

Organizing for TSMO

Case Study 9: State Department of Transportation Examples 1 of 2

July 2019



U.S. Department
of Transportation

**Federal Highway
Administration**

Notice

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for the use of the information contained in this document.

The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document.

Quality Assurance Statement

The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. The FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. FHWA-HOP-19-071	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Organizing for TSMO – Case Study 9: State Department of Transportation Examples 1 of 2		5. Report Date July 19, 2018	
		6. Performing Organization Code:	
7. Author(s) Lacey Atkins, Olivia R. Brey, Austin Hoekstra, Charles R. Lattimer		8. Performing Organization Report No.	
9. Performing Organization Name and Address Atkins North America, Inc. 482 South Keller Rd. Orlando, FL 32810		10. Work Unit No.	
		11. Contract or Grant No. DTFH6116D00048/0001	
12. Sponsoring Agency Name and Address United States Department of Transportation Federal Highway Administration 1200 New Jersey Ave. SE Washington, DC 20590		13. Type of Report and Period	
		14. Sponsoring Agency Code HOP	
15. Supplementary Notes Joseph Gregory (FHWA – HOTM)			
16. Abstract Given the varying stages of TSMO adoption and advancement, the Federal Highway Administration identified the need for case studies to provide examples of common challenges and best practices for transportation agencies to learn from each other. This is one of 12 case studies developed to support organizing for TSMO. This case study focuses on how TSMO activities were implemented at two state agencies: Maryland Department of Transportation State Highway Administration (MDOT SHA) and Tennessee Department of Transportation (TDOT). Each agency provided information on how they engaged stakeholders and implemented TSMO activities, lessons learned, and the next steps to continually improve these efforts			
17. Key Words Capability Maturity Model, Transportation Systems Management and Operations, reliability		18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161. http://www.ntis.gov	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 30	22. Price

Table of Contents

EXECUTIVE SUMMARY	1
CHAPTER 1 – INTRODUCTION	3
Purpose of Case Studies.....	4
Identified Topics of Importance	4
Interviews.....	5
Description of State DOTs.....	5
CHAPTER 2 – BEST PRACTICE EXAMPLES.....	7
Maryland Department of Transportation State Highway Administration (MDOT SHA)	7
Tennessee Department of Transportation (TDOT)	13
CHAPTER 3 – SUMMARY.....	17
REFERENCES.....	19

List of Figures

Figure 1. Chart. Four Levels of Maturity..... 4
Figure 2. Image. MDOT SHA 2018 TSMO Strategic Plan..... 7
Figure 3. Image. MDOT SHA TSMO Master Plan Components..... 8
Figure 4. Chart. MDOT SHA TSMO Organizational Structure..... 9
Figure 5. Diagram. Screenshot of the TSMO Website 10
Figure 6. Chart. Congestion Relief Decision Making Process 12
Figure 7. Chart. MDOT SHA TSMO Master Plan Priority Process..... 12
Figure 8. Chart. Agencies Involved in Integrated Corridor Management Committee 14

List of Tables

Table 1. Interview Participants and Agencies..... 19

List of Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials
CHART	Coordinated Highways Action Response Team
CMM	Capability Maturity Model
DOT	Department of Transportation
FHWA	Federal Highway Administration
ITS	Intelligent Transportation Systems
MDOT SHA	Maryland Department of Transportation State Highway Administration
MPO	Metropolitan Planning Organization
ROF	Regional Operations Forum
SHRP2	Strategic Highway Research Program 2
TDOT	Tennessee Department of Transportation
TIM	Traffic Incident Management
TRB	Transportation Research Board
TSMO/TSM&O	Transportation Systems Management and Operations

EXECUTIVE SUMMARY

Transportation systems management and operations (TSMO) provides tools for transportation managers to address safety, system performance, and reliability. TSMO is “an integrated set of strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.¹” Through participation in the second Strategic Highway Research Program workshops, transportation agencies are working to better support TSMO programs. Deploying intelligent transportation systems (ITS), hiring internal information technology staff, and using performance measures for data-driven decisions are just a few examples of the many activities a TSMO program can support.

Given the varying stages of TSMO adoption and advancement, the Federal Highway Administration identified the need for case studies to provide examples of common challenges and best practices for transportation agencies to learn from each other. This is one of 12 case studies developed to support organizing for TSMO. This case study focuses on how TSMO activities were implemented at two State agencies, including:

- Developing formal organization and structure for a TSMO program.
- Incorporating TSMO into planning documents and ITS architecture.
- Implementing safety and mobility strategies.
- Collaborating with stakeholders across the State.
- Identifying funding for TSMO activities and strategies.

Two State departments of transportation were identified for a holistic view of their TSMO programs: Maryland Department of Transportation State Highway Administration (MDOT SHA) and Tennessee Department of Transportation (TDOT). Each agency provided information on how they engaged stakeholders and implemented TSMO activities, lessons learned, and the next steps to continually improve these efforts. Some of the best practices identified include:

- MDOT SHA’s integration of TSMO into planning.
- MDOT SHA’s TSMO training and outreach efforts.
- TDOT’s use of performance measures to track progress.
- TDOT’s collaboration with regional partners.

