



# MnDOT Transportation Systems Management and Operations (TSMO) Strategic Plan

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# Introduction: Why Does Minnesota Need a TSMO Plan?

Transportation is critical in the economic and social vitality of all communities. A vital, efficient transportation system is key to supporting the economy and quality of life in Minnesota. However, there are many challenges facing Minnesota. The 20-year Minnesota’s Statewide Multimodal Transportation Plan (SMTP) identifies transportation trends and challenges facing the state. The trends presented below are those that could be addressed by a focus on Transportation Systems Management and Operations (TSMO):

- The **population** is **growing and aging**, putting pressure on both traditional transportation and specialty transportation services.
- The population is becoming more **urban** as more people are living in urban settings.
- The **economy** depends on transportation to connect people to jobs and move goods from producers to buyers.
- Our **infrastructure is aging** with a growing number of roadways and bridges needing maintenance or reconstruction.
- New companies, **technologies** and services (like **mobility as a service**) have made people re-think how they travel.
- **Climate change** is already having major impacts and will continue impact transportation into the future.

### MnDOT Specific Trends and Challenges

- » Aging pavement and bridge infrastructure
- » Increasing congestion
- » Continued safety challenges
- » Shift from building new to maintaining existing infrastructure
- » Increasing focus on operating existing infrastructure to maximize efficiency
- » Increasing need for collaboration
- » Persistent budget shortfalls

### What is Transportation System Management and Operations (TSMO)?

A broad set of strategies that aim to optimize the safe, efficient, and reliable use of transportation infrastructure. The following are examples of TSMO strategies:

- » Traffic incident management
- » Traffic signal coordination
- » Transit signal priority
- » Freight management
- » Work zone management
- » Special event management
- » Road weather management
- » Managed lanes
- » Ridesharing programs

*Source: FHWA*

In the face of these trends and challenges, the reliability and continuous availability of Minnesota's transportation network is more important than ever. Efficient and effective system operations remain critical to transportation reliability. Transportation Systems Management and Operations (TSMO) is focused on specifically optimizing the transportation network and providing a safe, efficient and reliable transportation system.

This strategic plan for TSMO will further explain how today's foreseeable challenges may be addressed with management and operations strategies. This strategic plan is one of the three TSMO plans that were developed. The 3 plans are:

- **TSMO Strategic Plan**
- **TSMO Implementation Plan**
- **TSMO Business Plan**

The relationship between these three plans is shown in the figure below.



# Case for TSMO in Minnesota

Overall, TSMO in Minnesota is intended to support the MnDOT Mission and Vision:

## MnDOT Mission and Vision

MISSION

VISION

▶ Plan, build, operate and maintain a safe, accessible, efficient and reliable multimodal transportation system that connects people to destinations and markets throughout the state, regionally and around the world

▶ Minnesota’s multimodal transportation system maximizes the health of people, the environment and our economy

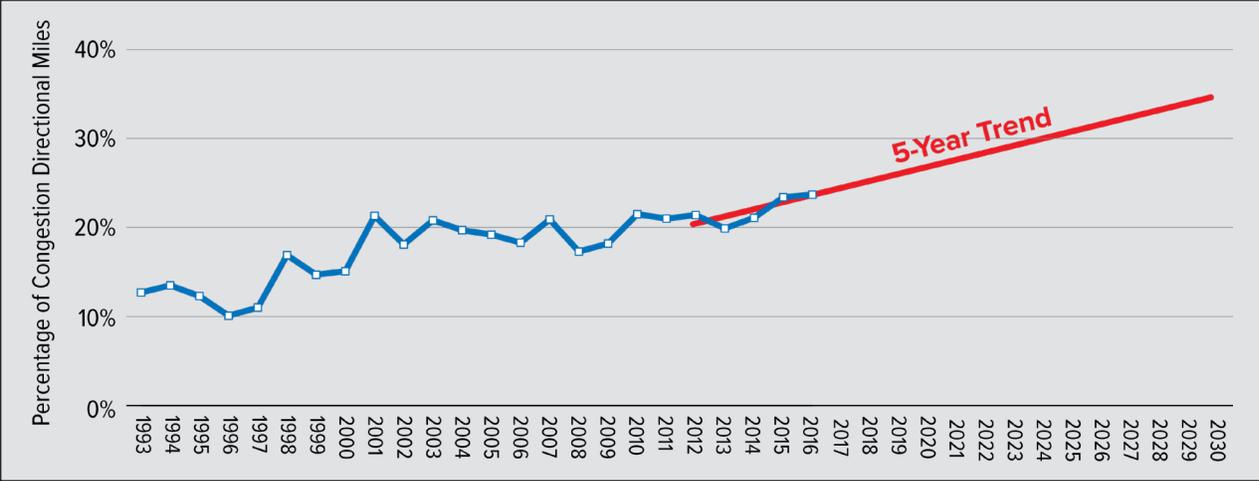
Transportation systems management and operations is not new to MnDOT nor does it apply to only certain regions of the state. TSMO has enjoyed a long history of successful application within MnDOT, imparting significant benefits to its customers. While the terminology might be new and less familiar, the concepts and strategies are not. TSMO complements MnDOT’s ongoing commitment to the state’s transportation infrastructure and maximizes the return on investment by operating and managing the system as efficiently and effectively as possible. TSMO

