Freight Facts and Figures 2017

U.S. Department of Transportation
Bureau of Transportation Statistics

Freight Facts and Figures 2017

Acknowledgements

U.S. Department of Transportation

Elaine L. Chao
Secretary of Transportation

Jeffrey Rosen
Deputy Secretary

Bureau of Transportation Statistics

Patricia Hu
Director

Rolf Schmitt
Deputy Director

This report was prepared under the direction of **Michael J. Sprung**, Director of the Office of Transportation Analysis. Data compilation and analysis was managed by **Long X. Nguyen**, Project Manager. **Matthew Chambers** and **Justyna Goworowska**, and **Chris Rick** and **Joanne Sedor** of Spatial Front were major contributors. Other Contributors included **John Berg, Chester Ford, Mindy Liu, Arup Mallik, Dominic Menegus, Birat Pandey**, and **David Smallen**. **William H. Moore** edited this report and **Alpha Wingfield** was the visual information specialist. Photos were courtesy of the BTS Stock Photo Library.

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Introduction

This 12th edition of *Freight Facts and Figures* was developed by the Bureau of Transportation Statistics. It provides a snapshot of the volume and value of freight flows in the United States; the extent and condition of the physical network over which freight moves; the economic conditions that generate freight movements; the characteristics of the industry that carries freight; and the safety, energy, and environmental implications of freight transportation. This snapshot helps decision makers, planners, and the public understand the magnitude and importance of freight transportation to the economy. An electronic version of this publication is available at www.bts.gov.

Chapter 1 summarizes the basic demographic and economic characteristics of the United States that contribute to the demand for raw materials, intermediate goods, and finished products. Chapter 2 identifies the freight that is moved and highlights international trade. Chapter 3 describes the extent and condition of the freight transportation system; volumes of freight moving over the system; and the amount of highway, air, rail, port, and pipeline activities required to move the freight. Chapter 4 presents information on transportation system performance and its effect on freight movement. Chapter 5 focuses on the economic characteristics of the transportation industry that provides transportation services to move freight. Chapter 6 covers the safety aspects, energy consumption, and environmental implications of freight transportation.

Many of the tables and figures are based on the Freight Analysis Framework (FAF), version 4, which builds on the 2012 Commodity Flow Survey to estimate all freight flows to, from, and within the United States, except shipments between foreign countries that are transported through the United States. Shipments to and from Puerto Rico are counted with Latin America.

The FAF covers all modes of transportation. The truck, rail, water, and pipeline categories include shipments transported by only one mode. Air includes shipments weighing more than 100 pounds moved by air or by air and truck. The multiple modes and mail category includes all other shipments transported by more than one mode, such as bulk products moved by rail and water and mixed cargo hauled by truck and rail. The multiple modes and mail category also includes small shipments sent via postal and courier services. The other and unknown category primarily comprises unidentified modes but includes miscellaneous categories, such as aircraft delivered to customers and shipments through foreign trade zones. Please visit www.bts.gov for FAF data and documentation.

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I. A Nation Served by Freight

The Nation's 125.8 million households, nearly 7.7 million business establishments, and 90,000 governmental units are all part of an economy that demands the efficient movement of freight. While the U.S. economy was affected by an economic recession from December 2007 to June 2009, it has since returned to prerecession levels.

Table 1-1 Economic and Social Characteristics of the United States: 2000, 2010, and 2014–2016

	2000	2010	2014	2015	2016	Percent change, 2000 to 2016
Resident population (thousands)	**(R) 282,172**	**(R) 309,348**	**(R) 318,563**	**320,897**	**323,128**	**14.5**
Households (thousands)	**104,705**	**117,538**	**123,229**	**124,587**	**125,819**	**20.2**
Median household income (2009 $)	**(R) 54,281**	**(R) 49,432**	**(R) 48,782**	**51,322**	**NA**	**[5]-5.5**
Civilian labor force (thousands)	**142,583**	**153,889**	**155,922**	**157,130**	**159,187**	**11.6**
Employed[1] (thousands)	(R) 136,891	(R) 139,064	(R) 146,305	148,834	151,436	10.6
Agriculture, forestry, fishing, and hunting (percent)	1.8	1.6	1.5	1.6	1.6	-9.8
Mining (percent)	0.3	0.5	0.7	0.6	0.5	50.7
Construction (percent)	7.3	6.5	6.7	6.7	6.8	-6.0
Manufacturing (percent)	14.4	10.1	10.3	10.3	10.2	-29.1
Wholesale and retail trade (percent)	14.6	14.2	13.8	13.7	13.4	-8.5
Transportation and utilities (percent)	5.4	5.1	5.2	5.2	5.3	-1.9
Information (percent)	3.0	2.3	2.1	2.0	1.9	-36.4
Financial activities (percent)	6.8	6.7	6.7	6.8	6.9	0.3
Professional and business services (percent)	10.0	11.0	11.6	11.7	12.1	21.4
Education and health services (percent)	19.1	23.1	22.4	22.6	22.6	18.3
Leisure and hospitality (percent)	8.2	9.0	9.2	9.3	9.4	14.7
Other services (percent)	4.7	4.9	4.9	4.9	4.8	2.6
Public administration (percent)	4.5	5.0	4.6	4.7	4.5	1.4
Business establishments (thousands)	**7,070**	**7,397**	**7,563**	**7,664**	**NA**	**NA**
Governmental units[2]	**[3]87,576**	**NA**	**[4]90,056**	**NA**	**NA**	**NA**
Gross domestic product (millions of chained 2009 $)	**12,559,700**	**14,783,800**	**15,982,300**	**16,397,200**	**16,662,100**	**32.7**
Foreign trade (millions of chained 2009 $)	**2,994,600**	**4,012,000**	**(R) 4,662,300**	**4,781,100**	**4,819,400**	**60.9**
Goods (percent)	(R) 78.7	(R) 75.9	(R) 75.9	76.0	75.9	-3.6
Services (percent)	(R) 21.1	(R) 24.1	(R) 24.1	24.0	24.1	14.3

KEY: NA = not available; R = revised.

[1] Based on the 2012 Census Industry Classification system. [2] Data for governments come from the Census of Governments, which is collected every 5 years. [3] 2002, [4] 2012, [5] percent change, 2000-2015

SOURCES: **Population**: U.S. Department of Commerce, Census Bureau, Population and Housing Unit Estimates Datasets, National Population Totals Datasets, available at https://www.census.gov/programs-surveys/popest/data.html as of June 2017. **Households**: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, Table HH-6, Average Population Per Household and Family: 1944 to Present, available at http://www.census.gov/hhes/families/data/households.html as of June 2017. **Civilian labor force and Employment**: U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Employment status of the civilian noninstitutional population, Household Date, 1 and 18, available at http://www.bls.gov/cps/tables.htm#empstat as of June 2017. **Median household income:** U.S. Department of Commerce, Census Bureau, Historical Income Tables, table H-6, available at https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html as of June 2017. **Business establishments:** U.S. Department of Commerce, Census Bureau, County Business Patterns, available at https://www.census.gov/programs-surveys/cbp.html as of June 2017. **Governmental units:** U.S Department of Commerce, Census Bureau, Census of Governments, available at www.census.gov/govs as of July 2016. **Gross domestic product** and **Foreign Trade**: U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts Table, table 1.1.6, available at http://www.bea.gov/national/index.htm as of June 2017.

Freight transportation has grown over time with the expansion of population and economic activity within the United States and with the increasing interdependence of economies across the globe. The U.S. population grew by 14.5 percent between 2000 and 2016, climbing to 323 million in 2016. The U.S. economy, measured by gross domestic product (GDP), increased by 32.7 percent in real terms (inflation adjusted) over the same period (see table 1-1). Median household income, another indicator of economic growth, declined by 5.5 percent between 2000 and 2015. Foreign trade grew faster than the overall economy, reflecting unprecedented global interconnectivity.

Although freight moves throughout the United States, the demand for freight transportation is driven primarily by the geographic distribution of population and economic activity. Both population and economic activity have grown faster in the South and West than in the Northeast and Midwest, but the Northeast has the highest economic activity per capita.

Table 1-2 Population and Gross Domestic Product (GDP) by Region: 2000, 2010, and 2014–2016

	(R) 2000	(R) 2010	(R) 2014	2015	2016	Percent change, 2000 to 2016
Resident population (thousands)						
Northeast	53,668	55,318	56,117	56,185	56,210	4.7
Midwest	64,494	66,930	67,726	67,838	67,941	5.3
South	100,560	114,563	119,696	121,039	122,320	21.6
West	63,451	71,947	75,024	75,834	76,657	20.8
GDP (millions of chained 2009 $)[1]						
Northeast	3,090,980	3,553,225	3,700,258	3,772,627	3,816,577	23.5
Midwest	2,806,991	3,000,447	3,215,098	3,257,438	3,294,998	17.4
South	4,059,638	4,862,984	5,268,516	5,422,600	5,490,134	35.2
West	2,664,019	3,211,646	3,501,251	3,636,790	3,735,446	40.2
GDP per capita (chained 2009 $)[1]						
Northeast	57,595	64,232	65,939	67,147	67,899	17.9
Midwest	43,523	44,830	47,472	48,018	48,498	11.4
South	40,370	42,448	44,016	44,800	44,884	11.2
West	41,986	44,639	46,668	47,957	48,729	16.1

KEY: R = revised.

[1]As of Oct. 26, 2006, the Bureau of Economic Analysis renamed the gross state product (GSP) series to gross domestic product (GDP) by state.

NOTES: Chained dollars are not additive, especially for periods farther away from the base year of 2009. Thus GDP for all regions is not equal to total GDP. Numbers may not add to totals due to rounding.

SOURCES: **Population**: U.S. Department of Commerce, Census Bureau, Population Division, Annual Population Estimates, available at www.census.gov/popest/data/index.html as of June 2017. **Gross Domestic Product**: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, available at www.bea.gov/regional/ as of June 2017.

II. Freight Moved in Domestic and International Trade

The American economy stretches across a continent with links to the world, drawing on natural resources and manufactured products from many locations to serve markets at home and abroad. More freight is moving greater distances as part of far-flung supply chains among distant trading partners.

In 2015 the U.S. transportation system moved a daily average of about 49.3 million tons of freight valued at more than $52.5 billion. The Freight Analysis Framework estimates show that the tonnage of goods moved in 2015 fully rebounded from the declines experienced during the December 2007–June 2009 economic recession. Tonnage is projected to increase at about 1.4 percent per year between 2015 and 2045.

Table 2-1 Weight of Shipments by Transportation Mode: 2012, 2015, and 2045

(millions of tons)

	2012				2015				2045			
Millions of tons	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**
Total	**16,896**	**14,901**	**864**	**1,130**	**17,978**	**15,983**	**920**	**1,075**	**25,346**	**20,940**	**2,202**	**2,204**
Truck	10,092	9,899	105	89	10,776	10,568	108	100	14,829	14,235	290	305
Rail	1,616	1,481	53	82	1,602	1,459	55	89	1,918	1,588	109	221
Water	884	502	68	313	884	544	95	246	1,100	609	190	301
Air, air & truck	10	2	4	4	10	2	4	5	37	4	16	18
Multiple modes & mail	1,311	309	596	406	1,346	324	615	407	2,962	431	1,521	1,010
Pipeline	2,942	2,672	37	233	3,326	3,056	43	226	4,468	4,058	73	338
Other & unknown	41	37	1	3	33	29	1	3	31	16	4	11

[1] Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode.

NOTES: Numbers may not add to totals due to rounding. The 2015 data are provisional estimates that are based on selected modal and economic trend data. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes & mail to avoid double counting. Multiple modes and mail also includes some air movements. As a consequence, some totals in this table are less than other published sources.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

The value of freight moved is forecasted to increase faster than the weight, rising from $1,044 per ton in 2012 to $1,461 per ton in 2045, when controlling for inflation. This increase is due to high-value, low-weight commodities growing at a faster rate than low-value, high-weight commodities. Exports at $1,772 per ton and imports at $1,941 per ton were higher than domestic shipments of $934 per ton in 2012. Exports and imports accounted for 11.8 percent of the tons and 21.1 percent of the value in 2012 and are projected to make up an even greater share of freight moving throughout the United States, reaching 17.5 percent of the tonnage and 39.3 percent of the value by 2045.

Table 2-2 Value of Shipments by Transportation Mode: 2012, 2015, and 2045

(billions of 2012 dollars)

	2012				2015				2045			
	Total	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**	**Total**	**Domestic**	**Exports[1]**	**Imports[1]**
Total	**17,700**	**13,965**	**1,532**	**2,204**	**19,146**	**14,978**	**1,704**	**2,465**	**37,026**	**22,474**	**6,482**	**8,071**
Truck	10,929	10,253	365	311	11,626	10,903	381	342	18,691	16,227	1,246	1,218
Rail	578	411	61	107	623	445	63	115	1,077	646	155	276
Water	588	270	72	246	596	297	99	200	973	340	273	360
Air, air & truck	1,030	132	428	470	1,178	145	459	573	5,085	317	2,424	2,344
Multiple modes & mail	3,265	1,748	578	938	3,590	1,870	665	1,055	9,155	3,396	2,287	3,471
Pipeline	1,271	1,150	10	111	1,450	1,317	15	118	1,721	1,546	21	154
Other & unknown	40	1	17	22	83	1	21	61	325	0	76	248

[1] Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode.

NOTES: Numbers may not add to totals due to rounding. The 2015 data are provisional estimates that are based on selected modal and economic trend data. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes & mail to avoid double counting. Multiple modes and mail also includes some air movements. As a consequence, some totals in this table are less than other published sources.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

In general, the largest percentage of goods move relatively short distances. Approximately 50 percent of the weight and 37 percent of the value of goods were moved less than 100 miles between origin and destination in 2015. About 7 percent of the weight and 17 percent of the value of goods were moved more than 1,000 miles. Distance, as used in this publication, refers to the Great Circle Distance, which is commonly called "as-the-crow-flies."

Table 2-3 Total Freight Moved by Distance: 2015

	Value			Weight			Ton-miles	
Distance band (miles)	Millions of dollars	Percent	Cumulative percent	Millions of tons	Percent	Cumulative percent	Percent	Cumulative percent
Below 100	7,105	37	37	8,998	50	50	5	5
100 - 249	2,855	15	52	2,900	17	67	10	16
250 - 499	3,225	17	69	3,011	17	84	21	36
500 - 749	1,550	8	77	1,144	5	89	14	49
750 - 999	1,135	6	83	566	3	92	9	59
1,000 - 1,499	1,411	7	90	780	4	97	18	77
1,500 - 2,000	744	4	94	326	2	99	11	88
Over 2,000	1,121	6	100	253	1	100	12	100

NOTE: Weight percents do not add to 100 due to rounding.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

The top 10 commodities by weight are comprised entirely of bulk products and accounted for 67.3 percent of total tonnage but only 26.8 percent of the value of goods moved in 2015. The top 10 commodities by value accounted for 57.3 percent of total value and 35.9 percent of all tons. The leading commodities by weight are bulk goods, including natural gas, coke, and asphalt; gravel; gasoline; cereal grains; and non-metallic mineral products. The leading commodities by value are high value-per-ton goods frequently requiring rapid delivery, including electronics, motorized vehicles, and machinery.

Most goods are moved relatively short distances (less than 250 miles), accounting for 50.3 percent of the value, and 66.6 percent of the weight for all shipments within the United States in 2015. Shipments transported more than 250 miles represented 33.4 percent of the tonnage but the vast majority (84.5 percent) of the ton-miles.

Modal shares of freight vary by distance. Trucks carry the largest shares by value, tons, and ton-miles for shipments moving 750 or fewer miles, while rail is the dominant mode by tons and ton-miles for shipments moved 750 to 2,000 miles. Air, multiple modes and mail, and other/unknown modes accounted for 54.2 percent of the value of shipments moved more than 2,000 miles.

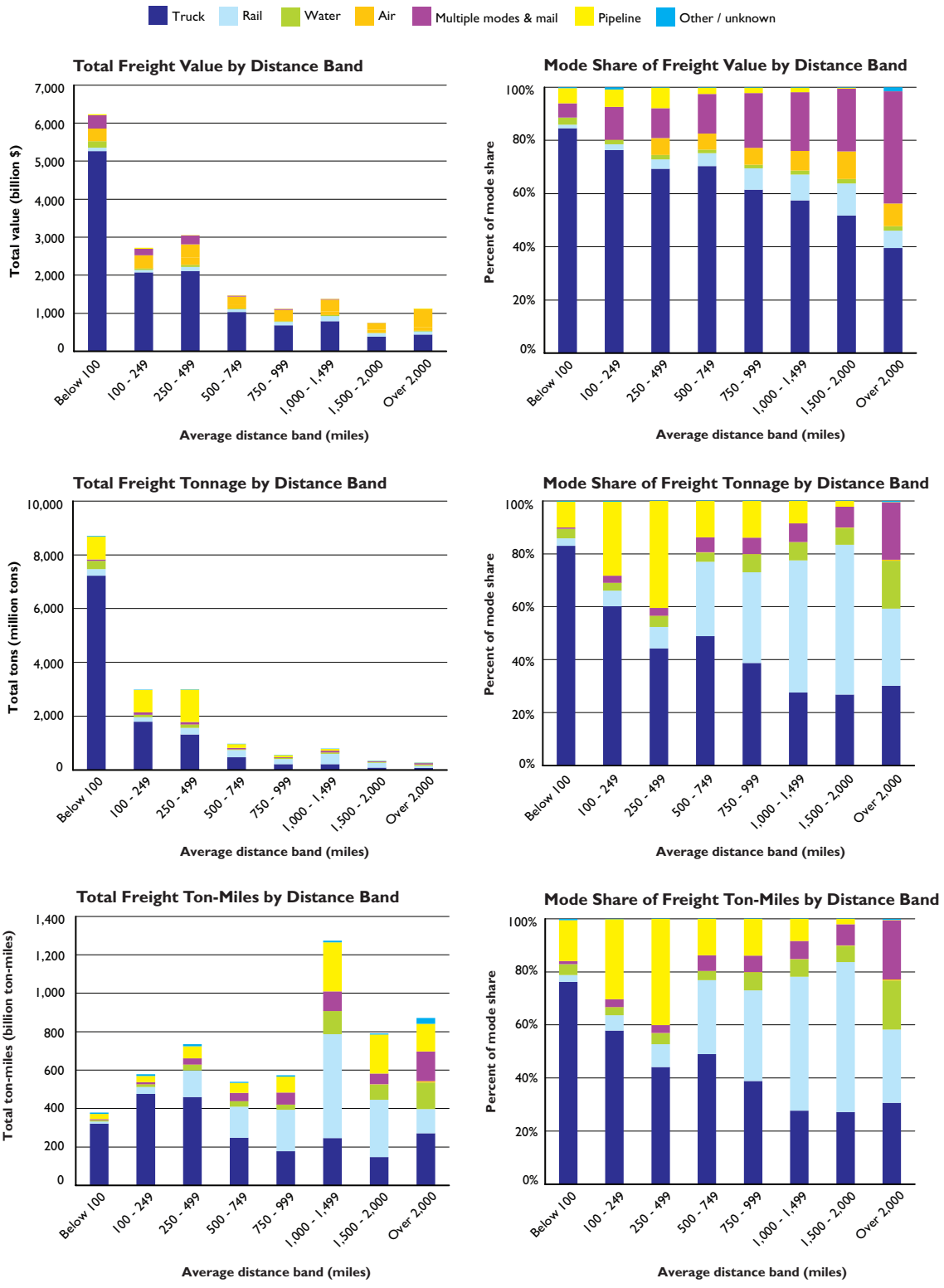
Table 2-4 Top 10 Commodities by Weight and Value: 2015

Weight	Millions of tons	Value	Billions of 2012 dollars
Natural gas, coke, asphalt[1]	2,647	Electronics	$1,673
Gravel	1,820	Motorized vehicles	$1,467
Gasoline	1,156	Mixed freight	$1,458
Cereal grains	1,099	Machinery	$1,148
Nonmetal mineral products	1,073	Gasoline	$1,059
Fuel oils	1,039	Natural gas, coke, asphalt[1]	$917
Coal	1,001	Pharmaceuticals	$903
Crude petroleum	912	Fuel oils	$836
Other foodstuffs	704	Miscellaneous manufacturing products	$791
Waste/scrap	653	Other foodstuffs	$710
Top 10 total	**12,104**	**Top 10 total**	**$10,963**
Total, all commodities	**17,978**	**Total, all commodities**	**$19,146**

[1]This group includes coal and petroleum products not elsewhere classified such as liquefied natural gas, coke, asphalt, and other products of coal and petroleum refining, excluding gasoline, aviation fuel, and fuel oil.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

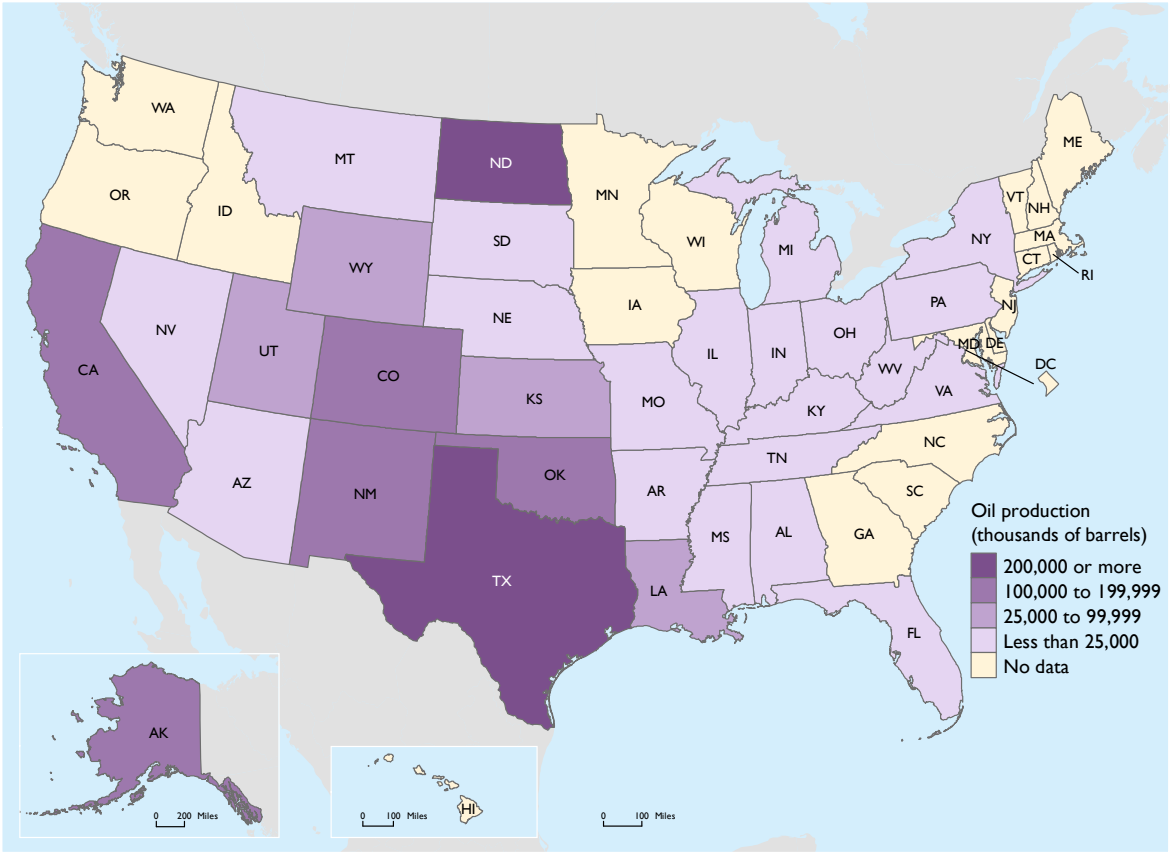
Figure 2-1 Value, Tonnage, and Ton-Miles of Freight by Distance: 2015



SOURCE: U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics, Freight Analysis Framework, Version 4.3.1, 2016.

A handful of states are responsible for more than 70 percent of domestic oil production. Texas is the largest oil producing state at 1,176 million barrels in 2016, accounting for 44.3 percent of total U.S. oil production, while North Dakota was a distant second at 378 million barrels (14.3%), followed by California's 188 million barrels (7.1%) and Alaska's 179 million barrels (6.8%).

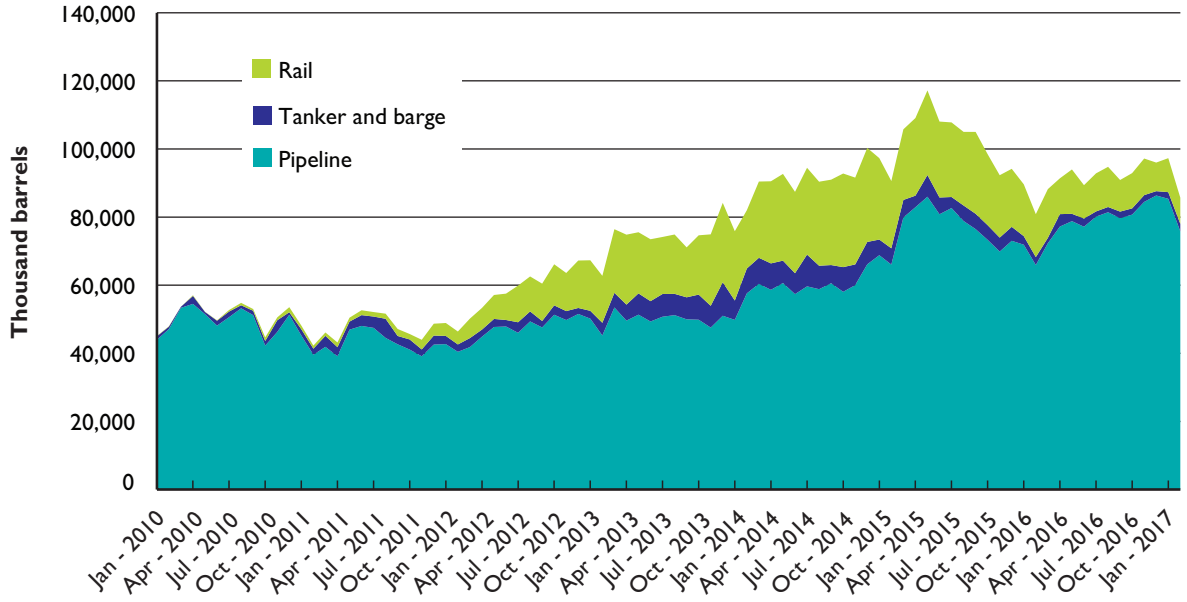
Figure 2-2 Crude Oil Production by State: 2016



SOURCE: U.S. Department of Energy, Energy Information Administration, Petroleum and Other Liquids, available at www.eia.gov/petroleum/ as of April 2017.

Expanded U.S. oil production and changes in where oil is produced have increased the use of rail and barges to move oil from the wellhead to refineries and terminals for distribution to the final consumer. Although pipelines continue to be the predominant mode for moving oil, rail shipments have increased substantially in recent years. Regional (PADD to PADD) oil shipments by rail increased, on average, from less than 1 percent in 2010 to 14.2 percent in 2016, after peaking at 26.7 percent for 2014. Oil production in the Bakken formation located in North Dakota has accounted for the majority of new rail shipments, while tankers and barges continued to move crude oil on U.S. inland waterways from port to port along the coast or on the Great Lakes. The use of tankers and barges for oil transport has decreased slightly, from an average of 2.6 percent in 2010 to 2.3 percent in 2016.

Figure 2-3 Shipments of Crude Oil by Pipeline, Tanker and Barge, and Rail: January 2010–February 2017



SOURCE: U.S. Energy Information Administration based on data from the Surface Transportation Board and other information, April 2017.

Establishment of PADD

During World War II, the United States was divided into five districts to organize the rationing of gasoline and other petroleum products. Today those same regions are called Petroleum Administration for Defense Districts (PADDSs). PADDS are used to analyze patterns of crude oil and petroleum product movements throughout the Nation.

The Bureau of Transportation Statistics' Commodity Flow Survey indicates that trucks moved 59.4 percent of the tonnage and 62.8 percent of the value of all hazardous materials shipped from within the United States. However, truck ton-miles of hazardous materials shipments accounted for a much smaller share, about one-third of all ton-miles, because such shipments travel relatively short distances. Specifically, hazardous materials shipments by trucks traveled the shortest distance, an average of 56 miles per shipment, compared to all other modes. By contrast, rail accounted for only 4.3 percent of hazardous materials shipments by weight but 27.6 percent of ton-miles.

Table 2-5 Hazardous Materials Shipments by Transportation Mode: 2012

	Value		Tons		Ton-miles[1]		Miles
Transportation mode	$ Billions	Percent	Millions	Percent	Billions	Percent	Average distance per shipment
All modes, total	**2,334.4**	**100.0**	**2,580.2**	**100.0**	**307.5**	**100.0**	**114**
Single modes, total	**2,304.7**	**98.7**	**2,552.9**	**98.9**	**275.6**	**89.6**	**68**
Truck[2]	1,466.0	62.8	1,531.4	59.4	96.6	31.4	56
For-hire	870.9	37.3	882.3	34.2	62.0	20.2	150
Private	595.1	25.5	649.1	25.2	34.5	11.2	33
Rail	79.2	3.4	111.0	4.3	84.9	27.6	808
Water	217.8	9.3	283.6	11.0	54.9	17.9	212
Air	4.4	0.2	0.3	Z	0.3	0.1	1,120
Pipeline[3]	537.3	23.0	626.7	24.3	S	S	S
Multiple modes, total	**29.7**	**1.3**	**27.3**	**1.1**	**31.9**	**10.4**	**654**
Truck and rail	13.3	0.6	17.0	0.7	16.6	5.4	954
Truck and water	S	S	S	S	S	S	1,181
Rail and water	2.5	0.1	4.6	0.2	1.4	0.4	S
Parcel, U.S. Postal Service, or courier	10.3	0.4	0.3	Z	0.2	0.1	650
Other multiple modes	0.0	0.0	0.0	0.0	0.0	0.0	0
Other modes	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0**

KEY: S = data are not published because estimate did not meet publication standards; Z = rounds to zero.

[1] Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

[2] Truck as a single mode includes shipments that went by private truck only or by for-hire truck only.

[3] Excludes crude petroleum shipments.

NOTES: The Commodity Flow Survey (CFS) is conducted every 5 years as part of the Economic Census, last administered in 2012. Value-of-shipment estimates have not been adjusted for price changes. Numbers and percents may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, *2012 Commodity Flow Survey*, Hazardous Materials (Washington, DC: February 2015), table 1a, available at www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf as of July 2016.

Flammable liquids, especially gasoline, are the predominant hazardous materials transported in the United States, accounting for 86.4 percent by value, 85.4 percent by weight, and 66.5 percent in term of ton-miles. Explosives, on average, traveled the longest distance, while radioactive materials moved the shortest.

Table 2-6 Hazardous Materials Shipments by Hazard Class: 2012

		Value		Tons		Ton-miles[1]		Miles
Hazard class	Description	$ Billions	Percent	Millions	Percent	Billions	Percent	Average distance per shipment
Class 1	Explosives	18.4	0.8	4.0	0.2	1.0	0.3	840
Class 2	Gases	125.1	5.4	164.8	6.4	33.2	10.8	57
Class 3	Flammable liquids	2,016.7	86.4	2,203.5	85.4	204.6	66.5	93
Class 4	Flammable solids	5.4	0.2	11.3	0.4	5.8	1.9	565
Class 5	Oxidizers and organic peroxides	7.6	0.3	12.0	0.5	5.5	1.8	437
Class 6	Toxic (poison)	15.2	0.7	7.6	0.3	3.6	1.2	513
Class 7	Radioactive materials	12.3	0.5	S	S	0.4	Z	34
Class 8	Corrosive materials	75.9	3.2	125.3	4.9	37.8	12.3	264
Class 9	Miscellaneous dangerous goods	58.0	2.5	51.0	2.0	16.1	5.2	530
Total		**2,334.4**	**100.0**	**2,580.2**	**100.0**	**307.5**	**100.0**	**114**

KEY: S = data are not published because of high sampling variability or other reasons; Z = rounds to zero.

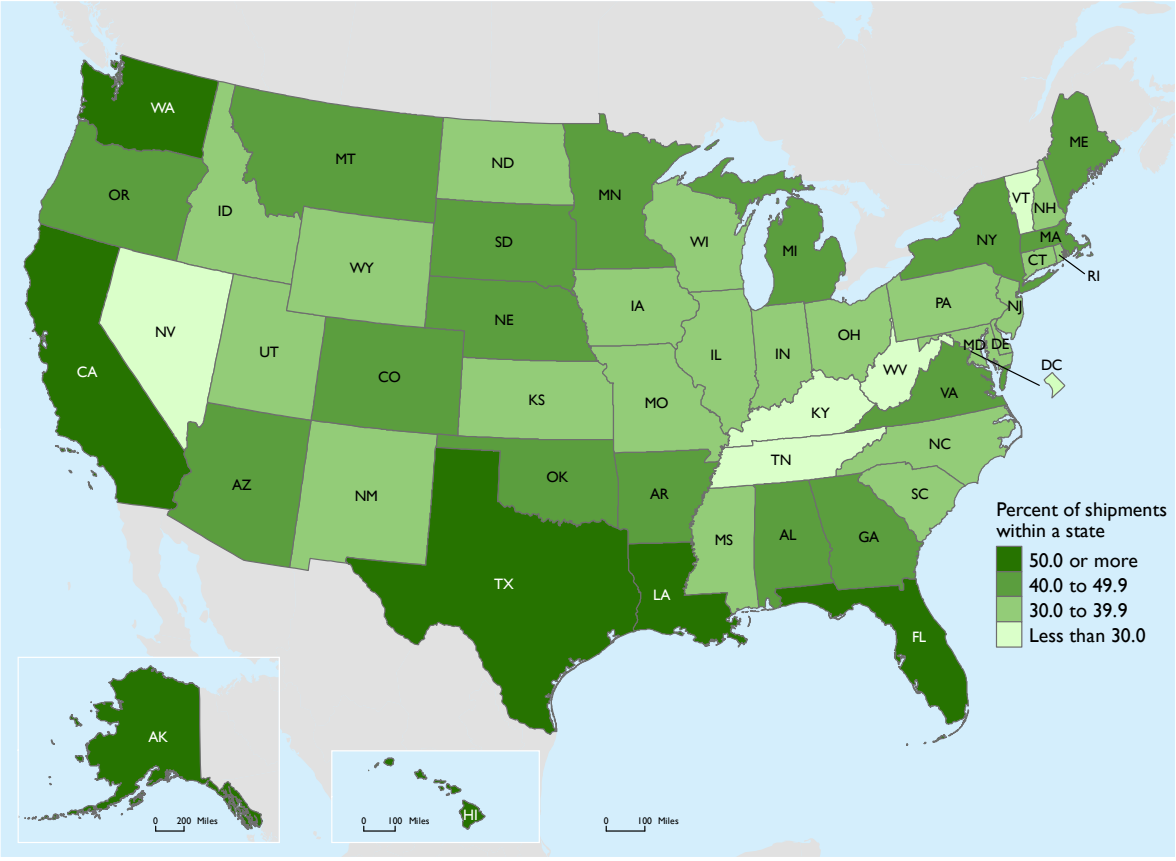
[1] Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

NOTES: The Commodity Flow Survey (CFS) is conducted every 5 years as part of the Economic Census, last administered in 2012. Value-of-shipments estimates have not been adjusted for price changes. Numbers and percents may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, *2012 Commodity Flow Survey*, Hazardous Materials (Washington, DC: February 2015), table 2a, available at www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf as of July 2016.