¹ Source: <https://ops.fhwa.dot.gov/tsmo/index.htm>

CHAPTER 1 – INTRODUCTION

Historically, transportation agencies have managed congestion primarily by funding major capital projects that focused on adding capacity to address physical constraints such as bottlenecks. Operational improvements were typically an afterthought and considered after the new infrastructure was already added to the system. Given the changing transportation landscape that includes increased customer expectations, a better understanding of the sources of congestion, and constraints in resources, alternative approaches were needed. Transportation systems management and operations (TSMO) provides such an approach to overcome these challenges and address a broader range of congestion issues to improve overall system performance. With agencies needing to stretch transportation funding further and demand for reliable travel increasing, TSMO activities can help agencies maximize the use of available capacity and implement solutions with a high benefit-cost ratio. This approach supports agencies' abilities to address changing system demands and be flexible for a wide range of conditions.

Effective TSMO efforts require full integration within a transportation agency and should be supported by partner agencies. This can be achieved by identifying opportunities for improving processes, instituting data-driven decision-making, establishing proactive collaboration, and developing actionable activities to develop processes that optimize performance.

Through the second Strategic Highway Research Program (SHRP2), a national partnership between the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Transportation Research Board, (TRB), a self-assessment framework was developed based on a model from the software industry. SHRP2 developed a framework for agencies to assess their critical processes and institutional arrangements through a capability maturity model (CMM). The CMM uses six dimensions of capability to allow agencies to self-assess their implementation of TSMO principles¹:

1. Business processes – planning, programming, and budgeting.
2. Systems and technology – systems engineering, systems architecture standards, interoperability, and standardization.
3. Performance measurement – measures definition, data acquisition, and utilization.
4. Culture – technical understanding, leadership, outreach, and program authority.
5. Organization and workforce – programmatic status, organizational structure, staff development, recruitment, and retention.
6. Collaboration – relationships with public safety agencies, local governments, metropolitan planning organizations (MPO), and the private sector.

Within each capability dimension, there are four levels of maturity (performed, managed, integrated, and optimized), as shown in Figure 1. An agency uses the CMM self-assessment to

¹ FHWA, Office of Operations, "Organizing for Reliability – Capability Maturity Model Assessment and Implementation Plans Executive Summary," May 2015. <https://ops.fhwa.dot.gov/docs/cmmexesum/sec1.htm>

identify their level of maturity in each dimension, to determine their strengths and weaknesses in each dimension and to determine the actions they can take to improve their capabilities.

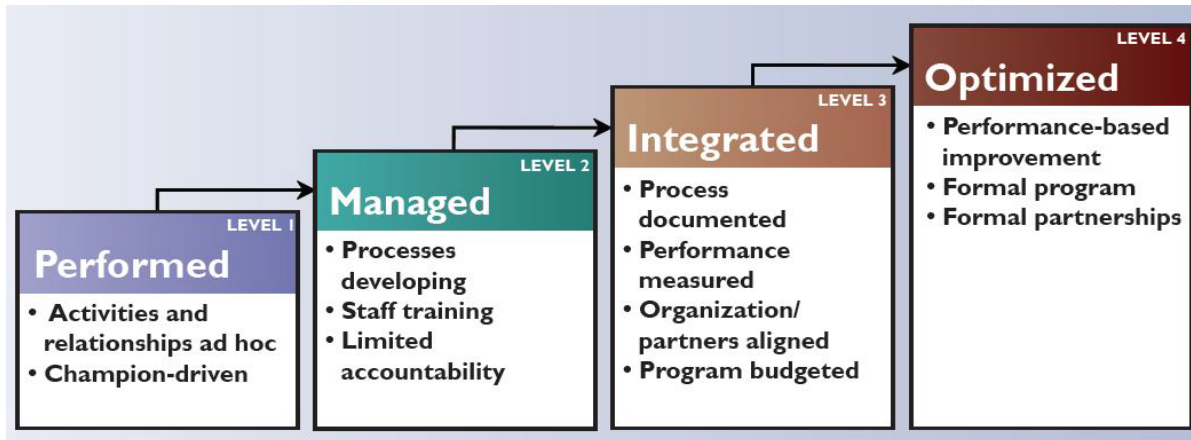


Figure 1. Chart. Four Levels of Maturity

Source: Creating an Effective Program to Advance Transportation System Management and Operations, FHWA Jan 2012

Purpose of Case Studies

In the first 10 years of implementation of the TSMO CMM, more than 50 States and regions used the tool to assess and improve their TSMO capabilities. With the many benefits experienced by these agencies, FHWA developed a series of case studies to showcase leading practices to assist other transportation professionals in advancing and mainstreaming TSMO into their agencies. The purposes of the case studies are to:

- Communicate the value of changing the culture and standard practices towards TSMO to stakeholders and decision-makers.
- Provide examples of best-practices and lessons learned by other State and local agencies during their adoption, implementation, and mainstreaming of TSMO.