includes a host of operational strategies, system management approaches, and specific technical or business processes that:

- Optimize system performance
- Improve safety
- Anticipate and manage traffic congestion and impacts to system reliability

Traffic congestion is a major concern in many parts of Minnesota, especially in urbanized areas. The growth of congestion in the Twin Cities is shown in Figure 1.

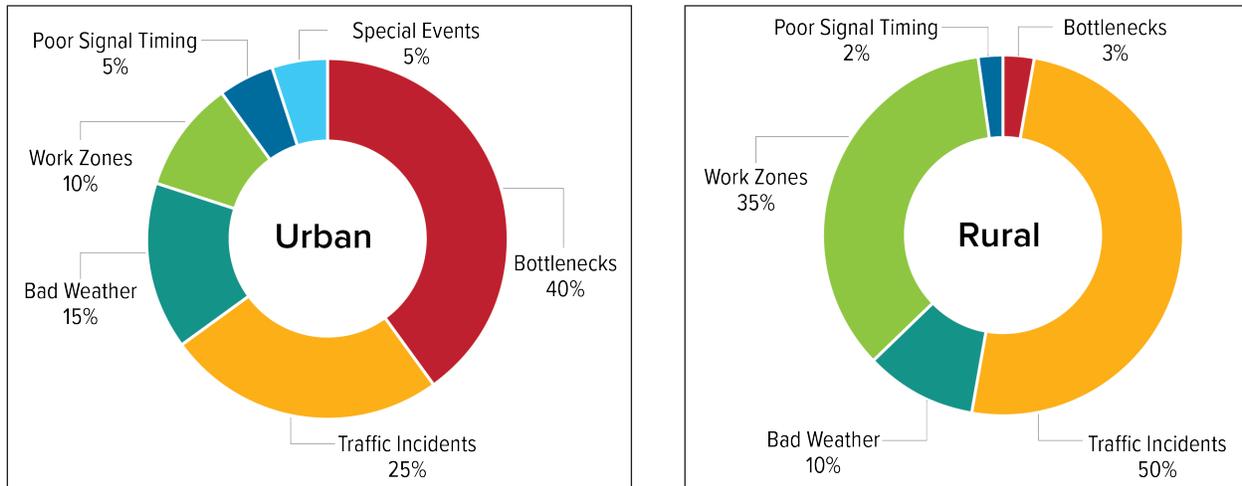
**Figure 1: Percentage of Miles of Twin City Urban Freeway System Congested**  
 (Source: Regional Transportation Management Center)



Congestion has a variety of causes, both in urban and in rural areas, as shown in Figure 2 below. TSMO strategies can reduce congestion resulting from all of these causes.

**Figure 2: Causes of Congestion**

(Source: FHWA)



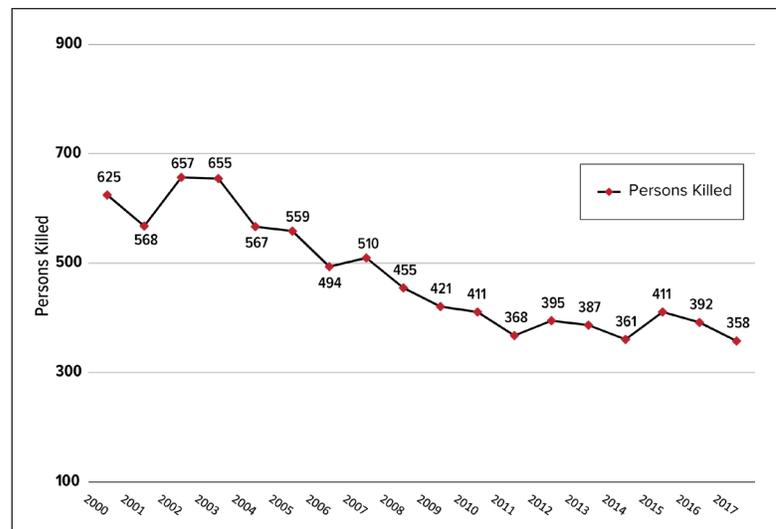
Twin Cities freeway congestion is expected to continue to increase as economic activity and population grows. Furthermore, fatalities and serious injuries as a result of vehicle crashes had experienced a steady decline, but recently plateaued in Minnesota, as shown in Figure 3.

