Cost of Congestion to the Trucking Industry: 2024 Update

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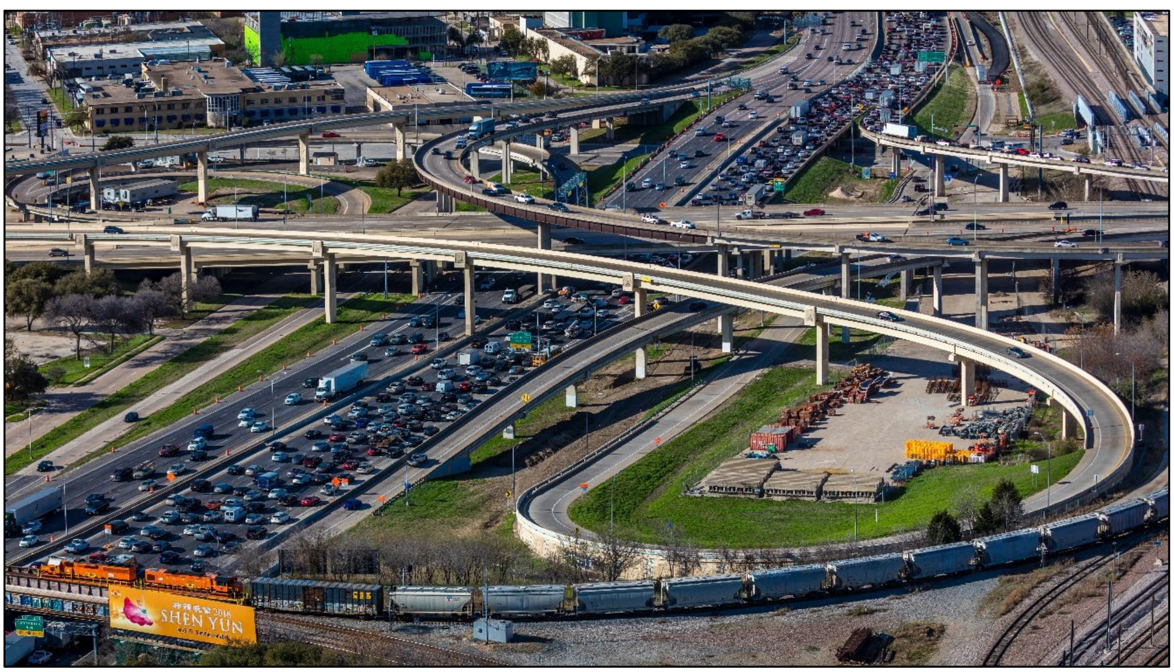

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TABLE OF CONTENTS

FIGURES AND TABLES

INTRODUCTION: THE COST OF CONGESTED HIGHWAYS

Traffic congestion has a significant impact on the U.S. economy, global supply chains, and the trucking industry in particular. The nation's highways are the trucking industry's backbone, helping facilitate the efficient movement of freight from warehouses to manufacturers and from farms to markets. When traffic volumes along critical freight corridors exceed highway capacity, however, the ensuing congestion impedes freight movement and creates inflationary increases in the cost of goods and services.

In the mid-1950s the U.S. began building the Eisenhower interstate highway system. Since that time, the U.S. population and economy have grown tremendously. Interstate capacity, however, has not kept pace with this growth.[1] Adding to this issue in recent years are efforts to stop the improvement of existing highway infrastructure (e.g. California I-80 and Oregon I-5), and even efforts to purposefully remove sections of the interstate system altogether (e.g. Minnesota I-94 and New York, I-81).[2] Of course, this is of great concern to trucking since the majority of miles traveled by truck (57%) are on interstate highways.[3]

Prior to the COVID-19 pandemic, the congestion costs borne by trucking had been on a steady rise, reaching more than $87 billion annually in 2018. The pandemic offered a small reprieve in congestion costs as the number of vehicles on the road hit record lows in 2020 due to mandatory office, school and retail closures. Since that time, however, drivers have returned to the road and traffic has slowed; in 2021, congestion costs exceeded $94 billion. In 2022, congestion's impact on the trucking industry was more than $108 billion annually.

Since the passing of the 2021 Infrastructure Investment and Jobs Act (IIJA), congestion has been a focal point for collaboration between industry advocates, government, and local communities. In 2022, the federal government spent $52 billion on highways through a variety of programs, several of which were established by IIJA specifically to target congestion.[4] State and local governments spent an additional $180 billion on highways during the year; combined government spending was equivalent to 0.92 percent of Gross Domestic Product (GDP).[5] Recent research affirms that, in addition to improving supply chain efficiency, infrastructure spending is an effective fiscal stimulus.[6] However, it is not clear whether all this infrastructure

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[1] TRIP, "America's Interstate Highway System at 65" (accessed December 2, 2024), https://tripnet.org/wp-content/uploads/2021/06/TRIP_Interstate_Report_June_2021.pdf.

[2] Ahmad, Aydian, "Northern California Environmental Groups Suing Caltrans over Interstate 80 Widening Project: (June 2, 2024), https://www.yahoo.com/news/northern-california-environmental-groups-suing-011856626.html; Fisher, Tyson, "Advocacy Groups Challenge Portland, Ore., I-5 Widening Project in Federal Court" (October 23, 2024), https://landline.media/advocacy-groups-challenge-portland-ore-i-5-widening-project-in-federal-court/; Stokes, Kyle, "Advocates Pitch Replacing I-94 with a Boulevard through the Twin Cities" (March 27, 2024), https://www.axios.com/local/twin-cities/2024/03/27/replacing-interstate-94-twin-cities-boulevard-minneapolis-stpaul; Breidenbach, Michelle; T. Knauss, "NY State is Free to Tear Down I-81 in Syracuse, Appeals Court Rules" (February 2, 2024), https://www.syracuse.com/news/2024/02/ny-state-is-free-to-tear-down-i-81-in-syracuse-appeals-court-rules.html.

[3] Federal Highway Administration, "Highway Statistics Series 2022" (accessed February 2024), U.S. Department of Transportation, https://www.fhwa.dot.gov/policyinformation/statistics.cfm.

[4] Congressional Budget Office, "Testimony on the Status of the Highway Trust Fund: 2023 Update" (October 18, 2023), https://www.cbo.gov/publication/59667.

[5] Ibid.

[6] Maria Vagliasindi and Nisan Gorgulu, "What Have We Learned about the Effectiveness of Infrastructure Investment as a Fiscal Stimulus?" *World Bank Group* (October 2021), https://documents1.worldbank.org/curated/en/178841633526651703/pdf/What-Have-We-Learned-about-the-Effectiveness-of-Infrastructure-Investment-as-a-Fiscal-Stimulus-A-Literature-Review.pdf.

investment was adequately targeted to traffic congestion hotspots and bottlenecks, which is where strategic investments are most needed.

It is clear through past research that investment in a modern interstate system is critical to the economic success of the United States.[7] Recent research affirms that, in addition to improving supply chain efficiency, infrastructure spending is an effective fiscal stimulus.[8] However, infrastructure investment must adequately target traffic congestion hotspots and bottlenecks. This report expands the existing literature by detailing the cost of congested highways to trucking as well as providing rationale for continued investment in strategic freight corridors and bottlenecks.

This report is a continuation of the American Transportation Research Institute's (ATRI) ongoing *Cost of Congestion* research. The *Cost of Congestion* initiative began in 2012 when ATRI's Research Advisory Committee (RAC) ranked an ongoing analysis of congestion costs as a top research priority.[9] For a discussion of ATRI's past congestion cost research, and the methodology for this report, please refer to Appendix A.[10] In 2024, the RAC requested that staff update the Congestion research to capture any effects of transportation investments and/or economic fluctuations.