These case studies support transportation agencies by showing a wide range of challenges, opportunities, and results to provide proof for the potential benefits of implementing TSMO. Each case study was identified to address challenges faced by TSMO professionals when implementing new or expanding existing practices in the agency and to provide lessons learned.

Identified Topics of Importance

This case study provides a holistic perspective of successful TSMO programs at State departments of transportation (DOT). This study features two agencies; another set of two agencies is featured in case study 10.

Highlighting all aspects of specific State DOTs is important because it demonstrates how the culmination of several different TSMO activities support the broader objective to improve safety and mobility. The agencies highlighted for this case study have different approaches, providing beneficial lessons learned for the development of TSMO divisions, integration of TSMO with planning activities, and taking advantage of opportunities to integrate strategies into projects.

Interviews

Agencies were selected for each case study based on prior research indicating that the agency was excelling in particular TSMO capabilities. Care was taken to include a diversity of geographical locations and agency types (departments of transportation, cities, and MPOs) to develop case studies that other agencies could easily relate to and learn from. Interviews were conducted with selected agencies to collect information on the topic for each case study.

Description of State DOTs

As the primary managers and operators of a State transportation system, State DOTs usually have a leading role in the execution of a TSMO program. How business is conducted in each State DOT affects the structure and delivery of TSMO programs in varying ways. Elements such as the DOT's organizational structure, the level of involvement of executive staff, existing relationships with partner agencies, and the DOT's culture greatly impact development and integration of TSMO within an agency's existing workflow. It is the responsibility of all partner agencies to advocate for and help enhance TSMO planning in their regions. State DOTs can play a leading role to promote TSMO in the following capacities:

- **Program Structure** – With their wide range of staff and responsibilities, State DOTs can be responsible for developing the structure and organization of a TSMO program. In this role, State DOTs are also responsible for developing TSMO goals and a unified vision for the program.
- **Processes and Institutional Arrangements** – Having a broad perspective, State DOTs can identify strategic partnerships, develop processes to improve collaboration or design, and establish maintenance or operations agreements.
- **Safety and Mobility Strategies** – State DOTs can identify specific strategies to deploy for improving safety and mobility. This requires close collaboration with MPOs and local agencies in order to have seamless travel experiences between jurisdictions.
- **Funding** – State DOT's funding opportunities can guide their role in developing a TSMO program. TSMO can help a transportation investment plan determine how to support specific programs and access different federal funding options.
- **Communication with Stakeholders** – With statewide coverage, DOTs have the opportunity to communicate with all MPOs, local agencies, multimodal agencies, and other stakeholders across various jurisdictions. State DOTs can leverage these relationships to share information about a TSMO program and unify regional goals with a wide range of participants.

CHAPTER 2 – BEST PRACTICE EXAMPLES

The agencies highlighted in this case study, Maryland Department of Transportation State Highway Administration (MDOT SHA) and Tennessee Department of Transportation (TDOT), participated in the second Strategic Highway Research Program (SHRP2) workshops to complete capability maturity model (CMM) assessments. The workshop assessments supported agency identification of needs and raised awareness of transportation systems management and operations (TSMO). The following section describes several successful initiatives that address the dimensions of the CMM that each agency accomplished to advance their TSMO programs across the State.

Maryland Department of Transportation State Highway Administration (MDOT SHA)

MDOT SHA owns, operates, and maintains the numbered, non-toll routes in Maryland. This includes interstate highways, freeways, and major arterials comprising of 17,000 lane-miles and 2,576 bridges. MDOT SHA operations are led by central offices like the Office of Coordinated Highways Action Response Team (CHART), Intelligent Transportation Systems (ITS) Development, and seven Districts that focus on implementation of transportation policies, programs, and projects across the State.

TSMO Implementation Plan

The 2016 MDOT SHA TSMO Strategic Implementation Plan was primarily focused on mainstreaming TSMO across the agency with a focus on highway operations. With progress made on various strategies from the 2016 TSMO Plan and to better align the TSMO program with policy priorities of the Administration, MDOT SHA released its 2018 TSMO Strategic Plan (Figure 2) with a focus on multimodal solutions that are applicable across jurisdictions. This revision was made because MDOT SHA realized the value of a wide range of solutions to improve safety and mobility.



Figure 2. Image. MDOT SHA 2018 TSMO Strategic Plan

Source: MDOT SHA 2018 TSMO Strategic Plan

The update is also different from the initial plan because the action items have come from MDOT SHA’s “front line implementers” through the TSMO working group and TSMO task forces. Working groups and task forces are comprised of mid-level management, subject matter experts from various domains, maintenance staff, traffic management center staff, first responders, signal timing experts, and other individuals that interface directly with assets. By engaging these individuals through the task forces regarding how daily responsibilities contribute to the overall TSMO program, MDOT SHA identified action items and areas for improvement in their day-to-day activities to help the agency reach their TSMO goals. They also identified resources needed to accomplish these tasks.

The 2018 MDOT SHA TSMO Strategic Plan provides vision, purpose, goals, objectives, and strategies. There is a huge focus on integration at institutional, operational, and technical levels across the agency and partners at all levels.

