U.S. Department of Transportation
Federal Highway Administration
Federal Transit Administration

25th Edition | Report to Congress

STATUS OF THE NATION'S
Highways, Bridges, and Transit
Conditions and Performance

EXECUTIVE SUMMARY

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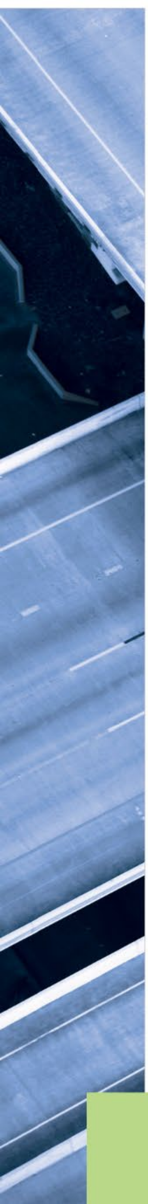
Conditions and Performance



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Introduction

This document is a summary of the 25th edition of the *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report to Congress* (C&P Report)—the 25th in a series of reports dating back to 1968 that offers a comprehensive, data-driven background context to support the development and evaluation of legislative, program, and budget options at all levels of government. This document consolidates conditions, performance, and financial data provided by States, local governments, and public transit operators to present a national-level summary. Some of the underlying data are available through DOT's regular statistical publications.

The C&P Report is intended to provide decision makers with an objective appraisal of the physical conditions, operational performance, and financing mechanisms of highways, bridges, and transit systems based on both their current state and their projected future state. The future investment scenario analyses are developed specifically for this report and provide projections at the national level only, under a set of alternative future investment scenarios.

This edition draws primarily on 2018 data. In assessing historical trends, many of the exhibits presented in this report provide statistics for the 10 years from 2008 to 2018. The prospective analyses presented in this report generally cover the 20-year period ending in 2038. Since this report draws primarily on 2018 data, the effects of the coronavirus 2019 (COVID-19) pandemic are not reflected in the analyses presented in Part I or Part II. However, the discussions presented in Parts III and Part IV include the impacts of the COVID-19 pandemic on highway passenger travel, freight transportation, and transit service, and the resulting implications for highway funding, transit ridership trends, and operating revenues.

The main body of the report is organized into five major sections. Part I, *Moving a Nation*, contains core retrospective analyses on infrastructure assets, revenue sources and expenditure patterns, personal travel, mobility and access, safety, and physical conditions of the Nation's highways, bridges, and transit assets.

Part II, *Investing for the Future*, contains the core prospective analyses of the report: 20-year future capital investment scenarios that are compared to the 2014–2018 levels of capital investment for highways, bridges, and transit. This includes supplemental analyses comparing the findings to findings in previous reports, sensitivity analyses to explore how changing some of the underlying technical assumptions would affect the future investment scenarios, and additional detail on the methodology used to develop the future investment scenarios.

Part III, *Additional Information*, explores two related topics not fully covered in the core analyses, including impacts of COVID-19 on the highway and transit transportation system, and issues relating to greenhouse gas mitigation.

Part IV, *Highway Freight Conditions and Performance*, explores issues pertaining specifically to freight movement, including an examination of the conditions and performance of the National Highway Freight Network.

Part V, *Recommendations for HPMS Changes*, provides information on the status and planned direction of the Highway Performance Monitoring System (HPMS). The C&P Report also contains three technical appendices that describe the investment/performance methodologies used in the report for highways, for bridges, and for transit. A fourth appendix describes an ongoing research effort called *Reimagining the C&P Report in a Performance Management-Based World*. Two additional appendices provide supporting material for the freight analysis presented in Part IV and the macroeconomic impact modeling results presented in Chapter 10.

Highlights

This edition of the C&P Report is based primarily on data through 2018. In assessing recent trends, it generally focuses on the 10-year period from 2008 to 2018. The prospective analyses generally cover the 20-year period from 2018 to 2038; the investment levels associated with these scenarios are stated in constant 2018 dollars. This section presents the key findings of the overall C&P Report. Key findings for individual chapters are presented in the Executive Summary.

Highlights: Highways and Bridges

Extent of the System

- The Nation's road network included 4,195,274 miles of public roadways and 616,096 bridges in 2018. This network carried 3.255 trillion vehicle miles traveled (VMT) and 5.591 trillion person miles traveled, up from 2.993 trillion VMT and up from 4.931 trillion person miles traveled in 2008.
- The 1,028,217 miles of Federal-aid highways (25 percent of total mileage) carried 2.772 trillion VMT (85 percent of total travel) in 2018.
- Although the 220,169 miles on the National Highway System (NHS) comprise only 5 percent of total mileage, the NHS carried 1.779 trillion VMT in 2018, approximately 55 percent of total travel.
- The 48,741 miles of the Interstate System carried 0.834 trillion VMT in 2018, slightly more than 1 percent of total mileage and close to 26 percent of total VMT. The Interstate System has grown since 2008, when it consisted of 46,892 miles that carried 0.741 trillion VMT.
- The Nation's 503 tunnels had a combined length of 666,858 feet. The annual average daily traffic (AADT) for tunnels was approximately 14.2 million vehicles, and the annual average daily truck traffic was 0.84 million.

Highway System Terminology

Federal-aid highways are roads that generally are eligible for Federal funding assistance under current law. (Certain Federal programs allow the use of Federal funds for other roads as well.)

The NHS includes roads that are most important to interstate travel, economic expansion, and national defense. It includes the entire Interstate System. The NHS was expanded under the Moving Ahead for Progress in the 21st Century Act (MAP-21).

Highway Funding—2018

- All levels of government spent a combined $244.5 billion for highway-related purposes in 2018. Just less than half (48 percent) of total highway spending ($117.0 billion) was for capital improvements to highways and bridges; the remainder included expenditures for physical maintenance, highway and traffic services, administration, highway safety, bond interest, and bond retirement.
- Of the $117.0 billion spent on highway capital improvements in 2018, $27.4 billion (23 percent) was spent on the Interstate

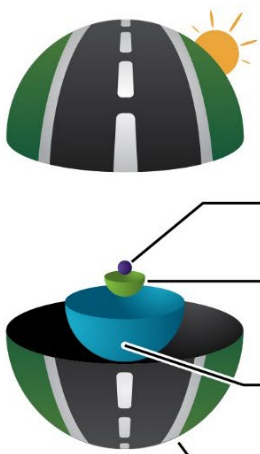
Constant-dollar Conversions for Highway Expenditures

This report uses the Federal Highway Administration's National Highway Construction Cost Index (NHCCI) 2.0 for inflation adjustments to highway capital expenditures, and the Consumer Price Index (CPI) for adjustments to other types of highway expenditures. From 2008 to 2018, the CPI increased by 16.6 percent (1.6 percent per year), whereas the NHCCI 2.0 increased by only 7.9 percent (0.8 percent per year).

System, $59.0 billion (50 percent) was spent on the NHS (including the Interstate System), and $93.6 billion (80 percent) was spent on Federal-aid highways (including the NHS).

- Revenues raised for use on highways, by all levels of government combined, totaled $237.8 billion in 2018. The $6.7 billion difference between highway revenues and highway expenditures ($244.5 billion) comes from funds drawn from reserves. This difference represents the net decrease during 2018 of the cash balances of the Federal Highway Trust Fund and comparable dedicated accounts at the State and local levels.
- Of the $237.8 billion of revenues raised in 2018 for use on highways, $121.3 billion (51 percent) was collected from user charges, including fuel taxes ($66.9 billion), tolls ($17.6 billion), and vehicle taxes and fees ($36.8 billion).
- During 2018, $116.5 billion was raised for use on highways from nonuser sources, including general fund appropriations ($39.4 billion), bond issue proceeds ($21.7 billion), investment income and other receipts ($22.0 billion), property taxes ($11.6 billion), and other taxes and fees ($21.8 billion).

2018 Highway System Statistics



United States Road System	Miles (Miles per System)	VMT (Vehicle Miles Traveled)	Capital Spending ($ Billions)
Interstate System	1% 48,741 miles	26% 0.834 trillion VMT	23% $27.4 billion
National Highway System	5% 220,169 miles	55% 1.779 trillion VMT	50% $59.0 billion
Federal-aid Highways	25% 1,028,217 miles	85% 2.772 trillion VMT	80% $93.6 billion
Systemwide (All Roads)	100% 4,195,274 miles	100% 3.255 trillion VMT	100% $117.0 billion

The Interstate System accounts for **1%** of road mileage, but carries **26%** of highway travel.

Highway Spending Trends

- In nominal dollar terms, highway spending increased by 29.7 percent (2.6 percent per year) from 2008 to 2018; after adjusting for inflation, this equates to a 15.4-percent increase (1.4 percent per year).
- Highway capital expenditures rose from $90.4 billion in 2008 to $117.0 billion in 2018, a 29.5-percent increase (2.6 percent per year) in nominal dollar terms; after adjusting for inflation, this equates to a 20.0-percent increase (1.8 percent per year).
- The portion of total highway capital spending funded by the Federal government decreased from 41.6 percent in 2008 to 40.1 percent in 2018. Federally funded highway capital outlay grew by 2.3 percent per year over this period, compared with a 2.9-percent annual increase in capital spending funded by State and local governments.

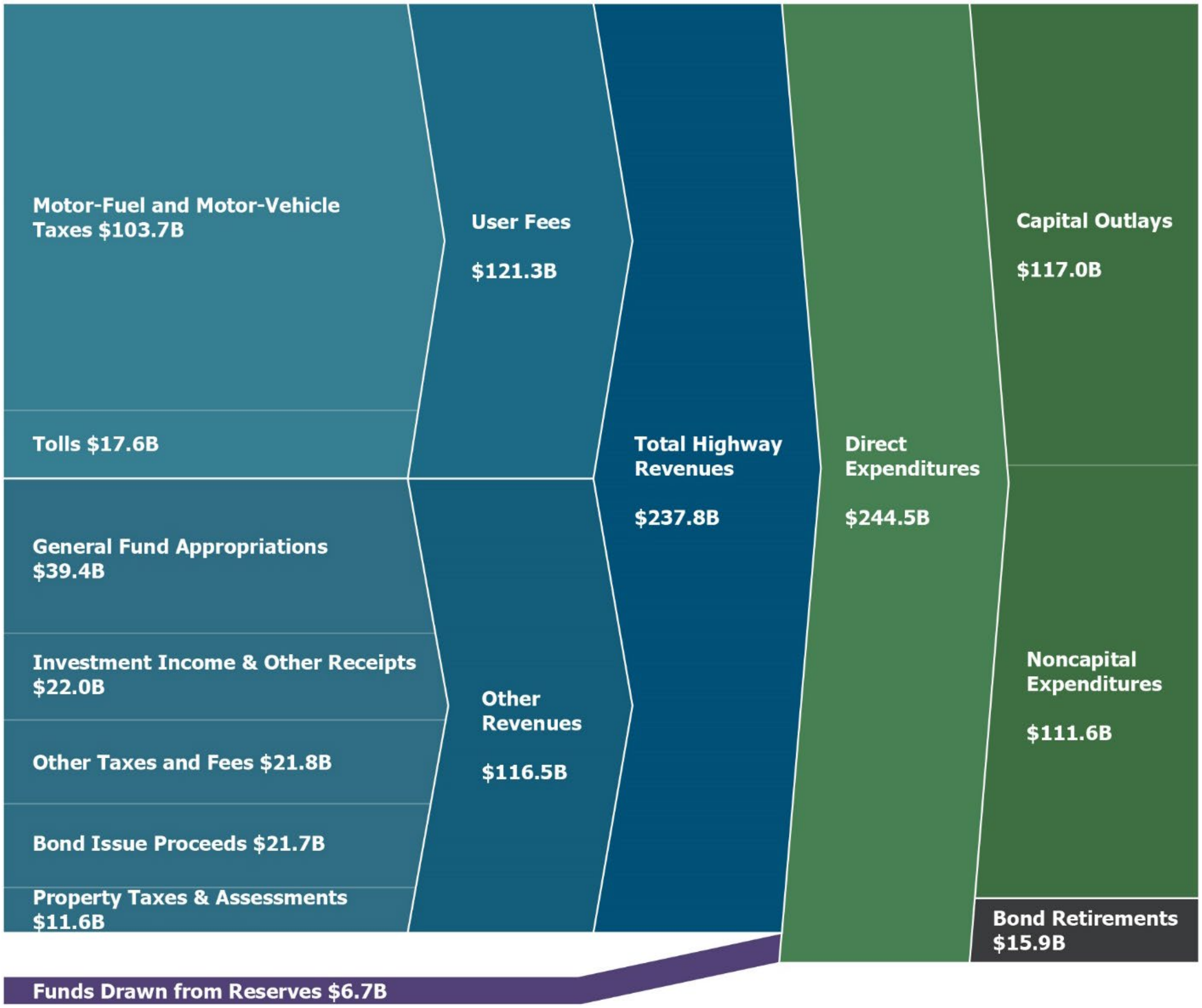
- The composition of highway capital spending shifted during the 2008–2018 period. The percentage of highway capital spending directed to system rehabilitation rose from 51.1 percent in 2008 to 66.1 percent in 2018. For the same period, the percentage of spending directed to system enhancement rose from 12.0 percent to 14.1 percent, whereas the percentage of spending directed to system expansion fell from 36.9 percent to 19.8 percent.

Highway Capital Spending Terminology

This report splits highway capital spending into three categories:

- **System rehabilitation—**resurfacing, rehabilitation, or reconstruction of existing highway lanes and bridges.
- **System expansion—**the construction of new highways and bridges and the addition of lanes to existing highways.
- **System enhancement—**safety enhancements, traffic operation improvements such as the installation of intelligent transportation systems, environmental enhancements, and other enhancements such as bicycle and pedestrian facilities.

2018 Highway Revenues and Expenditures



Conditions and Performance of the System

Bridge Conditions Have Improved

- Based on unweighted bridge count, the share of bridges classified as poor has improved, dropping from 10.1 percent in 2008 to 7.6 percent in 2018. The share of bridges classified as good rose from 46.0 percent to 47.8 percent during this decade.
- Weighted by deck area, the share of bridges classified as poor improved, declining from 8.8 percent in 2008 to 5.4 percent in 2018. The deck area–weighted share of poor NHS bridges dropped from 8.0 percent to 4.5 percent during the period.
- Weighted by deck area, the share of bridges classified as good declined slightly, from 45.8 percent in 2008 to 45.3 percent in 2018. The deck area–weighted share of good NHS bridges improved from 43.1 percent to 43.4 percent over this period.

Bridge Condition Terminology

Bridges are given an overall rating of "good" if the deck, substructure, and superstructure are all found to be in good condition. Bridges receive a rating of "poor" if any of these three bridge components is found to be in poor condition. All other bridges are classified as "fair."

Classifications are often weighted by bridge deck area, because in general, larger bridges are costlier to rehabilitate or replace than smaller bridges. Classifications are also sometimes weighted by annual daily traffic because more heavily traveled bridges have a greater effect on highway user costs.

The classification of a bridge as poor does not mean it is unsafe; bridges that are considered unsafe are closed to traffic.

Highway Safety Performance Has Been Mixed as Pedetrian and Bicyclist Fatalties Have Risen

- The annual number of traffic fatalities decreased by 2.3 percent from 2008 to 2018, dropping from 37,423 to 36,560, as reported in the Fatality Analysis Reporting System (FARS) Annual Report file. (More recent data shows a final count of 36,835 fatalities in 2018, 36,355 fatalities in 2019, 38,824 fatalities in 2020, and an estimated 42,915 fatalities in 2021.)
- From 2008 to 2018 the number of nonmotorists (pedestrians, bicyclists, etc.) killed by motor vehicles increased by 38.2 percent, from 5,320 to 7,354 (20.1 percent of all traffic fatalities). From 2008 to 2009, nonmotorist fatalities declined 8.1 percent, but beginning in 2009 that trend began to shift, and by 2018, nonmotorist fatalities had increased 50.5 percent.
- Fatalities related to roadway departure decreased by 6.8 percent from 2008 to 2018, but roadway departure remains a factor in over half (50.7 percent) of all traffic fatalities. Intersection-related fatalities increased 20.7 percent from 2008 to 2018, and more than one-fourth (27.4 percent) of traffic fatalities in 2018 occurred at intersections.
- The fatality rate per 100 million VMT declined from 1.26 in 2008 to 1.13 in 2018 but has increased since reaching a low of 1.08 in 2014.

Pavement Condition Trends Have Been Mixed

- The share of Federal-aid highway pavements with good ride quality improved during the 2008–2018 period, as measured on both a VMT-weighted basis (rising from 46.4 percent to 53.0 percent) and a mileage basis (rising from 40.7 percent to 47.2 percent).
- The share of Federal-aid highway pavements with poor ride quality measured on a mileage basis worsened more significantly during the 2008–2018 period (rising from 15.8 percent to 22.6 percent) than ride quality measured on a VMT-weighted basis (rising from 14.6 percent to 15.2 percent). Weighted by lane miles, the share of pavement with poor ride quality

improved, decreasing from 19.8 percent to 18.5 percent over this period. This divergence may be due to States focusing improvements on major roads that are more heavily traveled.

- The share of VMT on NHS pavements with good ride quality rose from 57.0 percent in 2008 to 61.7 percent in 2018. This gain is especially impressive considering MAP-21 expanded the NHS by 60,292 miles (37 percent), as pavement conditions on the additions to the NHS were not as good as those on the pre-expansion NHS. The share of VMT on pavements with good ride quality rose from 57 percent in 2008 to 60 percent in 2010 based on the pre-expansion NHS, and from an estimated 54.7 percent in 2010 to 61.7 percent in 2018 based on the post-expansion NHS.

- The share of VMT on NHS pavements with poor ride quality decreased from 8 percent in 2008 to 7 percent in 2010; since the expansion of the NHS under MAP-21 this share has remained relatively constant at about 11 percent.

Pavement Condition Terminology

This report uses the International Roughness Index (IRI) as a proxy for overall pavement condition. Pavements with an IRI value of less than 95 inches per mile are considered to have "good" ride quality. Pavements with an IRI value greater than 170 inches per mile are considered to have "poor" ride quality. Pavements that fall between these two ranges are considered "fair."

Pavement Data Reporting Change

A change in data reporting instructions beginning in 2010 led States to split roadways into shorter segments for purposes of evaluating pavement conditions. This more refined approach captured more of the variation in pavement conditions, which tended to increase the share of sections considered "good" or "poor" and to reduce the share considered "fair." For example, the share of mileage rated "poor" rose from 15.8 percent in 2008 to 20.0 percent in 2010.

Operational Performance Has Worsened

- Based on the National Performance Management Research Data Set (NPMRDS), the Travel Time Index (TTI) for freeways and expressways averaged 1.33 in 2018 in the Nation's 52 largest metropolitan areas. This means that the average peak-period trip took 33 percent longer than did the same trip under free-flow traffic conditions. The comparable TTI value for 2012 was 1.24.

Operational Performance Terminology

The TTI measures the average intensity of congestion, calculated as the ratio of the peak-period travel time to the free-flow travel time for the peak period on weekdays. The value of the TTI is always greater than or equal to 1, with a higher value indicating more severe congestion. For example, a value of 1.30 indicates that a 60-minute trip on a road that is not congested would typically take 78 minutes (30 percent longer) during the period of peak congestion.

The PTI measures travel time reliability and the severity of delay, defined as the ratio of the 95th percentile of travel time during the peak periods to the free-flow travel time. For example, a PTI of 1.60 means that, for a trip that takes 60 minutes in light traffic, a traveler should budget a total of 96 (60 × 1.60) minutes to ensure on-time arrival for 19 out of 20 trips (95 percent of the trips).

- For the Nation's 52 largest metropolitan areas, the Planning Time Index (PTI) as computed based on the NPMRDS averaged 2.12 for freeways and expressways in 2018, meaning that ensuring on-time arrival 95 percent of the time required planning for 2.12 times the travel time under free-flow traffic conditions. The comparable PTI value for 2012 was 2.17. On average, urban freeways and expressways in these areas were congested for 4.3 hours per day in 2018, up from 3.6 hours in 2012.
- The Texas Transportation Institute 2021 Urban Mobility Report estimates that the average commuter in 494 urbanized areas experienced a total of 54 hours of delay resulting from congestion in 2018, up from 42 hours in 2008. Total delay reached 8.6 billion hours and fuel wasted reached 3.4 billion gallons in 2018, leading to a total cost of $188 billion.