[7] Taylor Jaworski, Carl Kitchens, and Sergey Nigai, "Highways and Globalization" *National Bureau of Economic Research* (revised May 2023), https://www.nber.org/system/files/working_papers/w27938/w27938.pdf.
[8] Maria Vagliasindi and Nisan Gorgulu, "What Have We Learned about the Effectiveness of Infrastructure Investment as a Fiscal Stimulus?" *World Bank Group* (October 2021), https://documents1.worldbank.org/curated/en/178841633526651703/pdf/What-Have-We-Learned-about-the-Effectiveness-of-Infrastructure-Investment-as-a-Fiscal-Stimulus-A-Literature-Review.pdf.
[9] ATRI's Research Advisory Committee RAC is comprised of industry stakeholders representing motor carriers, trucking industry suppliers, government agencies, professional truck drivers, law enforcement, and academia. The RAC is charged with annually recommending a research agenda for the Institute.
[10] The 2023 report can be found at the following link: Jeffrey Short and Alex Leslie, *Cost of Congestion to the Trucking Industry: 2023 Update*, American Transportation Research Institute (October 2023), https://truckingresearch.org/2023/10/cost-of-congestion-to-the-trucking-industry-2023-update/.

DATA INPUTS FOR MEASURING CONGESTION COSTS

To measure the cost of congestion to the trucking industry, three data inputs are utilized. These are average truck speeds, truck volumes and operational costs in trucking, as described below.

- Average Speed. Average highway speeds for combination trucks by geographic and temporal segment identify the deviation from free flow speed (and thus additional travel time). These data are derived from ATRI's substantial truck GPS database.[11]

- Truck Volume/Vehicle Miles Traveled (VMT). The volume of combination truck traffic by geographic and temporal segment measures the number of trucks that are impacted by delay. Truck VMT is the total of all truck miles traveled in a given year in the U.S.; truck VMT can be segmented by metropolitan area, state or region. These data are derived from the Federal Highway Administration (FHWA) *Highway Statistics Series*.[12]

- Operational Costs. The marginal unit cost per hour to operate a Class 7/8 combination truck can be multiplied by hours of delay to produce a total congestion cost for the relevant location. The operational costs data are derived from ATRI's annual *Operational Costs of Trucking* study.[13]

It should be noted that ATRI calculations in this research utilize multiple decimal places; however, tables and figures are typically rounded to the nearest tenths place for clarity and presentation purposes. Tables and figures that include rounded numbers are marked in the report with an asterisk (*).

Update to Average Speed Trends

Figure 1 shows the annual average truck speed measured across more than 300 highway segments. The segments measured represent ATRI's "expanded bottleneck" approach to congestion costs, which represents critical freight infrastructure from all 50 states as well as 106 major metropolitan areas and is described in detail in the 2023 *Cost of Congestion* report.[14] As noted in previous *Cost of Congestion* research, travel delay is "concentrated on a relatively small portion of U.S. roadways, with just 17.2 percent of NHS segment miles representing almost 87 percent of total truck congestion costs nationwide in 2016."[15]

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[11] Since 2002 ATRI has collected and processed truck GPS data and has used this data in support of myriad local, state, and federal freight analyses. At present, the ATRI GPS database is comprised of more than 1 million anonymized GPS-installed trucks in North America, and contains spot speeds, timestamp, location, and anonymous truck identifiers at regular intervals. This resource provides the research team unique access to information related to key truck origins and destinations, route choices, and speeds.

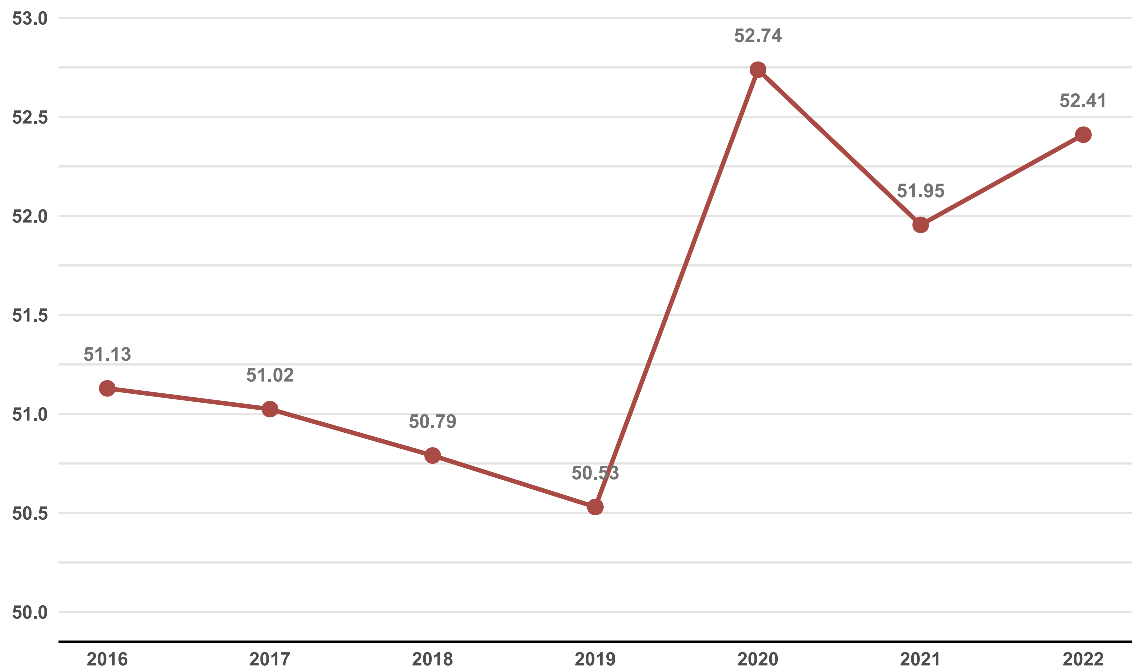
[12] Federal Highway Administration, *Highway Statistics Series*, Annual Report (2016-2022), https://www.fhwa.dot.gov/policyinformation/statistics.cfm. Total VMT for each road type in Table VM-2 were multiplied by the corresponding share of combination truck VMT in Table VM-4 to calculate combination truck VMT.

[13] American Transportation Research Institute, *Operational Costs of Trucking*, Annual Reports (2017-2023), https://truckingresearch.org/atri-research/operational-costs-of-trucking/.

[14] Jeffrey Short and Alex Leslie, *Cost of Congestion to the Trucking Industry: 2023 Update*, American Transportation Research Institute (October 2023), https://truckingresearch.org/2023/10/cost-of-congestion-to-the-trucking-industry-2023-update/.

[15] Alan Hooper, *Cost of Congestion to the Trucking Industry: 2018 Update*, American Transportation Research Institute (October 2018), https://truckingresearch.org/2018/10/cost-of-congestion-to-the-trucking-industry-2018-update/.

Figure 1: Annual Average Speed in Expanded Bottleneck Locations, 2016 – 2022



In 2022, the average truck speeds at the expanded bottleneck areas increased slightly to 52.41 miles per hour (MPH) from 51.95 MPH in 2021. The 2022 average speed remained below the sharp 2020 increase – when COVID-19-related workplace closures and quarantine orders significantly reduced personal vehicle traffic – but was still more than one MPH faster than average speeds in the period from 2016-2019.

This trend was largely consistent across the country. Only six states saw slower average truck speeds in 2022 than in 2021: Indiana, Nebraska, New Hampshire, North Dakota, Michigan, and Kentucky. The latter was the only state in which speeds slowed by more than 1 percent.

The exact cause of the remaining 44 states having faster average speeds in 2022 relative to 2021 is not certain. Contributors vary by location and include post-pandemic changes in driver behavior, a decrease in passenger vehicle VMT due to higher fuel costs, infrastructure improvements, or lower truck volumes. Many of these topics will be discussed later in this report.