A key component of the TSMO Strategic Implementation Plan is a TSMO master plan, which is a list of TSMO projects or strategies that are not fiscally constrained. MDOT SHA leveraged existing tools to develop benefit-cost analysis of strategies to prioritize projects. The TSMO master plan is aligned with long-range planning documentation and includes needs, strategies, solutions, and evaluations as shown in Figure 3. This approach is beneficial because it helps find funding from either capital funding or preservation funding without being siloed.



Figure 3. Image. MDOT SHA TSMO Master Plan Components

Source: MDOT SHA

Organizational Structure

MDOT SHA has established a leadership position to serve as the TSMO Program Manager overseeing implementation of the TSMO Strategic Plan. Responsibilities include management of the TSMO Program, TSMO Master Plan, education and training, communications and outreach, and coordination/collaboration with the Executive Committee, working groups, partners, and stakeholders.

Figure 4 shows the TSMO organization structure for MDOT SHA. The TSMO Executive Committee, co-chaired by the Chief Engineer-Operations and Deputy Administrator of Planning and Engineering, provides strategic guidance and program governance. The TSMO working group comprises mid-level management and subject matter experts from various offices and

Organizing for TSMO – Case Study 9: State DOT Examples 1 of 2

Districts. Various task forces have been developed with cross-cutting and interdisciplinary teams who develop action items to support TSMO Plan objectives and strategies.

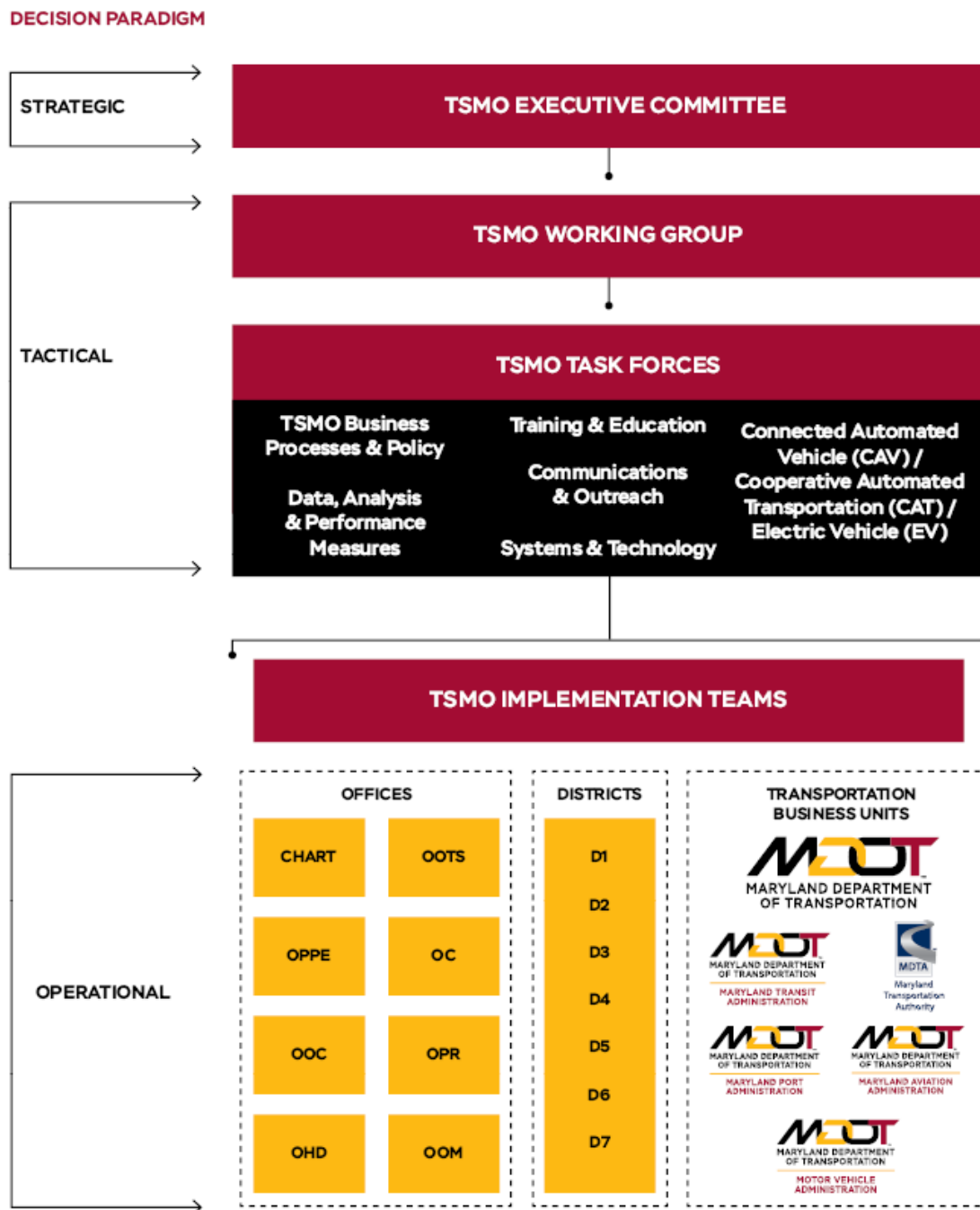


Figure 4. Chart. MDOT SHA TSMO Organizational Structure

Source: MDOT SHA 2016 TSMO Strategic Implementation Plan

The TSMO Working Group plays a role in tactical matters as it is the interface between TSMO Executive Committee strategic directives/guidance and the operational day-to-day functions at various offices and Districts. The TSMO Program implementation activities on specific action items are undertaken with management and staff efforts at individual offices and Districts. The

TSMO Program Manager works closely with implementation teams to develop appropriate performance measures, targets, resource needs, and expectations.

