$1,071	4.00%	\$1,071
Direct All Short-term Vehicle Lease and Rental Revenue to Highway Fund	8.00%	\$84	8.00%	\$84	8.00%	\$84	8.00%	\$84	8.00%	\$84
All Other NCDOT Revenue to Accumulate with No Changes ⁶	---	\$2,204	---	\$2,204	---	\$2,204	---	\$2,204	---	\$2,204
Total Revenue	---	\$3,800	---	\$4,800	---	\$5,042	---	\$6,300	---	\$8,200

Source: ITRE Analysis

¹Grade Level D assumes replacing the motor fuels tax with a 0.5 cents-per-mile RUC, increasing the HUT from 3-4 percent, and redirecting of all short-term vehicle lease and rental revenue to the Highway Fund.

²Grade Level C assumes replacing the motor fuels tax with a 1.1 cents-per-mile RUC, directing 0.25% of North Carolina's revenue from total taxable sales to the Highway Fund, an increase of the HUT from 3-4 percent, and redirecting all short-term vehicle lease and rental revenue to the Highway Fund.

³Achieving existing conditions assumes replacing the motor fuels tax with a 1.3 cents-per-mile RUC, directing 0.25% of North Carolina's revenue from total taxable sales to to the Highway Fund, increasing the HUT from 3-4 percent, and redirecting of all short-term vehicle lease and rental revenue to the Highway Fund.

⁴Grade Level B assumes replacing the motor fuels tax with a 2.1 cents-per-mile RUC, directing 0.5% of North Carolina's revenue from total taxable sales to to the Highway Fund, increasing the HUT from 3-4 percent, and redirecting of all short-term vehicle lease and rental revenue to the Highway Fund.

⁵Grade Level A assumes replacing the motor fuels tax with a 3.7 cents-per-mile RUC, directing 0.75% of North Carolina's revenue from total taxable sales to to the Highway Fund, increasing the HUT from 3-4 percent, and redirecting of all short-term vehicle lease and rental revenue to the Highway Fund.

⁶Based on NCDOT fiscal budget for FY2019-2020.



Source: Ivana Cajina

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Source: NCDOT



Appendix I: Evaluation Criteria

Several criteria were used to evaluate each alternative. These criteria, which are discussed in further detail below and summarized in *Figure A1*, provide the basis by which it is important to examine each key funding mechanism.

Yield Adequacy. Yield adequacy refers to the capacity of a tax to produce sufficient revenue to fund the services it is directed towards; in order to attain yield adequacy, the growth in revenue from the tax must meet any growth in the amount of funds required and the economic activity being taxed must maintain a

high enough volume that the tax rate can remain low (Oklahoma Policy Institute, 2020.)

Stability. Stability is a measure of how much variation there is in the volume of the taxed economic activity (Dye Management, 2009.) Stable revenues provide for the greatest long-term benefit because they aren't susceptible to fluctuations in economic cycles. Stability goes hand-in-hand with 'yield adequacy' because the reliability of the funding option to provide the revenue expected to move the project forward as planned is of utmost importance. Not only must the option provide

Figure A1: Evaluation Criteria for Revenue Options

Criteria	Description
Yield Adequacy	capacity of a tax to produce sufficient revenue to fund the services it is directed towards
Stability	measure of how much variation there is in the volume of the taxed economic activity
Implementation and Administration	terms pertaining to the feasibility of putting in place and enforcing a tax option
Equity	refers to whether the tax impairs the competitiveness of certain economic entities over others, whether it cuts into the funding of other government programs, and whether it applies to the business-es and individuals that fall under it fairly
Economic Efficiency	measure of the extent to which funds are allocated to their best use
Public Acceptance	the reaction of the public to how the tax itself impacts them; whether the public will be more accepting of a tax if the taxed economic activity and the way that the tax functions are clear

Source: ITRE Analysis, 2020

revenue consistently but must also be expected to do so to allow for good planning and room for flexibility. A high degree of reliability translates to good credit, which can be leveraged for effective financing.

Implementation and Administration. Implementation and administration are terms pertaining to the feasibility of putting in place and enforcing a tax option; important factors to consider when evaluating the implementation and administrability are whether the government would have to establish new functions to enable the enforcement and collection of the new tax, whether existing laws would have to be altered to accommodate the tax, whether collecting and/or paying the tax would incur additional costs for the government and taxpayers, and whether new technology would be required for the tax to be put in place (Dye Management, 2009.)

Equity. Equity encompasses multiple factors: whether the tax impairs the competitiveness of certain economic entities over others, whether it cuts into the funding of other government programs, and whether it applies to the businesses and individuals that fall under it fairly, not disproportionately impacting certain demographics over others (Dye Management, 2009.) One important descriptor for the equity of a tax is whether it is progressive, meaning that those with lower income and consequently ability to pay are required to pay a smaller proportion of their income, or regressive, meaning that the tax is fixed at a set rate and as a result places a proportionally higher demand on those with lower income (Northeastern University, N.D.).

Economic Efficiency. Economic efficiency Is a measure of the extent to which funds are allocated to their best use; if excess taxes are imposed on the public, the cost to the public can exceed the benefit provided to society by the tax revenue (Auerbach & Hines); this is exacerbated if there are costs involved with the collection of the tax.

Public Acceptance. Public acceptance is a multifaceted characteristic of a tax. One component is the reaction of the public to how the tax itself impacts them. The complexity of the tax is another; the public will be more accepting of a tax if the taxed economic activity and the way that the tax functions are clear. Additionally, the collection method can impact public acceptance in that the public will be disinclined to support a tax if paying the tax requires an additional effort or expense on the part of the taxpayer (Texas Department of Transportation, N.D.).



Appendix II: Other Revenue Generation Options

This analysis focused on four alternatives for further study: (1) the mileage-based user fee, (2) the state motor fuels tax, (3) the state and local sales tax, and (4) the highway use tax. The methods discussed below include the other options considered. This appendix also includes the draft revenue alternatives discussed during the NC First Commission meeting, held July 31, 2020.

Heavy Vehicle Fees. The heavy vehicle fee or tax (HVT) is an annual fee assessed by the federal government on vehicles operating on public highways exceeding 55,000lbs. The taxable weight is determined by adding the unloaded weight of the vehicle and the maximum load customarily carried by the trailer. The maximum HVUT is \$550 per year. The fees charged by KY, NY, OR, and NM are known as the weight-mile taxes, and are charged every month or quarter-year based on the combined vehicle/load weight and miles drive.

Current Use: The federal government charges a fee of \$100 for vehicles ranging from 55,000-75,000lbs and \$550 for vehicles with weights over 75,000lbs

Implementation Considerations: Oregon was the first state in the nation to institute a tax on motor fuels to provide funding for transportation infrastructure, beginning with a flat one-cent per gallon in 1919. Heavy commercial trucks, except those designated for farm uses (which pay fuel tax on gasoline or diesel) and those hauling certain products like logs or wood chips (which pay a flat fee based upon the weight of the vehicle) pay a weight-mile tax. Oregon's weight-mile tax generates around \$335 million in revenue each year, however, its primary flaw is that it relies on self-reporting. Thus the four states that do impose this fee are often subject to underreporting.

Severance Fees. A severance tax is a state tax imposed on the extraction of non-renewable natural resources that are intended for consumption in other states. These natural resources include such as crude oil, condensate and natural gas, coalbed methane, timber, uranium, and carbon dioxide. The revenue from these charges typically go to a common state fund and is parsed out to various projects. Current tax rates in North Carolina, effective until Jan. 1, 2019: Oil and condensates rate: 2 percent; Marginal gas rate: 0.4 percent; Gas rate: 0.9 percent.

Current Use: Thirty-four states currently produce natural gas. In 2017, the five states that produced the most natural gas in the United States included Texas, Pennsylvania, Oklahoma, Louisiana and Wyoming. Pennsylvania is the largest U.S. natural gas producer that does not impose a severance tax—though the state does levy a per well impact fee. In April 2018, of the 31 crude oil-producing U.S. states, the five highest producing states included Texas, North Dakota, New Mexico, Oklahoma and Alaska. In total, 34 states have enacted fees or taxes on oil and gas production. State and local governments collected \$8 billion from severance taxes in 2016. Nearly all this revenue came from state taxes. Only 12 states allowed local severance taxes in 2016, collecting a combined \$225 million that year.

