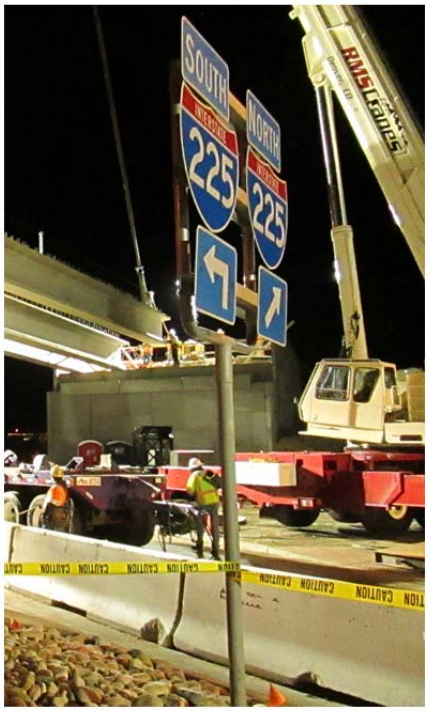
COMPARING COLORADO'S TRANSPORTATION PERFORMANCE 1

Colorado Department of Transportation Spring 2014



How CDOT communicates performance

CDOT's Transportation Performance Branch already communicates performance metrics on its public-facing website, YourCDOTDollar.com. The Department also reports dozens of metrics in its annual, state-mandated Performance Plan, its Stewardship Agreement with the Federal Highway Administration, and other required and voluntary reports. None of these publications, however, compares CDOT's performance to its peers using a single ranking, as is done on page 3 of this report.The ranking is based on performance data from 2008-12.

How does CDOT rank among state DOTs?

State transportation departments, the federal government and third-party groups use a variety of metrics to judge the performance of the 50 states' transportation systems and the effectiveness of the agencies that maintain them. The ranking of any particular department of transportation (DOT) can vary dramatically depending on the metrics used. This report provides an overview of some of the most popular rankings and offers a new ranking the Colorado Department of Transportation (CDOT) may use to compare its performance against its peers.

CDOT staff considered three primary ways to communicate the Department's performance:

World-class roads

Kansas' roads have long been considered among the nation's best and a couple studies released this summer support that contention. The Reason Foundation rated the Kansas highway system the nation's second best while spending 24 percent less than the U.S. average in per-mile disbursements. Kansas ranked number three in Reason's previous two reports. A CNBC analysis ranked Kansas' infrastructure/transportation fourth-best in the country. The CNBC ranking was part of a study of the best states for doing business. (Overall, the Kansas was rated the 14th best state for business.) In 2010, a Reader's Digest report ranked Kansas roads the nation's best.

This passage shows how a quarterly publication from the Kansas Department of Transportation communicates performance by citing rankings from multiple third parties.

1. **A journalistic approach.** This approach cites multiple sources and is demonstrated by the passage at right from the Kansas Department of Transportation. This approach helps ensure credibility by balancing multiple sources/agendas. A drawback is that such an approach may result in conflicting rankings.
2. **Third-party rankings**. Third-party rankings may come with established agendas, whether it's creating work for engineering firms or keeping transportation funding to a minimum. Even so, a third-party ranking of CDOT may be perceived as more objective than an in-house ranking. An overview of third-party rankings can be found on pages 5-7.
3. **An "in-house" ranking.** This is staff's preferred approach. Staff has created a new ranking that combines standardized metrics collected by the Federal Highway Administration on the performance of 52 transportation departments nationwide. This approach is shown on pages 3-4 of this report. Even when standardized metrics are used in a ranking, the choice of metrics can be subjective. CDOT has tried to mitigate this by basing its rankings—to the extent possible—on national metrics recommended by a performance management committee of the American Association of State Highway and Transportation Officials (AASHTO).

Rankings should focus on MAP-21 performance areas

Under the 2012 federal transportation authorization, the Moving Ahead for Progress in the 21st Century Act (MAP-21), the Federal Highway Administration and state transportation departments will work toward seven national performance goals. To the extent possible, any ranking created by CDOT to compare its performance should focus on these goals:

1. Safety—To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.

2. Infrastructure Condition—To maintain the highway infrastructure asset system in a state of good repair.

3. Congestion Reduction—To achieve a significant reduction in congestion on the National Highway System.

4. System Reliability—To improve the efficiency of the surface transportation system.

5. Freight Movement & Economic Vitality—To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.

6. Environmental Sustainability—To enhance the performance of the transportation system while protecting and enhancing the natural environment.