The finalized TSMO Strategic Plan was developed through close collaboration with a range of disciplines internally and externally. Each major stakeholder is discussed in detail in the TSMO Strategic Plan with specific roles, requirements, and authorities. This helps groups understand their part of the TSMO program and make staffing plans to accomplish TSMO activities.

Communicating TSMO

Alongside the 2018 TSMO Strategic Plan, MDOT SHA developed a dedicated TSMO website for communicating TSMO objectives, sharing resources to implement strategies, and providing access to operations-specific data as shown in Figure 5. The website provides accessible information to the public, external agencies, and internal staff so it is easier to be engaged in the TSMO program.



Figure 5. Diagram. Screenshot of the TSMO Website

Source: <http://maryland.maps.arcgis.com/apps/Cascade/index.html?appid=6e3f677b66ba439abeefe935caa3565f>

Training

To mainstream TSMO across MDOT SHA at all levels, the agency is developing various education and training programs. This includes web-based and in-person 2- to 4-hour coursework and full-day workshops across the State for district engineering management and staff to discuss the value of TSMO, how to get engaged in the program, and how current job functions can strategically align with TSMO objectives. The workshops also provide in-depth discussions and recommendations for specific operations strategies, such as ramp metering, hard shoulder running, adaptive signal timing, etc. Training and open dialogue helps encourage staff to better understand their role in supporting TSMO and engages them for future activities.

MDOT SHA supports several training opportunities to reach a wide range of participants, including:

- Graduate Engineering Training Program: Multi-year technical training (including incident management and signal operations) with some supervisor information.
- Supervisor Training: Training program to support supervisor responsibilities with some technical information.
- Advanced Leadership Program: Information geared towards leaders advancing to executive levels of the organization.
- Traffic Incident Management (TIM) Training: CHART oversees SHRP2 TIM training. Additional information regarding CHART can be found in Case Study 6: Collaboration – Collaboration for Traffic Incident Management.

MDOT SHA also provides training to public and local agencies. When new operations strategies are deployed, MDOT SHA provides information to travelers about the solution and how it fits into the overall TSMO vision and mission. This has been beneficial for MDOT SHA because if the public or interested stakeholders reach out, staff can explain how strategies are part of a broader program.

A key in gaining leadership support has been the use of outreach and training. Using a combination of policies, leadership directives, subject matter guidance, and partnerships has encouraged district staff to engage in new processes and responsibilities. Making a good business case and aligning with performance objectives that the Districts are scored on helps to support the Districts and prioritizes new opportunities.

Reliability Tools

MDOT SHA received funding from SHRP2 to create reliability analysis tools and build on existing research. Examples of reliability tools include the Federal Highway Administration's (FHWA) Tools for Operations Benefit/Cost used for estimating the value of operations projects; travel demand models and research for estimated projected operations; and statewide freight models to understand travel patterns of commercial vehicles. When TSMO strategies are evaluated, reliability performance metrics are considered using an analytic process.

User guides and training have been developed so data-driven decisions can be practiced both internally and externally. The reliability analysis process shown in Figure 6 and the master plan priority process shown in Figure 7 helped develop the TSMO master plan and supports long-range planning activities. MDOT SHA is able to provide data on expected reliability data and assign project improvements a monetary value that helps make the case to leadership for investments.