Severance taxes accounted for less than 1 percent of national, state, and local own-source general revenue in 2016, but provided a substantial amount of own-source revenue in a few resource-rich states, such as North Dakota (21 percent) and Wyoming (10 percent). “Own-source” revenue excludes intergovernmental transfers. The states with the next-highest contributions from severance taxes were Alaska, New Mexico, and West Virginia—all collected 4 percent of state and local own-source revenue from severance taxes. Severance taxes in Texas account for 30 percent of national state and local severance tax revenue, but they provide only 1 percent of Texas's state and local own-source revenue. Sixteen states and the District of Columbia do not levy severance taxes.

Implementation Considerations: The elasticity of severance taxes is inelastic, that is to say that marginal changes to the tax rate or fee magnitude do not appreciably affect the rate at which resources are extracted or the need to transport them, otherwise the usage of transportation infrastructure. This is likely due to the large demand for natural resources in the energy sector and the influence held by the companies therein. In Colorado, as of 2017, an oil well that produces less than an average of 15 barrels per producing day or a gas well that produces less than an average of 90,000 cubic feet per producing day is exempt from this tax. In 2017, Pennsylvania's Senate passed a budget that includes, for the first time, a severance tax on natural gas produced within the state. The state still remains the only major gas-producing state in the country that does not tax production, as of 2018. Implementation and administration is considered moderate as it is common practice to charge severance fees for natural resource extraction, but it has not been expanded to other forms of extraction in North Carolina outside of oil and gas and it is not well known the mechanism by which the funds can be diverted to improving transportation infrastructure. Equity is considered moderately high because it is a tax or fee which largely divorces from the public, impacting

primarily large industrial companies. The charge is directly correlated to the amount extracted and by extension the usage of roadways in transporting materials. Economic efficiency is fairly low as there are many degrees of separation between the charges being assessed and their impact on improving infrastructure, and in fact it is uncertain how much of the general funds are diverted to these projects. Acceptability is moderate as while it can be expected to be popular with the public, many politically influential companies have already expressed their disapproval of this funding method.

Vehicle Title, Registration, Vanity Plate Fees, and Access Fee. If you own or operate a car, the state law requires you to get it registered with your state's Department of Motor Vehicles or transportation agency. The vehicle registration process involves providing some personal information and details on your car and paying a registration fee. If you fail to register your car or renew your registration, you could face penalty fees, a ticket and possibly impoundment. A vanity plate is a special type of vehicle registration plate on an automobile or other vehicle. The owner of the vehicle pays extra money to have his or her own choice of numbers or letters, usually forming a recognizable phrase, slogan, or abbreviation on their plate. An access fee has been discussed as an option to assist in the funding of the North Carolina's transportation network. It would assessed a single or periodic (e.g., monthly) fee to each registered vehicle for use of the network.

Current Use: In North Carolina the fee for vehicle title is \$52 and the annual fee for registration can range from \$36 to \$72 depending on the class or size of the vehicle. Vanity plate fees are \$30 annually in North Carolina. An access fee is not currently in use; however, the Regional Transportation Alliance (RTA) business coalition in the Triangle market [has elevated this option](#) for a couple of years as it would provide greater and stable diversification.

Implementation Considerations: The elasticity of title and registration fees is inelastic, that is to say changes in these ownership costs do not create an appreciable change in vehicle ownership and use. These costs are fixed and a requisite to participate in the transportation network. The number of vanity plates, on the other hand, was shown to decrease by 0.08 percent for every \$1 increase in the annual fee. Implementation and administration is considered high as it is a part of the fundamental process by which the transportation network and vehicle ownership is managed. Equity is considered very low as all users, regardless of income level, are required to pay the same fees and there are no concessions for those of lower income. Economic efficiency is also fairly low, although there is an indication that these fees go towards the transportation network. However, there are no signals as to where the funds are being applied. Further, one is unable to measure the usefulness of the pricing being assessed towards improving transportation infrastructure.

Flat Rate Tolling. Flat-rate tolling is a fee levied to users of a specific length of highway. It requires users to pay or prepay, generally on the order of one dollar, upon entry for, ideally, the guarantee of free-flow traffic conditions through a given transit corridor. Depending on the length of the corridor, there may be multiple stations to assess tolls in relation to the amount of usage.

Current Use: At least 42 states, the District of Columbia and Puerto Rico have some form of public or private toll facility or authority. In North Carolina, tolling is presently imposed on the Triangle Expressway (NC147/NC540).

Implementation Considerations: Users have been found to be relatively sensitive to tolling with research finding a 10 percent increase in tolls reduces usage from 1.0 to 4.5 percent. Elasticity is higher still in roadways with fewer essential trips, more alternatives, or lower congestion levels. North Carolina's first modern toll road, the Triangle Expressway, is a six-lane toll road that utilizes all-electronic tolling technology, while improving regional mobility and setting the stage for future tolling projects in North Carolina. The project has earned several major engineering awards, including: the American Council of Engineering Companies (ACEC) Grand Award for Engineering Excellence in Transportation, as well as the ACEC People's Choice Award in 2012, the Southeastern Association of State Highway and Transportation Officials (SASHTO) Best Use of Innovation in the Southeastern Region Award

in 2013, the American Concrete Pavement Association (ACPA) Gold Award for Excellence in Concrete Pavement in 2014 and the International Bridge, Tunnel and Turnpike Association (IBTTA) Toll Excellence Award, as well as the IBTTA President's Award in 2016. The 18.8-mile facility was designed and built to eliminate the need for drivers to stop to pay a toll. Customers' license plates are identified while traveling at highway speeds through free-flow "toll zones." Customers are encouraged to sign up for a free NC Quick Pass® transponder that automatically deducts tolls from a prepaid account and provides a 35 percent discount off the bill by mail toll rate. For travelers without a transponder, high-speed cameras mounted on gantries record the license plates, and invoices are sent by mail based on the vehicle's registration information. Yield is considered to be fairly high. Tolling could potentially generate \$250 million for North Carolina in 2020, increasing to \$928 million in 2040. The I-95 corridor has a highly consistent traffic stream and is depended upon greatly by individuals associated with the regional universities and the Research Triangle Parkway, so the stability of existing tolling is considered high. New developments along I-95 are considered reasonable candidates for expanded tolling, given this high consistency. Due to the Triangle Expressway's strong performance, the NCTA was able to take advantage of favorable market conditions to refinance a portion of the project's outstanding appropriation bonds. As a result, the project reached gross savings of just over \$15 million. This is the third refinancing of outstanding bonds, totaling \$103 million in gross savings for the remaining life of the project. These savings could help reduce the state's contributions for Complete 540, give the North Carolina Turnpike Authority Board toll rate flexibility in the future, or pay off project debt more quickly. Comprehensive traffic and revenue study was finalized for the Triangle Expressway in April 2009 and this document remains the certified forecast. Receipts totaling \$48.9 million for FY 2018 have exceeded the 2009 certified revenue forecast by 37 percent. The initial budget for operations, maintenance, renewal and replacement was prepared just prior to financial close in 2009, before the selection of toll technology and the establishment of the NC Quick Pass Customer Service Center in Morrisville, NC. The FY 2018 operating budget was revised to reflect actual contracted amounts and cost trends observed since opening the road to traffic. It was subsequently used by the Authority's financial advisor to produce the updated financial model. Actual operating expenses for FY 2018 were approximately 1.2 percent lower than budgeted.

High-Occupancy Toll Lanes. HOT Lanes involve converting existing high-occupancy vehicle (HOV) lanes into priced lanes, or building new HOT lanes. These projects allow vehicles not meeting established occupancy requirements for an HOV lane to "buy-into" the lane by paying a toll. A HOT lane may also draw enough traffic off the congested lanes to reduce congestion on the regular lanes.

Current Use: These HOT lane projects are operating for a total of over 100 miles in the U.S., and many states have projects in the planning stages. All of the operating projects were conversions of HOV lanes to HOT lanes, although some have extended the HOT lanes. The average length is approximately 12 miles. The operating projects are either one- or two-lane facilities in each direction. Most strive to maintain speeds of at least 45 miles per hour. The variable toll ranges from \$0.25 in the off-peak to \$9.00 in heavily congested periods.

