Keeping North Carolina Mobile:

Providing a Modern, Reliable and Sustainable Transportation System in the Tar Heel State

TRIP
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Founded in 1971, TRIP ® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.

Executive Summary

Mobility, accessibility and connectivity are critical factors in a state's quality of life and economic competitiveness. The growth and development of a state or region hinges on efficient and safe access to employment, customers, commerce, recreation, education and healthcare via multiple transportation modes. The quality of life and the pace of a state's economic growth are directly tied to the condition, efficiency, safety and resiliency of its transportation system.

An adequate and reliable source of transportation funding is critical to providing a system of roads, highways, bridges, transit, pedestrian and bicycle facilities to support commerce within North Carolina and connect the state to markets around the globe, while providing safe, efficient mobility on a well-maintained transportation system. North Carolina transportation funding received a significant boost in 2022 when the legislature approved the use of a share of the state's sales tax for road and bridge projects. This followed the 2021 passage of the federal Infrastructure Investment and Jobs Act (IIJA), which increased federal highway, bridge and transit funding in North Carolina by approximately 29 percent. While this additional state and federal transportation investment will allow North Carolina to make progress in improving its transportation system, the erosion of motor fuel taxes -- a primary source of federal and state transportation funding -- due to inflation, improved fuel efficiency and the adoption of hybrid and electric vehicles, threatens North Carolina's ability to keep pace with the state's growing transportation needs.

TRIP's "Keeping North Carolina Mobile" report examines the condition, use, safety and efficiency of North Carolina's surface transportation system and the impact of additional transportation funding. The report also looks at the challenges North Carolina faces to accommodate future transportation growth, maintain the existing system, and sustain adequate state transportation investment despite the funding impacts of highway construction cost inflation, increasing fuel efficiency standards, and the adoption of electric vehicles. Sources of information for this report include the North Carolina Department of Transportation (NCDOT), the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau, the Texas Transportation Institute (TTI), the American Road & Transportation Builders Association (ARTBA), and the National Highway Traffic Safety Administration (NHTSA).

NORTH CAROLINA'S TRANSPORTATION SYSTEM AND FUNDING

North Carolina's roads, highways and bridges are funded by investments from local, state and federal governments. In 2022 the North Carolina legislature approved HB 103 to address a lack of adequate transportation funding by dedicating a portion of the state's sales tax revenue to road and highway projects. Under the 2022 legislation, two percent of general sales tax dollars are transferred to two highway funds, with the transfer rising to four percent in fiscal year (FY) 2023-24 and to six percent of sales tax revenues in FY 2024-25. This additional revenue from the sales tax is projected to provide an additional $193 million in highway funds in North Carolina in FY 2022-23, increasing to $710 million in FY 2024-25 and to $855 million in FY 2032-33, providing an additional $9.7 billion in highway funds through FY 2032-33.

The additional state revenue for highways will complement a boost in federal transportation funds received in North Carolina from the Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021. The IIJA will provide $7.2 billion in state funds for highway and bridge investments in North Carolina over five years, representing a 29 percent increase in annual federal funding for roads and bridges in North Carolina over the previous federal surface transportation program. Federal funds currently provide 33 percent of the revenue used by NCDOT to fund highway and bridge improvements.

NCDOT's ability to adequately maintain the state's major roads, highways and bridges depends on long-term, consistent, and sufficient funding that targets the assets in greatest need of repair. The state

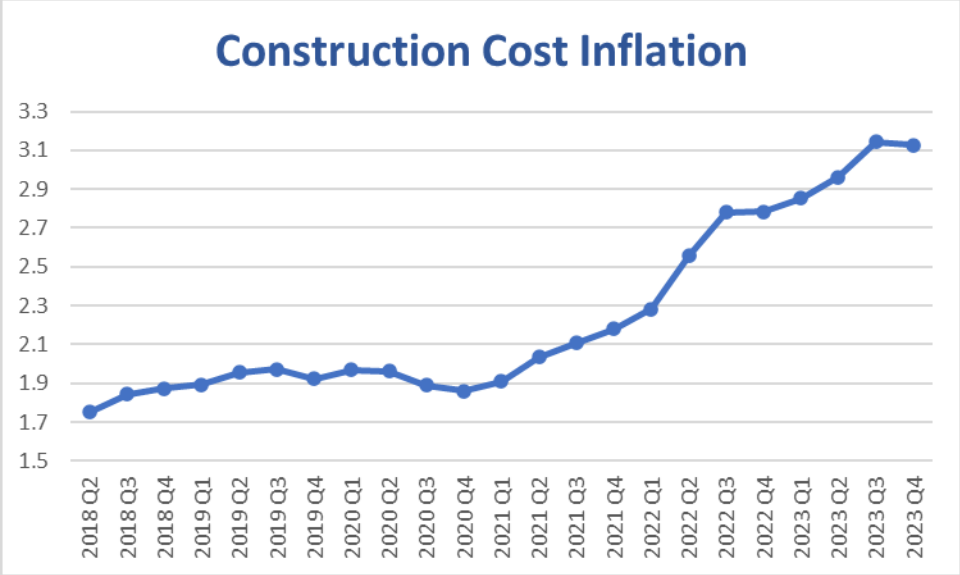
DOT's current annual level of investment in roadway and bridge preservation falls short of the amount needed to adequately maintain the state's roads, highways and bridges. While NCDOT spent $656 million on the preservation of roads and highways in 2022, this was $341 million short of the $997 million annual investment recommended by NCDOT. In 2022 NCDOT spent $371 million on bridge preservation, $39 million short of the $410 million annual investment recommended.

From 2023 to 2032 NCDOT expects to increase its annual investment in roadway preservation and bridge preservation by 17 percent and 22 percent, respectively, as a result of increased state and federal transportation revenue.

The ability of revenue from the North Carolina and the federal motor fuel tax -- as well as other sources of state and federal transportation funding -- to keep pace with North Carolina's future transportation needs is likely to erode as a result of increasing vehicle fuel efficiency, the increasing use of electric vehicles and inflation in highway construction costs.

The average fuel efficiency of U.S. passenger vehicles increased from 20 miles per gallon in 2010 to 24.5 miles per gallon in 2020. Average fuel efficiency is expected to increase another 31 percent by 2030, to 32 miles per gallon, and increase 51 percent by 2040, to 37 miles per gallon. The share of electric vehicles of total passenger vehicle sales in the U.S. is expected to increase to five percent in 2023 and to 60 percent by 2040, by which time electric vehicles will represent approximately 30 percent of the nation's passenger vehicle fleet.

The Federal Highway Administration's national highway construction cost index, which measures labor and materials cost, increased by 43 percent in 2022 and 2023 and by 68 percent since the beginning of 2021.



ROAD CONDITIONS IN NORTH CAROLINA

Statewide, 37 percent of North Carolina's major roads are in poor or mediocre condition. Twelve percent of North Carolina's major locally and state-maintained roads are in poor condition and 25 percent are in mediocre condition. Twenty-five percent of North Carolina's major roads are in fair condition and the remaining 38 percent are in good condition. The chart below details pavement conditions on major roads in the state's largest urban areas and statewide.

Location	Poor	Mediocre	Fair	Good
Asheville	11%	16%	19%	54%
Charlotte Metro	23%	27%	20%	30%
Raleigh-Durham	15%	24%	22%	39%
The Triad	12%	27%	21%	40%
Wilmington	19%	27%	21%	34%
North Carolina Statewide	**12%**	**25%**	**25%**	**38%**

TRIP has calculated the additional cost to North Carolina motorists of driving on roads in poor, mediocre or fair condition. When roads are in poor, mediocre or fair condition – which may include potholes, rutting or rough surfaces – the cost to operate and maintain a vehicle increases. These additional vehicle operating costs (VOC) include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. TRIP estimates that additional VOC borne by North Carolina motorists as a result of deteriorated road conditions is $5 billion annually, an average of $633 per driver statewide. The chart below shows additional VOC per motorist in the state's largest urban areas and statewide.

Location	VOC
Asheville	$428
Charlotte Metro	$784
Raleigh-Durham	$623
The Triad	$577
Wilmington	$661
North Carolina Statewide	**$633**

BRIDGE CONDITIONS IN NORTH CAROLINA

Seven percent of North Carolina's bridges are rated in poor/structurally deficient condition. Bridges that are rated poor/structurally deficient have significant deterioration of the bridge deck, supports or other major components. Fifty-two percent of the state's bridges are rated in fair condition and the remaining 41 percent are in good condition. Most bridges are designed to last 50 years before major overhaul or replacement, although many newer bridges are being designed to last 75 years or longer. In North Carolina, 32 percent of the state's bridges are 50 years or older.

The chart below details bridge conditions statewide and in the state's largest urban areas.