An average of 47.1 percent of shipments by value traveled only within state in 2015. States with the highest shares tended to be either very large or geographically isolated relative to other states. Hawaii had the highest share of intrastate shipments by value (90.0 percent), followed by Texas (67.4 percent) and Florida (62.8 percent). Trucks accounted for 81.0 percent of intrastate shipments. The only two states that shipped less than half their total intrastate value by truck were Alaska (46.7 percent) and Louisiana (48.4 percent) because a significant amount of petroleum products are moved by pipeline within both states. Overall, 7 states shipped most of their goods (by value) within their own borders, and another 16 states shipped between 40 and 50 percent, within state borders.

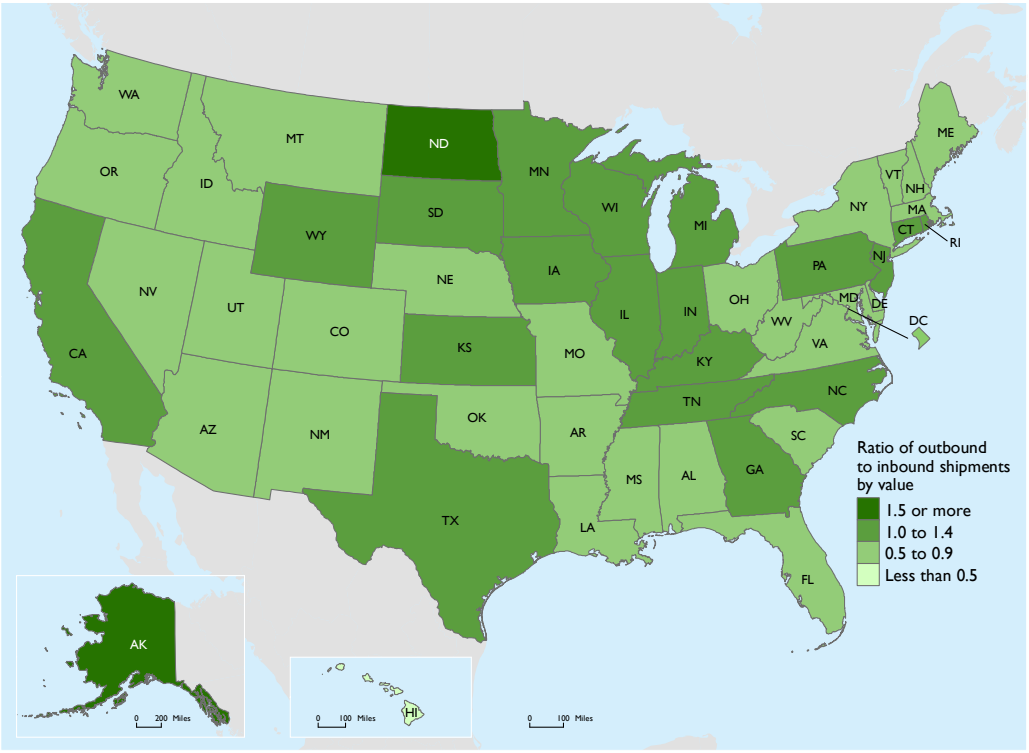
Figure 2-4 Value of Shipments Within a State: 2015



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

An interconnected freight transportation network contributes to state economic growth by supporting resource development and expanding interstate commerce. A ratio of outbound to inbound shipments that is greater than 1.0 indicates that a state ships more goods to markets in other states than it receives from other states, whereas a ratio less than 1.0 indicates that a state imports more goods from other states than it exports. Alaska and North Dakota have the highest ratios of about 2.0, indicating their exports of goods are about two times more than their imports of goods. Both states have relatively small populations and are major oil producers. According to the Freight Analysis Framework, nearly all of the crude petroleum moving out of Alaska was transported by water, while pipeline and rail were the primary modes for moving oil out of North Dakota. Other major states that export more than they import were California, Connecticut, and Illinois. Electronics was the top outbound domestic shipment category from California, while mixed shipments, such as groceries and convenience store goods, food for restaurants, office supplies, and hardware and plumbing items, were the top export from Connecticut. Coal was the top outbound shipment from Illinois. Hawaii had the lowest ratio of interstate outbound-to-inbound shipments by value at 0.09 because of its distant location from the mainland and resource dependency. Other states with low outbound-to-inbound ratios include Florida and Nevada, partly due to demographics.

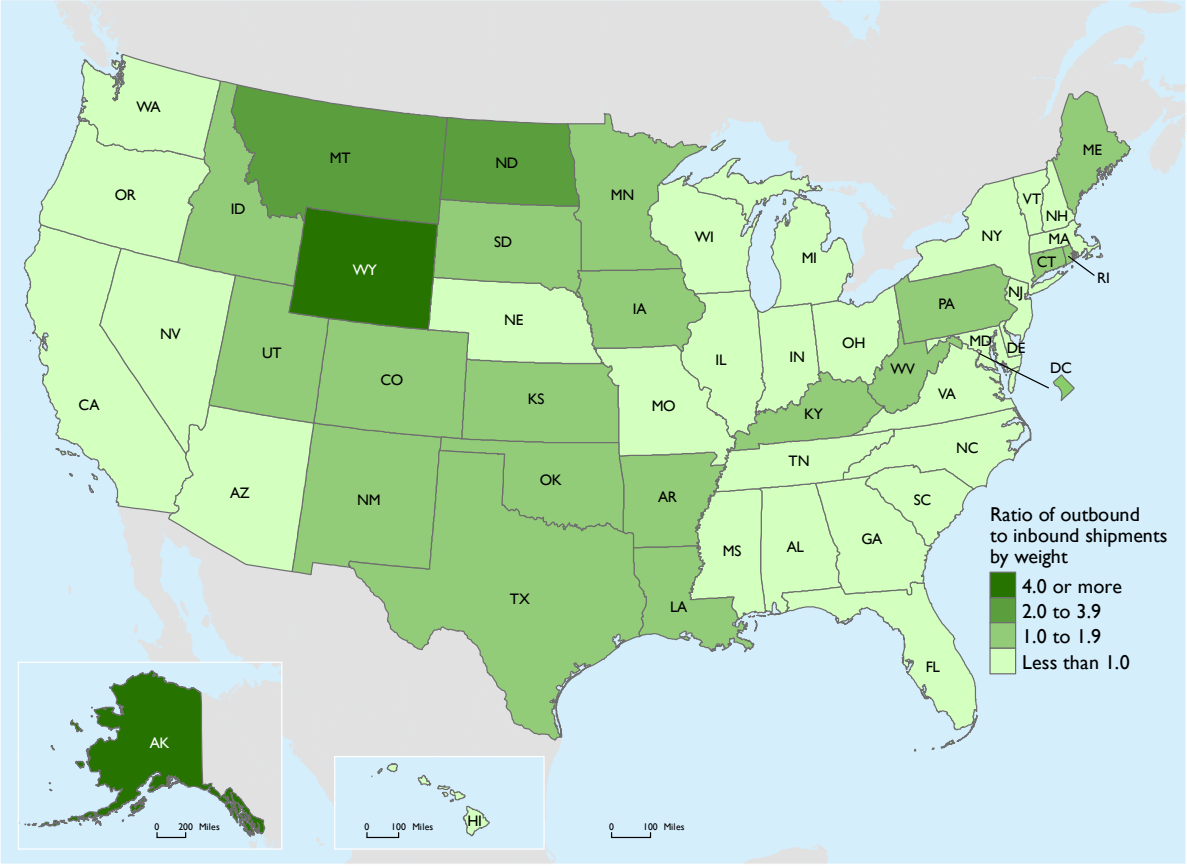
Figure 2-5 Ratio of Outbound to Inbound Domestic Shipments by Value: 2015



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

All of the top five net exporters by weight are producers of energy commodities: Wyoming, Alaska, Montana, North Dakota, and West Virginia. Net domestic exporters are states that ship more freight to other states than to markets within their borders. According to the Energy Information Administration, Wyoming is the largest U.S. coal producer, followed by West Virginia, while Montana is the sixth largest coal producer. For domestic markets, rail and barge are used to transport coal over long distances, primarily to power plants.

Figure 2-6 Ratio of Outbound to Inbound Domestic Shipments by Weight: 2015

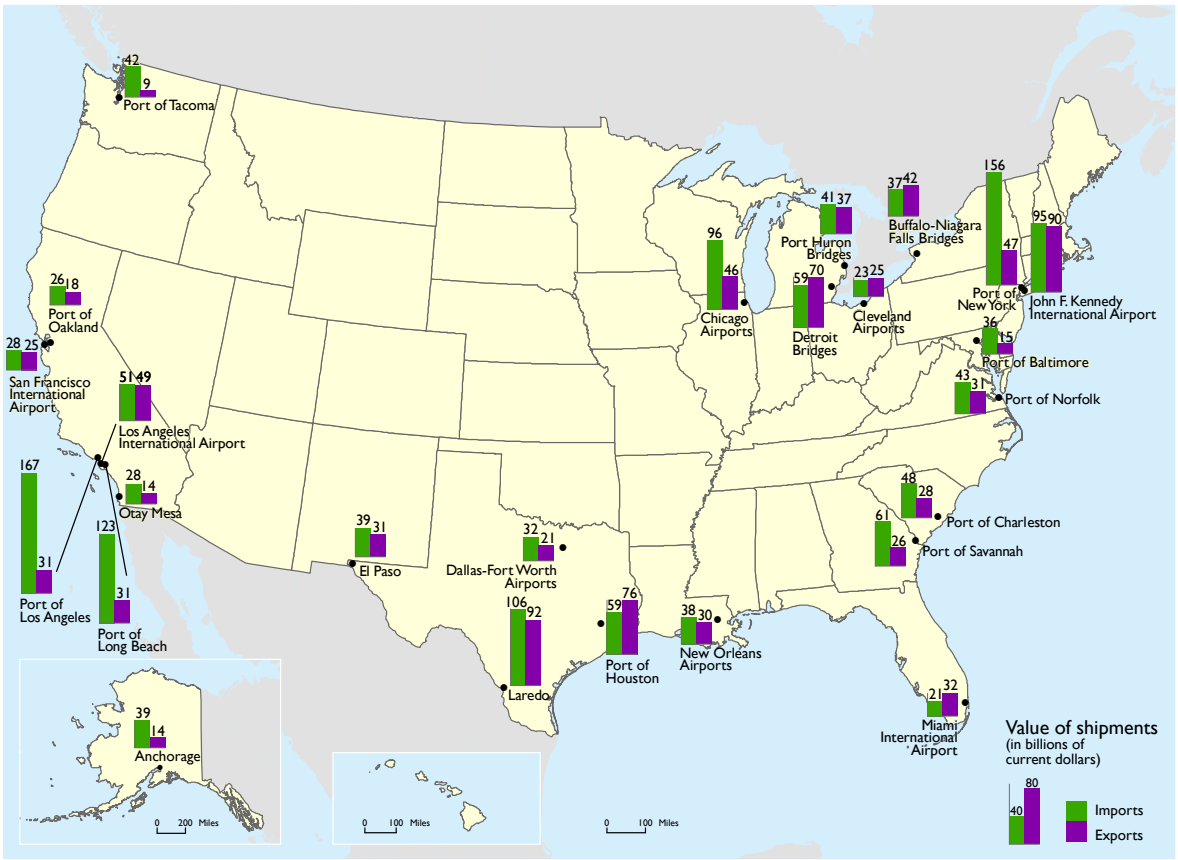


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Trade

Transportation facilities that move international trade into and out of the United States demonstrate the importance of all modes and intermodal combinations to global connectivity. The top 25 foreign-trade gateways measured by value of shipments in 2015 consist of 10 water ports, 6 land-border crossings, and 9 air gateways. Port of New York, $202.6 billion, was the highest international trade freight gateway (water). The top 25 gateways accounted for 61.5 percent of total U.S.-international trades.

Figure 2-7 Top 25 U.S.-International Trade Freight Gateways by Value of Shipments: 2015
(billions of current dollars)

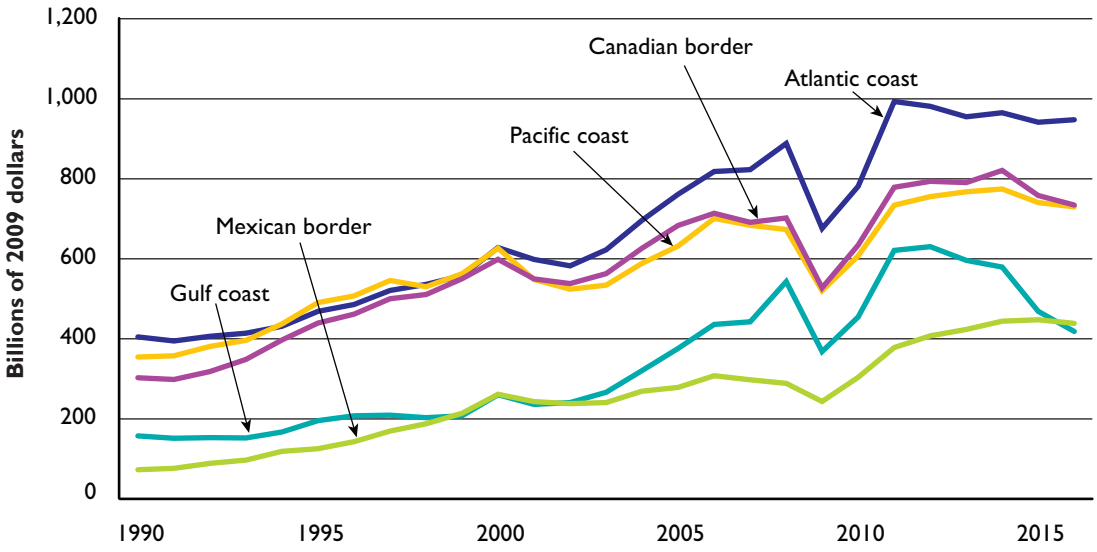


NOTES: **All data**: Trade levels reflect the mode of transportation as a shipment enters or exits at a border port. Flows through individual ports are based on reported data collected from U.S. trade documents. Trade does not include low-value shipments. (In general, these are imports valued at less than $1,250 and exports that are valued at less than $2,500). Numbers may not add to totals due to rounding. **Air**: Data for all air gateways are reported at the port level and include a low level (generally less than 2%-3% of the total value) of small user-fee airports located in the same region. Air gateways not identified by airport name (e.g., Chicago, IL and others) include major airport(s) in that geographic area in addition to small regional airports. In addition, due to Bureau of Census confidentiality regulations, data for courier operations are included in the airport totals for JFK International Airport, Chicago, Los Angeles, Miami, New Orleans, Anchorage, and Cleveland.

SOURCES: **Air**: U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, USA Trade Online, November 2016. **Land**: U.S. Department of Transportation, Bureau of Transportation Statistics, North American Transborder Freight Data, available at http://www.bts.gov/programs/international/transborder/ as of November 2016. **Water**: U.S. Army Corps of Engineers, Navigation Data Center, special tabulation, May 2017.

Foreign trade has had a major impact on all U.S. borders and coasts. For example, an increase in trade with China has resulted in a large share of trade moving through Pacific coast ports. The newly expanded Panama Canal allows larger vessels to transit between the Atlantic and Pacific Oceans. Since 1990 the value of merchandise trade has increased by 153 percent in inflation-adjusted terms. Ports and airports on the Atlantic coast continued to account for the largest share in terms of trade value. In 2016 they accounted for 29 percent of the total $3.3 trillion in trade.

Figure 2-8 Value of U.S.-International Merchandise Trade by Coasts and Borders: 1990–2016

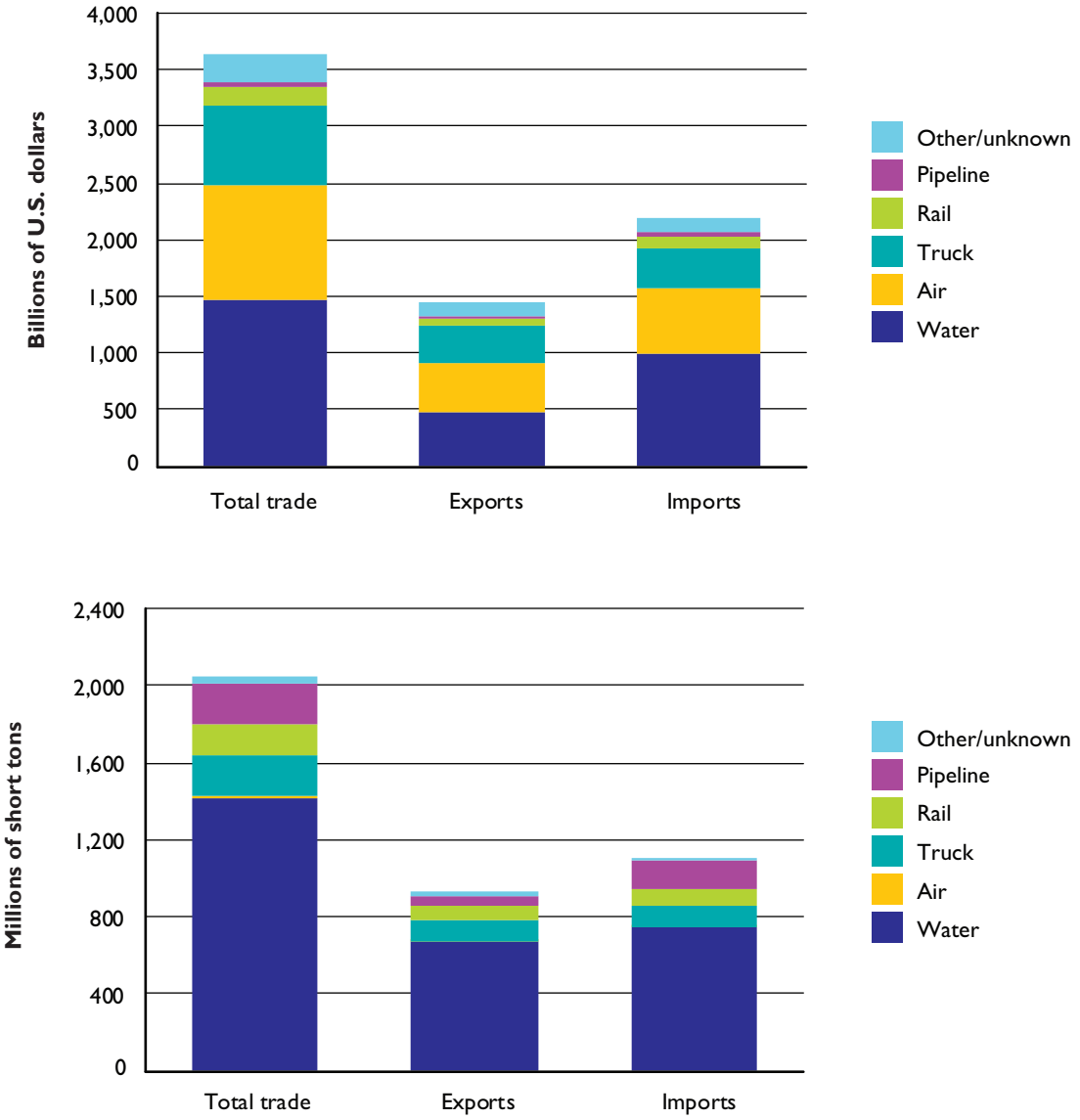


NOTES: The value of coal shipments through Mobile, AL; Charleston, SC; and Norfolk, VA are considered proprietary information and are consolidated. The total value of coal exports for the above three cities are included under the Atlantic Coast Customs District.

SOURCE: **1990-1999**: U.S. Department of Commerce, Census Bureau, *Statistical Abstract of the United States* (Washington, DC: annual issues); **2000-2015**: U.S. Department of Commerce, Census Bureau, Foreign Trade Division, *FT920 - U.S. Merchandise Trade: Selected Highlights* (Washington, DC: annual issues). **Implicit GDP Deflator**: U.S. Department of Commerce, Bureau of Economic Analysis, *Current-Dollar and Real Gross Domestic Product*, available at www.bea.gov as of April 2016.

Water is the major mode for U.S. foreign trade. Approximately 69 percent, 1.4 billion freight tons valued at 1.5 trillion dollars, of U.S. foreign trade moved by water in 2016. Air freight, although at only 0.4 percent of total trade by weight, was the second largest mode for value of goods moved internationally at slightly over one trillion dollars. By value, the water share was 40 percent, with air and truck accounting for 28 and 19 percent respectively. Together, rail and pipeline accounted for about 6 percent of the total.

Figure 2-9 U.S.-International Merchandise Trade Value and Weight by Transportation Mode: 2016



NOTES: 1 short ton = 2,000 pounds. The U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS) estimated 2015 weight data for truck, rail, pipeline, and other and unknown modes using value-to-weight ratios derived from imported commodities. Totals for the most recent year differ slightly from the USDOT, BTS and Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework (FAF) due to variations in coverage and FAF conversion of values to constant dollars. Numbers may not add to totals due to rounding.

SOURCE: **Total, water and air data**: U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, *FT920 - U.S. Merchandise Trade: Selected Highlights* (Washington, DC: December 2016). **Truck, rail, pipeline, and other and unknown data**: U.S. Department of Transportation, Bureau of Transporation Statistics, North American Transborder Freight Data, available at www.bts.gov/transborder as of May 2017.

International trade has grown considerably, and the movement of these goods within the United States is placing pressure on the domestic transportation network and on all modes. Trucks are the most common mode used to move imports and exports between international gateways and inland locations. This trend is expected to continue with tonnage of international trade forecast to grow at a rate of 4.0 percent per year between 2015 and 2045.

Table 2-7 Domestic Transportation Mode of Exports and Imports by Tonnage and Value: 2012, 2015, and 2045

	Millions of tons			Billions of 2012 dollars		
	2012	**2015**	**2045**	**2012**	**2015**	**2045**
Total	**2,000**	**2,011**	**4,431**	**3,746**	**4,177**	**14,566**
Truck[1]	812	864	2,273	2,070	2,273	8,185
Rail	244	234	502	196	211	549
Water	238	263	528	303	378	1,163
Air, air & truck[2]	5	5	19	534	643	2,910
Multiple modes & mail[3]	72	71	211	227	254	935
Pipeline	292	298	584	158	158	305
Other & unknown	4	5	15	39	82	324
No domestic mode[4]	335	273	297	220	179	195

[1] Excludes truck moves to and from airports.

[2] Includes truck moves to and from airports.

[3] Multiple modes & mail includes U.S. Postal Service, courier shipments, and all intermodal combinations, except air and truck. In this table, oceangoing export and import shipments that move between ports and domestic locations by single modes are classified by the domestic mode rather than by multiple modes & mail.

[4] No domestic mode includes waterborne import shipments of crude petroleum off-loaded directly at the domestic destination (refineries) with no domestic mode of transportation.

NOTE: Numbers may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics, and USDOT, Federal Highway Administration, Freight Analysis Framework, Version 4.2, 2016.

China moved from fourth place in 2000 to become this country's top trading partner by value in 2015 and 2016, followed closely by Canada and then Mexico. China's share of trade with the United States nearly tripled from 5.9 to 15.9 percent and value more than quadrupled from 135 to 575 billion dollars in the same time span. A drop in crude oil prices, rather than volume, has negatively affected the total value of U.S.-Canada trade in recent years.

Table 2-8 Top 25 Trading Partners of the United States in Merchandise Trade: 2000, 2010, 2015, and 2016
(billions of 2009 U.S. dollars)

Partner	2000	rank	2010	rank	2015	rank	2016	rank
China	135	4	429	2	574	1	575	1
Canada	466	1	497	1	553	2	541	2
Mexico	284	2	371	3	510	3	522	3
Japan	244	3	171	4	186	4	194	4
Germany	101	5	123	5	167	5	163	5
South Korea	78	7	83	7	110	6	111	6
United Kingdom	98	6	93	6	109	7	109	7
France	58	9	62	8	75	8	77	8
India	17	25	46	12	63	10	67	9
Taiwan	75	8	58	9	64	9	65	10
Italy	42	12	40	16	58	11	62	11
Switzerland	23	23	38	20	51	15	59	12
Netherlands	36	13	51	11	55	13	56	13
Brazil	33	14	56	10	57	12	56	14
Ireland	28	17	39	18	46	16	55	15
Vietnam	1	70	17	30	43	19	52	16
Belgium	27	18	39	17	51	14	49	17
Malaysia	42	11	38	19	44	18	48	18
Singapore	42	10	44	13	45	17	44	19
Hong Kong	30	15	29	25	42	20	42	20
Thailand	27	19	30	23	38	22	40	21
Israel	24	21	30	22	36	23	35	22
Saudi Arabia	24	22	40	15	40	21	35	23
Australia	22	24	29	26	34	24	32	24
Colombia	12	30	26	27	29	25	27	25
Top 25 total[1]	**2,010**		**2,510**		**3,084**		**3,115**	
U.S. total trade	**2,298**		**3,010**		**3,595**		**3,620**	
Top 25 as % of total	**87.4**		**83.4**		**85.8**		**86.0**	

[1] Top 25 trading partners change each year. Totals represent the top 25 trading partners for each year, not necessarily the top 25 trading partners listed here for 2016.

NOTE: Numbers may not add to totals due to rounding.

SOURCE: United States International Trade Commission, Interactive Traffic and Trade DataWeb, https://dataweb.usitc.gov/ as of May 2017. **Implicit Price Deflators**, Import Goods and Export Goods: U.S. Department of Commerce, Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product, available at www.bea.gov as of April 2017.

Trade with our North America Free Trade Agreement partners, Canada and Mexico, has grown since 2000. By value, trucks were the most heavily utilized mode, carrying 65.5 percent of the goods traded with these countries in 2016. Value decreased 3.4 percent from 2015 to 2016, due in part to lower crude oil prices.

Table 2-9 Value and Tonnage of U.S. Merchandise Trade with Canada and Mexico by Transportation Mode: 2000, 2010, 2015, and 2016

(billions of current U.S. dollars and millions of short tons)

	2000		2010		2015		2016	
Mode	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**
Truck[1]	429	NA	560	188	712	206	700	194
Rail[1]	94	NA	131	134	165	153	166	148
Air	45	<1	45	<1	43	<1	42	<1
Water	33	194	81	210	73	219	58	176
Pipeline[1]	24	NA	65	106	57	191	50	190
Other[1]	29	NA	37	11	56	35	54	30
Total[1]	**653**	**NA**	**921**	**650**	**1,106**	**803**	**1,069**	**738**

KEY: NA = not available.

[1] The U.S. Department of Transportation, Bureau of Transportation Statistics estimated the weight of exports for truck, rail, pipeline, and other modes using weight-to-value ratios derived from imported commodities.

NOTES: 1 short ton = 2,000 pounds. "Other" includes shipments transported by mail, other and unknown modes, and shipments through Foreign Trade Zones. Totals for the most recent year differ slightly from the Freight Analysis Framework (FAF) due to variations in coverage and FAF conversion of values to constant dollars. Numbers may not add to totals due to rounding.

SOURCES: **Truck, Rail, Pipeline, and Other:** U.S. Department of Transportation, Bureau of Transportation Statistics, North American Transborder Freight Data, available at www.bts.gov/transborder as of July 2016; **Air and Water**: U.S. Department of Commerce, Census Bureau, Foreign Trade Division, *FT920 - U.S. Merchandise Trade: Selected Highlights* (Washington, DC: annual issues).

Truck and rail transport most U.S. bidirectional freight trade with Canada and Mexico. Trade carried by truck was largely responsible for the 85.3 percent increase in the value of imports from Mexico between 2000 and 2016. Although trade via pipeline with these two countries increased markedly, pipeline comprises a relatively small share of total trade value.

Table 2-10 Value of U.S. Exports to and Imports from Canada and Mexico by Land Transportation Mode: 2000, 2010, 2014–2016

(millions of 2009 U.S. dollars)

	2000	2010	(R) 2014	2015	2016	Percent change, 2000 to 2016
Exports to Canada, total	**189,097**	**222,875**	**255,320**	**228,816**	**250,017**	**32.2**
Truck	158,541	174,443	188,485	171,703	182,468	
Rail	15,810	25,767	32,018	25,684	30,338	
Pipeline	197	3,847	9,466	5,980	8,159	
Other[1]	14,549	18,767	25,307	25,414	29,015	
Mail	<1	52	44	35	37	
Exports to Mexico, total	**118,649**	**137,562**	**188,216**	**186,086**	**204,577**	**72.4**
Truck	100,613	109,992	148,178	148,883	163,167	
Rail	12,817	19,423	27,215	26,137	29,231	
Pipeline	369	2,074	4,399	3,152	3,821	
Other[1]	4,851	6,072	8,423	7,914	8,355	
Mail	<1	1	<1	<1	3	
Imports from Canada, total	**256,780**	**244,443**	**288,718**	**245,231**	**230,985**	**-10.0**
Truck	156,088	121,823	137,183	133,652	134,588	
Rail	60,692	56,231	63,813	56,784	53,045	
Pipeline	28,230	58,053	72,547	42,619	34,113	
Other[1]	11,688	7,183	9,264	9,123	7,995	
Mail	5	<1	<1	<1	<1	
FTZ[2]	77	1,153	5,910	3,053	1,244	
Imports from Mexico, total	**138,527**	**179,214**	**229,165**	**241,855**	**256,630**	**85.3**
Truck	108,281	147,196	183,666	194,139	203,411	
Rail	25,714	28,141	40,586	41,923	46,296	
Pipeline	14	179	189	202	187	
Other[1]	1,922	1,856	1,757	1,788	2,558	
Mail	<1	<1	<1	<1	<1	
FTZ[2]	2,596	1,841	2,965	3,803	4,177	

KEY: R = revised.

[1]"Other" includes "flyaway aircraft" or aircraft moving under their own power (i.e., aircraft moving from the manufacturer to a customer and not carrying any freight), powerhouse (electricity), vessels moving under their own power, pedestrians carrying freight, and unknown.

[2] Foreign Trade Zones (FTZs) were added as a mode of transport for land import shipments beginning in April 1995. Although FTZs are treated as a mode of transportation in the North American Transborder Freight Data, the actual mode for a specific shipment into or out of an FTZ is unknown because U.S. Customs does not collect this information.

NOTE: Numbers may not add to totals due to rounding.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics, North American Transborder Freight Data, available at www.bts.gov/transborder as of May 2017. **Implicit GDP Deflator**: U.S. Department of Commerce, Bureau of Economic Analysis, Current-Dollar and Real Gross Domestic Product, available at www.bea.gov as of May 2017.

A large number of trucks and trains carry goods into and out of the United States from Mexico and Canada. In 2016 more than 5.8 million trucks hauled 4.1 million loaded containers into the United States from Mexico, an increase of 28.2 and 73.0 percent, respectively, over 2000 levels. This traffic reflects an increase of 85.3 percent imports in trade values (table 2-10). In contrast, the number of incoming trucks and loaded containers from Canada declined by 16.6 and 9.9 percent, respectively, while incoming loaded rail containers increased by 28.8 percent between 2000 and 2016.

Table 2-11 Number of Incoming Trucks, Trains, and Loaded Containers Crossing the U.S-Mexico and U.S-Canada Borders: 2000, 2010, and 2014–2016

(thousands)

	2000	2010	2014	2015	2016
Canadian border					
Trucks	7,048	5,444	5,802	5,791	5,878
Loaded truck containers	5,335	4,171	4,274	4,581	4,808
Trains	33	26	29	31	29
Loaded rail containers	1,215	1,209	1,575	1,611	1,566
Mexican border					
Trucks	4,526	4,743	5,415	5,535	5,803
Loaded truck containers	2,350	3,174	3,779	3,927	4,067
Trains	7	8	10	10	10
Loaded rail containers	266	318	474	482	508

KEY: R = revised.

NOTE: Trains include both passenger and freight trains.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Border Crossing/Entry Data, available at www.bts.gov as of May 2017.

III. The Freight Transportation System

Freight travels over an extensive network of highways, railroads, waterways, pipelines, and airways. Existing and anticipated increases in the number of freight vehicles, vessels, and other conveyances on both public and private infrastructure are stressing the system as more segments of the network approach or reach capacity, increasing maintenance requirements and affecting performance.

Extent

Road infrastructure increased 5.2 percent while traffic volume increased 14.0 percent from 2,747 billion to 3,131 billion vehicle-miles traveled, over the 2000 to 2015 period. During that time the total miles of gas pipeline mileage increased 15.9 percent, while Class I rail miles declined by 22.4 percent.

Table 3-1 Miles of Infrastructure by Transportation Mode: 2000, 2010, and 2013–2015

	2000	2010	2013	2014	2015
Public roads, route miles	**3,951,101**	**NA**	**4,115,462**	**4,177,074**	**4,154,727**
National Highway System (NHS)	161,189	NA	227,224	226,355	222,743
Interstates	46,673	NA	47,575	47,662	48,053
Other NHS	114,516	NA	179,650	178,693	174,690
Other	3,789,912	NA	3,888,238	3,950,718	3,931,984
Strategic Highway Corridor Network (STRAHNET)[1]	**62,066**	**NA**	**62,595**	**64,074**	**64,136**
Interstate	46,675	NA	47,574	47,662	48,053
Non-interstate	15,389	NA	15,021	16,412	16,082
Railroad[2]	**170,512**	**138,576**	**NA**	**NA**	**NA**
Class I	120,597	95,573	95,134	94,268	93,527
Regional	20,978	10,407	NA	NA	NA
Local	28,937	32,596	NA	NA	NA
Inland waterways					
Navigable channels	11,000	11,000	11,000	11,000	11,000
Great Lakes-St. Lawrence Seaway	2,342	2,342	2,342	2,342	2,342
Pipelines					
Oil	176,996	177,426	187,222	194,423	NA
Gas	1,377,320	(R) 1,554,270	(R) 1,575,536	(R) 1,585,672	1,596,214

KEY: NA = not available; R = revised.

[1]The Strategic Highway Corridor Network (STRAHNET) is the total minimum public highway network necessary to support deployment needs of the U.S. Department of Defense.

[2]Class I railroads had annual carrier operating revenue in 2015 of $457.91 million or more. Regional (Class II) railroads had annual carrier operating revenue in 2015 greater than $36.63 million and less than $457.91 million. Local (Class III) railroads had annual carrier operating revenue in 2015 below $36.63 million.

