



Keeping Virginia Mobile: Providing a Modern, Sustainable Transportation System in the Old Dominion State



A National
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Founded in 1971, [TRIP](http://tripnet.org)® 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.

As the state's population, economic opportunities and rates of vehicle travel grow, 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 Virginia and connect the state to markets around the globe, while providing safe, efficient mobility on a well-maintained transportation system. Virginia has been able to make progress in improving its transportation system due to recent state and federal funding increases: the 2020 passage of the [Governor's Omnibus Bill \(HB1414/SB8900\)](#), which made numerous changes to Virginia's transportation funding system to increase transportation revenue, and the 2021 passage of the federal [Infrastructure Investment and Jobs Act \(IIJA\)](#), which increased federal highway, bridge and transit funding in Virginia. Despite this additional funding, Virginia's ability to keep pace with the state's growing transportation needs is threatened by 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.

TRIP's "Keeping Virginia Mobile" report examines the condition, use, safety, efficiency and funding of Virginia's surface transportation system. The report also looks at the challenges Virginia 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 Virginia Department of Transportation (VDOT), 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).

VIRGINIA'S TRANSPORTATION SYSTEM AND FUNDING

Investment in Virginia's roads, highways and bridges is funded by local, state and federal governments. Over the last decade, state and federal legislation has boosted transportation funding in Virginia. In 2013, the General Assembly approved and Governor Bob McDonnell signed into law [HB 2313](#), the largest transportation funding bill in the history of the Commonwealth, which converted the 17 cents per gallon motor fuel tax to a percentage-based tax of 3.5 percent for gasoline and 6 percent for diesel, increased registration fees for hybrid and electric vehicles, raised the state sales and use tax from 4 to 4.3 percent, and increased the motor vehicle sales tax. In 2020, the [Governor's Omnibus Bill \(HB1414/SB890\)](#) made numerous changes to Virginia's transportation funding system to increase transportation revenue. The legislation converts the state's fuel tax (which was based on a percentage of the wholesale price of gas and diesel) to a cents-per-gallon tax and sets the rate at 26 cents per gallon, phased in over two years and indexed to inflation, and creates a new streamlined funding mechanism through which revenues will be distributed. The legislation lowers registration fees for vehicles and establishes a Highway Use Fee for alternative fuel and fuel-efficient vehicles. The bill also creates numerous new transportation safety programs.

The state's ability to improve its transportation system was further enhanced by a boost in federal transportation funds from the [Infrastructure Investment and Jobs Act \(IIJA\)](#), signed into law in November

2021. The IIJA will provide \$7.7 billion in state funds for highway and bridge investments in Virginia over five years, including a 40 percent funding increase in FY 2022. Federal funds currently support 56 percent of the state's transportation department spending on highway and bridge improvements.

The ability of revenue from the Virginia and the federal motor fuel tax -- and other sources of state and federal transportation funding -- to keep pace with Virginia'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 28 percent during the first three quarters of 2022.

PROGRESS IN IMPROVING ROAD & BRIDGE CONDITIONS, RELIABILITY & SAFETY

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

VDOT's efforts to improve travel reliability and safety include the following:

- Since 2020, the following projects have been completed: the widening of 21 miles of I-64 along the Virginia Peninsula, the southbound I-95 Rappahannock River Crossing Project to double capacity on the most heavily traveled section of interstate in the Fredericksburg region, the Chatham Bridge Rehabilitation linking Fredericksburg and Stafford County, and widening portions of I-81 and replacing or widening of eight bridges along the corridor.
- A \$33 million project to widen a portion of I-81 near the Bristol/Washington County line is underway, the first local project funded under the \$2 billion I-81 Corridor Improvement Program. Improvements also include 30 new digital message signs and the extension of acceleration and deceleration lanes in multiple locations.
- The I-66 Express Lanes Project modified nearly 23 miles of I-66 from I-495 to Gainesville to provide two express lanes alongside three regular lanes, with dedicated express lane access points and space in the median reserved for future transit.
- Construction on the I-495 Express Lanes Northern Extension began in March 2022 and is expected to open in 2025. The existing I-495 express lanes will be extended 2.5 miles north from the current terminus near the I-495 and Dulles Access Road interchange to near the American Legion Bridge, including the launch of new transit services and the construction of bike and pedestrian connections along the corridor.
- A variable speed limit system was implemented on I-95 north bound from north of the Ladysmith Exit in Caroline County to State Route 3 in Fredericksburg as part of the I-95 Corridor Improvement Plan. This \$10 million project includes variable speed limit signs with dynamic messaging to improve traffic flow and safety based on real-time traffic flow information.
- VDOT expanded the Towing Recovery Incentive Program (TRIP) during 2022 to cover the Northern, Northwest, and Southwest regions, which resulted in the entire I-81 corridor being covered. The program partners with heavy-duty towing and recovery companies to respond quickly and safely to