	POOR/STRUCTURALLY DEFICIENT		FAIR		GOOD		TOTAL
	Number	Share	Number	Share	Number	Share	BRIDGES
Asheville	42	8%	333	61%	171	31%	546
Charlotte Metro	97	5%	953	52%	779	43%	1,829
Raleigh-Durham	54	5%	520	50%	457	44%	1,031
The Triad	111	6%	971	52%	788	42%	1,870
Wilmington	4	3%	40	34%	73	62%	117
North Carolina Statewide	**1,336**	**7%**	**9,766**	**52%**	**7,715**	**41%**	**18,817**

TRAFFIC CONGESTION IN NORTH CAROLINA

Congested roads, highways and bottlenecks choke commuting and commerce and cost North Carolina drivers $4 billion each year in the form of lost time and wasted fuel. From 2000 to 2019, vehicle travel in North Carolina increased by 37 percent, the fifth highest rate in the country. Due to the COVID-19 pandemic, vehicle travel in North Carolina dropped by as much as 38 percent in April 2020 (as compared to vehicle travel during the same month the previous year). By 2023, vehicle miles of travel (VMT) in North Carolina had rebounded to two percent below pre-pandemic levels in 2019.

The chart below details the annual hours lost to congestion, congestion costs per driver and the average amount of fuel per driver wasted in 2024 due to congestion in the state's largest urban areas.

Urban Area	Hours Lost to Congestion	Annual Cost Per Driver	Gallons of Fuel Wasted Per Driver
Asheville	34	$849	13
Charlotte Metro	48	$1,319	20
Raleigh-Durham	36	$863	14
The Triad	27	$592	11
Wilmington	28	$660	11

Increasing congestion on North Carolina's major highways and roads hampers the state's ability to support economic development and quality of life by reducing the reliability and efficiency of personal and commercial travel, including the transport of goods and services. Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to consumers. Increased levels of congestion can also reduce the attractiveness of a location when a company is considering expansion or deciding where to locate a new facility.

The chart below details the 20 least reliable North Carolina highway segments with the widest variability in travel times from day to day as measured by the Level of Travel Time Reliability (LOTTR). A list of the 40 least reliable highway segments in the state is included in the report. The LOTTR index represents how a road performs on a congested day compared to an average day. For example, if a given trip takes a motorist 40 minutes on a congested day compared with 20 minutes to make the same trip on an average day, the LOTTR would be 2.0 (40/20). In addition to the trip taking longer than normal, this variability makes trip planning challenging for motorists.

RANK	ROUTE	DIRECTION	COUNTY	INTERSECTION	MILES	LOTTR
1*	I-40	WB	HAYWOOD	US-276/EXIT 20	3.52	5.29
2	NC-147	NB	DURHAM	CORNWALLIS RD/EXIT 6	0.29	4.35
3	NC-16	NB	MECKLENBURG	I-485	1.05	3.94
4	I-485	EB	MECKLENBURG	REA RD/EXIT 59	0.5	3.64
5*	I-40	WB	HAYWOOD	US-276/EXIT 20	0.22	3.55
6	I-485	WB	MECKLENBURG	ARROWOOD RD/EXIT 3	0.47	3.47
7	US-29	SB	GUILFORD	I-85 BUS/I-40/US-421	0.51	3.38
8	NC-51	EB	MECKLENBURG	SARDIS RD	0.85	3.37
9	I-485	WB	MECKLENBURG	ARROWOOD RD/EXIT 3	0.77	3.32
10	I-485	EB	MECKLENBURG	US-74/US-29/WILKINSON BLVD/EXIT 9	0.34	3.25
11	NC-147	NB	DURHAM	T W ALEXANDER DR/EXIT 7	0.37	3.24
12	NC-172	EB	ONSLOW	NC-24/FREEDOM WAY	9.55	3.23
13	US-70	EB	DURHAM	LAUREL DR	0.61	3.22
14	I-277	SB	MECKLENBURG	US-74/EXIT 2	0.14	3.11
15	NC-27	WB	MECKLENBURG	I-485	0.27	3.1
16	I-277	S TO E	MECKLENBURG	EXIT 9: I-277 SB/US-74 EB/WILKINSON BLVD	0.21	3.07
17	NC-27	WB	MECKLENBURG	RHYNE RD	0.17	3.07
18	I-277	SB	MECKLENBURG	DAVIDSON ST/EXIT 3	0.22	3.05
19	I-77	NB	MECKLENBURG	ARROWOOD RD/EXIT 3	0.17	3.01
20	US-15	SB	ORANGE	NC-54 BUS/RALEIGH RD	0.22	2.93

**In 2023 a significant work zone on I-40 in Haywood County affected this ranking.*

FREIGHT TRANSPORTATION IN NORTH CAROLINA

The health and future growth of North Carolina's economy is riding on its surface transportation system. In 2022 North Carolina's freight system moved 478 million tons of freight, valued at $741 billion – the 13th largest value of freight moved of all states. From 2022 to 2050, freight moved annually in North Carolina by trucks is expected to increase 64 percent by weight and 97 percent by value (inflation-adjusted dollars), the 15th largest projected increase in the U.S. Eight percent of travel on North Carolina's Interstate highways and 13 percent of travel on its rural Interstate highways is by combination trucks.

The amount of freight transported in North Carolina and the rest of the U.S. is expected to increase significantly as a result of economic growth, changing business and retail models, increasing international trade, and rapidly changing consumer expectations that place an emphasis on faster deliveries, often of smaller packages or payloads.

Accommodating the significant increase expected in the movement of truck freight in North Carolina will be further challenged by the significant number of freight routes in the state that are constrained because they have inadequate load carrying capacity to accommodate large trucks. The chart below lists North Carolina's top 10 interstate locations with the highest Truck Travel Time Reliability (TTTR).

RANK	ROAD	COUNTY	DIRECTION	INTERSECTION	MILES	TTTR
1*	I-40	HAYWOOD	WB	US-276/EXIT 20	3.52	10.83
2*	I-40	HAYWOOD	WB	NC-209/EXIT 24	0.47	10.61
3	I-85	DURHAM	SB	NC-147/EXIT 172	0.34	9.33
4*	I-40	HAYWOOD	WB	US-276/EXIT 20	0.22	7.36
5	I-85	DURHAM	SB	NC-147/EXIT 172	0.24	6.9
6	I-40	WAKE	EB	JONES SAUSAGE RD/EXIT 303	0.78	6.29
7	I-485	MECKLENBURG	EB	REA RD/EXIT 59	0.5	6.27
8	I-77	MECKLENBURG	NB	I-485/EXIT 2	1.02	5.99
9	I-26	BUNCOMBE	WB	AIRPORT RD/EXIT 40	0.4	5.93
10	I-277	MECKLENBURG	NB	NC-16/W 2ND ST/KENILWORTH AVE/EXIT 2	0.36	5.88

**In 2023 a significant work zone on I-40 in Haywood County affected this ranking.*

TRAFFIC SAFETY IN NORTH CAROLINA

From 2019 to 2023, 7,858 people were killed in traffic crashes in North Carolina, an average of 1,572 fatalities per year. The state's 2023 traffic fatality rate of 1.36 fatalities for every 100 million miles traveled was higher than the national average of 1.26. The traffic fatality rate on the state's rural, non-Interstate roads was the sixth highest in the nation and was nearly triple the fatality rate on all other roads in the state (2.59 vs. 0.88). From 2018 to 2022, 17 percent of the state's 7,678 traffic fatalities in crashes involving motorized vehicles were of pedestrians or bicyclists, a total of 1,166 pedestrian fatalities and 106 bicyclist fatalities over the five-year period.

Improving safety on North Carolina's roadways can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and, a variety of improvements in roadway safety features.

Nationwide, traffic fatalities began to increase dramatically in 2020 even as vehicle travel rates plummeted due to the COVID-19 pandemic, and the number of fatalities continued to increase in 2021. The number of fatalities in North Carolina increased 20 percent from 2019 to 2023, from 1,373 to 1,653, and the state's fatality rate per 100 million VMT increased 21 percent from 1.12 to 1.36 during that time. This increase in the number of fatalities and the rate of fatalities per 100 million VMT happened while vehicle travel in the state decreased by two percent overall from 2019 to 2023.

NORTH CAROLINA TRAFFIC FATALITY AND VEHICLE MILES OF TRAVEL (VMT) DATA						
	2019	2020	2021	2022	2023	2019-2023 Change
Traffic Fatalities	1,373	1,538	1,663	1,667	1,653	**20%**
Fatalities per 100M VMT	1.12	1.45	1.46	1.47	1.36	**21%**
VMT (Billions)	122.5	106.3	117.7	116.5	120.3	**-2%**

In early 2022 the U.S. Department of Transportation adopted a comprehensive National Roadway Safety Strategy, a roadmap for addressing the nation's roadway safety crisis based on a Safe System approach. The Safe System approach, which is also being adopted by state and local transportation agencies has five objectives: Safer People, Safer Roads, Safer Vehicles, Safer Speeds, and improved Post-Crash Care.