SOURCES: **Public Roads:** U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), tables HM-16 and HM-49, available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017. **Rail:** Association of American Railroads, *Railroad Facts* (Washington, DC: annual issues). **Navigable channels:** U.S. Army Corps of Engineers, *A Citizen's Guide to the USACE*, available at www.corpsreform.org/sitepages/downloads/CitzGuideChptr1.pdf as of May 2017. **Great Lakes-St. Lawrence Seaway:** The St. Lawrence Seaway Development Corporation, "The Seaway," available at www.greatlakes-seaway.com/en/seaway/facts/index.html as of May 2017. **Pipelines:** U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, *Pipeline Statistics*, available at www.phmsa.dot.gov/pipeline/library/data-stats as of May 2017.

Table 3-2 Freight Intermodal Connectors on the National Highway System by State: 2015

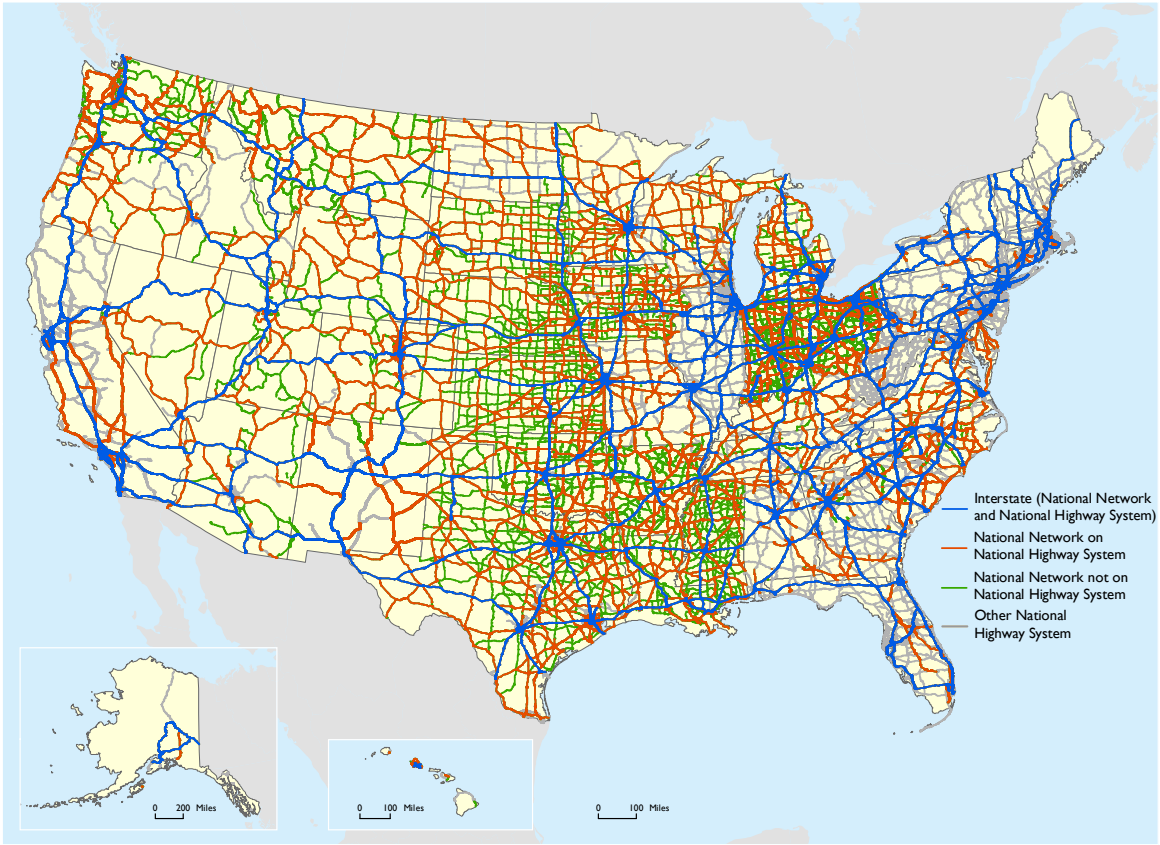
State	Port terminal	Truck/rail facility	Airport	Truck/pipeline terminal
Total	**329**	**269**	**268**	**68**
Alabama	5	4	4	1
Alaska	8	0	7	0
Arizona	0	2	4	0
Arkansas	3	7	3	3
California	17	15	14	3
Colorado	0	5	6	4
Connecticut	3	0	1	0
Delaware	1	0	1	0
Florida	14	12	25	0
Georgia	5	13	4	7
Hawaii	10	0	5	0
Idaho	1	0	2	1
Illinois	9	43	4	0
Indiana	8	2	5	0
Iowa	6	1	3	3
Kansas	0	4	1	2
Kentucky	4	7	3	3
Louisiana	9	9	8	0
Maine	3	4	5	0
Maryland	8	3	1	3
Massachusetts	5	10	12	0
Michigan	15	8	11	0
Minnesota	1	1	3	0
Mississippi	22	2	3	0
Missouri	4	8	4	0
Montana	0	0	1	0
Nebraska	0	2	1	1
Nevada	0	0	2	0
New Hampshire	1	0	4	0
New Jersey	5	5	2	0
New Mexico	0	0	1	0
New York	8	16	16	0
North Carolina	2	4	9	5
North Dakota	0	0	2	0
Ohio	29	19	8	4
Oklahoma	3	1	2	1
Oregon	15	5	6	1
Pennsylvania	8	8	5	4
Puerto Rico	5	0	4	0
Rhode Island	2	0	1	0
South Carolina	4	2	4	0
South Dakota	0	2	3	0
Tennessee	5	8	4	2
Texas	43	20	23	18
Utah	0	2	1	2
Vermont	0	2	2	0
Virginia	6	3	7	0
Washington	11	6	14	0
West Virginia	2	0	2	0
Wisconsin	19	4	5	0
Wyoming	0	0	0	0

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Planning, Environment, and Realty, Intermodal Connectors, available at www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/ as of July 2016.

Intermodal connectors are important components of the freight transportation network (see table 3-2). They provide access between major intermodal facilities, such as ports and truck/pipeline terminals, and the National Highway System (NHS). Although freight intermodal connectors account for less than 1 percent of total NHS mileage (1,604 miles in 2016), they are vital for truck movement. Texas has the highest number of freight intermodal connectors (104), followed by Ohio (60).

The National Network (NN) was established by Congress in 1982 to facilitate interstate commerce and encourage regional and national economic growth by requiring states to allow conventional combination trucks on the Interstate System and portions of the Federal-aid Primary System of highways. The NN, which has not changed significantly in three decades, differs in extent and purpose from the National Highway System (NHS). Both are about the same length, roughly 200,000 miles, but the NN includes approximately 65,000 miles of highways beyond the NHS, and the NHS includes about 50,000 miles of highways that are not on the NN. The NN supports interstate commerce by regulating the size of trucks, while the NHS supports interstate commerce by focusing federal investments.

Figure 3-1 National Network for Conventional Combination Trucks: 2016

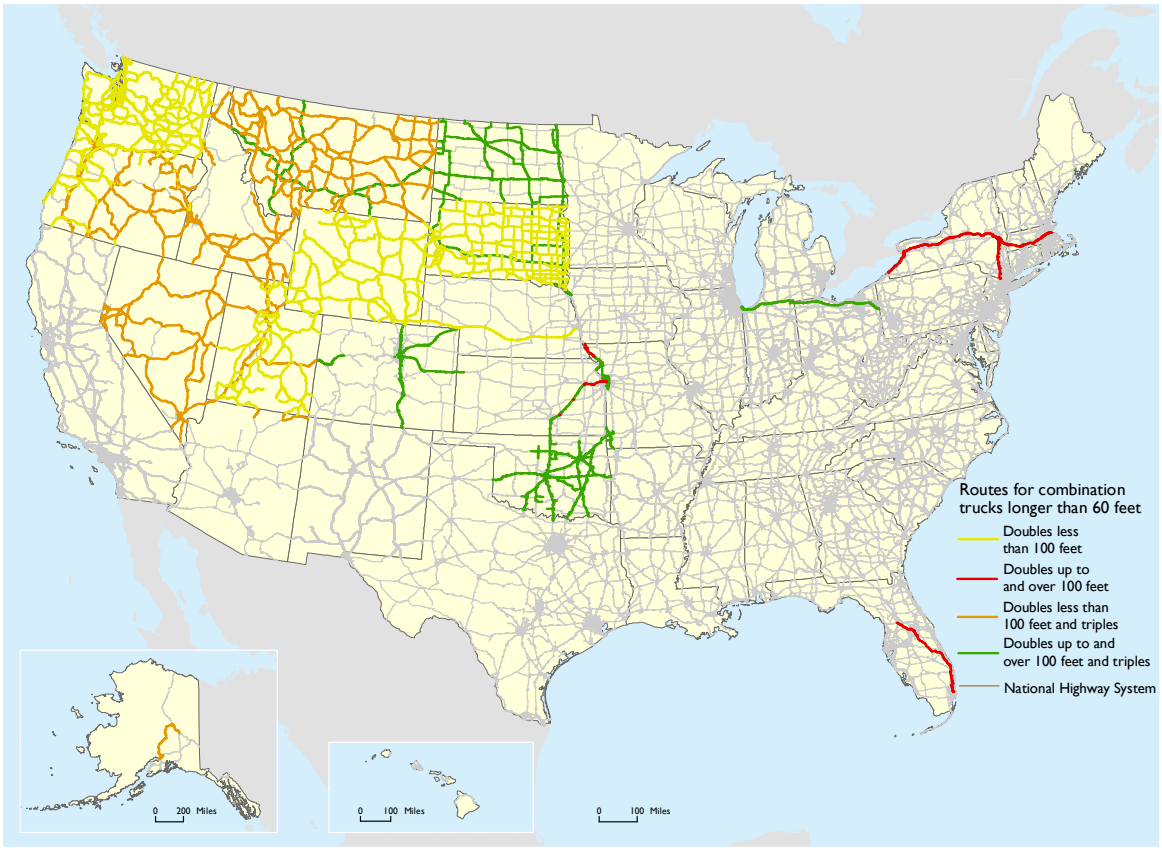


NOTES: This map should not be interpreted as the official National Network and should not be used for truck size and weight enforcement purposes. "Other National Highway System" refers to NHS mileage that is not included on the National Network. Conventional combination trucks are tractors with one semitrailer up to 48 feet in length or with one 28-foot semitrailer and one 28-foot trailer. Conventional combination trucks can be up to 102 inches wide.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, 2016.

Longer combination vehicles (LCVs) include truck tractors pulling a long semi-trailer plus a short trailer (often called a Rocky Mountain Double), a long semi-trailer and a long trailer (often called a Turnpike Double) or a short semi-trailer and two trailers (called a Triple). Although all states allow conventional combinations consisting of a 28-foot semi-trailer and a 28-foot trailer, only 14 states and 6 state turnpike authorities allow LCVs on at least some parts of their road networks. Allowable routes for LCVs have been frozen since 1991.

Figure 3-2 Permitted Longer Combination Vehicles on the National Highway System: 2016



NOTE: Empty triples are allowed on I-80 in Nebraska.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, 2016.

Current demands for truck parking spaces exceed supply, and projected increases in freight volume and a likely increase in the number of trucks may exacerbate the problem. Trucks moved 11.5 billion tons of goods, or 63.8 percent of total freight shipments, in 2015. That figure is projected to climb to 16.5 billion tons by 2045, an estimated 43 percent increase, according to the Freight Analysis Framework.

A recent Federal Highway Administration parking survey indicated that most states reported greater shortages of truck parking spaces at public facilities. Public parking facilities are typically located at state rest areas and welcome centers and offer few amenities. Of the 308,920 truck parking spaces available, 88.3 percent were provided by private truck stop operators. The survey noted that 37 states had truck parking shortages at all times throughout the week, and more than 75 percent of truck drivers reported having difficulty finding safe and legal parking during rest periods required by Federal Hours of Service regulations. That number increased to 90 percent at night when drivers often need to wait for their drop-off destination to open and accept deliveries. The shortage of truck parking facilities has major highway safety implications for both truck drivers and other highway users.

Table 3-3 Truck Parking Facilities by State: 2014

State	Total spaces	Ratio of private to public spaces	All spaces per 100k daily truck VMT	All spaces per 100 miles of NHS
Alabama	8,089	11.8	117.7	180.0
Alaska	179	0.0	86.1	6.6
Arizona	7,130	13.4	135.3	173.1
Arkansas	6,471	32.4	101.1	163.2
California	13,144	9.5	53.7	90.6
Colorado	4,487	4.3	106.2	89.7
Connecticut	1,536	1.9	60.2	104.8
Delaware	322	10.5	56.1	70.6
Florida	9,102	2.6	71.2	104.3
Georgia	13,718	7.1	122.3	197.0
Hawaii	0	0.0	0.0	0.0
Idaho	3,083	10.3	138.6	106.9
Illinois	11,262	5.9	76.9	141.1
Indiana	13,880	5.7	136.3	289.0
Iowa	7,180	9.5	115.8	138.1
Kansas	4,844	13.8	85.8	99.1
Kentucky	7,948	5.5	93.2	230.2
Louisiana	12,111	35.8	151.7	359.2
Maine	1,040	2.7	80.2	74.8
Maryland	3,036	5.2	72.2	129.0
Massachusetts	1,412	6.4	134.7	53.5
Michigan	7,392	3.6	95.2	111.0
Minnesota	4,266	5.8	116.9	74.6
Mississippi	6,140	7.6	105.9	169.5
Missouri	10,718	8.7	166.4	176.5
Montana	3,568	4.9	171.4	81.7
Nebraska	4,762	13.4	115.8	125.2
Nevada	3,971	16.6	157.4	150.6
New Hampshire	611	2.3	130.1	63.2
New Jersey	2,970	2.9	84.7	102.8

continued on next page

Table 3-3 Truck Parking Facilities by State: 2014 (continued)

State	Total spaces	Ratio of private to public spaces	All spaces per 100k daily truck VMT	All spaces per 100 miles of NHS
New Mexico	5,816	15.2	115.3	165.6
New York	5,383	7.5	83.2	68.9
North Carolina	5,845	7.1	80.5	93.4
North Dakota	2,858	15.1	102.9	74.0
Ohio	14,295	5.1	77.8	214.9
Oklahoma	7,527	39.9	107.0	168.7
Oregon	4,521	7.2	81.3	100.7
Pennsylvania	10,932	6.0	113.8	152.1
Rhode Island	226	7.7	31.4	38.5
South Carolina	7,948	8.4	131.5	211.8
South Dakota	2,765	5.8	128.8	71.8
Tennessee	7,679	9.8	54.2	162.6
Texas	27,380	22.8	80.6	147.3
Utah	3,633	5.9	70.1	125.5
Vermont	570	1.6	131.7	73.1
Virginia	8,192	10.2	95.5	182.9
Washington	3,596	2.9	68.5	77.6
West Virginia	2,388	2.7	107.9	116.1
Wisconsin	7,813	8.6	94.0	122.3
Wyoming	5,181	5.0	159.1	160.8

KEY: NHS = National Highway System; VMT = vehicle-miles traveled.

NOTE: All spaces includes public and private parking spaces.

SOURCE: U.S. Department of Transportation, Federal Highway Adminstration, Office of Freight Management and Operations, *Jason's Law Truck Parking Survey Results and Comparative Analysis* (Washington, DC: 2015), available at www.ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/index.htm as of August 2016.

A vast number of vehicles and vessels move goods over the transportation network. The number of highway vehicles and vessels has remained relatively stable in recent years, while the number of rail cars has continued to decline due to improved utilization and the deployment of larger cars.

Table 3-4 Number of Trucks, Locomotives, Rail Cars, and Vessels: 2000, 2010, and 2013–2015

	2000	2010	2013	2014	2015
Highway (all vehicles)[1]	**NA**	**250,070,048**	**255,876,822**	**260,350,938**	**263,610,219**
Total trucks	NA	10,770,054	10,597,356	10,905,956	11,203,184
Truck, single-unit 2-axle 6-tire or more	NA	8,217,189	8,126,007	8,328,759	8,456,302
Truck, combination	NA	2,552,865	2,471,349	2,577,197	2,746,882
Trucks as percent of all highway vehicles	NA	4.3	4.1	4.2	4.2
Rail					
Class I, locomotives	20,028	23,893	25,033	25,916	26,574
Total freight cars	1,380,796	1,309,029	1,335,639	NA	NA
Class I, freight cars[2]	560,154	397,730	373,838	NA	NA
Nonclass I, freight cars[2]	132,448	101,755	88,122	NA	NA
Car companies and shippers freight cars[2]	688,194	809,544	873,679	NA	NA
Water (total freight vessels)	**41,354**	**40,512**	**39,999**	**40,082**	**NA**
Nonself-propelled vessels[3]	33,152	31,412	31,081	31,043	NA
Self-propelled vessels[4]	8,202	9,100	8,918	9,039	NA

KEY: NA = not available.

[1] Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

[2] Beginning with 2001 data, Canadian-owned U.S. railroads are excluded. Canadian-owned U.S. railroads accounted for over 46,000 freight cars in 2000.

[3] Nonself-propelled vessels include dry-cargo barges, tank barges, and railroad-car floats.

[4] Self-propelled vessels include dry cargo, passenger, off-shore support, tankers, and towboats.

SOURCES: **Highway**: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1, available at https://www.fhwa.dot.gov/policyinformation/statistics.cfm as of May 2017. **Rail:** Locomotive: Association of American Railroads, *Railroad Facts* (Washington, DC: annual issues). **Freight cars:** Association of American Railroads, *Railroad Equipment Report* (Washington, DC: annual issues). **Water:** U.S. Army Corps of Engineers, Institute for Water Resources, *Waterborne Transportation Lines of the United States, Volume 1*, National Summaries (New Orleans, LA: annual issues), available at www.navigationdatacenter.us/veslchar/veslchar.htm as of May 2017.

Condition

Pavement smoothness is an important indicator of the condition of roads and bridges. The U.S. Department of Transportation, Federal Highway Administration uses the International Roughness Index to measure the roughness of pavement. Urban area interstates and other freeways and expressways and principal arterials showed modest improvements in pavement smoothness over the 2000 to 2015 period. In rural areas, interstates showed the greatest improvement (13.8 percent) in pavement smoothness, while other principal and minor arterials had increases in road roughness.

Table 3-5 Condition of U.S. Roadways by Functional System: 2000 and 2013–2015
(percent of mileage with an International Roughness Index over 170)

	2000	2013	2014	2015	Percent change, 2000 to 2015
Rural					
Interstates	2.1	2.4	2.2	1.8	-13.8
Other principal arterials	4.0	4.9	3.8	4.4	10.3
Minor arterials	7.0	7.2	7.2	7.9	13.3
Major collectors	22.1	19.7	20.3	21.5	-2.4
Urban					
Interstates	6.5	5.1	5.4	5.0	-22.6
Other freeways and expressway	10.9	7.2	8.5	8.2	-24.8
Other principal arterials	30.0	25.8	26.3	27.7	-7.7
Minor arterials	33.7	38.2	36.1	38.3	13.8
Collectors	52.3	53.7	49.8	52.2	-0.2

NOTES: Numbers may not add to totals due to rounding. Data are reported as the International Roughness Index (IRI) in inches per mile. Lower IRI represents smoother riding roadways. For more information on the rating system, refer to National Cooperative Highway Research Program (NCHRP) report 20-24(37)G, *Technical Guidance for Deploying National Level Performance Measurements*, available at http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24(37)G_FR.pdf as of June 2015.

SOURCE: U.S. Department of Transportation (USDOT), Federal Highway Administration, as cited in USDOT, Bureau of Transportation Statistics, *National Transportation Statistics*, Table 1-27, available at http://www.bts.gov/ as of May 2017.

Highway bridges are a critical part of road infrastructure. Many bridges are located in rural areas, but traffic is heaviest on urban bridges. The overall condition of bridges has improved slowly over time. In 2000, 15.2 percent of urban bridges (89,415) were considered structurally deficient, compared to 9.1 percent (56,007) in 2016. Structurally deficient bridges are characterized by the deteriorated condition of bridge elements and reduced load-bearing capacity. In some cases weight restrictions are placed on structurally deficient bridges, which may impact freight movement.

Table 3-6 Structurally Deficient U.S. Bridges: 2000 and 2013–2016

	2000	2013	2014	2015	2016	Percent change, 2000 to 2016
Total U.S. bridges	**587,135**	**607,708**	**610,749**	**611,845**	**614,386**	**4.6**
Structurally deficient bridges	89,415	63,510	61,365	58,791	56,007	-37.4
Percent structurally deficient bridges	15.2	10.5	10.0	9.6	9.1	
Total rural bridges	**455,357**	**444,488**	**444,457**	**443,092**	**443,610**	**-2.6**
Structurally deficient bridges	75,973	52,040	50,272	48,131	45,893	-39.6
Percent structurally deficient bridges	16.7	11.7	11.3	10.9	10.3	
Total urban bridges	**131,778**	**163,220**	**166,292**	**168,753**	**170,776**	**29.6**
Structurally deficient bridges	13,442	11,470	11,093	10,660	10,114	-24.8
Percent structurally deficient bridges	10.2	7.0	6.7	6.3	5.9	

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *National Bridge Inventory*. Available at https://www.fhwa.dot.gov/bridge/nbi.cfm as of May 2017.

The median age of the Class I Railroad locomotive fleet ranged from 16 to 20 years in 2015, compared to 11 to 15 years in 2010. Class I railroads added 12,327 new locomotives between 2000 and 2015. On average, about 3 percent of all locomotives are new in any given year.

Table 3-7 Class I Railroad Locomotive Fleet (locomotive units) by Year Built: 2000, 2010, and 2015

Year built[1]	2000	2010	2015
Before 1995	15,375	10,804	9,808
1995-1999	4,018	4,467	4,439
2000-2004	635	4,265	4,272
2004-2009	NA	4,098	4,030
2010-2014	NA	259	3,248
After 2014	NA	NA	777
Total	**20,028**	**23,893**	**26,574**
Median age range, years	16-20	11-15	16-20

[1]Disregards year of rebuilding.

KEY: NA = not available.

SOURCE: Association of American Railroads, *Railroad Facts* (Washington, DC: Annual Issues) p. 52 and similar pages in earlier editions.

The U.S. freight rail system owns and operates more than 138,000 rail miles, including 95,000 miles owned by Class I railroads (defined as having revenues of at least $457.9 million in 2015). To ensure the safety of the system, railroads inspect thousands of miles of track and make needed repairs each year. Of the eight track characteristics monitored, four have decreased since 2010—profile, alignments, warp, and limited speed—while exceptions for gage increased.

Table 3-8 Automated Track Inspection Program (ATIP) Exceptions[1] per 100 Miles: 2008–2015

	2008	2009	2010	2011	2012	2013	2014	2015	Average
Profile	2.4	1.9	2.1	2.4	1.4	17.4	9.9	1.5	4.9
Alignment	1.4	1.8	2.0	2.0	1.5	18.4	10.6	1.8	4.9
Gage	12.2	7.2	3.1	2.1	4.4	5.9	2.1	5.5	5.3
Cross-level	2.0	2.2	1.2	1.3	1.1	6.9	4.0	1.3	2.5
Warp	3.7	4.0	2.8	1.8	1.7	10.9	4.6	1.3	3.8
Runoff	0.6	0.7	0.6	0.8	0.4	10.0	8.4	0.7	2.8
Twist[2]	1.7	1.5	1.3	1.0	0.8	5.6	3.0	NA	2.1[3]
Limited speed	9.7	8.7	11.8	3.1	2.6	2.5	1.4	2.2	5.3
Total per 100 miles	**33.7**	**27.9**	**24.8**	**14.5**	**14.1**	**77.6**	**44.0**	**14.3**	**31.3**
Miles inspected	52,997	74,715	83,013	74,541	70,049	62,882	74,202	61,753	69,269

KEY: NA = not available.

[1] Exceptions mean track did not meet normal operation standards.

[2] Beginning in 2015, Federal Railroad Administration no longer reports Twist exceptions.

[3] 2008-2014 average.

NOTES: The ATIP program does not provide a comprehensive evaluation of the national rail network on an annual basis due to the limited number of surveying cars. Inspection locations vary by year and are prioritized by factors such as safety risk analysis and operation types. Defects are briefly defined as variations from design values for the following track geometry properties:

Profile - rail surface elevations
Alignment - track direction (tangent or curvature)
Gage - distance between rails
Cross-level - elevation difference between the rails
Warp - maximum change in cross-level over a specified distance
Runoff - elevation (ramp) difference of a line along the top of the rail is used for the projection
Twist - rate of introduction and removal of cross-level on transitions from straight to curved track alignment
Limited Speed - reduced operating speed due to track geometry constraints
Detailed definitions and standards may be found in U.S. Department of Transportation, Federal Railroad Administration, *Track and Rail and Infrastructure Integrity Compliance Manual*, July 2012.

SOURCE: U.S. Department of Transportation, Federal Railroad Administration, Office of Safety, *ATIP Statistics*, special tabulation, May 2016.

U.S. flag vessels include a wide range of vessel types that are used to move freight around the globe. However, shallow draft vessels (barges and towboats) make up 93.8 percent of the fleet and operate domestically on intracoastal waterways and river systems. Our inland waterways provide an alternative to truck and rail transportation, a barge can carry an amount equal to or greater than 15 railcars or 60 large semi-truck trailers.

Overall, the U.S. fleet decreased by more than 1,272 vessels (3.1 percent) between 2000 and 2014, largely due to the retirement of dry bulk barges. An increase in the percentage of tankers and liquid bulk barges 10 or less years old was largely driven by The Oil Pollution Act (OPA) of 1990, which required double hulls by January 1, 2015. Double hulls provide greater protection to the marine environment from spills caused by collisions or groundings.

Table 3-9 U.S. Flag Vessels by Type and Age: 2000 and 2014

	Vessel type							
Age[1]	**Dry cargo**	**Tanker**	**Towboat**	**Passenger**	**Crewboat**	**Dry barge**	**Liquid barge**	**Total**
2000, Total vessels	**737**	**135**	**4,995**	**918**	**1,414**	**29,141**	**4,011**	**41,354**
Age in years				**Percent**				
<6	9.0	8.1	6.5	14.6	17.4	23.1	14.5	19.6
6–10	6.8	3.0	2.9	12.9	7.5	10.5	8.2	9.2
11–15	15.3	5.9	2.8	19.4	4.1	5.4	1.2	5.1
16–20	18.5	25.2	18.6	13.5	32.1	20.1	15.0	19.6
21–25	14.2	22.2	19.1	9.8	23.5	18.4	17.8	18.3
>25	35.7	35.6	50.0	29.5	15.1	22.2	42.7	27.7
2014, Total vessels	**846**	**61**	**5,476**	**853**	**1,692**	**26,387**	**4,869**	**40,082**
Age in years				**Percent**				
<6	6.5	27.9	10.3	3.1	11.8	18.3	29.7	19.4
6–10	8.8	24.6	8.3	5.8	12.3	15.3	18.1	12.2
11–15	12.7	11.5	6.0	7.4	12.0	14.4	10.5	14.4
16–20	11.2	8.2	5.0	11.3	10.2	19.2	8.8	13.6
21–25	8.8	3.3	2.8	16.3	4.6	10.1	5.9	7.7
>25	52.1	24.6	67.6	56.2	49.1	22.8	27.0	32.7
>25 Change from 2000	16.4	-11.0	17.6	26.6	33.9	0.6	-15.8	5.0
Median age range								
Year				**Median age range in years**				
2000	16-20	21-25	21-25	16-20	16-20	16-20	21-25	16-20
2014	>25	6-10	>25	>25	21-25	16-20	11-15	16-20

[1] Age is based on the year the vessel was built or rebuilt.

NOTES: Figures include vessels available for operation. Passenger vessel includes ferries. Totals may be greater than sum because of unclassified vessels and vessels of unknown age, hence percentages may not add to 100, and also due to rounding.

SOURCE: U.S. Army Corps of Engineers, *Waterborne Transportation Lines of the United States, Volume 1: National Summaries* (Washington, D.C.: 2015), available at www.navigationdatacenter.us/veslchar/veslchar.htm as of April 2017.

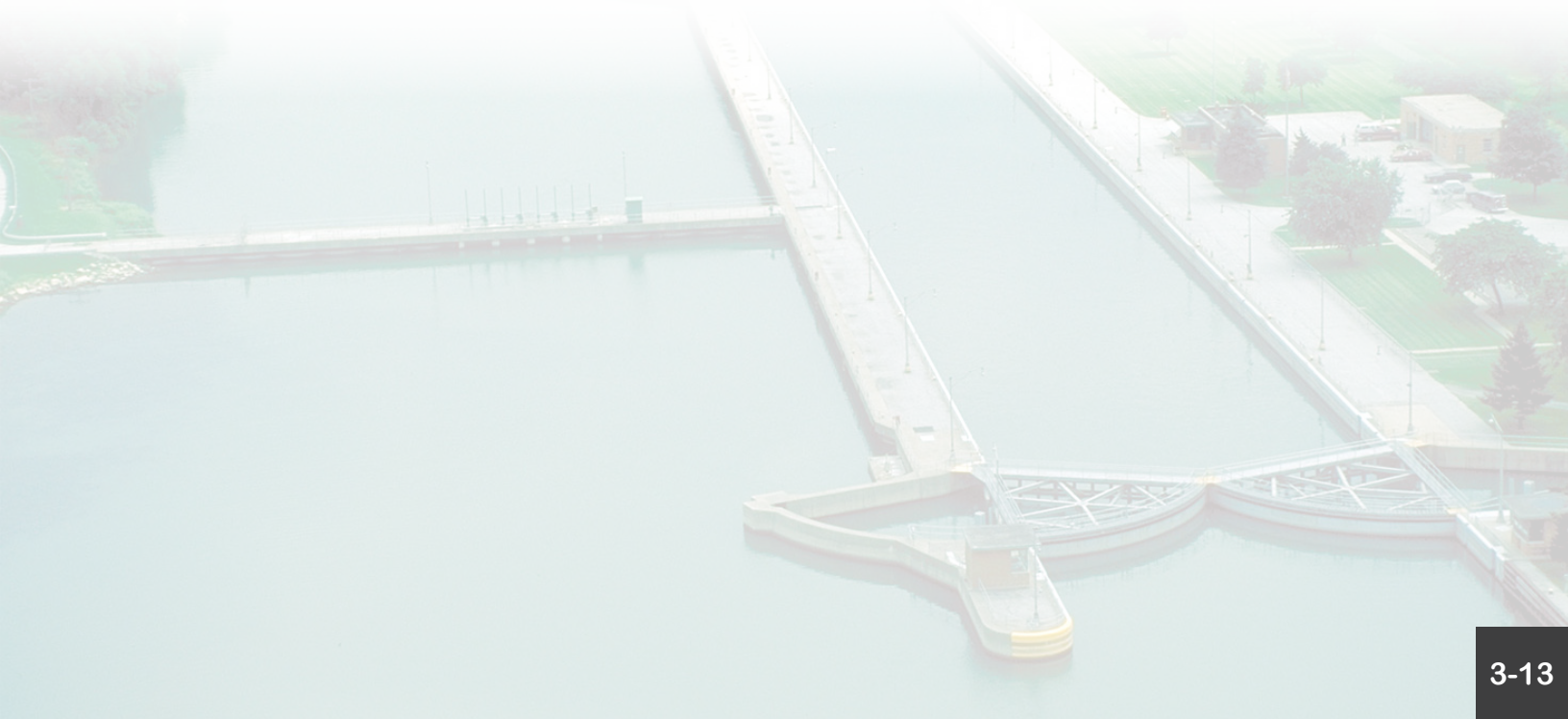
Locks make it easier for vessels to navigate the uneven water levels of U.S. rivers. Because of increasing traffic and aging locks, vessels may be delayed for hours while locks are shut down for maintenance and repair. The U.S. Army Corps of Engineers reports that the average age of all locks in 2015 was 60 years, with many locks exceeding that average. Between 2000 and 2015, average delay per lockage more than doubled from 64 to 143 minutes.

Table 3-10 Lock Characteristics and Delays in Rivers with 10,000 or More Lockages: 2000, 2010, and 2015

	Total lockages (2015)	Percent commercial lockages of all lockages (2015)	Average age of locks (2015)	Average delay in minutes			Percent of vessels delayed		
				2000	2010	2015	2000	2010	2015
All waterways	**595,089**	**77.9**	**60**	**64**	**80**	**143**	**35**	**36**	**48**
Ohio River	104,487	92.9	53	52	97	140	31	34	45
Mississippi River	99,339	72.1	74	90	81	109	20	19	42
Gulf Intracoastal Waterway	38,811	98.9	53	58	65	164	78	84	91
Illinois Waterway	24,941	94.1	81	127	53	143	41	29	65
Monongahela River	22,784	85.5	71	12	11	25	16	18	27
Tennessee River	22,370	69.3	69	209	122	432	24	24	51
Tennessee Tombigbee Waterway	19,403	72.1	33	9	3	19	38	10	16
Arkansas River	18,351	91.8	47	11	13	12	35	23	25
Chicago River	11,006	68.6	78	5	5	17	1	1	79

NOTES: A lockage is the movement through the lock by a vessel or other matter. Commercial vessels include all vessels operated for purposes of profit and include freight and passenger vessels.

SOURCE: United States Army Corps of Engineers, Navigation Data Center, *Lock Use, Performance, and Characteristics* (Alexandria, VA: annual issues), available at www.navigationdatacenter.us/ as of June 2017.



Most airport runway pavements at commercial, reliever, and select general aviation facilities were in good condition between 2000 and 2014, with 17 percent rated as fair. Only 2 percent of airport runway pavements were rated as poor.

Table 3-11 Condition of Airport Runway Pavement: 2000, 2010 and 2014–2016

	2000	2010	2014	2015	2016
NPIAS[1] airports, number	**3,361**	**3,332**	**3,331**	**3,330**	**3,332**
Good condition (percent)	73	79	80	80	80
Fair condition (percent)	22	18	17	18	18
Poor condition (percent)	5	3	2	2	2
Commercial service airports,[2] number	**546**	**503**	**514**	**506**	**510**
Good condition (percent)	79	82	83	84	84
Fair condition (percent)	19	16	15	15	15
Poor condition (percent)	2	2	2	1	1

KEY: NPIAS = National Plan of Integrated Airport Systems.

[1] The U.S. Department of Transportation, Federal Aviation Administration's (FAA's) National Plan of Integrated Airport Systems is composed of all commercial service airports, all reliever airports, and selected general aviation airports. It does not include over 1,000 publicly owned public-use landing areas, privately owned public-use airports, and other civil landing areas not open to the general public. NPIAS airports account for almost all enplanements. In 2005, there were approximately 16,500 non-NPIAS airports.

[2] Commercial service airports are defined as public airports receiving scheduled passenger service, and having at least 2,500 enplaned passengers per year.