2008–2018 Highway System Trends

Note: Poor ride quality data are affected by changes in reporting instructions beginning in 2010.

Future Capital Investment Scenarios

The scenarios that follow pertain to spending by all levels of government combined for the 20-year period from 2018 to 2038 (reflecting the impacts of spending from 2019 through 2038); the funding levels associated with these analyses are stated in constant 2018 dollars. The results discussed in this section apply to the overall road system; separate analyses for the Interstate System, the NHS, and Federal-aid highways are presented in the body of this report.

Highway Investment/Performance Analyses

To provide an estimate of the costs that might be required to maintain or improve system performance, this report includes a series of investment/performance analyses that examine the potential impacts of alternative levels of future combined investment by all levels of government on highways and bridges for different subsets of the overall system.

Drawing on these investment/performance analyses, a series of illustrative scenarios was selected for more detailed exploration and presentation.

Both the Sustain 2014–2018 Spending scenario and the Maintain Conditions and Performance scenario assume a fixed level of highway capital spending in each year in constant-dollar terms (i.e., spending keeps pace with inflation each year). These scenarios also assume that spending is directed to projects with the largest benefit-cost ratios.

Spending under the Improve Conditions and Performance scenario varies by year, depending on the level of cost-beneficial investments available at that time. Because a backlog of cost-beneficial investments has not been addressed, investment under this scenario is frontloaded, with higher levels of investment in the early years of the analysis and lower levels in the latter years.

Sustain 2014–2018 Spending Scenario

- The Sustain 2014–2018 Spending scenario assumes that capital spending by all levels of government is sustained through 2038 at the average annual level from 2014 to 2018 ($115.1 billion), and that all spending supports only cost-beneficial projects. Under these assumptions, the share of travel on pavements with poor ride quality is projected to improve (i.e., be reduced) by 6.2 percentage points, and the share of bridges classified as poor would also be projected to improve, declining from 5.4 percent in 2018 to 2.7 percent in 2038.

Maintain Conditions and Performance Scenario

- The Maintain Conditions and Performance scenario seeks to identify a level of capital investment at which, if only cost-beneficial projects are chosen, selected measures of conditions and performance in 2038 are maintained at 2018 levels. The average annual level of investment associated with this scenario is $79.0 billion, 31.4 percent lower than the level of the Sustain 2014–2018 Spending scenario.
- Under the Maintain Conditions and Performance scenario, $44.7 billion per year would be directed to system rehabilitation, $23.5 billion to system expansion, and $10.8 billion to system enhancement. The share of travel on severely congested roads and the share of bridges classified as poor in 2038 would match their 2018 levels.

Improve Conditions and Performance Scenario

- The Improve Conditions and Performance scenario seeks to identify the level of capital investment needed to address all potential investments estimated to be cost-beneficial. The average annual level of systemwide capital investment associated with this scenario is $151.1 billion, 31.3 percent higher than the level of the Sustain 2014–2018 Spending scenario.
- About 36.1 percent of the capital investment under the Improve Conditions and Performance scenario would go to addressing a backlog of cost-beneficial investments of $1.1 trillion. The rest would address new needs arising from 2019 through 2038.
- The $1.1 trillion backlog includes $237 billion for system expansion and $852 billion for existing assets. This $852 billion Highway Repair Backlog includes $511 billion for the pavement component of system rehabilitation investments, $191 billion for the bridge component of system rehabilitation investments, and $150 billion for system enhancement.
- The Improve Conditions and Performance scenario includes average annual spending of $87.0 billion (57.6 percent) for the $151.1 billion for system rehabilitation, $20.8 billion (13.7 percent) for system enhancement, and $43.3 billion (28.7 percent) for system expansion.
- Under the Improve Conditions and Performance scenario, the share of travel on pavements with poor ride quality is projected to improve (i.e., to be reduced) from 15.8 percent to 6.2 percent; the share of travel on severely congested roads is projected to improve from 11.2 percent to 7.5 percent. The share of bridges classified as poor is also projected to improve, decreasing from 5.4 percent in 2018 to 1.2 percent in 2038.

Why Poor Pavements and Bridges Are Reduced but Not Eliminated

The Improve Conditions and Performance scenario would not eliminate all poor pavements and bridges because in some cases improving assets becomes cost-beneficial only after assets have declined into poor condition, and in others improving assets before they reach poor condition is cost-beneficial. Therefore, at the end of any given year, some portion of the pavement and bridge population would remain in poor condition. Moreover, severely congested roads would also not be eliminated completely, because system users impose costs on other users and society at large that they do not pay for, which leads to overconsumption of travel and to congestion. Congestion would not be eliminated even by expanding road capacity because of the generated induced travel demand, which in turn would fill the additional capacity.

Changes in Improve Scenario and Highway Repair Backlog Estimates

- The average annual investment level in the 25th C&P Report for the Improve Conditions and Performance scenario ($151.1 billion) is 15.3 percent lower than in the 24th C&P report ($178.4 billion) when adjusted to the same dollar-year.
- The Department of Transportation has established a performance target to reduce the backlog of $830 billion [2016 dollars] in highway repairs by 50 percent by 2040. Although the 2018 Highway Repair backlog of $852 billion is 2.6 percent higher, in constant dollar terms, it has decreased from the 24th C&P Report to the 25th C&P Report by 4.6 percent.

2018–2038 Future Highway Capital Investment Scenarios

	Average Annual Investment	System Rehabilitation & Enhancement	Expansion	Share of Travel on Severely Congested Roads	Share of Travel on Pavements with Poor Ride Quality	Share of Deck Area on Poor Bridges
Maintain Conditions and Performance at 2018 Levels	$79.0	70.3% $55.5	29.7% $23.5	No Change 11.2%	Reduce to 15.7%	No Change 5.4%
Sustain Spending at 2014–2018 Levels, Adjusted for Inflation	$115.1	70.4% $81.0	29.6% $34.1	Reduce to 8.8%	Reduce to 9.6%	Reduce to 2.7%
Improve Conditions and Performance	$151.1	71.3% $107.7	28.7% $43.3	Reduce to 7.5%	Reduce to 6.2%	Reduce to 1.2%

Note: Billions of 2018 dollars. Includes all public and private investment.

Modeled vs. Nonmodeled Investment

The highway investment scenarios include projections for system conditions and performance based on simulations using the Highway Economic Requirements System (HERS) and the National Bridge Investment Analysis System (NBIAS). Each scenario scales up the total amount of simulated investment to account for capital improvements that are outside the scopes of the models or for which no data are available. Of 2014 to 2018 average annual capital spending on all U.S. roads, 13.7 percent was used for system enhancements (safety enhancements, traffic control facilities, and environmental enhancements) that neither model analyzes directly. An additional 14.5 percent was used for pavement and capacity improvements on non-Federal-aid highways; FHWA does not collect the data that would be necessary to support analysis for such roads using HERS. (FHWA does collect enough data for the Nation's bridges to support analysis using NBIAS.)

Combining these percentages yields about 28.2 percent; each scenario for the road system was scaled up so that nonmodeled investment would make up this share of its total investment level. For example, of the $151.1 billion average annual investment in the Improve Conditions and Performance scenario, $42.6 billion represents nonmodeled investment.

Highlights: Transit

Spending on the System

- All levels of government spent a combined $73.3 billion in 2018 to provide public transportation and maintain transit infrastructure.
- Public transportation operating expenditures (wages, salaries, fuel, spare parts, preventive maintenance, support services, and leased transit services) totaled $51.8 billion in 2018, a 37.9 percent increase from 2008. Of this total cost, 35.6 percent was funded by system-generated revenue, most of which came from passenger fares. The Federal government provided a further 8.5 percent of revenues, and the remaining funds came from State and local sources.
- Expenditures for transit capital investments, excluding directly generated sources, totaled $18.7 billion in 2018, a 16.4-percent increase from 2008. Capital investments are used for the acquisition, renovation, and repair of transit vehicles, such as buses and railcars, and fixed assets, such as stations and rail guideway elements. Federal funding made up 40.3 percent of these capital expenditures, while the remaining funds came from State and local sources.
- In 2018, $15.0 billion, or 70.1 percent, of total transit capital expenditures was invested in rail modes, and $6.0 billion, or 28.2 percent, was invested in nonrail modes. In 2018, $18.2 billion, or 39 percent, of total transit operating expenditures was invested in rail modes, and $28.0 billion, or 61 percent, was invested in nonrail modes. Guideway investments in at-grade rail, elevated structures, tunnels, bridges, track and power systems totaled $7.3 billion in 2018. Investments in vehicles, stations, and maintenance facilities totaled $10.1 billion.
- Between 2008 and 2018, after adjusting for inflation (constant dollars), public funding for transit increased at an average annual rate of 1.4 percent. Federal funding increased at an average annual rate of 1.4 percent, and State and local funding increased at an average annual rate of 1.5 percent.
- Farebox recovery ratios, representing the share of operating expenses that come from passenger fares, were about 43.9 percent for the top 10 transit agencies in 2018, down slightly from 44.1 percent in 2008. For all agencies, the 33.8 percent recovery ratio in 2018 is down slightly from 34.2 percent in 2008, reflecting an annual average change of -0.1 percent.

Federal Transit Funding, Urban and Rural

Federal Transit Administration (FTA) Urbanized Area Formula Funds are apportioned to urbanized areas (UZAs), as defined by the Census Bureau and the 2010 census. Each large UZA (more than 200,000 people) has a designated recipient—a metropolitan planning organization or large transit agency—that allocates FTA funds according to local policy. In small urban and rural areas, FTA apportions funds to the State, which allocates them according to State policy. Indian tribes are apportioned formula funds directly. When obligated, funds become available on a reimbursement basis.

Unlinked Passenger Trips, Passenger Miles, and Revenue Miles

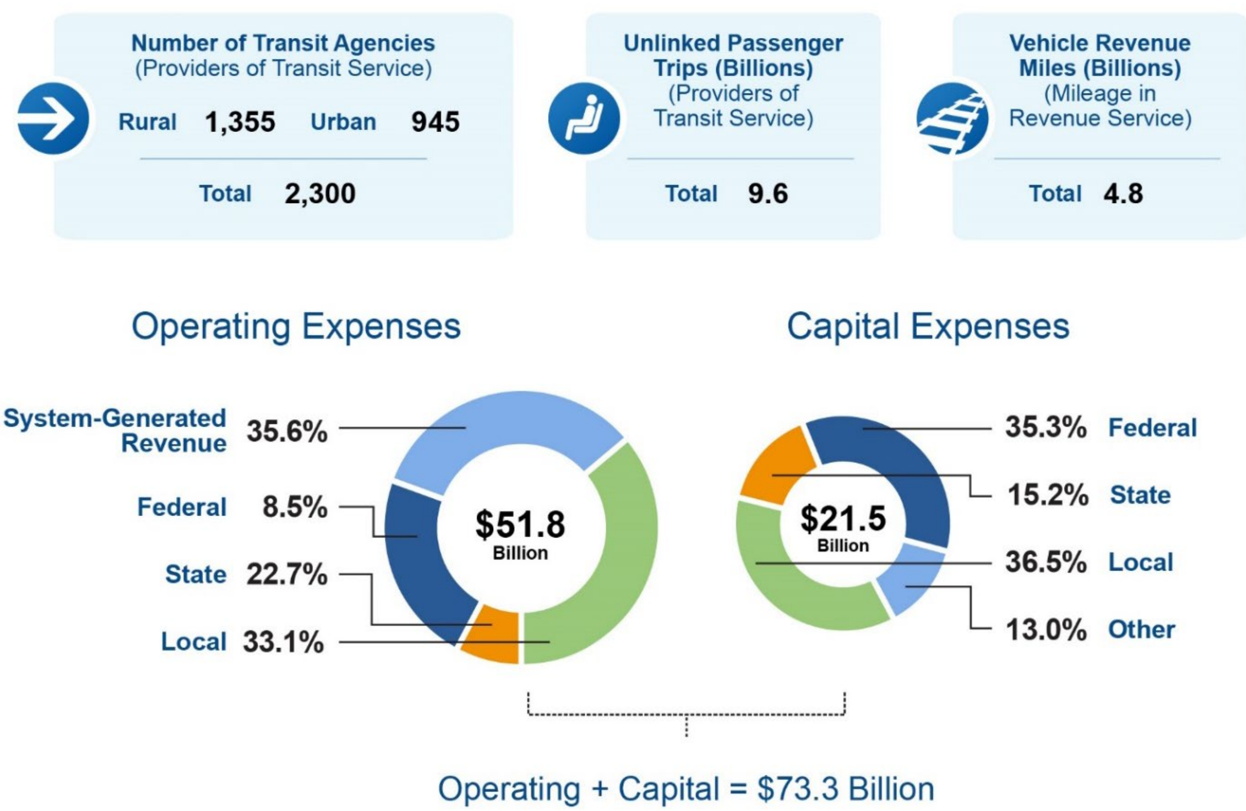
Unlinked passenger trips (UPT), also called boardings, count every time a person gets on an in-service transit vehicle. Each transfer to a new vehicle or route is considered another unlinked trip, so a person's commute to work may count as more than one trip if that person transferred between routes.

- Passenger miles traveled (PMT) count how many miles a person travels. UPT and PMT are common measures of transit service consumed.
- Vehicle revenue miles (VRM) count the miles of revenue service.

Extent of the System

- Of the transit agencies in the United States that report to the National Transit Database (NTD), in 2018, 945 agencies provided service primarily to urbanized areas and 1,355 provided service to rural areas. Of the 945 urban agencies, 278 agencies (about 30 percent) operated only one mode and the remaining agencies operated two to eight modes. Among the 1,355 rural agencies, about 71 percent operated only one transit mode, and the remaining agencies operated two to four modes.
- Transit is provided through 18 distinct modes in two major categories, rail and non-rail. In 2018, there were transit providers operated 1,174 regular fixed-route bus modes operated, 180 commuter bus modes operated, and 12 bus rapid transit modes operated. Rail modes include heavy rail (15), light rail (22), streetcar (19), hybrid rail (six), commuter rail (21), and other less common rail modes that run on fixed tracks. Demand-response service was provided by 1,906 operators. Open-to-the-public vanpool service was provided by 101 operators. Other modes include ferryboat (32) and trolleybus (five), as well as other less common modes
- Bus and heavy rail continue to be the largest segments of the industry, providing 47.6 percent and 37.8 percent of all transit trips, respectively. Demand-response systems are the second-largest transit supplier, generating 25.0 percent of vehicle revenue miles, yet carry only 1.1 percent of passenger trips. In 2018, light rail and commuter rail generated 5.1 percent and 5.5 percent of unlinked passenger trips, respectively.
- Transit operators reported 9.6 billion unlinked passenger trips on 4.8 billion vehicle revenue miles in 2018.

2018 Transit System Extent and Spending



Transit Modes

Public transportation is provided by different types of vehicles in different operating modes:

- Fixed-route bus service uses rubber-tire buses that run on scheduled routes.
- Commuter bus service is similar but runs longer distances between stops.
- Bus rapid transit is high-frequency bus service similar to light rail service.
- Públicos and jitneys are small, owner-operated buses or vans that operate on less-formal schedules along regular routes.

Larger urban areas are often served by one or more of the following kinds of fixed-guideway (rail) transit service:

- Heavy rail (often running in subway tunnels), which is characterized primarily by third-rail electric power and an exclusive dedicated guideway.
- Commuter rail, which often shares track with freight trains and usually uses overhead electric power (but may use diesel power or third rail), is typically found in extended urban areas.
- Light rail systems are common in large and medium-sized urban areas; they feature overhead electric power.
- Streetcars are small light rail systems, usually with only one or two cars per train, that often run in mixed traffic.
- Hybrid rail, previously classified as light rail or commuter rail, shares the characteristics of these two modes but has higher average station density (stations per track mile) than commuter rail and lower density than light rail; it has a smaller peak-to-base ratio than commuter rail.
- Cable cars, trolley buses, monorail, and automated guideway systems are less-common fixed-guideway systems.
- Demand-response transit service is usually provided by vans, taxicabs, or small buses that are dispatched to pick up passengers on request. This mode is used mostly to provide paratransit service, as required by the Americans with Disabilities Act. These vehicles do not follow a fixed schedule or route.

2018 Top Transit Modes Operated in the United States

	% of Transit Systems	% Vehicle Revenue Miles	% of Passenger Miles Traveled	No. of Transit Systems
Fixed-route Bus Systems	39.0%	45.1%	34.6%	1,366
Heavy Rail Systems	0.4%	14.3%	31.4%	15
Light Rail Systems (includes street cars)	1.2%	2.6%	5.1%	41
Commuter Rail Systems	0.6%	7.3%	23.4%	21
Demand-response Systems (includes taxi cabs)	54.4%	25.1%	1.8%	1,906
Other Systems (Rail)	0.5%	0.2%	0.1%	18
Other Systems (Nonrail)	4.0%	5.4%	3.6%	139
TOTAL	100.0%	100.0%	100.0%	3,506

Notes: Fixed-route Bus Systems includes local service bus, commuter bus, and Bus Rapid Transit (BRT). Other Systems (Rail) includes inclined plane, cable car, hybrid rail, automated guideway/monorail. Other Systems (Nonrail) includes vanpools, tramway, jitney, públicos, trolleybus, and ferryboat.

Conditions and Performance of the System

Increases in Fatalities

- The number of transit fatalities increased from 192 fatalities in 2008 to 260 fatalities in 2018. In 2018, 85 fatalities, or 32.7 percent, were classified as suicides. Collisions accounted for 84 percent of fatalities in 2018, generally at intersections and grade crossings.