7. Reduced Project Delivery Delays—To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

In addition to these goals, the Federal Highway Administration is setting performance *metrics* to be used by state transportation departments. Final rules are scheduled to be issued by March 2015, according to the Washington State Department of Transportation (WSDOT). See the WSDOT chart at right for expected performance reporting requirements.

MAP-21 performance reporting requirements

MAP-21 goals by program area	Federal threshold/ benchmark[1]	MAP-21 target[2]	Penalty[3] Y/N
Highway Safety Improvement Program			
Rate of **traffic fatalities** per 100 million vehicle miles traveled (VMT) on all public roads	No	TBD[4]	Yes
Rate of **traffic serious injuries** per million vehicle miles traveled (VMT) on all public roads	No	TBD	Yes
Number of **traffic fatalities** on all public roads	No	TBD	Yes
Number of **traffic serious injuries** on all public roads	No	TBD	Yes
Rate of per capita **traffic fatalities** for drivers and pedestrians 65 years of age or older	No	TBD	No
Rate of fatalities on high-risk rural roads	No	TBD	Yes
Highway-railway crossing fatalities	No	TBD	No
National Highway Performance Program			
National Highway System and Interstate **pavement condition**	TBD	TBD	Yes
Condition of bridges on the National Highway System	<10% of deck area on SD[5] bridges	TBD	Yes
Measures to be determined through federal rule-making	No	TBD	No
National Freight Movement Program			
Measures to be determined through federal rule-making	No	TBD	No
Congestion Mitigation and Air Quality (CMAQ			
Measures to be determined through federal rule-making	No	TBD	No
Measures for on-road mobile source emissions to be determined through federal rule-making	No	TBD	No
Project Delivery			
Duration of NEPA[7] documentation preparation	No	TBD	No

The chart above, from the Washington State Department of Transportation's The Gray Notebook, shows performance measures that will be required of the states under the federal Moving Ahead for Progress in the 21st Century Act (MAP-21).

HOW CDOT COMPARES

Colorado Department of Transportation staff in early 2014 combined several metrics to rank the performance of transportation departments in 50 states, Washington, D.C., and Puerto Rico.

CDOT ranked 13th of the 52 departments, tied with three other states. The rankings, based on performance data from 2008-12, combine four measures in the performance areas shown below. Measures were taken from *Highway Statistics*, an annual publication from the Federal Highway Administration (FHWA). *Highway Statistics* has been published since 1945, according to FHWA. This means CDOT can easily update the rankings each year. The rankings below contain the most recent data available, as of early 2014, on FHWA's website.

In choosing metrics for ranking states, CDOT sought to replicate as closely as possible the recommendations for national metrics from a performance management committee of the American Association of State Highway and Transportation Officials (AASHTO). The committee, the Standing Committee on Performance Management (SCOPM), has been making recommendations for measures that will be issued for the states under the federal MAP-21 transportation authorization.