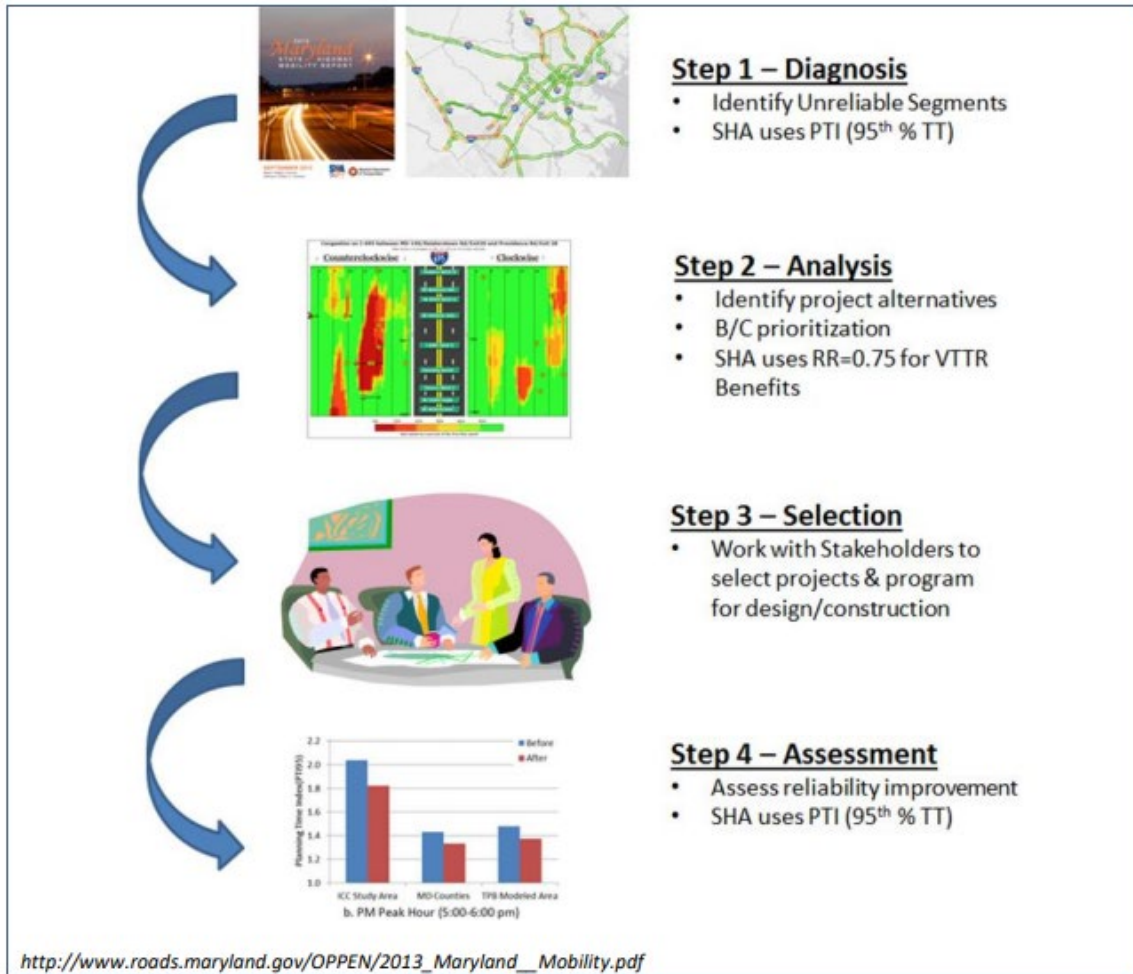


Figure 6. Chart. Congestion Relief Decision Making Process

Source: MDOT SHA Reliability Roadmap

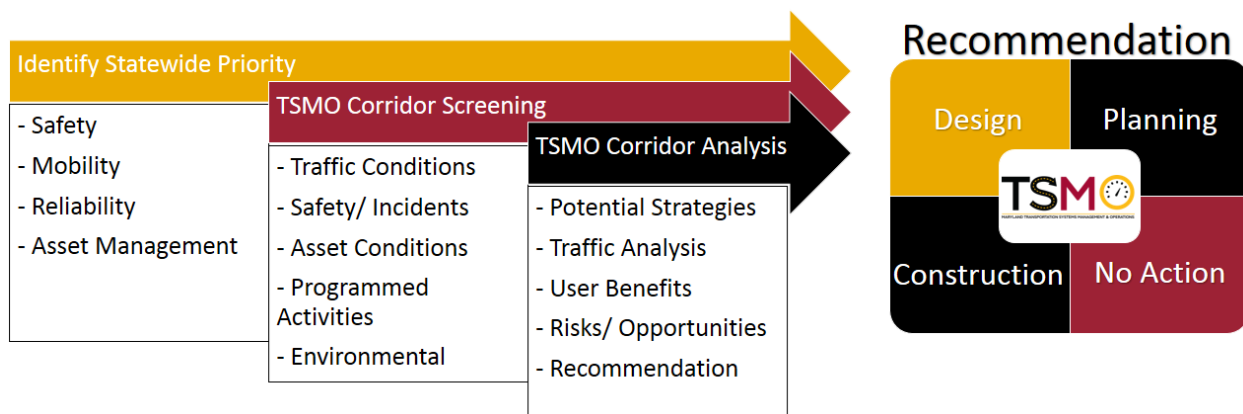


Figure 7. Chart. MDOT SHA TSMO Master Plan Priority Process

Source: MDOT SHA 2018 TSMO Strategic Plan

Local Agency Outreach

MDOT SHA maintains positive relationships with local agencies through engagement during strategic planning activities, involvement in the congestion management process for MPOs, and development of training materials for operations strategies, including integrated corridor management projects. MDOT SHA is also part of regional coalitions and develops presentations to provide updates on the TSMO program and facilitate conversations. Local agencies have great ideas and questions because of their in-depth understanding of their region. Oftentimes, agencies are seeking data on local facilities, but that data is not available yet due to connectivity or coverage gaps. MDOT SHA often uses these conversations to foster implementation of TSMO concepts and recommend pilot projects.

