TRANSPORTATION INVEST IN OUR FUTURE

State DOT Performance Management Programs: Select Examples

American Association of State Highway and Transportation Officials

AASHTO

The Voice of Transportation

JULY 2007

Photo courtesy of Washington State Department of Transportation.

A ferry with Mt. Rainier in the background.

National Surface Transportation Policy and Revenue Study Commission

July 2, 2007

Dear Commissioner:

On behalf of the Performance Based Highway Program Task Force, I'm pleased to provide you this report entitled "State DOT Performance Management Programs: Select Examples" to demonstrate a sampling of the current practice of performance management systems in State DOTs. It is my hope that this informational piece will provide you the confidence and reassurance that performance measurement has a significant role in decision making at State DOTs.

As you already know, I am an absolute believer in the valuable role performance measures play in fine-tuning organizations and providing true accountability to office holders and to the general public. Performance measures are critical to the future improvement of transportation in America. From my own experience, I've found that imposing specific performance measure standards or targets on an organization is counter-productive. Performance measures must be meaningful and applicable to the circumstance of an organization in order for them to have a true impact on organizational behavior, and ultimately on performance. Consequently, imposing "one size fits all" national performance standards on State DOTs is not advisable as it would not be an effective approach. Every state is different and every state needs the flexibility to customize performance management standards. However, outcomes are shared—safer roads, more efficient movement of people and freight, and improved system conditions. The results demonstrated in this primer show that performance measurements clearly help guide strategic business decisions for these DOTs to drive superior performance.

The Task Force that I have been asked to chair for the American Association of State Highway and Transportation Officials (AASHTO) is proud to provide this primer on state DOT performance-based management practices. We will follow this with a more comprehensive look at today's Federal-aid highway programs and a more in-depth analysis of State DOT performance measurement with a look to the future. We will have this report available to the Commission in the Fall.

Sincerely,

Pete K. Rahn
Task Force Chair; AASHTO Vice President;
Missouri Department of Transportation Director

Photo courtesy of Washington State Department of Transportation.

The existing (right) Tacoma Narrows Bridge and the new bridge span under construction, HW 16 near I-5.

CONTENTS

Letter to the National Surface Transportation Policy and Revenue Study Commission 1

INTRODUCTION 5

CHAPTER 1
Asset Management 7

CHAPTER 2
Congestion and System Performance 13

CHAPTER 3
Safety 17

CONCLUSION 23

APPENDIX 25

Photo courtesy of Missouri Department of Transportation.

INTRODUCTION

State transportation agencies successfully use performance measurement to solve complex management challenges. This report is illustrative of the use of performance-based management approaches in state DOTS. It is by no means inclusive of all that is done. The appendix cites more detailed reports and AASHTO will produce a more comprehensive report this Fall. It is hoped that this report will be informative to those who are not familiar with the use of performance measures and performance management systems. This report also reinforces the uniqueness of each state's needs.

All state departments of transportation (DOTs) track asset condition and safety data and the majority of states provide comprehensive performance data to decision makers to both increase accountability to customers, and achieve the best possible transportation system performance with current investment programs. The primary challenge for many agencies is the lack of funding to maintain and expand the current transportation system. However, by using a performance-based management approach, DOTs can maximize existing resources and justify recommendations for additional funding.

States use performance measures for a variety of reasons to:

- **Support Investment Decision Making.** DOTs use department-wide performance measurement programs to allocate resources, support performance driven investment decisions and enhance internal agency management of programs.
- **Provide a Solid Foundation for Statewide Planning.** DOTs have demonstrated that robust data and performance monitoring, teamed with actionable goals and strategic business plans, can be used to fine-tune an organization and lay the ground work to achieve short-, medium- and long-range planning goals.
- **Ensure Accountability and Responsiveness to Stakeholders.** Performance measurement can assist in communicating how tax dollars have been spent, and/or whether more funding is needed. This also supports "customer focus" and improved public relations and stakeholder involvement.

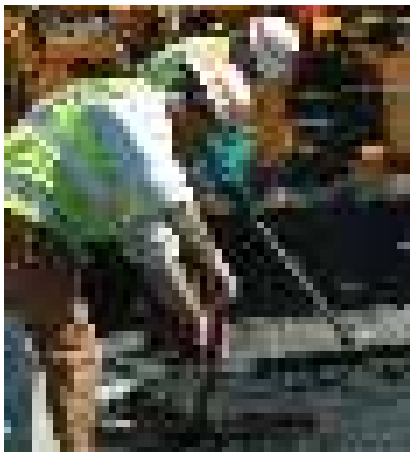


Photo courtesy of Missouri Department of Transportation.

- **Support Quantification of Program Benefits.** Infrastructure programs have a long history of documenting program impacts as embodied in pavement, bridge, and maintenance management systems.
- **Meet Federal and State Legislative Mandates.** In some states, the legislatures require transportation agencies to engage in a formal performance measurement and reporting process. The federal government also requires certain transportation performance measures be reported by every state.

There are many benefits to using performance measures. State DOTs use performance measures to enhance productivity and service delivery, and improve communication to customers. Transportation performance measures such as travel time, delay, or pavement conditions are easily understood concepts that can provide important ways to communicate system conditions. Consistent measurement and data tracking is useful in demonstrating program effectiveness and monitoring ongoing performance. In addition, Before-and-After performance case studies can further help identify the benefits and results of specific transportation management actions and strategies.

Every state is unique in its specific needs, funding levels and authorizing environment. Although state performance management programs and data vary, there is significant collaboration in the field. This collaboration has led to performance measurement exchanges and the sharing of best practices. Applications of performance measurement such as comparative performance measurement, customer surveys, state-to-state comparisons, and timeline reviews offer a variety of options for data collection, analysis and reporting.

This report will concentrate on three performance areas which illustrate the use of performance management systems, outcomes and measurement techniques based on a sample set of state DOTs that use a broad range of measures. The performance areas are 1) asset management, 2) congestion and system performance, and 3) safety. The departments of transportation in Florida, Maryland, Minnesota, Missouri, and Washington were selected as case studies to illustrate how state DOTs utilize performance measurement.

Photo courtesy of Minnesota Department of Transportation.

Traffic congestion near St. Paul affects both the travel time and safety of commuters.

CHAPTER 1
Asset Management

The goal of an asset management program is to minimize the life-cycle costs for managing and maintaining transportation assets, including roads, bridges, tunnels, rails, and roadside features. This approach focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well-defined objectives.

The performance measures in the following case studies are integral components of infrastructure asset management. Measures are linked to budget considerations where goals and strategic plans are developed to ensure acceptable quality and efficiency. The implementation of an effective and successful transportation asset management program relies on the use of performance measures to enable data-driven investment decisions.