Implementation Considerations: Communities around the nation are installing HOT lanes in response to increased congestion. There are 10 HOT lanes currently operating in eight states:

- I-15 FasTrak in San Diego, California
- US 290 Northwest Freeway QuickRide HOT Lanes in Houston, Texas
- I-394 and I-35W MnPass in Minneapolis, Minnesota
- I-25 Express Lanes in Denver, Colorado
- I-15 Express Lanes in Salt Lake City, Utah
- SR 167 HOT Lanes Pilot Project in Seattle, Washington
- I-95 Express Lanes in Miami, Florida
- I-680, Alameda County, California
- I-85, Atlanta, Georgia

Minnesota implemented I-394 MnPASS, which converted the existing high occupancy vehicle (HOV) lane into the state's first high occupancy toll (HOT) lane. The lanes, which are dynamically priced, remain free to HOVs and motorcyclists during peak hours, and are free to all users in off-peak periods. The project was conducted in the second quarter of 2018 and the updates are as follows; Total Tolloed Trips for the quarter: 390,564 or an average of about 32,547 toll trips per week Total Gross Revenue for the quarter: \$535,151 or about \$44,596 per week Toll per trip (avg.): \$1.37

Cordon Pricing (Priced Zones). Cordon pricing (also known as area or zone pricing) involves charging drivers to access a central business district through entry tolls. Cordon pricing manages congestion through a system of variable toll charges. During morning and evening peak periods, toll charges are higher to reduce the willingness of drivers to pay for entry into a specific cordon. This, in turn, manages traffic by decreasing the number of vehicles in congestion-prone areas.

Current Use: Approximately 12 international locations use cordon pricing with the most widespread use in England, Sweden, and Singapore.

Implementation Considerations: Cordon pricing is primarily a tool for congestion management; however, it can also generate significant revenue. Revenues of approximately \$237 million in London, \$116 million in Stockholm and \$54 million in Singapore are generated each year from these regions' respective pricing systems. San Francisco County, with a population of 825,000, is in the planning stages of implementing cordon pricing. The San Francisco County Transportation Authority predicts that it would net \$60-80 million annually and reduce peak-period trips by 12 percent in the region, if it were to implement a \$3 peak-period cordon charge. Cordon pricing is most suitable for urban areas that are already equipped with robust alternatives to driving. Since the primary objective of cordon pricing is to reduce congestion through the reduction of automobile usage, commuting alternatives are essential. In urban areas where viable alternatives exist, extensive trial periods, education, and strong leadership are required to build trust and overcome initial resistance from residents living in the region. Stockholm's congestion tax and London's congestion charge had initial approval ratings of 25 percent and 40 percent, respectively; however, after public outreach, a trial period, and program implementation, approval ratings grew to over 50 percent in both cities.

Income Tax. An income tax is a tax levied on the level of income earned by individuals to help fund public investments. While income tax revenue typically contributes to a state's general fund, some states specifically mandate some income tax revenue to transportation needs.

Current Use: Currently income tax revenue is not applied to North Carolina DOT projects.

Implementation Considerations: North Carolinians pay a flat income tax of 5.25%. The Federal Reserve Bank of St. Louis estimates total annual income in North Carolina using data from the fourth quarter of 2019 to be \$507 million. A one percent increase in income tax in order to dedicate funds to transportation as in Massachusetts would yield an additional \$5,076,940,000 annually.

Property Tax. Property tax is a tax paid on property owned by an individual or other legal entity, such as a corporation. Most commonly, property tax is a real estate ad-valorem tax, which can be considered a regressive tax. It is calculated by a local government where the property is located and paid by the owner of the property. The tax is usually based on the value of the owned property, including land. However, many jurisdictions also tax tangible personal property, such as cars and boats.

Current Use: The property tax in North Carolina is a locally assessed tax, collected by the counties. The N.C. Department of Revenue does not send property tax bills or collect property taxes. North Carolina's Tag and Tax Together program allows registration renewals and property taxes to be paid simultaneously.

Implementation Considerations: Effective property tax rates differ widely across and within states, making them difficult to compare. In addition to variation in statutory tax rates, local governments use various methods to calculate their real property tax base. Jurisdictions in all 50 states and the District of Columbia impose property taxes. Most property tax revenue comes from local levies on land and improvements to it, but some states also tax personal property (such as machinery, equipment, and motor vehicles). The tax equals a percentage of the taxable value of the property and may be levied in some form at every level of government: state, county, municipal, township, school district, and special district. New Hampshire, which has neither a broad-based income tax nor a general sales tax, was the most reliant on property taxes in 2016, with property tax revenue accounting for 47 percent of its combined state and local own-source general revenue. Property taxes also contributed more than 30 percent of state and local revenue in Connecticut, Maine, New Jersey, Rhode Island, and Vermont. Alabama was the least reliant on property tax revenue in 2016, with only 10 percent of its combined state and local own-source general revenue coming from the tax. Arkansas, Delaware, Hawaii, Kentucky, Louisiana, New Mexico, North Dakota, Oklahoma, and West Virginia also collected less than 15 percent of combined state and local revenue from property taxes. North Carolina counties are required to revalue real property at least once every 8 years. Many counties do so more frequently, usually on a 4-year cycle. Forsyth County is on a 4-year revaluation cycle. 2017 was a revaluation year in Forsyth County, which means that the county will not revalue real property again until 2021. Given that, the tax value of your real property should be the same for 2018 as it was for 2017, unless there was some physical change to it. The tax rate is determined by taking the county tax rate and adding to it any applicable municipal or other district rates. For example, if the property is in Winston Salem, the city-county combined tax rate for 2017 was approximately \$1.32 per \$100 of value. The tax rate is subject to change each year in June when the localities set their budgets.

Payroll Tax. A payroll tax is a tax withheld from an employee's salary by an employer who remits it to the government on their behalf. The tax is based on wages, salaries, and tips paid to employees. Payroll taxes are deducted directly from the employee's earnings and paid directly to the Internal Revenue Service (IRS) by the employer. The payroll tax in the United States is also known as FICA, which stands for the Federal Insurance Contribution Act. Essentially, this is a tax paid by employers and their employees, to fund the Social Security (also known as Old-Age, Survivors, and Disability Insurance, or OASDI) and Medicare programs.

Current Use: The state of North Carolina has implemented payroll taxes for causes such as state unemployment insurance and state disability insurance. The state requires employers to withhold state income taxes from employee paychecks in addition to employer paid unemployment taxes. However, none contribute to the revenue of the Department of Transportation.

Implementation Considerations: The population of Massachusetts in 2019 was 6,949,503, while the population for North Carolina was 10,488,084. Assuming that average payroll is the same for the two states, if a payroll tax of 0.16% in Massachusetts would generate revenue between \$145 and \$214 million, a similar tax in North Carolina would generate between \$219 and \$324 million in revenue. Though implementing a payroll tax is feasible, because the revenue collection infrastructure is currently in place, there is little connection between a payroll tax and road usage (low economic efficiency).

Advertising Revenue. Revenue generated from the NCDOT selling advertising and naming rights to private firms. This can include billboards, signs on freeways, greenways, trails, and department vehicles and websites.

Current Use: An advertising program began in early September 2014 to sell advertising and naming rights on highway shoulders, rest areas, ferry boats, and DOT websites. A study commissioned by the NCDOT estimated that vehicle-naming rights could be valued between \$800,000 and \$2.2 million per year, while sponsorship of the 511 service could range from \$1 million to \$2 million.

Implementation: Pinellas County, Florida, recently started an advertising program along Pinellas Trail, a 47-mile

greenway. A private company installs new signs to replace old ones while also selling advertising rights to potential sponsors. The county will receive 30 percent of profits, estimated at \$46,500 annually. In the case of Pinellas Trail, public protest occurred over the introduction of new signage and corporate sponsors along the trail. While some of the outcry stemmed from the county choosing a less than satisfactory private firm to partner with, a common complaint was that the signs affected the natural aspects of the trail. Limiting the number of signs on the trail, both with and without advertising, and focusing on trailheads would help alleviate this concern. Additionally, informing the public about the need for additional revenue to meet transportation and trail maintenance costs would help improve public opinion. However, the effort may not be worth the low revenue potential.

- Compared to greenway advertising, the vehicle-naming rights and sponsorship of the 511 service in North Carolina generate more revenue with less public concern.

Value Capture (Impact Fees). Transportation infrastructure projects typically increase the value of nearby land and grant additional benefits to firms within distance. Value capture is the use of mechanisms to gain financing for infrastructure projects from companies that stand to benefit from the projects, primarily land developers. For this particular study, value capture applies to the construction of a light rail system in Durham and Orange counties. There are eight common value capture techniques, but four are more prevalent: tax increment financing, special assessments, development impact fees, and joint development.