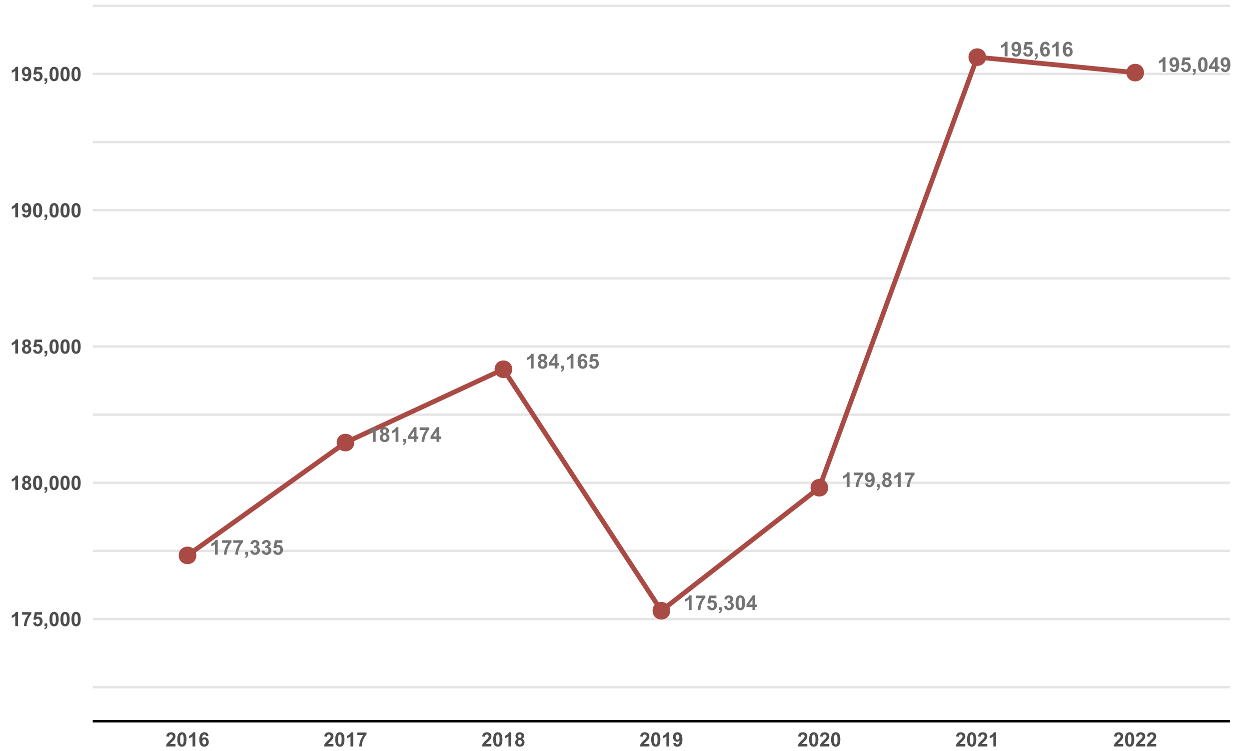
By itself, the increase in nationwide average speeds indicates a slight reduction in congestion. The cost of congestion, however, is also impacted by truck volumes and operational costs.

Update to Truck Vehicle Miles Traveled

Figure 2 shows the trend for national combination truck volumes on all roadways from 2016 through 2022, drawn from the FHWA *Highway Statistics Series*.[16]

[16] Federal Highway Administration, *Highway Statistics Series*, Annual Report (2016-2022), https://www.fhwa.dot.gov/policyinformation/statistics.cfm. Total VMT for each road type in Table VM-2 were multiplied by the corresponding share of combination truck VMT in Table VM-4 to calculate combination truck VMT.

Figure 2: Annual Combination Truck VMT (millions), 2016 – 2022



Truck VMT dipped slightly from 195,616 million miles traveled in 2021 to 195,049 million miles traveled in 2022. As a result, the number of truck miles impacted by congestion in 2022 went down slightly. This year-over-year decrease was driven by a softening freight market during the second half of 2022; that said, truck volumes remained well above pre-Covid levels.[17]

Update to Operational Costs

The most critical factor for the cost of congestion in 2022 was increased operating costs.

Figure 3 shows the trend in operational costs on a per-hour basis from 2016 through 2022, drawn from ATRI's annual *Operational Costs of Trucking* report.[18]

[17] DAT Freight & Analytics, "2023 Freight Focus" (December 2022), https://cdn.bfldr.com/8CX31GU6/as/hphg9tzsx6gb6r527fhpxmt/2023_Freight_Focus_Report.
[18] American Transportation Research Institute, *Operational Cost of Trucking*, Annual Reports (2017-2023), https://truckingresearch.org/atri-research/operational-costs-of-trucking/.

Figure 3: Annual Operational Costs per Hour, 2016 – 2022*

The marginal costs to operate a truck include line-items such as fuel, truck and trailer purchases/leases, repair and maintenance, tires, insurance premiums, tolls, permits and licenses, and truck driver wages and benefits. These costs reflect a wide range of economic factors such as freight demand, global oil production, litigation and labor markets.

In 2022, per-hour operational costs soared by 21.6 percent to a then-record high of $90.78. This steep rate of increase was driven by an array of internal and external factors, often unique to individual line-items:

- The price of diesel rose sharply following the U.S. prohibition on new domestic drilling leases in early 2021 and later the Russian invasion of Ukraine in February 2022.[19]

- Limited availability of new Class 7/8 truck tractors and components following the COVID-19 pandemic – due to production backlogs and supply issues for parts like computer chips – continued to drive prices up in the new, used, and leased truck markets.[20]

- Limited access to equipment meant that fleets had to run trucks longer than usual, resulting in significantly higher repair and maintenance costs. Growing inflation and

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[19] U.S. Energy Information Administration, "Weekly Retail Gas and Diesel Prices" (accessed on June 13, 2023), https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

[20] J.D. Power Valuation Services, "April 2023 Commercial Vehicle market Update: Class 8 Auction Update" (April 2023), https://discover.jdpa.com/hubfs/Files/Industry%20Campaigns/Valuation%20Services/04.2023_CommercialVehicleGuidelines_FINAL.pdf.

backlogs further increased parts prices, while a diesel technician shortage drove up the cost of technician labor.[21]

- A highly competitive U.S. labor market also fueled a 12.3 percent increase in total driver compensation (wages plus benefits). Rising wages in industries that compete with trucking for labor, a spike in inflation, and overall growth in the trucking industry all exerted upward pressure on driver wages.[22]

Consequently, it was costlier to do business in the trucking industry in 2022; high hourly truck operating costs made congestion delays more costly for trucking.

[21] ATA Technology Maintenance Council and Decisiv, "VMRS System Service Data Quarterly Report" (Q4 2022); Fullbay, Motor, and ATA Technology and Maintenance Council, *State of Heavy-Duty Repair 2022-2023* (2023), https://www.fullbay.com/state-of-heavy-duty-repair/.

[22] U.S. Bureau of Labor Statistics, "May 2022 National Occupational Employment and Wage Estimates" (accessed on May 2023), https://www.bls.gov/oes/2022/may/oes_nat.htm; U.S. Bureau of Labor Statistics, "Consumer Price Index: 2022 in review," (January 17, 2023), https://www.bls.gov/opub/ted/2023/consumer-price-index-2022-in-review.htm.

FINDINGS

The three congestion cost components described earlier were used to calculate national, regional, state, and metropolitan congestion cost totals.