Operational strategies are also encouraged during the project prioritization process for local agencies. MDOT SHA supports this process by providing tools, data, and training to develop project recommendations. MDOT SHA also gains understanding of each agencies' project prioritization process. They encourage considering operations strategies. This helps everyone collaborate to understand what causes unreliability and which solutions are appropriate for their individual conditions.

Tennessee Department of Transportation (TDOT)

TDOT manages and maintains interstate and highway facilities statewide as well as rail, transit, waterways, and trail systems. TDOT is decentralized in structure and composed of four regions. The central Traffic Operations Division provides strategic and program level direction and oversight, while individual regions are responsible for day-to-day operations with the transportation management center and TIM program. The Traffic Operation Division leads and coordinates transportation systems performance monitoring, ITS architectures and systems engineering, and traditional traffic design, among others.

TIM Performance Metrics

TDOT has an advanced TIM plan that tracks performance metrics such as incident clearance times and quick clearance memoranda of understanding signings. These metrics and associated targets are reported to the Governor annually. They are also used to help inform best practices for TSMO strategies. For example, a “protect the queue” initiative has been implemented to use TDOT resources to clear incidents from the roadway and warn drivers as they approach slow-moving traffic from congestion.

To monitor TIM performance metrics, TDOT collects data at the transportation management center through ITS infrastructure (closed-circuit television cameras and radar sensors on urban facilities), TDOT HELP operators and operations field staff, the Tennessee Highway Patrol, and other first responder partners. In addition, TDOT is utilizing crowdsourced data to help support identification of roadway incidents. This information is recorded in an incident management database that provides the three national TIM performance measures – time of lane closure, time responders are on scene, and number of secondary accidents – among others. TDOT is

considering leveraging probe data and other sources to automate processes and improve data quality in the future.

Project-Oriented Local Agency Outreach

TDOT is in the design and deployment stage of an integrated corridor management project on Interstate 24 between Nashville and Murfreesboro. This project has promoted collaboration through a technical advisory committee formed from multi-agency stakeholders that meet monthly (Figure 8). The monthly meetings provide an opportunity to discuss mobility and safety strategies, maintenance and operations of assets, and interoperability between jurisdictions.

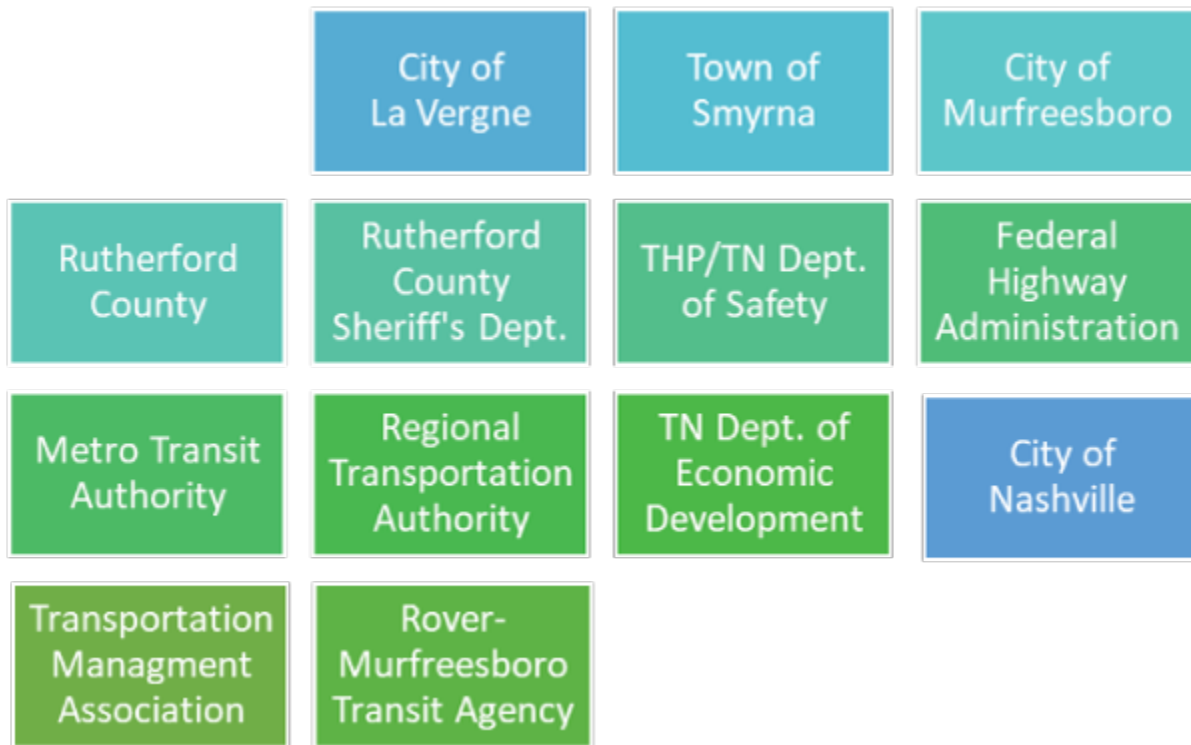


Figure 8. Chart. Agencies Involved in Integrated Corridor Management Committee

Training and Outreach

As a result of the CMM self-assessment completed with FHWA, TDOT identified a need for a traffic operations program plan. This plan includes structure for a program-level traffic operations division, establishing priority corridors, and identifying operational strategies. Collaboration to develop the plan was an opportunity to engage the regions and agency staff to understand their needs.