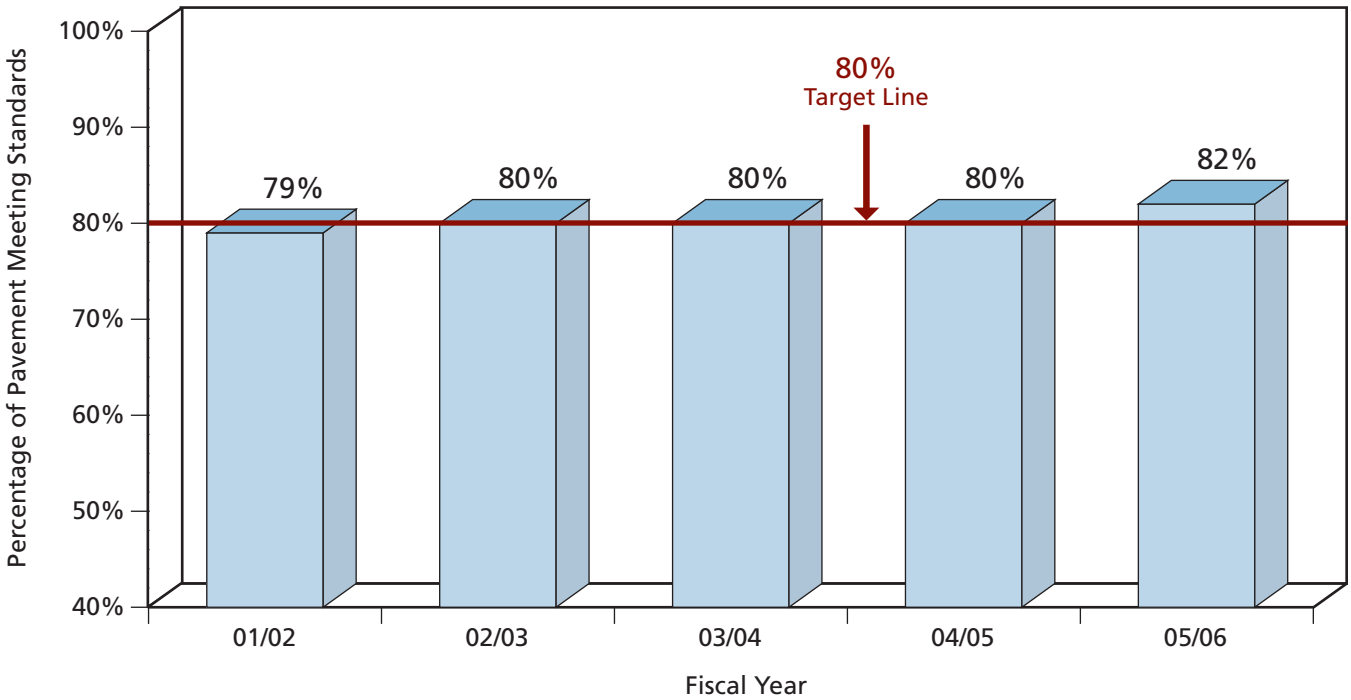
FDOT's Pavement Condition Criteria

The Florida Department of Transportation (FDOT) conducts an annual pavement condition survey to monitor three specific distress criteria: 1) ride quality, 2) rutting, and 3) cracking. These criteria are used to develop a 10-point scale known as the Pavement Condition Rating (PCR). The target is for 80 percent of all lanes on the state highway systems to have a PCR rating of "Good" or "Excellent," signifying pavement with a 6.5 or higher score. FDOT has been successful in reaching the objective and surpassing it in fiscal year 2006. (Figure 1.)

Maryland's Ride Quality Performance Measurement

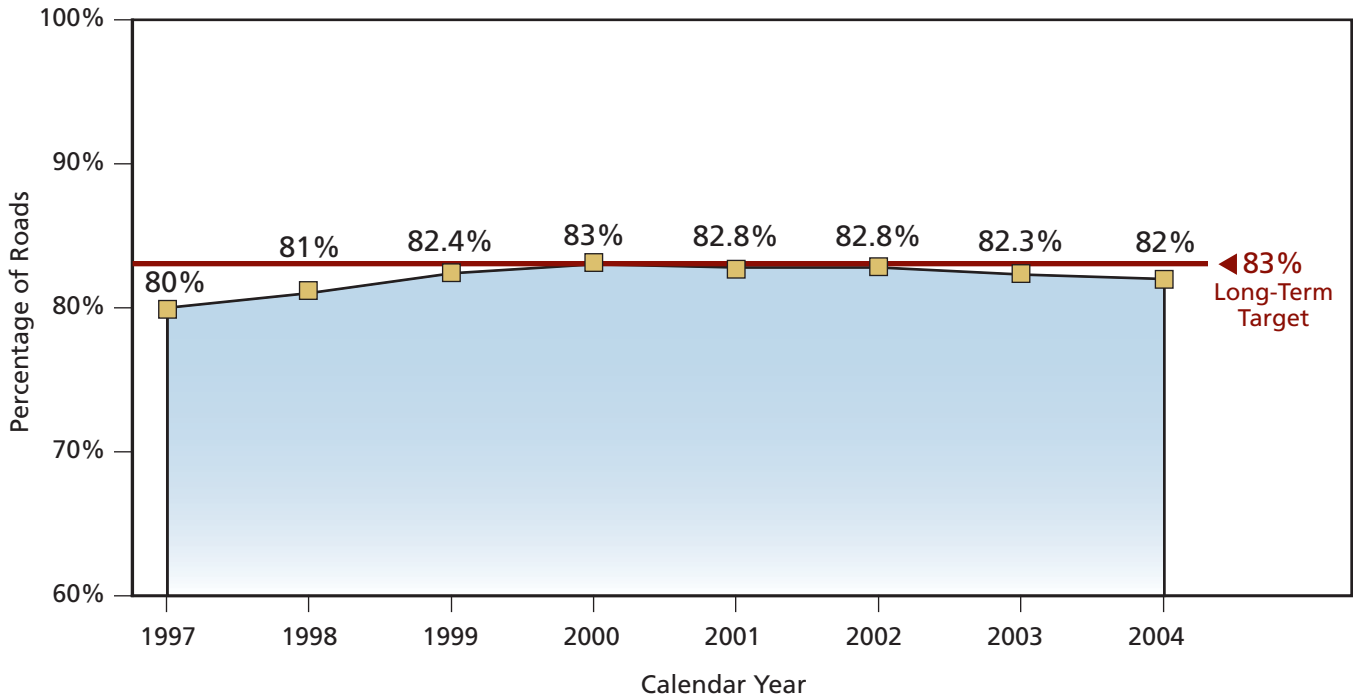
Maryland has six key performance measures related to the efficiency of existing infrastructure, including pavement conditions. The State Highway Administration (SHA) is required to survey highways under its administration for "Acceptable Ride Quality." (Figure 2.) The agency has a long-term performance goal and reports on the annual condition of state highways, how their performance compares with the previous year and the progress made towards the long-term target.

Figure 1. Percent of Pavement on Florida's Highway System Meeting Department Standards



Source: FDOT Pavement Management Office.

Figure 2. Percentage of Maryland-Maintained Roads with Acceptable Ride Quality
Ride Quality Facilitates Mobility, Efficiency, and a Safe Movement of People and Goods Within Maryland