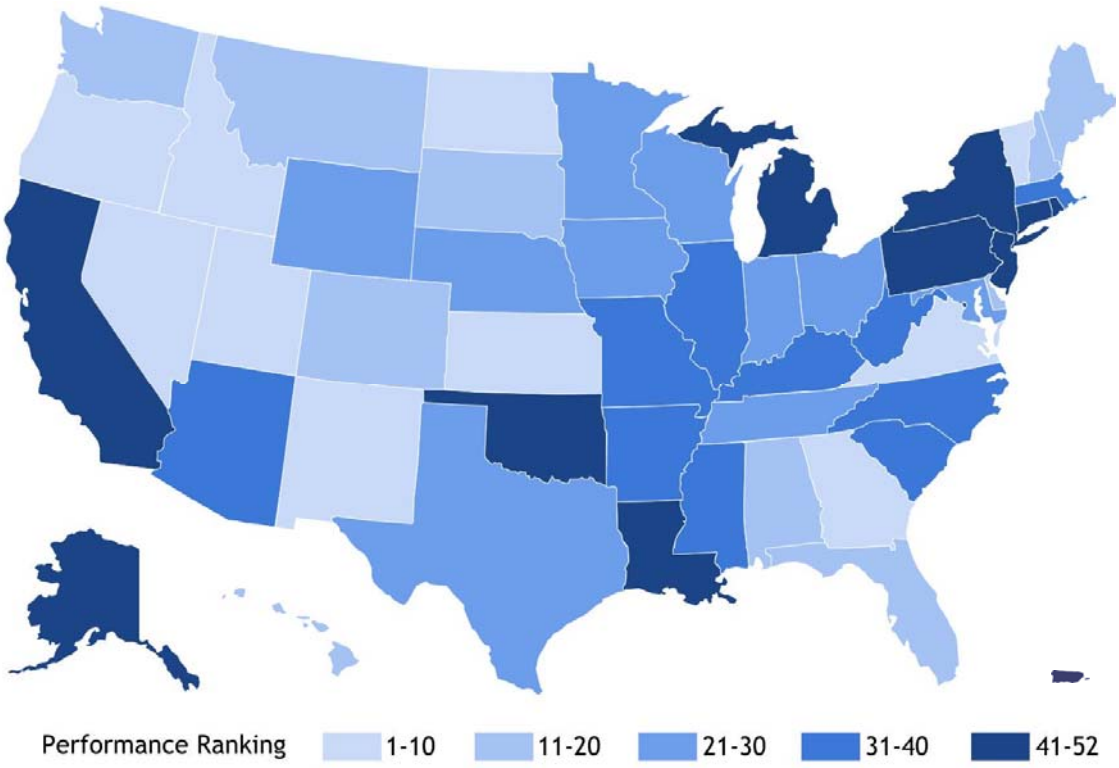
The performance measures most emphasized at CDOT can be found in the Colorado Transportation Commission's Policy Directive 14, but data to rank all 52 transportation departments on those metrics are not available from FHWA.

Performance Area	Performance Measure	CDOT Ranking Among DOTs (No. 1 is best/52 is worst)
Safety	Five-year average number of fatalities as a percent of most recent year total Vehicle Miles Traveled	20
Bridge	Percent of deck area (riding surface) on Structurally Deficient bridges	14
Pavement	Rural and urban NHS miles with International Roughness Index (IRI) > 170 as a percent of total rural and urban NHS Miles	27
Congestion	NHS urban Interstate and Other urban miles with a service flow ratio of >.80 as a percent of all NHS urban Interstate and Other urban miles	27
Overall CDOT Rank:		13 of 52 transportation departments in four categories*

**CDOT's average for all four categories is 22. The rank of that average is 13.*

Transportation Department Rankings

The map at right and the data table below show how each of 52 transportation departments performed in CDOT's rankings. The overall rankings combined scores for safety, congestion, and bridge and pavement conditions. Georgia performed best in the rankings, while Puerto Rico scored worst. See Appendix A to learn how departments performed in each area, and for links to the federal data upon which the rankings are based.



Department	Rank	Department	Rank	Department	Rank
Alabama	11	Louisiana	51	Ohio	21
Alaska	42	Maine	18	Oklahoma	42
Arizona	35	Maryland	27	Oregon	5
Arkansas	39	Massachusetts	38	Pennsylvania	48
California	49	Michigan	46	Rhode Island	47
Colorado	13	Minnesota	27	South Carolina	33
Connecticut	42	Mississippi	36	South Dakota	13
Delaware	12	Missouri	31	Tennessee	24
Washington, D.C.	50	Montana	13	Texas	27
Florida	13	Nebraska	21	Utah	5
Georgia	1	Nevada	5	Vermont	4
Hawaii	20	New Hampshire	17	Virginia	9
Idaho	10	New Jersey	41	Washington	19
Illinois	34	New Mexico	8	West Virginia	32
Indiana	23	New York	42	Wisconsin	25
Iowa	30	North Carolina	40	Wyoming	26
Kansas	3	North Dakota	2	Puerto Rico	52
Kentucky	37				