Some Improvement in System Performance

- Between 2008 and 2018, the service offered by transit agencies grew significantly. The annual rate of growth in VRM ranged from 0.5 percent per year for heavy rail to 4.0 percent per year for light rail. This has resulted in 0.2 percent more route miles available to the public.
- In 2018, agencies reported 212,002 transit vehicles serving urban and rural areas, 5,162 passenger stations, and 2,393 maintenance facilities. Rail systems operated on 13,086 miles of track, and fixed-route buses operated on 226,782 mixed traffic route miles.
- The average fleet age for buses was 7.4 years in 2018, up from 7.0 years in 2008, but the percentage of vehicles below the replacement threshold increased from 11.8 percent in 2008 to 15.1 percent in 2018.
- Between 2008 and 2018, the number of annual service miles per vehicle (vehicle productivity) remained unchanged, and the average number of miles between breakdowns (mean distance between failures) increased by 11 percent.
- Growth in service supplied was nearly in accordance with growth in service consumed. From 2008 to 2018, average passenger loads were either flat or they decreased, with the exception of Other Rail, while passenger miles traveled and unlinked passenger trips both decreased

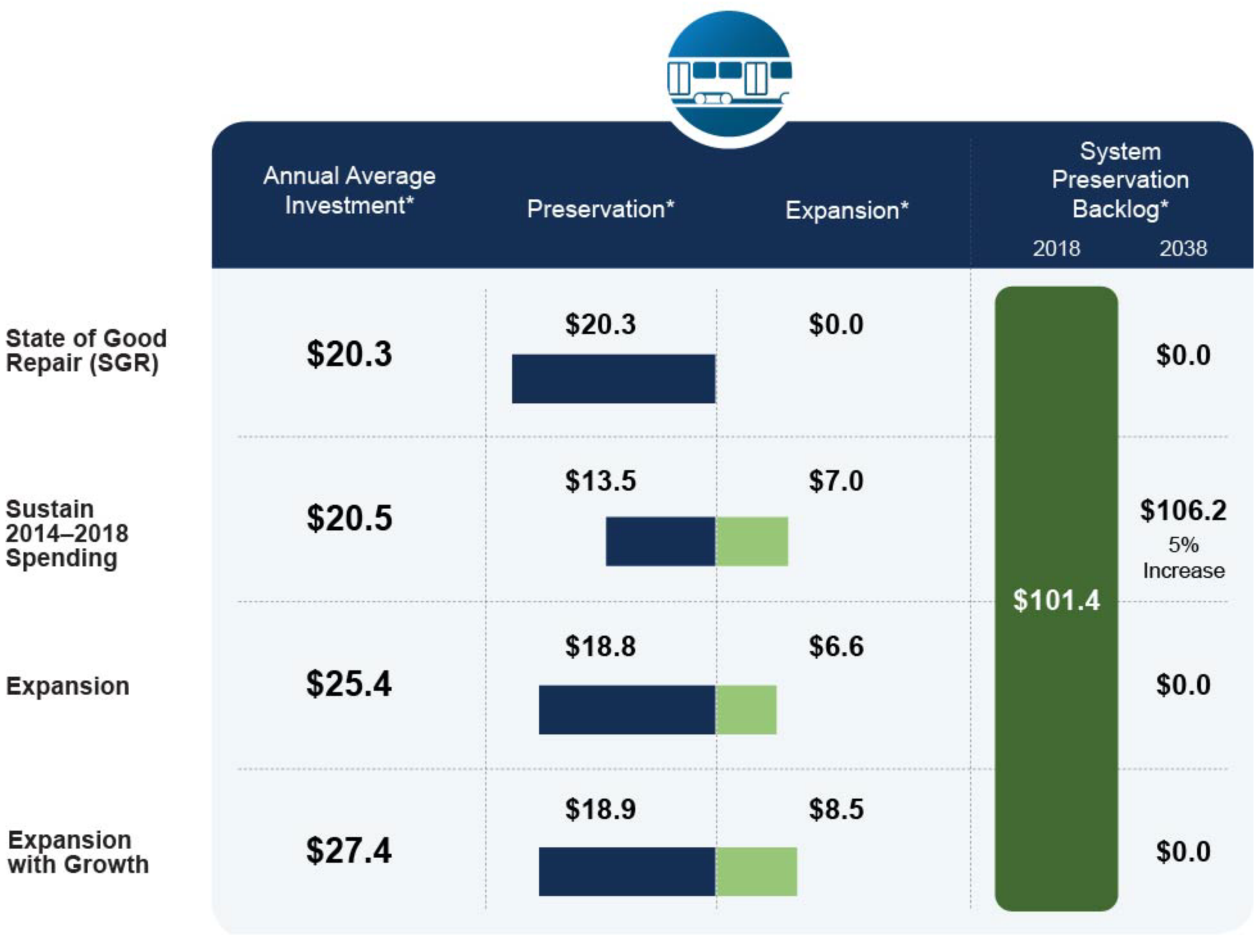
slightly. Vehicle occupancy decreased by 20 percent on fixed-route buses, the third largest decrease across all modes, following Demand Response and Other Nonrail modes.

Future Capital Investment Scenarios, Systemwide

As in the highway discussion, the transit investment scenarios that follow pertain to spending by all levels of government combined for the 20-year period from 2018 to 2038; the funding levels associated with all these analyses are stated in constant 2018 dollars. Unlike the highway scenarios, the transit scenarios assume an immediate jump to a higher (or lower) investment level that is maintained in constant-dollar terms throughout the analysis period.

Included in this section for comparison purposes is an assessment of the investment level needed to replace all assets that are currently past their useful life or that will reach that state over the forecast period. This level of investment would be necessary to achieve and maintain a state of good repair (SGR) but would not address any increases in demand during that period. Although not a realistic scenario, it provides a benchmark for infrastructure preservation.

2018–2038 Future Transit Capital Investment Scenarios



*Billions of 2018 Dollars

- For this report, the 20-year investment levels for transit capital assets have been estimated using the SGR Benchmark analysis and three investment scenarios that build on expansion investment components. The SGR Benchmark analysis found that the level of expenditure required to immediately attain and maintain SGR for the next 20 years, $20.3 billion per year, is roughly 50 percent higher than current asset preservation expenditures of $13.5 billion per year. Unlike the three capital investment scenarios which, with minor exceptions, apply a cost-benefit test to all investment needs, SGR Benchmark investments are not subject to any cost-benefit tests.

State of Good Repair—Expansion vs. Preservation

State of Good Repair (SGR) is defined in this report as all transit capital assets being within their average service life. This general construct allows FTA to estimate system preservation needs. The SGR analysis looks at the age of all transit assets and adds the value of those that are past the age at which that type of asset is usually replaced to an estimate of total reinvestment needs. Some assets continue to provide reliable service past the average replacement age and others do not; the differences average out over the large number of assets nationally. Some assets will need to be replaced; some will just get refurbished. Both types of cost are included in the reinvestment total. SGR is a measure of system preservation needs, and failure to meet these needs results in increased operating costs and poor service.

Expansion needs are treated separately in this analysis. Expansion needs address a range of objectives, including improving service coverage and frequency, and increasing operating speeds. The Expansion with Growth scenario includes investment to support long-term ridership increases (assuming a return to 2018 ridership levels after 2030).

Sustain 2014–2018 Spending Scenario

- The Sustain 2014–2018 Spending scenario assesses the expected impact on asset conditions and system performance if annual reinvestment expenditures are sustained at their 2014–2018 5-year average over the next 20 years. For this report, the 2014–2018 preservation and expansion expenditure levels are roughly in line with the estimated level of investment required to maintain the deferred investment backlog and system performance at 2018 levels. Note that annual investment levels are expected to exceed 2014–2018 levels under the BIL.
- Under the Sustain 2014–2018 Spending scenario, total preservation spending of $13.5 billion per year is well below that of the SGR Benchmark and other scenarios. Sustaining 2014–2018 spending levels is marginally less than that required to maintain the current size of the SGR backlog, but therefore significantly less than the $19.5 billion required to eliminate the backlog over 20 years. Total expansion spending of $7.0 billion per year is slightly more than that required to address the expansion investment levels identified in the Expansion scenario, but less than the amount estimated for the Expansion with Growth scenario. In this report, 2014–2018 spending levels are based on the inflation-adjusted annual average preservation and expansion spending for the most recent 5-year period reported to the NTD (2014–2018). This 5-year annual average

Expansion Investment in the Sustain 2014–2018 Spending Scenario

The Sustain 2014–2018 Spending scenario includes all the expansion investment types in the Expansion with Growth Scenario (including the investment components for transit deserts, frequency improvements, operating speeds and crowding reduction improvements, planned New Starts investments, and ridership growth analysis). TERM's benefit-cost analysis is then used to "constrain" these investment needs to include only investments with the highest benefit-cost ratios, such that the expansion investment needs equal the 2014–2018 $7.0 billion expansion investment average. (Note: New and Small Starts investments with Full Funding Grant Agreements are excluded from the cost-benefit test.)

helps smooth year-to-year variations in spending while limiting the analysis to more recent program funding levels.

Expansion Scenario

- The Expansion scenario estimates the total combined 20-year investment levels for both transit expansion and transit asset preservation. The expansion investments were driven by the level of investment required to (1) support planned New Starts/Small Starts investments, (2) attain specific service targets for areas currently unserved or underserved by transit, (3) attain specific service performance targets for urban areas with low average operating speeds, and (4) reduce crowding for transit agencies with high-capacity utilization, all relative to 2018 levels.
- Total preservation investment levels under the Expansion scenario are estimated to be $18.8 billion per year. This is less than the needed spending under the SGR benchmark because TERM's cost-benefit test projects that the Nation would not need to reinvest in certain transit assets that do not pass the test. Total expansion investments are estimated to be $6.6 billion per year.

Expansion with Growth Scenario

- The Expansion with Growth scenario builds on the needs identified in the Expansion scenario, including estimated expansion investment levels required to support projected growth in passenger miles traveled (PMT), taking into account the decline and expected slow recovery of ridership following the COVID-19 pandemic. Under these assumptions, investment in expansion assets does not occur until ridership reaches pre-pandemic levels in individual submarkets.
- Total preservation investment levels under the Expansion with Growth scenario are estimated to be $18.9 billion per year. This is slightly more than in the Expansion scenario because of the 20-year reinvestment levels for the additional assets required to support ridership growth. Total expansion levels are estimated to be $8.5 billion per year. This is about 22 percent higher than 2014–2018 spending.

Executive Summary

Part I: Moving a Nation

Part I includes six chapters; each describes the existing transportation system from a different perspective:

1. Chapter 1, **System Assets**, describes the extent of highways, bridges and transit systems based primarily on data from the Highway Performance Monitoring System (HPMS), the National Bridge Inventory (NBI), the National Tunnel Inventory (NTI), and the National Transit Database (NTD).
2. Chapter 2, **Funding**, provides data on the revenue collected and expended by different levels of governments and transit operators to fund transportation construction and operations.
3. Chapter 3, **People and Their Travel**, uses data from the National Household Travel Survey (NHTS) and U.S. Census Bureau to show how changes in population and population demographics influence travel demand.
4. Chapter 4, **Mobility,** covers highway congestion and reliability in the Nation's urban areas, as well as transit ridership, average speed, vehicle utilization, and maintenance reliability.
5. Chapter 5, **Safety**, presents statistics on highway safety and transit performance, focusing on common roadway factors that contribute to fatalities and injuries, as well as transit safety and security data by mode and type of service.
6. Chapter 6, **Infrastructure Conditions**, presents data on the physical conditions of the Nation's highways, bridges, and transit assets.

Transportation Performance Management

The Federal Highway Administration (FHWA) defines Transportation Performance Management (TPM) as a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals. FHWA has finalized six related rulemakings to implement the TPM framework:

- Statewide and Metropolitan / Nonmetropolitan Planning Rule (implements a performance-based planning process at the State and metropolitan levels; defines coordination in the selection of targets, linking planning and programming to performance targets).
- Safety Performance Measures Rule (PM-1) (establishes five safety performance measures to assess fatalities and serious injuries on all public roads, a process to assess progress toward meeting safety targets, and a national definition for reporting serious injuries).
- Highway Safety Improvement Program (HSIP) Rule (integrates performance measures, targets, and reporting requirements into the HSIP).
- Pavement and Bridge Performance Measures Rule (PM-2) (defines pavement and bridge condition performance measures, along with target establishment, progress assessment, and reporting requirements).
- Asset Management Plan Rule (defines the contents and development process for an asset management plan; also defines minimum standards for pavement and bridge management systems).
- System Performance and Freight Measures Rule (PM-3) (defines performance measures to assess performance of the Interstate System, non-Interstate National Highway System, freight movement on the Interstate System, Congestion Mitigation and Air Quality Improvement Program traffic congestion, and on-road mobile emissions).

All 50 State DOTs, the District of Columbia, and Puerto Rico report performance data and targets for each of 17 performance measures (https://www.fhwa.dot.gov/tpm/reporting/index.cfm).

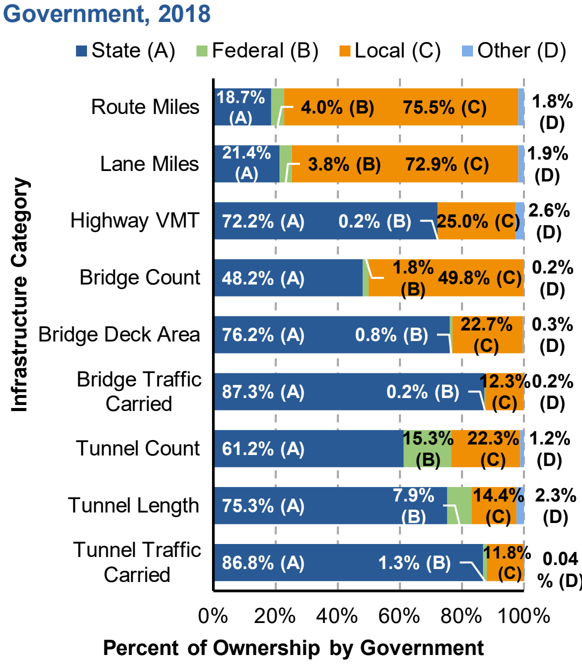
Chapter 1: System Assets – Highways

In 2018, local governments owned 75.5 percent of the Nation's 4,195,274 public road route miles and 72.9 percent of its lane miles (computed as roadway length times the number of lanes). However, State-owned roads carried a disproportionate share of the Nation's travel in motorized vehicles, accounting for 72.2 percent of the 3.255 trillion vehicle miles traveled (VMT) in 2018.

Ownership of bridges is more evenly split, as local governments owned slightly more (49.8 percent) of the Nation's 616,096 bridges in 2018 than did State governments (48.2 percent). State-owned bridges made up 76.2 percent of the Nation's bridge deck area and carried 87.3 percent of total bridge traffic.

State governments owned 61.2 percent of the Nation's 503 tunnels in 2018, and 75.3 percent of their combined length of 126.3 miles.

Highway, Bridge, Tunnel Ownership by Level of Government, 2018



Note: "Other" category represents private, railroad, and unknown.

Sources: HPMS; NBI; NTI.

Although the Federal government provides significant financial support for the Nation's highways and bridges, it owns only 4.0 percent of public road route miles. The Federal government owns 10,976 bridges and 77 tunnels.

Highway functional classifications are based on the degree to which roads provide access relative to mobility. Roads classified as local provide the most access to adjacent land. In 2018, 48.4 percent of route miles were classified as rural local and 20.7 percent were classified as urban local. Roads classified as arterials serve the longest distances with the fewest access points. Collectors funnel traffic from local roads to arterials.

Highway, Bridge and Tunnel Extent, 2018

Area	Functional System	Route Miles	Bridge Count	Tunnel Count
Rural	Interstate	0.7%	4.1%	6.4%
	Other Principal Arterial	2.2%	6.0%	8.2%
	Minor Arterial	3.2%	6.2%	5.0%
	Collector	16.1%	22.5%	16.3%
	Local	48.4%	32.9%	8.0%
	Subtotal Rural	**70.7%**	**71.7%**	**43.7%**
Urban	Interstate	0.5%	5.3%	20.7%
	Other Principal Arterial	1.9%	8.3%	22.5%
	Minor Arterial	2.7%	5.2%	5.2%
	Collector	3.5%	3.9%	1.6%
	Local	20.7%	5.6%	6.4%
	Subtotal Urban	**29.3%**	**28.3%**	**56.3%**
Total		**100.0%**	**100.0%**	**100.0%**

Note: Other Freeway and Expressway is shown within Other Principal Arterial. Collector includes Major Collector and Minor Collector.

Sources: HPMS; NBI; NTI.

In general, the 1,028,217 route miles of public roads that were functionally classified as arterials, urban collectors, or rural major collectors in 2018 are eligible for Federal-aid highway funding and are described as "Federal-aid highways."

The National Highway System (NHS) includes almost all principal arterials as well as collector and local roads that connect the principal arterials to other transportation modes and defense installations. The total length was 220,169 miles in 2018, which includes 48,741 miles on the Interstate Highway System. State governments own more than 89.4 percent of the NHS, and over 99.9 percent of the Interstate System.

Chapter 1: System Assets – Transit

Most transit systems in the United States report to the National Transit Database (NTD). In 2018, 945 systems served urbanized areas that had populations greater than 50,000. In rural areas, 1,355 systems were operating. In total, 2,300 transit systems reported data to NTD in 2018.

Modes

Transit is provided through 18 distinct modes in two major categories: rail and nonrail. Rail modes include heavy rail, light rail, streetcar, commuter rail, and other less common modes that run on fixed tracks, such as hybrid rail, inclined plane, monorail, and cable car. Nonrail modes include bus, commuter bus, bus rapid transit, demand response, vanpools, ferryboats, and other modes. In 2018, transit agencies operated 1,174 regular fixed-route bus modes, 180 commuter bus modes, and 12 bus rapid transit modes. Rail modes include heavy rail (15), light rail (22), streetcar (19), hybrid rail (six), commuter rail (21). Agencies operated 1,906 demand-response services (including demand-response taxi).

Urbanized Areas, Population Density, and Demand

Based on the 2010 census, the average population density of the United States is 82.4 people per square mile. The average population density of all 486 urbanized areas combined is 2,528 people per square mile. Areas with higher population density are able to attract more discretionary transit riders.

Organizational Structure of Urban and Rural Agencies

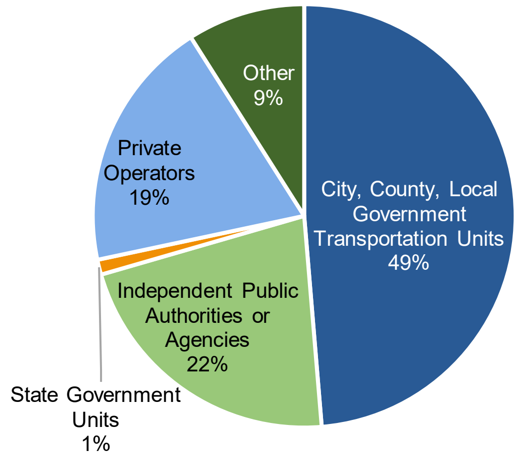
Approximately 50 percent of transit agencies in the United States are transportation units or departments of cities, counties, or other local governments. Independent public authorities or agencies account for 20 percent of transit agencies; 19 percent are private operators and the remaining 12 percent are other organizational structures such as State governments, area agencies on aging, municipal planning organizations, planning agencies, Tribes, and universities.

Agencies in rural and urban areas differ in several respects. Nearly one-third of urban transit agencies are independent public authorities or agencies; less than one-fifth of rural agencies fall into those categories. More than 25 percent of rural agencies are private operators, compared with less than 10 percent of urban operators.

National Transit Assets

- Of the 140,563 vehicles in urban and rural areas, 118,691 are nonrail vehicles (buses, demand response, and vanpool), whereas 21,014 are rail passenger cars.
- Rail systems operate on 13,086 miles of track; bus systems operate over 226,782 directional route miles.
- Urban and rural areas have 5,162 stations and 2,393 maintenance facilities.

Transit Agency Type



Source: NTD.

ADA Compliance

The Americans with Disabilities Act of 1990 (ADA) ensures equal opportunity and access for persons with disabilities. The ADA requires transit agencies to provide accessible vehicles (e.g., with lifts) and accessibility enhancements to key rail stations, such as barriers on platforms, ramps, elevators, and other elements. Nearly 95 percent of vehicles are ADA-compliant.

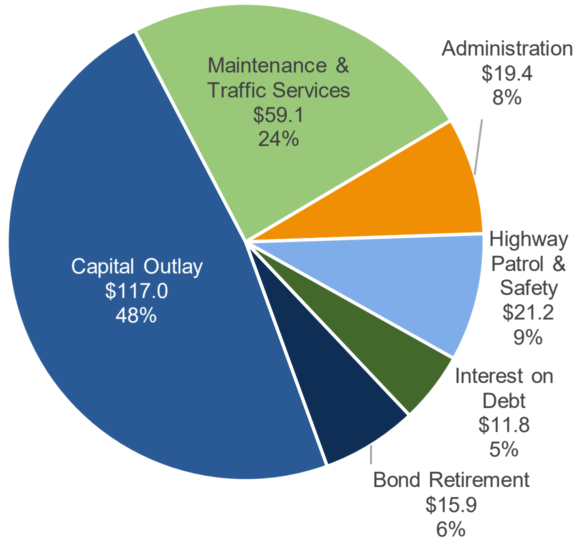
Chapter 2: Funding – Highways

Revenues and expenditures across the different levels of government are closely intertwined. Revenues are raised through fees and taxes collected from highway users and other sources at all levels of government—Federal, State, and local. Expenditures cover costs in construction, replacement, rehabilitation, maintenance, and other capital outlay for highways and bridges. In 2018, revenues raised for highways and bridges by all levels of government totaled $237.8 billion, and expenditure totaled $244.5 billion. When revenues fall below expenditures (such as in 2018), the difference is drawn from highway reserve accounts for current use at the Federal, State, and local levels. Total highway capital outlay on all systems reached $117.0 billion in 2018.

Total revenue increased by 2.1 percent per year from 2008 to 2018. Revenues from user charges, including motor fuel taxes, motor vehicle taxes and fees, and tolls generated $121.3 billion. The largest revenue increase was generated from tolls during this period. Toll revenues grew from $9.1 billion to $17.6 billion at an annual average rate of 6.8 percent. User charges accounted for about half of total revenue, including 44 percent of total revenues from motor fuel and motor vehicle taxes, and the 7 percent of tolls. The remaining $116.5 billion was generated from a variety of other sources, including property taxes and assessment, General Fund appropriations, other taxes and fees, investment income, and debt financing.