MnDOT's Pavement Preservation Program

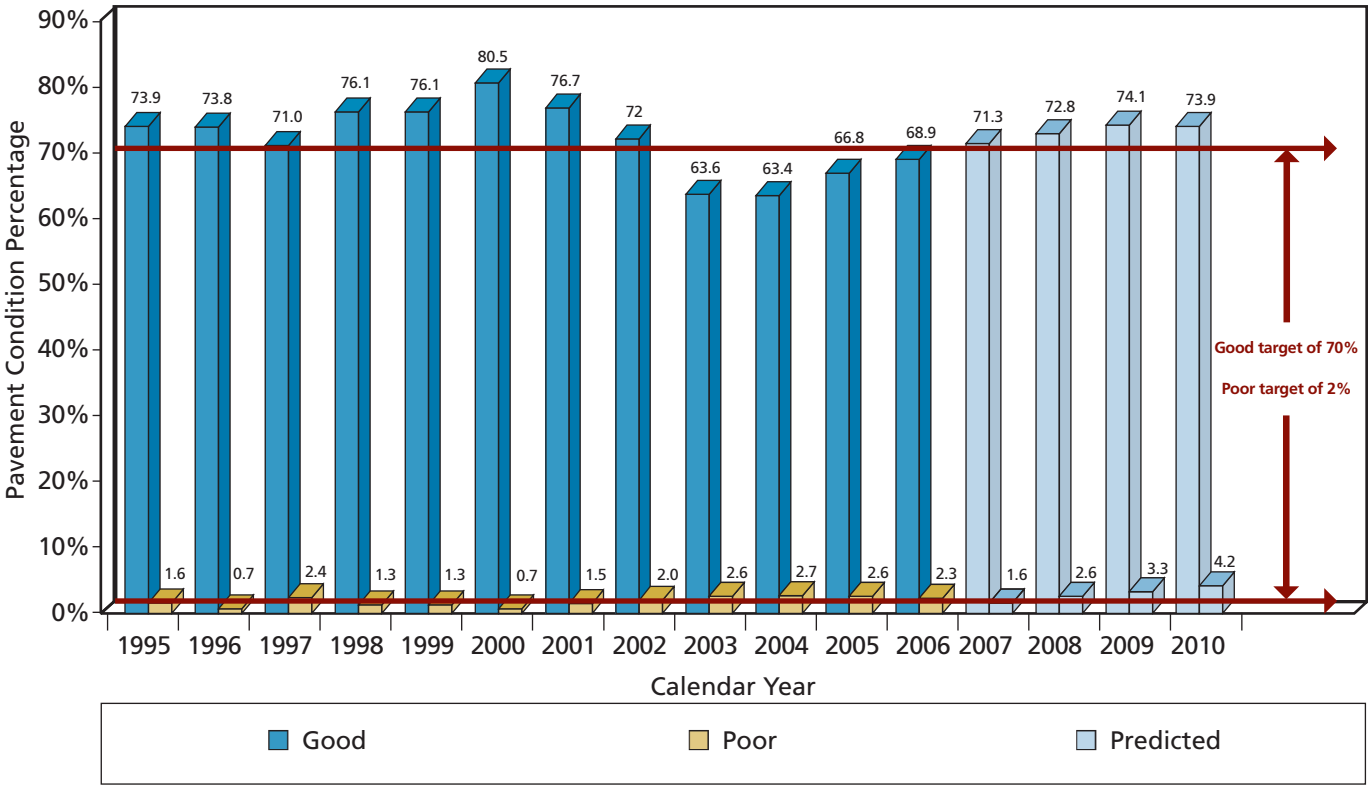
The Minnesota Department of Transportation (MnDOT) has made preserving pavement and bridges its highest priority for investment, and considers maintaining good pavement condition key to fulfilling MnDOT's goal to "safeguard what exists." MnDOT uses two measures to track pavement condition annually for all trunk highway miles: 1) the smoothness of the ride provided to travelers, and 2) the integrity of the pavement structure (Remaining Service Life). Each measure captures a different aspect of the pavement's health. They are used to rank pavement sections, to predict future maintenance and rehabilitation needs, and to select the most cost-effective treatments for each section.

Figure 3 shows that through 2002 Minnesota regularly exceeded desired targets for a "Good" quality smooth ride. While the pavement share rated "Good" began falling in 2001 due to heavy investment in expansion, it is projected to meet the 70 percent target again in 2007. The share with a "Poor" ride increased slightly above the 2 percent target in 2003 through 2006 and is expected to improve to 1.6 percent in 2007.

Photo courtesy of Minnesota Department of Transportation.

Night paving operations on I-494 in St. Paul reduces delays for commuters.

Figure 3. Customer Ride Quality on Minnesota's State Highways, Pavement Condition, Principal Arterials



MoDOT's Smooth Roads Initiative Program

Missouri tracks the condition of their existing major and minor roads as well as bridges on major and minor roads. This is an important measure because Missourians have indicated in customer surveys that the condition of the system should be of the highest priority. In response, Missouri's Smooth Roads Initiative (SRI) program recognized the relationship between pavement performance, quality and customer satisfaction. The SRI focused important resources to 2,200 miles of Missouri's most heavily traveled highways in order to bring them to "Good" condition. (Figure 4.)