Traffic crashes in North Carolina imposed a total of $16.9 billion in economic costs in 2022. TRIP estimates that roadway features, while not the primary factor, were likely a contributing factor in approximately one-third of all fatal traffic crashes, resulting in $5.6 billion in economic costs in North

Carolina in 2022. These costs include work and household productivity losses, property damage, medical costs, rehabilitation costs, legal and court costs, congestion costs, and emergency services.

PROGRESS IN IMPROVING TRAVEL RELIABILITY AND SAFETY IN NORTH CAROLINA

Using a combination of programs and projects, the North Carolina Department of Transportation is taking steps to address North Carolina's safety, traffic congestion and reliability challenges. These efforts are aimed at improving the efficiency and safety of the state's transportation system.

- NCDOT's efforts to improve travel reliability and safety include:

✓ Four regional and one statewide Transportation Management Centers (TMC) in Charlotte, the Triad/Greensboro area, Asheville, and the Triangle/Raleigh area provide continuous, proactive traffic management across the state. The TMC's coordinate with DOT staff, law enforcement, emergency management, adjacent state DOT's and other stakeholders to manage daily freeway disruptions by clearing incidents and providing real time information.

✓ Nearly 1,200 miles of safety service patrol serve freeways in Western North Carolina, the greater Charlotte metro area, the Triad, the Triangle, the Wilmington area, and I-95. The Incident Management Assistance Patrol (IMAP) provides emergency traffic control for emergency responders at crash scenes, works with emergency responders to clear crash scenes quickly, and provides services to stranded motorists. In 2023 IMAP responded to over 57,000 incidents and assisted more than 37,000 motorists across the state.

✓ The traveler Information program includes more than 300 Dynamic Message Signs, 900 traffic cameras, the DriveNC.gov website and 511 phone line. About 20,000 phone calls are made to 511 each year, nearly 600,000 visits were made to DriveNC.gov in 2023, and over 30,000 incidents were entered into the system and shared with Waze, Google, Apple, etc.

✓ In 2022 NCDOT retimed 39 systems (made up of 328 traffic signals), which yielded a 24 percent improvement in travel time, a 63 percent reduction in delays and a 59 percent reduction in the number of stops.

✓ In 2022 NCDOT released updated guidance on its Complete Streets policy which requires all projects in the state to include appropriate multimodal facilities when bicycle, pedestrian and transit needs are identified. The new guidance establishes standards and procedures for project evaluation, facility selection, and cost share. NCDOT staff reviewed over 450 transportation projects in 2022 using the new Complete Streets guidance to identify multimodal needs and ensure projects are scoped properly to address those needs.

✓ North Carolina is served by 25 urban transit systems that in 2021 provided approximately 31 million trips, and 80 rural transportation agencies, which in 2022 provided approximately 4.7 million demand response rides.

✓ Since 2019, NCDOT has invested approximately $6.2 billion to increase the capacity of numerous highway segments in the state to improve reliability. These improvements include additional capacity being added to portions of the Fayetteville Outer Loop, the Greensboro Loop, the I-485 Charlotte Beltway, the Winston-Salem Bypass, the Wilmington Bypass, the I-85 corridor, the Goldsboro Bypass, the Salem Parkway and the Jamestown Bypass.

THE IMPACT OF TRANSPORTATION INVESTMENT ON ECONOMIC GROWTH IN NORTH CAROLINA

According to a report by the American Road & Transportation Builders Association, the design, construction and maintenance of transportation infrastructure in North Carolina supports approximately 110,000 full-time jobs across all sectors of the economy. These workers earn $3.7 billion annually. Approximately 1.9 million full-time jobs in North Carolina in key industries like tourism, retail sales, agriculture and manufacturing are completely dependent on the state's transportation network.

Highway and bridge spending multiplies through the economy by stimulating additional output. A 2021 macroeconomic analysis by IHS Markit found that that every dollar spent on highway and bridge improvements results in $3.4 dollars in combined direct, indirect and induced output from industries throughout the economy, resulting in a multiplier for highway and bridge investment of 3.4.

Sources of information for this report include the Federal Highway Administration (FHWA), the North Carolina Department of Transportation (NCDOT), the American Road and Transportation Builders Association (ARTBA), the Bureau of Transportation Statistics (BTS), the U. S. Census Bureau, the Center for Transportation Studies, the Texas Transportation Institute (TTI) and the National Highway Traffic Safety Administration (NHTSA). All data used in the report are the most recent available.

Introduction

North Carolina's residents, visitors and businesses rely on the state's system of roadways, bridges, transit, pedestrian and bicycle facilities to provide a vital link to homes, jobs, shopping, natural resources and recreation across the state and beyond. An efficient, safe and well-maintained transportation system that allows for a high level of accessibility, connectivity and safety is required to support quality of life and a robust economy in North Carolina.

North Carolinians rely on a diverse economy including manufacturing, financial services, agriculture, healthcare, tourism and education. A safe, well-maintained and reliable transportation system is critical to each of these sectors and to the economic health of the state and the nation.

Adequate, sustained, long-term investment in North Carolina's transportation network will help enhance economic development opportunities, improve business productivity, and make it easier and more reliable for the public to get to and from destinations including work, home, school, shopping and social events.

Population, Travel and Economic Trends in North Carolina

North Carolina's residents and businesses require a high level of personal and commercial mobility. To foster quality of life and spur economic growth, it will be critical that North Carolina provide an efficient, safe and modern transportation system that can accommodate future growth in population, tourism, business, recreation and vehicle travel.

North Carolina's population reached 10.8 million residents in 2023, a 35 percent increase since 2000 and the ninth highest rate of population growth among states from 2000 to 2023.[1] North Carolina had approximately 8 million licensed drivers in 2022.[2] From 2000 to 2021, North Carolina's gross domestic product (GDP), a measure of the state's economic output, increased by 49 percent when adjusted for inflation.[3] U.S. GDP, adjusted for inflation, increased 48 percent during this period.[4]

From 2000 to 2019, annual VMT in North Carolina increased by 37 percent, the fifth highest rate of growth in the U.S., from approximately 89 billion miles traveled annually to approximately 122 billion miles traveled annually.[5] Due to the COVID-19 pandemic, vehicle travel in North Carolina dropped by as much as 38 percent in April 2020 (as compared to vehicle travel during the same month the previous year).[6] By 2023, North Carolina's overall VMT levels had rebounded to two percent below 2019's pre-pandemic levels.[7]

Road Conditions in North Carolina

The life cycle of North Carolina's roads is greatly affected by state and local governments' ability to perform timely maintenance and upgrades to ensure that road and highway surfaces last as long as possible.

The pavement data in this report, which is for all arterial and collector roads and highways, is provided by the Federal Highway Administration (FHWA), based on data submitted annually by NCDOT on the condition of major state and locally maintained roads and highways. Pavement data for Interstate highways and other principal arterials is collected for all system mileage, whereas pavement data for minor arterial and all collector roads and highways is based on sampling portions of roadways as prescribed by FHWA to ensure the data collected is adequate to provide an accurate assessment of pavement conditions on these roads and highways.

Twelve percent of North Carolina's major locally and state-maintained roads and highways have pavements rated in poor condition and 25 percent are in mediocre condition.[8] Twenty-five percent of North Carolina's major roads are rated in fair condition and the remaining 38 percent are rated in good condition.[9]

Nineteen percent of North Carolina's major locally and state-maintained urban roads and highways have pavements rated in poor condition and 29 percent are in mediocre condition.[10] Twenty-three percent

of North Carolina's major urban roads are rated in fair condition and the remaining 30 percent are rated in good condition.[11]

Seven percent of North Carolina's major locally and state-maintained rural roads and highways have pavements rated in poor condition and 22 percent are in mediocre condition.[12] Twenty-seven percent of North Carolina's major rural roads are rated in fair condition and the remaining 44 percent are rated in good condition.[13]

The chart below details pavement conditions on major roads in the state's largest urban areas and statewide.[14]

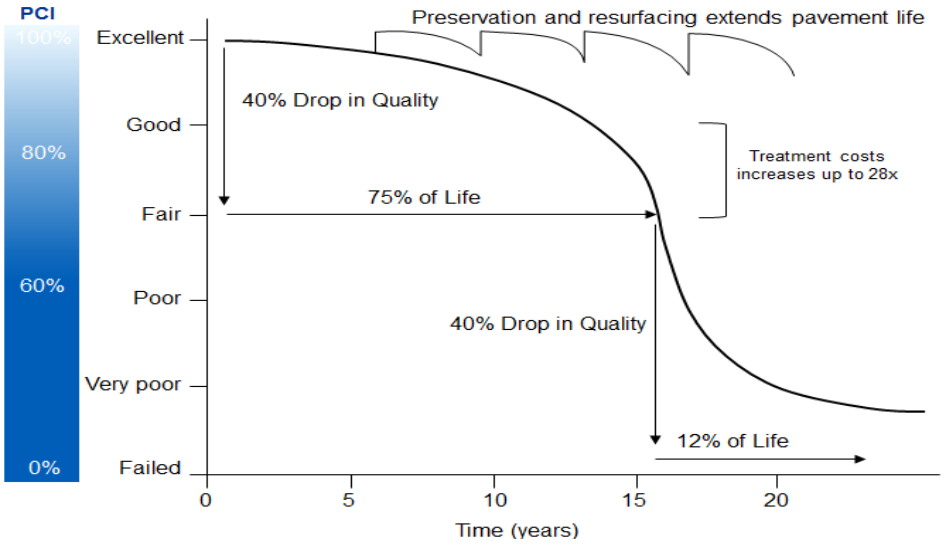
Chart 1. Pavement conditions on major roads in North Carolina's largest urban areas and statewide.