NOTES: Data are as of January 1 of each year. Runway pavement condition is classified by the FAA as follows: Good: All cracks and joints are sealed. Fair: Mild surface cracking, unsealed joints, and slab edge spalling. Poor: Large open cracks, surface and edge spalling, vegetation growing through cracks and joints.

SOURCES: U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Planning and Programming, National Planning Division, personal communication, February 2017.

Gas distribution pipelines comprise the largest components of the U.S. pipeline system. In 2016 gas distribution pipeline mileage totaled nearly 1.29 million miles. Approximately 31.5 percent of U.S. gas distribution pipelines were installed before 1970, and nearly 7 percent were installed prior to 1950. Age and degradation of pipeline material increase the risk of leaks and failures. Most old pipelines are located in the Northeast, while the newest pipelines are found in North Dakota, where recent oil and gas development has spurred the installation of new pipeline infrastructure.

Table 3-12 Gas Distribution Pipelines by Decade Installed: 2005, 2010, and 2014–2016

(percent)

Calendar year	2005	2010	2014	2015	2016
Pre 1940s	6.1	5.7	4.9	4.7	4.9
1940s	2.4	2.3	2.1	2.0	1.9
1950s	9.2	9.5	8.8	8.6	8.6
1960s	16.6	11.5	16.6	16.2	16.1
1970s	11.0	13.6	11.3	11.1	11.2
1980s	12.9	13.6	13.4	13.1	13.2
1990s	19.6	20.3	20.2	19.9	20.1
2000s	11.4	17.9	17.7	17.7	17.6
2010s	NA	1.0	5.9	7.5	8.9
Unknown	10.7	6.6	7.8	8.8	7.9
Total miles	**1,165,057**	**1,229,850**	**1,266,290**	**1,276,879**	**1,285,713**

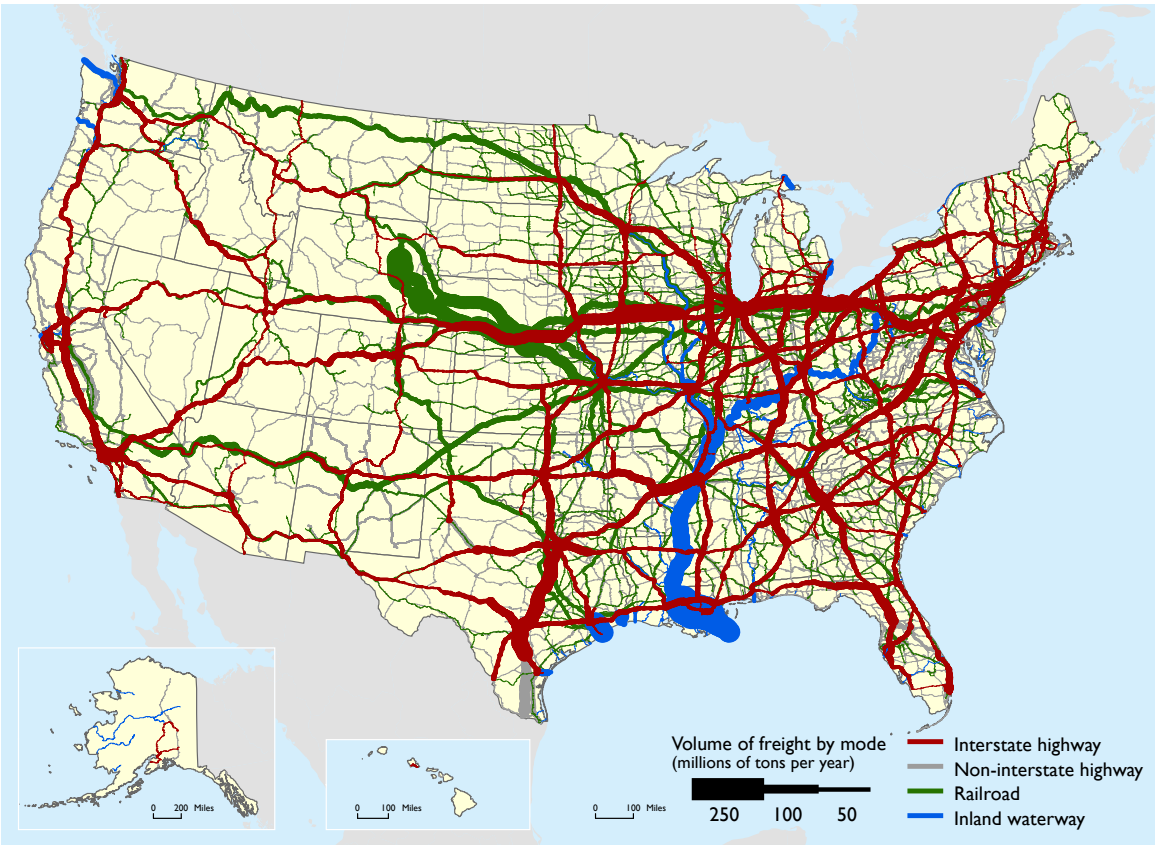
KEY: NA = not available.

SOURCE: U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, *Pipeline Replacement Updates*, available at http://opsweb.phmsa.dot.gov/pipeline_replacement/ as of May 2017.

Freight Flows

Trucks carry most of the tonnage and value of freight in the United States, but railroads and waterways carry significant volumes over long distances. Rail moves a large volume of coal between the Powder River Basin in Wyoming and the Midwest, while the principal inland waterways movement, by freight volume, occurs along the Lower Mississippi River.

Figure 3-3 Freight Flows by Highway, Railroad, and Waterway: 2012

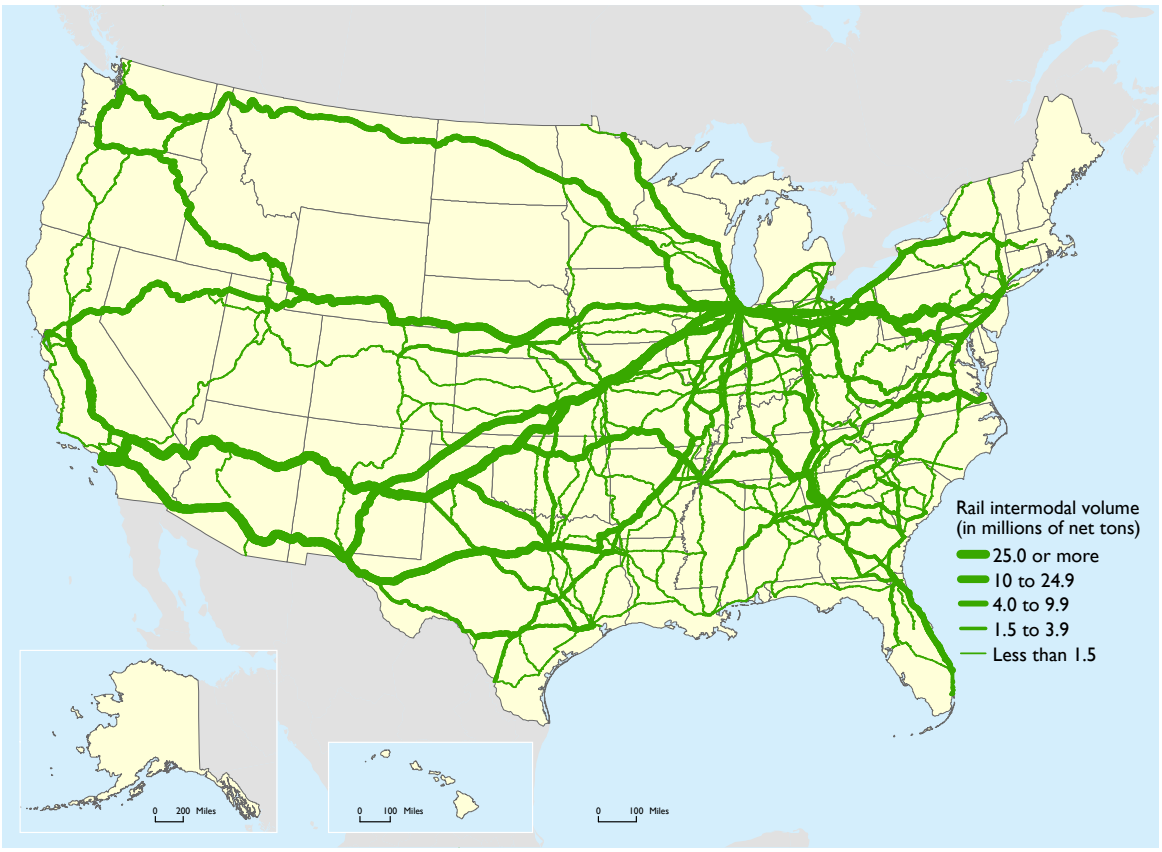


NOTE: The Freight Analysis Framework (FAF) is based in large part on results from the Commodity Flow Survey (CFS), last administered in 2012.

SOURCES: Highway: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016; **Rail**: Based on Surface Transportation Board, Annual Carload Waybill Sample and rail freight flow assignment done by Oakridge National Laboratory, 2016; **Inland Waterways**: U.S. Army Corps of Engineers, Institute of Water Resources, Annual Vessel Operating Activity and Lock Performance Monitoring System data, 2016.

Different modes of transportation are frequently used in combination to move cargo. The classic forms of rail intermodal transportation are trailer-on-flatcar and container-on-flatcar, and these services are spread throughout the United States. The largest concentrations are on routes between Pacific Coast ports and Chicago, southern California and Texas, and Chicago and New York.

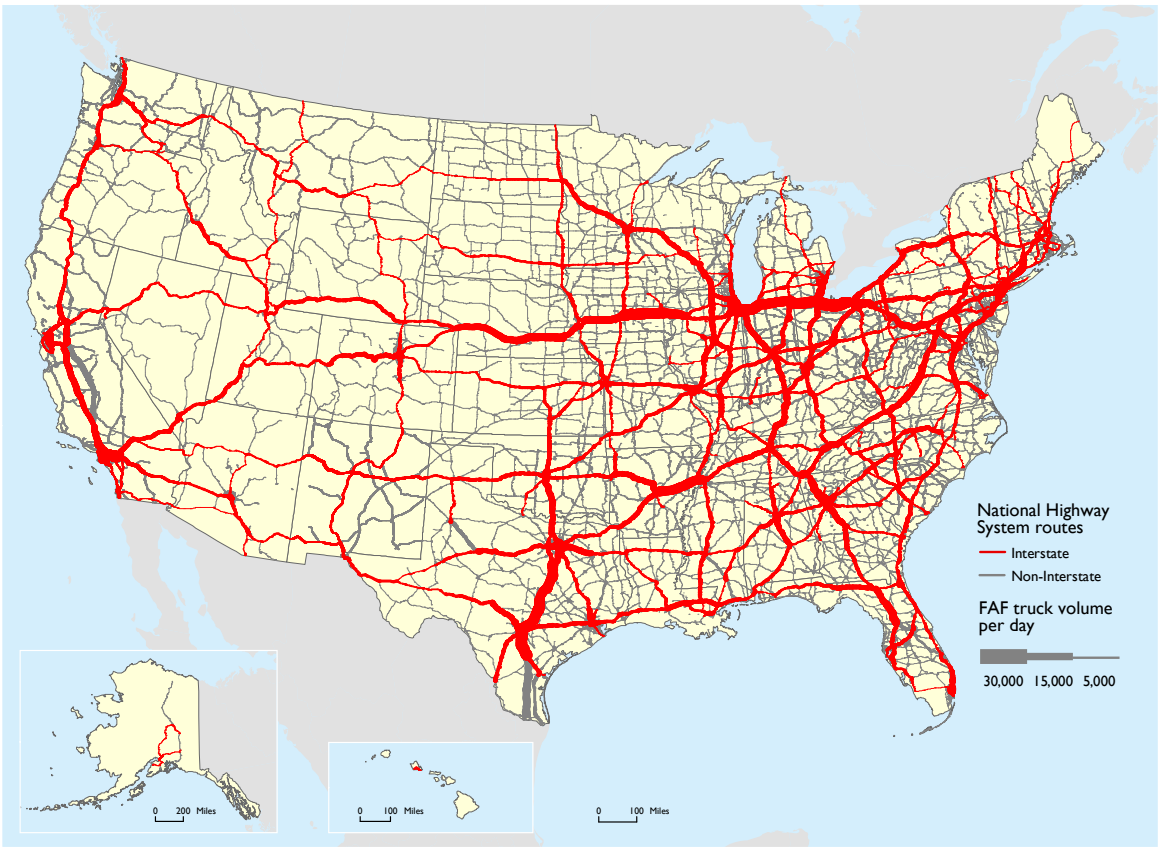
Figure 3-4 Tonnage of Trailer-on-Flatcar and Container-on-Flatcar Rail Intermodal Moves: 2013



SOURCE: U.S. Department of Transportation, Federal Railroad Administration, special tabulation, 2016.

Long-haul freight truck traffic in the United States is concentrated on major routes connecting population centers, ports, border crossings, and other major hubs of activity. Except for Route 99 in California and a few toll roads and border connections, most of the heaviest traveled routes are on the Interstate System.

Figure 3-5 Average Daily Long-Haul Truck Traffic on the National Highway System: 2012

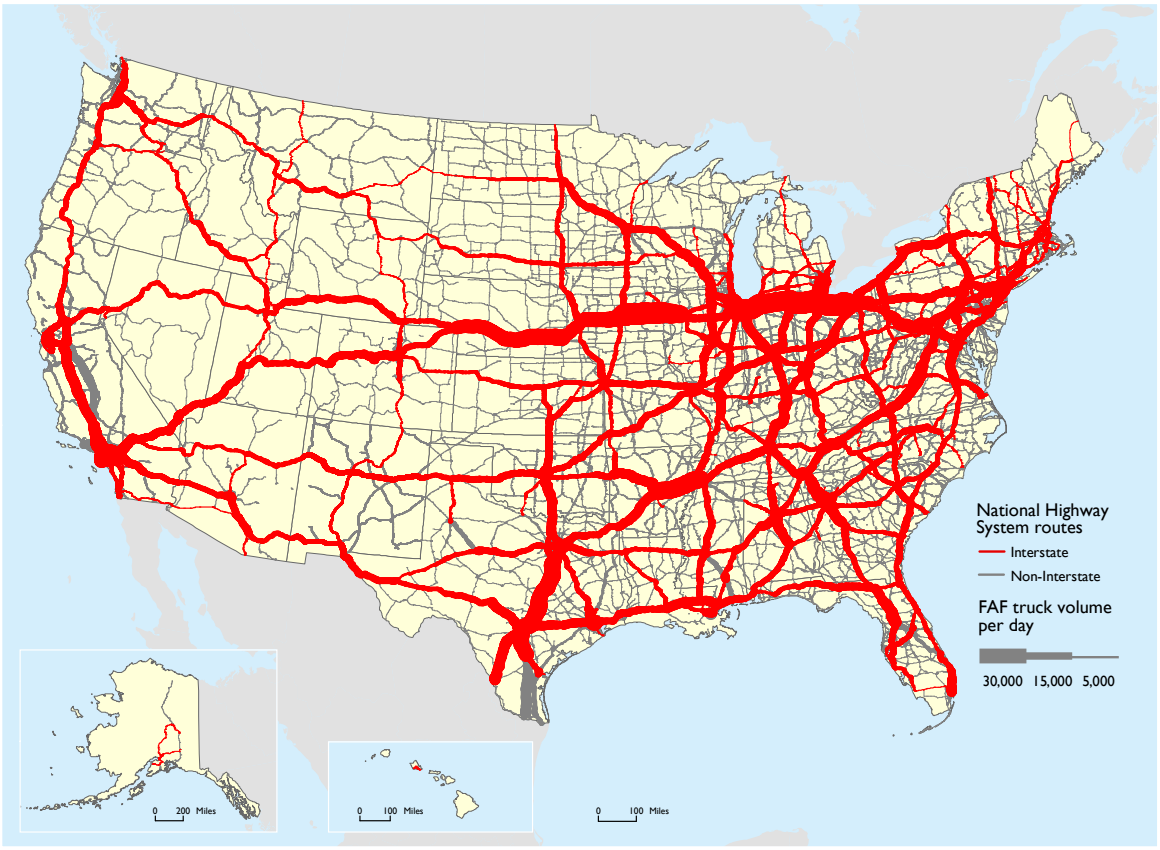


NOTES: The Freight Analysis Framework (FAF) is based in large part on results from the Commodity Flow Survey (CFS), last administered in 2012. Long-haul freight trucks typically serve locations at least 50 miles apart, excluding trucks that are used in movements by multiple modes and mail.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Long-haul freight truck traffic on the National Highway System is projected to increase dramatically. Projected data indicate that truck travel may increase from 282 million miles per day in 2012 to 488 million miles per day by 2045.

Figure 3-6 Projected Average Daily Long-Haul Truck Traffic on the National Highway System: 2045

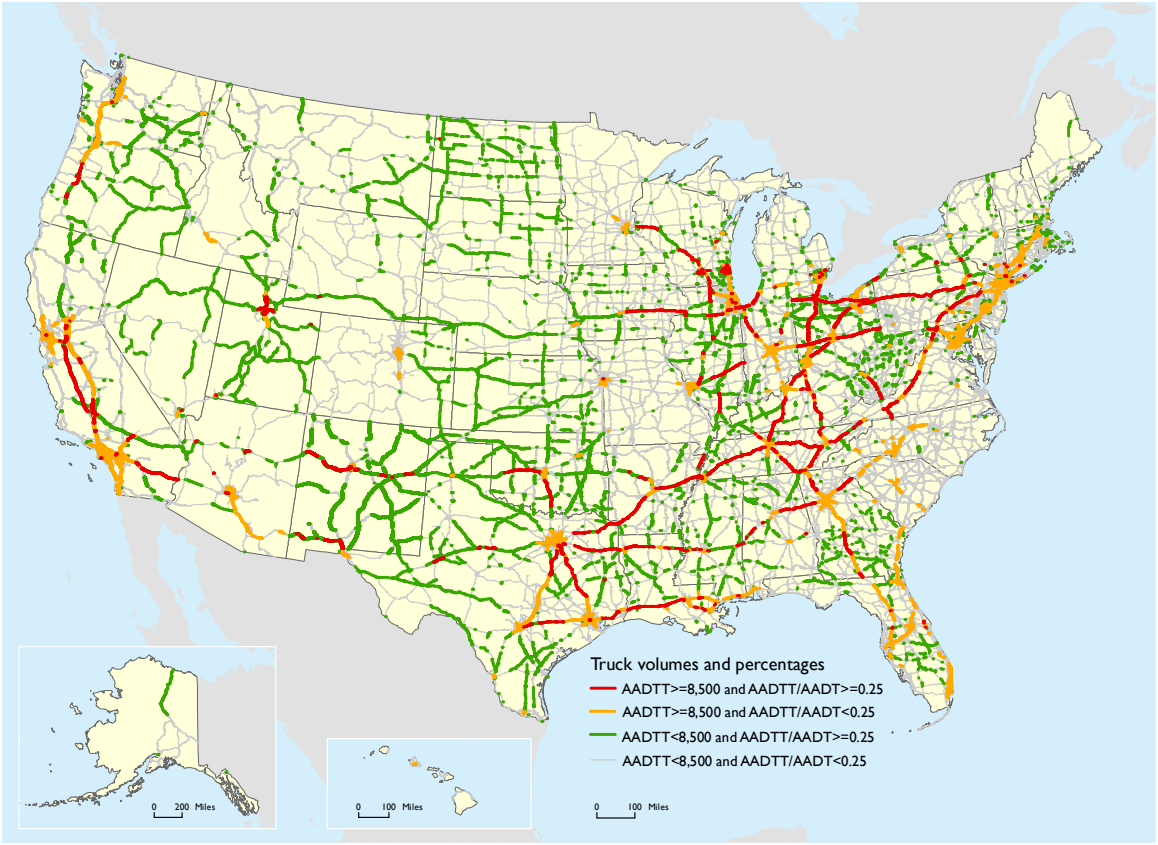


NOTES: Long-haul freight trucks typically serves locations at least 50 miles apart, excluding trucks that are used in movements by multiple modes and mail.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Several routes carry a significant concentration of trucks, either as an absolute number or as a percentage of the traffic stream. Nearly 5,560 miles of the 222,743 miles of the National Highway System carry more than 8,500 trucks per day where at least every fourth vehicle is a truck.

Figure 3-7 Major Truck Routes on the National Highway System: 2012

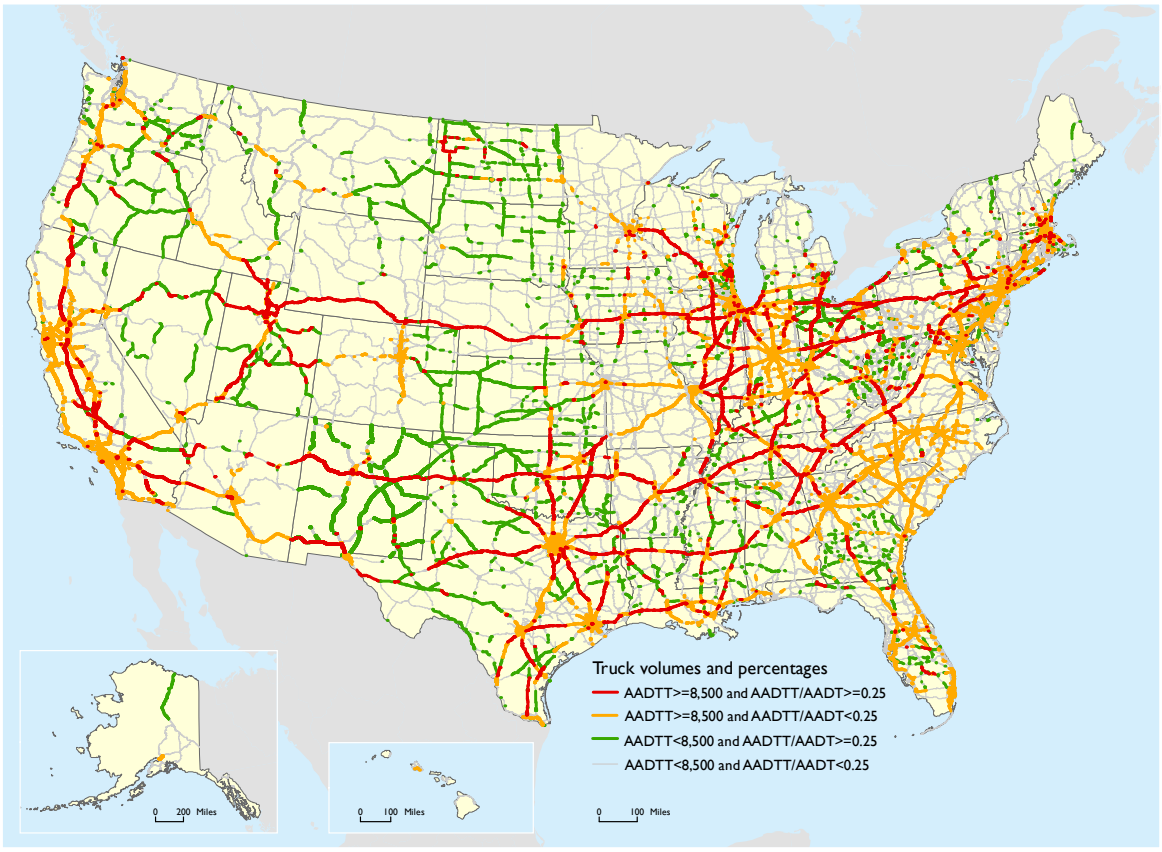


NOTES: The Freight Analysis Framework (FAF) is based in large part on results from the Commodity Flow Survey (CFS), last administered in 2012. Average annual daily truck traffic (AADTT) includes all freight-hauling and other trucks with six or more tires and includes all motor vehicles.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

The number of National Highway System miles carrying large volumes and high percentages of trucks is projected to increase dramatically by 2045. Segments with more than 8,500 trucks per day and where at least every fourth vehicle is a truck are estimated to grow from 5,560 miles in 2012 to 13,480 in 2045, an increase of more than 140 percent.

Figure 3-8 Projected Major Truck Routes on the National Highway System: 2045



NOTES: Average annual daily truck traffic (AADTT) includes all freight-hauling and other trucks with six or more tires and includes all motor vehicles.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Freight goods depend heavily on the Interstate System for delivery. Although only one-fourth of the miles traveled by all traffic is on the Interstate System, about one-half of combination-truck vehicle miles of travel are on interstate highways.

Table 3-13 Annual Vehicle Miles Traveled by Highway Category and Vehicle Type: 2015

	Combination trucks	Single-unit trucks[1]	Other[2]	Light-duty vehicles[3]	Total, all motor vehicles
Interstate vehicle-miles (millions)	88,695	27,163	7,878	653,216	776,952
Interstate percent	52.1	24.8	22.0	23.5	25.1
Non-interstate vehicle-miles (millions)	81,551	82,434	27,958	2,126,477	2,318,421
Non-interstate percent	47.9	75.2	78.0	76.5	74.9
Total vehicle-miles, all roadways	**170,246**	**109,597**	**35,836**	**2,779,693**	**3,095,373**

[1] Trucks on a single frame with at least two axles and six tires.

[2] Includes buses and motorcycles.

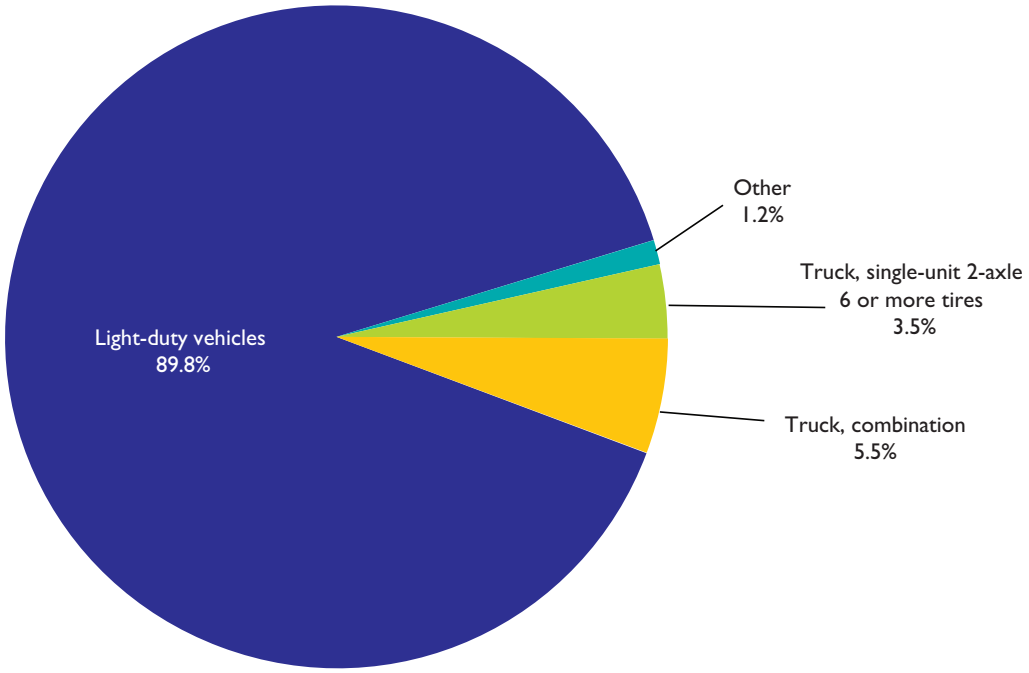
[3] Includes passenger cars, light trucks, vans and sport utility vehicles with a wheelbase equal to or less than 121 inches and large passenger cars, vans, light trucks, and sport utility vehicles with a wheelbase larger than 121 inches.

NOTES: Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*. Numbers may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table VM-1, available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017.

Despite doubling over the past two decades, truck traffic remains a relatively small share of highway traffic as a whole. In 2015 commercial trucks accounted for approximately 9 percent of highway vehicle-miles traveled. Truck tractors hauling semitrailers and other truck combinations accounted for approximately 60.8 percent of commercial truck travel, while single-unit trucks with six or more tires accounted for the remainder.

Figure 3-9 Share of Highway Vehicle-Miles Traveled by Vehicle Type: 2015



NOTES: "Other" comprises bus and motorcycle. "Light-duty vehicles" includes passenger cars, light trucks, vans, and sport utility vehicles.
Based on a new methodology, FHWA revised its annual vehicle miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this figure should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1, available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017.

Federal and state governments are concerned about truck weight because of the damage that heavy trucks can do to roads and bridges. To monitor truck weight, more than 208.3 million trucks were weighed in 2015, about 68.9 percent of which were weigh-in-motion, and 31.1 percent were weighed by static scales. Less than 0.2 percent of commercial vehicle weighs resulted in violations.

Table 3-14 Commercial Vehicle Weight Enforcement Activities: 2010, 2013–2015

	2010	2013	2014	2015
Total weigh activities	**198,564,690**	**201,496,351**	**227,808,233**	**208,293,951**
Weigh-in-motion	118,025,789	132,649,414	162,778,481	143,575,224
Static weighs[1]	80,538,901	68,846,937	65,029,752	64,718,727
Semiportable scales	285,484	259,749	235,537	263,099
Fixed scales	79,703,573	68,078,834	64,230,976	64,012,285
Portable scales	549,844	508,354	563,239	443,343
Violations[2]	**478,576**	**398,826**	**381,803**	**371,964**
Axle weight violations	216,735	176,898	161,964	163,612
Gross weight violations	114,171	87,714	85,461	76,412
Bridge weight violations	147,670	134,214	134,378	131,940
Permits[3]	**4,838,663**	**5,376,723**	**5,484,632**	**5,325,347**
Non-divisible trip permits	3,510,301	4,166,689	4,316,084	4,027,297
Non-divisible annual permits	303,230	336,333	364,824	341,048
Divisible trip permits	341,737	311,942	356,156	494,160
Divisible annual permits	683,395	561,759	447,568	462,842

[1] Static weighs include the total number of vehicles weighed from semiportable, portable, and fixed scales.

[2] Violations include those from axle, gross, and bridge formula weight limits.

[3] Permits issued are for divisible and non-divisible loads on a trip or on an annual basis, as well as for the over-width movement of a divisible load.

NOTE: Incomplete data from District of Columbia (2008), Hawaii (2008, 2009, 2010, and 2011), Massachusetts (2010), New Hampshire (2011), and Vermont (2011).

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Annual State Certifications of Size and Weight Enforcement on Federal-aid Highways, as prescribed under CFR Part 657, June 2017.

The top three U.S. airports together handled more than one-third of the total landed weight of all-cargo operations; they are Memphis, Anchorage, and Louisville. Memphis and Louisville are major hubs for FedEx and the United Parcel Service, respectively, and Anchorage is a major international gateway for trade with Asia. Both Memphis and Louisville experienced an increase of more than 50 percent between 2000 and 2015.

Table 3-15 Top 25 Airports by Landed Weight[1] of All-Cargo[2] Operations: 2000, 2010, and 2013–2015

		Landed weight (thousands of short tons)				
Airport	**2015 rank**	**2000**	**2010**	**2013**	**(R) 2014**	**2015**
Memphis, TN	1	6,318	9,772	10,946	11,387	11,274
Anchorage, AK (Ted Stevens)[3]	2	8,084	9,732	7,991	7,934	8,570
Louisville, KY (Standiford Field)	3	3,987	5,319	5,632	5,784	6,029
Chicago, IL (O'Hare)	4	2,062	2,448	3,432	3,771	4,532
Miami, FL	5	2,929	3,453	3,424	3,596	3,786
Los Angeles, CA	6	2,884	2,359	2,634	2,678	2,662
Indianapolis, IN	7	2,892	1,977	2,100	2,149	3,280
Dallas/Fort Worth, TX	8	912	1,216	1,711	1,822	1,541
New York, NY (John F. Kennedy)	9	2,793	1,962	1,686	1,585	1,628
Cincinnati, OH[4]	10	1,691	1,516	1,531	1,570	1,664
Oakland, CA	11	1,811	1,324	1,362	1,477	1,525
Newark, NJ (Newark Liberty)	12	1,961	1,489	1,267	1,250	1,445
Ontario, CA	13	1,220	1,121	1,186	1,180	1,294
Atlanta, GA (Hartsfield-Jackson)	14	1,090	1,314	1,094	1,131	1,229
Honolulu, HI	15	692	1,062	1,058	1,095	1,132
Philadelphia, PA	16	1,454	994	942	964	951
Houston, TX (George Bush)	17	480	763	852	867	873
Seattle, WA (Seattle-Tacoma)	18	1,060	697	693	787	785
Phoenix, AZ (Sky Harbor)	19	920	607	688	718	758
Denver, CO	20	900	619	630	657	682
San Francisco, CA	21	1,267	652	596	623	590
Portland, OR	22	882	531	569	563	585
San Juan, PR (Luis Munoz Marin)	23	485	441	424	425	504
Minneapolis, MN	24	622	512	366	486	493
Columbus, OH (Rickenbacker)	25	310	342	348	367	460
Top 25 airports[5]		**52,381**	**52,350**	**53,348**	**55,013**	**58,272**
United States, all airports[6]		**74,743**	**67,530**	**68,655**	**70,629**	**74,071**
Top 25 as percent of U.S. total		**70.1**	**77.5**	**77.7**	**77.9**	**78.7**

KEY: R = revised.

[1] Aircraft landed weight is the certificated maximum gross landed weight of the aircraft as specified by aircraft manufacturers.

[2] All-cargo operations do not include aircraft carrying passengers that also may be carrying cargo.

[3] Anchorage includes a large share of all-cargo operations in-transit.

[4] Dedicated to the exclusive transportation of cargo.

[5] Airport rankings change each year. Totals represent the top 25 airports for each year, not necessarily the top 25 airports listed here for 2015.