- commercial vehicle crashes to clear incidents while improving reliability and lessening the risk of secondary crashes during backups.
- In 2021, VDOT's Safety Service Patrol (SSP) responded to more than 177,000 traffic incidents and assisted approximately 114,000 disabled motorists. VDOT's SSP program includes over 170 vehicles and covers over 887 miles of Interstate to detect and respond to incidents and disruptions in traffic and minimize the duration of incidents. In addition, Incident Management Coordinators across the state respond to major incidents to provide safe and efficient incident mitigation, coordinate resources and work to safely clear scenes while allowing for continued traffic flow.
 - [Virginia's Highway Safety Improvement Program \(VHSIP\)](#), established as part of the 2020 legislation, applies low-cost measures over the state's road network to reduce traffic fatalities and serious crashes. It includes the following safety countermeasures: installation of high-visibility backplates and flashing yellow arrows on traffic lights, adding curve signs to roadways, adding safety features to unsignalized intersections, enhancing pedestrian crossings, installing shoulder wedges, and adding rumble strips to the centerline and edgeline of roadways. Additional safety measures implemented include banning the use of handheld cell phones while driving.
 - VDOT is implementing increasingly sophisticated and interconnected technologies to improve safety and traffic operations, including five state operations control centers and nine signal shops managing 3,100 signals, 464 message boards and 96 weather stations.
 - Virginia Trails Network continues to expand, with improvements completed in 2022 to bridges along the Jamestown leg of the Virginia Capital Trail and an agreement reached for funding of the Fall Line Trail – a 43-mile multi-use path through Chesterfield, Hanover and Henrico Counties. As of 2023, there are approximately 1,455 miles of shared path facilities and 852 lane-miles of bicycle lanes in the Commonwealth of Virginia of which approximately 400 miles and 367 lane-miles are maintained by VDOT.

ROAD CONDITIONS IN VIRGINIA

Statewide, in 2020, 13 percent of Virginia's major locally and state-maintained roads were in poor condition and 23 percent in mediocre condition. Twenty-two percent of Virginia's major roads were in fair condition and the remaining 41 percent in good condition.

Location	Poor	Mediocre	Fair	Good
Hampton Roads	28%	29%	17%	25%
Northern Virginia	20%	25%	23%	32%
Richmond	21%	27%	18%	33%
Roanoke	10%	25%	21%	45%
Virginia Statewide	13%	23%	22%	41%

TRIP has calculated the additional cost to Virginia 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 Virginia motorists as a result of deteriorated road conditions is \$3.2 billion annually, an average of \$536 per driver statewide. The chart below details additional VOC per motorist in the state's largest urban areas and statewide.

Location	VOC
Hampton Roads	\$714
Northern Virginia	\$579
Richmond	\$596
Roanoke	\$407
Virginia Statewide	\$3.2 Billion

BRIDGE CONDITIONS IN VIRGINIA

Four percent (498 of 14,068) of Virginia'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. Sixty-three percent of the state's bridges are rated in fair condition and the remaining 33 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 Virginia, 44 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 BRIDGES
	Number	Share	Number	Share	Number	Share	
Hampton Roads	34	3%	730	67%	318	29%	1082
Northern Virginia	51	2%	1,480	54%	1207	44%	2,738
Richmond	54	5%	860	78%	193	17%	1,107
Roanoke	7	1%	458	63%	265	36%	730
Virginia Statewide	498	4%	8,901	63%	4,669	33%	14,068

TRAFFIC CONGESTION IN VIRGINIA

Based on a [report](#) by the [Texas Transportation Institute](#) that analyzes urban traffic congestion levels and provides analysis on the amount of time and the value of lost time and wasted fuel as a result of traffic congestion, TRIP estimates that congested roads, highways and bottlenecks choke commuting and commerce and in 2022 cost Virginia drivers \$5 billion in the form of lost time and wasted fuel. From 2000 to 2019, vehicle travel in Virginia increased by 14 percent. Due to the COVID-19 pandemic, vehicle travel in Virginia dropped by as much as 45 percent in April 2020 (as compared to vehicle travel during the same month the previous year). By 2022, vehicle miles of travel (VMT) in Virginia had rebounded to two percent below 2019's pre-pandemic levels. During the first six months of 2023, VMT in Virginia was three percent higher than the first six months of 2022, surpassing pre-pandemic VMT levels.

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

Urban Area	Hours Lost to Congestion	Annual Cost Per Commuter	Gallons of Fuel Wasted Per Commuter
Hampton Roads	41	\$850	14
Northern Virginia	103	\$2,500	40
Richmond	34	\$791	18
Roanoke	25	\$629	11

Increasing congestion on Virginia'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.