Location	Poor	Mediocre	Fair	Good
Asheville	11%	16%	19%	54%
Charlotte Metro	23%	27%	20%	30%
Raleigh-Durham	15%	24%	22%	39%
The Triad	12%	27%	21%	40%
Wilmington	19%	27%	21%	34%
North Carolina Statewide	**12%**	**25%**	**25%**	**38%**

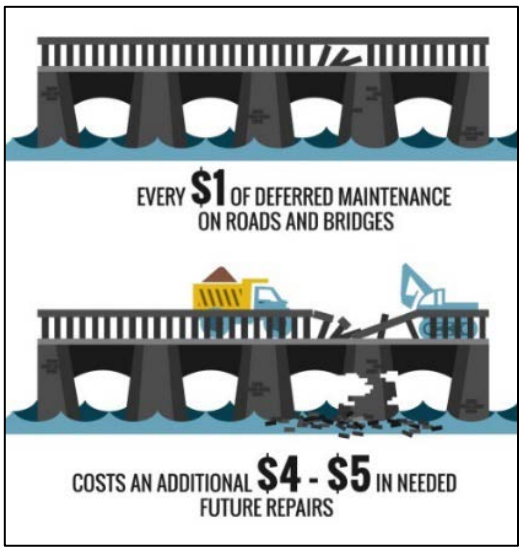
Source: TRIP analysis of Federal Highway Administration data.

Pavement failure is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.[15] As roads and highways continue to age, they will reach a point of deterioration where routine paving and maintenance will not be adequate to keep pavement surfaces in good condition and costly reconstruction of the roadway and its underlying surfaces will become necessary.

Chart 2. Pavement condition cycle time with treatment and cost



Source: North Carolina Department of Transportation (2016). 2016 Maintenance Operations and Performance Analysis Report



Long-term repair costs increase significantly when road and bridge maintenance is deferred, as road and bridge deterioration accelerates later in the service life of a transportation facility and requires more costly repairs. A report on maintaining pavements found that every $1 of deferred maintenance on roads and bridges costs an additional $4 to $5 in needed future repairs.[16]

The Cost of Inadequate Road Conditions in North Carolina

TRIP has calculated the additional cost to motorists of driving on roads in poor, mediocre or fair condition. When roads are in poor, mediocre or fair condition – which may include potholes, rutting or rough surfaces – the cost to operate and maintain a vehicle increases. These additional vehicle operating costs (VOC) include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. TRIP estimates that additional VOC borne by North Carolina motorists as a result of deteriorated road conditions is $5 billion annually, an average of $633 per driver statewide.[17] The chart below details additional VOC per motorist in the state's largest urban areas.

Chart 3. Annual vehicle operating costs per motorist as a result of driving on deteriorated roads.

Location	VOC
Asheville	$428
Charlotte Metro	$784
Raleigh-Durham	$623
The Triad	$577
Wilmington	$661
North Carolina Statewide	**$633**

Source: TRIP estimates.

Additional vehicle operating costs have been calculated in the Highway Development and Management Model (HDM), which is recognized by the U.S. Department of Transportation and more than 100 other countries as the definitive analysis of the impact of road conditions on vehicle operating costs. The HDM report is based on numerous studies that have measured the impact of various factors, including road conditions, on vehicle operating costs.[18] The HDM study found that road deterioration increases ownership, repair, fuel and tire costs. The report found that deteriorated roads accelerate the pace of depreciation of vehicles and the need for repairs because the stress on the vehicle increases in proportion to the level of roughness of the pavement surface. Similarly, tire wear and fuel consumption increase as roads deteriorate since there is less efficient transfer of power to the drive train and additional friction between the road and the tires.

TRIP's additional VOC estimate is based on taking the average number of miles driven annually by a motorist, calculating current VOC based on AAA's driving cost estimates and then using the HDM model to

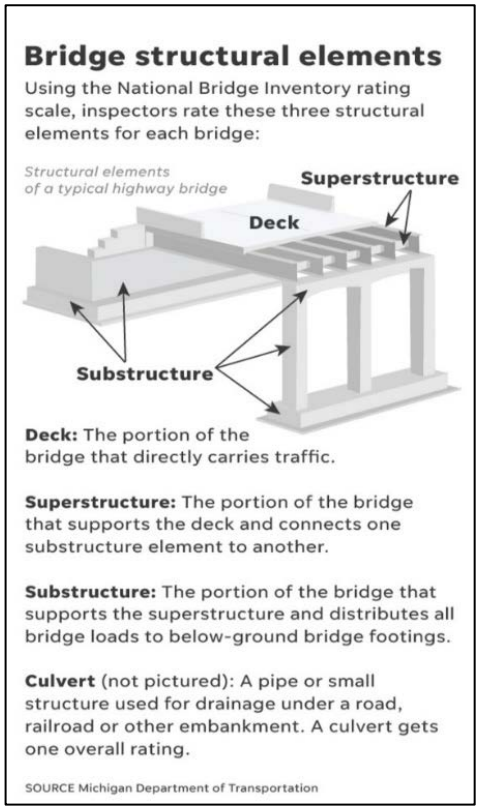
estimate the additional VOC paid by drivers as a result of substandard roads.[19] Additional research on the impact of road conditions on fuel consumption by the North Carolina Transportation Institute (TTI) is also factored into TRIP's vehicle operating cost methodology.

Bridge Conditions in North Carolina

North Carolina's bridges form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical facilities, and facilitating commerce and access for emergency vehicles.

Seven percent (1,336 of 18,817) of North Carolina's locally and state-maintained bridges are rated in poor/structurally deficient condition.[20] This includes all bridges that are 20 feet or more in length. A bridge is deemed poor/structurally deficient if there is significant deterioration of the bridge deck, supports or other major components.

Bridges that are poor/structurally deficient may be posted for lower weight limits or closed if their condition warrants such action. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy. Fifty-two percent of North Carolina's locally and state-maintained bridges have been rated in fair condition.[21] A fair rating indicates that a bridge's structural elements are sound but minor deterioration has occurred to the bridge's deck, substructure or superstructure. The remaining 41 percent of the state's bridges are rated in good condition.[22]



The chart below shows the condition of bridges statewide and in North Carolina's largest urban areas.[23]

Chart 4. Bridge conditions statewide and in North Carolina's largest urban areas.

	POOR/STRUCTURALLY DEFICIENT		FAIR		GOOD		TOTAL
	Number	Share	Number	Share	Number	Share	BRIDGES
Asheville	42	8%	333	61%	171	31%	546
Charlotte Metro	97	5%	953	52%	779	43%	1,829
Raleigh-Durham	54	5%	520	50%	457	44%	1,031
The Triad	111	6%	971	52%	788	42%	1,870
Wilmington	4	3%	40	34%	73	62%	117
North Carolina Statewide	**1,336**	**7%**	**9,766**	**52%**	**7,715**	**41%**	**18,817**

Source: TRIP analysis of Federal Highway Administration National Bridge Inventory (2023).

Most bridges are designed to last 50 years before major overhaul or replacement, although many newer bridges are being designed to last 75 years or longer. In North Carolina, 32 percent of the state's bridges are 50 years or older.[24] The service life of bridges can be extended by performing routine maintenance such as resurfacing decks, painting surfaces, ensuring that a facility has good drainage and

replacing deteriorating components. But most bridges will eventually require more costly reconstruction or major rehabilitation to remain operable.

Traffic Reliability in North Carolina

While traffic congestion is largely constrained to the state's urban areas, increasing congestion on North Carolina's major highways and roads hampers the state's ability to support economic development and quality of life by reducing the reliability and efficiency of personal and commercial travel, including the transport of goods and services. Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to consumers. Increased levels of congestion can also reduce the attractiveness of a location when a company is considering expansion or deciding where to locate a new facility.

