NEW YORK STATE OF OPPORTUNITY. Department of Transportation

# Transportation Systems Management and Operations Strategic Plan

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FINAL

# CONTENTS

# LIST OF ACRONYMS AND ABBREVIATIONS

| Acronym | Description |
|---|---|
| **ASCT** | Adaptive Signal Control Technologies |
| **ATDM** | Active Transportation Demand Management |
| **CAV** | Connected and Automated Vehicles |
| **CCTV** | Closed Circuit Television |
| **CMM** | Capability Maturity Model |
| **ConOps** | Concept of Operations |
| **DMS** | Dynamic Message Signs |
| **EISO** | Enterprise Information Security Office |
| **EOP** | Emergency Operations Plan |
| **ERS** | Emergency Response System |
| **FHWA** | Federal Highway Administration |
| **HELP** | Highway Emergency Local Patrol |
| **HOOCS** | Highway Oversize/Overweight Credentialing System |
| **ICM** | Integrated Corridor Management |
| **IMO** | Integrated Mobile Observations |
| **IT** | Information Technology |
| **ITS** | Intelligent Transportation System |
| **MAP** | Map Data (geometry) |
| **MO** | Main Office |
| **NYSDOT** | New York State Department of Transportation |
| **O&M** | Operations and Maintenance |
| **PIO** | Public Information Officer |
| **PMP** | Project Management Plan |
| **PS&E** | Plan, Specification, and Estimate |
| **RSDA** | Road Status/Damage Assessment |
| **RWIS** | Road Weather Information System |
| **SEMP** | System Engineering Management Plan |
| **SHSP** | Strategic Highway Safety Plan |
| **SPaT** | Signal Phase and Timing |
| **STICC** | Statewide Transportation Information Coordination Center |
| **SUNY** | State University of New York |
| **TAMS** | Traffic Asset Management System |
| **TANY** | Trucking Association of New York |
| **TDM** | Traffic Demand Management |
| **TIM** | Traffic Incident Management |
| **TMC** | Transportation Management Centers |
| **TSMO** | Transportation Systems Management and Operations |
| **VMS** | Variable Message Signs |
| **WRTM** | Weather Responsive Traffic Management |
| **WTA** | Winter Travel Advisory |
| **WZDI** | Work Zone Data Initiative |

# NEED FOR TSMO STRATEGY

Transportation Systems Management and Operations (TSMO) is an integrated approach to addressing mobility and safety issues on the transportation network. It focuses on optimizing the performance of existing and planned infrastructure through the implementation of systems, services, and projects that preserve capacity and improve the security, safety, and reliability of the multimodal transportation system.

TSMO consists of a set of strategies that target operational improvements to either maintain and/or restore the overall performance of the transportation system.[1] TSMO differs from traditional management of the transportation network in that the actions address immediate and near-term needs in system operations rather than longer-term expansion.

**Examples of TSMO strategies include, but are not limited to:**

- Work zone management
- Traffic incident management
- Special event management
- Road weather management
- Transit management
- Freight management
- Traffic signal coordination
- Traffic signal optimization
- Arterial/intersection traffic management
- Traveler information
- Ramp management
- Congestion pricing
- Active transportation and demand management (ATDM)
- Integrated corridor management (ICM)
- Access management
- Improved bicycle and pedestrian crossings
- Connected and automated vehicle deployment

## New York State Context

One of New York State Department of Transportation's (NYSDOT) core objectives is to operate the existing transportation network efficiently while providing travelers with safe and reliable travel conditions. TSMO has been a long-standing and essential function within the agency to support overall system efficiency. In fact, many of the TSMO techniques are not new to New York. To address traveler mobility and reliability challenges in the state, NYSDOT engages in a wide variety of activities that fall under the TSMO definition today—see Figure 1.

[1] Federal Highway Administration. "What is TSMO?" (https://ops.fhwa.dot.gov/tsmo/index.htm#q1; accessed January 28, 2019).