TSMO can address Minnesota’s transportation challenges by:

- Preserving and maximizing existing capacity
- Enhancing safety
- Improving reliability for commuters and freight and everyday travelers
- Promoting mobility
- Improving traveler information
- Managing bottlenecks
- Monitoring performance to understand outcomes and identify areas for further improvement
- Being able to implement quickly at relatively low cost

**Figure 3: Minnesota Roadway Fatalities**

(Source: MnDOT 2/20/2018)



# Example TSMO strategies and benefits

## TSMO Strategy

## How It Works<sup>1</sup>

## Observed Benefits

### Traveler Information



Provides current and anticipated travel and weather conditions, route, and mode options (and other information) via dynamic message signs, 511, web, social media, and text.

Supports travelers' optimal choice of trip route, timing, and mode

### National<sup>2</sup>

511 customer satisfaction of 68–92%

Route-specific travel times: 5–13% increase in on-time performance (i.e., reliability)

### Traffic Incident Management



Applies incident detection, verification, response, clearance, crash investigation, medical response, and traffic control

Organizes the management and clearance of disruptions and responses to emergencies and ensure incident site safety and restoration of traffic flow

### National<sup>2</sup>

Reduced duration of traffic incidents 30-50% resulting in

- Reduced congestion
- Improved reliability
- Improved safety including reduction in secondary crashes

### Safety Service Patrol



Locates, assists, and removes disabled vehicles, crashes, and debris from freeways; assists State Patrol with crash site traffic control and first aid

Reduces congestion, improves safety, and provides a customer-oriented approach to freeway operations

### National<sup>2</sup>

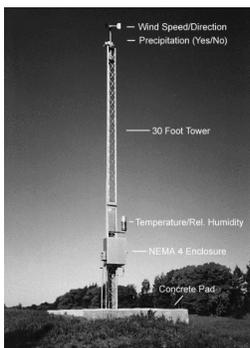
B/C ratio = 5:1 to 25:1

### MnDOT

MnDOT Freeway Incident Response Safety Team or FIRST:

B/C ratio = 15:1

### Road Weather Management Systems



Generates advance and current information regarding disruptive weather conditions by combining roadway environmental sensing, weather information, treatment and clearance strategies and weather information dissemination

Improves agency capacity to minimize traveler delay and improve agency efficiency of weather-related roadway maintenance

### National<sup>2</sup>

Wet pavement detection and advisory system reduced crashes by 39%

B/C ratio = 2:1 to 10:1

# Example TSMO strategies and benefits (Continued)

TSMO Strategy	How It Works <sup>1</sup>	Observed Benefits
<p><b>Work Zone Management Systems</b></p> 	<p>Provides dynamic, traffic-responsive traffic control (lane use, speeds, warnings) in construction work zones</p> <p>Improves safety to drivers and construction workers and improves traffic flow</p>	<p><b>National<sup>2</sup></b></p> <p>B/C ratio = 2:1 to 42:1</p>
<p><b>Traffic Signal Optimization</b></p> 	<p>Provides traffic-responsive or traffic adaptive signal operations at intersections for corridor and network optimization and event responsiveness</p> <p>Minimizes delay throughout corridor and network</p>	<p><b>National<sup>2</sup></b></p> <p>Reduced traffic delay 15–40%</p> <p>Reduced travel time up to 25%</p> <p>B/C ratios sometimes exceeding 50:1</p>
<p><b>Adaptive Ramp Metering</b></p> 	<p>Controls traffic flow (rate and spacing) entering freeway based on actual traffic conditions</p> <p>Minimizes main line traffic disruptions and safety hazards and improves travel time</p>	<p><b>National<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>• Increased freeway throughput 13–26%</li> <li>• Decreased crashes 15–43%</li> </ul> <p><b>MnDOT</b></p> <ul style="list-style-type: none"> <li>• Increased throughput 14%</li> <li>• Decreased crashes 25%</li> </ul> <p>B/C ratio = 15:1</p>

1. AASHTO TSMO Guidance  
2. FHWA

# MnDOT's Approach to TSMO—Proactive and Deliberate

MnDOT's approach to TSMO will further the vision, mission, and goals of the department through proactive and efficient management and operation of the transportation network. MnDOT's approach is to be deliberate in assessing and selecting TSMO strategies to ensure that most appropriate and cost-effective actions are taken to meet our TSMO goals and objectives. MnDOT will be consistent in selecting the best actions for the needs and conditions across the state. These actions include implementing strategies, as well as developing core capabilities that facilitate efficient management and operations. The full potential for TSMO is not solely dependent upon systems and technology. It also relies on collaborative relationships, knowledgeable workforce, organizational arrangements, and business processes. These elements of capability and strategy will be formalized through TSMO program planning and will mainstream management and operations at MnDOT. The TSMO program in Minnesota will help optimize traveler experience, and further the economic vitality of the state.