Based on Texas Transportation Institute's report that analyzes urban traffic congestion levels and provides estimates on the amount of time and the value of lost time and wasted fuel as a result of traffic congestion, TRIP has estimated in the following chart the average number of hours lost annually for each driver, the per-driver cost of lost time and wasted fuel due to congestion and the average amount of fuel per driver wasted annually in 2024 due to congestion in each of North Carolina's largest urban areas.

Chart 5. 2024 Annual hours and fuel lost to congestion and congestion costs per driver.

Urban Area	Hours Lost to Congestion	Annual Cost Per Driver	Gallons of Fuel Wasted Per Driver
Asheville	34	$849	13
Charlotte Metro	48	$1,319	20
Raleigh-Durham	36	$863	14
The Triad	27	$592	11
Wilmington	28	$660	11

Source: TRIP estimate based on Texas Transportation Institute Analysis.

Based on the TTI report, TRIP estimates that the total cost of traffic congestion in North Carolina in 2024 in the form of lost time and wasted fuel is $4 billion annually.[25] Increasing congestion on North Carolina's major highways and roads hampers the state's ability to support economic development and quality of life by reducing the reliability and efficiency of personal and commercial travel, including the transport of goods and services.

NCDOT assesses reliability on the state's major highways. The Level of Travel Time Reliability (LOTTR) index represents how a road performs on a congested day compared to an average day. For example, if a given trip takes a motorist 40 minutes on a congested day compared with 20 minutes to make the same trip on an average day, the LOTTR would be 2.0 (40/20). According to the Federal Highway Administration an LOTTR higher than 1.5 indicates the road was considered unreliable because of the wide variability in travel times from day to day. In addition to the trip taking longer than normal, this variability makes trip planning challenging for motorists. The chart below details the 30 segments of roadways in the state that are the least reliable based on their LOTTR.

Chart 6. Least Reliable Locations on North Carolina's Major Highways.

1*	I-40	WB	HAYWOOD	US-276/EXIT 20	3.52	5.29
2	NC-147	NB	DURHAM	CORNWALLIS RD/EXIT 6	0.29	4.35
3	NC-16	NB	MECKLENBURG	I-485	1.05	3.94
4	I-485	EB	MECKLENBURG	REA RD/EXIT 59	0.5	3.64
5*	I-40	WB	HAYWOOD	US-276/EXIT 20	0.22	3.55
6	I-485	WB	MECKLENBURG	ARROWOOD RD/EXIT 3	0.47	3.47
7	US-29	SB	GUILFORD	I-85 BUS/I-40/US-421	0.51	3.38
8	NC-51	EB	MECKLENBURG	SARDIS RD	0.85	3.37
9	I-485	WB	MECKLENBURG	ARROWOOD RD/EXIT 3	0.77	3.32
10	I-485	EB	MECKLENBURG	US-74/US-29/WILKINSON BLVD/EXIT 9	0.34	3.25
11	NC-147	NB	DURHAM	T W ALEXANDER DR/EXIT 7	0.37	3.24
12	NC-172	EB	ONSLOW	NC-24/FREEDOM WAY	9.55	3.23
13	US-70	EB	DURHAM	LAUREL DR	0.61	3.22
14	I-277	SB	MECKLENBURG	US-74/EXIT 2	0.14	3.11
15	NC-27	WB	MECKLENBURG	I-485	0.27	3.1
16	I-277	S TO E	MECKLENBURG	EXIT 9: I-277 SB/US-74 EB/WILKINSON BLVD	0.21	3.07
17	NC-27	WB	MECKLENBURG	RHYNE RD	0.17	3.07
18	I-277	SB	MECKLENBURG	DAVIDSON ST/EXIT 3	0.22	3.05
19	I-77	NB	MECKLENBURG	ARROWOOD RD/EXIT 3	0.17	3.01
20	US-15	SB	ORANGE	NC-54 BUS/RALEIGH RD	0.22	2.93
21	I-485	WB	MECKLENBURG	US-74/EXIT 51	0.81	2.92
22	I-26	WB	BUNCOMBE	NC-146/EXIT 37	0.46	2.92
23	I-40	EB	WAKE	AIRPORT BLVD/EXIT 284	0.54	2.92
24	I-485	EB	MECKLENBURG	I-77/US-21/EXIT 67	0.64	2.87
25	I-485	WB	MECKLENBURG	NC-49/TRYON ST/EXIT 1	0.63	2.87
26	I-85	NB	GASTON	COX RD/EXIT 21	0.51	2.87
27	I-85	NB	GASTON	COX RD/EXIT 21	0.4	2.86
28	I-485	WB	MECKLENBURG	NC-160/STEELE CREEK RD/EXIT 4	0.74	2.85
29	US-1	NB	WAKE	NC-98/DURHAM RD	0.48	2.81
30	I-485	WB	MECKLENBURG	JOHN ST/EXIT 52	0.46	2.78

Source: North Carolina Department of Transportation.

In 2023 a significant work zone on I-40 in Haywood County affected this ranking.

Freight Transportation in North Carolina

Today's culture of business demands that an area has well-maintained and efficient roads, highways and bridges if it is to remain economically competitive. Global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, making the quality of a region's transportation system, including its highways, railroads, air and maritime ports, a key component in a business's ability to compete locally, nationally and internationally.

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and e-commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods.

These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Highways are vitally important to economic development in North Carolina. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

The amount of freight transported in North Carolina and the rest of the U.S. is expected to increase significantly as a result of economic growth, changing business and retail models, increasing international trade, and rapidly changing consumer expectations that place an emphasis on faster deliveries, often of smaller packages or payloads.

In 2022 North Carolina's freight system moved 478 million tons of freight, valued at $741 billion – the 13th largest value of freight moved of all states. [26] From 2022 to 2050, freight moved annually in North Carolina by trucks is expected to increase 64 percent by weight and 97 percent by value (inflation-adjusted dollars), the 15th largest projected increase in the U.S. Eight percent of travel on North Carolina's Interstate highways and 13 percent of travel on its rural Interstate highways is by combination trucks.

The efficiency of freight movement in North Carolina is threatened by traffic bottlenecks, which reduce the reliability of goods movement to, from and through the state. The following chart details the Interstate highway segments in North Carolina that provide the worst travel reliability for commercial trucks as a result of traffic bottlenecks, traffic incidents, and active work zones.

Chart 7. North Carolina's Interstate locations ranked by Truck Travel Time Reliability (TTTR).

RANK	ROAD	COUNTY	DIRECTION	INTERSECTION	MILES	TTTR
1*	I-40	HAYWOOD	WB	US-276/EXIT 20	3.52	10.83
2*	I-40	HAYWOOD	WB	NC-209/EXIT 24	0.47	10.61
3	I-85	DURHAM	SB	NC-147/EXIT 172	0.34	9.33
4*	I-40	HAYWOOD	WB	US-276/EXIT 20	0.22	7.36
5	I-85	DURHAM	SB	NC-147/EXIT 172	0.24	6.9
6	I-40	WAKE	EB	JONES SAUSAGE RD/EXIT 303	0.78	6.29
7	I-485	MECKLENBURG	EB	REA RD/EXIT 59	0.5	6.27
8	I-77	MECKLENBURG	NB	I-485/EXIT 2	1.02	5.99
9	I-26	BUNCOMBE	WB	AIRPORT RD/EXIT 40	0.4	5.93
10	I-277	MECKLENBURG	NB	NC-16/W 2ND ST/KENILWORTH AVE/EXIT 2	0.36	5.88
11	I-277	MECKLENBURG	SB	DAVIDSON ST/EXIT 3	0.22	5.76
12	I-485	MECKLENBURG	EB	NC-49/TRYON ST/EXIT 1	0.62	5.63
13	I-77	IREDELL	SB	LANGTREE RD	0.49	5.54
14	I-485	MECKLENBURG	EB	I-77/US-21/EXIT 67	0.64	5.47
15	I-77	MECKLENBURG	SB	US-29/NC-27/MOREHEAD ST/EXIT 10	0.18	5.37
16	I-40	WAKE	EB	JONES SAUSAGE RD/EXIT 303	1.33	5.29
17	I-485	MECKLENBURG	WB	ARROWOOD RD/EXIT 3	0.77	5.21
18	I-540	WAKE	EB	US-70/EXIT 4	0.78	5.1
19	I-240	BUNCOMBE	WB	US-70/CHARLOTTE ST/EXIT 5B	0.4	5.07
20	I-40	JOHNSTON	WB	NC-42/EXIT 312	0.54	5.05

Source: NCDOT.

In 2023 a significant work zone on I-40 in Haywood County affected this ranking.