TRAFFIC SAFETY IN VIRGINIA

From 2018 to 2022, 4,479 people were killed in traffic crashes in Virginia, an average of 896 fatalities per year. The state's 2022 traffic fatality rate of 1.20 fatalities for every 100 million miles traveled was lower than the national average of 1.35. The fatality rate on Virginia's non-Interstate rural roads in 2020 was more than three times that on all other roads in the state (2.32 per 100 million vehicle miles of travel vs. 0.74). From 2018 to 2022, 16 percent of those killed in traffic fatalities in crashes involving motorized vehicles were pedestrians or bicyclists, a total of 647 pedestrian fatalities and 59 bicyclist fatalities over the five-year period.

Improving safety on Virginia'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.

In Virginia, traffic fatalities began to increase in 2020 even as vehicle travel levels decreased dramatically due to the COVID-19 pandemic. The number of traffic fatalities continued to increase in 2021 and 2022. The number of annual fatalities in Virginia increased 21 percent from 2019 to 2022, from 831 to 1,005, and the state's fatality rate per 100 million VMT increased 23 percent, from 0.97 to 1.20 during that time. This significant 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 2022.

VIRGINIA TRAFFIC FATALITY AND VEHICLE MILES OF TRAVEL (VMT) DATA					
	2019	2020	2021	2022	2019-2022 Change
Traffic Fatalities	831	850	973	1,005	21%
Fatalities per 100M VMT	0.97	1.12	1.18	1.20	23%
VMT (Billions)	85.4	76.1	80.1	84.1	-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 Virginia imposed a total of \$8.9 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 \$3 billion in economic costs in Virginia 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.

FREIGHT TRANSPORTATION IN VIRGINIA

The health and future growth of Virginia's economy is riding on its surface transportation system. In 2021, \$532 billion of freight was shipped to or from sites in Virginia, an amount that is anticipated to grow by 73 percent in inflation-adjusted dollars by 2045. Seventy-six percent of the goods by value shipped in 2022 to and from sites in Virginia were carried by truck and another 14 percent were carried by courier services or multiple-mode deliveries, which include trucking.

The amount of freight transported in Virginia 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.

THE IMPACT OF TRANSPORTATION INVESTMENT ON ECONOMIC GROWTH

According to [a report by the American Road & Transportation Builders Association](#), the design, construction and maintenance of transportation infrastructure in Virginia supports approximately 112,000 full-time jobs across all sectors of the economy. These workers earn \$5.2 billion annually. Approximately 1.5 million full-time jobs in Virginia 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 Virginia Department of Transportation (VDOT), 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). Cover photo credit: Grandbrothers/Adobe Stock. All data used in the report are the most recent available.



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Introduction

Virginia's system of roadways, bridges, transit, pedestrian and bicycle facilities provides a vital link for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, natural resources and recreation. Supporting quality of life and a robust economy in Virginia requires that the commonwealth provide an efficient, safe and well-maintained transportation system that allows for a high level of accessibility, connectivity and safety.

Virginians rely on a diverse economy including agriculture, government service, technology, manufacturing, tourism, banking and finance. A safe, well-maintained and reliable transportation system is critical to each of these sectors and to the economic health of the commonwealth and the nation.

Adequate, sustained, long-term investment in Virginia'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 Virginia

Virginia has seen significant growth in population, economic opportunity and vehicle travel. Virginia'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 Virginia provide an efficient, safe and modern transportation system that can accommodate future growth in population, tourism, business, recreation and vehicle travel.

Virginia's population reached nearly 8.7 million residents in 2022, a 23 percent increase since 2000.¹ Virginia had approximately 5.9 million licensed drivers in 2021.² From 2000 to 2021, Virginia's gross domestic product (GDP), a measure of the state's economic output, increased by 41 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 Virginia increased by 14 percent, from approximately 74.8 billion miles traveled annually to approximately 85.4 billion miles traveled annually.⁵ Due to the COVID-19 pandemic, vehicle travel in Virginia dropped by as much as 45 percent in April 2020 (as compared to vehicle travel during the same month the previous year).⁶ By 2022, Virginia's overall VMT levels had rebounded to 84.1 billion miles traveled annually, two percent below 2019's pre-pandemic levels.⁷ During the first six months of 2023, VMT in Virginia was three percent higher than the first six months of 2022, surpassing pre-pandemic VMT levels.⁸

Road Conditions in Virginia

The life cycle of Virginia'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 VDOT on the ride quality, which is based on a measurement of pavement smoothness, 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.