Total expenditures grew by 2.6 percent per year from 2008 to 2018. Federal, State, and local governments funded 20.4, 50.7, and 28.9 percent of total expenditures in 2018, respectively. Capital outlay represented nearly half (48 percent) of total expenditures, followed by maintenance and traffic services, which made up 24 percent. Administration, highway patrol and safety, bond retirement, and interest on debt each comprised between 9 and 6 percent of total government expenditures on highways in 2018.

Highway Expenditures by Type, 2018



Note: Dollar values are in billions.
Source: Highway Statistics 2018.

Total capital outlay increased at an annual average rate of 2.6 percent between 2008 and 2018. Federal spending increased by 2.3 percent and State and local spending by 2.9 percent during this same period. In 2018, the Federal government funded 40.1 percent of capital outlay but only 20.4 percent of highway expenditures.

About two-thirds (66.1 percent) of capital outlay was directed toward system rehabilitation, including $61.2 billion for highways and $16.2 billion for bridges. A fifth (19.8 percent) of capital outlay went to system expansion, mainly in the form of additions to highways.

Capital Outlay by Improvement Category, 2018

Improvement Type		Capital Outlay Funding in 2018		
System Rehabilitation	Highway	$61.2	52.3%	66.1%
	Bridge	$16.2	13.8%	
System Expansion	Additions to Existing Roadways	$13.3	11.3%	19.8%
	New Routes	$8.8	7.5%	
	New Bridges	$1.1	1.0%	
System Enhancement	All	$16.5	14.1%	14.1%
Total		**$117.0**	**100.0%**	**100.0%**

Note: Dollar values are in billions.
Source: Highway Statistics 2018.

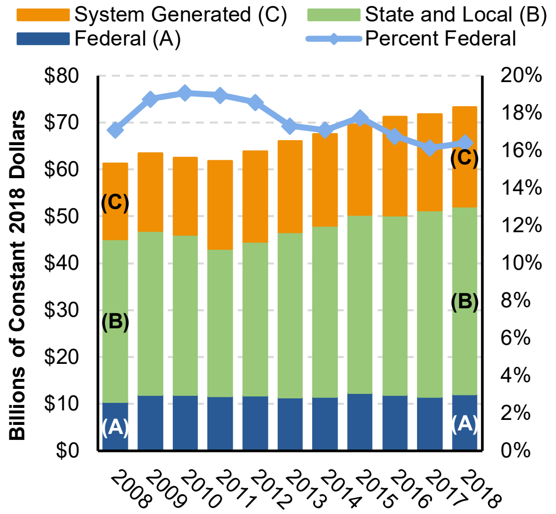
Chapter 2: Funding – Transit

Funding Sources

In 2018, $73.3 billion was generated from all sources to fund urban and rural transit. Transit funding comes from public funds allocated by Federal, State, and local governments and from system-generated revenues that transit agencies earn from the provision of transit services. Of the funds generated in 2018, 71 percent came from public sources and 29 percent came from system-generated funds (passenger fares and other system-generated revenue sources). The Federal share was $12.0 billion (23 percent of total public funding and 16 percent of all funding).

Between 2008 and 2018, all sources of public funding for transit increased by 1.4 percent per year. The Federal share remained relatively stable, varying in the range of 16 to 19 percent.

Funding for Urban Transit by Government Jurisdiction, 2008–2018



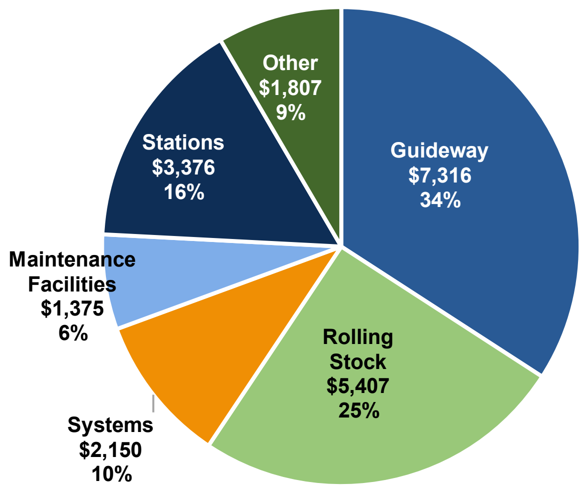
Source: NTD.

Expenditures

In 2018, operating expenses consumed $51.8 billion of all funding devoted to transit whereas capital expenditures consumed $21.5 billion of all funding.

The largest share of capital expenditures—34.7 percent ($7.3 billion)—was used for expansion or rehabilitation of guideway assets. Investments in vehicles, stations, and maintenance facilities totaled $10.1 billion or 48.2 percent.

Urban Capital Expenditures by Asset Type, 2018

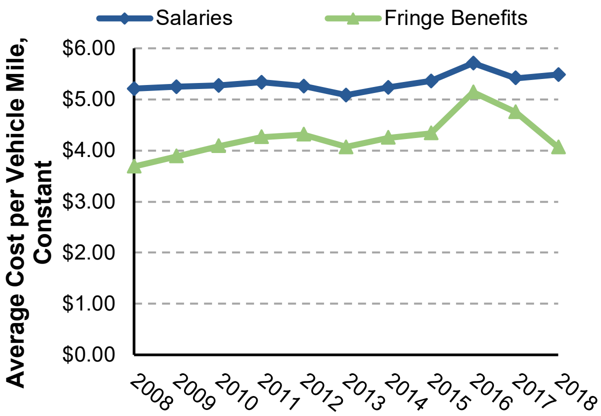


Note: In millions of dollars
Source: NTD.

Salaries and Fringe Benefits

From 2008 to 2018, fringe benefits at the top 10 transit agencies increased at the highest rate of any operating cost category on a per-mile basis. Over this period, fringe benefits increased at an annual compound average rate of 1.0 percent with a total accumulated increase of 10.2 percent. Fringe benefits can include many different components, but medical insurance usually plays a key role in the total cost. Meanwhile, salaries and wages increased by 5.3 percent.

Salaries/Wages and Fringe Benefits, Average Cost per Mile, Top 10 Transit Agencies, 2008–2018



Sources: NTD and Bureau of Labor Statistics Consumer Price Index.

Chapter 3: People and Their Travel

The U.S. population has grown significantly since 2000, according to the U.S. Census Bureau, experiencing a 16.3-percent increase from 282 million people to 332 million in 2020. The size of the population affects the total number of trips and miles traveled each day. Average annual person miles traveled increased by 4.2 percent—from 13,651 miles per person to 14,228 miles—between 2001 and 2017. The growth in person miles traveled, which accounts for travel on all modes of transportation, has outpaced the growth in vehicle miles traveled (VMT). Average annual VMT per person decreased from 8,206 to 7,698 miles between 2001 and 2017.

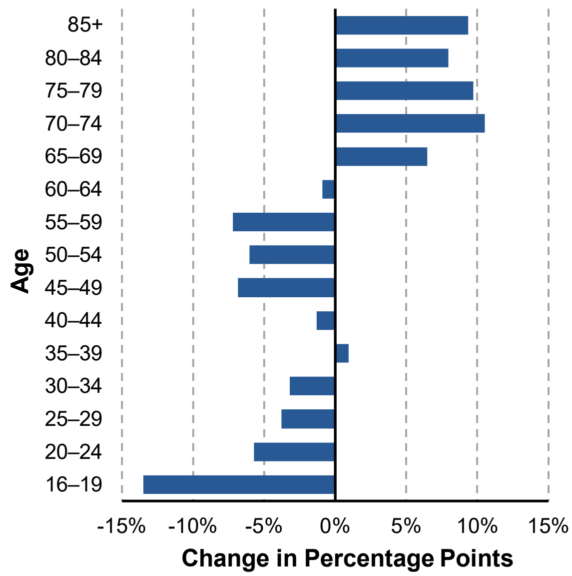
Age distribution of the population, population diversity, and income influence travel demand as well as characteristics of travel demand such as mode, distance, and purpose.

Population Age Distribution

The proportion of 35- to 54-year-olds in the total population declined from 29.5 percent in 2000 to 25.4 percent in 2020. Despite this decline, this age cohort makes the most trips, an average of 1,388 trips per year. The highest population growth has been among ages 55 and older, which increased from 21.1 percent of the population in 2000 to over 29.4 percent in 2019.

Overall, the proportion of total licensed drivers (ages 16 and older) in the United States changed from 86.5 percent of the population in this age range in 2001 to 83.9 percent in 2020. The percentage of licensed drivers decreased for all age groups below 60 years of age. In contrast, the percentage of licensed drivers among people ages 60 and older has grown. For example, the percentage of people ages 85 and older with a driver's license grew from 50 percent in 2001 to 59 percent in 2020, an increase of 9 percent. Given that there were 6.7 million Americans ages 85 and older in 2020, that equates to 4.0 million drivers ages 85 and older. Driver's license rates are lowest for people ages 16 to 19 years old, and declined from 47 percent of the 16- to 19-year-old population in 2001 to 33 percent in 2020.

Change in Percentage of Licensed Drivers by Age Cohort, 2001 vs. 2020



Source: FHWA Table DL-20.

Population Diversity

The U.S. population is not only aging, but also becoming more diverse. In 2000, 28.7 percent of the Nation's population comprised people of color: 12.8 percent Black or African American, 11.9 percent Hispanic or Latino (of any race), and 4.1 percent Asian, Native Hawaiian, and other Pacific Islander. By 2020, people of color accounted for 39.9 percent of the Nation's population.

Increased diversity brings changes in how people travel. The average trip rate is lower for minority population groups at 3.0 to 3.2 trips per day, compared with White and non-Hispanic travelers at 3.5 and 3.4 trips per day, respectively. On average, higher-income households make more trips and travel more miles compared with lower-income households. Similarly, for most racial and ethnic groups, the average number of daily trips increases as income increases.

Black households are an exception, where the highest number of average daily trips is made by households with incomes between $50,000 and $74,999.

Average Daily Trip Rate by Household Income and Race or Ethnicity, 2017

Household Income	Asian and Pacific Islander	Black	White	Hispanic (of any race)
$0-$24,999	2.6	3.0	3.0	3.1
$25,000-$49,999	3.1	3.3	3.4	3.2
$50,000-$74,999	3.0	3.4	3.4	3.2
$75,000-$99,000	3.2	3.2	3.5	3.1
$100,000+	3.2	3.1	3.7	3.5

Source: National Household Travel Survey, 2017.

Work Travel

Trends in work influence travel demand. The 2017 National Household Travel Survey (NHTS) shows that travel to work makes up about 19 percent of all trips. Full-time workers make more trips, at 3.8 to 3.9 trips per day per person, compared with nonworkers, who averaged 2.9 to 3.2 trips. According to the 2019 American Community Survey and the U.S. Census Bureau, driving to work continues to be the predominant choice for almost 85 percent of all workers, followed by working from home (6 percent), and using transit (5 percent). About 3 percent of workers walk or bike to work.

Household Travel

The number of households in the United States grew from 108.2 million in 2001 to 128.5 million in 2020. Many travel activities serve the entire household, such as grocery shopping, trips to places of worship, or dining out. Although personal vehicles are used for most trips across all incomes, both lower- and higher-income households are more likely to use public transit or walk. For example, households with annual incomes of $50,000 to $74,999 used a vehicle an average of 85 percent of the time and walked or used transit about 10 percent of the time, whereas households with annual incomes of $15,000 to $24,999 and those earning $150,000 to $199,999 used a vehicle less often (about 80 percent of the time) and walked more often (over 10 percent of the time). The lowest-income households, under $10,000 per year, walked for the largest percentage of total trips (21.2 percent) and had the highest level of transit use at 9.1 percent of all trips.

Percentage of Trips by Household Income and Mode of Travel, 2017

Household Income	Walk	Bicycle	Auto	Transit
<$10K	21.2%	2.1%	61.5%	9.1%
$10K–$14.9K	14.8%	1.2%	75.1%	5.0%
$15K–$24.9K	11.4%	1.1%	80.0%	3.6%
$25K–$34.9K	10.3%	0.8%	84.1%	2.3%
$35K–$49.9K	8.4%	0.7%	85.9%	1.9%
$50K–$74.9K	8.8%	0.9%	85.0%	1.8%
$75K–$99.9K	8.8%	0.8%	85.5%	1.8%
$100K–$124.9K	9.4%	0.8%	84.8%	1.8%
$125K–$149.9K	9.1%	0.6%	84.4%	2.1%
$150K–$199.9K	11.3%	1.5%	81.0%	2.5%
>$200K	12.3%	1.1%	79.9%	2.7%

Source: FHWA, 2018. Summary of Travel Trends: 2017 National Household Travel Survey.

The average number of vehicles per household in 2017 was the same as in 2001—about two vehicles (1.88)—despite the increases in population and number of households. This lack of change may be attributable to the decline in the number of people per household (from 2.62 in 2000 to 2.53 in 2020) or the increase in single-person households (from 25.5 percent in 2000 to 28.2 percent in 2020). According to the 2020 American Community Survey, 8.5 percent of U.S. households do not have access to a vehicle, either by choice or by circumstance. The slow growth in the number of vehicles per household could also be attributable to access to alternative transportation modes, such as on-demand transportation and shared modes. Households without a vehicle are more likely to be renters, single-person-households, and/or have annual incomes under $25,000 compared with households with one vehicle, according to the 2017 NHTS.

Personal vehicles are still the preferred mode of travel, but preference for them is declining—particularly among people under 60 years of age. This decline is likely being offset by other transportation modes, such as transit, on-demand services, and shared modes. In addition, advances in communication technology—particularly the increasing availability of high-speed internet—have supported online shopping trends and virtual meeting platforms, providing an alternative to personal travel.

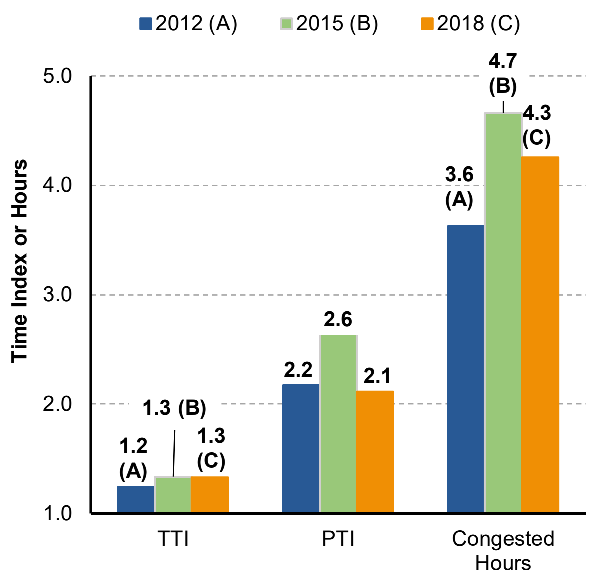
Chapter 4: Mobility – Highways

The Texas Transportation Institute's 2021 Urban Mobility Report estimates that the average commuter in 494 urbanized areas experienced a total of 54 hours of delay resulting from congestion in 2018, up from 42 hours in 2008. Total delay reached 8.6 billion hours and fuel wasted reached 3.4 billion gallons in 2018, leading to a total cost of $188 billion.

Congestion

The National Performance Management Research Data Set (NPMRDS) indicates that the Travel Time Index (TTI) for Interstate and other limited-access highways averaged 1.33 in 2018 in the Nation's 52 largest metropolitan areas. This means that the average peak-period trip took 33 percent longer than did the same trip under free-flow traffic conditions. The comparable TTI value for 2012 was 1.24.

Mobility on Limited-Access Highways in the 52 Largest Metropolitan Areas, 2012–2018



Source: FHWA staff calculation from the NPMRDS.

The average planning time index (PTI) was 2.12 for freeways and expressways in these 52 metropolitan areas in 2018. This means that drivers who wanted to arrive on time 95 percent of the time would need to leave early enough to account for their trip taking 2.12 times longer than it would under free-flow traffic conditions. The comparable PTI value for 2012 was 2.17.

On average, freeways and expressways in these 52 metropolitan areas were congested for 4.3 hours per day in 2018, up from 3.6 hours in 2012.

Road congestion varies over the course of a year. The TTI tended to be stable in the first half of 2018, but worsened substantially between July and October. The PTI generally worsened in fall and winter. High-congestion hours were concentrated in winter months and shorter periods of congestion tended to occur in warmer months.

Speed and Reliability

More than half (73 percent) of NHS travel in 2018 occurred near or at congestion-free conditions with median speeds above 45 mph. During weekday morning peak hours, travelers experienced heavily congested travel conditions with median travel speeds below 30 mph on 8 percent of the NHS and below 20 mph on 2 percent of the NHS. Trucks operated at lower median speeds compared with all vehicles combined. About 3 percent of NHS travel occurred at speeds below 20 mph, and 9 percent occurred at speeds between 20 and 30 mph.

Median speeds differed slightly between morning and afternoon peaks. However, a higher percentage of NHS roads were congested and less reliable during the afternoon peak compared with the morning peak.

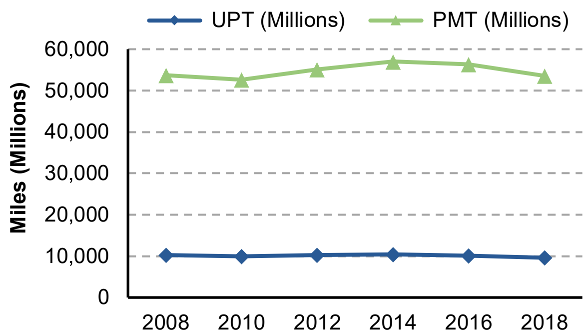
Most (80 percent) NHS segments were considered to be relatively reliable in 2018 for general traffic. However, during daylight hours on weekdays 38–40 percent of NHS road segments did not meet the more particular reliability needs for on-time truck deliveries. Truck travel appeared to be more reliable over weekends, when 44 percent of roads were reliable and 36 percent highly unreliable. Similarly, evening truck travel between 8 p.m. and 6 a.m. was more desirable with 43 percent of roads considered reliable and 32 percent highly unreliable.

Chapter 4: Mobility – Transit

Transit Ridership

After rising from 2008 to 2014, transit ridership declined through 2018. Over the 10-year period from 2008 to 2018, passenger miles traveled (PMT) were relatively flat, declining by 0.4 percent, whereas unlinked passenger trips (UPT) declined by 6.3 percent.

Passenger Miles Traveled and Unlinked Passenger Trips, 2008–2018



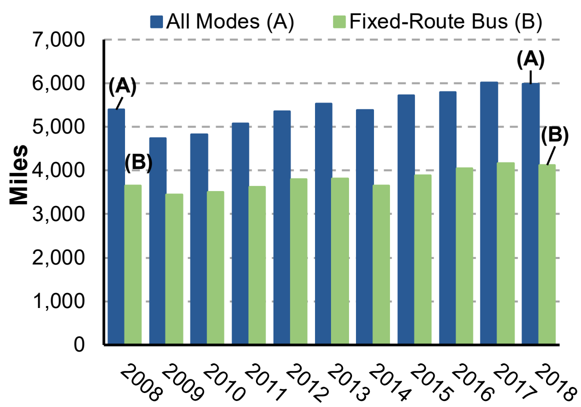
Note: PMT is passenger miles traveled, UPT is unlinked passenger trips.

Source: NTD.

Maintenance Reliability

The mean distance between failures is an important performance measure for analysis of replacement and rehabilitation needs of the national transit fleet. Between 2008 and 2018, the number of miles between failures increased by an average of 1.0 percent annually.

Mean Distance Between Urban Vehicle Failures, 2008–2018



Note: Only directly operated vehicle data were used to calculate mean distance between failures. 2014 data do not include agencies that qualified and opted to use the small systems waiver of the National Transit Database.