The ability of North Carolina's and the nation's freight transportation system to accommodate the growing demand for freight movement efficiently and safely could be hampered by inadequate transportation capacity, a lack of adequate safety features on some transportation facilities, institutional barriers to enhancing the nation's freight facilities, a lack of adequate funding for needed improvements to the freight network, and a shortage of drivers.

The need to improve the U.S. freight network is occurring at a time when the nation's freight delivery system is being transformed by advances in vehicle autonomy, manufacturing, warehousing and supply chain automation, increasing e-commerce, and the growing logistic networks being developed by Amazon and other retail organizations in response to the demand for a faster and more responsive delivery and logistics cycle.

Traffic Safety in North Carolina

A total of 7,858 people were killed in North Carolina traffic crashes from 2019 to 2023, an average of 1,572 fatalities per year.[27] The state's 2023 traffic fatality rate of 1.36 fatalities for every 100 million miles traveled was higher than the national average of 1.26.[28] The traffic fatality rate on the state's rural, non-Interstate roads was the sixth highest in the nation and was nearly triple the fatality rate on all other roads in the state (2.59 vs. 0.88).[29]

From 2018 to 2022, 17 percent of the 7,678 people killed in crashes involving motorized vehicles were pedestrians or bicyclists, a total of 1,166 pedestrian fatalities and 106 bicyclist fatalities over the five-year period.[30]

Chart 8. Non-motorized traffic fatalities in North Carolina 2017 – 2021.

Year	Total Fatalities	Pedestrian Fatalities	Bicyclist Fatalities	Share Bike and Ped.
2018	1,437	224	18	17%
2019	1,373	209	17	16%
2020	1,538	228	26	17%
2021	1,663	248	23	16%
2022	1,667	257	22	17%
TOTAL	**7,678**	**1,166**	**106**	**17%**
AVERAGE	**1,536**	**233**	**21**	**17%**

Source: National Highway Traffic Safety Administration.

The number of fatalities in North Carolina increased 20 percent from 2019 to 2023, from 1,373 to 1,653 and the state's fatality rate per 100 million VMT increased 21 percent during that time, from 1.12 to 1.36.[31] Traffic fatalities began to increase in 2020 even as vehicle travel rates plummeted due to the COVID-19 pandemic. This dramatic increase in the number of fatalities and the rate of fatalities per 100 million VMT happened while vehicle travel in the state decreased by two percent overall from 2019 to 2023.

Chart 9. North Carolina traffic fatality and VMT data, 2019-2022.

NORTH CAROLINA TRAFFIC FATALITY AND VEHICLE MILES OF TRAVEL (VMT) DATA						
	2019	2020	2021	2022	2023	2019-2023 Change
Traffic Fatalities	1,373	1,538	1,663	1,667	1,653	20%
Fatalities per 100M VMT	1.12	1.45	1.46	1.47	1.36	21%
VMT (Billions)	122.5	106.3	117.7	116.5	120.3	-2%

Source: National Highway Traffic Safety Administration and Federal Highway Administration.

The significant increase in traffic fatalities since the onset of the pandemic appears largely related to increased risks being taken by drivers. In an October 2021 report, the National Highway Traffic Safety

Administration found that "after the declaration of the public health emergency in March 2020, driving patterns and behaviors in the United States changed significantly. Of the drivers who remained on the roads, some engaged in riskier behavior, including speeding, failure to wear seat belts, and driving under the influence of alcohol or drugs."[32]The AAA Foundation for Traffic Safety (AAAFTS) drew similar conclusions about the role of increased risks being taken by drivers during the pandemic. A survey taken of drivers in October and November 2020 by the AAAFTS asked whether their level of driving had decreased, remained the same or increased since the beginning of COVID-19 related restrictions, and whether the motorist had engaged in a variety of risky driving behaviors in the previous 30 days.[33] In a February 2022 brief about the survey, the AAAFTS noted that drivers who maintained or increased their pre-COVID travel levels indicated that they were more likely to engage in risky driving behavior, including speeding, not wearing a seat belt, being impaired and driving aggressively. "It is possible that many of the individuals who were willing to travel—and even increase their travel—despite the health risks associated with the pandemic were already more willing than average to take other risks," the AAAFTS report found.[34]

In early 2022 the U.S. Department of Transportation adopted a comprehensive National Roadway Safety Strategy, a roadmap for addressing the nation's roadway safety crisis based on a Safe System approach that acknowledges the following: humans make mistakes and are physically vulnerable; traffic deaths and serious injuries are unacceptable; traffic deaths and serious injuries need to be reduced by the provision of a redundant transportation system that reduces or minimizes crashes and ensures that, if crashes do occur, they do not result in serious injury or death.[35]

Chart 10. The Safe System Approach

Source: US Department of Transportation.

The Safe System approach, which is also being adopted by state and local transportation agencies has five objectives:

- Safer People: Encourage safe, responsible behavior by people who use our roads, and create conditions that prioritize their ability to reach their destination unharmed.

- Safer Roads: Design roadway environments to mitigate human mistakes and account for injury tolerances, to encourage safer behaviors, and to facilitate safe travel by the most vulnerable users.
- Safer Vehicles: Expand the availability of vehicle systems and features that help to prevent crashes and minimize the impact of crashes on both occupants and non-occupants.
- Safer Speeds: Promote safer speeds in all roadway environments through a combination of thoughtful, context-appropriate roadway design, targeted education and outreach campaigns, and enforcement.
- Post-Crash Care: Enhance the survivability of crashes through expedient access to emergency medical care, while creating a safe working environment for vital first responders and preventing secondary crashes through robust traffic incident management practices.

Improving safety on the nation's roadways will require that additional steps are taken to make further progress in achieving the Safe System's objectives. NHTSA, which provides states with roadway safety grants, requires states to submit annually a state highway safety plan. The state plans outline numerous steps states are taking to improve traffic safety. Elements of these state roadway safety plans aimed at addressing the Safe System objectives include:

- Safer People: education on speeding, impaired or disadvantaged driving; education on safe pedestrian and bicycling behavior; education on driving safely around large commercial vehicles; enforcement of commercial driver license and vehicle weight requirements; extension of safety belt laws and their enforcement to include all passenger vehicle occupants; enhancing enforcement action of speeding, impaired, aggressive and distracted driving, particularly at high-risk locations; increase penalties, particularly for repeat offender drivers; and increased enforcement at work zones.
- Safer Roads: converting intersections to roundabouts; removing or shielding roadside objects; the addition of left-turn lanes at intersections; improved signalization and lighting at intersections; adding or improving median barriers; improved roadway lighting; adding centerline or shoulder rumble strips; improving pedestrian and bicycle facilities, including sidewalks and bike lanes and providing pedestrian crossing islands; improved work zone safety measures; wider lanes and paved shoulders; upgrading roads from two lanes to four lanes; providing or improving lane markings; updating rail crossings; eliminating vertical pavement drop-offs; and providing large truck parking spaces.
- Safer Vehicles: Support the development, testing and deployment of connected and autonomous vehicle technology such as collision avoidance, lane departure avoidance systems and turning detection systems.
- Safer Speeds: Where appropriate, provide roadway features to encourage safer speeds, including traffic roundabouts and curb extensions; improved signage and dynamic speed signing at high-risk locations; education on the consequences of speeding; and increased speeding enforcement, particularly at high-risk locations.
- Post-Crash Care: Reduce crash response time including the use of emergency vehicle preemption technology; improve emergency response to multi-vehicle or hazardous material crashes; and increase access to level one or two trauma centers for seriously-injured crash victims.

Transportation Funding in North Carolina

Investment in North Carolina's roads, highways and bridges is funded by local, state and federal governments.

The ability of NCDOT to adequately maintain the state's major roads, highways and bridges, depends on long-term, consistent, and sufficient funding that targets the assets in greatest need of repair and improvements. NCDOT's current annual level of investment in roadway and bridge preservation falls short of the amount needed to adequately maintain the state's roads, highways and bridges. In 2022 NCDOT spent $656 million on the preservation of roads and highways, $341 million short of the $997 million annual investment recommended by NCDOT. [36] In 2022 NCDOT spent $371 million on bridge preservation, $39 million short of the $410 million annual investment recommended.[37]

To address a lack of adequate transportation funding, the North Carolina legislature in 2022 approved HB 103 which dedicated a portion of the state's sales tax revenue to road and highway projects. The bill transfers two percent of general sales tax dollars to two highway funds, with the transfer rising to four percent in fiscal year (FY) 2023-24 and to six percent of sales tax revenues starting in FY 2024-25.[38] The sales tax revenue is expected to provide an additional $193 million in highway funds in North Carolina in FY 2022-23, increasing to $710 million in FY 2024-25 and rising to $855 million in FY 2032-33, providing an additional $9.7 billion in highway funds through FY 2032-33.