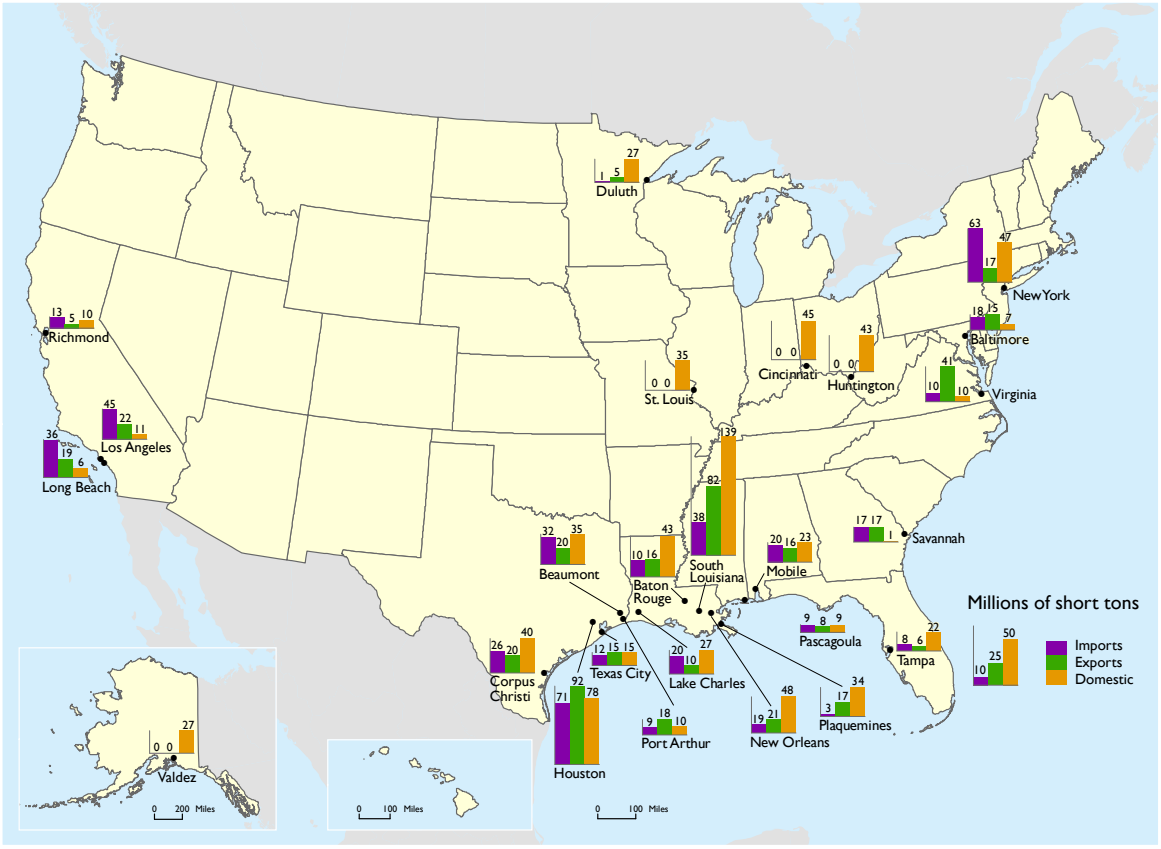
[6] Limited to airports with an aggregate landed weight in excess of 100 million pounds (50,000 short tons) annually.

NOTE: A short ton = 2,000 pounds.

SOURCE: U.S. Department of Transportation, Federal Aviation Administration, Air Carrier Activity Information System (ACAIS) database, All-Cargo Data, available at www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/ as of July 2016.

Although the top ports for containerized cargo are primarily on the Pacific and Atlantic Coasts, bulk cargo, such as coal, crude petroleum, and grain, moves through ports on the Gulf Coast and inland waterway system. The top 25 water ports by tonnage handled 69.1 percent of the weight of all domestic and foreign goods moved by water in 2015.

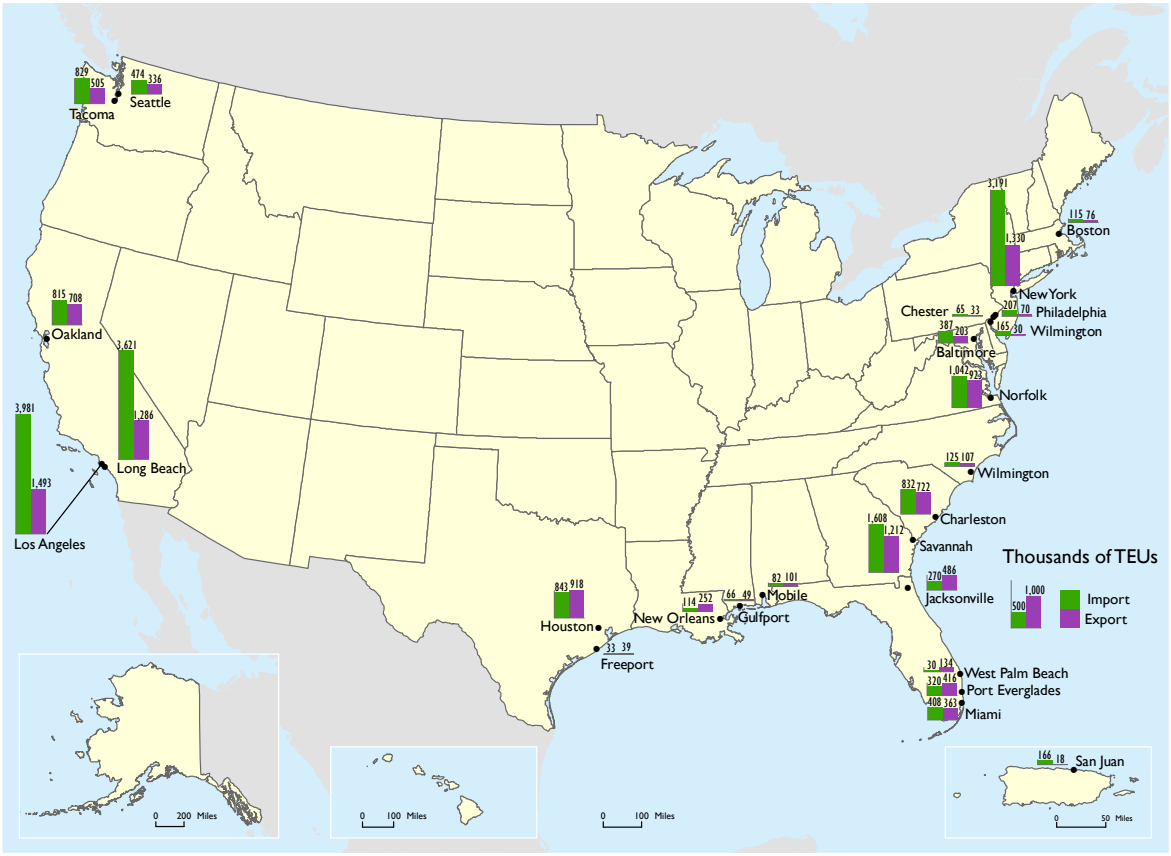
Figure 3-10 Top 25 Water Ports by Tonnage: 2015
(millions of short tons)



SOURCE: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, *Tonnage for Selected U.S. Ports in 2015*, available at www.navigationdatacenter.us/wcsc/porttons14.html as of November 2016.

Containerized cargo has grown rapidly from 17.9 million TEUs in 2000 to 32.0 million TEUs in 2015, and is concentrated at a few large water ports. The Ports of Los Angeles and Long Beach together handled 32.4 percent of all container traffic at water ports in the United States. Container trade at these two ports increased by nearly 61 percent between 2000 and 2015, but was outpaced by the growth in container trade for the entire United States, which grew by 79 percent.

Figure 3-11 Top 25 Water Ports by Volume of Containerized Cargo: 2015
(thousands of TEUs)



KEY: TEUs = twenty-foot equivalent units.

NOTE: The statistics include both government and non-government shipments by vessel into and out of U.S. foreign trade zones, the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Transportation, Maritime Administration, *U.S. Waterborne Container Trade by U.S. Custom Ports*, available at www.marad.dot.gov/resources/data-statistics/ as of June 2016.

In 2015, 7,836 oceangoing vessels made 82,044 calls at U.S. ports, a 36.8 percent increase since 2005. Tankers accounted for 40.4 percent of total calls, followed by containerships (22.8 percent) and dry bulk vessels (16.7 percent).

Table 3-16 Number of Vessel Calls at U.S. Ports: 2005, 2010, and 2013–2015
(vessels weighing 10,000 deadweight tons or greater)

Type	2005	(R) 2010	2013	2014	2015	Percent change, 2005–2015
Tanker	19,900	20,621	30,167	32,582	33,106	66.4
Container	18,532	19,466	19,920	19,743	18,711	1.0
Dry Bulk	11,191	9,162	10,946	14,064	13,666	22.1
Roll on/Roll off	5,626	5,838	5,909	6,233	7,065	25.6
Gas (LPG/LNG)	876	697	1,261	1,352	1,703	94.4
General Cargo	3,839	3,544	7,484	8,314	7,793	103.0
All types	**59,964**	**59,328**	**75,687**	**82,288**	**82,044**	**36.8**

KEY: R = revised.

NOTE: Deadweight tons (DWT) is a measurement of the capacity of a vessel. DWT is defined as the total weight (metric tons) of cargo, fuel, fresh water, stores and crew that a ship can carry when immersed to its load line.

SOURCE: U.S. Department of Transportation, Maritime Administration, *Vessel Calls in U.S. Ports* (Washington, DC: annual issues), available at www.marad.dot.gov/resources/data-statistics/ as of August 2016.

The average vessel capacity per call at U.S. ports has increased 2.1 percent, from 49,834 deadweight tons (dwt) in 2005 to 50,877 dwt in 2015. The greatest capacity increase from 2005 to 2015 was observed in container and dry bulk. The average size of containerships increased by 28.8 percent in terms of dwt as carriers expanded the deployment of megaships in U.S. trade.

Table 3-17 Average Vessel Capacity Per Call at U.S. Ports: 2005, 2010, and 2013–2015
(deadweight tons)

Type	2005	(R) 2010	2013	2014	2015	Percent change, 2005–2015
Tanker	72,120	71,665	64,328	62,193	61,501	-14.7
Container	44,601	51,227	52,421	54,768	57,458	28.8
Dry Bulk	43,236	50,429	56,065	55,052	54,772	26.7
Roll on/Roll off	19,867	20,573	18,550	18,625	18,128	-8.8
Gas (LPG/LNG)	38,871	42,212	24,060	25,213	25,791	-33.7
General Cargo	25,217	23,603	16,189	16,393	17,441	-30.8
All types	**49,834**	**53,435**	**51,048**	**50,716**	**50,877**	**2.1**

KEY: R = revised.

NOTE: Deadweight tons (DWT) is a measurement of the capacity of a vessel. DWT is defined as the total weight (metric tons) of cargo, fuel, fresh water, stores and crew that a ship can carry when immersed to its load line.

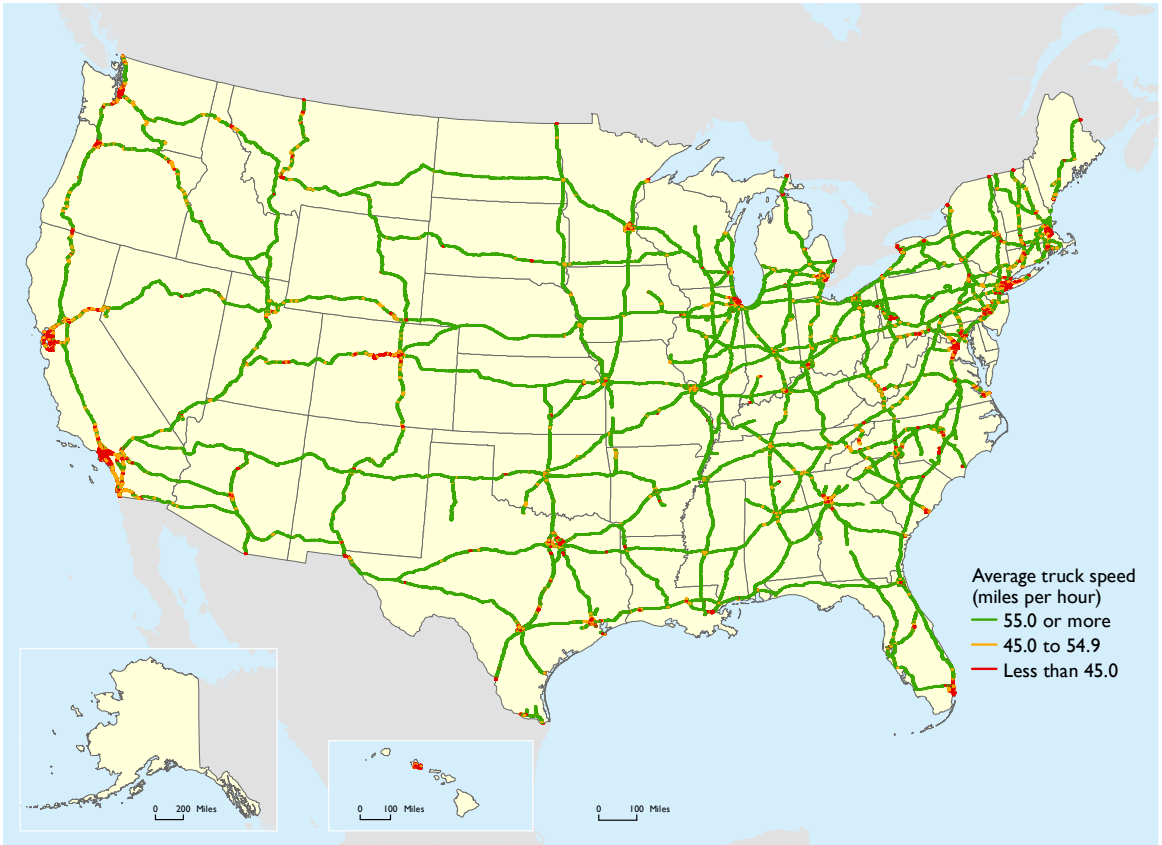
SOURCE: U.S. Department of Transportation, Maritime Administration, *Vessel Calls in U.S. Ports* (Washington, DC: annual issues), available at www.marad.dot.gov/resources/data-statistics/ as of August 2016.

IV. Freight Transportation System Performance

The efficient and reliable movement of goods is important to the U.S. economy. Travel time and speed are two indicators of transportation system performance. Slower speeds and unreliable travel times caused by congestion, weather, and other factors diminish productivity, increase fuel costs, and reduce operations efficiency.

The U.S. Department of Transportation, Federal Highway Administration, in cooperation with private industry, measures the speed and travel-time reliability of more than 500,000 trucks on 25 freight-significant corridors on an annual basis. Average truck speeds drop below the base free-flow speed of 55 miles per hour (mph) on interstates near major urban areas, border crossings and gateways, and in mountainous terrain.

Figure 4-1 Average Truck Travel Speeds on Select Interstate Highways: 2015
(miles per hour)



SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Performance Measurement Program, 2016.

Analysis has shown truck speed decreases in urban areas. The Federal Highway Administration uses Freight Performance Measurement Program data to measure truck speeds within 14 very large Census Metropolitan Statistical Areas. In 2015, 7 of the 14 metropolitan areas had average truck speeds of less than 55 mph on their interstate highways, with San Francisco the slowest at 47.61 mph and Los Angeles at 47.93 mph.

Table 4-1 Average Truck Travel Speeds on Select Metropolitan Area Interstates: 2012–2015

(miles per hour)

Metropolitan Area	2012	2013	2014	2015
Atlanta, GA	60.51	60.16	59.01	58.79
Boston, MA	56.84	56.62	55.11	54.79
Chicago, IL	55.41	54.40	52.61	53.26
Dallas, TX	60.16	59.64	59.33	59.46
Detroit, MI	57.44	57.35	56.21	56.54
Houston, TX	59.15	58.73	57.87	58.06
Los Angeles, CA	49.29	48.95	48.29	47.93
Miami, FL	60.35	60.20	59.17	59.04
New York, NY	55.55	55.64	53.65	53.90
Philadelphia, PA	56.29	56.02	53.86	54.54
Phoenix, AZ	60.16	60.03	58.99	60.36
San Francisco, CA	47.01	47.82	47.22	47.61
Seattle, WA	54.41	54.42	54.03	54.07
Washington, DC	56.31	55.78	54.94	56.34

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Performance Measurement Program, special tabulation, 2016.

Truck speed and travel time reliability data can be used to identify and quantify major freight truck chokepoints and bottlenecks along highways that are critical to the Nation's freight transportation system. The Federal Highway Administration developed a freight congestion index that ranks congestion's impact on freight movement. The index factors in both the number of trucks using a particular highway facility and the impact that congestion has on the average speed of those vehicles.

Table 4-2 Top 25 Congested Freight-Significant Locations: 2014

Location	Congestion ranking	Average speed (mph)	Peak period average speed (mph)	Non-peak period average speed (mph)	Non-peak/ peak ratio
Atlanta, GA: I-285 at I-85 (North)	1	39.79	27.65	46.55	1.68
Chicago, IL: I-290 at I-90/I-94	2	26.95	21.05	29.13	1.38
Fort Lee, NJ: I-95 at SR 4	3	36.17	29.34	38.91	1.33
Louisville, KY: I-65 at I-64/I-71	4	43.93	37.53	46.64	1.24
Houston, TX: I-610 at US 290	5	38.20	28.57	43.01	1.51
Houston, TX: I-10 at I-45	6	42.37	32.17	47.46	1.48
Cincinnati, OH: I-71 at I-75	7	47.19	40.34	49.68	1.23
Houston, TX: I-45 at US 59	8	38.54	28.21	43.52	1.54
Los Angeles, CA: SR 60 at SR 57	9	44.76	37.51	48.00	1.28
Houston, TX: I-10 at US 59	10	43.31	31.71	49.71	1.57
Dallas, TX: I-45 at I-30	11	38.94	28.24	43.85	1.55
Atlanta, GA: I-75 at I-285 (North)	12	45.89	34.95	51.16	1.46
St. Louis, MO: I-70 at I-64 (West)	13	42.02	38.05	43.63	1.15
Seattle, WA: I-5 at I-90	14	35.10	26.00	40.11	1.54
Chicago, IL: I-90 at I-94 (North)	15	32.05	17.59	39.51	2.25
Austin, TX: I-35	16	33.25	20.89	39.75	1.90
Auburn, WA: SR 18 at SR 167	17	45.97	38.55	49.87	1.29
Los Angeles, CA: I-710 at I-105	18	44.24	34.46	48.85	1.42
Baton Rouge, LA: I-10 at I-110	19	42.31	34.53	46.25	1.34
Hartford, CT: I-84 at I-91	20	46.05	36.74	49.89	1.36
Houston, TX: I-45 at I-610 (North)	21	45.80	35.59	50.73	1.43
Seattle, WA: I-90 at I-405	22	39.26	28.54	45.10	1.58
Cincinnati, OH: I-75 at I-74	23	45.48	39.76	47.78	1.20
Indianapolis, IN: I-65 at I-70 (North)	24	50.09	44.95	52.32	1.16
Denver, CO: I-70 at I-25	25	45.47	38.50	48.57	1.26

KEY: mph = miles per hour.

NOTES: The American Transportation Research Institute (ATRI) monitors 250 freight-significant highway infrastructure locations on an annual basis. These locations were identified over several years through reviews of past research, available highway speed and volume datasets, and surveys of private- and public-sector stakeholders. FHWA developed a freight congestion index to rank congestion's impact on freight. The index factors in the number of trucks using a particular highway facility and the impact that congestion has on average commercial vehicle speed in each of the 250 study areas. These data represent truck travel during weekdays at all hours of the day in 2014. Average speeds below 55 miles per hour indicate congestion.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Performance Measurement Program, special tabulation, 2016.

On weekdays, average speeds during peak periods (between 6:00 a.m. and 9:00 a.m. and between 4:00 p.m. and 7:00 p.m.) are typically lower than those recorded during nonpeak periods. Freight traveling across urban interstate interchanges is affected to the greatest degree by peak-period congestion.

Several monitored locations have recorded noticeable improvements in performance from 2013 to 2014 when considering average travel speed over a 24-hour period. Locations along I-35 in the Minneapolis-St. Paul area have seen the greatest improvement in overall and peak-period average speeds, while I-95 in the Richmond area has shown the largest improvement in nonpeak-period average speeds.

Table 4-3 Largest Improvement in Average Travel Speed for Congested Freight Highway Locations: 2013 and 2014

	Overall average speed (mph)			Peak-period average speed (mph)			Non-peak-period average speed (mph)		
Location	2013	2014	Percent change, 2013 to 2014	2013	2014	Percent change, 2013 to 2014	2013	2014	Percent change, 2013 to 2014
Minneapolis - St. Paul, MN: I-35W at I-494	45.55	48.74	7.0	35.88	40.63	13.3	50.37	52.45	4.1
Denver, CO: I-70 at I-25	43.34	45.47	4.9	36.78	38.50	4.7	46.26	48.57	5.0
Richmond, VA: I-95 at I-64 (North)	48.73	51.11	4.9	47.89	47.27	-1.3	49.06	52.82	7.6
Duluth, MN: I-35 at I-535	49.10	51.21	4.3	48.54	51.04	5.2	49.32	51.29	4.0
Atlanta, GA: I-20 at I-285 (East)	48.84	50.92	4.2	43.51	44.91	3.2	51.16	53.63	4.8
Stamford, CT: I-95	43.74	45.55	4.1	36.23	35.58	-1.8	46.13	48.92	6.1
Ft. Worth, TX: I-35W at I-30	45.93	47.43	3.3	38.81	40.23	3.7	48.89	50.47	3.2
Van Buren, AR: I-40 at I-540	52.64	54.20	3.0	50.45	52.77	4.6	53.53	54.78	2.3
Minneapolis-St. Paul, MN: I-35W at I-694	47.82	49.17	2.8	38.73	40.38	4.2	52.68	53.89	2.3
Charlotte, NC: I-85 near Concord	53.24	54.69	2.7	51.57	53.89	4.5	53.88	55.00	2.1

KEY: mph = miles per hour.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Performance Measurement Program, special tabulation, 2016.

Intercity travel-time is a key freight performance measure. It influences logistics, operational strategies, and load optimization. The Federal Highway Administration analyzed the minimum and maximum truck travel times of key city-pair origins and destinations. Travel time between Philadelphia and New York City, San Francisco and Sacramento, and San Diego and Los Angeles have the highest percent difference between the shortest and longest recorded trip times in 2015.

Table 4-4 Minimum and Maximum Travel Times of Truck Trips Between Select City-Pairs: 2015

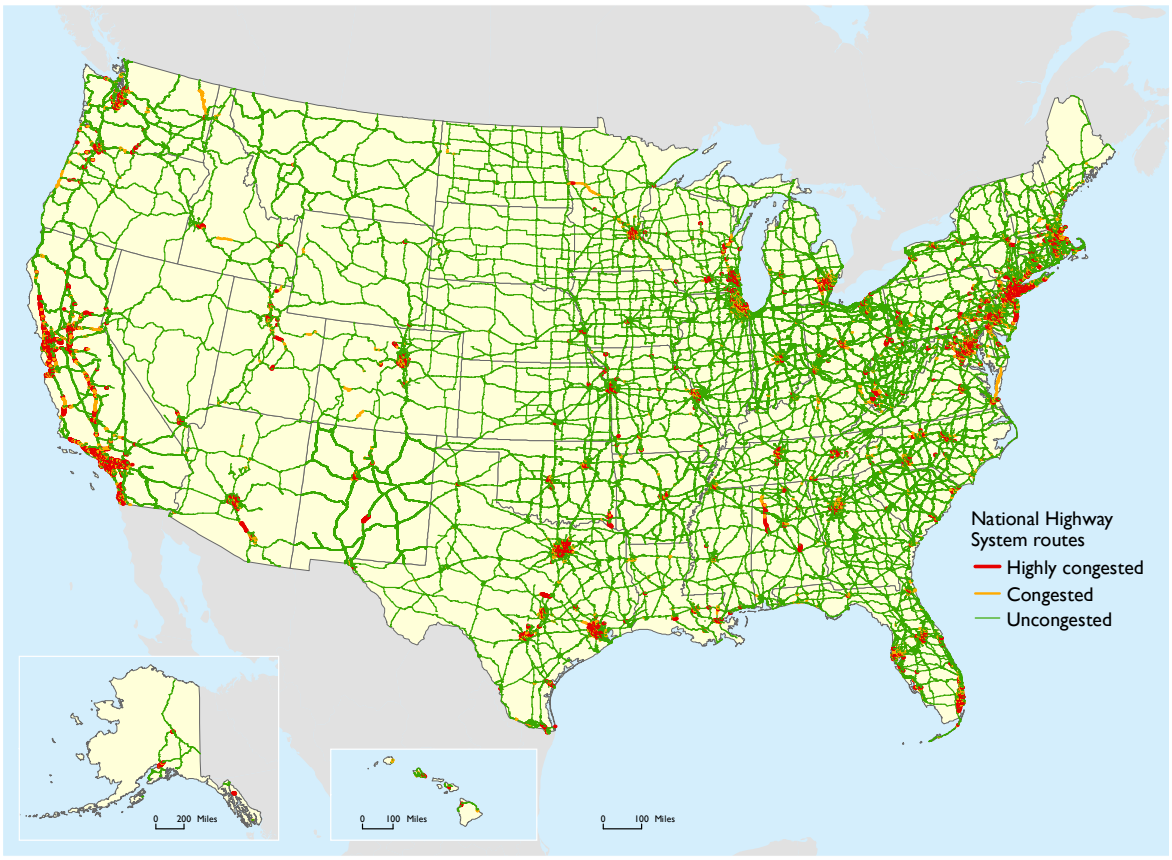
	Northbound/Eastbound			Southbound/Westbound		
Location	Minimum	Maximum	Maximum/ minimum percent difference	Minimum	Maximum	Maximum/ minimum percent difference
Atlanta, GA - Savannah, GA	4:04:18	4:40:14	14.7	4:02:45	4:39:16	15.0
Chicago, IL - Milwaukee, WI	1:32:06	2:16:30	48.2	1:32:43	2:51:25	84.9
Chicago, IL - Nashville, TN	7:59:51	8:47:09	9.9	7:53:13	8:28:24	7.4
Detroit, MI - Chicago, IL	4:56:06	5:27:20	10.5	4:57:16	5:31:00	11.4
Detroit, MI - Grand Rapids, MI	2:32:40	3:03:36	20.3	2:33:24	3:07:36	22.3
Houston, TX - Beaumont, TX	1:25:11	1:51:20	30.7	1:25:38	1:45:04	22.7
Houston, TX - Dallas, TX	3:49:57	4:30:43	17.7	3:51:20	4:31:26	17.3
Houston, TX - San Antonio, TX	3:20:32	4:15:47	27.6	3:21:46	4:27:04	32.4
Indianapolis, IN - Chicago, IL	3:05:34	3:41:33	19.4	3:01:36	3:33:07	17.4
Las Vegas, NV - Los Angeles, CA	4:19:45	6:00:46	38.9	4:26:35	5:41:43	28.2
Los Angeles, CA - San Francisco, CA	7:10:36	8:38:05	20.3	7:20:30	8:39:57	18.0
Miami, FL - Tampa, FL	4:50:32	5:52:47	21.4	4:51:31	5:55:07	21.8
Nashville, TN - Indianapolis, IN	4:48:38	5:30:46	14.6	4:48:55	5:13:57	8.7
New York, NY - Albany, NY	2:45:19	3:35:28	30.3	2:42:18	3:35:13	32.6
New York, NY - Buffalo, NY	7:32:47	8:38:10	14.4	7:36:06	8:29:39	11.7
New York, NY - Hartford, CT	1:59:23	3:27:10	73.5	1:58:37	3:21:01	69.5
Philadelphia, PA - New York, NY	1:48:19	3:59:31	121.1	1:46:19	3:30:42	98.2
Phoenix, AZ - Los Angeles, CA	6:17:58	7:48:01	23.8	6:29:27	7:35:49	17.0
Phoenix, AZ - Tucson, AZ	1:51:36	2:26:50	31.6	1:51:56	2:20:58	25.9
San Antonio, TX - Austin, TX	1:26:52	2:18:10	59.0	1:27:03	2:23:31	64.9
San Diego, CA - Los Angeles, CA	2:21:02	4:17:45	82.8	2:15:19	4:07:02	82.6
San Francisco, CA - Sacramento, CA	1:37:44	3:12:21	96.8	1:33:37	2:47:42	79.1
Seattle, WA - Portland, OR	2:58:13	4:01:45	35.6	2:57:38	4:02:04	36.3
Tampa, FL - Orlando, FL	1:21:02	1:57:34	45.1	1:22:28	1:56:30	41.3
Washington, DC - Baltimore, MD	0:53:59	1:34:24	74.9	0:53:04	1:30:18	70.1

NOTES: Travel times are shown in hours, minutes, and seconds. The trip times were calculated between city centers using Interstate average travel speed data from the Freight Performance Measurement Program.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Performance Measurement Program, special tabulation, 2016.

Recurring congestion caused by volumes of passenger vehicles and trucks that exceed capacity on roadways during peak periods is concentrated primarily in major metropolitan areas. In 2012 peak-period congestion resulted in traffic slowing below posted speed limits on 12,200 miles of the National Highway System and created highly congested (stop-and-go) conditions on an additional 7,000 miles.

Figure 4-2 Peak-Period Congestion on the National Highway System: 2012

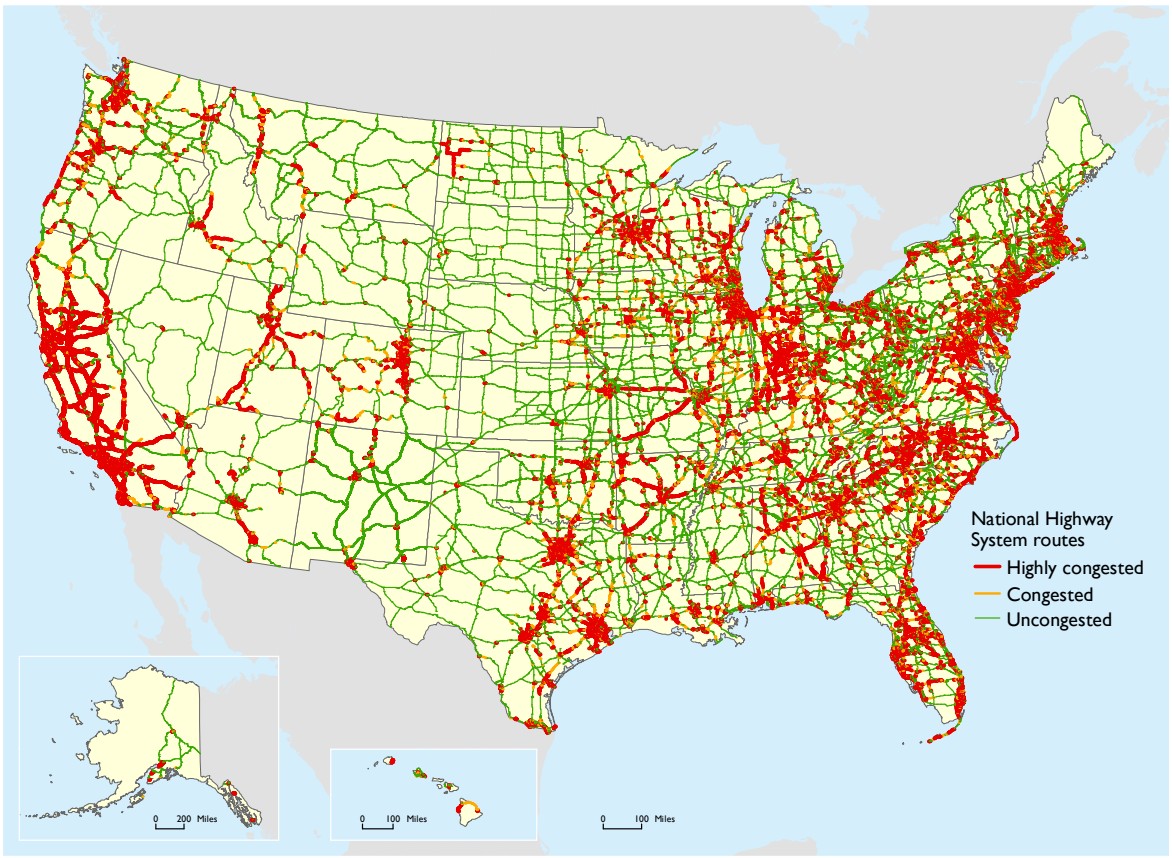


NOTE: The Freight Analysis Framework (FAF) is based in large part on results from the Commodity Flow Survey (CFS), last administered in 2012.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Assuming no changes in network capacity, increases in truck and passenger vehicle traffic are forecast to expand areas of recurring peak-period congestion to 35 percent of the National Highway System (NHS) in 2045, compared with 8 percent in 2012. This will slow traffic on 22,700 miles of the NHS and create stop-and-go conditions on an additional 55,800 miles, almost eight times more than that of 2012.

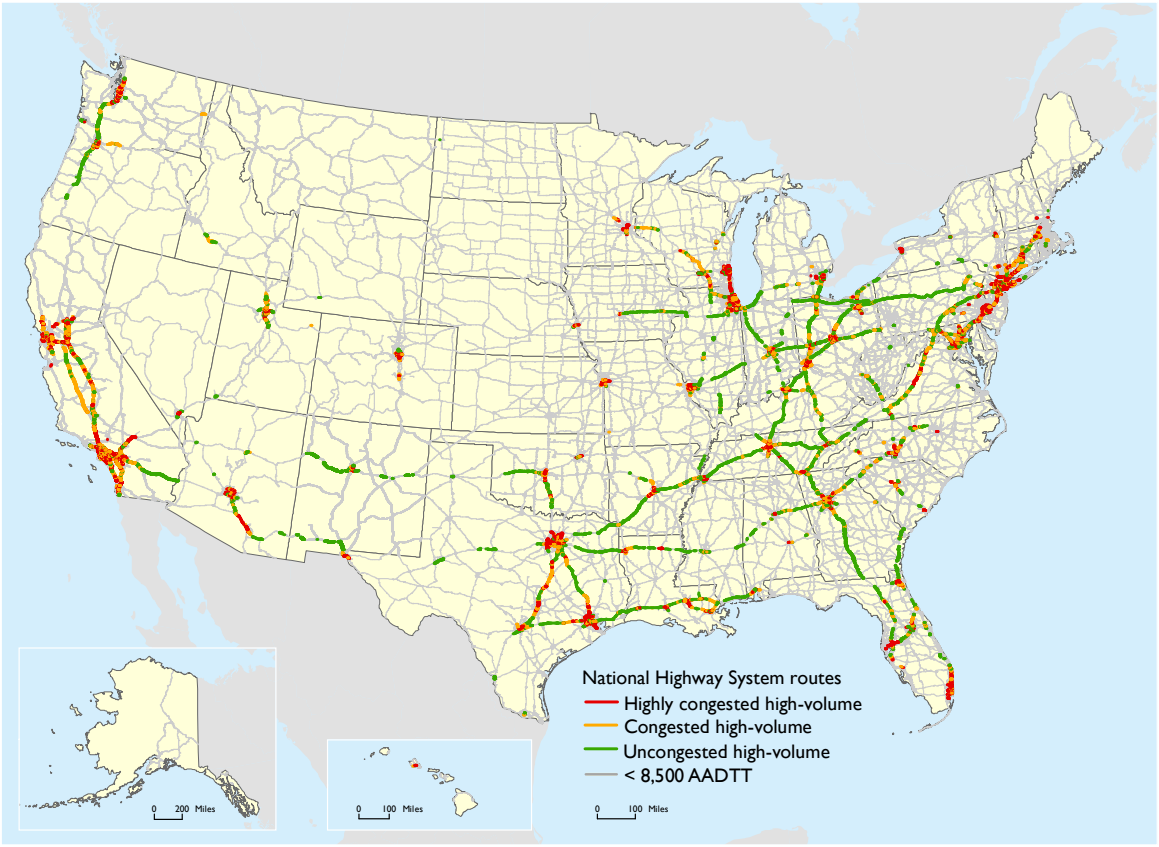
Figure 4-3 Projected Peak-Period Congestion on the National Highway System: 2045



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Congested highways carrying a large number of trucks substantially impede interstate commerce, and trucks on those segments contribute significantly to congestion. On highways carrying more than 8,500 trucks per day, recurring congestion slows traffic on 1,600 miles and creates stop and go conditions on another 800 miles of the National Highway System.