Thirteen percent of Virginia's major locally and state-maintained roads and highways have pavements rated in poor condition and 23 percent are in mediocre condition.⁹ Twenty-two percent of Virginia's major roads are rated in fair condition and the remaining 41 percent were rated in good condition.¹⁰

Twenty-three percent of Virginia’s major locally and state-maintained urban roads and highways have pavements rated in poor condition and 28 percent are in mediocre condition.¹¹ Nineteen percent of Virginia’s major urban roads are rated in fair condition and the remaining 30 percent are rated in good condition.¹²

Eight percent of Virginia’s major locally and state-maintained rural roads and highways have pavements rated in poor condition and 20 percent are in mediocre condition.¹³ Twenty-four percent of Virginia’s major rural roads are rated in fair condition and the remaining 47 percent are rated in good condition.¹⁴

The chart below details pavement conditions on major roads in the state’s largest urban areas and statewide.¹⁵

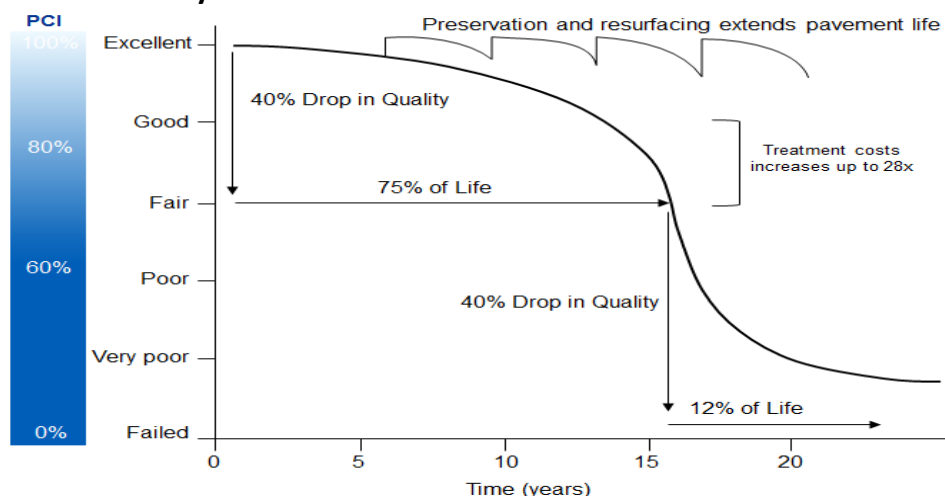
Chart 1. Pavement conditions on major roads in Virginia’s largest urban areas and statewide.

Location	Poor	Mediocre	Fair	Good
Hampton Roads	28%	29%	17%	25%
Northern Virginia	20%	25%	23%	32%
Richmond	21%	27%	18%	33%
Roanoke	10%	25%	21%	45%
Virginia Statewide	13%	23%	22%	41%

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.¹⁶ 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.¹⁷

The Cost of Inadequate Road Conditions in Virginia

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 Virginia motorists as a result of deteriorated road conditions is \$3.2 billion annually, an average of \$536 per driver statewide.¹⁸ The chart below details additional VOC per motorist in the state’s largest urban areas and statewide.

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

Location	VOC
Hampton Roads	\$714
Northern Virginia	\$579
Richmond	\$596
Roanoke	\$407
Virginia Statewide	\$3.2 Billion

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.¹⁹ 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.

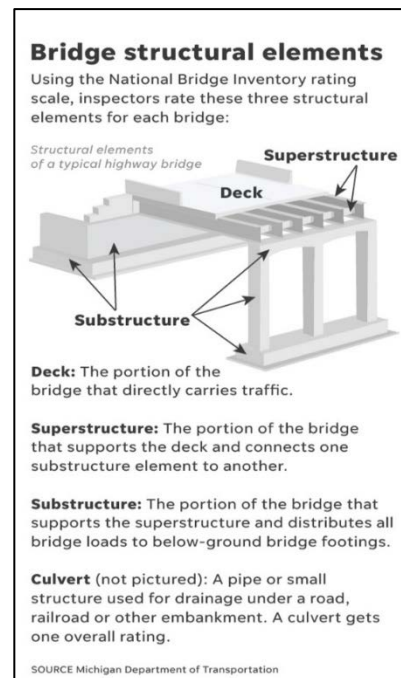
TRIP’s additional VOC estimate is based on taking the average number of miles driven annually by a motorist, calculating current VOC based on [AAA’s driving cost estimates](#) and then using the HDM model to estimate the additional VOC paid by drivers as a result of substandard roads.²⁰ Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into TRIP’s vehicle operating cost methodology.

Bridge Conditions in Virginia

Virginia’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.

Four percent (498 of 14,068) of Virginia’s locally and state-maintained bridges are rated in poor/structurally deficient condition.²¹ 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. Sixty-three percent of Virginia’s locally and state-maintained bridges have been rated in fair condition.²² 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 33 percent of the state’s bridges are rated in good condition.²³



The chart below shows the condition of bridges statewide and in Virginia’s largest urban areas.²⁴

Chart 4. Bridge conditions statewide and in Virginia’s largest urban areas.