Figure 4. Percent of Missouri Major Highways That Are in Good Condition

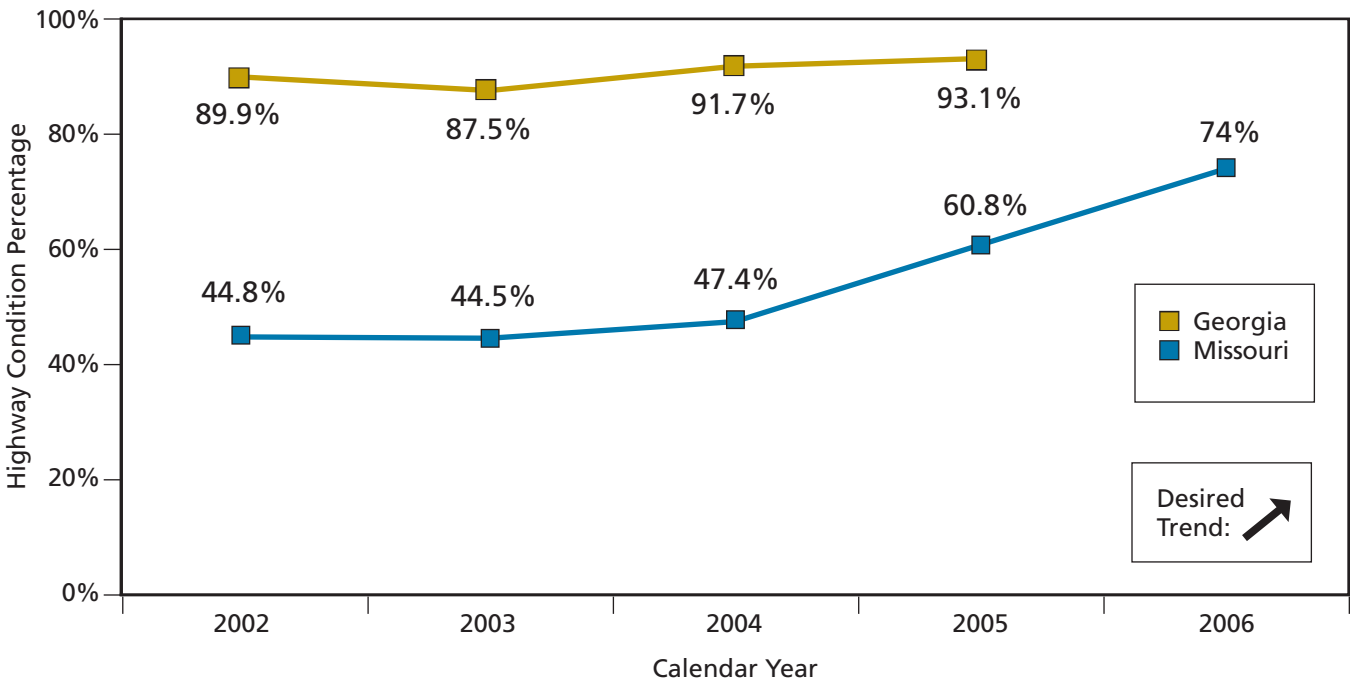


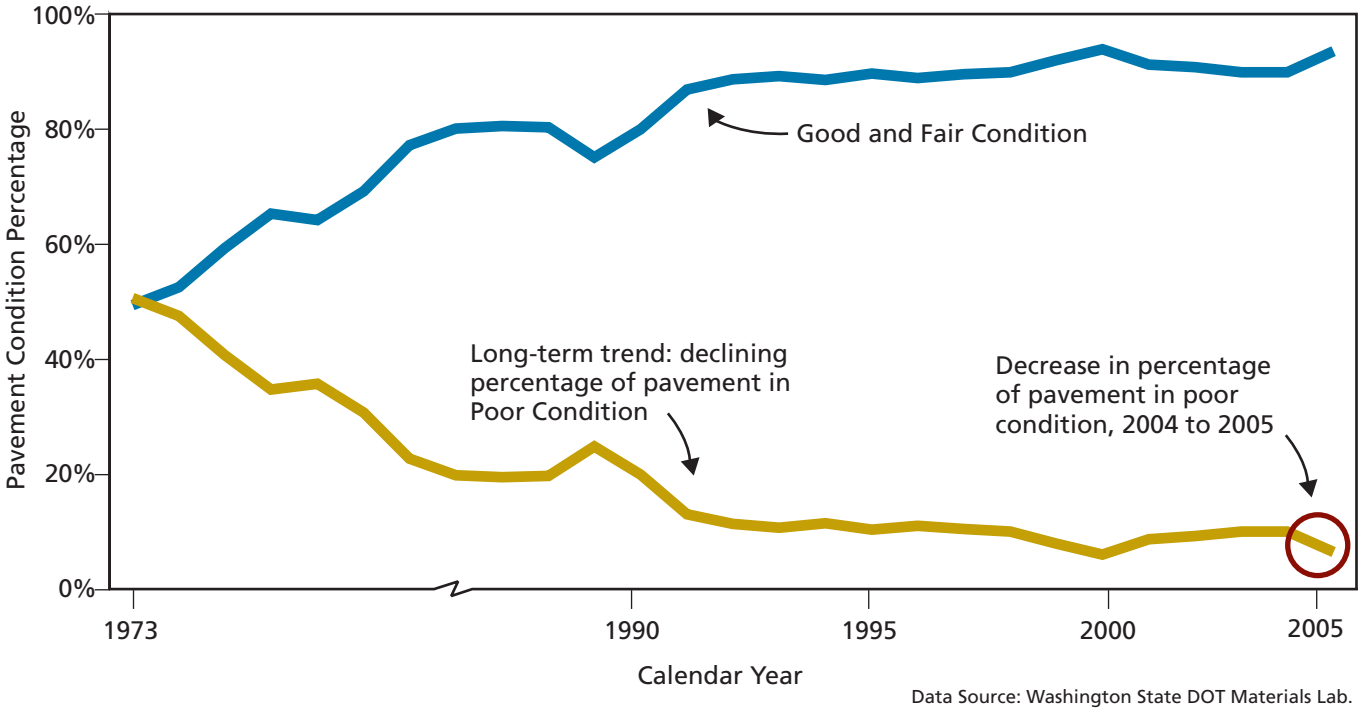
Photo courtesy of Missouri Department of Transportation.

Photo courtesy of Missouri Department of Transportation.

WSDOT's Lowest Life Cycle Cost Management Approach to Pavement

The Washington State Department of Transportation (WSDOT) annually assesses pavement conditions as part of the department's asset management program. WSDOT uses a combination of pavement ratings to determine when pavement is due for rehabilitation, based on Lowest Life Cycle Cost (LLCC) management. Pavement performance measures used to make specific investment decisions include structural condition (PSC), rutting condition and roughness (International Roughness Index [IRI]). WSDOT also measures the relationship between vehicle miles traveled (VMT) and pavement condition. WSDOT's combined pavement rating for 2005 shows that 93.5 percent of all pavement is in "Good" condition. (Figure 5.)

Figure 5. Washington State Highways Pavement Condition Trends, 1973–2005



Data Source: Washington State DOT Materials Lab.

Photo courtesy of Washington State Department of Transportation.

A typical travel day in Seattle.

Photo courtesy of Minnesota Department of Transportation.

Traffic congestion on eastbound I-94 near St. Paul increases travel time for commuters.

CHAPTER 2
Congestion and System Performance

Demand for highway travel by Americans continues to grow as the population increases, particularly in metropolitan areas. Construction of new highway capacity to accommodate this growth in travel has not kept pace. Between 1980 and 1999, lane-miles of highways increased 1.5 percent while vehicle miles of travel increased 76 percent. State DOTs examine two types of congestion delay: 1) recurring congestion (due to excess demand such as rush hour traffic and bottlenecks caused by the highway design), and 2) non-recurring congestion (generated by temporary conditions such as traffic incidents, work zones, extreme weather, and special events). It is estimated that non-recurrent congestion causes 30 percent to 60 percent of the total delay on highways.

Travel Time predictability and reliability are some of the most important performance expectations that freight movers and commuters share. As a result, many DOTs have explored ways to measure reliability and "real" travel times. Many have deployed key operational strategies such as incident response programs to reduce non-recurring congestion and increase safety and travel time reliability and maximize throughput on the existing system.

Florida's Incident Response Program

The primary goals of the FDOT Traffic Incident Management (TIM) Program are to increase mobility and reduce secondary incidents. Florida uses a program to patrol congested areas and high incident locations along urban highways. The mission is to provide highway assistance services during incidents to reduce delay and improve safety for the motoring public and responders. In 2005, 298,776 service assists were performed, more than double the 112,000 assists performed in 2000, the first year of the program. Over 1.5 million service assists have been performed since 2000, with the busiest year of 342,895 assists in 2004.

Maryland's Incident Response Program

The Coordinated Highways Action Response Team (CHART) is a comprehensive traffic management system and incident management program which includes emergency traffic

patrols to provide emergency motorist assistance, emergency response units for overall traffic control at accident locations, and pre-stocked trailers with traffic control tools used to quickly set up pre-planned detour routes when incidents require full roadway closure.

The CHART incident management program provides safety and economic benefits to motorists and commerce in Maryland. By June 2008, this program is anticipated to save motorists and commercial traffic approximately 30 million vehicle-hours annually, equivalent to $570 million a year in cost savings through incident clearance. (Table 1.)

Table 1. Vehicle-Hours Saved Annually from 2003 to Target Date (June 2008) Maryland

Performance Measure	Calendar Year			
	2003	2004	2005	Target
Reduction in incident congestion delay	26.8 million vehicle hours saved	25.9 million vehicle hours saved	27.9 million vehicle hours saved	30.0 million vehicle miles saved

Missouri's Uninterrupted Traffic Flow

This measure is used to determine the trends in incident clearance on the state highway system. Motorist Assist and the traffic operations centers track the time for all lanes to be cleared following an incident.

This tracking approach has continued to reduce incident clearance times. Increased efforts in incident management, Motorist Assist and police coordination in both the St. Louis and Kansas City regions continue to support MoDOT's objective of quick clearance and open roadways with the ultimate goal of improving clearance times. (Figure 6.)

Figure 6. Average Time to Clear Traffic Incident in Kansas City, Missouri, 2005–2007

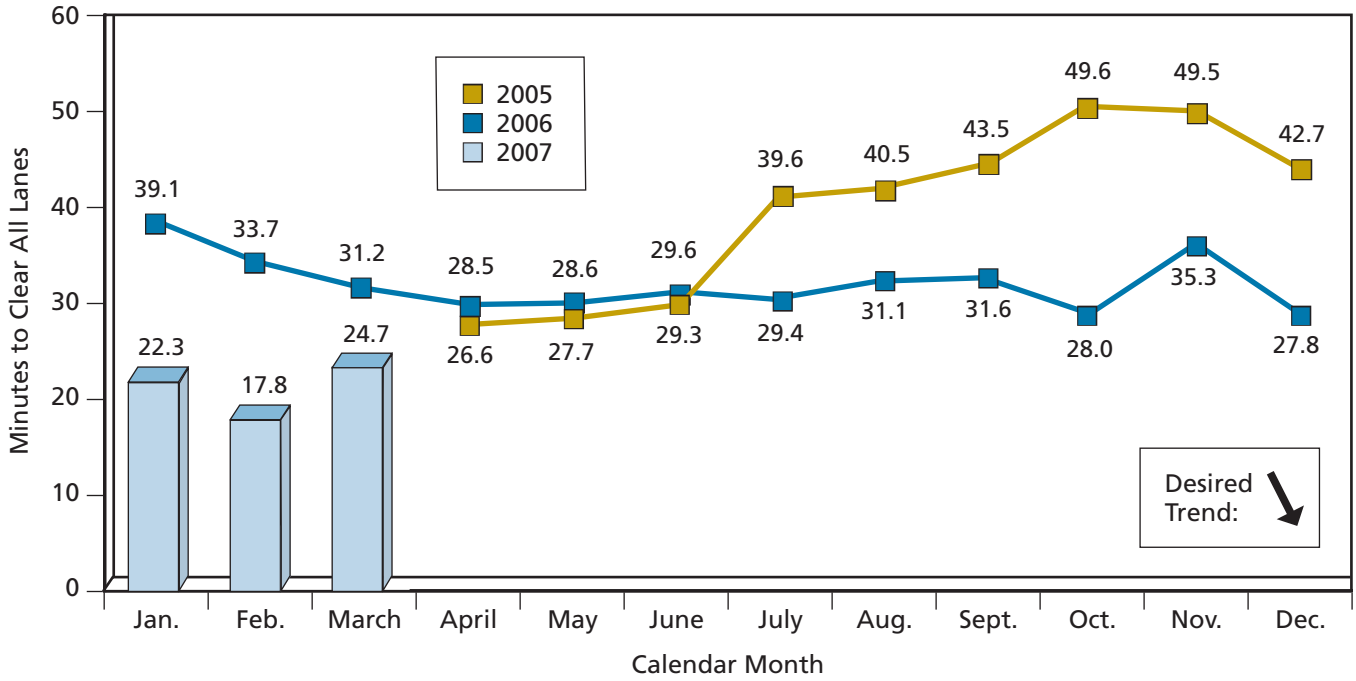


Photo courtesy of Missouri Department of Transportation.