National Findings

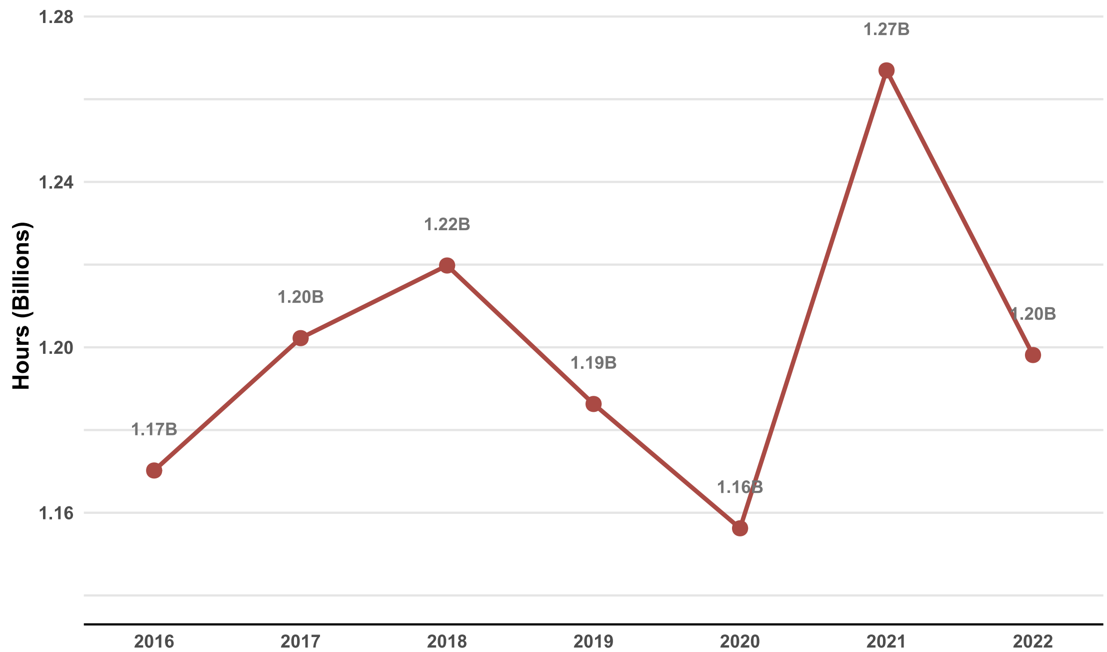
The national cost of congestion rose to **$108.8 billion** in 2022, a 15.0 percent increase over 2021's congestion cost of $94.6 billion (Figure 4).

Figure 4: National Cost of Congestion Trend, 2016 Baseline through 2022*

While truck VMT and truck speeds had modest fluctuations, extreme inflation had a major impact on operational costs. As a result, the upward shift in the national cost of congestion for trucking between 2021 and 2022 was largely driven by the historic 21.6 percent increase in truck operating costs.

As Figure 5 shows, slight fluctuations in speeds and truck volume resulted in a 5.4 percent decrease in the total hours of congestion. After hitting a high of 1.27 billion hours in 2021, total congestion time dropped to 1.20 billion hours in 2022.

Figure 5: National Hours of Congestion Trend, 2016 Baseline through 2022*



Though the hours lost to congestion decreased, each hour lost was significantly more expensive when compared to the prior year. The congestion-related loss of 1.20 billion operating hours in a single year is, of course, a massive drain on supply chain productivity. One consequence of this wasted time is inefficient workforce utilization. The total congestion delay in 2022 was equivalent to 435,686 truck drivers remaining idle for the entire year, equating to idling 22.0 percent of all Class-A licensed commercial truck drivers.[23]

Additionally, ATRI estimates that individual carriers and owner-operators saw a congestion cost of $7,588 per truck in 2022, or 2.8 percent of the average annual per-truck revenue in the truckload sector.[24]

Table 1 compares the national congestion totals for 2021 and 2022 across several key metrics.

[23] A working year is defined as driving 11 hours a day, 5 days a week, for 50 weeks per year. Alan Hooper, *Cost of Congestion to the Trucking Industry: 2018 Update*, American Transportation Research Institute (October 2018), https://truckingresearch.org/2018/10/cost-of-congestion-to-the-trucking-industry-2018-update/; Bureau of Labor Statistics, "Occupational Employment and Wages Statistics: Heavy and Tractor-Trailer Truck Drivers, May 2022 Period," (accessed on December 2024), https://www.bls.gov/oes/2022/may/oes533032.htm.

[24] Alex Leslie and Dan Murray, *An Analysis of the Operational Costs of Trucking: 2023 Update* (June 2023), https://truckingresearch.org/2023/06/an-analysis-of-the-operational-costs-of-trucking-2023-update/.

Table 1: Cost of Congestion National Statistics, 2021 – 2022*

Congestion Metric	2021	2022	Percent Change
Total Cost of Congestion	$94,579,256,586	$108,766,919,737	15.0%
Hours of Delay	1,266,969,278	1,198,137,472	- 5.4%
Annual Number of Idle Drivers	460,716	435,686	- 5.4%
Registered Trucks	13,859,181	14,333,821	3.4%
Average Congestion Cost per Truck	$6,824	$7,588	11.1%

National Impacts of Congestion on Fuel Consumption and Air Quality

Congestion also leads to wasted diesel fuel, which in turn impacts the environment through excess carbon dioxide (CO_2) emissions. This problem is augmented by the fact that stop-and-go traffic significantly reduces fuel economy when compared to that of trucks operating at free-flow highway speeds.

Though the exact fuel economy of a truck in congestion varies based on a number of mechanical and circumstantial factors, there is general consensus on the average impact. The American Trucking Associations (ATA) Technology and Maintenance Council estimated that a truck with a fuel economy of 7 miles per gallon (MPG) on a flat interstate would be reduced to a fuel economy of between 2.64 and 4.83 MPG in stop-and-go traffic.[25] Similarly, an Oak Ridge National Laboratory (ORNL) report estimated that a Class 8 truck operating at 15 to 20 MPH had a fuel economy of 3.73 MPG.[26] This speed corresponds to ATRI's analysis of performance at the nation's bottlenecks: the speed of trucks experiencing high congestion, while fluctuating between 1 MPH to 40 MPH, averaged 20 MPH.[27] Driving 20 MPH at 3.73 MPG equates to 5.362 gallons of diesel consumed per hour of delay. A separate ATRI analysis arrived at a similar figure.[28]

Accordingly, based on the ORNL average of 5.362 gallons of diesel lost per hour of delay and the total of 1,198,137,472 hours lost to congestion, it is estimated that congestion in 2022 resulted in the unnecessary consumption of an additional 6,424,413,125 gallons of diesel.

The financial costs of excess diesel consumption were particularly acute during a year in which domestic and geopolitical events disrupted the global oil market. With an average annual diesel price of $4.989 per gallon, the cost of this wasted fuel amounted to $32.05 billion in 2022.[29]