	POOR/STRUCTURALLY DEFICIENT		FAIR		GOOD		TOTAL BRIDGES
	Number	Share	Number	Share	Number	Share	
Hampton Roads	34	3%	730	67%	318	29%	1082
Northern Virginia	51	2%	1,480	54%	1207	44%	2,738
Richmond	54	5%	860	78%	193	17%	1,107
Roanoke	7	1%	458	63%	265	36%	730
Virginia Statewide	498	4%	8,901	63%	4,669	33%	14,068

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 Virginia, 44 percent of the state’s bridges are 50 years or older.²⁵ 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 Congestion in Virginia

While traffic congestion is largely constrained to the state’s urban areas, increasing congestion on Virginia’s major highways and roads hampers the state’s ability to support economic development and quality of life by reducing the 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 urban mobility data from a [report](#) by the [Texas Transportation Institute](#) 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 auto commuter, the per-auto commuter of lost time and wasted fuel due to congestion and the average amount of fuel per auto commuter wasted annually in 2022 due to congestion in each of Virginia’s largest urban areas.

Chart 5. 2022 Annual hours and fuel lost to congestion and congestion costs per commuter.

Urban Area	Hours Lost to Congestion	Annual Cost Per Commuter	Gallons of Fuel Wasted Per Commuter
Hampton Roads	41	\$850	14
Northern Virginia	103	\$2,500	40
Richmond	34	\$791	18
Roanoke	25	\$629	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 Virginia in 2022 in the form of lost time and wasted fuel is \$5 billion annually.²⁶

Traffic Safety in Virginia

A total of 4,479 people were killed in Virginia traffic crashes from 2018 to 2022, an average of 896 fatalities per year.²⁷

Chart 6. Virginia traffic fatalities 2018 – 2022.

Year	Total Fatalities
2018	820
2019	831
2020	850
2021	973
2022	1,005
TOTAL	4,479
AVERAGE	896

Source: Virginia Department of Transportation

From 2018 to 2022, 16 percent of those killed in crashes involving motorized vehicles were pedestrians or bicyclists, a total of 647 pedestrian fatalities and 59 bicyclist fatalities over the five-year period.²⁸

Chart 7. Non-motorized traffic fatalities in Virginia 2018 – 2022.

Year	Total Fatalities	Pedestrian Fatalities	Bicycle Fatalities	Share Bike and Ped.
2018	820	118	12	16%
2019	831	124	13	16%
2020	850	111	7	14%
2021	973	123	16	14%
2022	1,005	171	11	18%
TOTAL	4,479	647	59	16%
AVERAGE	896	129	12	16%

Source: Virginia Department of Transportation

Virginia’s traffic fatality rate of 1.2 fatalities per 100 million vehicle miles of travel in 2022 is lower than the national average of 1.35.²⁹ The fatality rate in 2020 on Virginia’s non-interstate rural roads is more than three times that on all other roads in the state (2.32 fatalities per 100 million vehicle miles of travel vs. 0.74).³⁰

The chart below details the average annual number of traffic fatalities in each of the state’s largest urban areas from 2018 to 2022.³¹

Chart 8. Average annual traffic fatalities, 2018-2022.

Urban Area	Average Fatalities 2018-2022
Hampton Roads	149
Northern Virginia	178
Richmond	118
Roanoke	37

Source: TRIP analysis of Virginia Department of Transportation Data

Nationwide, traffic fatalities began to increase dramatically in 2020 even as vehicle travel rates plummeted due to the COVID-19 pandemic. The number of fatalities continued to increase in 2021. In Virginia, traffic fatalities began to increase in 2020 while vehicle travel levels decreased due to the COVID-19 pandemic, and the number of traffic fatalities continued to increase in 2021 and 2022. The number of fatalities in Virginia increased 21 percent from 2019 to 2022, from 831 to 1,005, and the state’s fatality rate per 100 million VMT increased from 0.97 to 1.2 during that time – a 23 percent increase.³² This significant 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 2022.

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

VIRGINIA TRAFFIC FATALITY AND VEHICLE MILES OF TRAVEL (VMT) DATA					
	2019	2020	2021	2022	2019-2022 Change
Traffic Fatalities	831	850	973	1,005	21%
Fatalities per 100M VMT	0.97	1.12	1.18	1.20	23%
VMT (Billions)	85.4	76.1	80.1	84.1	-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.”³³The 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.³⁴ 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.³⁵

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.³⁶

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.

Traffic crashes in Virginia imposed a total of \$8.9 billion in economic costs in 2022.³⁷ 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 \$3 billion in economic costs in Virginia in 2022.³⁸ According to a [2023 National Highway Traffic Safety Administration \(NHTSA\) report](#), the economic costs of traffic crashes includes work and household productivity losses, property damage, medical costs, rehabilitation costs, legal and court costs, congestion costs and emergency services.³⁹

[VDOT's Strategic Highway Safety Plan](#) (SHSP) is the guiding five-year plan for road safety efforts in the Commonwealth. details how the Commonwealth will address infrastructure and behavioral safety.⁴⁰ The SHSP emphasizes safe road users, safe vehicles, safe speeds, safe roads and post-crash care.