Survey/ Report	CDOT Performance
American Society of Civil Engineers' Report Card for America's Infrastructure	D for roads, C- for bridges
CarInsurance Comparison.com, Most Dangerous Highways	No. 40 of 50 states in Most Dangerous Highway rankings (No. 1 is safest)
CNBC	No. 23 of 50 states for Infrastructure & Transportation (No. 1 is best)
Reader's Digest: America's Best, Worst and Deadliest Roads	No. 18 of 50 for best roads (No. 1 is best). No. 21 for deadliest roads (No. 1 is safest).
Reason Foundation's 20th Annual Highway Report	No. 41 of 50 for overall performance (No. 1 is best)
Texas A&M Transportation Institute's 2012 Urban Mobility Report	Denver is No. 87 for travel delay for 101 urban areas (No. 1 has least delay.)
Transportation for America's State of Our Nation's Bridges—2013	No. 11 of 51 for bridge condition (No. 1 is best)
U.S. Chamber of Commerce	Score of 61.52 on Transportation Performance Index for 2007, when national score was 50.74. (Higher values mean better performance.)

The chart above shows how CDOT ranks in various third-party reports. ***For clarity, values have been adjusted so that No 1 is always better or safer.*** *An exception is the Chamber of Commerce Index, in which a higher value means better performance.*

Third-party reports: a brief overview

To determine the best way of communicating CDOT's performance relative to its peers, CDOT staff has researched several third-party rankings and reports. These reports are briefly summarized below. *For clarity, values have been adjusted so that No 1 is always better or safer.* An exception is the Chamber of Commerce Index, in which a higher score means better performance.

American Society of Civil Engineers

The American Society of Civil Engineers issues a *Report Card for America's Infrastructure* about every four years. The society uses an A to F school report card format to grade infrastructure. The most recent report for the nation is 2013, when the United States' bridges were given a C+, and roads were given a D.

Engineers publishes a report card on America's infrastructure, which includes reports on the condition of roads and bridges.

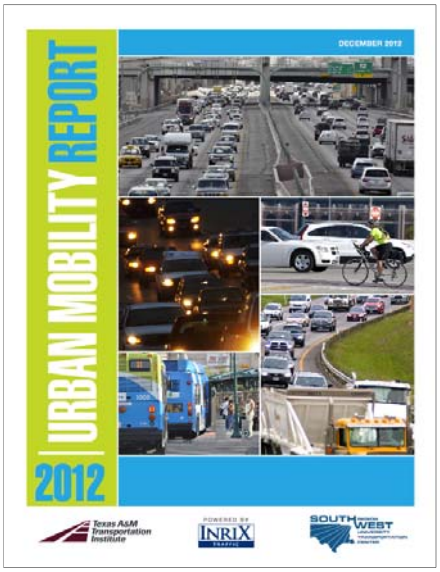
Colorado's most recent grades for roads and bridges are for 2010. Even those grades, however, are based on projections from 2007 data. The state received a D for roads and a C- for bridges. Grades are based on data and analyses of trends, which incorporate a degree of subjectivity.

For example, the overall 2010 grade of D for roads is not based on a standardized, single metric used for all states. Instead, it incorporates an individual grade for pavement condition, a grade for "need versus capacity", and a grade for "funding versus need". The grade for road condition is derived from 2007 "Good/Fair" data for pavement. The society assigned a C grade to Colorado's pavement condition in 2007 (59 percent Good/Fair), and then projected a grade of C- for 2010 because of forecasts of continued deterioration. The society projected a D- for the "need versus capacity" component of Colorado's road grade, based on trends of increasing Vehicle Miles Traveled and congestion. The "funding versus need" grade was a D-, based on increasing Vehicle Miles Traveled "combined with no identifiable increase" in future funding, the society said.

Colorado's bridges were given a C- for 2010. This was based on a B- that the society gave the state's bridges for 2007, when 17 percent were Structurally Deficient or Functionally Obsolete. The 2010 grade was based on anticipated deterioration and was "more subjective", the society said. The grade appears to have been forecasted before FASTER legislation was passed in Colorado. This funding has led to improvement—as opposed to the society's projections of deterioration—in bridge condition in recent years.