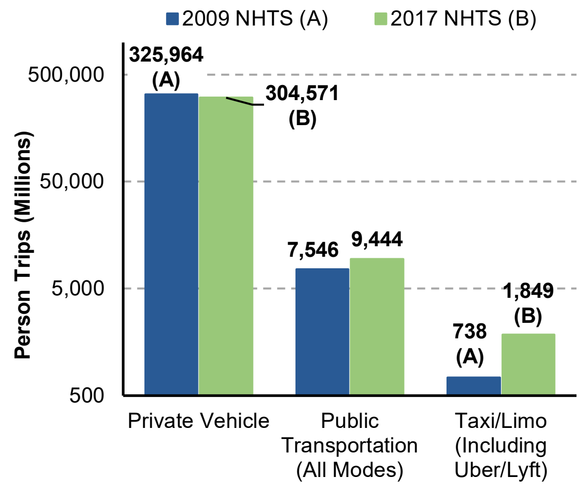
Source: National Transit Database.

Miles between failures for all modes increased in seven of the 10 years from 2008 to 2018, decreasing in 2009, 2014, and 2018. The overall increase from 2008 to 2018 was 10.8 percent.

Market Share of Public Transportation

The share of public transportation users increased from 1.9 percent of person trips in 2009 to 2.5 percent in 2017. The New York City UZA had the highest market share of public transit work trips, with nearly 33 percent of work trips taken on transit. The Chicago, Washington (DC), San Francisco, Boston, Philadelphia, and Seattle UZAs also had a greater than 10 percent market share for work trips taken on transit.

Market Share Change of Public Transportation, Private Vehicles, and Taxi Trips, 2009 and 2017



Notes: NHTS is National Household Travel Survey. Vertical axis is portrayed using a logarithmic scale.

Source: NHTS, FHWA, 2017.

ADA Accessibility

In 2018, the overall level of ADA accessibility was 94.8 percent. The most significant increases in ADA accessibility were in commuter rail passenger and self-propelled cars, which saw increases from approximately 22.7 percent and 5.4 percent in 2008 to 83.0 percent and 86.3 percent in 2018. In 2018, vans and all other rail vehicles were nearly tied for the smallest share of ADA-accessible vehicles at 78 and 77 percent, respectively.

Chapter 5: Safety – Highways

DOT's top priority is to make the U.S. transportation system the safest in the world. Three operating administrations within DOT—FHWA, the National Highway Traffic Safety Administration (NHTSA), and the Federal Motor Carrier Safety Administration (FMCSA)—have specific responsibilities for addressing roadway safety. This balance of coordinated efforts, coupled with a comprehensive focus on shared, reliable safety data, enables these DOT administrations to concentrate on their areas of expertise while working together toward the Nation's safety goal.

The data below come from NHTSA's Fatality Analysis Reporting System (FARS):

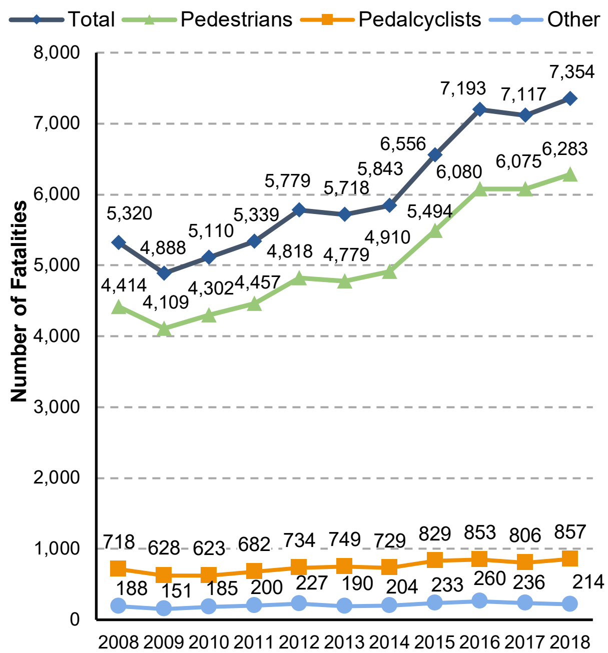
- From 2008 to 2018, highway fatalities decreased by 2.3 percent, from 37,423 to 36,560.
- Motor vehicle fatalities declined by 13 percent from 2008 to 2011. The number of fatalities changed little from 2011 through 2014, but increased by 12 percent from 2014 to 2018.
- From 2008 to 2018, fatality rates per 100 million vehicle miles traveled (VMT) decreased by 10 percent.
- From 2008 to 2010, the fatality rate per 100 million VMT dropped from 1.26 to 1.11 and varied little from 2010 through 2014. The rate rose from 1.08 in 2014 to 1.19 in 2016 and dropped to 1.13 in 2018.

Although progress was made in reducing overall highway fatalities from 2008 to 2018, certain types of fatal crashes increased. Three focus areas established by FHWA, based on the most common crash types relating to roadway characteristics, are roadway departure, intersection, and pedestrian/pedalcyclist fatalities, which accounted for 51 percent, 27 percent, and 20 percent, respectively, of total fatalities in 2018.

These three categories overlap, and 11 percent of fatalities involve more than one of these three focus areas; 13 percent do not involve a focus area.

- From 2008 to 2018, roadway departure fatalities decreased by 6.8 percent.
- From 2008 to 2018, intersection-related fatalities increased by 20.7 percent. Estimates indicate that the United States has more than 3 million intersections, most of which are nonsignalized (controlled by stop signs or yield signs, or without any traffic control devices), and a small portion of which are signalized (controlled by traffic signals). In 2018, 29.9 percent of fatalities related to intersections occurred in rural areas and 70.1 percent occurred in urban areas.
- From 2008 to 2018, pedestrian/bicyclist fatalities increased by 38.2 percent.
- From 2008 to 2009, nonmotorist fatalities declined by 8.1 percent. Beginning in 2009, that trend shifted and resulted in a 50.4-percent increase by 2018. Pedestrian fatalities rose from 4,109 in 2009 to 6,283 in 2018, an increase of 52.9 percent. Pedalcyclist (primarily bicyclist) fatalities rose from 628 in 2009 to 857 in 2018, an increase of 36.5 percent.

Pedestrian, Pedalcyclist, and Other Nonmotorist Traffic Fatalities, 2008–2018



Source: Fatality Analysis Reporting System, National Center for Statistics and Analysis, National Highway Traffic Safety Administration.

More recent data show an increase in overall highway fatalities since 2018; these trends are discussed in Chapter 11.

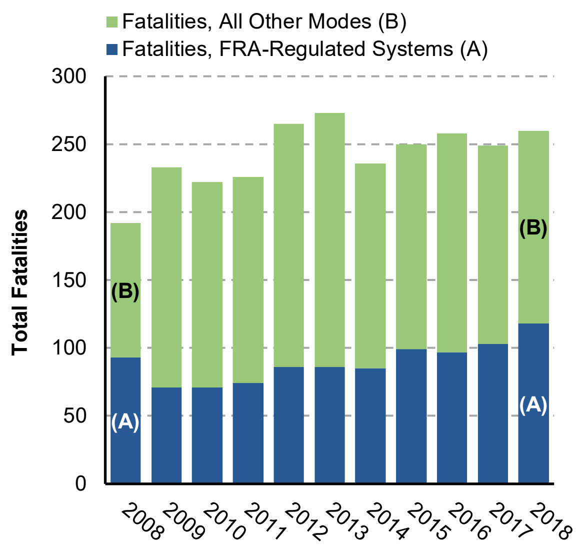
Chapter 5: Safety – Transit

Rates of injuries and fatalities on public transportation generally are lower than for other types of transportation. Nonetheless, serious incidents do occur and the potential for catastrophic events remains.

Most victims of injuries and fatalities in rail transit are not passengers or patrons but are members of the general public such as pedestrians, automobile drivers, bicyclists, or trespassers. Patrons are individuals in stations who are waiting to board or who have just disembarked from transit vehicles. Passengers are individuals boarding, traveling, or alighting a transit vehicle.

Transit fatalities, including FRA-regulated systems, rose from 285 in 2008 to 378 in 2018. Two significant contributors to this increase were growth in the number of suicides in transit, from 45 in 2008 to 85 in 2018, and growth in FRA-regulated rail system fatalities, from 93 in 2008 to 118 in 2018.

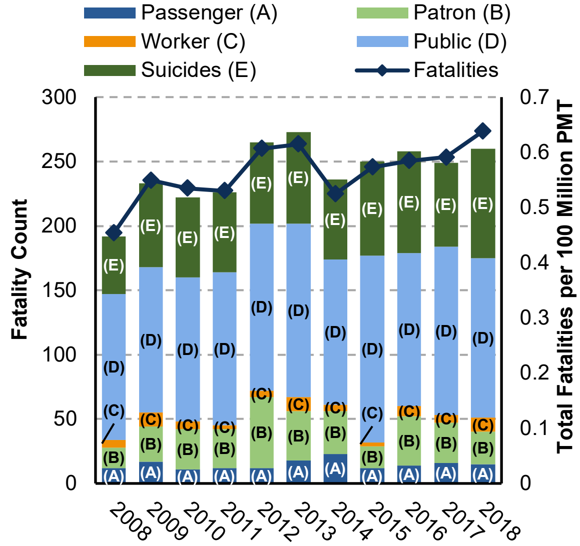
Fatalities, for All Modes, 2008–2018 (Including FRA-Regulated Rail Systems)



Sources: NTD; FRA.

Of the 260 transit-related fatalities in 2018 (excluding FRA-regulated rail systems), 15 were passengers, 25 were patrons, 11 were workers, and 124 (48 percent) were other members of the public. The remaining 85 were suicides. The number of fatalities per 100 million passenger miles travelled increased from 0.5 in 2008 to 0.7 in 2018.

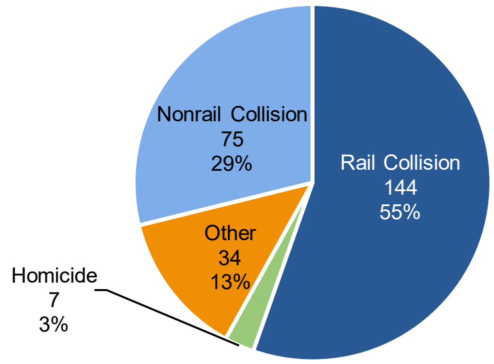
Annual Transit Fatalities, by Victim Type, 2008–2018 (Excluding FRA-Regulated Systems)



Source: NTD.

Between 2008 and 2018, rail transit fatalities increased by 35 percent. Collisions are the most common type of fatal incident in rail transit. In 2018, 219 people, or 84 percent of all fatalities (excluding FRA-regulated systems), died in collision incidents. Rail collisions make up nearly two-thirds of these fatalities. Within rail modes, fatality rates differ considerably. In every year from 2008 to 2018, the fatality rate for light rail was higher than that for heavy rail.

Transit Fatality Event Types, 2018 (Excluding FRA-Regulated Rail Systems)



Source: NTD.

FRA-regulated rail systems fatalities rose by 26.9 percent from 2008 to 2018, from 93 to 118. In this same period, injuries on FRA-regulated systems rose by 5.2 percent and incidents rose by 18.6 percent.

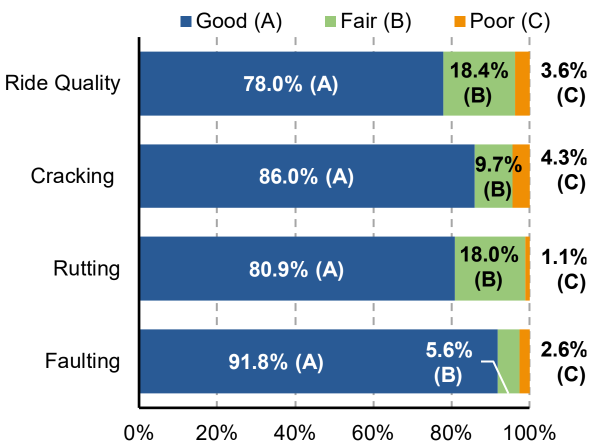
Chapter 6: Infrastructure Conditions – Highways

FHWA measures pavement and bridge conditions based on categorical ratings of good, fair, and poor. Condition data presented by raw counts are simplest to compute, but weighting by VMT or bridge traffic provides a metric for the extent to which pavement or bridge conditions are affecting the traveling public.

HPMS contains data on multiple types of pavement distresses, including pavement roughness (used to assess the quality of the ride that highway users experience), pavement cracking (distresses occurring on the surface of pavements), pavement rutting (surface depressions in the vehicle wheel path of asphalt surface pavements), and pavement faulting (the vertical displacement between adjacent jointed sections on concrete surface pavements).

Weighted by lane miles, 3.6 percent of pavements on Interstate highways for which data were available had poor ride quality in 2018; the comparable shares for cracking, rutting, and faulting were 4.3 percent, 1.1 percent, and 2.6 percent, respectively.

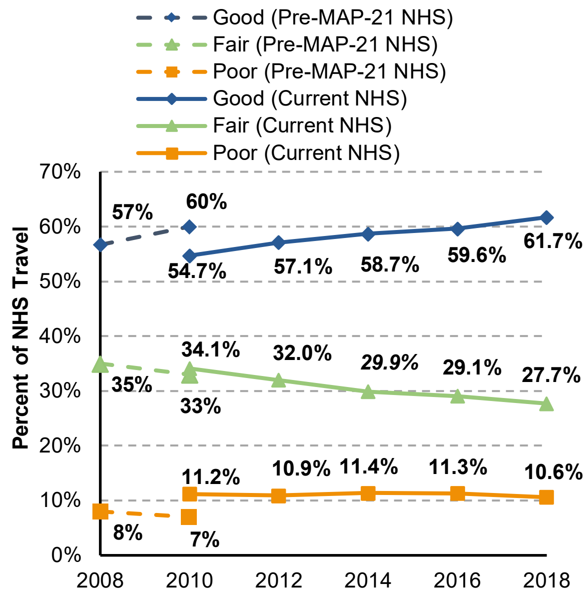
Interstate Highway Pavement Condition, Weighted by Lane Miles, 2018



Source: HPMS.

FHWA uses the share of VMT on NHS pavements with good ride quality as a metric for performance planning purposes; this metric was affected by the expansion of the NHS under MAP-21, as pavement conditions on the additions to the NHS were not as good as those on the pre-expansion NHS. The share of pavements with good ride quality rose from 57 percent in 2008 to 60 percent in 2010 on the pre-expansion NHS, and from an estimated 54.7 percent in 2010 to 61.7 percent in 2018 on the expanded NHS.

NHS Pavement Ride Quality, Weighted by VMT, 2008–2018



Notes: Data for odd-numbered years are omitted.
Source: HPMS.

The NBI contains data on bridge decks, superstructures, and substructures that combined form an overall bridge condition rating. The unweighted share of bridges rated poor was reduced from 10.1 percent in 2008 to 7.6 percent in 2018. Poor bridge condition ratings were further reduced from 8.8 percent to 5.4 percent in the deck-area-weighted share and from 7.1 percent to 3.8 percent in the traffic-weighted share over this period. A poor condition rating does not mean that a bridge is unsafe.

Systemwide Bridge Conditions, 2008–2018

Condition	Measurement Type	2008	2018
Good	By Bridge Count	47.8%	46.0%
	Weighted by Deck Area	45.8%	45.3%
	Weighted by ADT	44.7%	46.4%
Fair	By Bridge Count	41.9%	46.4%
	Weighted by Deck Area	45.3%	49.2%
	Weighted by ADT	48.2%	49.8%
Poor	By Bridge Count	10.1%	7.6%
	Weighted by Deck Area	8.8%	5.4%
	Weighted by ADT	7.1%	3.8%

Source: NBI.

Chapter 6: Infrastructure Conditions – Transit

Transit asset infrastructure in the C&P Report includes five major asset groups: guideway elements, maintenance facilities, stations, systems, and vehicles.

Major Asset Categories

Asset Category	Components
Guideway Elements	Tracks, ties, switches, ballast, tunnels, elevated structures, and bus guideways
Maintenance Facilities	Bus and rail maintenance buildings, bus and rail maintenance equipment, and storage yards
Stations	Rail and bus stations, platforms, walkaways, and shelters
Systems	Systems for train control, electrification, communication, and revenue collection; also includes utilities, signals, train, centralized vehicle/train control, and substations
Vehicles	Large buses, vans, heavy rail, light rail, commuter rail passenger cars, nonrevenue vehicles

Source: TERM.

Condition Rating

FTA uses a capital investment needs tool, the Transit Economic Requirements Model (TERM), to measure the condition of transit assets. The model uses a numeric scale that ranges from 1 to 5.

Definition of Transit Asset Conditions

Rating	Condition	Description
Excellent	4.8–5.0	No visible defects, near-new condition
Good	4.0–4.7	Some slightly defective or deteriorated components
Adequate	3.0–3.9	Moderately defective or deteriorated components
Marginal	2.0–2.9	Defective or deteriorated components in need of replacement
Poor	1.0–1.9	Seriously damaged components in need of immediate repair

Source: TERM.

The replacement value of the Nation's transit assets was $1,161 billion in 2018.

The relatively substantial proportion of facilities, elements, and systems assets that are rated below 2.5, or a state of good repair (SGR), and the magnitude of the $101-billion investment required to replace them (referred to as the reinvestment backlog), represent major challenges to the rail transit industry.

Guideway elements and stations represent more than 63 percent of the total value of transit assets in the United States. However, both categories represent a very small portion of assets categorized as below SGR, with each category having only 3 percent and 6 percent of assets not in a state of good repair. The asset category with the highest percentage of assets not in a state of good repair is systems: 25 percent of systems assets are not in a state of good repair, with 18 percent of assets categorized as in poor condition.

Assets that support rail service account for more than 84 percent of the total value of transit assets. In contrast, assets that support nonrail services—including bus, paratransit, ferry, and other modes—account for 15 percent of the total value of transit assets. A remaining 0.3 percent of transit assets support both rail and nonrail services at larger multimodal agencies.

Asset Categories Rated Below SGR, 2018

Asset Category	Percentage Below SGR
Guideway Elements	2.9%
Systems	25.3%
Facilities	16.7%
Stations	5.7%
Vehicles	13.8%

Source: TERM.

Trends in Urban Bus and Rail Transit Fleet not in SGR

The average condition rating for bus and rail fleets did not change much between 2008 and 2018, ranging between 3.3 and 3.6 for buses and ranging between 3.2 and 3.5 for rail. The percentage of the bus fleet not in SGR rose from 11.1 percent in 2008 to 14.6 percent in 2018. For rail, the percentage not in SGR increased between 2008 and 2018 from 4.2 percent to 9.2 percent, after declining to a low of 2.8 percent in 2012.

The average fleet age of all buses was 7.1 years in 2018, up from 6.1 years in 2008. The average fleet age of rail vehicles increased from 20.1 years in 2008 to 24.4years in 2018.

Introduction to Part II: Investing for the Future

Within this report, the term "investment" refers to capital spending, which includes the construction or acquisition of new assets and the rehabilitation of existing pavement, bridge, and transit assets, but does not include routine maintenance expenditures. Chapters 7 through 10 present and analyze general scenarios for future capital investment in highways, bridges, and transit.

Chapter 7, Capital Investment Scenarios, defines the core scenarios and examines the associated projections for condition and performance. It also explains how the projections are derived by supplementing the modeling results with assumptions about nonmodeled investment.

Chapter 8, Supplemental Analysis, explores some implications of the scenarios presented in Chapter 7 and discusses potential alternative methodologies. It includes a comparison of highway projections from previous editions of the C&P Report with current findings.

Chapter 9, Sensitivity Analysis, explores the impacts on scenario projections of changes to several key assumptions that are relatively arguable, such as the discount rate and the future rate of growth in travel demand.

Lastly, Chapter 10, Impacts of Investment, explores the impacts of alternative levels of possible future investment on various indicators of conditions and performance.

These four chapters measure investment levels in constant 2018 dollars except where noted otherwise. The chapters consider scenarios for investment from 2019 through 2038 that are geared toward maintaining some indicator of physical condition or operational performance at its 2018 level, sustaining investment at recent levels, or achieving some objective linked to benefits versus costs.

These scenarios are illustrative, and DOT does not endorse any of them as a target level of investment. Where practical, supplemental information is included to describe the impacts of other possible investment levels.