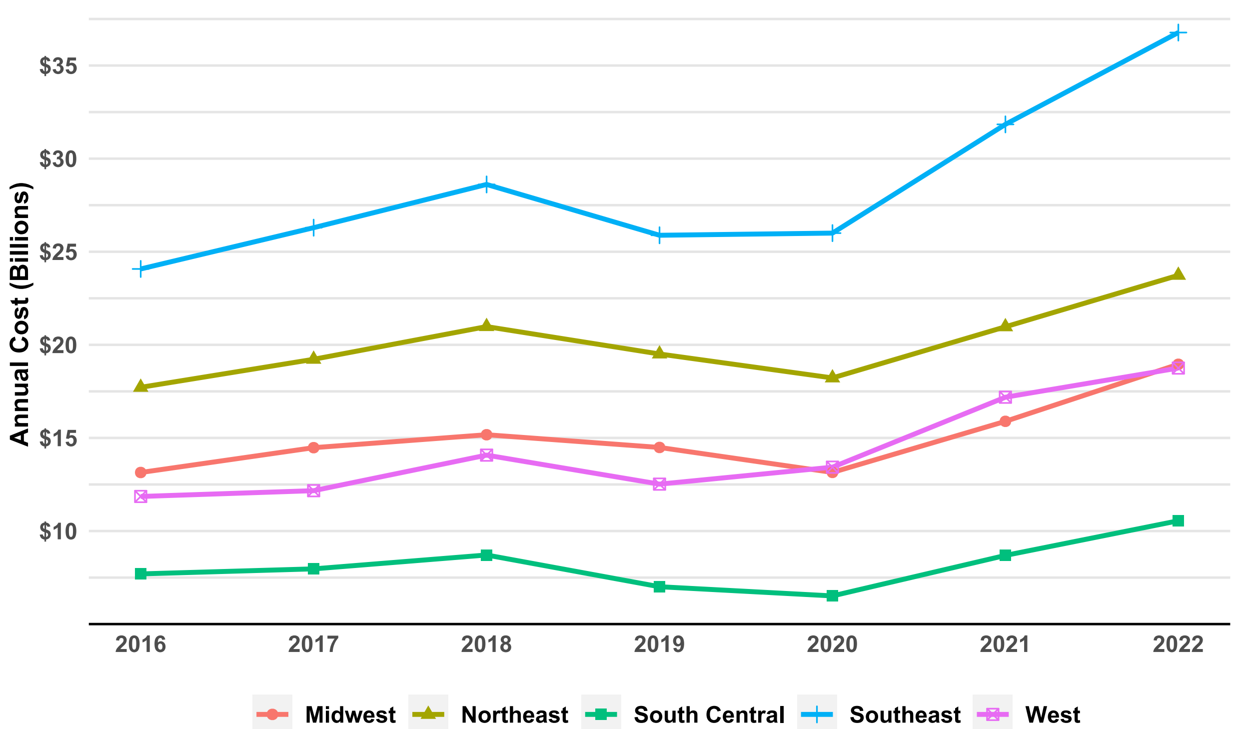
[25] Gary Capps et al., *Class-8 Heavy Truck Duty Cycle Project Final Report*, Oak Ridge National Laboratory (December 2008), ORNL/TM-2008/122, cited in Stacy C. Davis and Robert G. Boundy, *Transportation Energy Data Book Edition 40*, Oak Ridge National Laboratory (June 2022), https://tedb.ornl.gov/wp-content/uploads/2022/03/TEDB_Ed_40.pdf.
[26] Ibid.
[27] American Transportation Research Institute, "Bottlenecks/Congestion/Infrastructure Funding," (accessed September 20, 2023), https://truckingresearch.org/atri-research/bottlenecks-congestion-infrastructure-funding/.
[28] Mike Tunnell, *Fixing The 12% Case Study: Atlanta, Georgia Fuel Consumption and Emissions Impacts*, American Transportation Research Institute (February 2019), https://truckingresearch.org/2019/03/fixing-the-12-case-study-atlanta-georgia/.
[29] U.S. Energy Information Administration, "U.S. No 2 Diesel Retail Prices" (accessed on November 1, 2024), https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMD_EPD2D_PTE_NUS_DPG&f=A.

The environmental consequences of congestion-related diesel consumption were equally impactful. Based on the U.S. Department of Transportation-accepted CO_2 generation rates per gallon of diesel, congestion resulted in 65.4 million metric tons of additional CO_2 released in 2022.[30]

Regional Findings

Following the national trend, the cost of congestion grew again in each of the five regions tracked in 2022. Figure 6 shows regional trends dating back to 2016, and regional groups are mapped in Figure 7. While the exact total for each region primarily reflects differences in size, the relative change from year to year can be instructive.

Figure 6: Congestion Cost Trends by Region, 2016 – 2022



The Southeast, where congestion costs grew at the highest rate in 2021, was outpaced by the Midwest and South Central regions in 2022. Congestion costs in the Midwest rose at the second-highest rate, closing the gap between it and the Northeast. The West, after two years in which high port activity had fueled higher congestion costs in that region, was surpassed by the Midwest once again.

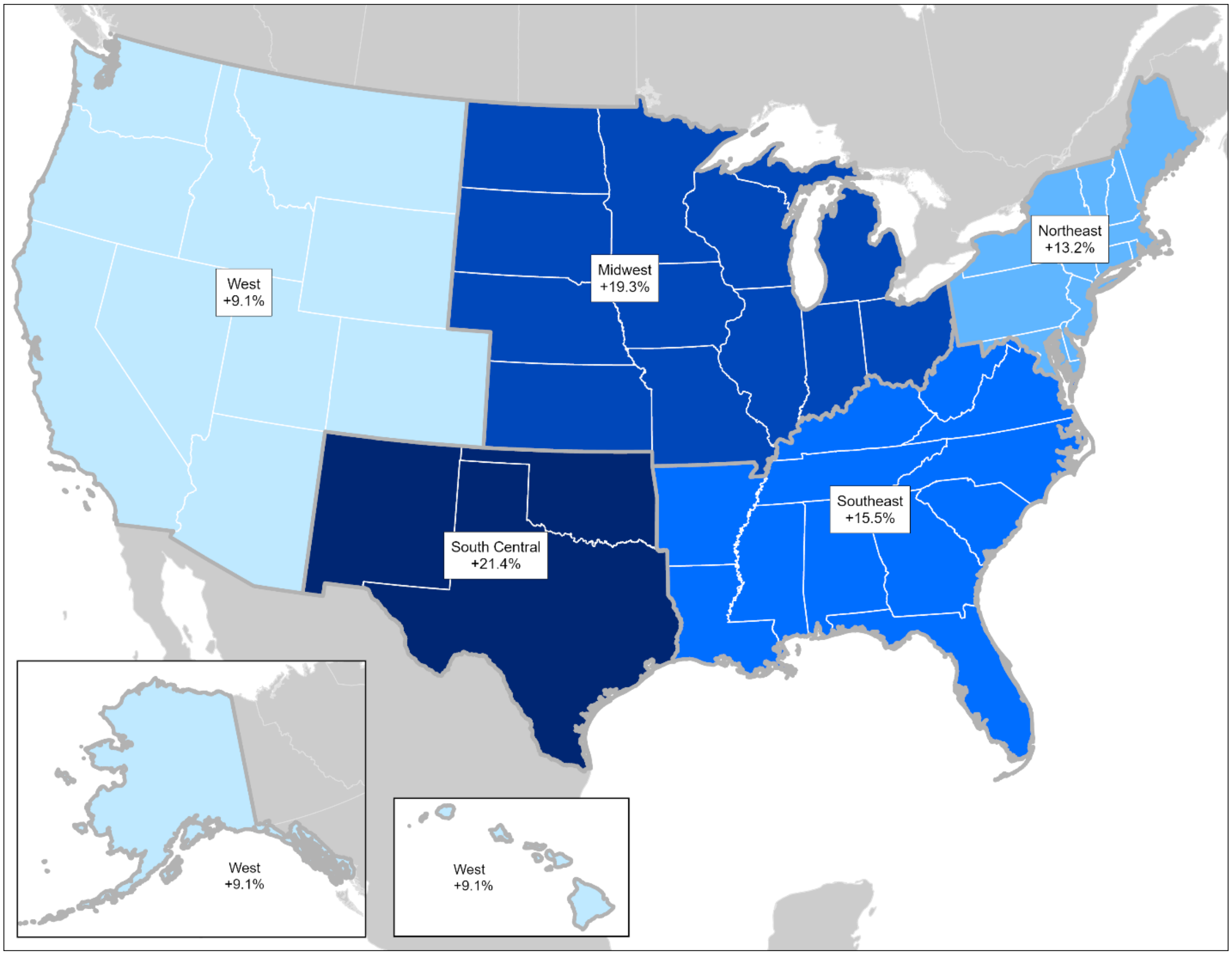
Economic growth exerted partial influence on the changes in regional congestion costs. The Southeast experienced the greatest regional growth in GDP between 2021 and 2022, at 3.5

[30] "Greenhouse Gases Equivalencies Calculator," U.S. Environmental Protection Agency (accessed August 2024), https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references; "Annual Retail Gasoline and Diesel Prices," U.S. Energy Information Administration (accessed August 2024), https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_a.htm.

percent, consistent with its status as the region with the fastest-growing congestion costs.[31] In other regions, however, this linear relationship was less pronounced.

Figure 7 highlights the percentage change in congestion costs between 2021 and 2022 for each region.

Figure 7: Percent Increase in Congestion Costs by Region, 2021 – 2022*



[31] Bureau of Economic Analysis, "Regional Data GDP and Personal Income" (accessed November 4, 2024), https://apps.bea.gov/itable/?ReqID=70&step=1.