Car Insurance Comparison

The "Car Insurance Comparison" website, a Seattle-based website that allows consumers to compare insurance from different companies, contains rankings of the nation's most



The Texas A&M Transportation Institute issues an annual Urban Mobility Report.

dangerous highways. Among its sources, the site lists the U.S. Census Bureau, FHWA, the National Highway Traffic Safety Administration and the Insurance Institute for Highway Safety (IHHS). In the Most Dangerous Highways rankings, Colorado was No. 40, with No. 1 (Iowa) being the state with the safest highways. Rankings were based on highway deaths per 1,000 highway miles traveled; highway bridges rated obsolete or deficient; Interstate speeding fatalities per mile of Interstate; per-capita Federal Aid to state and local governments from the U.S. Highway Trust Fund in 2009; death rates from the IIHS; and percent of drivers without seat belts.

CNBC

CNBC ranked Colorado 23 of 50 states for Infrastructure & Transportation. The network measured transportation systems "by the quantity of goods shipped by air, waterways, roads and rail. [CNBC also] looked at the availability of air travel in each state, the quality of the roads, bridges and the water supply, as well as the time it takes to commute to work." More specific measures were not listed on the CNBC website.

Reader's Digest

Reader's Digest in 2010 issued a study entitled *America's Best, Worst and Deadliest Roads* that used federal data from 2007 and 2008, including data on highway condition, bridge condition, congestion and safety. Kansas was ranked as having the best roads, at No. 1, while Colorado was No. 18, and Louisiana was No. 50. Colorado ranked No. 21 for deadliest roads, when No. 1 is the safest and No. 50 is deadliest.

Rankings for best roads were calculated using performance measures for safety, highway condition, bridge condition and congestion. Highway condition was determined by a formula based on the percent of arterial pavement that was in poor or "mediocre" condition. Bridge condition was determined by a formula based on the percent of bridges that were Structurally Deficient of Functionally Obsolete. Congestion measures included the "percent of urban freeways congestion" and "daily travel per urban arterial lane mile". The performance indicator for safety was fatalities per 100 million vehicle miles traveled (VMT). In addition to being used in the overall ranking, this was the sole measure that the "deadliest roads" rankings were based on.

Reason Foundation

The Reason Foundation, a nonprofit group that promotes libertarian principles, in July 2013 published its *20th Annual Report on the Performance of State Highway Systems* to evaluate state-owned highway systems nationwide. Colorado ranked No. 41 of 50 states. North Dakota was ranked No. 1, the best-performing state. The Reason report is perhaps the most comprehensive study of those that staff examined, and the report is issued almost annually. The report acknowledges that the "best-performing states tend to be smaller, rural states with limited congestion." Four of 11 performance measures used in the rankings are based on disbursements per mile. See the Appendix in this report for the full list of measures.

Texas A&M Transportation Institute

The Texas A&M Transportation Institute produces an annual urban congestion report. The 2012 report, the institute says, features improved methodology compared to previous reports and more coverage of urban congestion in the United States, including content on potential solutions. The report uses speed data from INRIX, a private traffic-data provider

based in Kirkland, Wash. According to a release from the institute and INRIX, INRIX receives its data from "GPS-enabled vehicles and mobile devices [including mobile phones] to reliably deliver real-time and historical traffic conditions". In the 2012 report, Denver was ranked No. 87 of 101 urban areas for travel delay, with No. 1 having the least delay. See the Appendix of this report for more performance measures used in the institute's report.

Transportation for America

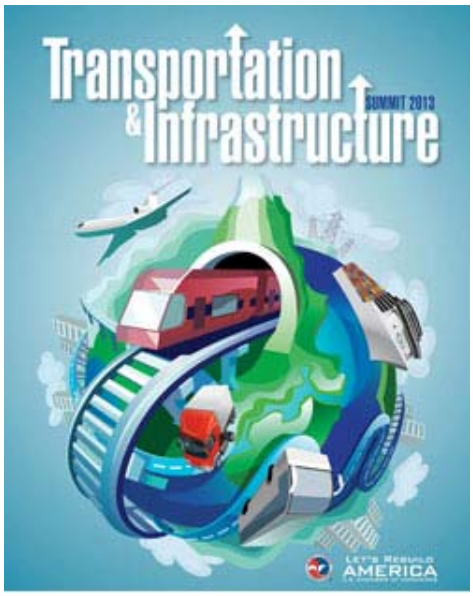
Transportation for America is a group of elected, business and civic leaders that issued *The State of Our Nation's Bridges 2013*. The analysis uses National Bridge Inventory data reported by states in 2012 to rank 50 states and Washington, D.C., on their total number of Structurally Deficient bridges as a percentage of all bridges. Colorado was ranked No. 11 of 51 transportation systems, with 6.6 percent of bridges deficient. Florida performed best, with just 2.2 percent of bridges rated deficient. Pennsylvania was ranked worst, with 24.5 percent deficient.