Current Use: State law specifically authorizes the use of value capture. Rules affecting each value capture technique in North Carolina vary. Currently 48 states allow for the use of value capture for financing public infrastructure projects. As in North Carolina, policy concerning specific value capture techniques varies in other states. Limitations on how value capture may be used for transportation infrastructure are also present, such as in California, Maryland, and Oregon.

Implementation Considerations: Tax increment financing uses taxes levied on the increment in property value within a development to finance development-related costs. While the effectiveness of this tool for transportation projects is debatable, successes in Chicago show that this method can generate revenue. However, this method does bring into question geographic equity concerns such as overlapping districts. Special assessments uses geographic proximity and other means to charge property owners that benefit from newly completed infrastructure. North Carolina authorized special assessments levies on “benefited property” from 2008 to 2013. Development impact fees are one-time charges collected from land developers to help finance new infrastructure. In North Carolina, local governments are unable to collect impact fees without the approval of the General Assembly, and there is no formal impact fee program in place. Joint development refers to the spatially coincidental development of transportation infrastructure and private real estate development, with the private firm providing either the facility or a financial contribution. Joint development is politically acceptable due to a narrow tax base but requires more administrative oversight. In most cases, multiple value capture techniques are used in conjunction to finance public infrastructure projects. Differing administration and varying revenue by project limits a single value capture technique from financing a project singlehandedly



NC First Commision Handout

The following draft document was shared during the NC First Commission meeting on July 31, 2020.

Revenue Options Advantages and Disadvantages

This chart describes various state revenue options for transportation funding, both existing mechanisms and some new concepts, and outlines some of their advantages and disadvantages. This material is educational in aim and is not intended as endorsement or rejection of any particular option.

User fee options	
Existing state user fees and taxes	<p>Increase motor fuel tax</p> <ul style="list-style-type: none"> • Description: Raise existing per-gallon taxes on gasoline and diesel. These taxes are adjusted annually based on changes to population and the Consumer Price Index for energy costs (N.C. Gen. Stat. §105-449.80). • Advantages: Substantial revenue yield with small rate change; as structured, directly responsive to changes in population and inflation; historically clear relationship between revenue source and use of transportation system; relatively low implementation and administrative costs because tax mechanism is already in place; paid by both in-state and out-of-state residents • Disadvantages: Long-term sustainability issues due to increases in vehicle fuel efficiency and other factors; CPI does not necessarily keep pace with rising costs of transportation facility building materials; relationship between revenue source and use of transportation system is diminishing with the rollout of electric and other highly fuel efficient vehicles; regressive; likely public opposition; rate is already higher than, and therefore not competitive with, those of surrounding states

	<p>Increase DMV fees</p> <ul style="list-style-type: none">• Description: Raise existing fees on driver licenses, passenger or commercial vehicle registrations, vehicle titles, vehicle inspections, or other DMV services. These fees are adjusted every four years based on changes in the Consumer Price Index (N.C. Gen. Stat. §20-4.02).• Advantages: Stable and predictable revenue source; some connection to use of transportation system because paid by motorists; as structured, directly responsive to inflation; low potential for evasion; relatively low implementation and administrative costs because fee mechanisms are already in place<ul style="list-style-type: none">○ If commercial vehicle registrations: Reflects heavy vehicles' greater wear-and-tear on roadways; substantial revenue yield with small rate change• Disadvantages: Except for commercial vehicle fees, only paid by in-state residents; weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; CPI does not necessarily keep pace with rising costs of transportation facility building materials; likely public opposition<ul style="list-style-type: none">○ If passenger vehicle registrations: As structured, even more regressive than gas taxes because the same flat rate is paid across income groups regardless of vehicle value or use; large annual fees are more difficult for low-income households than revenues that are collected incrementally
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	<p>Adjust formula for passenger vehicle registration fees</p> <ul style="list-style-type: none">• Description: Adjust existing fee schedules for passenger vehicle registrations while retaining quadrennial adjustment based on changes to the Consumer Price Index (N.C. Gen. Stat. §20-4.02). Currently, North Carolina assesses a flat registration fee for cars and fees that vary by weight for private trucks (N.C. Gen. Stat. §20-87). These fee schedules could be revised to include factors such as vehicle weight (for cars), age, type, horsepower, value, or fuel efficiency.• Advantages: Could be incorporated into existing vehicle registration process; could capture revenues from vehicles that pay less in motor fuel taxes, reduce disparities, or achieve other policy goals; see also <i>Increase DMV fees</i>, above<ul style="list-style-type: none">○ If based on vehicle value: More equitable across income groups than other adjustments; if vehicle fleet increases in size and value, could have greater revenue-generating potential over time than a flat fee○ If based on fuel efficiency: Helps restore financial equity by capturing revenues from vehicles that pay less in motor fuel taxes• Disadvantages: More complex and costly to implement and administer than a flat fee; may be harder for customers to understand; see also <i>Increase DMV fees</i>, above<ul style="list-style-type: none">○ If based on vehicle value: Possible opposition from vehicle owners impacted by higher fees; could affect vehicle buying choices; possible issues with private resale or vehicles bought at a lower price than MSRP○ If based on fuel efficiency: Could discourage purchase of highly fuel efficient vehicles, at cross-purposes with state policy goal to reduce emissions
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	<p>Increase electric vehicle fee</p> <ul style="list-style-type: none"> • Description: Raise existing additional registration fees for plug-in electric vehicles. As with other DMV fees, these fees are adjusted every four years based on changes in the Consumer Price Index (N.C. Gen. Stat. §20-4.02). Based on N.C. Division of Motor Vehicles data, electric and hybrid vehicle owners currently pay about \$50 less per year in state transportation taxes than gasoline vehicle owners. • Advantages: Relatively low implementation and administrative costs because fee mechanism is already in place; helps restore financial equity by capturing revenues from vehicles that pay no motor fuel tax; helps make overall transportation revenues more stable and predictable by offsetting the loss of motor fuel taxes due to electric vehicles; less regressive than some other options because fee mainly affects people who can afford to invest in electric vehicles; see also <i>Increase DMV fees</i>, above • Disadvantages: Does not increase overall transportation funding because fee revenue would be offset by corresponding decline in motor fuel taxes; no additional cost imposed on highly fuel efficient gas-powered or hybrid vehicles that also pay less in motor fuel taxes; could discourage purchase of electric vehicles, at cross-purposes with state policy goal to increase their use; likely opposition on environmental basis and from vehicle owners impacted by higher fees; see also <i>Increase DMV fees</i>, above
	<p>Increase highway use tax</p> <ul style="list-style-type: none"> • Description: Raise existing highway use tax on vehicle purchases. North Carolina's tax rate of 3% has never been adjusted, is the lowest among neighboring states, and is among the lowest in the nation. • Advantages: Substantial revenue yield with small rate change; relatively low implementation and administrative costs because tax mechanism is already in place; responsive to inflation because revenues rise with vehicle prices; makes North Carolina's tax rate more comparable to those of other states; captures revenues from all vehicles regardless of type, including electric and other vehicles that pay little or no motor fuel tax; less regressive than many other options because tax mainly affects people who can afford new vehicles, with rates that reflect the purchased vehicle's value • Disadvantages: Weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; stability of revenues may be impacted by trends toward the purchase of smaller, more fuel efficient cars that cost less than larger vehicles, and by changes in consumer behavior due to vehicle technology innovations; revenues closely tied to economic condition

	<p>Eliminate highway use tax “net-of-trade” exemption</p> <ul style="list-style-type: none"> • Description: Assess the highway use tax on the total purchase price of a vehicle. Currently, North Carolina’s tax is only applied to a vehicle’s sales price after subtracting any allowance that the retailer gives for a trade-in vehicle that is taken as full or partial payment for the purchased vehicle (N.C. Gen. Stat. §105-187.3). • Advantages: Relatively low implementation and administrative costs because tax mechanism is already in place; substantial revenue yield; relatively low tax rate applied to low dollar value trade-in results in minimal tax increase to consumers with older, low value motor vehicles • Disadvantages: Weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; increased overall vehicle cost to consumer could potentially affect the retail market for new and used motor vehicles; reduced incentive for trade-ins could impact growth of highway use tax collections for vehicle sales
	<p>Dedicate alternative highway use tax on short-term vehicle leases, rentals, and car sharing services</p> <ul style="list-style-type: none"> • Description: Dedicate all revenues from the 8% alternative highway use tax on short-term vehicle leases, vehicle rentals, and car sharing services to transportation purposes. Currently, these revenues and taxes on vehicle subscription services are directed to the General Fund, minus a \$10 million transfer to NCDOT for airport improvements (N.C. Gen. Stat. §105-187.5). • Advantages: Substantial revenue yield; stable and predictable revenue source; some connection to use of transportation system because paid by motorists; responsive to inflation because revenues rise with prices of relevant services; no additional implementation or administrative costs because tax mechanism is already in place; rate remains constant, resulting in no additional tax burden for motorists; paid by both in-state and out-of-state residents, especially (for rentals) out-of-state travelers • Disadvantages: Weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; possible opposition to transferring revenues from General Fund to transportation purposes