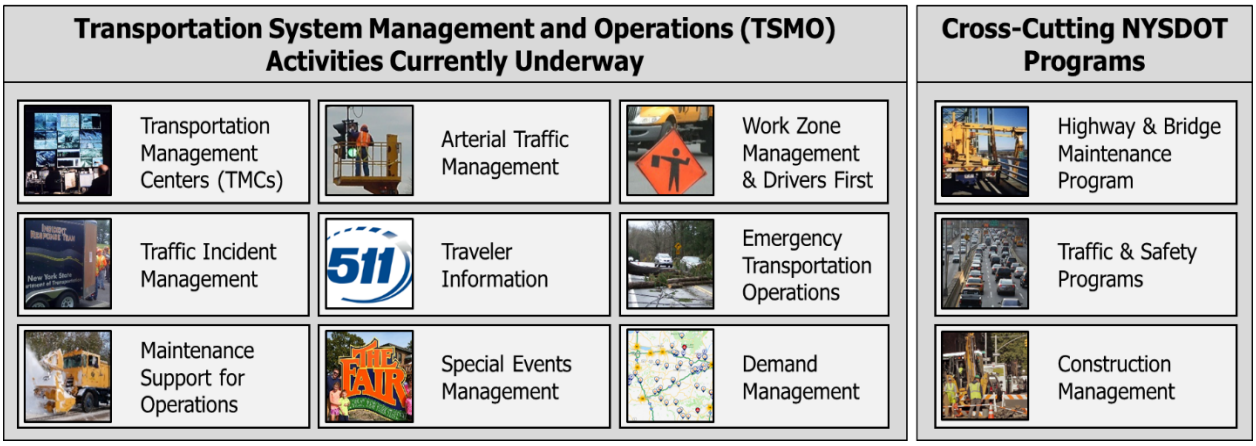


**Figure 1. NYSDOT's ongoing TSMO-related strategies.**

While traveler information systems are considered a statewide program, the responsibility for undertaking most of the other activities listed in Figure 1 falls to NYSDOT's regions. In the regions, TSMO includes roles for regional management centers, field assets, people, and systems. Highlights of TSMO functions include:

1. Eleven (11) regions and ten (10) Regional Transportation Management Centers (TMCs) provide day-to-day systems management functions from traveler information, incident management, and emergency transportation operations.
2. Each regional office maintains a program of projects and is responsible for the day-to-day operations of the transportation system within their geographic area.
3. Deployment and maintenance of TSMO/Intelligent Transportation System (ITS) field assets vary across regions based on the maturity of their ITS programs and systems, availability of field communication equipment, and specific needs. For example:
    - All regions, except Region 11, manage traffic signals as part of their functions.
    - Statewide, there are over 1,400 regionally managed directional miles of roadside assistance Highway Emergency Local Patrol (HELP) Safety Service Patrols.
    - NYSDOT controls over 1,200 signals. The TMC does not operate signals in most regions except in Region 4.

These are just a few examples of how TSMO-related functions and responsibilities are distributed throughout the organization, both at the regional and Main Office (MO) level, with varying primary and supporting responsibilities based on the TSMO function—see Table 1.

**Table 1. TSMO-Related Functions and Responsibilities**

| | | Regions | | | | | | Main Office | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Traffic Safety and Mobility | Transportation Maintenance | Construction | Planning and Programming | Local and Modal Programs | Design | Traffic Safety and Mobility | Transportation Maintenance | Construction | Planning and Programming | Modal Programs |
| TSMO Activities | Transportation Management Centers | ● | ○ | | | | | ○ | ○ | | | |
| | Arterial Management | ● | ○ | | | ○ | ○ | ○ | | | | |
| | Work Zone Mgmt. and Drivers First | ○ | ● | ● | | ○ | ○ | ○ | ○ | ○ | | |
| | Traffic Incident Management | ● | ● | | | | | ○ | | | | |
| | Traveler Information | ○ | ○ | ○ | | ○ | | ● | | | ○ | ○ |
| | Emergency Transportation Ops | ● | ● | | | | | ○ | ○ | | | |
| | Maintenance Support for Operations | ○ | ● | | | | | ○ | ○ | | | |
| | Special Events Management | ● | ● | | ○ | | | ○ | | | ○ | |
| | Demand Management | ○ | | | ● | ○ | | | | | ● | ○ |
| Cross-Cutting NYSDOT Programs | Highway and Bridge Maintenance | ○ | ● | | | | | ○ | ○ | | | |
| | Traffic Safety Programs | ● | | | | ● | | ○ | | | | |
| | Construction Management | | | ● | | | ○ | | ○ | ○ | | ○ |

● Primary Responsibility ○ Supporting Responsibility

NYSDOT regions approach TSMO at the local level to address their complex and unique operating conditions. Each region has significant flexibility on how to manage the system within their jurisdiction. Figure 2 illustrates some of the noteworthy practices that have emerged across New York State.