TSMO will support the department's core values around safety and excellence, as well as its goal for operational excellence – to plan, build, operate and maintain Minnesota's multimodal transportation system to get the most out of investments and optimize system performance. To help achieve this goal, MnDOT will leverage TSMO to strategically and cost-effectively maintain, upgrade and operate transportation assets. It will also support research and development, training and pilot demonstrations to prepare MnDOT and its partners for emerging technologies. Finally, it will support agency policies, processes, resources, decision-making and organizational structure to manage risk, spur innovation and increase MnDOT's adaptive capacity.

# TSMO Goals and Objectives

## TSMO Goals intended to Support MnDOT Vision and Mission



### Improve Reliability, Mobility, and Efficiency

Maximize existing capacity and reduce recurring (bottlenecks) and non-recurring (work zones, weather, incidents, special events) congestion.



### Increase Safety

Reduce the frequency, severity (fatalities and injuries) and clearance times of crashes.



### Carefully and Responsibly Manage Transportation Operations Assets

Proactively and cost-effectively operate, maintain, upgrade, and manage the assets required for effective operations (staff, data, equipment).



# Improve Reliability, Mobility, and Efficiency

Maximize existing capacity and reduce recurring (bottlenecks) and non-recurring (work zones, weather, incidents, special events) congestion. This goal and its objectives support the **Operational Excellence** Strategic Operating Goal.

## Objectives:



1. Reduce congestion for all travel modes on the freeways and arterials in urbanized areas throughout Minnesota



2. Provide and promote alternatives to single occupant vehicle travel
3. Increase availability of travel times to travelers for multiple modes



4. Reduce the impacts of snow and ice on mobility



5. Reduce incident response and clearance times in the Twin Cities and Greater Minnesota



6. Increase pre-trip and en-route traveler awareness of multi-modal incidents and alternate options in the Twin Cities and Greater Minnesota



7. Reduce delays associated with construction activities
8. Reduce delays associated with maintenance activities



# Increase Safety

Reduce the frequency, severity (fatalities and injuries) and clearance times of crashes. This goal and its objectives support the **Operational Excellence** Strategic Operating Goal.

## Objectives:



9. Reduce the crashes related to congestion in urbanized areas throughout Minnesota



10. Reduce the frequency of secondary crashes and crashes related to work zones



11. Reduce worker responder exposure to crashes



12. Reduce the frequency of single vehicle roadway departures



13. Reduce the frequency of crashes at signalized and unsignalized intersections



14. Reduce the frequency of crashes related to road weather conditions (e.g. snow, ice, fog, etc.)



Focus on both freeways and arterials (signalized and non-signalized intersections)



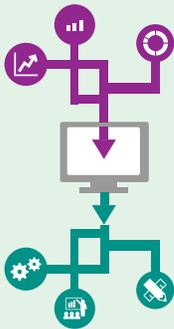
# Carefully and Responsibly Manage Transportation Operations Assets

Proactively and cost-effectively operate, maintain, upgrade, and manage the assets required for effective operations (staff, data, equipment). This goal and its objectives support the **Operational Excellence** Strategic Operating Goal.

## Objectives:



15. Understand and appropriately fund the life-cycle costs of operating, managing, and maintaining the assets needed for operations activities



16. Acquire, secure, and manage the data needed for MnDOT to effectively perform operations, performance management and planning

# Summary

This strategic plan for TSMO in Minnesota articulates how today's challenges, and those in the foreseeable future, may be addressed with transportation systems management and operations strategies. These strategies are not new to Minnesota and have a proven track record of providing significant benefits cost-effectively. Applying these strategies throughout the state as appropriate for the conditions in each district or region, will enhance the safety and mobility of travelers and enhance the economic vitality of the state. The goals of the Minnesota TSMO program are to:

- Improve reliability, mobility, and efficiency
- Increase safety
- Carefully and responsibly manage transportation operations assets

These goals support MnDOT's Vision and Mission and furthers its goal for operational excellence.



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