State and Metro Findings

The following section contains total costs and changes in cost at the state and metropolitan level. A variety of sources were consulted when attempting to identify causal factors for changes in truck congestion costs. These included:

- State Department of Transportation (DOT) reports on major highway construction
- Population (Census Bureau)[32]
- Gross Domestic Product (Bureau of Economic Analysis)[33]
- Monthly Retail Sales (Census Bureau)[34]
- New Private Housing Units Authorized (Census Bureau)[35]
- Crude Oil Production (EIA)[36]
- Metrics that represent major state-specific industries, such as manufacturing, vehicle sales, and agricultural produce volumes.

While the analysis includes a discussion of causal factors in some instances, for many states and metro areas there were no clear causal factors.

Additionally, it should be noted that ATRI conducted checks on the state-level VMT data to identify anomalies. It was determined that five states had unrealistic truck VMT changes – of greater than 40 percent – between 2021 and 2022. These were Alaska, Indiana, New Mexico, Tennessee, and Wyoming. The research team received confirmation from officials in two of these states that there were issues with the FHWA Highway Performance Monitoring System (HPMS) reporting during the period of comparison. In each instance, the error arose from inaccurate percentages of combination trucks. To rectify the issue, each instance was replaced with an average of the previous five years. In the case of Indiana, state officials supplied corrected figures.

State Findings

Texas reclaimed the top spot in the state ranking of highest congestion costs in 2022, while California fell to second (Table 2). This was due to a large increase in truck volumes in Texas, coupled with a decrease in truck volumes in California.

32 U.S. Census Bureau, "Population and Housing Unit Estimates," https://www.census.gov/programs-surveys/popest.html.
33 U.S. Bureau of Economic Analysis, "GDP by State," https://www.bea.gov/data/gdp/gdp-state.
34 U.S. Census Bureau, "Monthly State Retail Sales," https://www.census.gov/retail/state_retail_sales.html.
35 U.S. Census Bureau, "Building Permits Survey," https://www.census.gov/construction/bps/index.html.
36 U.S. Energy Information Administration, "Petroleum Supply Annual," https://www.eia.gov/petroleum/supply/annual/volume1/.

Table 2: Top Ten Statewide Congestion Costs, 2022*

2022 Rank	State	Statewide Costs 2021	Statewide Costs 2022	Percent Change	2021 Rank
1	Texas	$7,256,430,452	$9,171,520,948	26.40%	2
2	California	$9,000,397,702	$8,774,467,001	-2.50%	1
3	Florida	$7,157,229,169	$8,437,202,215	17.90%	3
4	New York	$4,917,126,628	$5,795,489,531	17.90%	4
5	Georgia	$4,021,578,225	$4,638,414,469	15.30%	6
6	New Jersey	$3,838,944,444	$4,424,571,565	15.30%	7
7	Illinois	$3,379,889,793	$4,315,102,629	27.70%	8
8	Pennsylvania	$3,268,381,038	$3,705,348,642	13.40%	9
9	Louisiana	$4,217,050,404	$3,680,837,351	-12.72%	5
10	Tennessee	$3,154,354,178	$3,613,265,679	14.50%	10

The full list of congestion costs by state can be found in Appendix B.

States with the Highest Percentage Increase in Congestion Costs

The states with the largest percentage increase in congestion costs between 2021 and 2022 are shown in Table 3. It is notable that Hawaii experienced a near doubling of congestion costs between 2021 and 2022.

Table 3: Top Ten States by Percentage Increase in Truck Congestion Costs, 2021-2022*

State	Statewide Costs 2021	Statewide Costs 2022	Percent Change	Annualized Rate of Increase 2016-2022
Hawaii	$89,586,374	$172,231,376	92.25%	12.35%
Vermont	$198,195,961	$301,706,904	52.23%	8.91%
Minnesota	$800,431,419	$1,159,742,011	44.89%	6.23%
Kentucky	$2,411,968,336	$3,441,480,853	42.68%	13.55%
Alaska	$62,164,857	$86,494,248	39.14%	1.87%
Arizona	$811,125,558	$1,124,041,476	38.58%	9.47%
Mississippi	$804,395,379	$1,082,197,010	34.54%	10.39%
Rhode Island	$411,188,165	$536,185,791	30.40%	8.67%
Connecticut	$1,361,412,548	$1,751,474,283	28.65%	6.22%
Illinois	$3,379,889,793	$4,315,102,629	27.67%	8.11%

It is likely that the high rate of increase in congestion costs between 2021 and 2022 was a correction from COVID-19-related decreases in 2020 and 2021 in many of these states. Hawaii in particular experienced protracted economic adversity, hence negative freight impact, during those years due to the impact of COVID-19 restrictions on tourism.[37]

States with Decreasing Congestion or Congestion Costs

Twenty-five U.S. states experienced a decrease in total hours of congestion between 2021 and 2022 (more than 1% decline). Table 4 shows the five states that experienced a decrease in the cost of congestion.

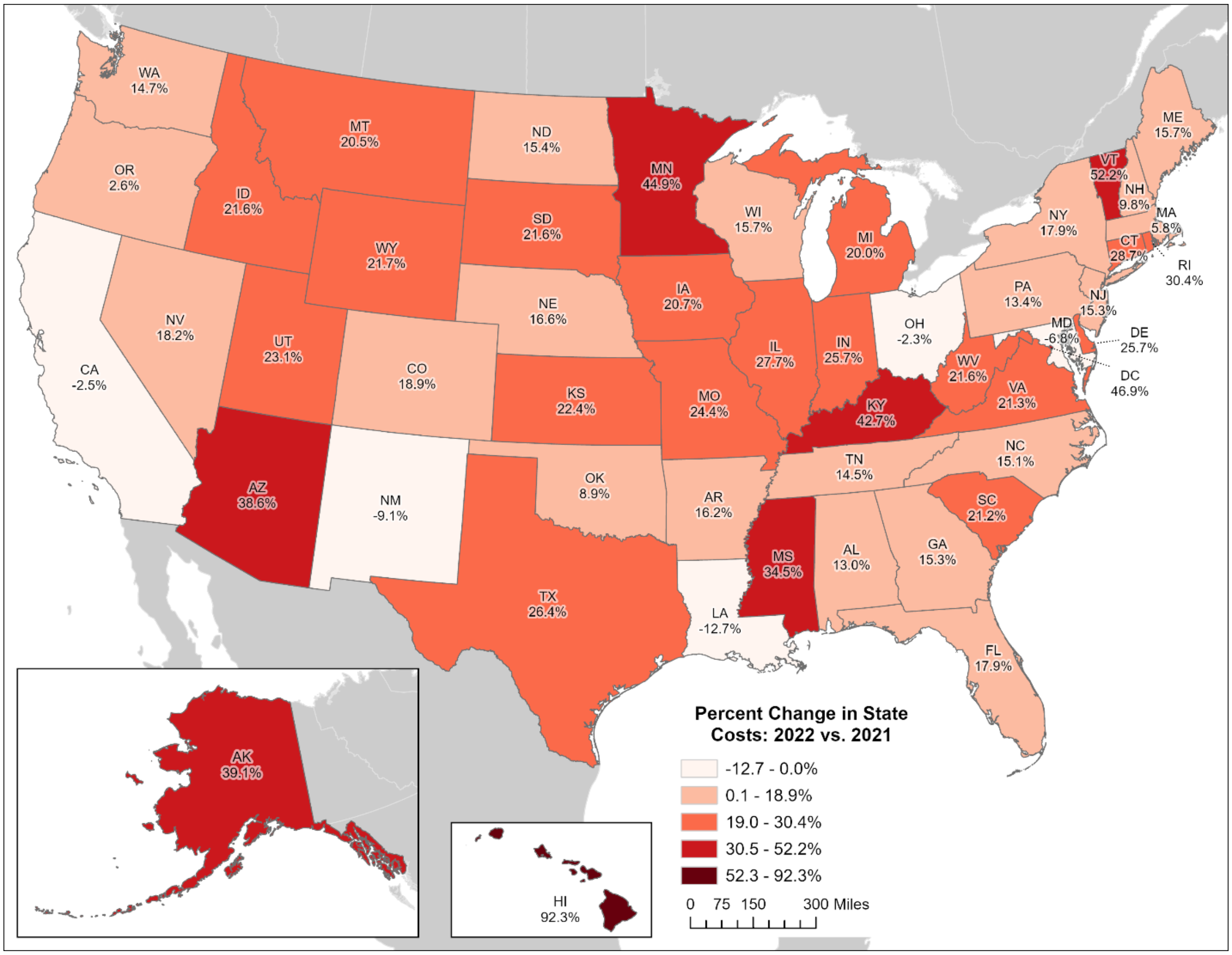
Table 4: States with Decreases in Truck Congestion Costs, 2021 – 2022*

