TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS

U.S. Department of Transportation
Federal Highway Administration

SAFETY

ENHANCING TRANSPORTATION:
CONNECTING TSMO AND SAFETY

Photo Source: Getty Images

The safe and efficient movement of people and goods is one of the most basic missions of any transportation agency. More and more, transportation agencies are realizing the importance of TSMO to help them achieve their safety-focused mission.

TSMO strategies can help reduce injuries and fatalities on our roadways and support *The Road to Zero* vision.[1] Significant overlap exists between strategies that improve operations and those that improve safety, including access management strategies, signal optimization, winter weather operations, traveler information, and traffic incident management. Safety strategies can have positive impacts on operations, and operational strategies can result in improved safety of the transportation network. Below are examples of TSMO strategies that have safety benefits:

- Safe, quick clearance of traffic incidents on roadways reduces the occurrence of secondary incidents (incidents caused by the effects of the original incident). One study estimates that the chance of secondary incidents increases by 2.8 percent for each minute the initial incident continues to pose a hazard.[2]
- Road weather management promotes safety by providing timely, accurate, and relevant information about roadway impacts of weather on travelers and transportation agencies, allowing agencies and drivers to make safe decisions during inclement weather.
- Traveler information before and within work zones and in advance of congested slowdowns and queues can alert drivers of upcoming hazards, enable drivers to re-route, and create safer driver behavior.
- Active traffic management strategies such as dynamic speed limits and dynamic lane control on freeways can harmonize vehicle speeds when congestion is building and reduce erratic flow conditions that lead to crashes.

TSMO and safety are inherently linked. For example, congestion is a frequently cited reason drivers give for aggressive driving.[3] By helping to reduce congestion, TSMO strategies can reduce unsafe

1 The Road to Zero is a vision for achieving zero roadway deaths by 2050. It is supported by a coalition managed by the National Safety Council and supported by the U.S. Department of Transportation. For more information, see: https://www.nsc.org/road-safety/get-involved/road-to-zero.

2 SafeHighways.org, Enhancing Safety Service Patrol Driver's Safety, 2018. Available at http://www.safehighways.org/safe-highway-matters/fallwinter-2013/enhancing-safety-service-patrol-drivers-safety/.

3 Stuster, J., Aggressive Driving Enforcement: Evaluations of Two Demonstration Programs, National Highway Traffic Safety Administration, 2004. Available at: https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809707.pdf.

WHAT IS TSMO?

Transportation systems management and operations (TSMO) is the use of strategies, technologies, mobility services, and programs to optimize the safety, mobility, and reliability of the existing and planned transportation system. A significant cause of congestion and unreliable travel is non-recurring events, such as crashes, and transportation network disruptions, such as bad weather, and special events. TSMO enables agencies to target the underlying operational causes of congestion and unreliable travel through innovative solutions that typically cost less and are quicker to implement than adding capacity. TSMO expands the range of mobility choices available to system users, including shared mobility and non-motorized options.

This Fact Sheet is part of a series that explains how TSMO relates to other State and local transportation agency functions and offices. Other Fact Sheets focus on how TSMO relates to: asset management, performance management, maintenance, design, environment, planning, human resources, and construction.

driver behaviors. In 2018, the Texas Department of Transportation (DOT) renamed its Traffic Operations Division, where both TSMO and safety are housed, to the Traffic Safety Division. At the Washington State DOT, safety is part of its TSMO program.

Safety engineers should be part of the planning and implementation of TSMO strategies to ensure that the safety impacts of TSMO are considered. Although TSMO offers many safety benefits, in some instances improving mobility, and thus travel speeds, can increase safety risks. Likewise, specific safety treatments can reduce efficient mobility. For example, protected-only left turn signal phases are generally safer than permitted or protected/permitted phasing but typically cause drivers to wait longer at signals. Alternatively, managed lanes often create differences in speed profiles with adjacent general use lanes that may increase safety risks. Using a data-driven, performance-based approach for both safety and TSMO planning will help agencies better understand the potential impacts of safety and TSMO strategies and identify the appropriate threshold for risk. Making these tradeoffs involves balancing the needs of different users of the system based on community goals and priorities.

A lack of information exists as to the safety impacts or crash modification factors associated with many TSMO strategies. The American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual has limited information to help predict the safety performance of TSMO strategies. Ongoing research by the Federal Highway Administration (FHWA) and the National Cooperative Highway Research Program aims to address many of the knowledge gaps and support agencies in making important safety and mobility decisions. For example, the FHWA has developed the Intersection Control Evaluation, a data-driven, performance-based framework and approach. It supports agencies in evaluating their intersection configuration and control options. It also helps them to balance their operational, safety, and multimodal objectives.[4]

HOW HAS THIS WORKED IN PRACTICE?

- An **Arizona** study on the effectiveness of traffic signal coordination concluded that crash rates on intersection approaches decreased 6.7 percent after signal coordination.[5]
- In **Virginia**, researchers found nearly a 25-percent reduction in total crashes of all severity levels on segments of I-66 where hard-shoulder running was deployed.[6]
- Road weather information systems can reduce traveler delay and lower crash rates by 7 to 83 percent.[7]
- The **Maryland DOT's** Coordinated Highways Action Response Team (CHART), which provides incident detection, response, and traffic management operations on Interstate highways and major arterials, prevents an estimated 225-250 secondary crashes each year.[8]
- In 2014, the **Oregon DOT** deployed an active traffic management system on OR 217 that included variable speed limits, traveler information, queue warning, and updated ramp metering. Preliminary crash data showed a 21-percent reduction in the total number of crashes after the first full year.[9]

The goal of this fact sheet is to incorporate TSMO strategies into routine safety planning and practices and incorporate a safety perspective into TSMO strategy development. This fact sheet raises the awareness of the benefits of employing TSMO strategies as approaches to safety solutions.

4 Learn more about FHWA's Intersection Control Evaluation (ICE) at https://safety.fhwa.dot.gov/intersection/ice/.

5 FHWA, "Signalized Intersection Safety Strategies," (Washington, DC: February 2008). Available at: https://safety.fhwa.dot.gov/intersection/other_topics/fhwasa08008/sa4_Signal_Coordination.pdf.

6 Dutta, N., M. D. Fontaine, R. A. Boateng, and M. Campbell, Evaluation of the Impact of I-66 Active Traffic Management System: Phase II, Final Report Virginia Transportation Research Council (VTRC) 19-R7, October 2018. Available at: http://www.virginiadot.org/vtrc/main/online_reports/pdf/19-R7.pdf.

7 U.S. DOT, Intelligent Transportation Systems (ITS) Joint Program Office, Investment Opportunities for Managing Transportation Performance through Technology, January 2009.

8 Maryland DOT Coordinated Highway Action Response Team, "CHART Traffic Incident Management." Available at: http://chart.maryland.gov/about/incident_management.asp.

9 Oregon DOT, Portland Region 2016 Traffic Performance Report, 2016. Available at: https://www.oregon.gov/ODOT/Regions/Documents/Region1/2016_TPR_FinalReport.pdf.

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