This report does not attempt to address issues of cost responsibility. The scenarios do not address how much different levels of government might contribute to funding the investment, nor do they address the potential contributions of different public or private revenue sources.

Analytical Tools and Uncertainty

Applying an economic approach to transportation investment modeling entails analysis and comparison of benefits and costs. Investments that yield benefits for which the values exceed their costs increase societal welfare and are thus considered "economically efficient," or "cost-beneficial."

The models used for the analysis are the Highway Economic Requirements System (HERS), the Transit Economic Requirements Model (TERM), and the National Bridge Investment Analysis System (NBIAS). Each of these tools incorporates benefit-cost analysis (BCA) within its analytical framework. However, each of the scenarios presented in this report includes components that were not computed via BCA.

Simplifying assumptions have been used to make analysis practical and to report within the limitations of available data. Each of the models used in this report—HERS, NBIAS, and TERM—omits various types of investment impacts from its analysis. To some extent, these omissions reflect the national coverage of the models' primary databases. Although consistent with this report's national focus, such broad geographic coverage requires some sacrifice of detail to stay within feasible budgets for data collection.

The investment models are deterministic, not probabilistic, in that they provide a single projected value of total investment for a given scenario rather than a range of likely values. Specific information about overall confidence intervals cannot be determined as the component variables used are not independent. Each input data and componenet variable has a unique level of uncertainty or confidence.

For example, HPMS data are collected with sampling precision requirements to ensure the samples are an accurate representation of the population. If a sample is designed at the 90-10 confidence interval and precision rate, the resultant sample estimate will be within 10 percent of the true value, 90 percent of the time.

HPMS Sample Selection Precision Level

Confidence Interval and Precision Rate	Functional Classes
90-5	Interstate (Rural; Small Urban)
	Other Freeway and Expressway (Rural; Small Urban)
	Other Principal Arterial (Rural; Small Urban)
90-10	Interstate (Urbanized > 200,000)
	Other Freeway and Expressway (Urbanized > 200,000)
	Other Principal Arterial (Urbanized > 200,000)
	Minor Arterial (Rural; Small Urban; Urbanized > 200,000)
80-10	Interstate (Urbanized < 200,000)
	Other Freeway and Expressway (Urbanized < 200,000)
	Other Principal Arterial (Urbanized < 200,000)
	Major Collector (Rural; Small Urban; Urbanized > 200,000)
	Minor Collector (Small Urban; Urbanized > 200,000)
80-10 (Or 70-15 if a State has three or more urbanized areas with a population < 200,000)	Minor Arterial (Urbanized < 200,000)
	Major Collector (Urbanized < 200,000)
	Minor Collector (Urbanized < 200,000)

Source: HPMS Field Manual.

Within HPMS, lower precision rates are defined for lower-level functional roads and lower population densities because of the limited resources of the communities managing those systems.

Supplemental analysis on alternative modeling strategies and sensitivity analysis on alternative parameter values are presented in Chapters 8 and 9, respectively, to assess the impacts and significance of these uncertainties on future investment levels and future highway performance estimates.

Sustain 2014–2018 Spending Scenario

Although some earlier C&P editions included analyses showing the impacts of sustaining spending at base-year levels, this edition follows the approach of the 24th C&P Report in using a 5-year average for the base period. This approach is expected to smooth out annual variations and make the scenarios more consistent between editions of this report. The Sustain Spending scenario for this edition is based on average annual spending over 2014–2018.

Constant-dollar conversions for the Highway Sustain 2014–2018 Spending scenario were performed using the National Highway Construction Cost Index (NHCCI), resulting in an average annual capital spending level from 2014 to 2018 of $115.1 billion.

Derivation of Highway Sustain 2014–2018 Spending Scenario

Year	National Highway Construction Cost Index	Total Highway Capital Spending (Billions of $)	
		Current Dollars	Constant 2018 Dollars
2014	1.6816	$105.4	$112.0
2015	1.6984	$109.3	$115.0
2016	1.6606	$104.5	$112.4
2017	1.6745	$111.5	$119.0
2018	1.7861	$117.0	$117.0
5-Year Average		**$109.6**	**$115.1**

Sources: FHWA: Highway Statistics, Various Years, Tables HF-10A and PT-1.

Constant-dollar conversions for the Transit Sustain 2014–2018 Spending scenario were performed using the RS Means Construction Index, resulting in an average annual capital spending level from 2014 to 2018 of $20.5 billion.

Derivation of Transit Sustain 2014–2018 Spending Scenario

Year	RS Means Construction Index (2018 = 100)	Total Transit Capital Spending (Billions of Dollars)	
		Current Dollars	Constant 2018 Dollars
2014	90.77	$17.4	$19.2
2015	92.44	$19.3	$20.8
2016	93.03	$19.4	$20.9
2017	95.82	$19.6	$20.5
2018	100.00	$21.1	$21.1
5-Year Average		**$19.4**	**$20.5**

Note: Excludes reduced reporter agencies.

Source: NTD.

Chapter 7: Capital Investment Scenarios – Highways

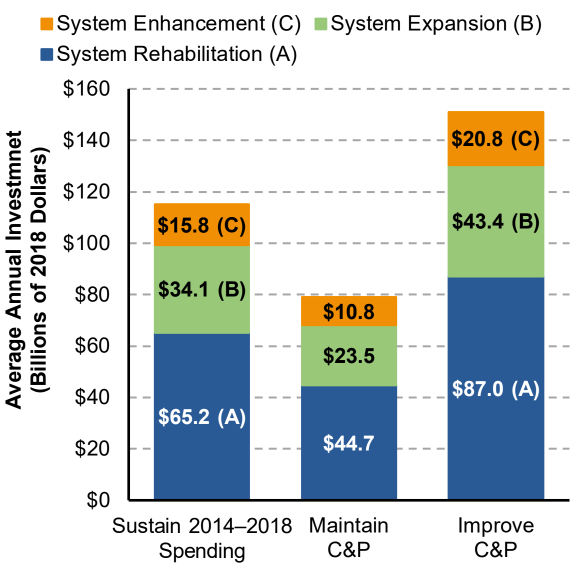
This report presents a set of illustrative 20-year highway capital investment scenarios based on simulations developed using HERS and NBIAS, with scaling factors applied to account for types of capital spending that are not currently modeled. All scenario investment levels are stated in constant 2018 dollars.

The Maintain Conditions and Performance scenario seeks to identify the level of investment needed to keep selected measures of overall system conditions and performance unchanged after 20 years. The average annual investment level associated with this scenario is $79.0 billion.

The Sustain 2014–2018 Spending scenario assumes that annual capital spending is sustained over the next 20 years at the average level from 2014–2018 ($115.1 billion), in constant-dollar terms. In other words, spending would rise by exactly the rate of inflation during that period.

Since the level of 2014–2018 spending has been significantly higher than that of the Maintain Conditions and Performance scenario, the Sustain 2014–2018 Spending scenario should result in improved overall conditions and performance in 2038 relative to 2018.

Highway Capital Investment Scenarios

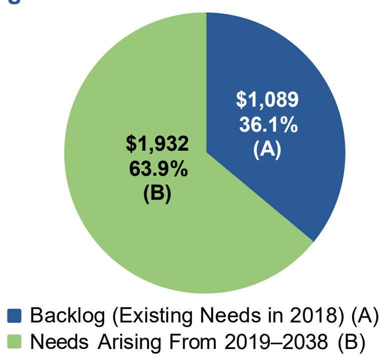


Sources: HERS and NBIAS.

The Improve Conditions and Performance scenario seeks to identify the level of investment needed to implement all potential investments estimated to be cost-beneficial. This scenario can be viewed as an "investment ceiling," above which it would not be cost-beneficial to invest. Of the $151.1 billion average annual investment level under the Improve Conditions and Performance scenario, $87.0 billion would be directed to system rehabilitation, $20.8 billion to system enhancement and $43.3 billion to system expansion.

Cumulative 20-year investment under the Improve Conditions and Performance scenario would total more than $3.0 trillion. This includes an estimated $1.1 trillion (36.1 percent), as of 2018, needed to address an existing backlog of cost-beneficial highway and bridge investments. The remainder would address future highway and bridge needs as they arise over the next 20 years.

Composition of 20-year Improve Conditions and Performance Scenario, Investment Backlog vs. Emerging Needs



Note: Values are in billions of 2018 dollars.
Source: HERS and NBIAS.

The estimated Highway Repair Backlog (a subset of the total backlog that excludes system expansion needs) is $143.0 billion for the Interstate System, $361.2 billion for the NHS, $641.0 billion for Federal-aid highways, and $852.0 billion for all public roads.

The Improve Conditions and Performance Scenario investment estimate and its backlog component both include projects off the Federal-aid highways and enhancement projects regardless of whether they are cost-beneficial, due to data limitations.

Chapter 7: Capital Investment Scenarios – Transit

This chapter provides an analysis of the State of Good Repair (SGR) Benchmark and three investment scenarios—the Sustain 2014–2018 Spending, Expansion, and Expansion with Growth scenarios.

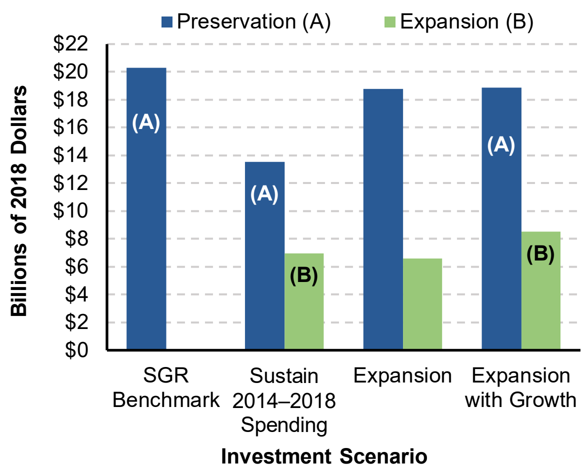
SGR Benchmark

The SGR Benchmark estimates the level of investment required to eliminate the SGR backlog by 2038. Unlike the investment scenarios, the benchmark does not include investment in expansion assets and is not subject to a benefit-cost screen.

Expenditures: An estimated $20.3 billion in annual investment is required to eliminate the SGR backlog by 2038. This is 50 percent higher than the 2014–2018 annual spending of $13.5 billion. (Funding levels are expected to increase under BIL.)

Asset Conditions: The SGR Benchmark projects improvement in average asset condition ratings, from 3.4 in 2018 to 3.5 by 2038.

Scenario Investment Summary



Source: TERM.

Sustain 2014–2018 Spending Scenario

In this scenario, for the period 2016–2018, the average annual investments in transit asset preservation and expansion are maintained at $13.5 billion and $7.0 billion, respectively, for the next 20 years.

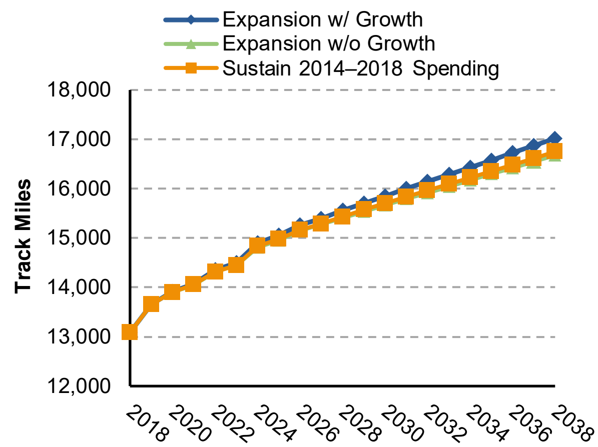
Backlog and Conditions: The recent rate of investment is not enough to maintain the current size of the SGR backlog, with the backlog growing from $101.4 billion in 2018 to $106.2 billion in 2038. At this level of underinvestment, average asset conditions decline from 3.4 in 2018 to 3.3 in 2038.

Transit Capacity: The $7.0 billion in average annual expansion investment is sufficient to increase rail transit route miles by 28 percent by 2038.

Expansion Scenarios

Expansion scenarios address a range of objectives, such as funding planned New Starts investments, improving bus service coverage and frequency, increasing operating speeds, and expanding the fleets of high-occupancy operators, all relative to 2018 levels. The Expansion with Growth scenario includes investment for long-term ridership increases (primarily after 2030).

Rail Expansion



Source: TERM.

Backlog and Conditions: Reinvestment levels are unconstrained for these scenarios, which results in elimination of the backlog by 2038 (subject to a benefit-cost test). With the backlog eliminated and significant investment in expansion, average asset conditions improve from 3.4 in 2018 to roughly 3.5 by 2038 (and slightly higher when growth in ridership is included).

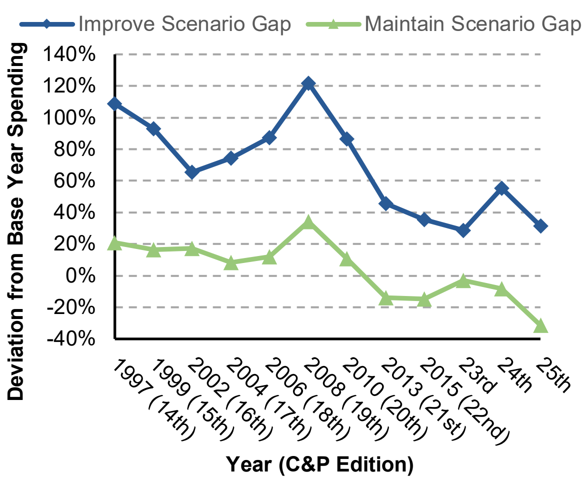
Transit Capacity: The average annual expansion investment of $6.6 billion to $8.5 billion in the expansion scenarios is sufficient to increase rail transit route miles by 27 percent to 30 percent by 2038.

Chapter 8: Supplemental Analysis – Highways

The 24th C&P Report estimated the average annual investment level for the Improve Conditions and Performance scenario as $165.9 billion in 2016 dollars, or $178.4 billion in 2018 dollars (after adjusting for inflation, using the National Highway Construction Cost Index 2.0). The 25th C&P Report estimates the comparable value at $151.1 billion in 2018 dollars, approximately 15.3 percent lower than the adjusted 24th C&P Report estimate.

The implied **funding gap** is measured as the percentage by which the estimated average annual investment needs for a specific scenario exceed the base-year level of investment. The gap between base-year spending and the average annual investment level for the primary Maintain and Improve scenarios presented in each C&P edition has varied, reaching the highest level in the 2008 C&P Report. The gaps between the average annual investment levels for both the Maintain and Improve scenarios decreased between the 24th and 25th editions.

Comparison of Implied Funding Gaps



Sources: Highway Economic Requirements System and National Bridge Investment Analysis System.

The Department of Transportation has established a performance target to **reduce the backlog** of $830 billion in highway repairs by 50 percent by 2040. This figure represents the combination of the System Rehabilitation and System Enhancement portions of the 2016 backlog presented in the 24th C&P Report. Although the 2018 highway repair backlog of $852 billion is 2.6 percent higher in nominal dollar terms, when computed in constant dollar terms the backlog has decreased from the 24th C&P Report to the 25th C&P Report by 4.6 percent.

Externalities represent the uncompensated impact of one person's actions on the wellbeing of a bystander. Congestion is a common example of a negative externality that drivers have on other drivers. Similarly, emissions and noise pollution are negative externalities imposed by drivers on society. The existence of externalities means that highway use is underpriced from the individual driver's perspective, leading to overconsumption in the form of higher VMT. This in turn may result in higher investments in system expansion. If externalities were internalized in some manner by drivers on severely congested roads during peak periods (be it through altruism or through some sort of pricing scheme), HERS estimates that the level of cost-beneficial highway capacity investments would be 44.9 percent lower than that reflected in the Improve scenario.

Examining the implications of **alternative investment allocations**, such as a Mixed Spending strategy allocating resources to both system rehabilitation and system expansion compared to a Rehabilitation First strategy that includes system rehabilitation only, can yield a better understanding of the modeling framework underlying the C&P Report. As should be expected, the HERS and NBIAS models predict a Rehabilitation First strategy would lead to better overall physical conditions and worse operational performance relative to the Mixed Spending strategy. An exception to this trend is on urban Interstates, where HERS predicted worse pavement conditions under the Rehabilitation First strategy relative to the Mixed Spending strategy. This appears as a result of some potential projects featuring both rehabilitation and expansion elements being deferred by HERS to a later date outside the 20-year analysis window once the system expansion elements were removed from consideration.

Chapter 8: Supplemental Analysis – Transit

FTA uses a capital investment needs tool, TERM, to measure the condition of transit assets. The model uses a numeric scale that ranges from 1 to 5.

Definition of Transit Asset Conditions

Rating	Condition	Description
Excellent	4.8–5.0	No visible defects, near-new condition
Good	4.0–4.7	Some slightly defective or deteriorated components
Adequate	3.0–3.9	Moderately defective or deteriorated components
Marginal	2.0–2.9	Defective or deteriorated components in need of replacement
Poor	1.0–1.9	Seriously damaged components in need of immediate repair

Source: TERM.

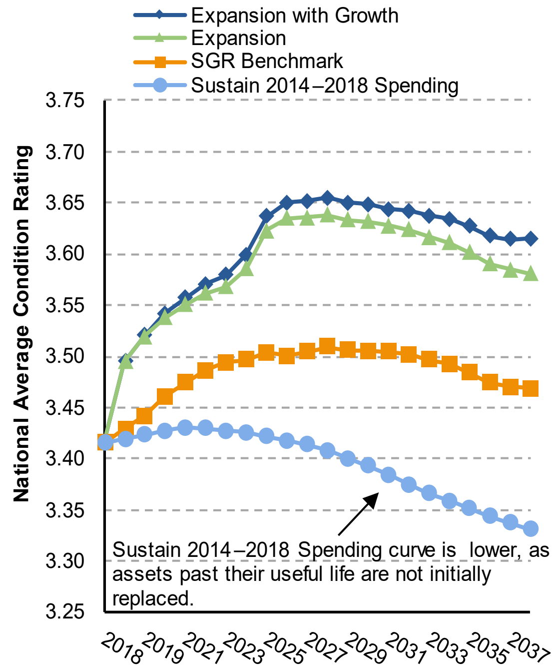
The national condition level of transit assets in 2018 stood at 3.41 (on a scale from 1 to 5), which is in roughly the mid-range of the adequate condition (3.0–3.9).

Asset Conditions under Investment Scenarios

Under the Expansion and Expansion with Growth Investment scenarios, there is an initial jump in the average condition over the first 10 years of the forecast period, driven by significant investments in new expansion assets. The increase in average conditions for these scenarios begins to slow in the later years of the forecast period and then average conditions start to decline, with the average condition in 2038 projected to be in the 3.6 range.

Under the Sustain 2014–2018 Spending scenario, the average condition is predicted to decrease consistently from the 2018 level (3.4) toward 3.3, in the bottom of the adequate condition range (3.0–3.9). The two main reasons for this result are: (1) assets past their useful life are not initially replaced because investment in replacement is constrained; and (2) many asset types have either very long useful lives (up to 80 years or more) or are nonreplaceable (tunnels and historic buildings), which together can pull down the average condition of even unconstrained scenarios.

Asset Condition Forecast for All Existing and Expansion Transit Assets

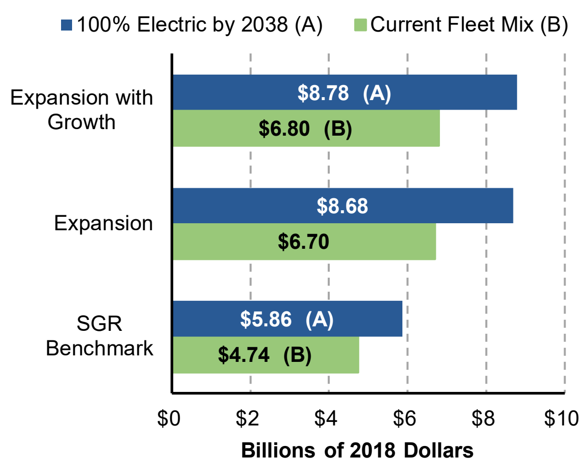


Source: TERM.