[Virginia's Highway Safety Improvement Program \(VHSIP\)](#), established by legislation in 2020, applies low-cost measures over the commonwealth's road network to reduce traffic fatalities and serious crashes. It includes the following safety countermeasures: installation of high-visibility backplates and flashing yellow arrows on traffic lights, adding curve signs to roadways, adding safety features to unsignalized intersections, enhancing pedestrian crossings, installing shoulder wedges, and adding rumble strips to the centerline and edgeline of roadways.⁴¹ Additional safety measures implemented include banning the use of handheld cell phones while driving, banning open containers of alcohol in vehicles, making failure to wear a seatbelt a primary offense, enhancing speed enforcement, and allowing localities to lower speed limits. Combined, these measures are expected to save more than 120 lives a year.⁴²

The U.S. has a \$146 billion backlog in needed roadway safety improvements, according to a 2017 [report](#) from the AAA Foundation for Traffic Safety. The report found implementing these cost-effective and needed roadway safety improvements on U.S. roadways would save approximately 63,700 lives and reduce the number of serious injuries as a result of traffic crashes by approximately 350,000 over 20 years.

Freight Transportation in Virginia

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 Virginia. 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 Virginia 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 2021, \$532 billion of freight was shipped to or from sites in Virginia, an amount that is anticipated to grow by 73 percent in inflation-adjusted dollars by 2045.⁴³ Seventy-six percent of the goods by value shipped in 2022 to and from sites in Virginia were carried by truck and another 14 percent were carried by courier services or multiple-mode deliveries, which include trucking.⁴⁴

The ability of Virginia'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.

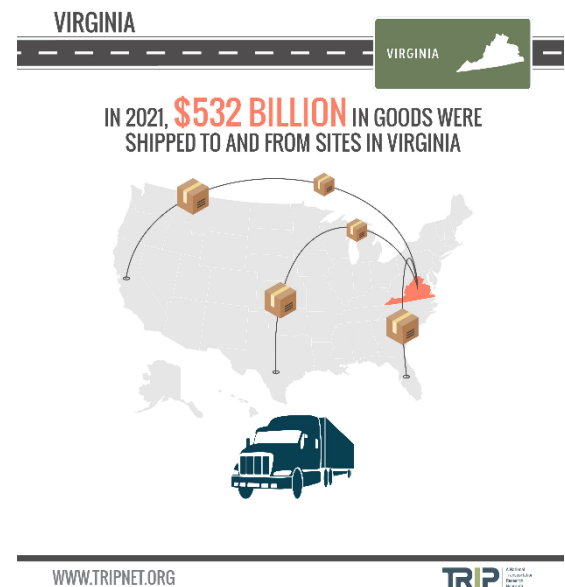
Transportation Funding in Virginia

Investment in Virginia's roads, highways and bridges is funded by local, state and federal governments. Over the last decade, state and federal legislation has boosted transportation funding in Virginia. In 2013, the General Assembly approved and Governor Bob McDonnell signed into law [HB 2313](#), the largest transportation funding bill in the history of the Commonwealth, which converted the 17 cents per gallon motor fuel tax to a percentage-based tax of 3.5 percent for gasoline and 6 percent for diesel, increased registration fees for hybrid and electric vehicles, raised the state sales and use tax from 4 to 4.3 percent, and increased the motor vehicle sales tax.⁴⁵ In 2020, the [Governor's Omnibus Bill \(HB1414/SB890\)](#) made numerous changes to Virginia's transportation funding system to increase transportation revenue. The legislation converted the state's fuel tax (which was based on a percentage of the wholesale price of gas and diesel) to a cents-per-gallon tax and sets the rate at 26 cents per gallon, phased in over two years and indexed to inflation, and creates a new streamlined funding mechanism through which revenues will be distributed.⁴⁶ The legislation also lowers registration fees for vehicles, establishes a Highway Use Fee for alternative fuel and fuel-efficient vehicles, and creates numerous new transportation safety programs.⁴⁷

The additional state highway funding has been enhanced by 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 \$27.8 billion in state funds for highway and bridge investments in Virginia over five years, including a 26 percent funding increase in FY 2022.⁴⁸ Federal funds currently provide 43 percent of the revenue used by VDOT to fund highway and bridge improvements.⁴⁹

The erosion of motor fuel taxes due to inflation, improved vehicle fuel efficiency, the adoption of hybrid and electric vehicles, and construction cost inflation threaten the state's ability to keep pace with growing transportation needs.