U.S. Department of Transportation/Federal Highway Administration

Many studies examined by staff are based on data from the Federal Highway Administration or its parent, the U.S. Department of Transportation. For example, the Department of Transportation provides state-by-state transportation performance information on the website of the Bureau of Transportation Statistics, which is part of the transportation department's Research and Innovative Technology Administration.

U.S. Chamber of Commerce

The U.S. Chamber of Commerce's national Transportation Performance Index tracks performance since 1990. The most recent update, from 2011, features 2009 data. The national index had a value of 56.60 that year. The most recent report from the Chamber featuring state data is based on 2007 results. Colorado had a score of 61.52 in the index, versus the national score of 50.74 that year. North Dakota performed best in the index, at 85.12. Higher values mean better performance. State scores are determined in a manner similar to the national score, which "combines indicators of supply (availability), quality of service (reliability, predictability, and safety), and utilization (potential for future growth) across all modes of passenger and freight transportation." Performance measures used in the index can be found in the Appendix of this report. They include fatalities per 100 million Vehicle Miles Traveled (VMT), a travel-time index, a road condition measure based on the International Roughness Index (IRI), and more.



The U.S. Chamber of Commerce publishes a Transportation Performance Index and each year holds a Transportation Infrastructure Summit.

Appendix A: Rankings data

The first table below shows how transportation departments ranked in individual areas that make up CDOT's overall performance rankings. The second table shows links to the Federal Highway Administration data sets upon which CDOT based its rankings.

Department	Safety	Bridge	Pavement	Congestion	Average	Rank
Alabama	39	7	13	25	21.00	11
Alaska	40	36	46	15	34.25	42
Arizona	42	9	22	41	28.50	35
Arkansas	47	15	30	34	31.50	39
California	15	49	39	51	38.50	49
Colorado	20	14	27	27	22.00	13
Connecticut	3	50	38	46	34.25	42
Delaware	26	8	33	18	21.25	12
Washington, D.C.	7	51	52	47	39.25	50
Florida	36	4	12	36	22.00	13
Georgia	28	5	2	17	13.00	1
Hawaii	23	6	49	20	24.50	20
Idaho	34	25	3	21	20.75	10
Illinois	12	33	42	26	28.25	34
Indiana	18	34	34	14	25.00	23
Iowa	27	42	26	11	26.50	30
Kansas	31	11	5	16	15.75	3
Kentucky	45	21	15	42	30.75	37
Louisiana	46	32	44	40	40.50	51
Maine	22	43	21	8	23.50	18
Maryland	11	10	40	44	26.25	27
Massachusetts	1	46	48	29	31.00	38
Michigan	16	30	43	52	35.25	46
Minnesota	2	18	35	50	26.25	27
Mississippi	49	19	18	31	29.25	36
Missouri	29	39	11	28	26.75	31
Montana	51	20	16	1	22.00	13
Nebraska	21	29	37	12	24.75	21
Nevada	25	1	1	49	19.00	5
New Hampshire	8	40	20	24	23.00	17
New Jersey	4	37	47	48	34.00	41
New Mexico	37	22	7	13	19.75	8
New York	10	45	45	37	34.25	42
North Carolina	33	35	19	45	33.00	40
North Dakota	30	24	4	1	14.75	2
Ohio	14	23	24	38	24.75	21
Oklahoma	43	44	31	19	34.25	42
Oregon	24	12	10	30	19.00	5
Pennsylvania	35	48	29	N/A*	37.33	48
Rhode Island	6	52	50	35	35.75	47
South Carolina	48	26	9	N/A*	27.67	33
South Dakota	38	41	8	1	22.00	13
Tennessee	41	13	14	33	25.25	24
Texas	32	2	32	39	26.25	27
Utah	13	3	17	43	19.00	5
Vermont	9	28	28	10	18.75	4
Virginia	17	17	25	22	20.25	9
Washington	5	31	36	23	23.75	19
West Virginia	50	27	23	9	27.25	32
Wisconsin	19	16	41	N/A*	25.33	25
Wyoming	44	47	6	7	26.00	26
Puerto Rico	52	38	51	32	43.25	52