Electric Bus Fleet Costs

Assuming broad adoption of electric buses in place of existing diesel and CNG models by 2038, total bus fleet investment costs can be expected to increase by roughly 25 to 30 percent over this period.

Impact of Electric Vehicles on Scenario Average Annual Needs by Scenario



Source: TERM.

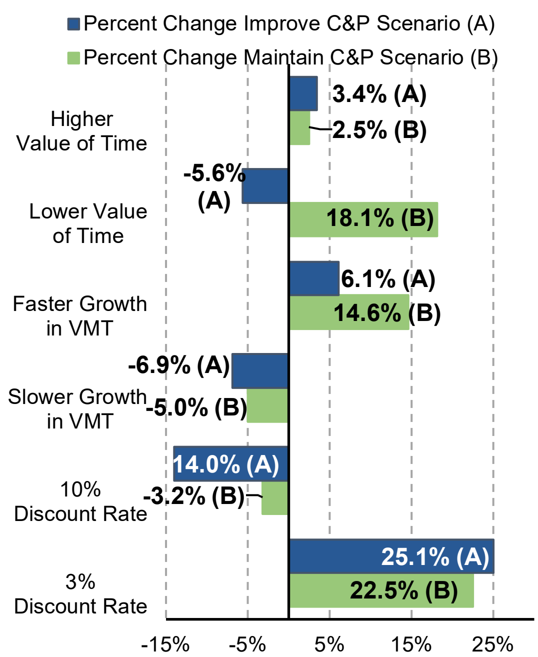
This equates to a roughly $2.2 billion increase in annual funding through 2038 to cover the transition to 100-percent electric fleets.

Chapter 9: Sensitivity Analysis – Highways

Sound practice in modeling includes analyzing the sensitivity of key results to changes in assumptions. This section analyzes how changing assumptions regarding the value of travel time savings, the discount rate, and traffic growth projections would affect the investment levels for two of the future capital investment scenarios presented in Chapter 7.

Investments are sensitive to the discount rate, a value used in benefit-cost analyses to scale down benefits and costs arising in the future relative to those arising sooner. Substituting a 3-percent discount rate for the baseline rate of 7 percent would increase the average annual investment requirements for the Improve Conditions and Performance scenario (Improve) by 25.1 percent (from $151.1 billion to $188.9 billion). Investments under the Maintain Conditions and Performance scenario (Maintain) would increase by 22.5 percent, assuming a 3-percent discount rate. A 10-percent discount rate would decrease average annual investment requirements by 14.0 percent for the Improve scenario, and 3.2 percent for the Maintain scenario.

Sensitivity of Highway Scenarios to Alternative Assumptions, Percent Change in Investment Levels from Baseline



Sources: HERS and NBIAS.

The overall impact of different estimates of growth in VMT was similar for both scenarios. Applying a 1.3-percent VMT growth per year (an optimistic forecast), instead of 1.1 percent, increases the Improve scenario funding level by 6.1 percent and the Maintain scenario level by 14.6 percent. Applying a forecast of 0.9-percent growth in VMT per year (a pessimistic forecast) reduces the Improve scenario funding level by 6.9 percent and the Maintain scenario by 5.0 percent.

Assuming lower values of time (35 percent of median hourly household income instead of 50 percent for personal travel time) reduces that average annual investment level for the Improve scenario by 5.6 percent while increasing investment levels for the Maintain scenario by 18.1 percent. Conversely, assuming higher values of time (60 percent of median hourly household income for personal travel time) increases the average annual investment level for the Improve scenario by 3.4 percent and the Maintain scenario by 2.5 percent.

Impact of Alternative Assumptions on Highway Scenario Investment Levels

Test	Maintain C&P Scenario	Improve C&P Scenario
Baseline	$79.0	$151.1
Lower Value of Time	$93.3	$142.5
Higher Value of Time	$80.9	$156.2
Slower Growth in VMT	$75.0	$140.6
Faster Growth in VMT	$90.5	$160.3
Lower Discount Rate of 3%	$96.8	$188.9
Higher Discount Rate of 10%	$76.4	$129.9

Note: Amounts are in billions of dollars.

Sources: HERS and NBIAS.

DOT's guidance on the value of a statistical life saved in 2018 to be assumed for benefit-cost analysis recommends a base value of $10.5 million and alternative values of $6.3 million and $14.7 million. Applying the recommended alternatives in HERS and NBIAS would increase both scenarios by less than 1 percent, assuming a higher value of a statistical life, and reduce both scenarios by approximately 1 percent, assuming a lower value of a statistical life.

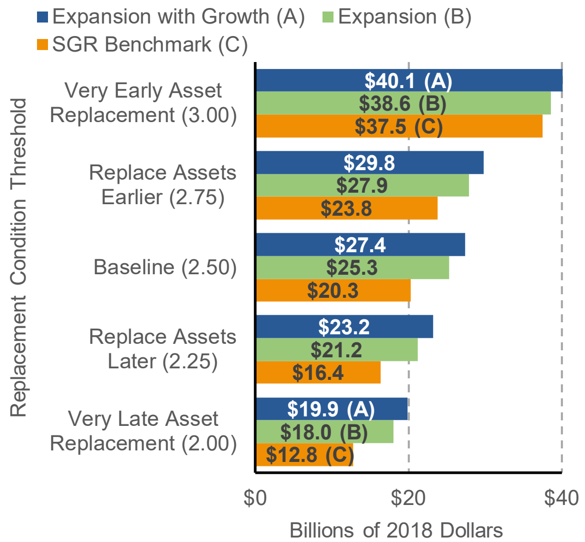
Chapter 9: Sensitivity Analysis – Transit

TERM relies on several key input parameters, variations of which can significantly influence the model's needs and backlog estimates.

Replacement Thresholds

TERM uses a "replacement threshold" to specify the condition at which aging assets are replaced. The benchmark threshold value is 2.5. A 0.5-point change in the thresholds yields a roughly ±30-percent change in replacement needs.

Sensitivity to Replacement Threshold



Source: TERM.

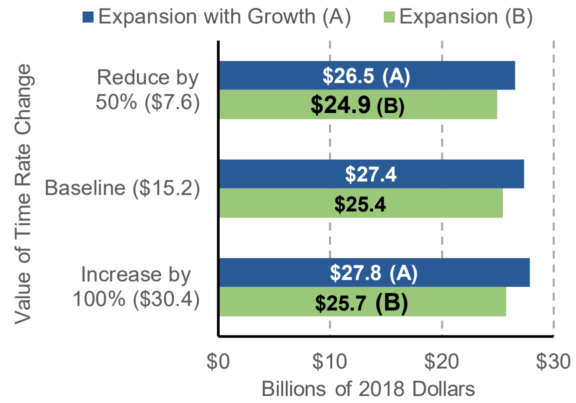
Capital Costs

TERM projects that a 25-percent increase in capital costs (i.e., all costs are set to 125 percent of the value used in this report) would lead to proportional growth in the SGR Benchmark but would be only partially realized (a 14- to 15-percent increase) under the Expansion or Expansion with Growth scenarios. This difference in sensitivity results is driven by the fact that investments are not subject to TERM's benefit-cost test in computing the SGR Benchmark.

Value of Time

The per-hour value of travel time for transit riders is a key model input and a key driver of total investment benefits. However, preservation expenditures have low sensitivity to variations in the value of time. Doubling the $15.20 current hourly rate from DOT's benefit-cost analysis guidance increases overall investment by 1–3 percent.

Sensitivity to Value of Time



Source: TERM.

Discount Rate

TERM's benefit-cost test is sensitive to the discount rate used to calculate the present value of investment costs and benefits. TERM's analysis uses a rate of 7.0 percent in accordance with Office of Management and Budget guidance. TERM is relatively insensitive to changes in the discount rate. Decreasing the discount rate from 7 percent to 3 percent leads to an increase of only 1 percent in investment levels.

Service Coverage and Frequency

Sensitivity analyses were conducted to understand how changes in the density and service parameters would affect estimated investment levels for the Expansion scenario. For transit coverage, the change to a density threshold of three dwelling units per acre would result in a 71-percent increase in the Expansion costs relative to the transit coverage component of the baseline Expansion scenario. For transit frequency, changing the density thresholds for peak-period service would result in a 42-percent increase in the Expansion costs relative to the transit frequency component of the baseline Expansion scenario. These significant percentage increases in coverage and frequency improvement costs reflect the large number of block groups that benefit from each of the threshold reductions.

Chapter 10: Impacts of Investment – Highways

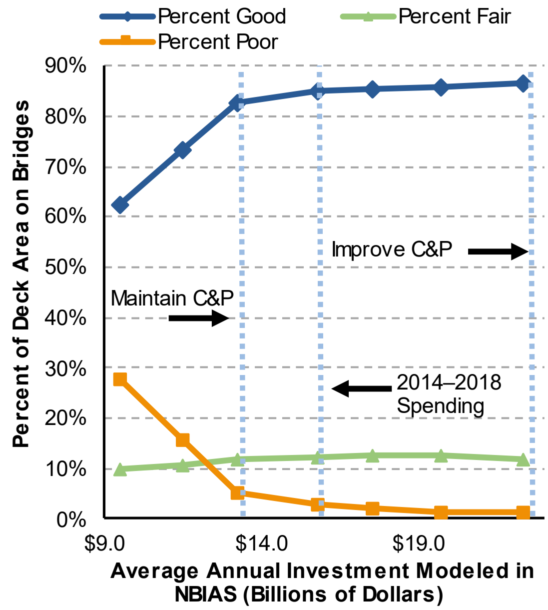
Of the $151.1 billion average annual investment level for all public roads under the Improve Conditions and Performance scenario presented in Chapter 7, 14.8 percent ($22.3 billion) was derived from NBIAS estimates of rehabilitation and replacement needs for all bridges. HERS evaluates needs on Federal-aid highways for pavement resurfacing or reconstruction and widening, including those associated with bridges; 57.0 percent ($86.1 billion) of this scenario was derived from HERS. The remaining 28.2 percent was nonmodeled; this includes estimates for system enhancements on all public roads plus pavement resurfacing or reconstruction and widening not on Federal-aid highways. Nonmodeled spending was scaled so that its share of the total scenario investment level would match its share of 2014 to 2018 spending.

Sustaining NBIAS-modeled investment at $15.8 billion (the portion of 2014 to 2018 spending directed toward implementation types modeled in NBIAS) in constant-dollar terms over 20 years is projected to result in deck area-weighted bridge conditions of 84.9 percent good, 12.2 percent fair, and 2.7 percent poor. Increasing annual investment to $22.3 billion would increase the deck area-weighted share rated as good to 86.7 percent and reduce the share rated as poor to 1.2 percent.

Sustaining HERS-modeled investment at $66.8 billion (the portion of 2014 to 2018 spending directed toward improvement types modeled in HERS) in constant-dollar terms over 20 years is projected to result in 70.6 percent of VMT in 2038 occurring on Federal-aid highway pavements with good ride quality, 19.8 percent on pavements with fair ride quality, and 9.6 percent on pavements with poor ride quality. Increasing annual investment to $86.1 billion would increase the VMT-weighted share rated as good to 76.2 percent and reduce the share rated as poor to 6.2 percent.

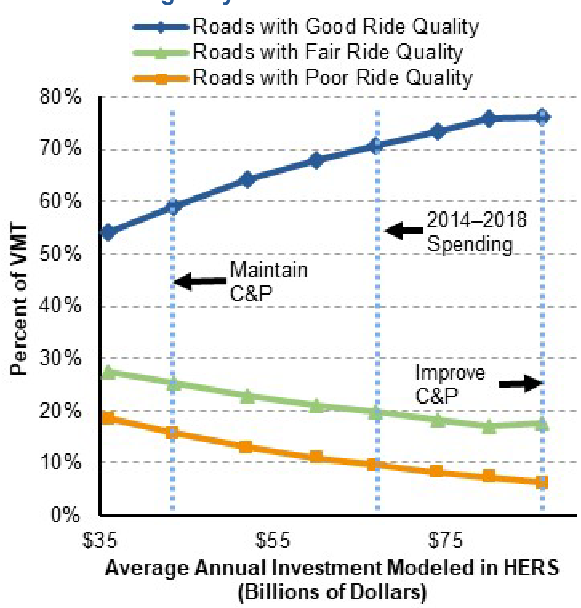
Other projected impacts of investing at the Improve scenario level include reducing VMT-weighted average pavement roughness on Federal-aid highways by 18.7 percent in 2038 relative to 2018 and reducing the percentage of VMT on congested roads from 11.2 percent to 7.5 percent. Average total user costs (including travel time costs, vehicle operating costs, and crash costs) are projected to decrease by 6.6 percent, from $1.449 per VMT in 2018 to $1.373 per VMT in 2038.

Projected Impact of Future Investment Levels on 2038 Bridge Condition Indicators for All Bridges



Source: NBIAS.

Projected Impact of Alternative Investment Levels on 2038 Pavement Ride Quality Indicators for Federal-aid Highways



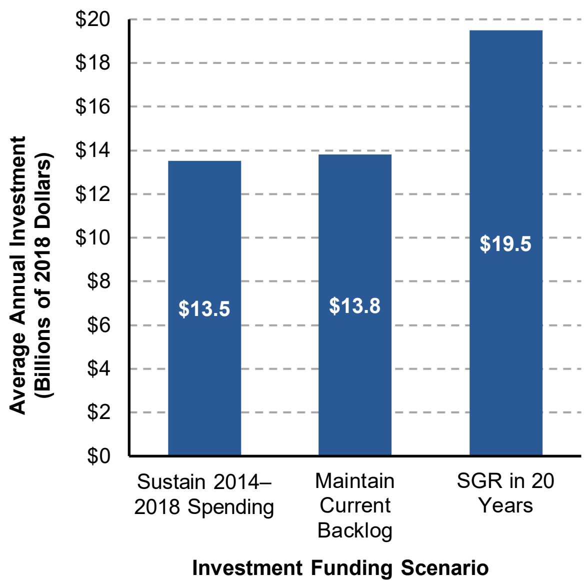
Source: NBIAS.

Chapter 10: Impacts of Investment – Transit

Impact of Preservation Investments on Transit Backlog and Conditions

TERM analysis suggests that the 2014–2018 average annual rate of capital reinvestment of $13.5 billion is marginally lower than that required to maintain the SGR backlog and, if sustained over the next 20 years, would result in a reinvestment backlog of roughly $106.2 billion by 2038. In contrast, increasing the annual rate of reinvestment to an average of $20.3 billion would fully eliminate the backlog by 2038. Finally, an annual level of reinvestment of roughly $13.8 billion is required to maintain the backlog at its current level.

Impact of Preservation Investment on 2038 Transit State of Good Repair Backlog



Source: TERM.

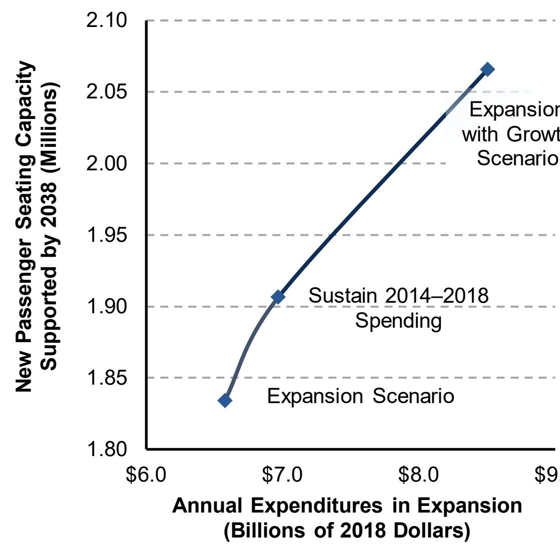
Sustained 2014–2018 spending at the recent average annual level of $13.5 billion is sufficient to maintain average condition of *existing* assets at roughly their estimated 2018 level (3.4). In contrast, unconstrained average annual replacement of $20.3 billion increases the average condition rating of the nation's transit assets to 3.5 by 2038, but with much higher conditions during the early years of the 20-year forecast period (followed by a slow decline in conditions).

Impact of Expansion Investments on Transit Capacity

Although capital spending on preservation primarily benefits the condition of existing transit assets, expansion investments are typically undertaken to expand the asset base to expand transit capacity and potentially to improve service performance for existing transit system users. The recent rate of investment in asset expansion ($7.0 billion in 2018 dollars) could support an increase in U.S. transit seating capacity by roughly 1.9 million additional seats by 2038 (approximately a 1.6-percent annual growth in seating capacity). This might result in less-crowded conditions in stations and vehicles, along with increased operating speeds.

Under the Expansion with Growth scenario, an additional $1.5 billion in annual expansion investment (an annual total of $8.5 billion) is required to deliver the seating capacity required to support that scenario's capacity increase of 2.1 million seats by 2038 (without increasing vehicle crowding).

New Passenger Seating Capacity in 2038 Supported by Expansion Investments in All Urbanized and Rural Areas



Note: TERM assesses expansion needs at the agency-mode level subject to (1) current vehicle occupancy rates at the agency-mode level and (2) expected transit PMT growth at the UZA level (hence, all agency modes within a given UZA are subject to the same transit PMT growth rate). However, TERM does not generate expansion needs estimates for agency modes that have occupancy rates well below the national average for that mode.

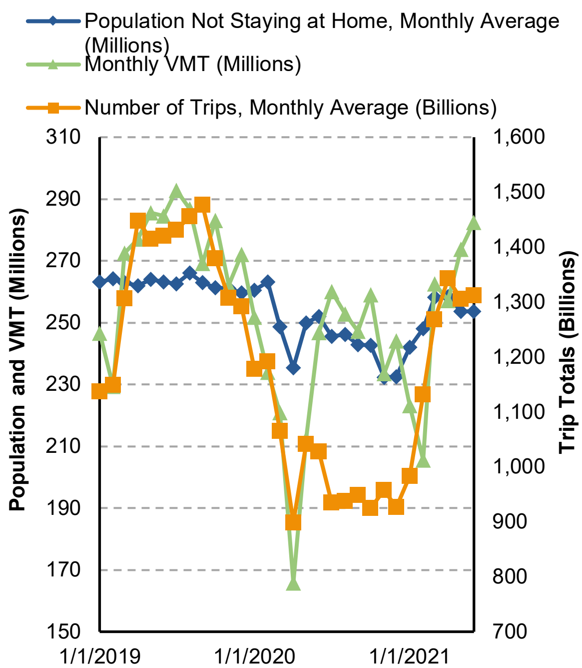
Source: TERM.

Chapter 11: Impacts of the COVID-19 Pandemic on Transportation – Highways

The declaration of Coronavirus Disease 2019 (COVID-19) as a pandemic in March 2020 caused many people to stay at home, except to access essential services, to contain the disease. This resulted in drastic declines in traffic volume and trips that are proportionate to the change in the number of people who opted to stay, or not stay, at home.

In 2019, an average of 63.4 million people opted to stay home, and 262.8 million people opted to leave home for work, school, healthcare, goods and services, or other reasons. By March 15, 2020, the number of people staying at home sharply increased by 37 percent compared with the 2019 average. The number of people staying at home peaked on April 12, 2020, at over 110 million people, nearly 73.5 percent higher than the 2019 annual average, compared with 216.9 million people who did not stay home.

Population Not Staying Home, VMT and Trip Totals



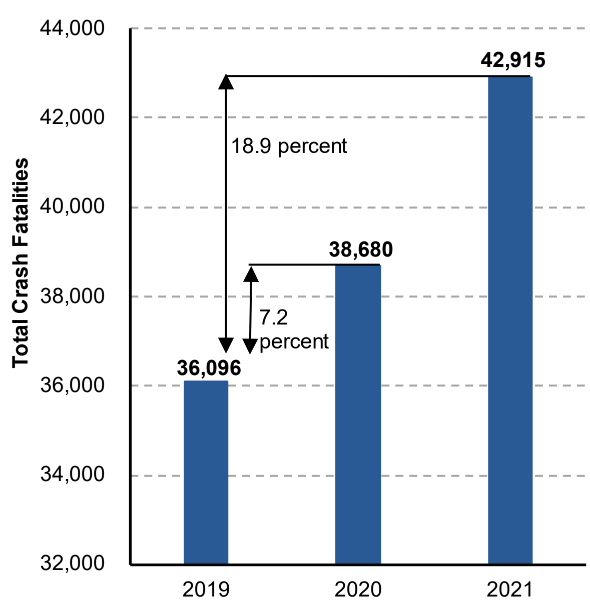
Sources: Bureau of Transportation Statistics; FHWA.