Most federal funds for highway and transit improvements in Virginia 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 Virginia and the federal motor fuel tax -- as well as other sources of state and federal transportation funding -- to keep pace with Virginia'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.⁵⁰ 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.⁵¹

The Federal Highway Administration's national highway construction cost index, which measures labor and materials cost, increased by 28 percent during the first three quarters of 2022.⁵²

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 3.4.⁵³

Progress in Improving Travel Reliability and Safety in Virginia

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

VDOT's efforts to improve travel reliability and safety include the following:⁵⁴

- Since 2020, the following projects have been completed: the widening of 21 miles of I-64 along the Virginia Peninsula, the southbound I-95 Rappahannock River Crossing Project to double capacity on the most heavily traveled section of interstate in the Fredericksburg region, the Chatham Bridge Rehabilitation linking Fredericksburg and Stafford County, and widening portions of I-81 and replacing or widening eight bridges along the corridor.
- A \$33 million project to widen a portion of I-81 near the Bristol/Washington County line is underway, the first local project funded under the \$2 billion I-81 Corridor Improvement Program. Improvements also include 30 new digital message signs and the extension of acceleration and deceleration lanes in multiple locations.
- The I-66 Express Lanes Project which modified 23 miles of I-66 from I-495 to Gainesville to provide two express lanes alongside three regular lanes, with dedicated express lane access points and space in the median reserved for future transit.
- Construction on the I-495 Express Lanes Northern Extension began in March 2022 and is expected to open in 2025. The existing I-495 express lanes will be extended 2.5 miles north from near the I-495 and Dulles Access Road interchange to near the American Legion Bridge, including the launch of new transit services and the construction of bike and pedestrian connections along the corridor.
- A variable speed limit system was implemented on I-95 north bound from north of the Ladysmith Exit in Caroline County to State Route 3 in Fredericksburg as part of the I-95 Corridor Improvement Plan. This \$10 million project includes variable speed limit signs with dynamic messaging to improve traffic flow and safety based on real-time traffic flow information.
- VDOT expanded the Towing Recovery Incentive Program (TRIP) during 2022 to cover the Northern, Northwest, and Southwest regions, which resulted in the entire I-81 corridor being covered. The

- program partners with heavy-duty towing and recovery companies to respond quickly and safely to commercial vehicle crashes to clear incidents while improving reliability and lessening the risk of secondary crashes during backups.
- In 2021, VDOT's Safety Service Patrol (SSP) responded to more than 177,000 traffic incidents and assisted approximately 114,000 disabled motorists. VDOT's Safety Service Patrol program includes over 170 vehicles and covers over 887 miles of Interstate to detect and respond to incidents and disruptions in traffic and minimize the duration of incidents. In addition, Incident Management Coordinators across the state respond to major incidents to provide safe and efficient incident mitigation, coordinate resources and work to safely clear scenes while allowing for continued traffic flow.
 - [Virginia's Highway Safety Improvement Program \(VHSIP\)](#), established as part of the 2020 legislation, applies low-cost measures over the state's road network to reduce traffic fatalities and serious crashes. It includes the following safety countermeasures: installation of high-visibility backplates and flashing yellow arrows on traffic lights, adding curve signs to roadways, adding safety features to unsignalized intersections, enhancing pedestrian crossings, installing shoulder wedges, and adding rumble strips to the centerline and edgeline of roadways. Additional safety measures implemented include the banning of the use of handheld cell phones while driving.
 - VDOT is implementing increasingly sophisticated and interconnected technologies to improve safety and traffic operations, including five state operations control centers and nine signal shops managing 3,100 signals, 464 message boards and 96 weather stations.
 - Virginia Trails Network continues to expand, with improvements completed in 2022 to bridges along the Jamestown leg of the Virginia Capital Trail and an agreement reached for funding of the Fall Line Trail – a 43-mile multi-use path through Chesterfield, Hanover and Henrico Counties. As of 2023, there are approximately 1,455 miles of shared path facilities and 852 lane-miles of bicycle lanes in the Commonwealth of Virginia of which approximately 400 miles and 367 lane-miles are maintained by VDOT.⁵⁵

The Importance of Transportation to Economic Growth in Virginia

Investments in transportation improvements in Virginia 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 112,000 full-time jobs across all sectors of Virginia's economy, earning these workers approximately \$5.2 billion annually.⁵⁶ These jobs include approximately 56,000 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 56,000 full-time jobs in Virginia.⁵⁷ Transportation construction in Virginia contributes an estimated \$956 million annually in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.⁵⁸

Approximately 1.5 million full-time jobs in Virginia 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 \$55.2 billion in wages and contribute an estimated \$10.1 billion in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.⁵⁹

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.

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. 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.⁶⁰

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. 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.

Shifting environmental conditions – including recurrent flooding in both coastal and inland areas, sea level rise, temperature changes, increased precipitation, and extreme weather events – threaten the capacity to move people and goods safely and efficiently in the commonwealth. [VDOT's Resilience Plan](#) was created to formalize a framework for the incorporation of resilience through transportation planning, project development, delivery, operations, maintenance, and asset management.⁶¹ It emphasizes the use of the best available data to guide decisions, engagement and partnership with stakeholders, the identification of at-risk infrastructure and measures needed to mitigate risk, the development of feasibility and economic analysis, and the incorporation of resilience measures into the Department's decision making process.