State	Statewide Costs 2021	Statewide Costs 2022	Percent Change
Louisiana	$4,217,050,404	$3,680,837,351	-12.72%
New Mexico	$514,883,869	$468,029,870	-9.10%
Maryland	$2,857,975,431	$2,662,254,338	-6.85%
California	$9,000,397,702	$8,774,467,001	-2.51%
Ohio	$2,893,319,844	$2,827,248,259	-2.28%

Figure 8 highlights the percentage change in truck congestion costs between 2021 and 2022 for each state. All states with a percentage change less than the 21.6 percent increase in operational costs experienced a reduction in total hours of congestion.

[37] Jeffrey Short and Alex Leslie, *Cost of Congestion to the Trucking Industry: 2023 Update*, American Transportation Research Institute (October 2023), https://truckingresearch.org/2023/10/cost-of-congestion-to-the-trucking-industry-2023-update/.

Figure 8: Changes in Truck Congestion Costs by State, 2021 – 2022*



Metropolitan Area Findings

Congestion trends were also analyzed for 106 major metropolitan areas, of which the top ten are highlighted in Table 5. The ten metro areas with the highest congestion costs in 2022 generally did not change rankings from previous years.

Table 5: Top Ten Metropolitan Areas by Total Cost of Congestion*

2022 Rank	Metro Area	Metro Costs 2021	Metro Costs 2022	Percent Change	2021 Rank
1	New York City Metro	$5,491,372,273	$6,677,734,133	21.60%	1
2	Miami Metro	$2,618,229,310	$3,199,518,010	22.20%	2
3	Chicago Metro	$2,570,539,181	$3,143,215,804	22.28%	3
4	Philadelphia Metro	$2,101,897,497	$2,355,714,029	12.08%	4
5	Dallas Metro	$1,795,595,925	$2,105,081,634	17.24%	6
6	Los Angeles Metro	$1,804,864,142	$2,077,210,231	15.09%	5
7	Washington DC Metro	$1,613,805,707	$1,893,486,979	17.33%	8
8	Houston Metro	$1,633,751,272	$1,879,151,601	15.02%	7
9	Nashville Metro	$1,440,765,701	$1,716,903,773	19.17%	9
10	Atlanta Metro	$1,393,415,723	$1,536,620,815	10.28%	10

No metro areas saw declines in congestion costs in 2022. Of the 106 metro areas analyzed:

- 92 saw fewer hours of congestion or no change;
- 39 had improvements in average speed.

It is logical to believe that the primary cause of reduced hours of truck congestion was the softening freight market. This improvement in truck congestion was felt most in rust belt cities such as York and Harrisburg, PA, Cincinnati and Cleveland, OH, Louisville, KY, and St. Louis, MO.

Metro Areas with the Highest Percentage Increase in Congestion Costs

The metro areas with the greatest increase in congestion costs between 2021 and 2022 are shown in Table 6.

Table 6: Metro Areas with the Highest Percent Increase in Congestion Costs*

Metro Area	Statewide Costs 2021	Statewide Costs 2022	Percent Change	Annualized Rate of Increase 2016-2022
New Orleans, LA Metro	$632,035,596	$866,727,792	37.13%	9.37%
Buffalo, NY Metro	$322,063,522	$414,260,620	28.63%	3.84%
El Paso, TX Metro	$331,349,540	$423,579,733	27.83%	10.89%
Orlando, FL Metro	$713,652,821	$911,251,015	27.69%	8.48%
Tulsa, OK Metro	$92,024,449	$115,554,066	25.57%	4.14%
Knoxville, TN Metro	$435,968,529	$545,447,099	25.11%	10.12%
Jacksonville, FL Metro	$427,766,884	$531,794,468	24.32%	8.48%
Phoenix, AZ Metro	$300,316,710	$370,590,072	23.40%	9.95%
Chicago, IL Metro	$2,570,539,181	$3,143,215,804	22.28%	6.33%
Miami, FL Metro	$2,618,229,310	$3,199,518,010	22.20%	7.12%

Some of the metro areas with the highest increases in congestion costs in 2022 (Buffalo and Tulsa) can be interpreted as recoveries from decreases in 2020 and 2021. Both of these metro areas returned to 2019 truck VMT levels in 2022.

In Buffalo, port volumes increased by 12.7 percent between 2021 and 2022.[38] The metro area also experienced unusually high snowfall in November and December 2022 that brought significant freight slowdowns and delays.[39]

New Orleans' 37.13 percent jump in congestion costs was driven in large part by a large increase in truck activity. The Port of New Orleans was an important conduit of this additional freight. In 2022, the port doubled its breakbulk volumes (led by steel, plywood, and rubber), added 1 million TEUs of container capacity, and nearly doubled its cold storage facilities.[40]

El Paso was another metro area where higher congestion costs were influenced by growing international trade. The value of imports and exports crossing the U.S.-Mexico border by truck at El Paso and Ysleta Port of Entry increased by 16 percent from 2021 to 2022.[41] This occurred as tariff wars with China continued and concerns about supply chain resiliency heightened in the

[38] U.S. Bureau of Transportation Statistics, "TransBorder Freight Data" (accessed on November 5, 2024), https://data.bts.gov/stories/s/myhq-rm6q. Data was calculated using the "Mode, Port, and Commodity Dashboard," filtered for Buffalo-Niagara Falls, from January 2022 to December 2022, comparing to the time period of the previous year, encompassing the value (in millions) of all exports and imports on truck.
[39] National Weather Service, "Buffalo New York Winter Summary 2022-23" (accessed on November 15, 2024), https://www.weather.gov/media/buf/Winter_Summary_2022_23.pdf.
[40] Port of New Orleans, "Port NOLA CEO Delivers 2022 State of the Port Address" (September 29, 2022), https://portnola.com/info/news-media/press-releases/port-nola-ceo-delivers-2022-state-of-the-port-address.
[41] U.S. Bureau of Transportation Statistics, "TransBorder Freight Data" (accessed on November 5, 2024), https://data.bts.gov/stories/s/myhq-rm6q. Data was calculated using the "Mode, Port, and Commodity Dashboard," filtered for El Paso and Ysleta, from January 2022 to December 2022, comparing to the time period of the previous year, encompassing the value (in millions) of all exports and imports on truck.

wake of COVID-19 disruptions, which led many firms to embrace "nearshoring" by expanding their sales and sourcing in Mexico or other Central American countries.[42]

Two Florida metro areas, Orlando and Jacksonville, had some of the fastest-rising congestion costs in the country. In both cases, congestion was driven upward by growth in truck activity. This increase in truck volumes accompanied a 16 percent year-over-year increase in the value of vegetables, melons and berries volumes – Florida's largest agricultural produce category.[43] Hurricane Ian, one of the costliest hurricanes ever recorded in the state, impacted congestion throughout the state, slowing trucks, driving up freight volumes immediately before and after landfall, and closing the state's largest container port in Jacksonville.[44]

Finally, Knoxville was a leading contributor to Tennessee's rapidly growing freight and logistics industry. In this respect, it contributed to Tennessee's appearance in this year's list of states with the highest congestion costs and followed Chattanooga and Memphis' top-ten metro rankings in last year's *Cost of Congestion* report.[45] Eastern Tennessee, including Knoxville and its surrounding counties, has been a hotbed of population growth in recent years.[46]

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[42] Daniel Zaga and Alessandra Ortiz, "Nearshoring in Mexico," Deloitte Insights (July 13, 2023), https://www2.deloitte.com/us/en/insights/economy/issues-by-the-numbers/advantages-of-nearshoring-mexico.html.