	<p>Dedicate alternative highway use tax on vehicle subscription services</p> <ul style="list-style-type: none"> • Description: Dedicate all revenues from the 5% alternative highway use tax on vehicle subscription services to transportation purposes. Currently, these revenues and taxes on short-term vehicle leases, vehicle rentals, and car sharing services are directed to the General Fund, minus a \$10 million transfer to NCDOT for airport improvements (N.C. Gen. Stat. §105-187.5). • Advantages: Some connection to use of transportation system because paid by motorists; responsive to inflation because revenues rise with prices of relevant services; no additional implementation or administrative costs because tax mechanism is already in place; rate remains constant, resulting in no additional tax burden for motorists; less regressive than many other options because tax only affects consumers of a luxury service, with rates that reflect price of service • Disadvantages: Ongoing growth is predicted, but this is still a volatile market, which could affect stability and predictability of revenues; possible opposition to transferring revenues from General Fund to transportation purposes
	<p>Expand road and bridge tolls</p> <ul style="list-style-type: none"> • Description: Expand the use of tolling to more roads, bridges, or managed lanes. NCDOT is currently limited to 11 toll projects and revenues can only be used on the tolled facilities and associated costs (N.C. Gen. Stat. §136-89.183 and §136-89.188). The Turnpike Authority annually adjusts toll rates for each facility based on rate schedules that are designed to meet the project's financing obligations and adopted before it opens to traffic (N.C. Turnpike Authority Toll Rate Policy, 2008). • Advantages: Can generate substantial revenues for specific tolled projects; clear relationship between revenue source and use of transportation system; captures revenues from all vehicles that use the tolled facility, including electric and other vehicles that pay little or no motor fuel tax; paid by both in-state and out-of-state residents; toll rates rise over time to cover project costs <ul style="list-style-type: none"> ○ If managed lanes or dynamic pricing: Can offer other benefits such as congestion management and faster travel times ○ If truck-only: Reflects heavy vehicles' greater wear-and-tear on roadways • Disadvantages: As structured, cannot generate revenues for other projects or support the transportation system as a whole; high implementation and administrative costs (somewhat mitigated because North Carolina exclusively uses electronic toll collection); revenues can be volatile due to changes in travel patterns or economic downturns; changes in driver behavior due to tolling, such as evasion or re-routing, can significant impact nearby "free" alternative routes; annual toll increases are based on factors other than inflation; highly regressive; likely public opposition and concerns about "double taxation" for roadway use; likely opposition from trucking industry, especially against truck-only tolls <ul style="list-style-type: none"> ○ If electronic toll collection is widely used: Additional privacy concerns

	<p>Expand ferry tolls</p> <ul style="list-style-type: none">• Description: Expand the use of ferry tolling to additional routes. State statute allows the tolling of three of the state's seven permanent ferry routes, authorizes the Board of Transportation to modify existing toll rates, and prohibits the tolling of untolled routes. The proceeds can only be used to fund approved ferry projects in the Highway Division in which they are earned (N.C. Gen. Stat. §136-82). Ferry tolls are currently structured as flat per-vehicle, per-trip fees that vary by vehicle size, with no indexing or regularly scheduled rate increases.• Advantages: Can generate sufficient revenues to cover ferry operating costs and capital needs; clear relationship between revenue source and use of transportation system; captures revenues from all vehicles that use the tolled facility, including electric and other vehicles that pay little or no motor fuel tax; paid by both in-state and out-of-state residents; resident annual passes can offset frequent resident use• Disadvantages: One route has no highway alternative; as structured, cannot generate revenues for non-ferry projects or support the transportation system as a whole; some additional implementation and administrative costs (somewhat mitigated because overall collection system is already in place); if not indexed, revenues will decline in purchasing power due to inflation; revenues can be volatile due to changes in travel patterns or economic downturns; highly regressive; likely opposition from tourism community and from industries with impacted employees
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New state user fees and taxes	<p>Mileage-based user fee (flat rate or indexed)</p> <ul style="list-style-type: none"> • Description: Implement a cents-per-mile fee. A range of approaches are possible for reporting mileage and paying the fee, from self-reported odometer readings to high-tech, GPS-enabled, in-vehicle devices. A mileage-based fee could either be assessed at a flat rate or indexed to population and inflation using the same annual adjustment formula as the current motor fuels tax (N.C. Gen. Stat. §105-449.80). • Advantages: Clear relationship between revenue source and use of transportation system; depending on the rate set and the approach taken, could generate substantial revenues that match or exceed current motor fuel taxes; more equitable (and, if set at revenue-neutral rates, less costly) for rural and low-income residents than motor fuel taxes; rates could be adjusted to reduce inequity among income groups or achieve other policy goals; could be collected incrementally, making it easier for low-income households than large annual fees <ul style="list-style-type: none"> ○ If using odometer readings: Few privacy concerns; could be incorporated into existing vehicle registration process; least costly per-mile approach ○ If using in-vehicle devices: Could assess fee on in-state miles or public roads only; could use dynamic pricing to manage congestion ○ If replacing the gas tax: Solves the problem of lost motor fuel tax revenues due to vehicle fuel efficiency and electric vehicles by charging all users regardless of vehicle type ○ If only for high-efficiency or electric vehicles: Helps restore financial equity by capturing revenues from vehicles that pay little or no motor fuel tax ○ If indexed: Directly responsive to changes in population and inflation • Disadvantages: Only paid by in-state residents unless a multi-state collection system is adopted; substantial implementation costs and challenges, including interstate travel; limited real-world experience with implementation; likely public opposition; not a viable short-term option <ul style="list-style-type: none"> ○ If based on odometer readings: Enforcement challenges; concerns about in-state versus out-of-state miles ○ If using in-vehicle devices: Privacy concerns; most costly per-mile approach; accessibility issues for unbanked users ○ If replacing the gas tax: Approach not yet proven at this large of a scale ○ If not indexed: Revenues will decline in purchasing power due to inflation
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	<p>Hybrid vehicle fee (indexed)</p> <ul style="list-style-type: none"> • Description: Assess additional registration fees for hybrid vehicles. As with other DMV fees, these fees would be adjusted every four years based on changes in the Consumer Price Index (N.C. Gen. Stat. §20-4.02). Based on N.C. Division of Motor Vehicles data, electric and hybrid vehicle owners currently pay about \$50 less per year in state transportation taxes than gasoline vehicle owners. • Advantages: Moderate implementation and administrative costs because basic registration fee mechanism is already in place; if indexed, directly responsive to inflation; low potential for evasion; helps restore financial equity by capturing revenues from vehicles that pay less in motor fuel taxes • Disadvantages: Only paid by in-state residents; CPI does not necessarily keep pace with rising costs of transportation facility building materials; no additional cost imposed on highly fuel efficient gas-powered vehicles that also pay less in motor fuel taxes; weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; could discourage purchase of hybrid vehicles, at cross-purposes with state policy goal to reduce emissions; could be inequitable given the large range of fuel efficiencies among hybrid vehicles; large annual fees are more difficult for low-income households than revenues that are collected incrementally; likely public opposition
	<p>Statewide vehicle property tax</p> <ul style="list-style-type: none"> • Description: Assess a statewide property tax on motor vehicles. In North Carolina, vehicle property taxes are currently levied at the local level only. The N.C. Division of Motor Vehicles collects these taxes on behalf of counties at the same time as annual vehicle registration fees (N.C. Gen. Stat. §§105-330 et seq.). • Advantages: Stable and predictable revenue source; relatively low implementation and administrative costs because tax mechanism is already in place and administered by a state agency; some connection to use of transportation system because paid by motorists; somewhat responsive to inflation because revenues rise with assessed value of vehicles; captures revenues from all vehicles regardless of type, including electric and other vehicles that pay little or no motor fuel tax; less regressive than some other options because rates reflect vehicle value • Disadvantages: Weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; possible opposition from vehicle owners impacted by higher taxes