The additional state highway funding will enhance the increased federal highway and transit funding provided by the Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021. The IIJA will provide $7.2 billion in state funds for highway and bridge investments in North Carolina over five years, representing a 29 percent increase in annual federal funding for roads and bridges in North Carolina over the previous federal surface transportation program.[39] Federal funds currently provide 33 percent of the revenue used by NCDOT to fund highway and bridge improvements.[40]

Due to increased state and federal transportation revenue, NCDOT expects to increase its annual investment in roadway preservation and bridge preservation by 17 percent and 22 percent, respectively, from 2023 to 2032.[41]

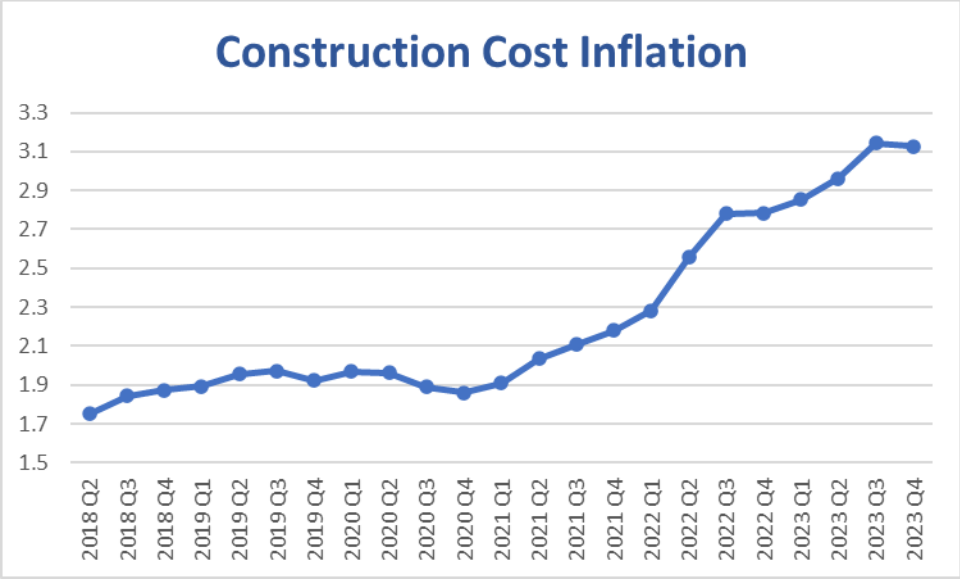
Most federal funds for highway and transit improvements in North Carolina are provided by federal highway user fees, largely an 18.4 cents-per-gallon tax on gasoline and a 24.4 cents-per-gallon tax on diesel fuel (additional revenue is generated by fees on the sale of large trucks, a highway use tax levied on vehicles in excess of 55,000 pounds and a tax on the sale of large truck tires).

The ability of revenue from the North Carolina and the federal motor fuel tax -- as well as other sources of state and federal transportation funding -- to keep pace with North Carolina's future transportation needs is likely to erode as a result of increasing vehicle fuel efficiency, the increasing use of electric vehicles and inflation in highway construction costs.

The average fuel efficiency of U.S. passenger vehicles increased from 20 miles per gallon in 2010 to 24.5 miles per gallon in 2020. Average fuel efficiency is expected to increase another 31 percent by 2030, to 32 miles per gallon, and increase 51 percent by 2040, to 37 miles per gallon.[42] The share of electric vehicles of total passenger vehicle sales in the U.S. is expected to increase to five percent by 2023 and 60 percent by 2040, by which time electric vehicles will represent approximately 30 percent of the passenger vehicle fleet.[43]

The Federal Highway Administration's national highway construction cost index, which measures labor and materials cost, increased by 43 percent in 2022 and 2023 and increased 68 percent since the beginning of 2021. [44]

Chart 11. FHWA's national highway construction cost index.



Source: Federal Highway Administration.

According to the Status of the Nation's Highways, Bridges, and Transit, 24th Edition, submitted to Congress by the United States Department of Transportation (USDOT) in 2021, the nation faces a $1 trillion backlog in needed repairs and improvements to the nation's roads, highways and bridges.[45] This backlog includes $556 billion for highway rehabilitation; $132 billion for bridge rehabilitation; $181 billion for system expansion and $143 billion for system enhancement.[46] The USDOT report found that the nation's current $107 billion annual investment in roads, highways and bridges by all levels of government should be increased by 55 percent to $166 billion annually to improve the conditions of roads, highways and bridges, relieve traffic congestion and improve traffic safety.[47]

The USDOT report also found that the nation faces a $105 billion backlog in needed repairs and improvements to its transit systems.[48] The USDOT report found that the nation's current $18.8 billion annual investment in transit repairs and improvements by all levels of government should be increased by 30 percent to $24.7 billion annually to improve the condition and expand the service of the nation's transit systems.[49]

Highway and bridge spending multiplies through the economy by stimulating additional output. A 2021 macroeconomic analysis by IHS Markit found that that every dollar spent on highway and bridge improvements results in $3.4 dollars in combined direct, indirect and induced output from industries throughout the economy, resulting in a multiplier for highway and bridge investment of 3.4.[50]

The Importance of Transportation to Economic Growth in North Carolina

Investments in transportation improvements in North Carolina play a critical role in the state's economy. A report by the American Road & Transportation Builders Association found that the design, construction and maintenance of transportation infrastructure supports the equivalent of approximately 110,000 full-time jobs across all sectors of North Carolina's economy, earning these workers approximately $3.7 billion annually.[51] These jobs include approximately 55,000 full-time jobs directly involved in transportation infrastructure construction and related activities. Spending by employees and companies in the transportation design and construction industry supports an additional 55,000 full-time jobs in North Carolina.[52] Transportation construction in North Carolina contributes an estimated $674 million annually in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.[53]

Approximately 1.9 million full-time jobs in North Carolina in key industries like tourism, retail sales, agriculture and manufacturing are dependent on the quality, safety and reliability of the state's transportation infrastructure network. These workers earn approximately $69 billion in wages and contribute an estimated $12.6 billion in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.[54]

Local, regional and state economic performance is improved when a region's surface transportation system is expanded or repaired. This improvement comes as a result of the initial job creation and increased employment created over the long-term because of improved access, reduced transport costs and improved safety.

Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system. Highway access has a significant impact on the competitiveness of a region's economy. In a 2023 survey of corporate executives by Area Development Magazine, 78 percent of corporate executives said that highway accessibility was an important or very important factor in making decisions about expansion or investment.[55]

Improving Transportation Safety, Resiliency and Efficiency

Recognizing that extreme weather, sea level change, and changes in environmental conditions may threaten the condition and longevity of the nation's transportation infrastructure, transportation agencies have begun to assess vulnerabilities and consider the resilience of their transportation assets during the transportation planning process. Weather-related events, including hurricanes, winter storms, heavy rainfalls and rockslides caused an average of $106 million annually in damage to North Carolina roads and bridges from 2018 to 2022.[56] Transportation agencies across the country have begun to incorporate resilience in asset management plans, addressing resilience in project development and design and optimizing operations and maintenance practices.[57]

Based on the importance of maximizing the level and safety of mobility provided by its transportation system, transportation agencies are adopting Transportation Systems Management and Operations (TSMO) practices and incorporating improved resiliency into their transportation network. The NCDOT has begun to develop a transportation resiliency plan which will guide resilience awareness, policy amendments, practice enhancements and investment decisions to assist the state in preparing for and responding to natural hazards and extreme events.[58] While a TSMO program does not eliminate the need for capacity expansions along some routes, it helps enhance the mobility of an existing corridor as much as possible.

A TSMO program adopts an integrated set of strategies to improve traffic flow and safety on a portion of a roadway, including work zone management, traffic incident management, freight management, traveler information, traffic signal coordination, ramp management, transit management and improved bicycle and pedestrian crossings.[59] The benefits of TSMO can include reduced traffic congestion, reduced fuel consumption and reduced emissions.