MoDOT's Motorist Assist responds to incident.

Minnesota's Performance Measures for Measuring Recurrent and Non-Recurrent Delay

Minnesota is another state that uses real-time performance information to communicate freeway congestion and travel time data to the public. In addition, MnDOT measures the average clearance time for freeway incidents. In 2006, the MnDOT stabilized the average time for clearing incidents on Metro freeways at 38.8 minutes. The target is 35 minutes. (Figure 7.)

Figure 7. Average Clearance Time for Minnesota Urban Freeway Incidents in Metro Area in Minutes (3-Year Average)

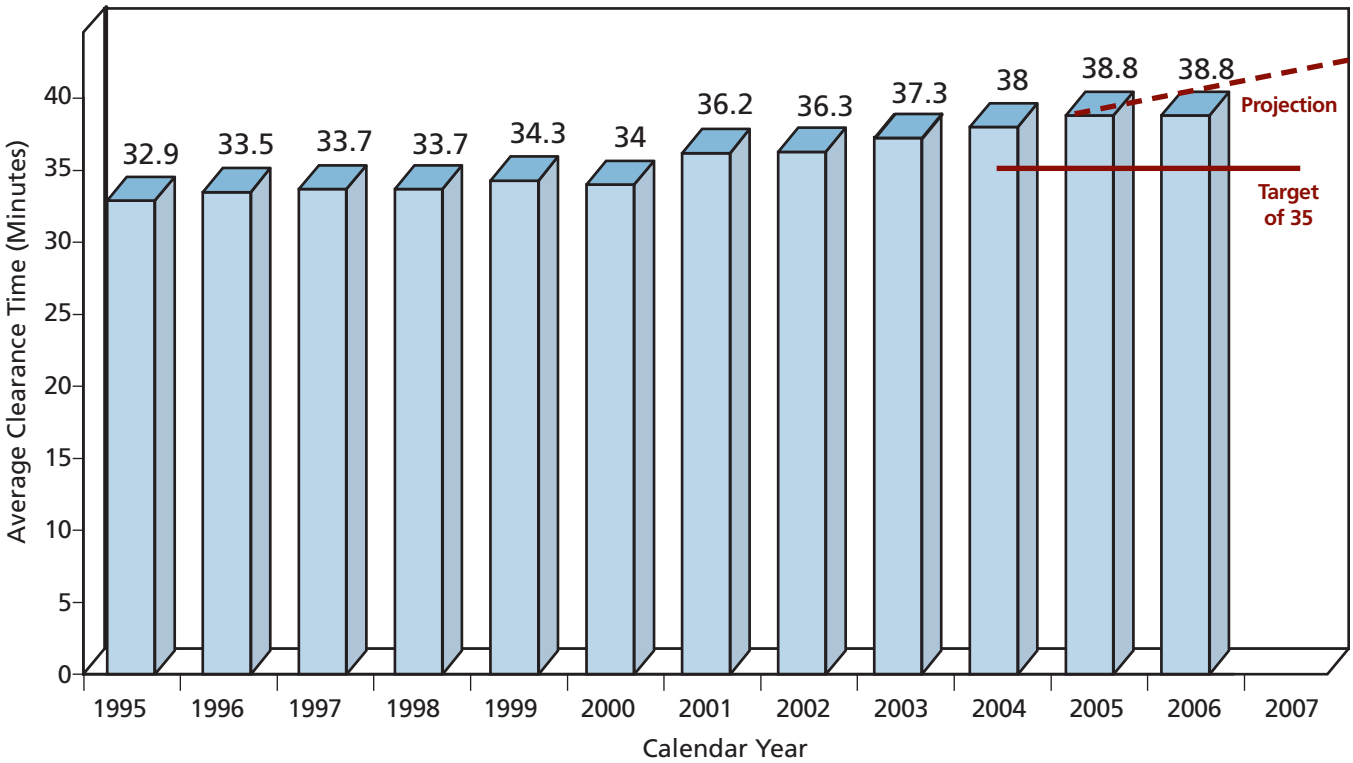


Photo courtesy of Missouri Department of Transportation.

Increasing traffic volumes and accidents tend to continue to push clearance time upward, but strategies such as close coordination with the State Patrol and expansion of FIRST service patrol are being used to keep clearance times from increasing.

Washington's Performance Measures for Congestion and System Performance

Washington collects real travel time data to produce a comprehensive, annual congestion report that analyzes system performance. Key metrics include average peak travel time, 95 percent reliable travel time, vehicle throughput, lost throughput productivity, delay, percent of days that the speed falls below 35 mph, duration of congestion, incident response clearance time, and Before-and-After analysis of performance for selected highway improvement projects. An example of how Washington has been able to manage congestion with performance measures is its effort to enhance incident response, which has resulted in average clearance time of less than 20 minutes since 2003. Table 2 is another measurement example for specific travel time and reliability measures that give commuters information and provide WSDOT the needed data to make informed decisions about capital and operational congestion strategies and investments.

Table 2. Travel Time Performance for Selected Central Puget Sound Commutes, 2005*

Route	Route Description	Peak Time	Length (Miles)	Travel Time at Posted Speeds (in minutes)	Average Peak Travel Time, Based on Peak Time (in minutes)	95% Reliable Travel Time (in minutes)	Ratio of Peak Travel Time to Maximum Throughput Travel Time (MT^3I)	Duration of Peak Congestion Period (hours: minutes)
I-5	Everett to Seattle	7:30 AM	23.7	24	48	68	1.7	2:35
I-5	Seattle to Everett	5:20 PM	23.7	24	46	68	1.7	3:30

** In addition to the peak time performance measure, WSDOT uses additional measures to evaluate annual congestion thresholds.*