For several years, TDOT has been an active supporter of regional operations forums (ROF) to provide operations training to national stakeholders. Inspired by the California Department of Transportation and previous ROF experience, TDOT initiated ROFs in each of their regions. The ROF includes regional CMM self-assessments to establish action items for local TSMO improvements, refining the traffic operations program plan, and engaging additional TSMO

champions. A small challenge was encountered during the planning for the ROFs because of staff turnover. However, when TDOT was invited to the Regional Operations Leadership Forum and sent six regional stakeholder leaders to attend, the attendees were inspired by the training they received and re-energized to support the planning and organization of TDOT's ROF among other outreach activities.

After learning best practices from peer State departments of transportation, TDOT developed a video to explain "What is TSMO" as well as a quarterly video newsletter. Providing training and informational content has led to success for other TDOT programs. Making information easily accessible to internal staff and the public is key. The videos for the TSMO program are an opportunity to promote the TSMO culture throughout the organization and engage stakeholders in the goals of the TSMO program.

CHAPTER 3 – SUMMARY

State agencies have a vital role in developing and implementing transportation systems management and operations (TSMO) programs including: developing the organizational structure and processes, identifying strategies to implement, and collaborating with a wide range of stakeholders. Statewide agencies have the opportunity to provide a framework for how TSMO programs are conducted. The agencies in this case study contributed to the goals of TSMO through initiatives that other agencies can learn from:

- Defined TSMO organizational structures to support the institutionalized culture change needed to implement TSMO programs. Champions identified for TSMO activities support development of agency planning and project prioritization processes to ensure project development objectives align with agency TSMO goals.
- TSMO training activities greatly benefit integration of TSMO into day-to-day operations by effectively communicating agency goals and objectives. Knowledgeable staff is empowered to make more informed decisions when their role in implementing TSMO is apparent.
- Outreach to the public and other local agencies facilitates regional culture shifts needed to maximize the value of TSMO strategies. Regional partners can support TSMO activities when the objectives and benefits are successfully communicated.
- Clearly identifying goals and objectives, how they will be achieved, and what methods will be used to track them, is critical to ensuring success. The agencies highlighted in this case study identified many opportunities to track progress of their TSMO goals and objectives:
 - Performing multiple capability maturity model assessments over a period of time.
 - Developing action items with deliverable dates for future growth.
 - Using software to track system reliability and performance measures.

State DOTs can help ensure that TSMO program objectives are consistent with existing statewide and regional objectives. In many cases, the DOT will lead the effort to develop a TSMO plan for their State. The DOTs highlighted in this case study have taken varying approaches to integrate TSMO with existing agency processes. Lessons learned in this case study can be used to develop TSMO plans in other agencies.

REFERENCES

Information for use in this case study was gathered from sources noted throughout the report together with the following web sites:

- FHWA’s What is Transportation Systems Management and Operations (TSMO)?
 - <https://ops.fhwa.dot.gov/tsmo/>
- AASHTO’s TSMO Guidance
 - <http://www.aashtotsmoguidance.org/>
- FHWA’s Organizing and Planning for Operations
 - <https://ops.fhwa.dot.gov/plan4ops/>
- FHWA’s Organizing for Operations Resources
 - https://ops.fhwa.dot.gov/plan4ops/focus_areas/organizing_for_op.htm
- FHWA’s Organizing for Reliability – Capability Maturity Model Assessment and Implementation Plans
 - <https://ops.fhwa.dot.gov/docs/cmmexesum/sec1.htm>
- FHWA’s Creating an Effective Program to Advance Transportation Systems Management and Operations, Primer
 - <https://ops.fhwa.dot.gov/publications/fhwahop12003/index.htm>
- Maryland DOT State Highway Administration
 - <https://www.roads.maryland.gov/Home.aspx>
- Maryland DOT State Highway Administration – Mobility and Reliability
 - <https://www.roads.maryland.gov/Index.aspx?PageId=711>
- Maryland DOT State Highway Administration – CHART Reading Room
 - <https://chart.maryland.gov/readingroom/readingroom.asp>
- Tennessee Department of Transportation
 - <https://www.tn.gov/>

Table 1. Interview Participants and Agencies

Agency	Maryland Department of Transportation State Highway Administration (MDOT SHA)	Tennessee Department of Transportation (TDOT)
Agency Representative Name:	Subrat Mahapatra	Brad Freeze
Agency Representative Title:	Deputy Director, TSMO & CAV	Director
Agency Representative Email:	SMahapatra@mdot.maryland.gov	Philip.b.freeze@tn.gov
Interview Date:	August 14, 2018	August 13, 2018

U.S. Department of Transportation
Federal Highway Administration
Office of Operations
1200 New Jersey Avenue, SE
Washington, DC 20590

Office of Operations Web Site
<https://ops.fhwa.dot.gov>

July 2019
FHWA-HOP-19-071