[43] Florida Department of Agriculture and Consumer Servies, "Florida Agriculture Overview and Statistics" (accessed on November 7, 2024), https://www.fdacs.gov/Agriculture-Industry/Florida-Agriculture-Overview-and-Statistics.

[44] Tom Quimby, "Unlike prior storms Hurricane Ian delivers 'more regional impact' on loads and rates," *Commercial Carrier Journal* (October 4, 2022), https://www.ccjdigital.com/economic-trends/freight-demand/article/15301065/hurricane-ian-delivers-more-regional-impact-on-loads-and-rates.

[45] Jeffrey Short and Alex Leslie, *Cost of Congestion to the Trucking Industry: 2023 Update*, American Transportation Research Institute (October 2023), https://truckingresearch.org/2023/10/cost-of-congestion-to-the-trucking-industry-2023-update/.

[46] U.S. Census Bureau, "Population and Housing Unit Estimates" (accessed on November 8, 2024), https://www.census.gov/programs-surveys/popest.html.

CONCLUSION

The *Cost of Congestion* research has generated a series of index-based truck congestion cost estimates, ultimately providing insight into national, state, regional and metro area congestion cost trends for the trucking industry.

National Findings for 2022

Based on this analysis, the cost of congestion to the trucking industry is at its highest level to-date. In 2021, the year covered by ATRI's previous report, the annual cost of congestion to the U.S. trucking industry reached an all-time high of $94.6 billion. Congestion costs in 2022 surpassed this level, with a national cost of $108.8 billion – an increase of 15 percent year-over-year. This was an increase in annual costs of more than $14.1 billion.

Additionally, the 2022 national congestion figure of 1.2 billion hours of delay is the equivalent of more than 435,000 truck drivers sitting idle for one year. On average, annual congestion costs per truck were $7,588, an increase of 11.1 percent per year.

These congestion delays generate fuel and environmental consequences. This report estimates that in 2022, 6.424 billion additional gallons of diesel were wasted due to congestion, costing the industry more than $32 billion. The CO_2 production associated with additional fuel use is substantial at 65.4 million metric tons.

State Findings for 2022

The congestion cost increases experienced by individual states were primarily driven by operational costs. At the state level, the four states with the highest congestion costs were ranked as follows:

1. Texas
2. California
3. Florida
4. New York

These four states alone make up 29.6 percent of national congestion costs.

Metropolitan Findings for 2022

Congestion costs were highest in the New York City, Miami and Chicago metropolitan areas, though congestion cost increases in these leading metros were only slightly higher than the industry-wide operational costs increase. Several smaller metro areas had costs increase at a much greater rate, including New Orleans, LA (37.1%), Buffalo, NY (28.6%), and El Paso, TX (27.8%). These cities contain ports that experienced growth in international trade following the COVID-19 pandemic.

APPENDIX

Appendix A: Discussion of Past Reports

The original *Cost of Congestion* reports quantified congestion cost for the year 2014 through 2016. The methodology for those reports relied in part on truck speed data from the NPMRDS, managed by FHWA. In 2017, however, FHWA changed the data used in NPMRDS, resulting in different road network shapefiles and unrealistically faster speeds that likely indicate the inclusion of other vehicle types.[47]

Accordingly, ATRI developed a new selective indexing methodology to extend the 2014-2016 congestion analysis for the years 2017-2021 in *Cost of Congestion to the Trucking Industry: 2023 Update*.[48] This 2023 report contains a detailed discussion of past methodology and the methodology used in this report.

[47] Jeffrey Short and Alex Leslie, *Cost of Congestion to the Trucking Industry: 2023 Update*, American Transportation Research Institute (October 2023), https://truckingresearch.org/2023/10/cost-of-congestion-to-the-trucking-industry-2023-update/.
[48] Ibid.

Appendix B: 2022 Congestion Costs by State (in Alphabetical Order)

State	2021 Cost of Congestion	2022 Cost of Congestion	Change in Cost
Alabama	$1,304,300,320.87	$1,473,996,336.48	13%
Alaska	$62,164,856.90	$86,494,248.16	39%
Arizona	$811,125,557.77	$1,124,041,476.01	39%
Arkansas	$1,058,280,617.57	$1,229,758,587.30	16%
California	$9,000,397,701.93	$8,774,467,001.24	-3%
Colorado	$1,068,223,039.04	$1,270,556,920.06	19%
Connecticut	$1,361,412,547.94	$1,751,474,283.35	29%
Delaware	$485,229,867.61	$610,135,515.87	26%
District of Columbia	$39,368,852.58	$57,821,546.69	47%
Florida	$7,157,229,168.95	$8,437,202,214.90	18%
Georgia	$4,021,578,225.37	$4,638,414,469.47	15%
Hawaii	$89,586,374.35	$172,231,375.90	92%
Idaho	$272,190,028.53	$331,003,493.50	22%
Illinois	$3,379,889,793.02	$4,315,102,629.27	28%
Indiana	$2,398,138,213.88	$3,014,766,916.95	26%
Iowa	$542,135,780.76	$654,094,067.39	21%
Kansas	$409,523,739.29	$501,416,522.40	22%
Kentucky	$2,411,968,336.28	$3,441,480,852.92	43%
Louisiana	$4,217,050,404.30	$3,680,837,350.93	-13%
Maine	$595,958,354.36	$689,412,532.84	16%
Maryland	$2,857,975,430.80	$2,662,254,338.49	-7%
Massachusetts	$2,246,162,535.04	$2,376,525,436.17	6%
Michigan	$631,505,949.98	$757,740,102.06	20%
Minnesota	$800,431,418.87	$1,159,742,010.90	45%
Mississippi	$804,395,378.65	$1,082,197,009.65	35%
Missouri	$1,257,534,466.35	$1,563,960,911.50	24%

State	2021 Cost of Congestion	2022 Cost of Congestion	Change in Cost
Montana	$204,516,802.13	$246,431,697.61	20%
Nebraska	$373,049,994.96	$434,971,295.86	17%
Nevada	$636,383,942.18	$752,220,935.07	18%
New Hampshire	$749,400,041.31	$823,059,903.19	10%
New Jersey	$3,838,944,443.84	$4,424,571,565.25	15%
New Mexico	$514,883,869.38	$468,029,870.48	-9%
New York	$4,917,126,628.29	$5,795,489,531.25	18%
North Carolina	$2,883,892,271.50	$3,320,226,177.20	15%
North Dakota	$239,540,536.62	$276,439,869.46	15%
Ohio	$2,893,319,843.63	$2,827,248,259.26	-2%
Oklahoma	$837,704,494.65	$912,413,125.54	9%
Oregon	$962,769,910.80	$987,359,633.13	3%
Pennsylvania	$3,268,381,038.20	$3,705,348,642.04	13%
Rhode Island	$411,188,164.59	$536,185,791.09	30%
South Carolina	$1,805,631,554.67	$2,188,101,547.55	21%
South Dakota	$285,411,347.80	$347,081,609.56	22%
Tennessee	$3,154,354,177.69	$3,613,265,679.07	15%
Texas	$7,256,430,452.49	$9,171,520,947.55	26%
Utah	$2,459,281,995.31	$3,028,528,184.30	23%
Vermont	$198,195,960.89	$301,706,903.86	52%
Virginia	$2,056,503,954.97	$2,493,673,857.39	21%
Washington	$1,449,959,454.30	$1,662,998,431.26	15%
West Virginia	$964,842,264.54	$1,173,320,573.01	22%
Wisconsin	$2,681,755,454.83	$3,103,662,282.80	16%
Wyoming	$259,667,080.25	$315,935,273.90	22%