CHAPTER 3
Safety

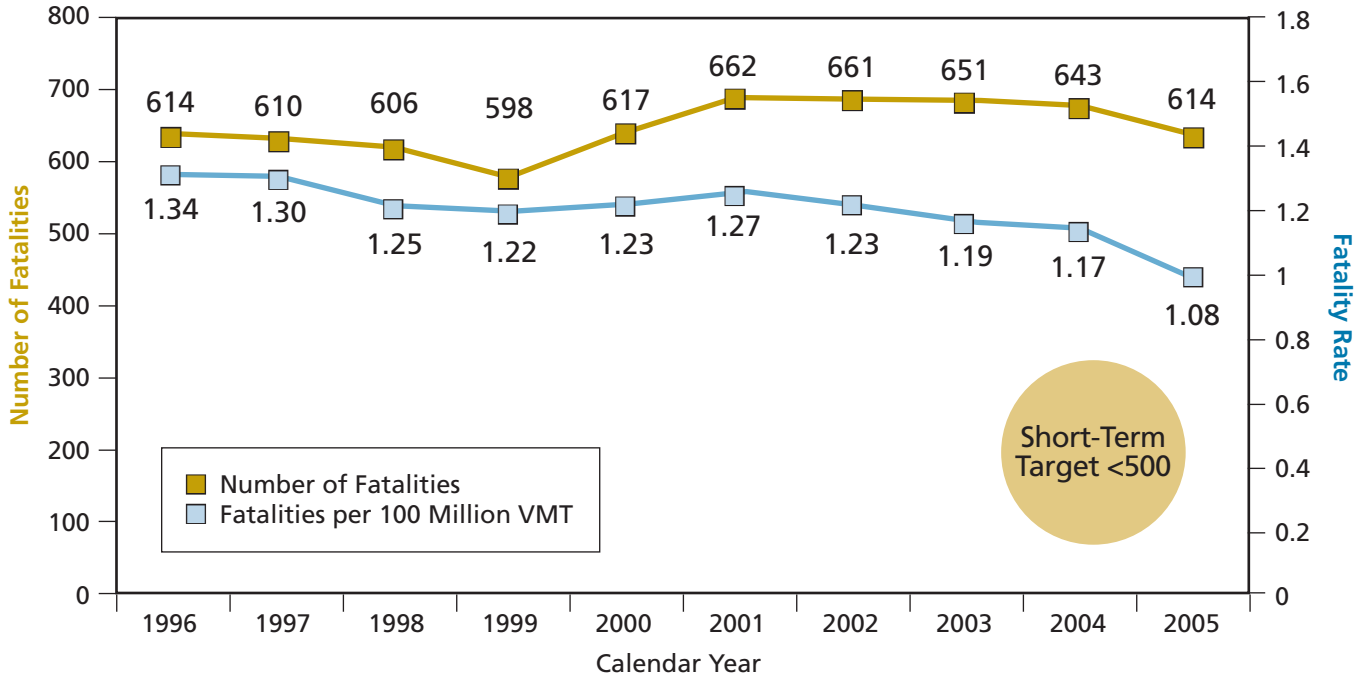
The National Safety Council (NSC) reports that highway accidents are the leading cause of death among persons aged 1 to 34, and the fifth leading cause of death among all persons. It follows that safety is among the top considerations when it comes to maintaining and improving the nation's transportation infrastructure. While the fatality rates on the nation's highways are going down, the actual number of highway fatalities is increasing as a result of population and vehicle-miles traveled (VMT) increases. State DOTs are primarily measuring the benefits of safety improvements through the collection of crash data, through Before-and-After safety project analysis and by tracking supplemental data that is obtained in accidents such as the involvement of alcohol, controlled substances and seatbelt use. The ongoing practice of safety performance measurement has been further highlighted by the passage of SAFETEA-LU which requires statewide, performance-based safety plans that track and report results.

Photo courtesy of Missouri Department of Transportation.

Maryland's Annual Highway Fatality Performance Measures

For 30 years, accident rates on Maryland roads have declined. Maryland's fatality rate is 26 percent lower than the 2005 national fatality rate of 1.47. (Figure 8.) Maryland DOT attributes its success to increased use of median barriers on high-speed roads, increased seat belt usage, lowered impaired driving rates, public information campaigns and improved traffic enforcement. Maryland DOT plans to use the data collected in this measure for future studies, and has set a short-term target of decreasing annual traffic fatalities to fewer than 500 people per year.

Figure 8. Annual Number and Rate of Traffic Fatalities on All Roads in Maryland

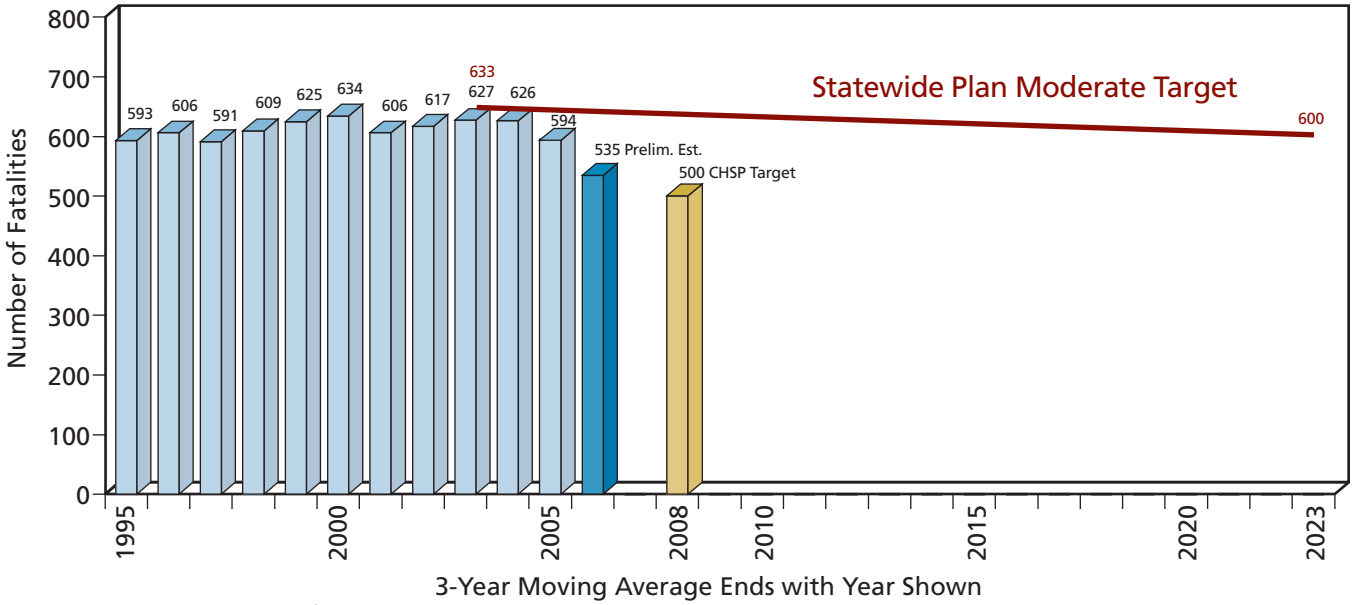


Minnesota's Highway Fatality Performance Measures

In partnership with the Minnesota Department of Public Safety, local governments, and the private sector, Minnesota's DOT has been engaged in a sustained effort to reduce fatalities and serious injuries. They set an aggressive target to reduce annual fatalities from 655 in 2003 to 500 by 2008. The target was achieved ahead of schedule in 2006 with 494 annual fatalities, the fewest since 1945. Minnesota's fatality rate fell to 0.99 in 2005, the fourth lowest in the nation, surpassing FHWA's 2008 target of 1.0 fatalities per million vehicle miles traveled. (Figure 9.)

Minnesota DOT's long-term safety plan called "Toward Zero Deaths" builds on safety performance planning and reporting with its federal and local transportation partners, as well as implementing local community coalitions to promote safer driving habits, infrastructure inventory, lower-cost safety design strategies, and faster emergency medical response.