Figure 4-4 Peak-Period Congestion on High-Volume Truck Portions of the National Highway System: 2012

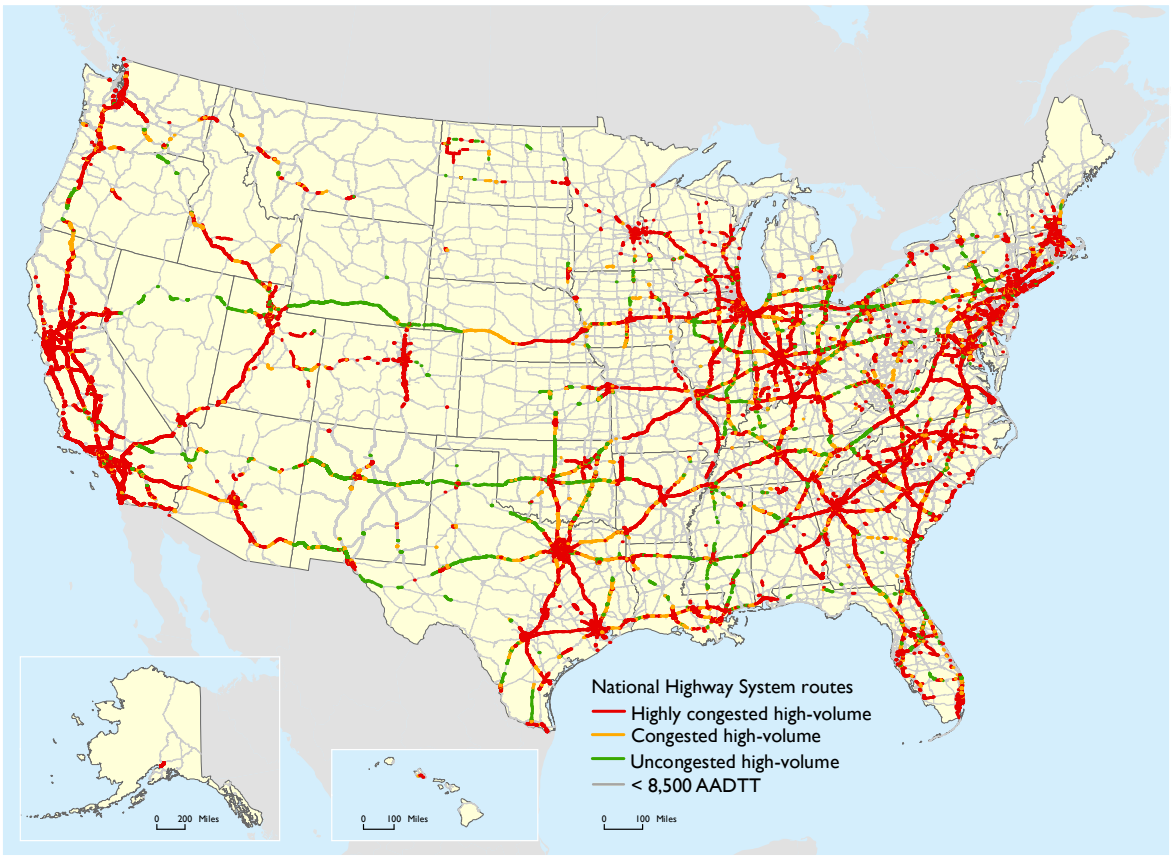


NOTE: The Freight Analysis Framework (FAF) is based in large part on results from the Commodity Flow Survey (CFS), last administered in 2012.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Assuming no change in network capacity, the number of National Highway System miles with recurring congestion and traveled by a large number of trucks is forecast to increase significantly between 2012 and 2045. On highways carrying more than 8,500 trucks per day, recurring congestion will slow traffic on close to 3,700 miles and create stop-and-go conditions on an additional 13,000 miles.

Figure 4-5 Projected Peak-Period Congestion on High-Volume Truck Portions of the National Highway System: 2045



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Border crossings are potential bottlenecks in the freight transportation network. The Federal Highway Administration monitors truck crossing times at 15 designated truck-lanes at U.S.-Canada border crossings. At all but two crossings, transit times were longer for inbound U.S. traffic than for travel to Canada.

Table 4-5 Average Time for Commercial Vehicles to Travel One Mile at Select U.S.-Canada Border Crossings: 2015

Location	Direction	Average minutes per mile
Ambassador Bridge - Detroit, MI	Inbound	5.7
	Outbound	5.3
Port Huron, MI	Inbound	4.6
	Outbound	3.8
Peace Bridge - Buffalo, NY	Inbound	5.0
	Outbound	5.3
Lewiston-Queenston Bridge - Lewiston, NY	Inbound	4.6
	Outbound	4.0
Champlain, NY	Inbound	4.4
	Outbound	2.9
Blaine, WA	Inbound	6.2
	Outbound	3.0
Alexandria Bay, NY	Inbound	4.9
	Outbound	2.4
Pembina, ND	Inbound	5.8
	Outbound	2.5
Derby, VT	Inbound	3.1
	Outbound	2.3
Calais, ME	Inbound	2.3
	Outbound	2.6
Sumas, WA	Inbound	3.8
	Outbound	3.6
Highgate, VT	Inbound	2.8
	Outbound	2.4
Houlton, ME	Inbound	3.9
	Outbound	3.1
Sweetgrass, MT	Inbound	5.2
	Outbound	3.0
Jackman, ME	Inbound	2.6
	Outbound	2.2

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, special tabulation, 2016.

The U.S. Department of Transportation in partnership with the Texas Department of Transportation also measures transit times from Mexico to the Unites States at the Bridge of the Americas and the Pharr-Reynosa International Bridge. The data are collected using radio frequency identification technology installed at the start of the crossing (typically the end of the queue) and at the vehicle safety inspection station exit (the end of the crossing trip). Vehicle identification information is anonymously collected and time-stamped at each reader station, and travel time (including vehicle inspection time) is calculated between the reader stations.

Table 4-6 Average Truck Transit Time at Select U.S.-Mexico Border Crossings: 2015

Month	Bridge of the Americas - El Paso, Texas (minutes)	Pharr-Reynosa International Bridge - Pharr, Texas (minutes)
January	42	66
February	45	73
March	48	69
April	68	67
May	69	63
June	62	48
July	70	52
August	79	51
September	NA	NA
October	NA	NA
November	NA	NA
December	NA	NA

KEY: NA = not available.

NOTE: Data collection methods changed in September 2015 and data collected after this point is not yet considered reliable.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations; U.S. Department of Transportation, Intelligent Transportation Systems Joint Program Office; Texas Department of Transportation; and Texas A&M Transportation Institute, available at http://bcis.tamu.edu/Commercial/en-US/queryArchivedData.aspx as of September 2016.

V. Economic Characteristics of the Freight Transportation Industry

The transportation sector is an integral part of the U.S. economy. It employs millions of people and comprises 8.9 percent of the Nation's economic activity as measured by gross domestic product (GDP).

Fixed transportation assets reflect the important role of both the public and private sectors in moving freight. Freight railroad facilities and services are almost entirely private, while private-sector trucks operate over public highways. Air-cargo services in the private sector operate in public airways and mostly public airports, and ships in the private sector serve public waterways and both public and private port facilities. Pipelines are mostly privately owned, although significantly controlled by public regulation. In the public sector, virtually all truck routes are owned and maintained by state or local governments. Airports and harbors are typically owned by public authorities, although terminals are usually owned or managed by private operators. Air and water navigation is mostly controlled by the Federal Government, and safety is regulated by all levels of government.

Total private and public fixed assets grew from about $4.9 trillion in 2010 to nearly $6.0 trillion in 2015 (current U.S. dollars). Transportation equipment and structures (private and public) accounted for approximately 43.2 percent of the total U.S. assets in 2015. The components of transportation fixed assets and their 2015 values are private transportation equipment ($1.4 trillion), private transportation structures ($457 billion), and government transportation structures ($4.1 trillion).

Table 5-1 Freight-Related Fixed Assets: 2010 and 2013–2015
(billions of current dollars)

	2010	2013	2014	2015	Percent change, 2010 to 2015
Total transportation fixed assets	**4,912**	**5,650**	**5,800**	**5,961**	**21.4**
Private sector					
Transportation equipment[1]	985	1,193	1,289	1,407	42.8
Transportation structures[2]	405	434	444	457	12.8
Public sector					
Highways	2,935	3,338	3,368	3,386	15.3
Transportation structures[2]	586	684	699	712	21.6
Federal	12	13	13	13	13.7
State and local	574	671	686	699	21.7

KEY: R = revised.

[1] Includes trucks, truck trailers, buses, automobiles, aircraft, ships, boats, and railroad equipment.

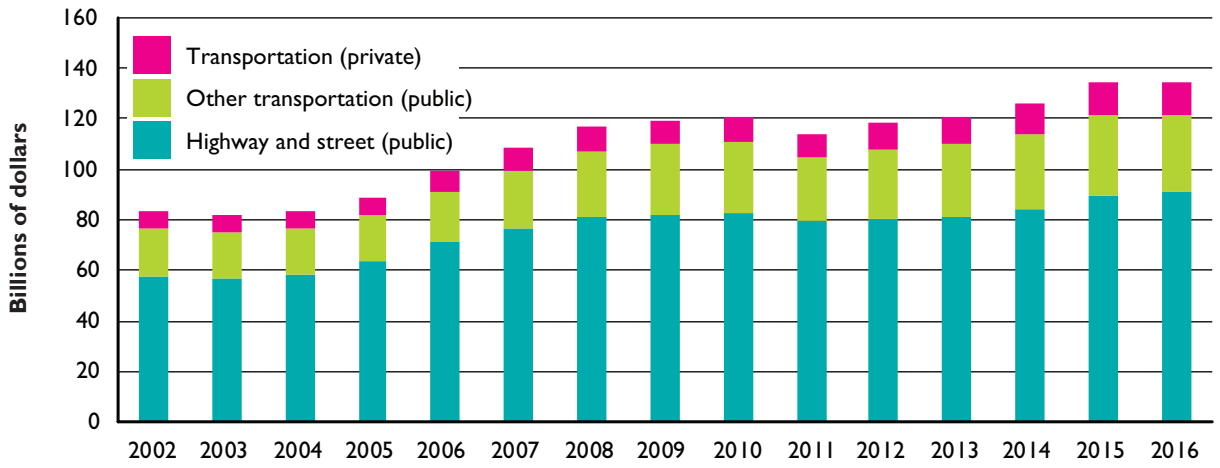
[2] Includes physical structures for all modes of transportation.

NOTE: Numbers may not add to totals due to rounding.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, National Economic Accounts, Fixed Assests Tables, tables 2.1 and 7.1b, available at www.bea.gov/iTable/index_FA.cfm as of May 2017.

Federal, state, and local governments are a major source of funding for transportation infrastructure construction. In 2016 the value of government-funded transportation construction underway was $121.6 billion, accounting for 90.7 percent of total spending on transportation construction. Approximately three-fourths of public sector funding went to highways and streets; the remainder supported the construction of airport terminals and runways, transit and water transportation facilities, and pedestrian and bicycle infrastructure.

Figure 5-1 Value of Annual Transportation Infrastructure Construction Put in Place: 2002–2016

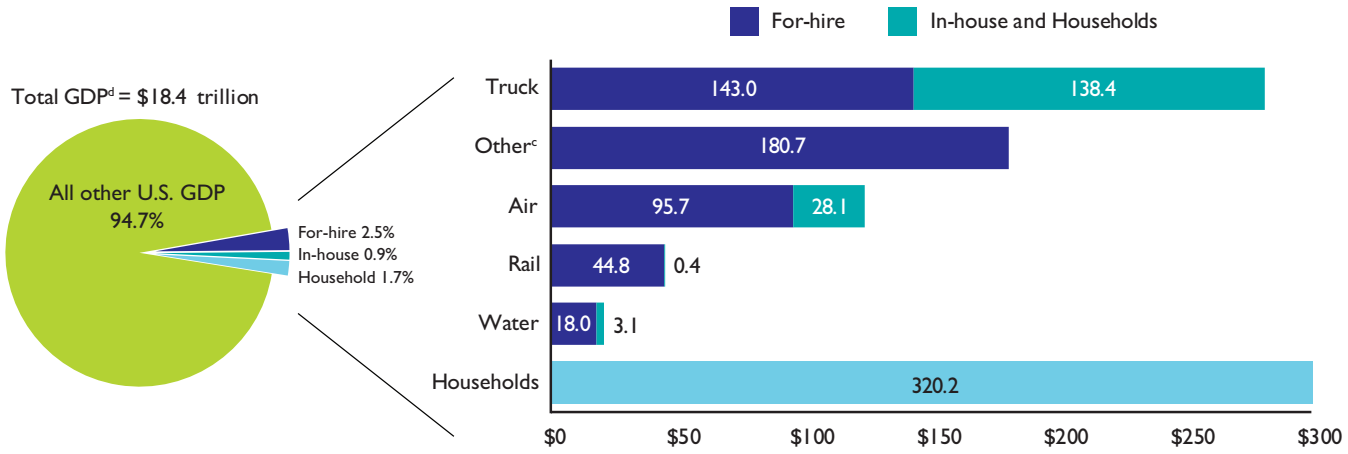


SOURCE: U.S. Department of Commerce, Census Bureau, Value of Construction Put in Place, Not Seasonally Adjusted ((2002-2016), available at http://www.census.gov/ as of May 2017.

In addition to using for-hire transportation services, many nontransportation industries also undertake transportation activities for their own purposes (called in-house transportation).

Transportation's total estimated contribution was $972.4 billion for 2015. For-hire transportation contributed $482.3 billion (2.6 percent) to the U.S. GDP of $18.4 trillion. Transportation services (air, rail, truck, and water) provided by nontransportation industries for their own use (in-house transportation) contributed an additional $169.9 billion (0.9 percent). Total household transportation (i.e., the depreciation cost associated with households owning motor vehicles) contributed $320.2 billion (1.7 percent). Total household transportation's contribution to GDP was larger than any of the other transportation modes. Trucking contributed the second largest amount, at $281.4 billion. In-house truck transportation operations contributed $138.4 billion, while for-hire truck transportation services contributed $143.0 billion.

Figure 5-2 Contribution of For-Hire[a] and In-House[b] Transportation to Gross Domestic Product

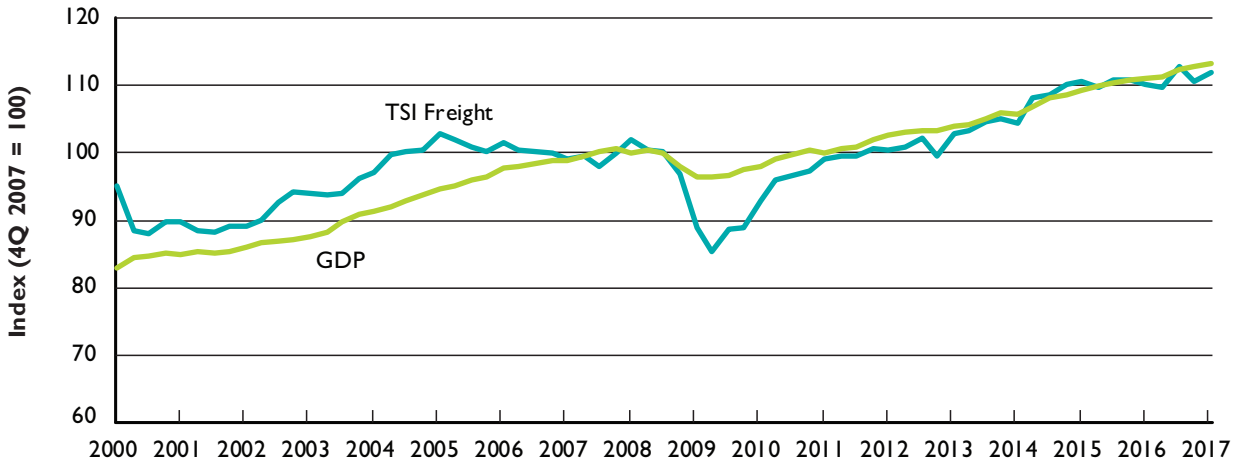


NOTES: (a) In-house transportation consists of the services provided by nontransportation industries, including households, for their use. Business in-house transportation includes privately owned and operated vehicles of all body types, used primarily on public rights of way, and the supportive services to store, maintain, and operate those vehicles. Household transportation covers transportation provided by households for their own use through the use of an automobile. (b) For-hire transportation consists of the services provided by transportation firms to industries and the public on a fee-basis. (c) Other for-hire transportation includes: pipeline, transit and ground passenger transportation, including State and local government passenger transit; sightseeing transportation and transportation support; courier and messenger services; and warehousing and storage. (d) Gross domestic product (GDP) increased from value reported by the Bureau of Economic Analysis in I-O use table by total output from the household production of transportation services.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Satellite Accounts, available at www.bts.gov, as of May 2017.

The gross domestic product (GDP) includes monetary value of all goods and services produced within the United States. Between the first quarters of 2000 and 2017, real GDP increased 36.4 percent, and BTS's freight Transportation Services Index (TSI) increased by 17.8 percent. However, due to the recession, GDP decreased 3.6 percent from the first quarter of 2008 to the second quarter of 2009, and the freight TSI decreased 14.6 percent. Both measures have since recovered to prerecession levels. GDP includes many sectors besides transportation, thus the magnitude of changes in GDP are not directly reflected in the TSI although their trends may be similar.

Figure 5-3 Real Quarterly Gross Domestic Product and Freight Transportation Services Index, 2000 Q1 to 2017 Q1



KEY: GDP = gross domestic product; TSI = Transportation Services Index.

SOURCES: **GDP and Foreign Trade**: U.S. Department of Commerce, Bureau of Economic Analysis, *National Income and Product Accounts*, table 1.1.6, available at www.bea.gov/iTable/index_nipa.cfm. Foreign trade is the sum of imports and exports. **Freight TSI**: U.S. Department of Transportation, Bureau of Transportation Statistics, *Transportation Services Index*, available at www.rita.dot.gov/bts/transportation_services_index.

The freight industry has many components, encompassing companies large and small. All told there were nearly 214,000 transportation and warehousing establishments (excluding rail) in 2012, with more than one-half of those primarily engaged in trucking. Revenue generated by trucking accounted for 32.6 percent of transportation and warehousing sector revenue, while warehousing accounted for a small percentage of the total.

Table 5-2 Economic Characteristics of Transportation and Warehousing Establishments in Freight-Dominated Modes: 2007 and 2012

	Establishments		Revenue (millions of current $)		Payroll (millions of current $)		Paid employees	
NAICS	2007	(R) 2012	2007	(R) 2012	2007	(R) 2012	2007	(R) 2012
Transportation and warehousing, total	**219,706**	**213,809**	**639,916**	**730,541**	**173,183**	**183,841**	**4,454,383**	**4,305,464**
Rail transportation	NA	NA	NA	NA	NA	NA	NA	NA
Water transportation	1,721	1,496	34,447	41,709	4,544	4,802	75,997	67,428
Truck transportation	120,390	111,899	217,833	238,003	58,266	57,861	1,507,923	1,363,102
Pipeline transportation	2,529	3,391	25,718	36,483	3,219	5,086	36,964	47,387
Support activities for transportation	42,130	42,489	86,596	103,439	24,579	28,435	608,385	617,663
Couriers and messengers	13,004	13,799	77,877	69,362	20,431	21,157	557,195	529,489
Warehousing and storage	13,938	14,448	21,921	28,494	25,526	28,157	720,451	712,790

KEY: NA = not available; NAICS = North American Industry Classification System.

NOTES: Total includes air transportation, transit and ground passenger transportation, and scenic and sightseeing transportation. Data are for establishments in which transportation is the primary business. Data exclude transportation provided privately, such as trucking organized "in-house" by a grocery company. Data are not collected for rail transportation or for governmental organizations even when their primary activity would be classified in industries covered by the Economic Census. For example, data are not collected for publicly operated buses and subway systems.

SOURCES: **2007**: U.S. Department of Commerce, Census Bureau, *2007 Economic Census, Transportation and Warehousing*, United States (Washington, DC: 2010), available at www.census.gov/econ as of June 2017; **2012**: U.S. Department of Commerce, Census Bureau, *2012 Economic Census, Transportation and Warehousing*, United States (Washington, DC: 2014), available at www.census.gov/econ as of June 2017.

Class I freight and operating revenues in 2015 dropped 8.1 and 7.7 percent, respectively, from 2014. Its 69.0 and 71.7 billion dollar collection of revenues in 2015 represented an increase of 108.6 and 110.3 percent since 2000.

Table 5-3 Economic Characteristics of Freight Railroads: 2000, 2012, 2014, and 2015

	Class I				Non-Class I				Total			
	2000	2012	2014	2015	2000	2012	2014	2015	2000	2012	2014	2015
Number of railroads	8	7	7	7	552	568	568	NA	560	575	575	NA
Freight revenue (billions of current dollars)	33.1	67.6	75.1	69.0	3.2	4.0	NA	NA	36.3	71.6	NA	NA
Operating revenue (billions of current dollars)	34.1	69.9	77.7	71.7	NA	NA	NA	NA	NA	NA	NA	NA
Employees	168,360	163,464	166,209	169,394	23,448	17,800	NA	NA	191,808	181,264	NA	NA

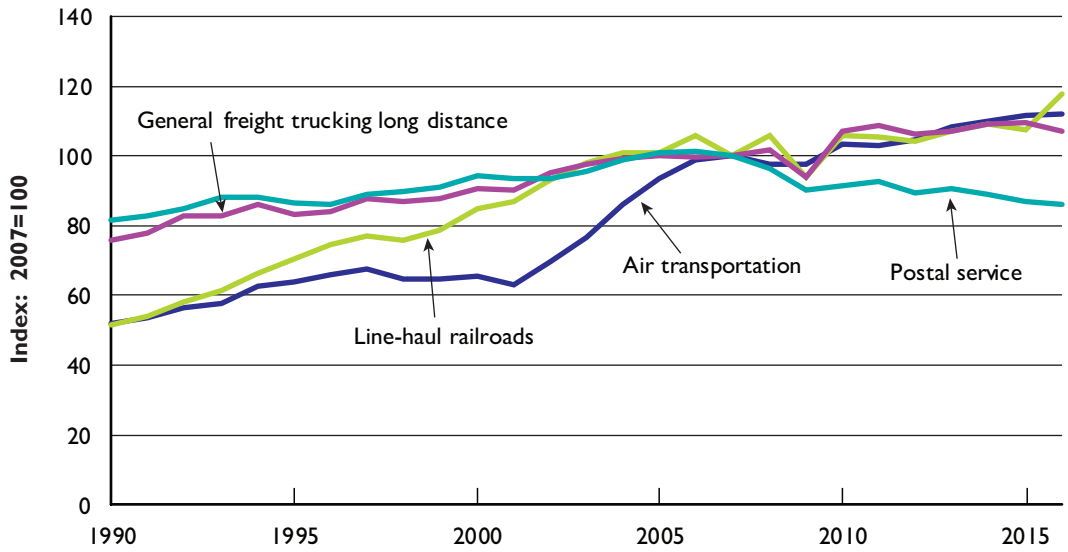
KEY: NA = not available.

NOTES: Class I railroads have annual carrier operating revenue of $457.91 million or more. Numbers may not add to totals due to rounding.

SOURCES: **2000, 2012, and 2014**: Association of American Railroads, *Railroad Facts* (Washington, DC: annual issues), p. 3. **2015**: Association of American Railroads, *Class I Railroad Statistics* (Washington, DC: May, 2017).

Between 1990 and 2016, output-per-hour worked more than doubled in line-haul railroading and the air transport industry (line-haul railroads do not include switching and terminal operations or short-distance/local railroads). Long-distance, general-freight trucking grew by 41.4 percent over the same period (long-distance, general-freight trucking establishments exclude local trucking and truck operators that require specialized equipment, such as flatbeds, tankers, or refrigerated trailers).

Figure 5-4 Labor Productivity in Selected Transportation Industries: 1990–2016



SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Industry Productivity, available at www.bls.gov/lpc/ as of July 2017.

Employment in the truck, rail, water, and pipeline industries has grown since 2000, while air transport has experienced a decline in the number of employees. Between 2000 and 2016, air transport employment declined by 22.5 percent. Trucking in 2015 accounted for nearly 29.2 percent of total transportation and warehousing sector employment.

Table 5-4 Employment in For-Hire Transportation Establishments Primarily Serving Freight: 2000, 2010, 2015, and 2016[1]

(thousands)

	(R) 2000	(R) 2010	(R) 2015	2016
Total U.S. labor force[2]	**132,033**	**130,353**	**141,813**	**144,306**
Transportation and warehousing	**4,412**	**4,192**	**4,869**	**4,987**
Rail transportation	232	216	241	215
Water transportation	56	62	66	66
Truck transportation	1,406	1,251	1,453	1,454
Air transportation[3]	614	458	458	476
Pipeline transportation	46	42	50	49
Support activities for transportation[4]	537	543	652	660
Couriers and messengers	606	528	611	639
Warehousing and storage	515	633	828	915

KEY: R = revised.

[1] Annual average across 12 months.

[2] Excludes farm employment.

[3] Data for air transportation includes passenger and freight transportation employment.

[4] Industries in the support activities for transportation subsector provide services to transportation carrier establishments or to the general public. This subsector includes a wide array of establishments, including air traffic control services, marine cargo handling, and motor vehicle towing.

NOTES: These data include workers employed in transportation industries but not necessarily in a transportation occupation, such as a lawyer working for a trucking company. Moreover, these data exclude workers in transportation occupations employed by non-transportation industries, such as a truck driver employed by a retail company.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics survey, available at www.bls.gov/ces as of June 2017.

Freight transportation jobs are not limited to for-hire carriers. Truck driving is by far the largest freight transportation occupation in the United States, and many drivers work for retailers and other establishments with shipper-owned trucks. There were approximately 2.99 million truck drivers in 2016; about 57.0 percent of these professionals drive heavy/tractor trailer trucks, 28.7 percent drive light/delivery service trucks, and about 14.3 percent are driver/sales workers.

Table 5-5 Employment in Select Freight Transportation-Related Occupations: 2000, 2010, 2015, and 2016

Occupation (SOC code)	2000	2010	2015	2016
Vehicle operators, pipeline operators, and primary support				
Driver/sales worker (53-3031)	373,660	371,670	417,660	426,310
Truck drivers, heavy and tractor-trailer (53-3032)	1,577,070	1,466,740	1,678,280	1,704,520
Truck drivers, light or delivery services (53-3033)	1,033,220	780,260	826,510	858,710
Locomotive engineers (53-4011)	29,390	40,750	37,490	39,900
Rail yard engineers, dinkey operators, and hostlers (53-4013)	4,020	5,600	4,460	4,530
Railroad brake, signal, and switch operators (53-4021)	16,830	22,760	18,970	19,860
Railroad conductors and yardmasters (53-4031)	40,380	42,700	42,330	42,880
Sailors and marine oilers (53-5011)	30,090	31,690	30,570	32,530
Captains, mates, and pilots of water vessels (53-5021)	21,080	29,280	33,110	36,720
Ship engineers (53-5031)	7,370	9,470	9,940	9,750
Bridge and lock tenders (53-6011)	4,790	3,250	3,170	3,510
Gas compressor and gas pumping station operators (53-7071)	6,510	4,040	4,100	3,890
Pump operators, except wellhead pumpers (53-7072)	13,730	9,440	13,390	12,030
Transportation equipment manufacturing and maintenance occupations				
Bus and truck mechanics and diesel engine specialists (49-3031)	258,800	222,770	251,750	254,280
Rail car repairers (49-3043)	10,620	19,280	21,410	22,090
Transportation Infrastructure construction and maintenance occupations				
Rail-track laying and maintenance equipment operators (47-4061)	9,940	15,520	14,470	14,250
Signal and track switch repairers (49-9097)	5,540	7,400	8,190	8,680
Dredge operators (53-7031)	3,100	1,720	1,850	1,760
Secondary support service occupations				
Dispatchers, except police, fire, and ambulance (43-5032)	167,180	180,540	196,940	197,910
Postal service mail carriers (43-5052)	354,980	324,990	315,950	328,950
Shipping, receiving, and traffic clerks (43-5071)	864,530	687,850	674,820	676,990
Transportation inspectors (53-6051)	26,520	24,280	25,860	27,430
Tank car, truck, and ship loaders (53-7121)	17,480	10,390	11,960	10,920

KEY: SOC = Standard Occupational Classification.

NOTE: Data are for May of each year.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, *National Occupational Employment and Wages*, available at www.bls.gov/oes as of June 2017.

Average hourly wages for different freight-related occupations vary widely. In 2016 ship engineers and captains and pilots of water vessels were among the highest paid freight transportation occupations.

Table 5-6 Average Hourly Wages in Select Freight Transportation-Related Occupations: 2000, 2010, 2015, and 2016

(current dollars)

Occupation (SOC code)	2000	2010	2015	2016
Vehicle operators, pipeline operators, and primary support				
Driver/sales worker (53-3031)	11.08	13.02	13.41	13.67
Truck drivers, heavy and tractor-trailer (53-3032)	15.78	18.97	20.43	20.96
Truck drivers, light or delivery services (53-3033)	11.84	15.45	16.38	16.73
Locomotive engineers (53-4011)	21.20	24.46	28.54	29.34
Rail yard engineers, dinkey operators, and hostlers (53-4013)	19.22	18.18	22.88	25.15
Railroad brake, signal, and switch operators (53-4021)	20.16	23.47	25.96	26.60
Railroad conductors and yardmasters (53-4031)	20.11	25.18	27.29	27.99
Sailors and marine oilers (53-5011)	13.94	18.28	20.63	22.20
Captains, mates, and pilots of water vessels (53-5021)	23.30	33.89	39.98	39.19
Ship engineers (53-5031)	23.12	34.09	37.97	35.64
Bridge and lock tenders (53-6011)	14.60	20.72	22.10	22.44
Gas compressor and gas pumping station operators (53-7071)	20.05	24.48	27.65	28.66
Pump operators, except wellhead pumpers (53-7072)	18.00	22.14	22.21	22.24
Transportation equipment manufacturing and maintenance occupations				
Bus and truck mechanics and diesel engine specialists (49-3031)	15.97	20.31	22.17	22.45
Rail car repairers (49-3043)	15.85	22.31	26.02	25.77
Transportation Infrastructure construction and maintenance occupations				
Rail-track laying and maintenance equipment operators (47-4061)	14.84	22.23	24.68	25.39
Signal and track switch repairers (49-9097)	18.94	24.80	30.12	30.15
Dredge operators (53-7031)	14.32	17.59	21.18	22.37
Secondary support service occupations				
Dispatchers, except police, fire, and ambulance (43-5032)	14.62	18.00	19.33	19.80
Postal service mail carriers (43-5052)	17.71	24.16	24.58	24.33
Shipping, receiving, and traffic clerks (43-5071)	11.22	14.46	15.55	15.94
Transportation inspectors (53-6051)	21.25	30.31	34.72	34.93
Tank car, truck, and ship loaders (53-7121)	15.62	21.40	19.72	19.04

KEY: SOC = Standard Occupational Classification.

NOTE: Data are for May of each year.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, *National Occupational Employment and Wages*, available at www.bls.gov/oes as of July 2016.

From 2010 to 2016, the prices charged for transportation purchased from carriers and support activities have gone up in all industries shown in table 5-7. Rail transportation prices increased by 12.4 percent and air prices by 6.8 percent.

Table 5-7 Producer Price Indices for Select Transportation Services: 2010 and 2014–2016

	2010	2014	2015	2016
Air Transportation (NAICS 481)[1]	**202.9**	**230.0**	**221.7**	**216.7**
Scheduled Air Transportation (NAICS 4811)[2]	247.7	283.8	272.5	266.1
Scheduled Freight Air Transportation (NAICS 481112)	130.2	157.0	151.4	151.5
Nonscheduled Air Transportation (NAICS 4812)[3]	165.4	166.8	168.1	165.8
Rail Transportation (NAICS 482)[3]	**156.2**	**186.5**	**179.5**	**175.5**
Line -Haul Railroads (NAICS 482111)[4]	174.3	208.0	200.2	195.7
Water Transportation (NAICS 483)	**125.5**	**138.4**	**138.9**	**131.7**
Deep Sea Freight Transportation (NAICS 483111)[5]	244.8	262.5	259.2	241.6
Coastal and Great Lakes Freight Transportation (NAICS 483113)	146.7	167.7	173.4	166.8
Inland Water Freight Transportation (NAICS 483211)[6]	217.4	234.7	226.3	215.5
Truck Transportation (NAICS 484)	**119.4**	**134.9**	**132.3**	**131.4**
General Freight Trucking (NAICS 4841)	119.3	137.5	134.9	133.9
General Freight Trucking, Local (NAICS 48411)	127.2	135.2	135.1	130.3
General Freight Trucking, Long Distance (NAICS 48412)	117.5	138.1	134.9	134.8
Specialized Freight Trucking (NAICS 4842)	119.9	129.2	126.9	126.2
Used Household and Office Goods Moving (NAICS 48421)	114.7	126.7	126.1	124.6
Specialized Freight (except Used Goods) Trucking, Local (NAICS 48422)	126.5	135.6	132.3	132.3
Specialized Freight (except Used Goods) Trucking, Long Distance (NAICS 48423)	115.8	123.9	121.6	120.7
Pipeline Transportation (NAICS 486)	**NA**	**NA**	**NA**	**NA**
Pipeline Transportation of Crude Oil (NAICS 4861)	183.4	222.6	233.0	237.0
Other Pipeline Transportation (NAICS 4869)[7]	133.8	160.4	168.0	171.8
Support Activities for Transportation (NAICS 488)	**110.7**	**118.7**	**118.7**	**119.2**
Support Activities for Water Transportation (NAICS 4883)[8]	120.2	131.7	132.0	135.3
Navigational Services to Shipping (NAICS 48833)	122.9	130.8	121.5	123.2
Freight Transportation Arrangement (NAICS 4885)[3]	95.2	102.8	101.0	99.8
Postal Service (NAICS 491)[6]	**187.7**	**213.2**	**216.5**	**215.1**
Couriers and Messengers (NAICS 492)	**153.4**	**198.3**	**203.2**	**203.4**

KEY: NA = not available; NAICS = North American Industry Classification System.

[1] Base year = 1992.