VMT declined by 19 percent in March 2020 and by 40 percent in April 2020 compared with 2019 totals. By 2021, VMT remained below traffic volumes encountered before COVID-19 and did not increase to pre-pandemic levels until September of 2021. Patterns in passenger vehicle and truck VMT differ, however. Passenger vehicle VMT was 13 percent lower than 2019 levels in October 2020, whereas truck VMT was 14 percent higher. Truck VMT has been higher than 2019 values since June 2020.

The total number of trips by all modes of roadway travel declined by as much as 38 percent in 2020 compared with 2019 totals, but rebounded to near pre-pandemic levels in early 2021. Since the start of the COVID-19 pandemic, all trip totals have been below 2019 totals except for trips less than one mile, which have continued to exceed 2019 levels since February 2021.

Despite declines in traffic volumes, roadway fatalities increased. By the end of 2020, a total of 38,680 fatalities occurred due to roadway crashes, a 7.2-percent increase from 2019, or 2,584 more fatalities. The total number of annual fatalities increased to 42,915 at the end of 2021, almost 19 percent (18.9 percent) higher than 2019 totals or 6,819 more deaths.

Total Crash Fatality Trends



Source: NHTSA.

The decline in travel led to a $3.86 billion reduction in the amount of fuel taxes collected and deposited into the Highway Trust Fund in 2020 compared with 2019 quarterly trust fund certifications.

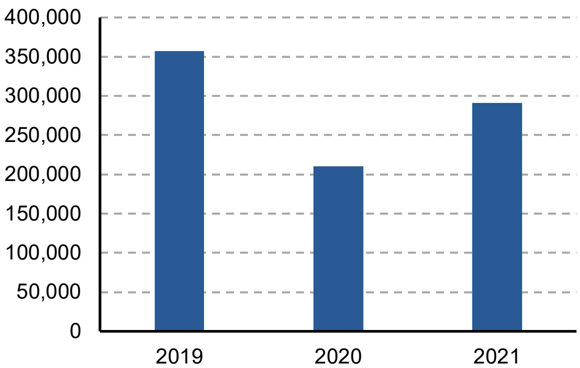
Chapter 11: Impacts of the COVID-19 Pandemic on Transportation – Transit

The COVID-19 pandemic greatly affected all areas of life including work, school, and social activities. As a result of people staying home, travel volumes decreased, and travel patterns shifted. Between April 2019 and April 2020, transit ridership decreased by 81 percent.

Ridership. Not all transit modes were affected at the same rate. The two hardest-hit modes were commuter rail and commuter bus. Ridership on these modes decreased by 93 percent between April 2019 and April 2020. The least affected mode was local bus service, which experienced only a 71 percent decrease in ridership during the same period. Overall, ridership on rail modes was more affected than on nonrail modes. Ridership began to rebound in 2021, but not to pre-pandemic levels.

Among the top 10 transit agencies, BART in the Bay Area experienced the most significant ridership decrease between January 2020 and May 2021, with 81 percent fewer trips. During the same period, transit ridership for Los Angeles Metro decreased by only 42 percent.

Vehicle Revenue Miles Throughout the Pandemic

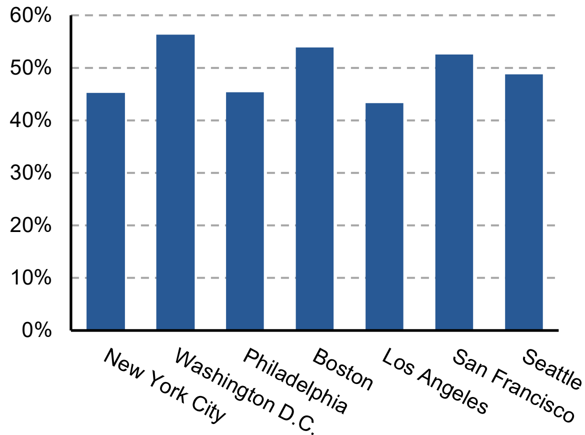


Source: NTD.

Service. Vehicles Revenue Hours (VRH) and Vehicle Revenue Miles (VRM) decreased by 38 percent and 41 percent, respectively, between April 2019 and April 2020. These figures are much lower than the ridership decreases experienced in the same period. Although declines in ridership affected rail modes at a higher rate, service reductions were higher for nonrail modes, with VRM decreasing by 42 percent for nonrail modes and 38 percent for rail modes. VRM increased between April 2020 and April 2021, but not to pre-pandemic levels.

Fare Revenues. As a result of the pandemic, many transit agencies temporarily suspended fares. Suspended fares, coupled with ridership decreases, caused fare revenue to decrease anywhere from 19 to 70 percent between 2019 and 2020 among the top 10 transit agencies. In 2020, the top 10 transit agencies suspended fare collection, although suspension varied in length and by mode. Fare revenue decreases between 2019 and 2020 varied from 70 percent for King County Metro in Washington State to 19 percent for the Massachusetts Bay Transportation Authority. The New York MTA experienced a 59-percent decrease in fare revenue in 2020, equivalent to $3.7 billion.

Households with Teleworkers, August 2020



Note: Telework numbers represent people who answered yes to the following question: “Some adult in household substituted some or all of their typical in-person work for telework because of the coronavirus pandemic?”

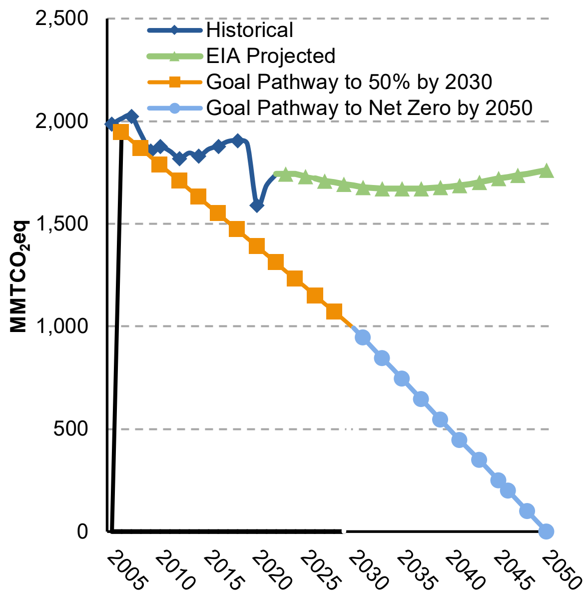
Source: BTS.

Telework. Teleworking increased during the pandemic, leading to fewer people commuting and decreases in transit ridership. In major metropolitan areas across the country, between 42 percent and 56 percent of households reported having at least one teleworker due to COVID-19. According to the 2019 American Community Survey, less than 10 percent of workers in these same metropolitan areas were working from home.

Chapter 12: Greenhouse Gas Mitigation – Highways

Transportation is the largest source of greenhouse gas (GHG) emissions in the United States, having surpassed emissions from electricity generation in 2016. Transportation accounted for 28.5 percent of total U.S. GHG emissions as of 2019. On-road vehicles are the heaviest contributors to U.S. transportation GHG emissions, accounting for over 83.1 percent of the sector's total in 2019. Light-duty vehicles (LDVs) represent 69.7 percent, and medium- and heavy-duty vehicles account for 23.7 percent. Accounting for GHG reduction policies in place at the end of 2020, the transportation sector is expected to remain the largest source of U.S. CO_2 emissions through 2050, increasing at an average annual rate of 0.3 percent despite gains in energy efficiency.

Projected Transportation Sector Energy-related CO2 Emissions Compared with Net Zero Goal



Sources: U.S. Energy Information Administration, Annual Energy Outlook 2006 through 2021, Reference Case Table 18: Carbon Dioxide Emissions by Sector and Source; Projections: EIA, AEO2021 National Energy Modeling System run ref 2021.d113020a.

Reducing the sector's CO_2 emissions by 50–52 percent below 2005 levels is the nationally determined contribution (NDC) that U.S. targeted starting in April 2021. Meeting this target would require yearly reductions of almost 6 percent starting in 2022. This rate of improvement would be approximately seven times greater than what was achieved in reducing on-road vehicle GHG emissions between 2005 and 2015. Four primary routes are available to reduce GHGs from transportation:

1. Increase vehicle fuel efficiency.
2. Transition to lower-carbon transportation energy sources, including electric and alternative fuel vehicles.
3. Shift travel and goods movement to more efficient and low- or no-emission modes.
4. Reduce travel distances through more efficient land-use patterns such as increased density and mixed-use development.

Federal programs and policies to mitigate GHG emissions from the transportation sector have evolved over recent years, including new Corporate Average Fuel Economy (CAFE) standards, established by DOT, that regulate fuel economy standards for LDVs and for medium- and heavy-duty trucks. State and local transportation planning, as well as land use policy, can be used to improve the convenience and efficiency of the transportation system by better connecting origins and destinations, reducing travel distances, and increasing access to less emission-intensive modes (such as biking and transit), resulting in reduced GHG emissions.

The Infrastructure Investment and Jobs Act, referred to as the "Bipartisan Infrastructure Law," (BIL) provides investments supporting a more equitable and climate-friendly transportation system, including a $7.5 billion grant program to strategically deploy publicly accessible EV charging and alternative fueling infrastructure along highway corridors. In addition to investments, BIL establishes a carbon reduction program that requires States, in coordination with MPOs, to develop carbon reduction strategies to reduce transportation emissions. Several States are also pursuing programs that reduce GHG emissions and provide funding for transportation projects and programs that support climate and equity goals.

Related FHWA resources are available at https://www.fhwa.dot.gov/environment/sustainability/energy/.

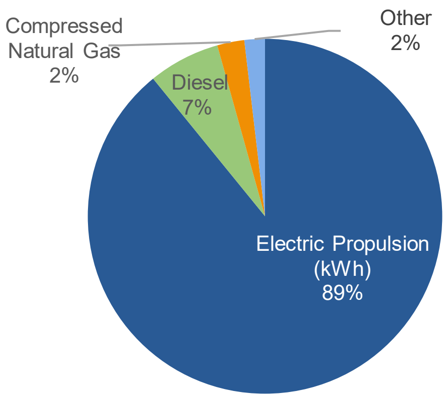
Chapter 12: Greenhouse Gas Mitigation – Transit

Public transit has an important role to play in reducing emissions. By converting personal vehicle trips into transit trips that are less energy-intensive per capita, public transit can help to lower GHG emissions. Transit can also reduce road congestion and create land-use efficiencies that encourage shorter and fewer driving trips that further reduce GHG emissions. In 2018, the use of public transportation avoided 75 million metric tons of GHG emissions while producing only 12 million metric tons.

Fuel Type

Public transit vehicles are powered by a variety of fuel sources including electric (propulsion and battery), diesel, compressed natural gas, gasoline, liquefied petroleum, and biodiesel. All rail modes are powered primarily by electric propulsion, with a few using biodiesel and diesel. In 2018, rail modes used more than 6 billion kilowatt-hours of electricity.

Transit Fuel Type Use



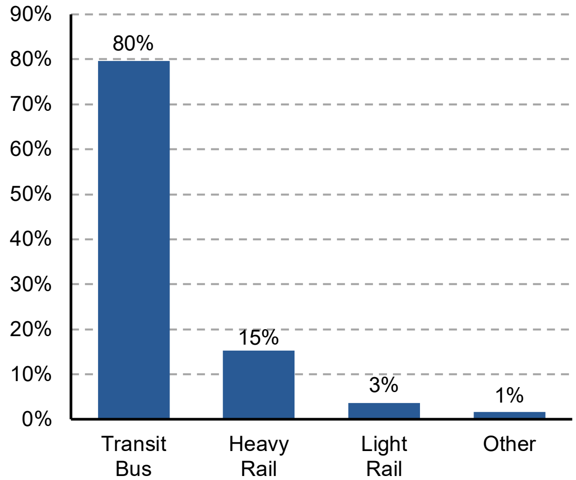
Notes: Electric includes propulsion and battery. Other includes gasoline, liquefied petroleum, biodiesel, and other fuel.
Source: NTD.

Bus modes are powered primarily by diesel and compressed natural gas, although buses use every type of fuel source. In 2018, buses used more than 305 million gallons of diesel and nearly 166 million gallons of compressed natural gas. Demand-response vehicles use every type of fuel except electric propulsion. Gasoline is the most common fuel for these vehicles. In 2018, demand-response vehicles used more than 65,000 gallons of gasoline. Ferryboats rely on diesel and biodiesel. In 2018, ferryboats used more than 40,000 gallons of diesel and biodiesel.

Number of Vehicles

In 2018, there were 76,164 transit vehicles. Most vehicles were buses, while nearly one-fifth of vehicles were rail vehicles. These vehicles were used on heavy rail, light rail, automated guideway/monorail, historic trolley, aerial tramway, and cable car modes. Additional vehicles included 234 ferry boats and 68 other vehicles. Bus vehicles include articulated, trolley, and double-decker buses.

Share of Transit Vehicles by Mode



Note: Transit bus includes bus, articulated bus, and double-decker bus. Any mode that accounts for less than 1 percent has been combined into Other.
Source: NTD.

Emissions

All transit modes produce greenhouse gas (GHG) emissions. The U.S. Energy Information Administration develops an Annual Energy Outlook that forecasts GHG emissions by transit mode and fuel type for bus modes. Between 2020 and 2050, GHG emissions are expected to increase for both rail and bus. For bus, all fuel types are expected to produce more emissions by 2050, with electric expected to see a nearly 2,000-percent increase in emissions. Overall, bus emissions are expected to increase by 35 percent. For rail, the Annual Energy Outlook only forecasts electricity emissions. Between 2020 and 2050, GHG emissions from electricity for rail modes are expected to increase by 118 percent.

Part IV: Highway Freight Conditions and Performance Report

The Fixing America's Surface Transportation (FAST) Act required FHWA to establish a National Highway Freight Network (NHFN) to help strategically direct Federal resources and policies toward improved performance along that network. Projects for improving freight movement on the NHFN are eligible for National Highway Freight Program (NHFP) obligations. The NHFN comprises four component subsystems: the Primary Highway Freight System (PHFS), other Interstate portions not on the PHFS, Critical Rural Freight Corridors (CRFCs), and Critical Urban Freight Corridors (CUFCs).

The analysis included in this *Highway Freight Conditions and Performance Report to Congress* (third edition) supports improved decision-making that will result in a safer, more reliable, and more efficient freight transportation system. This edition builds on and enhances the analysis included in the previous two editions by:

- Updating all condition and performance indicators using the latest data available at the time of writing;
- Providing an enhanced NHFN performance analysis based on the FHWA Freight Mobility Trends tool, a freight performance analysis tool released in 2020;
- Updating and expanding the analysis of CRFCs/CUFCs and State Freight Plans;
- Updating and expanding the discussion of Federal, State, and other freight industry efforts that address NHFN conditions and performance-related needs or issues; and
- Discussing several special topics including supply chains, freight transportation equity, and climate impacts from freight movement.

Freight Demand Overview

In 2018, the Nation's freight transportation system moved a daily average of about 51 million tons of freight worth more than $51.8 billion. From 2000 to 2018, total freight ton-miles grew by 3.7 percent, from 5,065,648 to 5,250,670.

Performance Analyses

Performance Analysis: Safety

Safety is a top U.S. Department of Transportation (DOT) priority, a major NHFP goal, and a key element of freight performance. There is a strong public interest in ensuring the safe movement of freight along the NHFN as well as the full extent of the Nation's freight transportation system. Between 2014 and 2019 the number of fatal crashes and fatalities on the NHFN increased by 17 percent, peaking in 2016.

Performance Analysis: Mobility

Freight mobility pertains to how efficiently freight moves. Approximately 82 percent of the most congested NHFN corridors in 2019 (based on 2019 truck hours of delay per mile) were located in coastal metropolitan areas. On 30 of the 50 most congested NHFN corridors, truck hours of delay per mile increased in 2019 compared with 2017.

Performance Analysis: Reliability

Reliability measures the impacts of non-recurring congestion on trip consistency. Reliability was assessed through an evaluation of the peak period Planning Time Index (PTI) and Truck Travel Time Reliability (TTTR) index for the top 50 most congested freight corridors on the NHFN (based on 2019 truck hours of delay per mile):

- The highest PTI (representing the least reliable corridor) was on I-95/I-295 in New York, New York (with a PTI value of 10.56); the lowest PTI (representing the most reliable corridor) was on I-15 in Salt Lake City, Utah (with a PTI value of 1.74).
- Compared with 2017, the TTTR index on the Interstate system increased from 1.36 to 1.39 in 2019, indicating overall reliability was worse in 2019.

Performance Analysis: Freight Demand

Truck volumes provide indicators of freight demand. Expected growth in freight over the next 25 to 30 years will translate to higher volumes of freight vehicles on the Nation's freight transportation network, particularly on its highways.

CRFC/CUFC

CRFCs/CUFCs provide States and eligible metropolitan planning organizations (MPOs) an opportunity to designate high-priority connectors leading to the NHFN from freight generators or other freight facilities. As of January 1, 2021, States and MPOs had designated 5,681 CRFC and CUFC miles, about 10 percent of the total 2021 NHFN roadway mileage. As of this date, 29 States and the District of Columbia had submitted CRFC/CUFC designations to FHWA.

Program Highlights

Program Highlights: State Freight Plans

BIL added new requirements for the State Freight Plans that each State receiving NHFP funding must develop. Now plans should be updated every four years and must address an eight-year forecast period. Most States have updated their plans accordingly. The plans address a wide array of conditions and performance-related issues, including infrastructure conditions, truck parking, and funding.

Program Highlights: Truck Parking

Jason's Law requires DOT to conduct a survey assessing States' capabilities to provide adequate commercial motor vehicle parking and rest facilities. First conducted in 2015, this survey was updated in 2019. The 2019 survey documented the locations of approximately 313,000 truck parking spaces, including 40,000 spaces at public rest areas and toll service plazas, and 273,000 spaces at private truck stops. Compared with the 2015 survey, the 2019 survey found an 11-percent increase in the number of private parking spaces and a 6-percent increase in the number of public parking spaces.

Conditions Analyses

The International Roughness Index (IRI) assesses pavement ride quality as experienced by a driver. In 2018, the IRI for 76 percent of NHFN pavement mileage was rated good, 19 percent was rated fair, and 5 percent was rated poor. Overall pavement condition is a combination indicator that incorporates IRI and an assessment of individual pavement distresses. In 2018, the overall pavement condition for 57 percent of NHFN mileage was rated good, 42 percent was rated fair, and 1 percent was rated poor.

In 2019, 37 percent of the total NHFN bridge mileage was in good condition, 58 percent was in fair condition, and 5 percent was in poor condition.

Special Topics

Special Topic: Supply Chain

Widespread impacts from unexpected supply chain disruptions can upset freight movement in the short term with potentially lasting economic implications. These impacts underscore the need for public investment to improve freight movement safety, resilience, mobility, and reliability. DOT invests in research and innovation delivery to improve the understanding of national supply chains for better investment decisions in freight transporation improvements.

Special Topic: Freight Transportation Equity

Freight transportation equity refers to how costs and benefits of freight transportation are distributed to users. To increase Federal agencies' capacity and ability to address freight transportation equity, DOT is collaborating with internal partners; researching and documenting noteworthy practices among States, regions, and localities; and creating grant programs that incorporate racial equity and environmental justice as focus areas.

Special Topic: Climate Impacts

Freight transportation contributes to negative climate impacts and is also vulnerable to the impacts of climate change. FHWA is researching strategies and tools to assist public sector transportation professionals in considering climate change as part of freight planning and analysis, as well as addressing climate change through freight planning programs, activities, and project development.

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STATUS OF THE NATION'S
Highways, Bridges, and Transit
Conditions and Performance

EXECUTIVE SUMMARY

25th Edition | Report to Congress

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Federal Highway Administration
Federal Transit Administration