	<p>Tax on electricity for vehicles (indexed)</p> <ul style="list-style-type: none">• Description: Assess per-kilowatt-hour taxes on electricity used to charge electric and plug-in hybrid vehicles. As a tax on vehicle fuel, the assumption is that this tax would be indexed to population and inflation using the same annual adjustment formula as the current motor fuels tax (N.C. Gen. Stat. §105-449.80).• Advantages: Mirrors the logic of existing motor fuel taxes; clear relationship between revenue source and use of transportation system; if indexed, directly responsive to changes in population and inflation; helps restore financial equity by capturing revenues from vehicles that pay no motor fuel tax; helps make overall transportation revenues more stable and predictable by offsetting the loss of motor fuel taxes due to electric vehicles; less regressive than some other options because tax mainly affects people who can afford to invest in electric vehicles; could be collected incrementally, making it easier for low-income households than large annual fees• Disadvantages: Does not increase overall transportation funding because tax revenue would be offset by corresponding decline in motor fuel taxes; as with motor fuel taxes, improvements or variations in the efficiency of electric vehicles could affect revenue stability as well as the relationship between revenue source and actual use of the system; substantial implementation costs and challenges, including identifying where, when, and how much a vehicle is being charged; no additional cost imposed on highly fuel efficient gas-powered or non-plug-in hybrid vehicles that also pay less in motor fuel taxes; could discourage purchase of electric vehicles, at cross-purposes with state policy goal to increase their use; possible opposition on environmental basis and from vehicle owners impacted by new tax
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	<p>Carbon tax (indexed)</p> <ul style="list-style-type: none"> • Description: Assess a new statewide tax, to be collected at the wholesale level, on each metric ton of carbon (or carbon equivalent) emissions generated by the combustion of fossil fuels. As conceptualized here, the carbon taxes on all fuels used to propel vehicles—including gasoline, diesel, natural gas, and electricity—would be dedicated to transportation purposes and, as taxes on vehicle fuels, would be indexed to population and inflation using the same annual adjustment formula as the current motor fuels tax (N.C. Gen. Stat. §105-449.80). Given these assumptions, each dollar levied on a metric ton of carbon would be approximately equivalent to a one-cent-per-gallon increase in the gasoline tax in terms of transportation funding. • Advantages: Clear relationship between revenue source and use of transportation system; could help achieve state policy goal to reduce emissions; depending on the rate set, could generate substantial revenues that match or exceed current motor fuel taxes; if indexed, directly responsive to changes in population and inflation; more stable than motor fuel taxes because emissions from the electric and natural gas sectors are also priced, ensuring ongoing revenues from alternative fuel vehicles; low administrative costs once implemented if assessed at wholesale level • Disadvantages: Revenues would likely still decline as vehicles become more fuel efficient and electric vehicles increase their market share; regressive, similar to motor fuel taxes; approach not yet proven in the United States; likely public opposition
	<p>Tax on TNCs</p> <ul style="list-style-type: none"> • Description: Assess a new statewide, percentage-based tax on transportation network companies, defined in law as “any person that uses an online-enabled application or platform to connect passengers with TNC drivers who provide prearranged transportation services” (N.C. Gen. Stat. § 20-280.1). Examples of TNCs include Uber and Lyft. In North Carolina, these companies currently pay annual permit fees to the DMV, corporate taxes if nexus is established, and pick-up and drop-off fees at some airports; all other fees are prohibited by state law (N.C. Gen. Stat. §20-280.9). • Advantages: Clear relationship between revenue source and use of transportation system, especially because trip pricing is typically based in part on distance traveled; revenue potential from taxation of an active and growing industry; responsive to inflation because revenues rise with prices of relevant services; relatively low implementation and administrative costs because tax would be collected from a small number of companies <ul style="list-style-type: none"> ○ If tax is passed on to customers: Less regressive than some other options because tax only affects users of an optional service, with rates that reflect price of service • Disadvantages: Ongoing growth is predicted, but this is still a volatile market, which could affect stability and predictability of revenues <ul style="list-style-type: none"> ○ If tax is passed on to customers: Still somewhat regressive

	<p>Fee on micromobility services</p> <ul style="list-style-type: none"> • Description: Assess per-trip fees on shared-use micromobility services such as bikeshares and e-scooters. As conceptualized, this revenue option would be structured as a flat per-trip fee, with no indexing. • Advantages: Some connection to use of transportation system because paid by roadway users; revenue potential from fees on an active and growing industry; could help offset the loss of motor fuel taxes due to micromobility as an alternative to driving; relatively low implementation and administrative costs because tax would be collected from a small number of companies <ul style="list-style-type: none"> ○ If tax is passed on to customers: Less regressive than some other options because tax only affects users of an optional service • Disadvantages: Ongoing growth is predicted, but this is still a volatile market, which could affect stability and predictability of revenues; weaker relationship to use of the transportation system because insensitive to miles traveled and lightweight devices cause minimal impact to roadways; if not indexed, revenues will decline in purchasing power due to inflation <ul style="list-style-type: none"> ○ If tax is passed on to customers: Still somewhat regressive
	<p>Dedicated sales tax from auto parts, accessories, and related services</p> <ul style="list-style-type: none"> • Description: Dedicate to transportation purposes the portion of the existing sales and use tax that is collected from the sale of auto parts, accessories, and related services such as vehicle warranties and repairs. • Advantages: Substantial revenue yield; stable and predictable revenue source; captures revenues from parts and accessories for all types of passenger vehicles, including electric and other vehicles that pay little or no motor fuel tax; some connection to use of transportation system because paid by motorists; responsive to inflation because revenues rise with prices of auto parts and accessories; relatively low implementation or administrative costs because sales tax mechanism is already in place; rate remains constant, resulting in no additional tax burden for motorists • Disadvantages: Weaker relationship to use of the transportation system because insensitive to miles traveled and associated impact to roadways; possible opposition to transferring revenues from General Fund to transportation purposes; sales tax is a regressive tax

Non-user-fee options	
	<p>Statewide real property tax</p> <ul style="list-style-type: none"> • Description: Assess a statewide property tax on real property. In North Carolina, property taxes are currently levied at the local level only. • Advantages: Substantial revenue yield with small rate change; stable and predictable revenue source; somewhat responsive to inflation because revenues rise with assessed value of real property; revenue source acknowledges overall economic and other benefits of transportation investments for property owners; less regressive than many other options because tax only affects property owners, with rates that reflect assessed property value • Disadvantages: No direct relationship to actual use of the transportation system or associated impacts; some additional implementation and administrative costs for a new statewide tax; likely public opposition
	<p>Hotel / occupancy tax</p> <ul style="list-style-type: none"> • Description: Assess a statewide, percentage-based occupancy tax on temporary lodging including hotels, motels, and other short-term rental options such as Airbnb. In North Carolina, local occupancy taxes are currently levied at the local level only, including taxes that are assessed by 83 of the state's 100 counties and some cities. • Advantages: Revenue source acknowledges overall economic and other benefits of transportation investments for providers of temporary lodging; stable and predictable revenue source, especially by including growing markets such as Airbnb; responsive to inflation because revenues rise with prices of relevant services; paid by both in-state and out-of-state residents, especially out-of-state travelers • Disadvantages: No direct relationship to actual use of the transportation system or associated impacts; some additional implementation and administrative costs for a new statewide tax; likely opposition from tourism community <ul style="list-style-type: none"> ○ If passed on to customers: Would create additional burden for people who rely on low-cost accommodations as a semi-permanent housing solution