[2] Base year = 1989.

[3] Base year = 1996.

[4] Base year = 1984.

[5] Base year = 1988.

[6] Base year = 1990.

[7] Other pipeline transportation includes pipeline transportation of refined petroleum products (NAICS 48691).

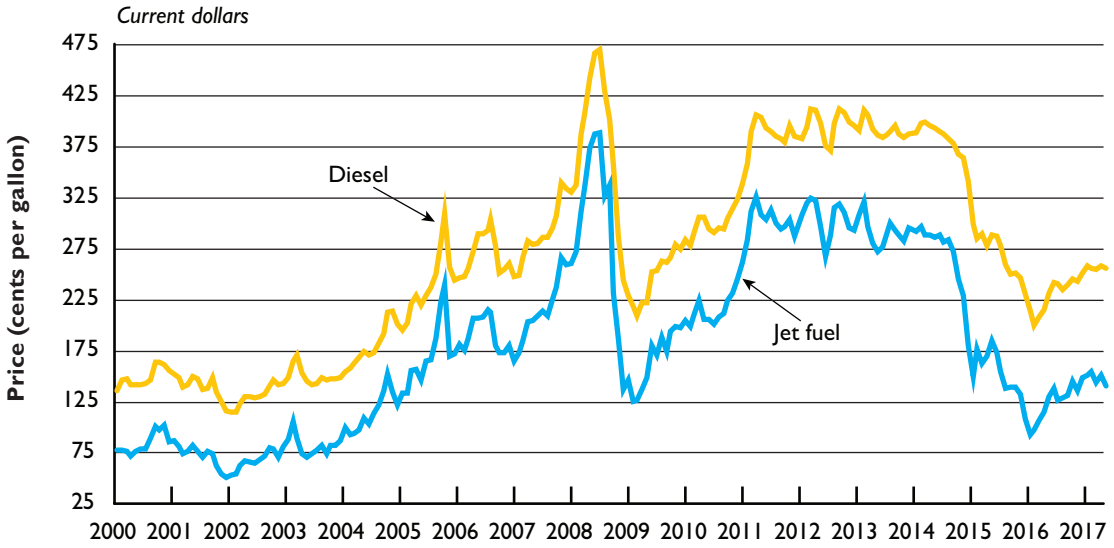
[8] Support activities for water transportation include port and harbor operations (NAICS 48831), marine cargo handling (NAICS 48832), and navigational services to shipping (NAICS 48833).

NOTES: Index values start at 100.0 in 2003 unless another year is specified. This table shows annual data, which are calculated by the Bureau of Labor Statistics by averaging monthly indices. Data are reported monthly from January to December. The monthly indices, however, are available for fewer than 12 months for some years. In both cases, a simple average of the available monthly indices is reported for each year. Data are not seasonally adjusted.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Producer Price Index Industry Data, available at www.bls.gov/ppi/ as of July 2017.

Prices for diesel and jet fuel peaked in summer 2008, followed by a sharp decline during the economic recession. Between 2011 and 2014, diesel and jet fuel prices were relatively stable, with shorter term or less severe changes. In 2015 both diesel and jet fuel prices declined before trending upward in the first five months of 2016.

Figure 5-5 Monthly Diesel and Jet Fuel Prices: January 2000–May 2017



SOURCE: **Diesel price**: U.S. Department of Energy, Energy Information Agency, U.S. Petroleum Prices, available at www.eia.gov as of July 2016. **Jet fuel price**: U.S. Department of Energy, Energy Information Agency, U.S. Gulf Coast Kerosene-Type Jet Fuel Spot Price, available at www.eia.gov as of June 2017.

VI. Safety, Energy, and Environmental Implications of Freight Transportation

Growing demand for freight transportation heightens concerns about its safety, energy consumption, and environmental impacts. While safety in all freight modes continues to be monitored actively, the availability of energy consumption data has declined with the discontinuation of the Vehicle Inventory and Use Survey.

Safety

While the amount of freight transportation activity has increased, the total number of related fatalities declined by 23.8 percent from 2000 to 2015. All modes have substantially reduced the number of fatalities over that period. Trucks accounted for 87.8 percent of all freight transportation fatalities and 11.6 percent of all highway fatalities in 2015. The vast majority of fatalities involve passenger travel on highways.

Table 6-1 Fatalities by Freight Transportation Mode: 2000, 2010, and 2013–2015

	2000	2010	2013	2014	2015
Total transportation fatalities	**44,276**	**35,039**	**34,685**	**34,638**	**36,973**
Total highway fatalities	**41,945**	**32,999**	**32,894**	**32,744**	**35,092**
Total freight transportation fatalities	**6,079**	**4,287**	**4,558**	**4,523**	**4,631**
Freight as a share of total fatalities	**13.7%**	**12.2%**	**13.1%**	**13.1%**	**12.5%**
Highway[1]	**5,282**	**3,686**	**3,981**	**3,902**	**4,067**
Large-truck occupants	754	530	695	656	667
Others killed in crashes involving large trucks	4,528	3,156	3,286	3,246	3,400
Railroad	**717**	**520**	**505**	**552**	**502**
Train accidents	8	4	6	2	1
Highway-rail grade crossing[2]	353	187	157	203	155
Trespassers	328	310	317	325	302
Other incidents	28	19	25	22	44
Waterborne[3]	**42**	**62**	**64**	**50**	**52**
Freight	NA	22	19	18	40
Industrial/other	NA	40	45	32	12
Pipeline	**38**	**19**	**8**	**19**	**10**
Hazardous liquid pipeline	1	1	1	0	1
Gas pipeline	37	18	7	19	9

KEY: NA = not available

[1] *Large trucks* have a gross vehicle weight rating at or above 10,000 pounds and include single-unit and combination trucks.

[2] *Highway-rail grade crossing* fatalities include freight train collisions with vehicles and people at all public and private highway-rail grade crossings.

[3] *Freight* includes barges, bulk carriers, general dry cargo ships, refrigerated cargo ships, roll-on/roll-off ships, tank ships, and towing ships. *Industrial/Other* includes fishing vessels, miscellaneous vessels, and offshore. *Waterborne fatalities* include only closed cases in which vessels were involved in a marine casualty as of July 6, 2015. Open cases by year not included above: 2010 = 47, 2011 = 71, 2012 = 106, 2013 = 97, and 2014 = 464. Data prior to 2002 were tabulated using a different reporting system and are not directly comparable with later years.

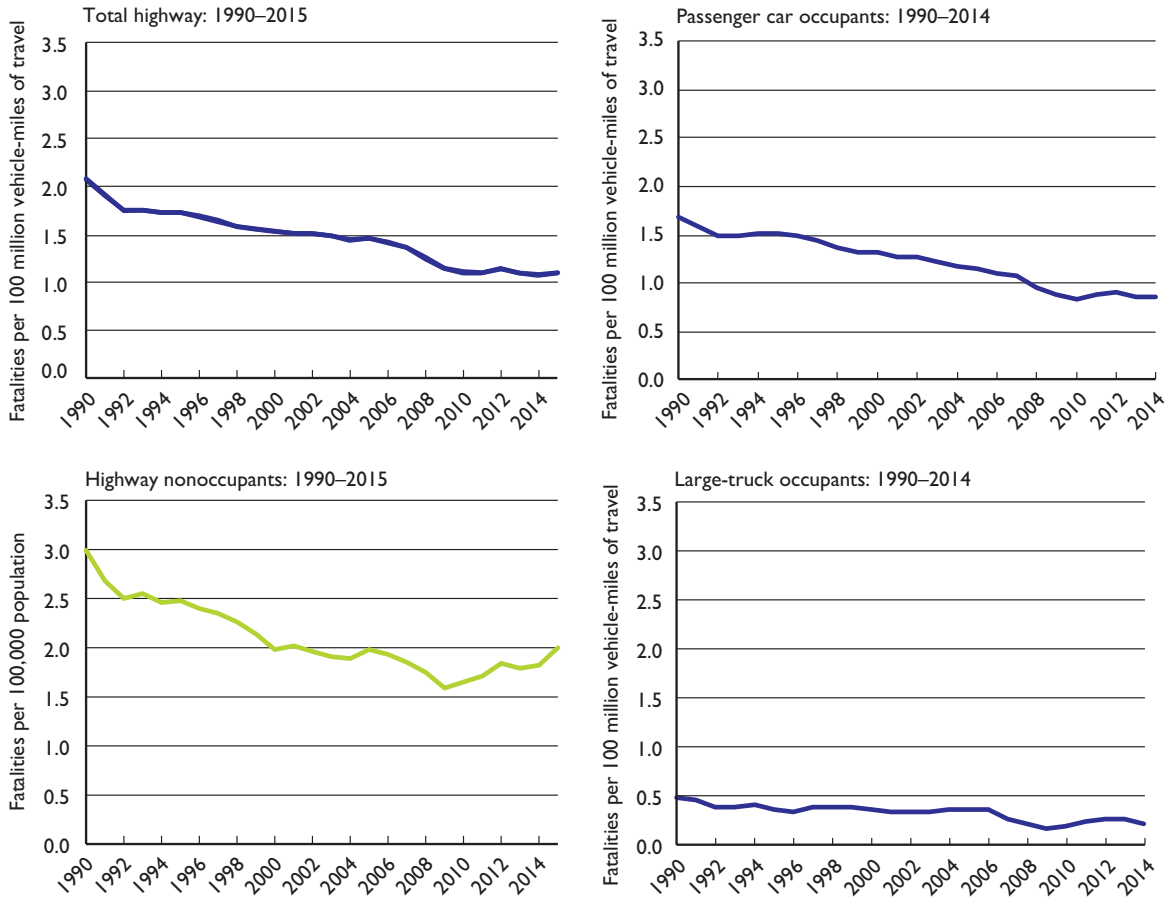
NOTE: There are differences in definitions and reporting periods across modes due to regulatory and legal requirements.

SOURCES: **Total:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics*, Table 2-1, available at http://rita.dot.gov/bts as of August 2016. **Highway**: U.S. Department of Transportation, National Highway Transportation Safety Administration, National Center for Statistics and Analysis, *Traffic Safety Facts, Large Trucks and Highlights* (annual issues). **Railroad**: U.S. Department of Transportation, Federal Railroad Administration, Office of Safety Analysis, available at http://safetydata.fra.dot.gov/officeofsafety/default.asp as of Mar. 24, 2017. **Waterborne**: U.S. Department of Homeland Security, U.S. Coast Guard, Data Administration Division, *Marine Casualty and Pollution Data for Researchers* (July 6, 2016), available at homeport.uscg.gov as of Mar. 24, 2017. **Pipeline**: U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Accident and Incident Summary Statistics by Year, available at http://phmsa.dot.gov/pipeline as of Mar. 24, 2017.

According to the National Highway Traffic Safety Administration, the number of total highway fatalities in 2015 grew by 7.2 percent (2,348) over the 2014 level. This was the first annual increase in highway fatalities since 2012 and the greatest annual fatality total since 2008. Large-truck occupant fatalities increased by 1.7 percent, from 656 in 2014 to 667 in 2015.

From 1990 through 2015, the overall rate of highway fatalities per vehicle-miles of travel (vmt) declined by 47.1 percent as the highway modes showed across-the-board reductions. Fatalities per vmt for large truck occupants decreased by 58.5 percent.

Figure 6-1 Fatality Rates for Select Highway Modes of Transportation: 1990–2015



NOTE: *Passenger car occupants* include both passenger car and light truck occupants. Passenger car occupants and large truck occupants data are for 1990-2014. Nonoccupants include pedestrians and bicyclists.

SOURCE: Calculated by U.S. Department of Transportation, Bureau of Transportation Statistics (BTS) based upon multiple sources as cited in BTS's *National Transportation Statistics*, tables 2-17, 2-19, 2-20, and 2-21. Available at www.bts.gov as of March 2017.

Historically, freight transportation comprises a relatively small percentage of all transportation-related injuries—4.6 percent in 2000 versus 4.9 percent in 2015. However, of the freight-transportation injuries that do occur, the majority of them are attributable to the highway mode—94.6 percent in 2000 versus 96.4 percent in 2015. These ratios have remained relatively steady from year to year despite a drop of 775,725 (24.1 percent) in the estimated number of all transportation-related injuries during the 2000 to 2015 time period.

Table 6-2 Injuries by Freight Transportation Mode: 2000, 2010, and 2013–2015

	2000	2010	2013	2014	2015
Total transportation injuries	**3,218,900**	**2,259,336**	**2,333,501**	**2,351,372**	**2,443,175**
Total freight transportation injuries	**147,802**	**84,607**	**99,398**	**115,564**	**120,389**
Freight as a share of total injuries	**4.6%**	**3.7%**	**4.3%**	**4.9%**	**4.9%**
Highway[1]	**139,832**	**80,000**	**95,000**	**111,000**	**116,000**
Large-truck occupants	30,832	20,000	24,000	27,000	30,000
Others injured in crashes involving large trucks	109,000	60,000	71,000	84,000	86,000
Railroad	**7,834**	**4,097**	**4,003**	**4,102**	**4,101**
Train accidents	128	53	71	51	263
Highway-rail grade crossing[2]	1,099	667	754	679	710
Trespassers	362	310	355	363	345
Other incidents	6,245	3,067	2,823	3,009	2,783
Water[3]	**55**	**407**	**353**	**369**	**239**
Freight	NA	254	196	225	165
Industrial/Other	NA	153	157	144	74
Pipeline	**81**	**103**	**42**	**93**	**49**
Hazardous liquid pipeline	4	3	6	0	0
Gas pipeline	77	100	36	93	49

KEY: NA = not available.

[1] Large trucks have a gross vehicle weight rating at or above 10,000 pounds and include single-unit and combination trucks.

[2] *Highway-rail grade crossing injuries* include freight train collisions with vehicles and people at all public and private highway-rail grade crossings.

[3] *Freight* includes barges, bulk carriers, general dry cargo ships, refrigerated cargo ships, roll-on/roll-off ships, tank ships, and towing ships. *Industrial/Other* includes fishing vessels, miscellaneous vessels, and offshore. Waterborne fatalities include only closed cases in which vessels were involved in a marine casualty as of July 6, 2015. Open cases by year not included above: 2010 = 47, 2011 = 71, 2012 = 106, 2013 = 97, and 2014 = 464. Data prior to 2002 were tabulated using a different reporting system and are not directly comparable with later years.

NOTES: There are differences in definitions and reporting periods across modes due to regulatory and legal requirements.

SOURCES: **Total:** U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics*, Table 2-2, available at http://rita.dot.gov/bts as of October 2016. **Highway**: U.S. Department of Transportation, National Highway Transportation Safety Administration, National Center for Statistics and Analysis, *Traffic Safety Facts, Large Trucks and Highlights* (annual issues). **Railroad**: U.S. Department of Transportation, Federal Railroad Administration, Office of Safety Analysis, available at http://safetydata.fra.dot.gov/officeofsafety/default.asp as of Mar 24, 2017. **Waterborne**: U.S. Department of Homeland Security, U.S. Coast Guard, Data Administration Division, Marine Casualty and Pollution Data for Researchers (July 6, 2016), available at homeport.uscg.gov as of Mar 24, 2017. **Pipeline**: U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Accident and Incident Summary Statistics by Year, available at http://phmsa.dot.gov/pipeline as of March 2017.

Because most hazardous materials are transported by truck, the majority of incidents related to the movement of hazardous materials occur on highways or in truck terminals. A very small share of hazardous materials transportation incidents are the result of a vehicular crash or derailment (referred to as "accident related"). While 1.5 percent of the incidents in 2016 were accident related, they accounted for 64.3 percent of all property damage. Highway had the highest share of incidents at 90.4 percent but accounted for 60.9 percent of all property damage.

Table 6-3 Hazardous Materials Transportation Incidents and Property Damage: 2000, 2010, 2015, and 2016

	2000		2010		2015		2016	
	Number	$ (thousands)	Number	$ (thousands)	Number	$ (thousands)	Number	$ (thousands)
Total	**17,557**	**78,132**	**14,798**	**71,609**	**16,854**	**108,351**	**18,255**	**75,187**
Accident related	394	62,636	358	60,691	317	92,893	265	48,358
Air	**1,419**	**272**	**1,295**	**20**	**1,129**	**47**	**1,199**	**1,930**
Accident related	3	42	2	0	3	0	4	49
Highway	**15,063**	**51,030**	**12,651**	**63,672**	**15,120**	**62,215**	**16,501**	**45,817**
Accident related	329	37,837	320	55,981	280	48,824	236	31,079
Rail	**1,058**	**26,547**	**747**	**7,342**	**581**	**46,086**	**543**	**27,386**
Accident related	62	24,756	35	4,688	33	44,070	23	17,228
Water[1]	**17**	**283**	**105**	**574**	**24**	**3**	**11**	**53**
Accident related	0	0	1	23	1	0	1	1
Other[2]	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
Accident related	0	0	0	0	0	0	1	1

[1] Water category only includes packaged (nonbulk) marine. Non-packaged (bulk) marine hazardous materials incidents are reported to the U.S. Coast Guard and are not included.

[2] Other category includes freight forwarders and modes not otherwise specified.

NOTES: Hazardous materials transportation incidents required to be reported are defined in the Code of Federal Regulations (CFR), 49 CFR 171.15, 171.16 (Form F 5800.1). Hazardous materials deaths and injuries are caused by the hazardous material in commerce. Accident related means vehicular accident or derailment. Each modal total also includes fatalities caused by human error, package failure, and causes not elsewhere classified. As of 2005, the "Other" data is no longer included in the hazardous materials information system report.

SOURCE: U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, Hazardous Materials Information System Database, available at www.phmsa.dot.gov/hazmat/library/data-stats as of May 2017.

The safety fitness of motor carriers is a top priority of the U.S. Department of Transportation. As part of its efforts to improve safety, federal and state governments conducted 7,576 safety compliance reviews in 2016. Of that total, about 6.1 percent (460) of motor carriers that were subject to the review received an unsatisfactory rating. If a carrier gets a conditional rating, it means that there are conditions that need to be met for the carrier's operations to be in full compliance. Once the conditions have been met, the carrier would need a new ratable review to get the rating upgraded to satisfactory. An unsatisfactory rating implies that there are serious deficiencies that need to be rectified within 45 – 60 days. If rectified, the rating can be upgraded to a conditional or satisfactory rating. If not, the provisional unsatisfactory rating becomes final and the carrier is placed out-of-service.

Table 6-4 Commercial Motor Carrier Compliance Reviews by Safety Rating: Fiscal Years[1] 2014, 2015, and 2016

	FY 2014			FY 2015			FY 2016		
Safety rating	**Federal**	**State**	**Total**	**Federal**	**State**	**Total**	**Federal**	**State**	**Total**
Satisfactory	1,540	1,196	2,736	1,547	1,151	2,698	1,499	1,160	2,659
Conditional	1,535	1,012	2,547	1,837	971	2,808	1,846	893	2,739
Unsatisfactory	300	125	425	280	149	429	324	136	460
Not rated	258	1,695	1,953	266	1,328	1,594	224	1,494	1,718
Total	**3,633**	**4,028**	**7,661**	**3,930**	**3,599**	**7,529**	**3,893**	**3,683**	**7,576**

[1] Begins October 1 and ends September 30. A fiscal year is specified by the year in which it ends.

NOTES: Data presents a breakdown of reviews by safety rating and includes all reviews resulting in a safety rating, including Motor Carrier Safety Compliance Reviews. A satisfactory safety rating means a motor carrier has implemented safety management controls that meet the safety fitness standards prescribed in 49 CFR section 385.5, and that are appropriate for the size and type of operation of the particular motor carrier. A conditional safety rating means a motor carrier does not have safety management controls in place that are adequate to ensure compliance with the safety fitness standards prescribed in 49 CFR section 385.5, and which may result in non-compliance. An unsatisfactory safety rating means a motor carrier is not in compliance with the safety fitness standards prescribed in 49 CFR section 385.5. Not rated is the number of reviews that have not had a safety rating assigned.

SOURCE: U.S. Department of Transportation, Federal Motor Carrier Administration, Motor Carrier Management Information System (MCMIS), Compliance Review Activity by Safety Rating for Fiscal Years, available at www.fmcsa.dot.gov as of April 2017.

About one-fifth of all roadside inspections of commercial vehicles resulted in a vehicle being placed out of service (OOS) for a serious violation. Much lower percentages of driver and hazardous materials inspections resulted in OOS orders. In 2016, 4.9 percent of driver inspections and 3.9 percent of hazardous materials inspections resulted in OOS orders.

Table 6-5 Activity Summary of Roadside Safety Inspections by Motor Carrier Inspection Type: Fiscal Years[1] 2000, 2010, and 2014–2016

	2000	2010	2014	2015	2016
Roadside inspections	**2,453,776**	**3,569,373**	**3,437,808**	**3,384,363**	**3,418,659**
With no violations	639,593	1,225,324	1,359,956	1,394,553	1,418,345
With violations	1,814,183	2,344,049	2,077,852	1,989,810	2,000,314
Driver inspections	**2,396,688**	**3,470,871**	**3,319,856**	**3,264,607**	**3,300,745**
With OOS violations	191,031	183,350	166,586	159,930	161,535
Driver OOS rate	8.0%	5.3%	5.0%	4.9%	4.9%
Vehicle inspections	**1,908,300**	**2,413,094**	**2,368,221**	**2,309,450**	**2,348,187**
With OOS violations	452,850	480,416	479,436	468,386	470,831
Vehicle OOS rate	23.7%	19.9%	20.2%	20.3%	20.1%
Hazardous material inspections	**133,486**	**211,154**	**198,611**	**191,275**	**200,462**
With OOS violation	9,964	9,210	7,788	7,449	7,875
Hazmat OOS rate	7.5%	4.4%	3.9%	3.9%	3.9%

KEY: OOS = out-of-service.

[1] Begins October 1 and ends September 30. A fiscal year is specified by the year in which it ends.

NOTES: A roadside inspection is an examination of individual commercial motor vehicles and drivers to determine if they are in compliance with the Federal Motor Carrier Safety Regulations and/or Hazardous Materials Regulations. Serious violations result in the issuance of driver or vehicle OOS orders. Serious violations include operating a vehicle in a hazardous condition, hazardous materials onboard, or lack of required operating authority. These violations must be corrected before the driver or vehicle can return to service. Moving violations also may be recorded in conjunction with a roadside inspection.

SOURCE: U.S. Department of Transportation, Federal Motor Carrier Safety Administration, Motor Carrier Management Information System (MCMIS), *Roadside Inspection Activity Summary for Fiscal Years*, August 2017.

Energy

While truck vehicle-miles traveled decreased by 8 percent over the 2007 to 2015 period, truck fuel consumption declined by 7.4 percent, from 47.2 billion gallons to 43.7 billion gallons. Fuel use in Class I freight railroads declined by 8.9 percent, from 4.1 billion gallons in 2007 to 3.7 billion gallons in 2015. These decreases occurred despite growing numbers of trucks and Class I locomotives in recent years (table 3-4).

Table 6-6 Fuel Consumption by Transportation Mode: 2007, 2010, and 2013–2015

	2007	2010	2013	2014	2015
Highway[1]					
Gasoline, diesel and other fuels (million gallons)	176,203	170,411	169,651	173,347	172,864
Truck, total	47,219	45,023	43,297	44,012	43,734
Single-unit 2-axle 6-tire or more truck	16,314	15,097	14,502	14,894	14,850
Combination truck	30,904	29,927	28,795	29,118	28,884
Truck (percent of total)	26.8	26.4	25.5	25.4	25.3
Rail, Class I (in freight service)					
Distillate/diesel fuel (million gallons)	4,087	3,519	3,713	3,897	3,723
Water					
Residual fuel oil (million gallons)	6,327	5,143	4,212	3,847	3,358
Distillate/diesel fuel oil (million gallons)	1,924	2,003	1,676	1,593	2,417
Gasoline (million gallons)	1,222	1,167	1,123	(R) 1,126	2,066
Pipeline					
Natural gas (million cubic feet)	621,364	674,124	833,061	(R) 700,150	666,214

KEY: R = revised.

[1] Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCES: **Highway:** U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. **Rail**: Association of American Railroads, *Railroad Facts 2016* (Washington, DC: 2015), p. 63. **Water**: U.S. Department of Energy, Energy Information Administration, *Fuel Oil and Kerosene Sales 2015* (Washington, DC: 2016), table HL1, and similar tables in earlier editions; U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table MF-24. **Pipeline**: U.S. Department of Energy, *Natural Gas Annual 2015*, (Washington, DC: September 2016.), table 15 and similar tables in earlier editions.

In 2015 freight truck accounted for a majority of freight transportation energy consumption, followed by water, a distant second.

Table 6-7 Energy Consumption by Select Freight Transportation Modes: 2007, 2010, and 2013–2015

(trillions of BTUs)

	2007	2010	2013	(R) 2014	2015
Truck	6,549	6,245	6,005	6,104	6,066
Class I Rail	567	488	515	541	516
Water	1,367	1,194	1,003	938	1,096
Pipeline (natural gas only)	(R) 641	695	859	722	687

KEY: R = revised; BTU = British thermal unit.

NOTES: Class I railroads had annual carrier operating revenue of $457.91 million or more in 2015. Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this figure should not be compared to those in pre-2011 editions of Freight Facts and Figures. Data do not include energy consumed by oil pipelines (crude petroleum and petroleum products) or coal slurry/water slurry pipelines.

The following conversion rates were used:
Diesel = 138,700 Btu/gallon.
Gasoline = 125,000 Btu/gallon
Bunker fuel = 149,700 Btu/gallon.
Natural gas = 1,031 Btu/cubic foot

SOURCES: **Highway:** U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. **Rail**: Association of American Railroads, *Railroad Facts 2016* (Washington, DC: 2016), p. 63. **Water**: U.S. Department of Energy, Energy Information Administration, *Fuel Oil and Kerosene Sales 2015* (Washington, DC: 2016), table HL1, and similar tables in earlier editions; U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table MF-24. **Pipeline**: U.S. Department of Energy, *Natural Gas Annual 2015*, (Washington, DC: September 2016), table 15 and similar tables in earlier editions.

Miles per gallon of single-unit trucks (based on total travel and fuel consumption) have been relatively stable over the 2007 to 2015 period. Despite this small change in fuel efficiency, fuel consumption dropped as single-unit trucks traveled fewer miles overall and fewer miles per vehicle.

Table 6-8 Single-Unit Truck Fuel Consumption and Travel: 2007, 2010, and 2013–2015

	2007	2010	2013	2014	2015
Number registered (thousands)	8,117	8,217	8,126	8,329	8,456
Vehicle-miles traveled (millions)	119,979	110,738	106,582	109,301	109,597
Fuel consumed (million gallons)	16,314	15,097	14,502	14,894	14,850
Average miles traveled per vehicle	14,782	13,476	13,116	13,123	12,960
Average miles per gallon	(R) 7.3	7.3	7.3	7.3	7.4
Average fuel consumed per vehicle (gallons)	2,010	1,837	1,785	1,788	1,756

KEY: R = revised.

NOTES: Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017.

Miles per gallon of combination trucks (based on average miles traveled and fuel consumption) remained stable between 2007 and 2015. During the same period, vehicle-miles traveled by combination trucks declined by about 14.0 billion (about 7.6 percent).

Table 6-9 Combination Truck Fuel Consumption and Travel: 2007, 2010, and 2013–2015

	2007	2010	2013	2014	2015
Number registered (thousands)	2,635	2,553	2,471	2,577	2,747
Vehicle-miles traveled (millions)	184,199	175,789	168,436	169,830	170,246
Fuel consumed (million gallons)	30,904	29,927	28,795	29,118	28,884
Average miles traveled per vehicle	69,896	68,859	68,155	65,897	61,978
Average miles per gallon	6.0	5.9	5.8	5.8	5.9
Average fuel consumed per vehicle (gallons)	11,727	11,723	11,652	11,298	10,515

KEY: R = revised.

NOTES: Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017.

Energy intensity is the amount of energy used to produce a given level of output or activity which is measured by vehicle-miles, freight-car-miles, or ton-miles. In recent years, the energy intensity of trucking and rail has remained relatively stable.

Table 6-10 Energy Intensities of Domestic Freight Transportation Modes: 2007, 2010–2014

	2007	2010	2011	2012	2013	2014
Highway[1] (BTU per vehicle-mile)	21,238	21,499	21,677	(R) 21,524	21,540	21,573
Railroad (Class I) (BTU per freight-car-mile)	14,846	13,733	14,043	13,800	14,607	14,533
Railroad (Class I) (BTU per ton-mile)	320	289	298	294	296	292
Domestic waterborne commerce (BTU per ton-mile)	225	217	211	210	NA	NA

KEY: BTU = British thermal unit; NA = not available.

[1] Includes heavy single-unit and combination trucks. Heavy single-unit trucks are trucks that have two axles and at least six tires or a gross vehicle weight rating exceeding 10,000 pounds. Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Energy intensity data are based on the new FHWA methodology. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCE: Oak Ridge National Laboratory, *Transportation Energy Data Book: Edition 35* (Oak Ridge, TN: annual issues), table 2.17, available at http://cta.ornl.gov/data/index.shtml as of May 2017.

Environment

Air quality is affected by freight vehicle emissions. Compared with gasoline-fueled cars and trucks, diesel-fueled heavy trucks emit small amounts of carbon monoxide (CO) but larger amounts of nitrogen oxides (NOx). However, since 2000 the rate of NOx emissions from diesel-fueled heavy-duty trucks declined by 69.6 percent.

Table 6-11 Estimated National Average Vehicle Emissions Rates: 2000, 2010, 2015, and 2016
(grams per mile)

	(R) 2000	(R) 2010	(R) 2015	2016
	Gasoline			
Cars				
Exhaust HC	0.95	0.42	0.26	0.23
Nonexhaust HC	0.37	0.21	0.15	0.13
Total HC	**1.32**	**0.63**	**0.40**	**0.36**
Exhaust CO	13.10	5.56	3.84	3.58
Exhaust NO_x	1.63	0.87	0.50	0.43
Light trucks[1]				
Exhaust HC	0.88	0.64	0.40	0.35
Nonexhaust HC	0.20	0.14	0.11	0.10
Total HC	**1.07**	**0.78**	**0.51**	**0.45**
Exhaust CO	14.12	9.10	6.12	5.54
Exhaust NO_x	2.22	1.39	0.84	0.73
Heavy trucks[2]				
Exhaust HC	2.03	1.35	0.90	0.80
Nonexhaust HC	0.43	0.38	0.33	0.31
Total HC	**2.46**	**1.73**	**1.23**	**1.11**
Exhaust CO	55.01	38.03	27.26	24.99
Exhaust NO_x	6.34	4.38	2.86	2.58
	Diesel			
Cars				
Exhaust HC	2.91	0.91	0.21	0.18
Exhaust CO	42.37	12.10	2.75	2.46
Exhaust NO_x	2.82	0.97	0.24	0.19
Light trucks[1]				
Exhaust HC	0.77	0.71	0.41	0.36
Exhaust CO	8.71	5.73	3.22	2.86
Exhaust NO_x	4.15	2.80	1.71	1.53
Heavy trucks[2]				
Exhaust HC	1.17	1.05	0.75	0.70
Exhaust CO	4.77	3.83	2.57	2.36
Exhaust NO_x	24.82	12.82	8.29	7.54

KEY: CO = carbon monoxide; HC = hydrocarbon; NO_x = nitrogen oxides; R = revised.

[1] Includes pick-up trucks, sport-utility vehicles, and minivans with a gross vehicle weight rating up to 8,500 pounds.

[2] Includes trucks with a gross vehicle weight rating over 8,500 pounds.

NOTES: This table is based on MOVES2013, the latest highway vehicle emissions factor model from the U.S. Environmental Protection Agency. Similar tables in previous editions of *Freight Facts and Figures* were based on earlier models. Thus, the data in this table should not be compared to those in previous editions.

SOURCE: U.S. Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory, special tabulation, January 2017.

The U.S. Environmental Protection Agency (EPA) estimates that trucks produced more than 2.3 million tons of NOx in 2016. Substantial reductions in freight-related NOx emissions have been made since the EPA required the use of ultra-low sulfur diesel fuel in heavy-duty trucks and other diesel-powered highway vehicles beginning in 2006. Between 2000 and 2016, NOx emissions from gasoline- and diesel-powered single-unit and combination trucks decreased by 63.4 percent. PM-10 emissions declined by 59.3 percent over the same period. By 2030 truck-related NOx and PM-10 emissions are projected to decline by 84.6 percent and 78.1 percent, respectively, from 2000 levels.

Table 6-12 Nitrogen Oxides (NOx) and Particulate Matter (PM-10) Emissions from Single-Unit and Combination Trucks: 2000, 2010, 2016, 2020, and 2030

(thousands of short tons)

Trucks	(R) 2000	(R) 2010	2016	(R) 2020	(R) 2030
Total truck emissions	**6,661**	**3,923**	**2,452**	**1,768**	**1,046**
NOx emissions	**6,336**	**3,713**	**2,320**	**1,667**	**975**
Total PM-10 emissions	**325**	**211**	**132**	**101**	**71**
Exhaust emissions	288	170	90	56	18
Brake emissions	30	33	34	37	43
Tire emissions	7	7	8	8	10

KEY: R = revised.

NOTE: Single-unit trucks have 2-axles and at least 6 tires or a gross vehicle weight rating exceeding 10,000 lbs.

SOURCE: U.S. Environmental Protection Agency, MOVES (Motor Vehicle Emission Simulator) model 2013, special tabulation, January 2017.

In addition to carbon monoxide, nitrogen oxide, and particulate matter emissions, the transportation sector releases large quantities of greenhouse gases (GHGs), such as carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons. Transportation was responsible for about 27.5 percent of all greenhouse gases emitted in the United States in 2015, second only to the industrial sector which produces the largest amount of GHG emissions (29.3 percent).

Table 6-13 U.S. Greenhouse Gas Emissions by Economic End-Use Sector: 2005, 2010, and 2013–2015 (electricity-related emissions distributed among sectors)[1]

(millions of metric tonnes of CO_2 equivalent)

Sector	(R)2005	(R) 2010	(R) 2013	(R)2014	2015
Industry [2,3]	2,178.1	1,979.1	1,977.4	1,978.7	1,931.1
Transportation [2,4]	2,005.9	1,832.0	1,794.3	1,820.0	1,810.4
Commercial [2]	1,217.6	1,212.8	1,128.5	1,139.9	1,114.8
Residential	1,241.3	1,216.9	1,122.0	1,143.7	1,071.6
Agriculture	612.4	699.5	609.9	610.8	612.0
U.S. territories [5]	58.1	45.3	48.1	46.6	46.6
Total	**7,313.3**	**6,985.5**	**6,680.1**	**6,739.7**	**6,586.7**

KEY: CO_2 = carbon dioxide; R = revised.

[1] Emissions from electricity generation are allocated to each economic end-use sector on the basis of each sector's share of aggregate electricity consumption. This method assumes each sector consumes electricity that is generated from the national average mix of fuels according to their carbon intensity.