*Did not report congestion

FHWA Data Sources	Links
Safety Data A (Motor Vehicle Fatalities) (2007-11 data)	www.fhwa.dot.gov/policyinformation/statistics/2011/fi20.cfm
Safety Data B (Vehicle Miles Traveled) (2011 data)	www.fhwa.dot.gov/policyinformation/statistics/2011/vm2.cfm
Bridge (2012 data)	www.fhwa.dot.gov/bridge/deficient.cfm
Pavement (2011 data)	www.fhwa.dot.gov/policyinformation/statistics/2011/hm47.cfm
Congestion (2008 data)	www.fhwa.dot.gov/policyinformation/statistics/2008/hm42.cfm

Appendix B: Performance measures used in selected third-party rankings

Below are performance measures too extensive to list on pages 5-7.

U.S. Chamber of Commerce Transportation Performance Index, Performance Measures	**Supply** • Highway Density: Route Miles per 10,000 Population • Transit Density: Miles of Transit per 10,000 Population • Airport Access: Percent of Population Within 50 Miles of Major Airport(s) • Airport Capacity: Average Airport Arrival Rate (AAR) + Departure Rate (ADR) per Hour • Rail Density: Route Miles per 10,000 Population • Waterway Density: Miles of Waterways per 10,000 population • Port Access: Distance from the Center of MSA to the Closest International Container Port • Intermodal Connectivity: Number of Ramps per 10,000 Population **Quality of Service** • Highway Congestion: Travel Time Reliability (TTI) • Highway Safety: Fatalities per 100 Million Vehicle Miles Traveled (VMT) • Road Roughness: Percent of Lane Miles with IRI Greater Than 170 Inches per Mile • Bridge Integrity: Percent of Bridges Structurally Deficient or Functionally Obsolete • Air Congestion: Percent of On-Time Departures • Air Safety: Runway Incursions per Million Operations • Rail Safety: Number of Incidents per Million Train Miles • Waterway Congestion: Average Lock Delay per Tow (Hours) • Transit Safety: Number of Incidents per Million Passenger Miles Traveled (PMT) **Utilization** • Uncongested Roads: Percent of Lane Miles at Level of Service C or Better • Air Utilization: Percent Capacity Used between 7 a.m. to 9 p.m. • Transit Utilization: Passenger Miles Traveled (PMT) per Capacity (Standing + Seating) • Rail Utilization: Million Ton Miles of Freight per Track Mile
Reason Foundation, Report on the Performance of State Highway Systems, Performance Measures	• Capital-Bridge Disbursements per Mile • Maintenance Disbursements per Mile • Administrative Disbursements per Mile • Total Disbursement per Mile • Rural Interstate, Percent Poor Condition • Rural Other Principal Arterial Percent Poor • Urban Interstate, Percent Poor • Urban Interstate, Percent Congested • Rural Arterial Percent Narrow Lanes • Percent of Deficient Bridges • Fatality Rate
Texas A&M Transportation Institute, Urban Mobility Report, Key Performance Measures	• Yearly Delay Per Auto Commuter (Hours) • Travel Time Index • Excess Fuel per Auto Commuter (Gallons) • Congestion Cost per Auto Commuter (Dollars) • Travel or Total Delay (Hours) • Truck Delay (Hours) • Excess Fuel Consumed (Gallons) • Truck Congestion Cost (Dollars) • Planning Time Index • Pounds per Auto Commuter (CO_2 Produced During Congestion Only) • Pounds (millions) of CO_2 Produced During Congestion Only • Pounds (millions) of CO_2 Produced During Free-Flow • Rank of Delay Per Auto Commuter • Total Peak-Period Travel Time (Minutes) • Delay per Non-Peak Traveler (Hours) • Commuter Stress Index • Solutions to Congestion Problems (Operational Treatment Savings) • Solutions to Congestion Problems (Public Transportation Savings)