	<p>Dedicated general sales tax</p> <ul style="list-style-type: none"> • Description: Assess an additional surcharge on top of the existing statewide sales and use tax, with all revenues dedicated to transportation purposes. • Advantages: Substantial revenue yield with small rate change; stable and predictable revenue source; responsive to inflation because revenues rise with prices of goods and services; revenue source acknowledges the overall economic and other benefits of transportation investments, especially in getting goods to market; relatively low implementation and administrative costs because sales tax mechanism is already in place; paid by both in-state and out-of-state residents who purchase goods in state • Disadvantages: No direct relationship to actual use of the transportation system or associated impacts, except for any sales taxes collected on transportation-related services; possible opposition to using sales tax revenues for transportation purposes rather than General Fund; sales tax is a regressive tax
	<p>Dedication of sales tax collected on remote sales</p> <ul style="list-style-type: none"> • Description: Dedicate to transportation purposes the portion of the existing sales and use tax that is collected from remote sales. Most remote sales are online, but also included are sales made by catalog, mail order, call center, or television shopping channel retail companies (N.C. Gen. Stat. §105-164.3 and §105-164.8). • Advantages: Substantial revenue yield; revenue source acknowledges increased use of transportation system due to delivery of remotely purchased goods; relatively low implementation or administrative costs because sales tax mechanism is already in place; rate remains constant, resulting in no additional tax burden for purchasers; see <i>Dedicated general sales tax</i>, above • Disadvantages: see <i>Dedicated general sales tax</i>, above
	<p>Dedicated tax on electricity</p> <ul style="list-style-type: none"> • Description: Assess an additional surcharge on top of the existing statewide sales and use tax on electricity, with all revenues dedicated to transportation purposes. • Advantages: Substantial revenue yield with small rate change; stable and predictable revenue source; responsive to inflation because revenues rise with price of electricity; revenue source acknowledges the overall economic and other benefits of transportation investments for all state residents; captures revenues from electric vehicles that pay no motor fuel tax, among other uses of electricity; relatively low implementation and administrative costs because tax mechanism is already in place • Disadvantages: No direct relationship to actual use of the transportation system or associated impacts; possible opposition to using sales tax revenues for transportation purposes rather than General Fund; sales tax is a regressive tax, especially when assessed on a critical service such as electricity

	<p>General Fund appropriations</p> <ul style="list-style-type: none">• Description: Appropriations from the General Fund to transportation purposes. Appropriations could be structured as one-time, multi-year, or recurring allocations. If recurring allocations, the amount could be indexed to changes in population or inflation. North Carolina's General Fund is currently supported by various regressive and non-regressive revenue sources including individual income tax (53%), state sales tax (31%), corporate income and franchise taxes (6.4%), excise taxes on alcohol and tobacco products (2.7%), insurance premium tax (2.1%), and non-tax revenues (4%) (OSBM, 2017).• Advantages: Revenue source acknowledges overall economic and other benefits of transportation investments for all state residents; specific advantages would depend on the ultimate source of the funds and how the allocation was structured (for example, many other countries rely on general revenues for transportation funding, with mechanisms in place to ensure stable, predictable funding levels)• Disadvantages: No direct relationship to actual use of the transportation system; possible opposition to transferring revenues from General Fund to transportation purposes; revenue transfers could be reduced during economic downturns; specific disadvantages would depend on the ultimate source of the funds and how the allocation was structured (for example, relying on discretionary appropriations through the state budgetary process could result in competition with other funding priorities)
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*Source: NCDOT*

Appendix III: COVID-19 Impacts on Public Perception

COVID-19 will unequivocally have a lasting impact on the world. It has already had a measurable impact on unemployment and disrupted public transit systems. With the risk of contracting the virus and the uncertainty of economic recovery, the public is experiencing intense paranoia and stress. As states transition from response to recovery, researchers pose the question, how will this pandemic alter society? Some industries have exceeded capacities while others wait to brace for economic fallout. In a world of turmoil, companies are innovating to address the crisis. This innovation will determine the predictions for the future of transportation.

Driver Behavior. North Carolina Governor Roy Cooper declared a state of emergency for North Carolina on March 10th and then issued the first Stay-at-Home order on March 27th (F. Porter, 2020). Daily traffic volume trends from April to May have reported a drop in traffic by 29 (MS2, 2020) to 38 percent (Schuman, 2020). Traffic sharply dropped after the Stay-at-Home order was instituted, but most North Carolina residents did not remain at home. In January and February, 19 and 17.9 percent of residents respectively remained at home. Nearly a quarter of the population stayed at home in April, but this number has been returning to pre-pandemic levels in May (Bureau of Transportation Statistics, 2020) as the Stay-at-Home order lifted.

Many contributing factors may be increasing COVID-19 cases in North Carolina. In late spring, the counties with the greatest number of cases were Mecklenburg, Forsyth, Guilford, Durham, Wake, Wayne, and Duplin County (NCDHHS, 2020). If the reopening of the state is not successful, new restrictions may encourage another dip in traffic volumes resulting in less revenue for the state.

To understand how the public is responding to restrictions, companies like Google and Safegraph are tracking cellphone data to understand travel across the country. North Carolina retailers and recreation areas are averaging about 13 percent less visitors. However, parks are bringing in much more traffic. North Carolina parks are experiencing 70 percent more visitors than the baseline. The public is still cautious about traveling using public transit and visiting places of employment. Public transit operators have 24 percent less visitors and places of employment are averaging about 17 percent less traffic (Google, 2020).

Safegraph has also been tracking where residents have been traveling to gauge a sense of normalcy. On April 13, 2020 North Carolina businesses were experiencing a 50 percent reduction in consumer foot traffic. On June 14, 2020 businesses were experiencing an 18 percent reduction of consumer foot traffic. So far, the least impacted businesses have included supermarkets and retail stores (Safegraph, 2020).

Based on national rankings published by Safegraph, North Carolina is ranked 17th in the US in terms of normal foot traffic (Safegraph, 2020). With less traffic on North Carolina roads, drivers are pushing the bar by exceeding most speed limits. The State Highway Patrol is reporting speeds greater than 100 mph from drivers in their 50s and 60s (Marusak, 2020).

Transportation Revenue. Due to less overall traffic for most businesses and workplaces, it is crippling the ability for NCDOT to maintain contracts and support existing projects. Since the NCDOT relies heavily on taxes and vehicle fees, the state is expected to lose over \$300 million of revenue for this fiscal year (NCDOT, 2020). COVID-19 is exacerbating an already vulnerable agency, which was recovering from cash imbalances from the current fiscal year. NCDOT is expected to lose \$370 million in the upcoming 2021 fiscal year (NCDOT, 2020). To curtail the economic fallout, NCDOT has significantly reduced staffing by laying off all temporary workers and requiring all employees to take 20 hours of unpaid leave, which will save the state \$7 million (Associated Press, 2020). Further cost cutting measures will be needed to offset the loss in revenue due to COVID-19.

Supply Chains. The pandemic is testing the vulnerabilities of global supply chains and technological infrastructure. As with many other transportation impacts, there remains a balancing act between positive and negative reactions to COVID-19 within industry. While the trucking industry benefits from reduced traffic, products and services that rely on global distribution are buckling in the weight of factory closures and travel restrictions. Businesses are seeking to innovate restricted, outdated business practices. Technology is expanding to relieve pressure on these sensitive machines of production by tracking impacts quantitatively. This simply recognizes the capacity for global resilience.

Traffic Impacts Trucking. As a result of the Stay-at-Home order issued by the governor of North Carolina, traffic across the state was reduced by 40 to 50 percent (R. Stradling, 2020, news). This has resulted in increased driving speed due to fewer vehicles on the roads. For the trucking industry, this means faster deliveries and increased efficiency. This reduction in traffic has had an impact on the number of crashes reported. In California, the shelter-in-place order has reduced collisions and fatal crashes, which saves the state \$40 million per day (F. Shiling, 2020, 1).

Policies Changing the Industry. As manufacturing and consumer markets attempt recovery, federal and state governments expand services and protections, which protect the movement of goods and services. The Federal Motor Carrier Safety Administration (FMCSA) which regulates the commercial trucking industry has altered break requirements and shift changes to increase capacity across the country. License expiration dates for trucking professionals have also been extended (Verizon Connect, 2020). Addressing changes in behavior through policy modification will help alleviate the stress presented by this crisis.

Innovative Strategies. In response to the pandemic, many transit agencies across the country have responded by

reducing services and limiting operational budgets. These budgets rely on fares and taxes to maintain them. While some services are being eliminated, other cities are proactively responding to the crisis. In Tel Aviv, the government has closed public transit to reduce exposure to the public. In response, the rideshare service Bubble Dan increased its serviceable region by four cities in a matter of days to provide access for healthcare workers (F. Cooperman, 2020). The Central Ohio Transit Authority in Columbus, Ohio quickly identified specific routes to address essential service worker needs by using its personalized phone app, COTA Plus (F. Cooperman, 2020). Companies like Cool (Malta), ITC and United Trans (Abu Dhabi, UAE), and Berliner Verkehrsbetriebe (Berlin, Germany) provide on-demand transportation for essential service workers with some adjusting service hours and limiting rider capacity to meet the needs of healthcare workers (F. Cooperman, 2020).