[2] There was a method update in this Inventory for estimating the share of gasoline used in on-road and non-road applications. The change does not impact total U.S. gasoline consumption. It mainly results in a shift in gasoline consumption from the transportation sector to industrial and commercial sectors for 2015, creating a break in the time series.

[3] Industry includes manufacturing, construction, and mining. Six manufacturing industries--petroleum refineries, chemicals, primary metals, paper, food, and nonmetallic mineral products--represent the vast majority of energy use and thus GHG emissions in the industrial sector.

[4] Includes emissions from military aircraft (14.7 million metric tonnes in 2015) and "other" transportation, primarily lubricants (10.0 million metric tonnes in 2015). Emissions from international bunker fuels are not included.

[5] Electricity-related emissions were not distributed to U.S. Territories.

NOTE: Totals may not sum due to independent rounding.

SOURCE: U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, EPA 430-P-17-001* (Washington, DC: April 15, 2017, table ES-7, available at https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf as of July 17, 2017.

Carbon dioxide (CO_2) accounts for nearly all of the transportation sector's greenhouse gas emissions, primarily from the combustion of fossil fuels. Almost all of the energy consumed by the sector is petroleum-based and includes motor gasoline, diesel fuel, jet fuel, and residual oil. Gasoline-fueled passenger cars and light-duty trucks are responsible for about 63.1 percent of transportation sector CO_2 emissions, while the combustion of diesel fuel in medium- and heavy-duty trucks and jet fuel in aircraft produced much of the rest.

Although CO_2 emissions from the transportation sector have leveled off in recent years, they were 8.0 percent lower in 2015 than in 2005. However, the transportation sectors share of total U.S. CO_2 emissions increased slightly to 34.4 percent in 2015, likely the result of more travel, population and economic growth, and/or low fuel prices.

Table 6-14 U.S. Transportation Sector CO_2 Emissions from Fossil Fuel Combustion by Fuel Type: 2005, 2010, and 2013–2015

(millions of metric tonnes of CO_2 equivalent)

Fuel	2005	2010	2013	2014	2015
Petroleum [1]	**(R)1,854.0**	**(R)1,690.2**	**(R)1,666.0**	**(R)1,702.5**	**1,697.6**
Motor gasoline	(R)1,183.7	(R)1,092.5	(R)1,065.6	(R)1,096.1	1,070.5
Distillate fuel oil	(R)457.5	(R)422.0	(R)433.9	(R)447.7	460.7
Jet fuel	189.3	151.5	147.1	148.6	157.7
Residual fuel	19.3	20.4	(R)15.1	5.8	4.2
Aviation gasoline	2.4	1.9	1.5	1.5	1.5
Liquefied petroleum gas	1.7	1.8	(R)2.7	(R)2.9	3.0
Natural gas	**33.1**	**38.1**	**(R)47.0**	**(R)40.3**	**38.8**
Transportation CO_2 total [1,2]	**(R)1,887.0**	**(R)1,728.3**	**(R)1,713.0**	**(R)1,742.8**	**1,736.4**
U.S. CO_2 total [2]	**(R)5,746.9**	**(R)5,520.0**	**(R)5,156.5**	**(R)5,202.3**	**5,049.8**
Transportation sector as % of total	**32.8**	**(R)31.3**	**33.2**	**33.5**	**34.4**

KEY: CO_2 = carbon dioxide; R = revised.

[1] There was a method update in this Inventory for estimating the share of gasoline used in on-road and non-road applications. The change does not impact total U.S. gasoline consumption. It mainly results in a shift in gasoline consumption from the transportation sector to industrial and commercial sectors for 2015, creating a break in the time series.

[2] Electricity-related emissions are not included in the transportation sector and U.S. totals for CO2 emissions from fossil fuel combustion.

NOTES: CO_2 equivalent is computed by multiplying the weight of the gas being measured by its estimated Global Warming Potential (GWP). The Intergovernmental Panel on Climate Change developed the GWP concept to compare the ability of one GHG to trap heat in the atmosphere to another gas. Carbon comprises 12/44 of CO_2 by weight. Numbers may not add to totals due to rounding. Electricity-related emissions are not included in this table.

SOURCE: U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, EPA 430-P-17-001* (Washington, DC: April 15, 2017), tables ES-3 and 3-1; and Annex 2, tables A-11, A-12, A-13, A-14, A-15, and A-21; available at https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf as of July 17, 2017.

Since 2005 greenhouse gas emissions from both freight and passenger transportation sources have declined. Passenger emissions declined at a faster rate at 13.5 percent than that of freight. Between 2005 and 2015, truck emissions rose by 4.0 percent and pipeline by 17.3 percent. An increase in the volume of freight movements by truck and pipeline contributes to the rise in their emissions over the last two decades.

Table 6-15 U.S. Greenhouse Gas Emissions from Domestic Freight Transportation: 2005, 2010, and 2013–2015

(millions of metric tonnes of CO_2 equivalent)

Mode	(R)2005	(R)2010	(R)2013	2014	2015	Percent change, 2005 to 2015
Trucking	398.9	389.7	(R)395.8	408.3	415.0	4.0
Freight rail	45.0	38.0	(R)40.9	42.8	41.3	-8.2
Ships and other boats[1]	27.9	28.5	(R)27.8	6.3	4.8	-82.8
Pipelines[2]	32.4	37.1	(R)46.2	39.4	38.0	17.3
Commercial aircraft[3]	21.4	16.3	15.90	16.2	16.5	-22.9
Freight total	**525.6**	**509.6**	**(R)526.6**	**513.0**	**515.6**	**-1.9**
Passenger total	**1,450.6**	**1,299.1**	**(R)1,252.4**	**1,272.2**	**1,254.1**	**-13.5**
Transportation total[3,4]	**2,005.9**	**1,832.0**	**(R)1,794.3**	**1,820.0**	**1,810.4**	**-9.7**
Freight as % of transportation total	**26.2**	**27.8**	**(R)29.3**	**28.2**	**28.5**	

KEY: CO_2 = carbon dioxide; R = revised.

[1]Fluctuations in emissions estimates are associated with fluctuations in reporting fuel consumption and may reflect issues with data sources.

[2]Includes only CO_2 emissions from natural gas used to only power pipelines.

[3]Does not include emissions from general aviation and military aircraft (25.9 and 14.7 million metric tonnes in 2015 respectively) and "other" transportation, primarily lubricants (10.0 million metric tonnes in 2015). Emissions from international bunker fuels are not included.

[4]There was a method update in this Inventory for estimating the share of gasoline used in on-road and non-road applications. The change does not impact total U.S. gasoline consumption. It mainly results in a shift in gasoline consumption from the transportation sector to industrial and commercial sectors for 2015, creating a break in the time series.

NOTES: U.S. Environmental Protection Agency (EPA) used U.S. Department of Energy fuel consumption data to allocate freight and passenger rail emissions. EPA used U.S. Department of Transportation, Bureau of Transportation Statistics data on freight shipped by commercial aircraft and the total number of passengers enplaned to split commercial aircraft emissions between passenger and freight transportation. Each passenger was estimated to weigh an average of 150 pounds and luggage was estimated to weigh 50 pounds. Previous Inventories included commercial aircraft emissions under passenger travel. CO_2 equivalent is computed by multiplying the weight of the gas being measured by its estimated Global Warming Potential (GWP). The Intergovernmental Panel on Climate Change developed the GWP concept to compare the ability of one GHG to trap heat in the atmosphere to another gas. Carbon comprises 12/44 of CO_2 by weight. Numbers may not add to totals due to rounding.

SOURCE: U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, EPA 430-P-17-001* (Washington, DC: April 15, 2017), table ES-7 and Annex 3 tables A-118 and A-119, available at https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf as of July 17, 2017.

Water quality is affected by oil spills from vessels and pipelines transporting crude oil and petroleum products and by facilities, such as offshore drilling units and platforms. In 2016 vessel-related spills accounted for 79.1 percent of total gallons spilled. Since 2000, significant reductions were seen in the number of oil-spill incidents and in the total gallons of oil spilled, 68 and 79 percent, respectively.

Table 6-16 Oil Spills In and Around U.S. Waterways: 2000 and 2013–2016

	2000		2013		2014		(R) 2015		2016	
Source	Incidents	Gallons spilled	Incidents	Gallons spilled	Incidents	Gallons spilled	Incidents	Gallons spilled	Incidents	Gallons spilled
Total, all spills	**8,354**	**1,431,370**	**3,223**	**497,710**	**3,077**	**668,363**	**2,873**	**361,482**	**2,663**	**301,723**
Vessel sources, total	**5,560**	**1,033,643**	**1,721**	**207,106**	**1,716**	**273,432**	**1,545**	**296,520**	**1,500**	**238,651**
Tankship	111	608,176	20	711	18	146	75	147,087	73	32,165
Tank barge	229	133,540	100	19,568	89	199,667	24	1,147	17	87,416
Other vessels[1]	5,220	291,927	1,601	186,827	1,609	73,619	1,446	148,286	1,410	119,070
Nonvessel sources, total	**1,645**	**373,761**	**1,048**	**284,513**	**963**	**386,350**	**931**	**63,027**	**943**	**59,318**
Offshore pipelines	4	17	35	6,028	41	5,267	26	474	22	9,139
Onshore pipelines	21	17,004	N	N	N	N	N	N	N	N
All other non-vessels[2]	1,620	356,740	1,013	278,485	922	381,083	905	62,553	921	50,179
Unknown	**1,149**	**23,966**	**454**	**6,091**	**398**	**8,581**	**397**	**1,935**	**220**	**3,754**

KEY: N = data do not exist; R = revised.

[1]Other vessels include commercial vessels, fishing boats, freight barges, freight ships, industrial vessels, oil recovery vessels, passenger vessels, unclassified public vessels, recreational boats, research vessels, school ships, tow and tug boats, mobile offshore drilling units, offshore supply vessels, publicly owned tank and freight ships, as well as vessels not fitting any particular class (unclassified).

[2]All other non-vessels include aircraft, land vehicles, railroad equipment, bridges, factories, fleeting areas, industrial facilities, marinas, common carriers, sewer drainage, shipyard/repair facilities, and shorelines.

NOTES: Any spills inshore (pipeline or not) are now handled by the EPA and the associated state government agency. Spills involving interstate pipelines are the responsibility of the Department of Transportation, Pipeline and Hazardous Materials Safety Administration. Beginning in 2007, the U.S. Coast Guard no longer differentiated between offshore and onshore pipelines in data collection.

SOURCES: **2000**: U.S. Coast Guard, *Polluting Incidents In and Around U.S. Waters, A Spill/Release Compendium: 1969-2011* (Washington, DC: January 2013), tables *Number of Spills by Source, Volume of Spills by Source (Gallons) and Oil Spills In U.S. Waters Calendar Year*, available at http://homeport.uscg.mil/ as of July 2017. **2013-2016**: Incidents and gallons spilled are derived from Pollution Incident Investigation records from the Marine Information for Safety and Law Enforcement System (MISLE) as of July 2017.

APPENDIX A. SELECT METRIC DATA

Table 2-1M Weight of Shipments by Transportation Mode: 2012, 2015, and 2045
(millions of metric tonnes)

	2012				2015				2045			
	Total	Domestic	Exports[1]	Imports[1]	Total	Domestic	Exports[1]	Imports[1]	Total	Domestic	Exports[1]	Imports[1]
Total	**15,379**	**13,565**	**784**	**1,030**	**16,380**	**14,556**	**828**	**997**	**22,993**	**18,973**	**1,986**	**2,033**
Truck	9,223	9,045	97	81	9,851	9,661	100	91	13,486	12,946	264	277
Rail	1,463	1,349	47	67	1,458	1,323	49	77	1,743	1,449	98	196
Water	846	459	62	326	849	502	85	262	1,051	557	171	322
Air, air & truck	9	2	4	4	10	2	4	5	34	4	15	16
Multiple modes & mail	1,197	282	541	375	1,227	297	556	374	2,695	394	1,378	924
Pipeline	2,604	2,396	33	176	2,956	2,737	34	185	3,956	3,609	57	289
Other & unknown	37	33	1	3	30	26	1	3	28	15	4	10

[1] Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode.

NOTES: The Commodity Flow Survey (CFS) is conducted every 5 years as part of the Economic Census, last administered in 2012. 1 metric tonne = 1.1023 short tons. Numbers may not add to totals due to rounding. The 2015 data are provisional estimates that are based on selected modal and economic trend data. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes & mail to avoid double counting. Multiple modes and mail also includes some air movements. As a consequence, some totals in this table are less than other published sources.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

Table 2-4M Top 10 Commodities by Weight and Value: 2015

Weight	Millions of metric tonnes	Value	Billions of 2012 dollars
Natural gas, coke, asphalt[1]	2,401	Electronics	$1,673
Gravel	1,651	Motorized vehicles	$1,467
Gasoline	1,049	Mixed freight	$1,458
Cereal grains	997	Machinery	$1,148
Nonmetal mineral products	973	Gasoline	$1,059
Fuel oils	943	Natural gas, coke, asphalt[1]	$917
Coal	908	Pharmaceuticals	$903
Crude petroleum	827	Fuel oils	$836
Other foodstuffs	639	Miscellaneous manufacturing products	$791
Waste/scrap	592	Other foodstuffs	$710
Top 10 total	**10,981**	**Top 10 total**	**$10,963**
Total, all commodities	**16,309**	**Total, all commodities**	**$19,146**

[1] This group includes coal and petroleum products not elsewhere classified such as liquefied natural gas, coke, asphalt, and other products of coal and petroleum refining, excluding gasoline, aviation fuel, and fuel oil.

NOTE: The Commodity Flow Survey (CFS) is conducted every 5 years as part of the Economic Census, last administered in 2012. 1 metric tonne = 1.1023 short tons.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

Table 2-5M Hazardous Materials Shipments by Transportation Mode: 2012

Transportation mode	Value		Tonnes		Tonne-kilometers[1]		Kilometers
	$ Billions	Percent	Millions	Percent	Billions	Percent	Average distance per shipment
All modes, total	**2,334.4**	**100.0**	**2,340.7**	**100.0**	**449.0**	**100.0**	**183.5**
Single modes, total	**2,304.7**	**98.7**	**2,316.0**	**98.9**	**402.4**	**89.6**	**109.4**
Truck[2]	1466.0	62.8	1,389.3	59.4	141.0	31.4	90.1
For-hire	870.9	37.3	800.4	34.2	90.5	20.2	241.4
Private	595.1	25.5	588.9	25.2	50.4	11.2	53.1
Rail	79.2	3.4	100.7	4.3	124.0	27.6	1300.3
Water	217.8	9.3	257.3	11.0	80.2	17.9	341.2
Air	4.4	0.2	0.3	Z	0.4	0.1	1802.4
Pipeline[3]	537.3	23.0	568.5	24.3	S	S	S
Multiple modes, total	**29.7**	**1.3**	**24.8**	**1.1**	**46.6**	**10.4**	**1052.5**
Truck and rail	13.3	0.6	15.4	0.7	24.2	5.4	1535.2
Truck and water	S	S	S	S	S	S	1900.5
Rail and water	2.5	0.1	4.2	0.2	2.0	0.4	S
Parcel, U.S. Postal Service, or Courier	10.3	0.4	0.3	Z	0.3	0.1	1046.0
Other multiple modes	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other modes	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

KEY: S = data are not published because estimate did not meet publication standards; Z = rounds to zero.

[1] Tonne-kilometer estimates are based on estimated distances traveled along a modeled transportation network.

[2] Truck as a single mode includes shipments that went by private truck only or by for-hire truck only.

[3] Excludes crude petroleum shipments.

NOTES: The Commodity Flow Survey (CFS) is conducted every 5 years as part of the Economic Census, last administered in 2012. 1 metric tonne = 1.1023 short tons. 1 tonne-kilometer = .6849 ton-miles. 1 kilometer = .6214 miles. Value-of-shipment estimates have not been adjusted for price changes. Numbers and percents may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, *2012 Commodity Flow Survey, Hazardous Materials* (Washington, DC: February 2015), table 1a, available at www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf as of July 2016.

Table 2-6M Hazardous Materials Shipments by Hazard Class: 2012

Hazard class	Description	Value		Metric tonnes		Tonne-kilometers[1]		Kilometers
		$ Billions	Percent	Millions	Percent	Billions	Percent	Average distance per shipment
Class 1	Explosives	18.4	0.8	3.6	0.2	1.5	0.3	1,351.8
Class 2	Gases	125.1	5.4	149.5	6.4	48.5	10.8	91.7
Class 3	Flammable liquids	2,016.7	86.4	1,999.0	85.4	298.7	66.5	149.7
Class 4	Flammable solids	5.4	0.2	10.3	0.4	8.5	1.9	909.2
Class 5	Oxidizers and organic peroxides	7.6	0.3	10.9	0.5	8.0	1.8	703.3
Class 6	Toxic (poison)	15.2	0.7	6.9	0.3	5.3	1.2	825.6
Class 7	Radioactive materials	12.3	0.5	S	S	0.6	Z	54.7
Class 8	Corrosive materials	75.9	3.2	113.7	4.9	55.2	12.3	424.8
Class 9	Miscellaneous dangerous goods	58.0	2.5	46.3	2.0	23.5	5.2	852.9
Total		**2,334.4**	**100.0**	**2,340.7**	**100.0**	**449.0**	**100.0**	**183.5**

KEY: S = data are not published because of high sampling variability or other reasons; Z = rounds to zero.

[1] Tonne-kilometer estimates are based on estimated distances traveled along a modeled transportation network.

NOTES: The Commodity Flow Survey (CFS) is conducted every 5 years as part of the Economic Census, last administered in 2012. 1 metric tonne = 1.1023 short tons. 1 tonne-kilometer = .6849 ton-miles. 1 kilometer = .6214 miles. Value-of-shipments estimates have not been adjusted for price changes. Numbers and percents may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, *2012 Commodity Flow Survey, Hazardous Materials* (Washington, DC: February 2015), table 2a, available at www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf as of July 2016.

Table 2-7M Domestic Transportation Mode of Exports and Imports by Tonnage and Value: 2012, 2015, and 2045

	Millions of metric tonnes			Billions of 2012 dollars		
	2012	2015	2045	2012	2015	2045
Total	**1,814**	**1,824**	**4,020**	**3,746**	**4,177**	**14,566**
Truck[1]	736	783	2,062	2,070	2,273	8,185
Rail	221	212	456	196	211	549
Water	216	238	479	303	378	1,163
Air, air & truck[2]	4	4	18	534	643	2,910
Multiple modes & mail[3]	65	64	192	227	254	935
Pipeline	265	271	530	158	158	305
Other & unknown	4	4	14	39	82	324
No domestic mode[4]	304	248	269	220	179	195

[1] Excludes truck moves to and from airports.

[2] Includes truck moves to and from airports.

[3] Multiple modes & mail includes U.S. Postal Service, courier shipments, and all intermodal combinations, except air and truck. In this table, oceangoing export and import shipments that move between ports and domestic locations by single modes are classified by the domestic mode rather than by multiple modes & mail.

[4] No domestic mode includes waterborne import shipments of crude petroleum off-loaded directly at the domestic destination (refineries) with no domestic mode of transportation.

NOTES: 1 metric tonne = 1.1023 short tons. Numbers may not add to totals due to rounding.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2016.

Table 2-9M Value and Tonnage of U.S. Merchandise Trade with Canada and Mexico by Transportation Mode: 2000, 2010, 2015, and 2016

(Billions of current U.S. dollars and millions of metric tonnes)

	2000		2010		2014		2015	
Mode	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**
Truck[1]	429	NA	560	170	712	187	700	176
Rail[1]	94	NA	131	122	165	139	166	134
Air	45	<1	45	<1	43	<1	42	<1
Water	33	176	81	191	73	198	58	160
Pipeline[1]	24	NA	65	97	57	173	50	172
Other[1]	29	NA	37	10	56	31	54	27
TOTAL[1]	**653**	**NA**	**921**	**589**	**1,106**	**729**	**1,069**	**669**

KEY: NA = not available.

[1] The U.S. Department of Transportation, Bureau of Transportation Statistics estimated the weight of exports for truck, rail, pipeline, and other modes using weight-to-value ratios derived from imported commodities.

NOTES: 1 metric tonne = 1.1023 short tons. "Other" includes shipments transported by mail, other and unknown modes, and shipments through Foreign Trade Zones. Totals for the most recent year differ slightly from the Freight Analysis Framework (FAF) due to variations in coverage and FAF conversion of values to constant dollars. Numbers may not add to totals due to rounding.

SOURCES: **Truck, Rail, Pipeline, and Other:** U.S. Department of Transportation, Bureau of Transportation Statistics, North American Trans-border Freight Data, available at www.bts.gov/transborder as of May 2017; **Air and Water:** U.S. Department of Commerce, Census Bureau, Foreign Trade Division, *FT920 - U.S. Merchandise Trade: Selected Highlights* (Washington, DC: annual issues).

Table 3-1M Kilometers of Infrastructure by Transportation Mode: 2000, 2010, and 2013–2015

	2000	2010	2013	2014	2015
Public roads, route miles	**6,358,386**	**NA**	**6,622,887**	**6,722,037**	**6,686,075**
National Highway System (NHS)	259,397	NA	365,665	364,266	358,453
Interstates	75,109	NA	76,561	76,701	77,330
Other NHS	184,287	NA	289,105	287,565	281,123
Other	6,098,989	NA	6,257,222	10,231,367	6,327,622
Strategic Highway Corridor Network (STRAHNET)[1]	**99,881**	**NA**	**100,732**	**103,112**	**103,211**
Interstate	75,113	NA	76,559	76,701	77,330
Non-Interstate	24,765	NA	24,173	26,411	25,881
Railroad[2]	**274,400**	**223,006**	**NA**	**NA**	**NA**
Class I	194,073	153,803	153,096	151,703	150,510
Regional	33,759	16,748	NA	NA	NA
Local	46,567	52,456	NA	NA	NA
Inland waterways					
Navigable channels	17,702	17,702	17,702	17,702	17,702
Great Lakes-St. Lawrence Seaway	3,769	3,769	3,769	3,769	3,769
Pipelines					
Oil	284,834	285,526	301,291	312,879	NA
Gas	2,216,479	(R) 2,501,239	(R) 2,535,462	(R) 2,551,773	2,568,738

KEY: NA = not available; R = revised.

[1]The Strategic Highway Corridor Network (STRAHNET) is the total minimum public highway network necessary to support deployment needs of the U.S. Department of Defense.

[2]Class I railroads had annual carrier operating revenue in 2014 of $475.75 million or more. Regional (Class II) railroads had annual carrier operating revenue in 2014 greater than $38.06 million and less than $475.75 million. Local (Class III) railroads had annual carrier operating revenue in 2014 below $38.06 million.

NOTE: 1 kilometer = .6214 miles.

SOURCES: **Public Roads:** U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), tables HM-16 and HM-49, available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017. **Rail:** Association of American Railroads, *Railroad Facts* (Washington, DC: annual issues). **Navigable channels:** U.S. Army Corps of Engineers, *A Citizen's Guide to the USACE*, available at www.corpsreform.org/sitepages/downloads/CitzGuideChptr1.pdf as of July 2016. **Great Lakes-St. Lawrence Seaway:** The St. Lawrence Seaway Development Corporation, "The Seaway," available at www.greatlakes-seaway.com/en/seaway/facts/index.html as of May 2017. **Pipelines:** U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, *Pipeline Statistics*, available at www.phmsa.dot.gov/pipeline/library/data-stats as of May 2017.

Table 3-15M Top 25 Airports by Landed Weight[1] of All-Cargo[2] Operations: 2000, 2010, and 2013–2015

Airport	2015 rank	Landed weight (thousands of metric tonnes) 2000	2010	2013	(R) 2014	2015
Memphis, TN	1	5,732	8,865	9,930	10,330	10,228
Anchorage, AK (Ted Stevens)[3]	2	7,333	8,829	7,250	7,198	7,774
Louisville, KY (Standiford Field)	3	3,617	4,825	5,110	5,247	5,469
Chicago, IL (O'Hare)	4	1,870	2,221	3,114	3,421	4,111
Miami, FL	5	2,657	3,132	3,106	3,263	3,435
Los Angeles, CA	6	2,616	2,140	2,390	2,429	2,415
Indianapolis, IN	7	2,624	1,794	1,905	1,949	2,976
Dallas/Fort Worth, TX	8	828	1,103	1,553	1,653	1,398
New York, NY (John F. Kennedy)	9	2,534	1,780	1,530	1,438	1,477
Cincinnati, OH[4]	10	1,534	1,375	1,389	1,425	1,510
Oakland, CA	11	1,643	1,201	1,235	1,340	1,384
Newark, NJ (Newark Liberty)	12	1,779	1,351	1,149	1,134	1,311
Ontario, CA	13	1,107	1,017	1,076	1,071	1,174
Atlanta, GA (Hartsfield-Jackson)	14	989	1,192	992	1,026	1,115
Honolulu, HI	15	628	963	960	993	1,027
Philadelphia, PA	16	1,319	902	855	874	862
Houston, TX (George Bush)	17	435	692	773	787	792
Seattle, WA (Seattle-Tacoma)	18	961	632	629	714	712
Phoenix, AZ (Sky Harbor)	19	835	550	624	652	688
Denver, CO	20	817	561	571	596	618
San Francisco, CA	21	1,149	592	540	565	535
Portland, OR	22	800	482	516	511	530
San Juan, PR (Luis Munoz Marin)	23	440	400	384	386	457
Minneapolis, MN	24	564	465	332	441	447
Columbus, OH (Rickenbacker)	25	281	310	316	333	417
Top 25 airports[5]		**47,520**	**47,491**	**48,397**	**49,908**	**52,864**
United States, all airports[6]		**67,807**	**61,263**	**62,283**	**64,074**	**67,197**
Top 25 as percent of U.S. total		**70.1**	**77.5**	**77.7**	**77.9**	**78.7**

KEY: R = revised

[1] Aircraft landed weight is the certificated maximum gross landed weight of the aircraft as specified by aircraft manufacturers.

[2] All-cargo operations do not include aircraft carrying passengers that also may be carrying cargo.

[3] Anchorage includes a large share of all-cargo operations in-transit.

[4] Dedicated to the exclusive transportation of cargo.

[5] Airport rankings change each year. Totals represent the top 25 airports for each year, not necessarily the top 25 airports listed here for 2015.

[6] Limited to airports with an aggregate landed weight in excess of 100 million pounds (50,000 short tons) annually.

NOTE: 1 metric tonne = 1.1023 short tons.

SOURCE: U.S. Department of Transportation, Federal Aviation Administration, Air Carrier Activity Information System (ACAIS) database, All-Cargo Data, available at www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/ as of July 2016.

Table 6-6M Fuel Consumption by Transportation Mode: 2007, 2010, and 2013-2015

	2007	2010	2013	2014	2015
Highway[1]					
Gasoline, diesel and other fuels (million liters)	666,929	645,006	642,131	656,121	654,292
Truck, total	178,724	170,413	163,879	166,584	165,535
Single-unit 2-axle 6-tire or more truck	61,750	57,141	54,890	56,373	56,208
Combination truck	116,973	113,273	108,989	110,211	109,327
Truck (percent of total)	26.8	26.4	25.5	25.4	25.3
Rail, Class I (in freight service)					
Distillate / diesel fuel (million liters)	15,471	13,320	14,052	14,751	14,093
Water					
Residual fuel oil (million liters)	23,948	19,465	15,941	14,562	12,710
Distillate / diesel fuel oil (million liters)	7,282	7,581	6,342	6,031	9,148
Gasoline (million liters)	4,625	4,417	4,249	(R) 4,261	7,818
Pipeline					
Natural gas (million cubic meters)	17,595	19,089	23,590	(R) 19,826	18,865

KEY: R = revised.

[1] Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

NOTE: 1 liter = .2642 gallons. 1 cubic meter = 35.3147 cubic feet.

SOURCES: **Highway:** U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. **Rail**: Association of American Railroads, *Railroad Facts 2016* (Washington, DC: 2015), p. 63. **Water**: U.S. Department of Energy, Energy Information Administration, *Fuel Oil and Kerosene Sales 2015* (Washington, DC: 2016), table HL1, and similar tables in earlier editions; U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table MF-24. **Pipeline**: U.S. Department of Energy, *Natural Gas Annual 2015*, (Washington, DC: September 2016.), table 15 and similar tables in earlier editions.

Table 6-8M Single-Unit Truck Fuel Consumption and Travel: 2007, 2010, and 2013-2015

	2007	2010	2013	2014	2015
Number registered (thousands)	8,117	8,217	8,126	8,329	8,456
Vehicle-kiometers traveled (millions)	(R) 193,078	(R) 178,208	(R) 171,518	175,895	176,372
Fuel consumed (million liters)	61,750	57,141	54,890	56,373	56,208
Average kilometers traveled per vehicle	23,788	21,687	21,107	21,119	20,857
Average kilometers traveled per liter	3.1	3.1	3.1	3.1	3.1
Average fuel consumed per vehicle (liters)	7,608	6,954	6,755	6,769	6,647

KEY: R = revised.

NOTES: 1 liter = .2642 gallons. 1 kilometer = .6214 miles. Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017.

Table 6-9M Combination Truck Fuel Consumption and Travel: 2007, 2010, and 2013–2015

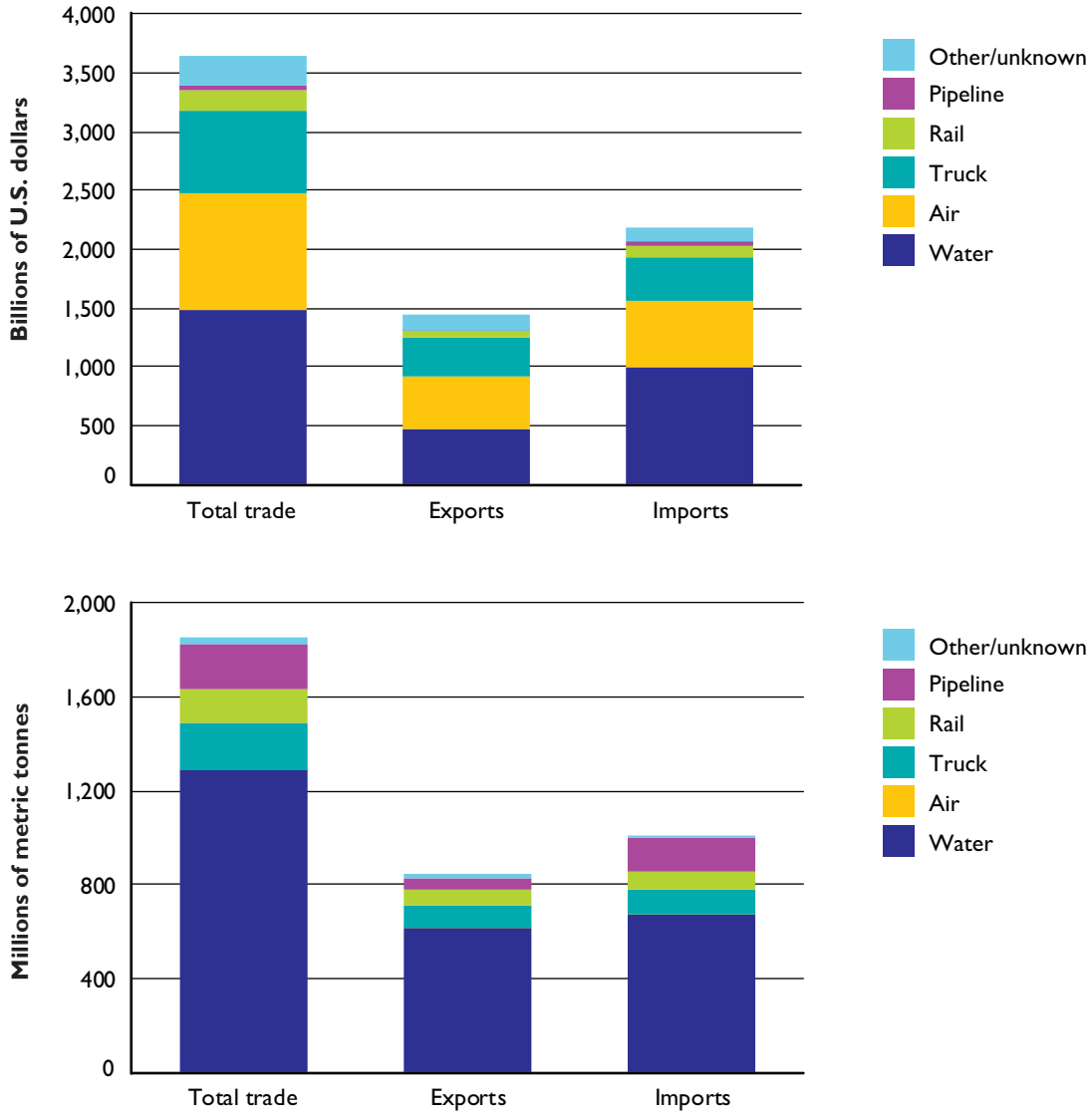
	2007	2010	2013	2014	2015
Number registered (thousands)	2,635	2,553	2,471	2,577	2,747
Vehicle-kiometers traveled (millions)	296,426	282,892	(R) 271,058	(R) 273,303	273,972
Fuel consumed (million liters)	116,973	113,273	108,989	110,211	109,327
Average kilometers traveled per vehicle	112,481	110,813	(R) 109,680	106,046	99,739
Average kilometers traveled per liter	2.5	2.5	2.5	2.5	2.5
Average fuel consumed per vehicle (liters)	44,386	44,371	44,101	42,764	39,800

KEY: R = revised.

NOTES: 1 liter = .2642 gallons. 1 kilometer = .6214 miles. Based on a new methodology, FHWA revised its annual vehicle-miles traveled, number of vehicles, and fuel economy data beginning with 2007. Information on the new methodology is available at www.fhwa.dot.gov/policyinformation/statistics.cfm. Data in this table should not be compared to those in pre-2011 editions of *Freight Facts and Figures*.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: annual issues), table VM-1. available at www.fhwa.dot.gov/policyinformation/statistics/2015/ as of May 2017.

Figure 2-9M U.S. International Merchandise Trade Value and Weight by Transportation Mode: 2016



NOTES: 1 short ton = 2,000 pounds. The U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS) estimated 2015 weight data for truck, rail, pipeline, and other and unknown modes using value-to-weight ratios derived from imported commodities. Totals for the most recent year differ slightly from the USDOT, BTS and Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework (FAF) due to variations in coverage and FAF conversion of values to constant dollars. Numbers may not add to totals due to rounding.

SOURCE: **Total, water and air data**: U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, *FT920 - U.S. Merchandise Trade: Selected Highlights* (Washington, DC: February 2016). **Truck, rail, pipeline, and other and unknown data**: U.S. Department of Transportation, Bureau of Transporation Statistics, North American Transborder Freight Data, available at www.bts.gov/transborder as of May 2017.

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