Figure 9. Minnesota Fatalities—All State and Local Roads
Results vs. 2003 Statewide Plan Target and CHSP* Target

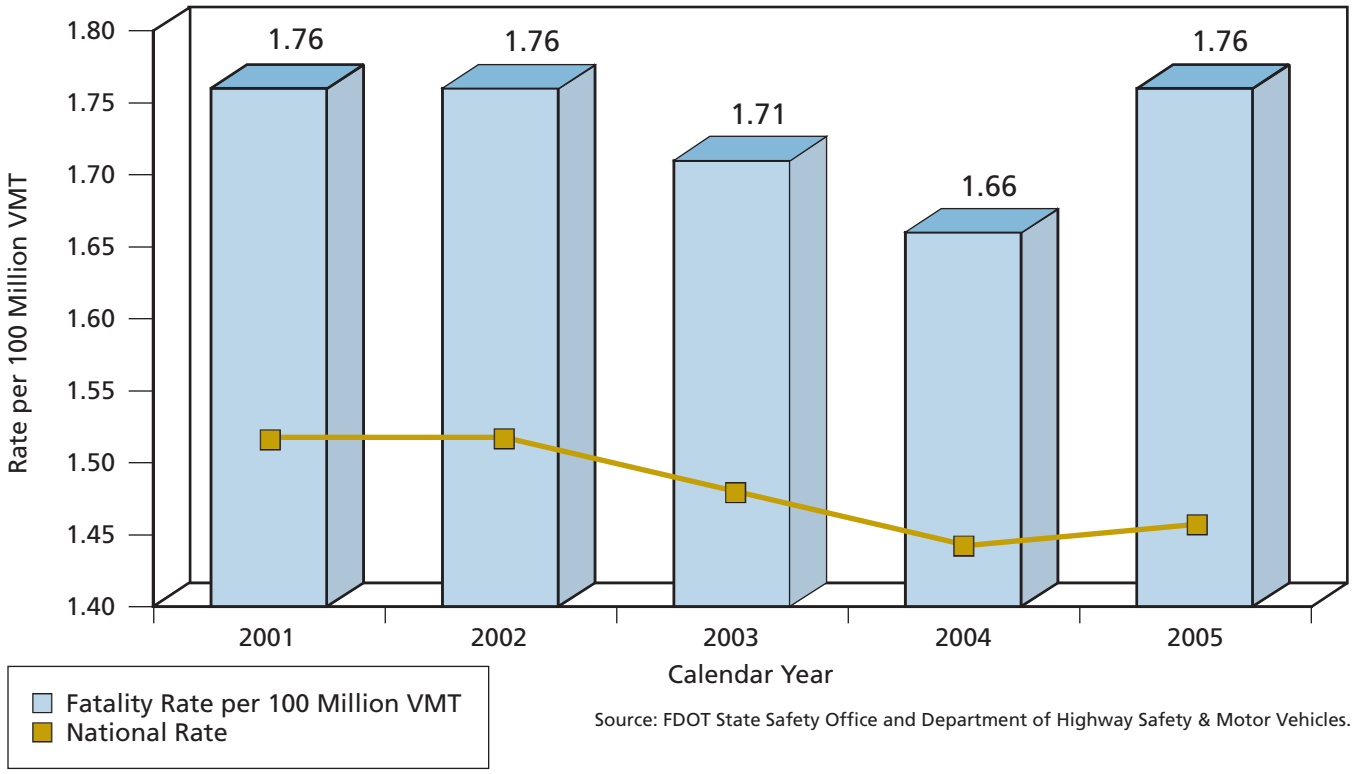


*Note: Comprehensive Highway Safety Plan.

Florida's Highway Fatality Performance Measures

Florida has adopted a comparative performance measure using the national fatality rate. Objectives for highway, bicyclist, pedestrian and motorcycle fatality and injury rates have been adopted. The objective for moving to within 5 percent of the national fatality rate by 2015 is a challenge in a high-growth state like Florida. (Figure 10.)

Figure 10. Fatalities per 100 Million VMT on All Public Roads in Florida



Source: FDOT State Safety Office and Department of Highway Safety & Motor Vehicles.

Missouri's Safety Impacts of Guard Cable Installation

Cross-median crashes are frequently severe because vehicles often hit head-on at high speeds. The crashes are most frequent on highways with high traffic volumes and narrow medians. Median guard cable has proven to be an effective countermeasure for this crash type. Due to the installation of 179 miles of guard cable on Missouri Highways, cross-median fatalities have continued to decrease. Figure 11 shows that the investment in these median cable systems has led to a decrease in cross-median fatalities.

Figure 11. Missouri Interstate Cross-Median Fatalities, 2001–2006

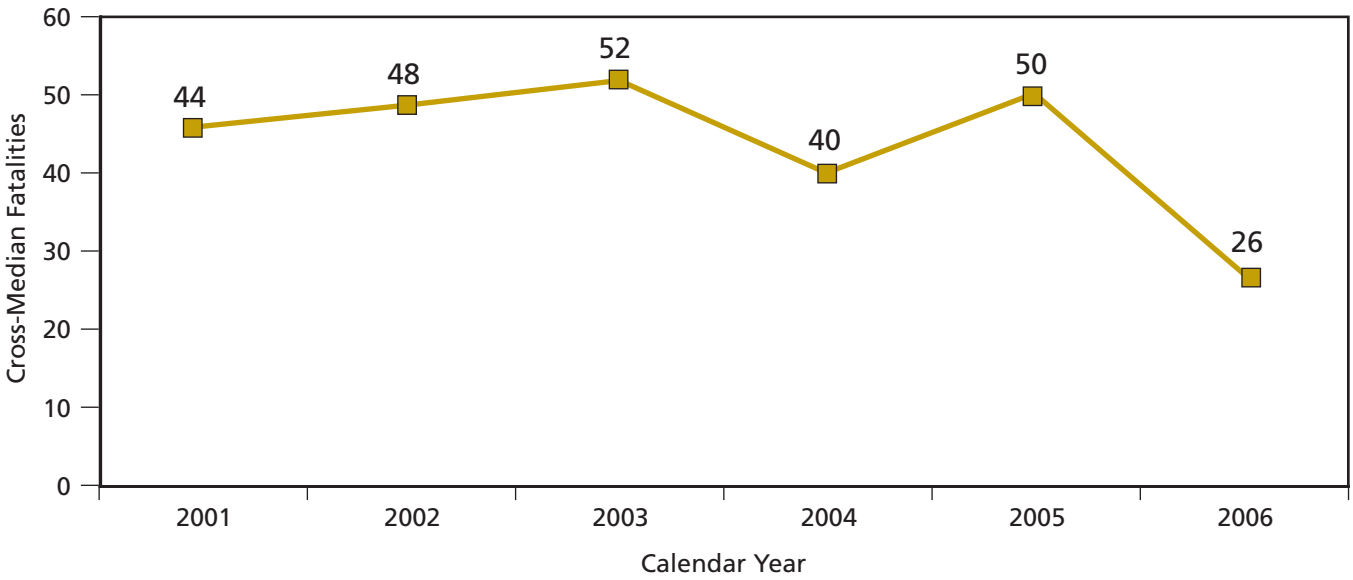


Photo courtesy of Missouri Department of Transportation.

Guard cable helps reduce traffic fatalities during cross-median crashes.

Washington's Target Zero Highway Safety Performance Measures

The fatality rate on Washington's public roads has decreased 36 percent over the past 15 years (from 1.85 in 1990 to 1.17 in 2005). (Figure 12.) Washington's long-term objective is known as Target Zero, with a goal to eliminate fatal collisions on Washington's public roadway system by the year 2030. Target Zero incorporates four key components commonly referred to as the four "E"s: enforcement, engineering, education and emergency services.