Transportation agencies will need to revisit established public safety policies, which address pandemics. The National Cooperative Highway Research Program published a guide for pandemic planning to address risk perceptions and maintain safety for riders and employees (K. Fletcher, 2014). Associations supporting industrial partners will need to use these resources to identify best management practices so that impacts from COVID-19 can be mitigated and prevented. Companies like IBM are developing recommendations on how businesses and governments should plan to address the reality after COVID-19: encouraging remote work, providing access to resources online, and preparing for a digital world protected by cybersecurity (IBM, 2020). Much like coalitions have been formed around Vision Zero and Complete Streets, there is growing momentum to develop solutions together.

Shared Mobility. Covid-19 is changing the way some cities provide a multi-modal society. Large cities are seeing significant drops in ridership. NYC is experiencing 40 percent less riders, which is attributed by public leadership discouraging public transit usage (Y. Shi, 2020, web). Rideshare businesses like Uber and Lyft have had less ridership and revenue. Uber has announced a reduction of 14 percent in staff to reduce spending by \$1 billion in response to the pandemic. Lyft also reported a reduction in ridership of 75 percent (R. Wall, 2020).

Bikeshare programs, however, have seen mixed expansion since the start of the pandemic in the United States. NYC, Boston, Chicago, and Washington, D.C. businesses are combating the reduction in public transportation services by providing free service for essential workers (J. Linton, 2020). The public sees the value in an alternative option to public transit, which limits the interaction with others.

Policy makers will need to decide on how cities will accommodate these changes. As people choose to use alternative forms of transportation over public transit, cities and states will need to consider the infrastructure needed to provide a safe experience for a multi-modal society. Much like the expansion to an electrified society, micro-mobility has been gaining traction long before COVID-19.

Transportation Electrification. Cities across the United States have been planning for the expansion of major electrical infrastructure updates: the installation of recharging stations to support the growing reliance on electric vehicles. This electrification process is a joint effort being employed by partner cities wishing to connect residents across city, county, and state boundaries. As demand increases in EV, so too will the demand on electricity. The Brattle Group published a report on electrification, pre-pandemic, in 2019. They forecasted that electrification could increase annual energy demand 25 to 85 percent by 2050 (Dr. J. Weiss, 2019). However, electric car sales have dropped since the emergence of COVID-19. Gas prices are the condition impacting EV sale decisions (J. Motavalli, 2020). The average gas price for regular grade gas in NC is \$1.812 (AAA, 2020), which is a result of a sharp drop in demand for gasoline. This is expected to increase as states remove stay-at-home orders across the county (AAA, 2020).

COVID-19 has since destabilized the consumer market. With the increase in unemployment across the globe, electric vehicle sales are expected to drop by 43 percent. Regardless of the demand for EV, many of the factories have since shut down or transitioned to manufacturing ventilators to support the fight against the pandemic (A. Alamalhodaie, 2020). With the shutdowns impacting event venues, the peak demand in electricity is waning. When Italy first instituted its lockdown, the utilities in Italy observed a sharp reduction between 18 and 21 percent (R.

Walton, 2020).

Amazon is committed to transitioning 100 percent of operations to renewable energy by 2030 even with the pandemic. They are slated to receive 100,000 fully electric delivery vans by 2040 (R. Beals, 2020). Since the decline in revenue generated by the motor fuels tax, the outlook for implementing a utility user fee on EVs looks promising. In a study to review the recovery of funds in California, the Mineta Transportation Institute concludes that the revenue generated from a user fee for EVs can surpass the loss generated by the motor fuels tax (A. Agrawal, 2020). This will rely heavily on the continued demand on EVs. Even with a utility fee, the motor fuels tax revenue in California still contributes more than any funding source (A. Agrawal, 2020).

Other Impacts. When COVID-19 impacted travel across the country in March, airports lost 90 percent of their passengers. Raleigh-Durham International Airport reached an all-time low - a 97 percent loss. Growth is increasing, however, as states and countries across the world continue to reopen. As of June 6th, RDU has reported an increase in passenger travel by 9.3 percent between the months of April and June (RDU, 2020). Small businesses in North Carolina will begin to feel a strain on finances and resources. If COVID-19 presents a resurgence in cases and the state reinstitutes restrictions, some businesses may not be able to recover. Small businesses, made up of 1 to 19 employees, make up 85 percent of the North Carolina employer base. However, medium-sized businesses provide one-third of all privately held positions in North Carolina (Carolina Small Business Development Fund, 2020). Policy considerations to address motor fuels tax alternatives will need to consider the potential impacts to North Carolina businesses during the COVID-19 pandemic.

Historical Reactions to Pandemics. COVID-19 recovery will be dependent on many factors. At its core how the public perceives risk and the willingness for risk exposure will determine how quickly the public will recover from the pandemic. Policy that impacts the every-day American will benefit from the lessons of past pandemics to communicate program expectations effectively.

The world has experienced crisis before. Globally, humans have outlasted the Black Plague, the Spanish Influenza, the SARS epidemic, and the all too familiar seasonal flu. These public health emergencies are a testament to the resiliency of humanity. While they are all similar in their classification as an infectious disease (CDC, 2020), each community impacted by these events have exhibited different reactions. These reactions are impacted by the differences in social norms, industrial practices, and available science and technology.

The Spanish Influenza of 1918 brought the world to its knees towards the end of World War I. This flu pandemic undermined the stability of a society recovering from its first global conflict. Infecting nearly one-third of the world's population, hospitals struggled to maintain the illness (CDC, 2020). Many cities across the United States disagreed about the pandemic's response, which shed light on the virus's impact. Cities choosing to postpone preventative measures saw the greatest deaths compared to those who acted quickly and decisively (NIH, 2007). Since the emergence of the flu, the United States has invested \$4.7 billion to combat future outbreaks and ensure security (A. Kamradt-Scott, 2012). It is difficult to make assumptions and conclusions on the impact the Spanish Flu had on the global economy due to its proximity in time to the recovery of World War I.

The SARS epidemic emerged similarly to COVID-19 from within Chinese territory. While the death toll for SARS was small in comparison to the Spanish Influenza or COVID-19, the economic impact in the region was quite severe (R. Smith, 2006). Risk perception played a key role in these impacts. It is estimated that SARS impacted the global economy at a cost of 30 to 100 billion US dollars (R. Smith, 2006). This risk perception was dictated by the risk of contraction, the severity of symptoms, the availability of safety, the location in which increased risk occurs, and paranoia (R. Smith, 2006). The outcomes of the SARS epidemic may provide insight on how the world will recover from COVID-19.

Modeling the Spread. To predict the behavior of infectious diseases, past pandemic movements provide insight into future modeling. Public transportation continues to contribute to the spread of most infectious diseases due to the proximity of potential hosts. Modeling has been developed to understand how infections spread and what methods

can be employed to reduce exposure (F. Xu, 2013; A. Tatem, 2006; K. Chong, 2012). Transportation is considered a vector, which contributes to global spread. For instance, air travel can greatly increase disease transmission, because infected passengers can exhibit no symptoms and still travel widely across the globe (T. Luke, 2008). Researchers have often used air travel as a mode for modeling potential spread (A. Tatem, 2006). Infectious disease outbreaks pose a greater risk to society today than when the Spanish Influenza first emerged. This risk is associated with the high interconnectedness of air, port, and land travel. Surveillance and contact tracing technology may be paramount in the future as humanity will inevitably continue to grow and expand through its transportation system (A. Tatem, 2006).

Risk Perception During COVID-19. The pandemic contributes a unique opportunity to understand the public's perception of risk. This is attributed by the willingness to follow established safety protocols and existing laws. By understanding the behaviors of the public, transportation agencies can employ the proper tools for addressing insecurities and communication to encourage future participation and reliance on public transit. Risk perception may also contribute to identifying safety protocols for addressing speeding and road safety. The psychology factors impacted by COVID-19 can help predict how the public will recover from the pandemic. Researchers have identified that communicating the personal risks of contracting COVID-19 are more effective at addressing increased risk perception and reducing disease transmission (T. Wise, 2020).

Risk perception is influenced by “experiences, beliefs, attitudes, judgements, (mis)conceptions, and feelings, as well as wider social, cultural, and institutional processes” (L. Cori, 2020). Understanding the mechanisms impacting risk perception amongst the public provides an outlook on how transportation agencies can address public fear. Arizona State University completed a preliminary study to understand the impacts COVID-19 is having on Americans. Forty-two percent of participants in the study will likely fly less often for work due to the online working shift (D. Salon, 2020). Personal air travel is expected to decrease due to potential virus exposure (D. Salon, 2020). Commuters are more likely to travel via bicycle or walk to practice social distancing and save money (D. Salon, 2020).

Modernizing North Carolina's Infrastructure Through
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