VDOT's PROTECT Program (Promoting Resilient Operations for Transformative, Efficient and Cost-Saving Transportation) provides funding for resilience programs through formula based and discretionary grants. It includes funding for vulnerability assessments, evacuation planning, flood mitigation, drainage improvements, roadway realignment, and strengthening at-risk coastal infrastructure.⁶²

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.⁶³ The benefits of TSMO can include reduced traffic congestion, reduced fuel consumption and reduced emissions.

Conclusion

As Virginia 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.

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

###

ENDNOTES

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- ³ TRIP analysis of [Bureau of Economic Analysis data](#) (2020).
- ⁴ U.S. Bureau of Economic Analysis (2020).
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- ¹⁰ [Ibid.](#)
- ¹¹ [Ibid.](#)
- ¹² [Ibid.](#)
- ¹³ [Ibid.](#)
- ¹⁴ [Ibid.](#)
- ¹⁵ [Ibid.](#)
- ¹⁶ Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.
- ¹⁷ [Pavement Maintenance](#), by David P. Orr, PE Senior Engineer, Cornell Local Roads Program, March 2006.
- ¹⁸ TRIP calculation.
- ¹⁹ Highway Development and Management: Volume Seven. Modeling Road User and Environmental Effects in HDM-4. Bennett, C. and Greenwood, I. 2000.
- ²⁰ [Your Driving Costs. American Automobile Association. 2021](#)
- ²¹ [Federal Highway Administration National Bridge Inventory. 2022](#).
- ²² [Ibid.](#)
- ²³ [Ibid.](#)
- ²⁴ Bridge condition data for each urban area includes the following cities and counties: *Hampton Roads*: Chesapeake, Gloucester, Hampton, Isle of Wight, James City, Matthews, Newport News, Norfolk, Portsmouth, Suffolk, Virginia Beach, York County; *Northern Virginia*: Alexandria, Arlington, Clarke County, Culpepper County, Fairfax City, Fairfax County, Falls Church, Fauquier County, Frederick County, Fredericksburg, Loudon County, Madison County, Manassas, Manassas Park, Prince William, Rappahannock County, Spotsylvania County, Stafford County, Warren County and Winchester; *Richmond*: Charles City, Chesterfield County, Goochland, Hanover, Henrico, Powhatan, Richmond City and Richmond County; *Roanoke*: Botetourt, Craig, Franklin, Roanoke City and Roanoke County.
- ²⁵ TRIP analysis of [Federal Highway Administration National Bridge Inventory data](#) (2022).
- ²⁶ TRIP estimate based on the [2019 Urban Mobility Report](#) by the Texas Transportation Institute and 2022 Federal Highway Administration [traffic volume trends](#) data.
- ²⁷ TRIP analysis of Virginia Department of Transportation data.
- ²⁸ [Ibid.](#)
- ²⁹ [Ibid.](#)
- ³⁰ [Ibid.](#)
- ³¹ Fatality data for each urban area includes the following cities and counties: *Hampton Roads*: Chesapeake, Gloucester, Hampton, Isle of Wight, James City, Matthews, Newport News, Norfolk, Portsmouth, Suffolk, Virginia Beach, York County; *Northern Virginia*: Alexandria, Arlington, Clarke County, Culpepper County, Fairfax City, Fairfax County, Falls Church, Fauquier County, Frederick County, Fredericksburg, Loudon County, Madison County, Manassas, Manassas Park,

Prince William, Rappahannock County, Spotsylvania County, Stafford County, Warren County and Winchester; *Richmond*: Charles City, Chesterfield County, Goochland, Hanover, Henrico, Powhatan, Richmond City and Richmond County; *Roanoke*: Botetourt, Craig, Franklin, Roanoke City and Roanoke County.

³² [Ibid.](#)

³³ [Continuation of Research on Traffic Safety During the COVID-19 Public Health Emergency: January-June 2021](#). U.S. Department of Transportation National Highway Traffic Safety Administration.

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³⁷ TRIP estimate based on [NHTSA report “The Economic and Societal Impact of Motor Vehicle Crashes, 2010 \(Revised\), 2016](#). P. 146.

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⁴¹ [VDOT Highway Safety Update](#). March 29, 2023.

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⁴⁵ [Virginia Legislative Information System. HB 2313 Summary](#).

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⁵³ IHS Markit (2021). Economic Impacts of Transportation Infrastructure. [ARTBA EIA IJJA Report Sept2021.pdf](#)

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⁵⁵ VDOT response to TRIP survey. (2023).

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⁵⁸ [Ibid](#)

⁵⁹ [Ibid.](#)

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