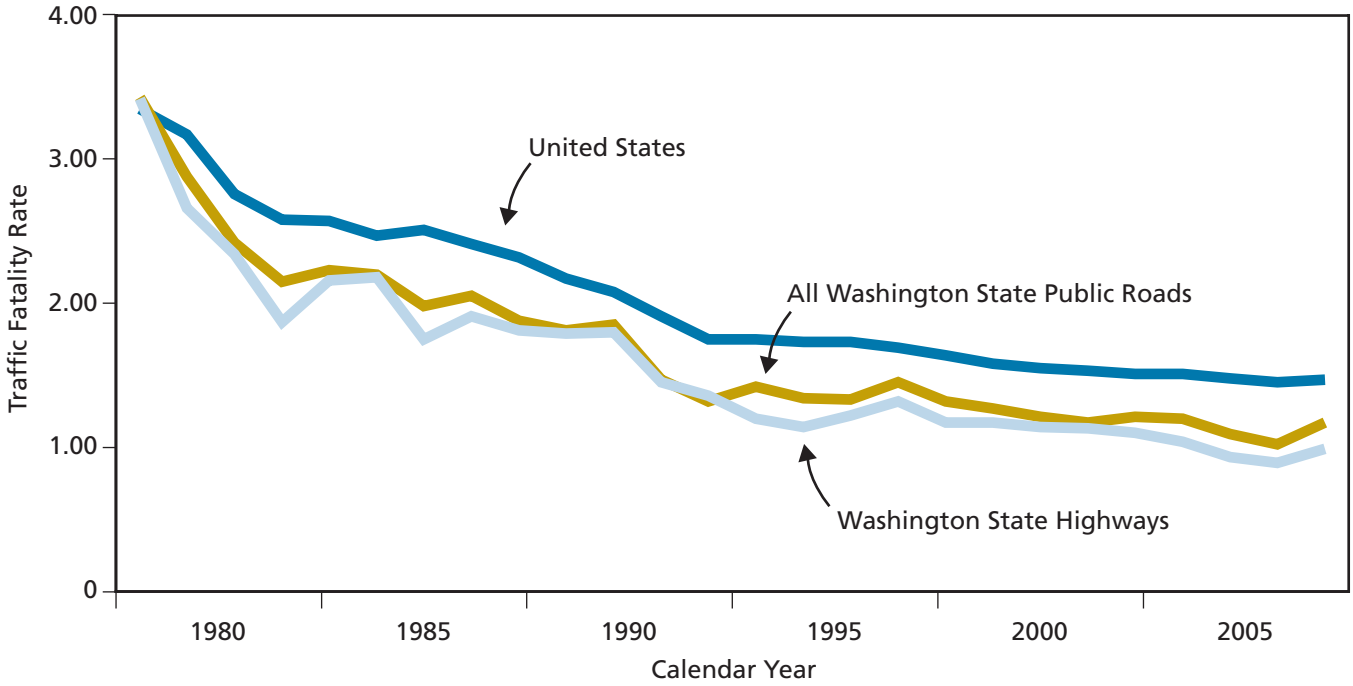
As part of a continuing effort to determine the effect on reducing the number and severity of traffic collisions, completed projects are subject to extensive Before-and-After studies. (Table 3.) For example, 32 completed highway improvement projects that were analyzed in 2006 show a 43 percent reduction in injury and fatality accidents.

Table 3. Combined Average Collisions per Year for All of Washington State DOT's Before-and-After Study Projects

Type of Collisions	Before Period	After Period	% Reduction
All Types	16.2	10.5	35%
Property Damage Only	8.8	6.2	30%
Injury/Fatal	7.4	4.2	43%

Source: WSDOT Transportation Data Office.

Figure 12. Traffic Fatality Rates in Washington Compared to the National Average
Fatalities per 100 Million VMT: 1980–2005



Provided by: WSDOT-Traffic Data Office.
Sources: U.S. Fatalities/Vehicle Miles Traveled (VMT): National Highway Traffic Safety Administration (NHTSA) Traffic Safety Facts WA Fatalities: Fatal Accident Reporting System (FARS); State Highway Fatalities; WSDOT-Traffic Data Office; WA VMT: WSDOT-Traffic Data Office.

Photo courtesy of Washington State Department of Transportation.

A roadway in eastern Washington State.

CONCLUSION

The increasing pressure for public accountability and transparency combined with the need to maximize limited resources have prompted many state DOTs to adopt performance-based management programs. Many state DOTs have used performance measurement successfully for years to provide the most efficient transportation system and services. These efforts have resulted in improved system performance, enhanced public credibility and, in several cases, increased state funding. These case studies illustrate this common experience, yet, "one size does not fit all." Performance programs and targets vary among states in order to accommodate their unique environments, funding scenarios and specific operational and capital strategies.

The state DOTs cited in each area of this report represent a brief snapshot of the performance-based programs across the country. While performance systems are customized to each DOT's mandate and need, these systems are not created in a vacuum. Many agencies track similar indicators and have begun to apply comparative performance measurement methods to identify best practices that can be shared with all DOTs. AASHTO's recent effort in comparing state DOTs' construction project cost and schedule performance is one example of that ongoing work. This enables data sharing among DOTs and the traveling public, and allows for benchmarking and continuous improvement as well as citizen input. Through these individual and collaborative efforts, state DOTs have demonstrated that their performance management practices have yielded measurable results and that they are well on track to continue to improve system conditions, system performance and safety on state and Federal-aid highways.

For your information and reference, see attached Appendix, *Performance Management Reference and Resources*. This portion of the document provides links and references to the participating State's performance management publications as well as citations and links for the premier performance management documents and guidance used by DOTs.

Photo courtesy of Missouri Department of Transportation.

APPENDIX

Performance Management References and Resources

Measuring Performance Among State DOTs, AASHTO, March 2006
http://www.transportation.org/sites/quality/docs/MeasuringPerformance.pdf

Strategic Performance Measures for State Departments of Transportation, A Handbook for CEOs and Executives, AASHTO, June 2003
http://downloads.transportation.org/Quality-CEOHandbook.pdf

Comparing State DOTs' Construction Project Costs and Schedule Performance—28 Best Practices from 9 States, April 2007, NCHRP Project 20-24, Task 37A
http://www.transportation.org/sites/quality/docs/Comparing%20State%20DOTs.pdf

Survey of State DOT Performance Measures, SCoQ, May 2007
http://knowledge.fhwa.dot.gov/cops/pm.nsf/home?OpenForm&Group=PMEE6W7JBJ&tab=REFERENCE

Performance Measures and Targets for Transportation Asset Management, NCHRP 5551, 2006
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_551.pdf

Peer Exchange Series on State and Metropolitan Transportation Planning Issues; Meeting 2: Non-Traditional Performance Measures, NCHRP 8-36 Task 53, March 2006
http://www.transportation.org/sites/planning/docs/NCHRP%208-36%2853%29%282%29%20NonTraditional%20Perf%20Measures.pdf

Transportation Planning Performance Measures, Oregon Department of Transportation and Federal Highway Administration, October 2005
http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/PlanningPerformanceMeasures.pdf

ScoQ Quality Information Center
http://www.transportation1.org/quality/center.htm

Florida Department of Transportation
http://www.dot.state.fl.us/businessmodel/

Maryland Department of Transportation
http://www.e-mdot.com/Planning/Plans%20Programs%20Reports/Index.html

Minnesota Department of Transportation
http://www.departmentresults.state.mn.us/dot/index.html

Missouri Department of Transportation
http://www.modot.org/about/general_info/Tracker.htm

Washington State Department of Transportation
http://www.wsdot.wa.gov/accountability/default.htm

AASHTO Performance-Based Highway Program Task Force

Pete Rahn, Chair
Director, Missouri Department of Transportation

Mara Campbell
Director of Organizational Results
Missouri Department of Transportation

Daniela Bremmer
Director of Strategic Assessment
Washington State Department of Transportation

Susan Mortel
Bureau Director, Transportation Planning
Michigan Department of Transportation

Sandy Straehl
Administrator, Rail, Transit, and Planning
Montana Department of Transportation

Jeff Roerden
Management Engineer
North Carolina DOT Productivity Services

Carlos Braceras
Deputy Director
Utah Department of Transportation

Barbara Reese
Chief Financial Officer
Virginia Department of Transportation

John Zamurs
New York State Department of Transportation

Dianna Noble
Director, Environmental Affairs
Texas Department of Transportation

David Ganovski
Director, Office of Freight Logistics
Maryland Department of Transportation

Richard Nordahl
Chief, Office of Goods Movement
California Department of Transportation

Troy Costales
Division Administrator
Oregon Department of Transportation

Larry Tibbits
Chief Operations Officer
Michigan Department of Transportation

Douglas Rose
Deputy Administrator and Chief Engineer
Maryland Department of Transportation

Timothy Henkel
Division Director
Minnesota Department of Transportation

Robert Romig
Director, Office of Policy Planning
Florida Department of Transportation

American Association of
State Highway and
Transportation Officials

AASHTO

The Voice of Transportation

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
444 N. Capitol St., NW, Suite 249
Washington, DC 20001

www.transportation.org

ISBN: 978-1-56051-381-0
Publication Code: RP-TIF6S-1