Progress in Improving Reliability and Safety in North Carolina

Using a combination of programs and projects, NCDOT is taking steps to address North Carolina's traffic reliability and safety challenges. These efforts are aimed at improving the efficiency and expanding the capacity of the state's transportation system and include the following:

Incident management: NCDOT provides nearly 1,200 miles of safety service patrols, serving freeways in Western North Carolina, the greater Charlotte metro area, the Triad, the Triangle, the Wilmington area, and

I-95. The Incident Management Assistance Patrol (IMAP) provides emergency traffic control for first responders at crash scenes, works with emergency responders to clear crash scenes quickly, and provides services to stranded motorists. In 2023 IMAP responded to over 57,000 incidents and assisted more than 37,000 motorists across the state. [60]

Improved traffic signalization: In 2022 NCDOT re-timed 39 systems (made up to 328 traffic signals) yielding a 24 percent improvement in travel time, a 63 percent reduction in delays and a 59 percent reduction in the number of stops.[61]

Traffic Management Centers: Four regional and one statewide Transportation Management Centers (TMC) in Charlotte, the Triad/Greensboro, Asheville, and the Triangle/Raleigh provide proactive continuous traffic management across the state. The TMCs coordinate with NCDOT staff, law enforcement, emergency management, adjacent state transportation departments and other stakeholders to manage daily freeway disruptions by clearing incidents and providing real time information.[62]

Traveler Information: NCDOT provides a traveler Information program that includes more than 300 Dynamic Message Signs, 900 traffic cameras, the DriveNC.gov website and 511 phone line. About 20,000 phone calls are made to 511 each year. Nearly 6000,000 visits were made to DriveNC.gov in 2023 and over 30,000 incidents were entered into the system and shared with Waze, Google, Apple, etc.[63]

Pedestrian and bike facilities: In 2022 NCDOT released updated guidance on its Complete Streets policy which requires all projects in the state to include appropriate multimodal facilities when bicycle, pedestrian and transit needs are identified.[64] NCDOT also facilitated programs to encourage bike helmet wearing and walking or biking to school in 2022, awarding nearly 20,000 bicycle helmets to over 260 North Carolina agencies.[65]

Transit: North Carolina is served by 25 urban transit systems that provided approximately 31 million trips in 2021, and 80 rural transportation agencies that provided approximately 4.7 million demand-response rides in 2022. In August 2022, USDOT awarded two RAISE discretionary grants totaling nearly $25 Million for multimodal projects. One project will transform a busy corridor in Rutherfordton and Spindale to more easily accommodate bicyclists, pedestrians and public transit. The other project will fund the planning and preliminary design of mobility hubs in seven communities in central North Carolina along the S-Line passenger rail corridor. The hubs will allow train passengers to catch a bus or walk to a local restaurant or bike to work. In December 2022, USDOT awarded a Rural Surface Transportation Grant to NCDOT to deploy on-demand microtransit services in up to eleven rural communities. This project will build on the success of existing on-demand services in communities across North Carolina, including the award-winning Wilson RIDE program that has increased access and mobility for many disadvantaged residents in Wilson.

Additional capacity: Since 2019, NCDOT has invested approximately $6.2 billion to increase the capacity of numerous highway segments in the state to improve reliability. These improvements include additional capacity added to portions of the Fayetteville Outer Loop, the Greensboro Loop, the I-485 Charlotte Beltway, the Winston-Salem Bypass, the Wilmington Bypass, the I-85 corridor, the Goldsboro Bypass, the Salem Parkway and the Jamestown Bypass.

The following chart list significant capacity expansion projects competed in North Carolina since 2019.

Chart 12. Significant Highway Capacity Added in North Carolina Since 2019.

North Carolina Capacity Expansion Projects		
US 220, I-73 Corridor Guilford/Rockingham		
Widening US-220 from Horsepen Creek Rd to NC-68/US 220 Intersection	Oct-19	13.2 Miles
Constructing I-73 from Joseph M. Bryan Blvd/Airport Pkwy Int. to South of US-220	Dec-21	9.4 Miles
I-73/74 from Harrington Rd. to I-73/74 Interchange South of Ellerbe	Sep-24	3.7 Miles
US-220/NC-68 interchange construction	Nov-19	1.3 Miles
	Total Project Cost	$353 Million
Fayetteville Outer Loop		
South of Cliffdale Rd. to East of All American Freeway	Jul-20	6.7 Miles
Fayette Outer Loop Design Build - Future I-295 from S of US-401 to S of SR-1400	Open	3.1 Miles
East of Yadkin Rd. to West of Bragg Blvd.	Mar-19	1.9 Miles
	Total Project Cost	$318 Million
Greensboro Loop		
Western Loop - Battleground Ave. to Lawndale Dr.	1-Nov	1.9 Miles
High Point Road/Jamestown Bypass - Vickery Chapel Rd. to Hilltop Rd.	Feb-18	4.8 Miles
Western Loop - South of Old Oak Ridge Rd. to North of Battleground Ave.	Jul-20	3.9 Miles
Eastern Loop - US-29 North to Lawndale Ln.	Open	5.3 Miles
Eastern Loop - North of US-70 to US-29 North of Greensboro	Apr-20	5.5 Miles
	Total Project Cost	$573 Million
I-85 Corridor		
I-85 widening from North of Exit 55 to North of Exit 63	Nov-21	7.9 Miles
I-85 from North of Lane St. to North of US-29/601 Connector	May-21	5.9 Miles
I-85 from North of Dabney Ln. to VA State Line	Nov-21	20.6 Miles
	Total Project Cost	$568 Million
Turnpike Projects		
Monroe Expressway from US-74 near I-485 to US-74 between Wingate & Marshville	Oct-20	20 Miles
Public Private Partnership for I-77 HOT Lanes	Open	53 Miles
	Total Project Cost	$729 Million
Winston-Salem Beltway		
Northern Beltway from US-311 to US-158	May-21	2 Miles
Northern Beltway from US-158 to I-40 Bus/US-421	May-21	4 Miles
Future I-74 Salem Parkway Stream Relocation	May-23	1 Mile
Future I-74 from west of NC-66/University Pkwy to New Walkerton Rd.	May-23	7 Miles
	Total Project Cost	$397 Million
US-221		
From US-421 in Watauga Co. to North of South Fork of New River	May-22	4.6 Miles
From South of UC-194 to US-221 Bypass	Jan-21	4.1 Miles
From North of South Fork of New River to South of NC-194	Open	4 Miles
	Total Project Cost	$152 Million
I-40 Corridor		
I-40 and I-77 Interchange Upgrade	Dec-18	3.4 Miles
I-40 widening - Exit 301 to Cornwallis Rd. including improvements to NC-42 & SR-1010	Partially Open	13 Miles
I-40/I-77 Interchange Design Build	Open	4 Miles
I-40 over Yadkin River - From West of NC-801 to East of SR-1101	Dec-21	3.3 Miles
I-40/US-64 from West of Jones Franklin Rd. along I-440/US-64 to North of US-64/US-264	Jun-19	11.4 Miles
	Total Project Cost	$1.1 Billion

Other Capacity Projects		
Greeenville Southwest Bypass from South of Old NC-11 to US-264	Jan-22	12.4 Miles
US-64 Asheboro Bypass	Dec-21	16.4 Miles
US-17 Pollocksville/Maysville Bypass	Oct-20	16 Miles
Peacehaven/Rural Hall Interchanges - US-421/SR-1891/US-52/NC-65	Apr-21	1.8 Miles
Salem Parkway - Business 40	Jun-21	1.2 Miles
Harvey Parkway - NC-148 from NC-58 to NC-11	Sep-22	5.8 Miles
Durham East End Connector	Open	4 Miles
Bonner Bridge Replacement from Bodie Island to Hatteras Island	Jun-22	3.7 Miles
US-19 from Micaville to Spruce Pine	Aug-22	7.9 Miles
NC-12 Rodanthe Bridge Improvements	Jan-23	3 Miles
Troy Bypass from Dairy Rd. to East of Little River	Nov-21	6.7 Miles
I-26/NC-191 Interchange Design Build	Apr-23	1.2 Miles
US 17 Bridge in Perquimas County Design Build	Sep-23	0.8 Miles
Military Cutoff Road Extension from SR-1409 to US-17 in Wilmington	Open	4.2 Miles
South Main Street (NC-273) widening in Mount Holly	Oct-22	1.4 Miles
I-95 rehab and median barrier work from South of Lizzie Mill Rd. to Wilson Co. Line	Dec-22	7.3 Miles
NC-16 four lane from North of Caldwell Rd. to Tower Rd.	Open	8 Miles
Jamestown Bypass - SR-1486/SR-4121 from US-311 Bypass to West of Vickrey Chapel Rd.	Open	3.8 Miles
	Total Cost	$2 Billion
Total Investment in Capacity Projects		**$6.2 Billion**

Source: NCDOT.

Conclusion

As North Carolina strives to support ongoing population and economic growth, it is critical that the state can provide a well-maintained, safe, and efficient 21st-Century network of roads, highways, bridges, and transit to accommodate the mobility demands of modern society.

The combination of additional state and federal transportation funding has allowed North Carolina to move forward with numerous projects to improve the condition, use and efficiency of the surface transportation network. While this has allowed the state to undertake numerous, needed transportation projects, North Carolina still faces a funding shortfall to make needed improvements and repairs to ensure the safety, reliability and condition of its roadways, bridges, transit system and pedestrian and bike facilities.

A safe and reliable transportation system that is maintained in good condition and offers improved mobility and accessibility to meet the needs of North Carolina residents, businesses, and tourists alike, is critical to keeping North Carolina mobile and moving the state forward.

# # #

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