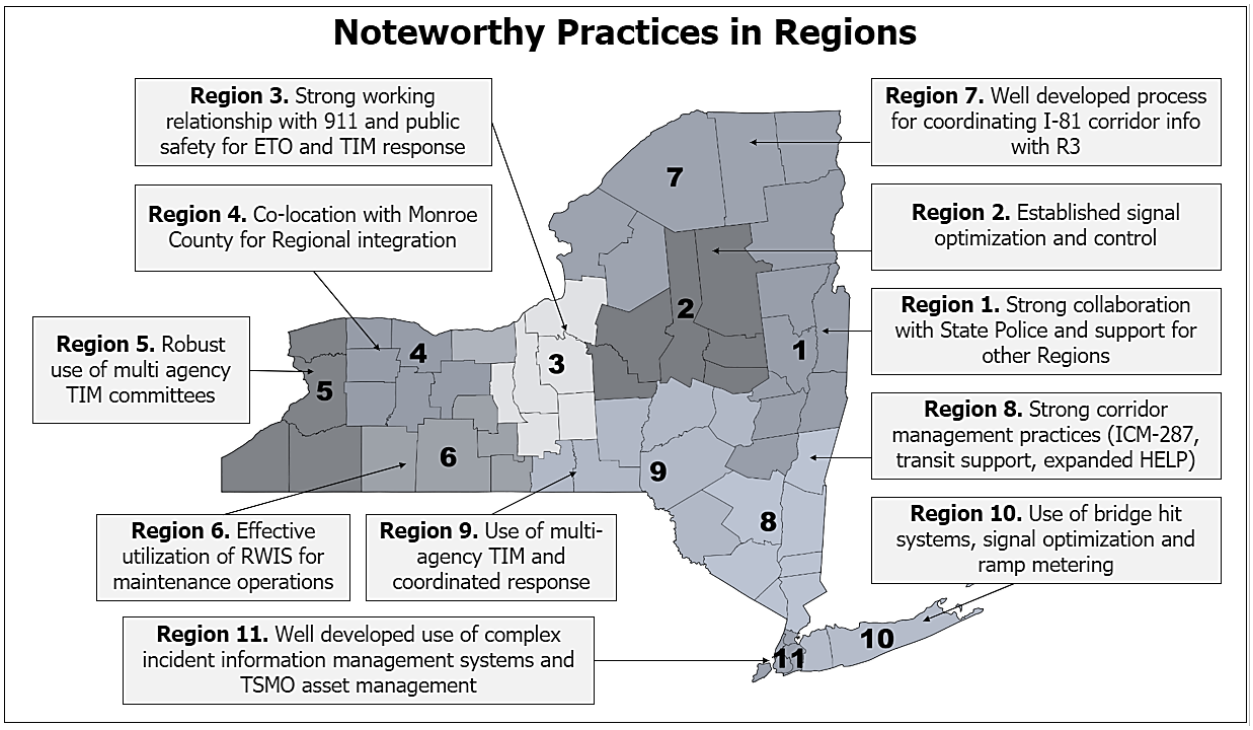


**Figure 2. Noteworthy TSMO Practice Examples in NYSDOT Regions.**

## Challenges and Gaps

To kick off the TSMO strategic planning process, NYSDOT engaged internal stakeholders across the agency to review current and desired levels of capability for managing the transportation system. The feedback from the stakeholders identified the following challenges facing NYSDOT in terms of addressing mobility and reliability issues in the state.

### Maintaining and Modernizing TSMO Equipment and Systems

- TSMO-related devices and systems require significant investment for continued operations and modernization.
- Emerging technologies like connected and automated vehicles (CAVs) create the need for modernization of equipment and systems.
- Limited TSMO asset management tools and practices make it difficult to plan for system maintenance, upgrade, and replacement.

### Staffing and Workforce Constraints

- Staffing, workforce skills, and resources to meet traveler expectations for situational awareness response and efficient operations are lacking.
- New workforce capabilities are needed for rapidly evolving technology areas like connected and automated vehicles, big data, and shared mobility integration.

### Connecting and Integrating Systems and Technology

- Complex decentralized technologies, systems, and business processes have evolved over the years to support differing business needs across regions.
- Systems independently implemented on a regional level do not readily support scaling up to cover multiple regions or statewide events.
- Significant challenges exist to ensure compliance with growing OITS data systems and cybersecurity requirements as they relate to upgrading/integrating ITS equipment (modems, cameras, VMS, etc.) and related software, and other TSMO software (ATIS, ATMS, etc.).

### Limited Integration of TSMO with NYSDOT Business Processes

- Existing NYSDOT ITS project design and operational guidelines have not been updated to account for the latest approaches to managing the transportation system.
- Incorporation of TSMO elements in the project development cycle is not standard practice.
- Integration of TSMO strategies and projects into NYSDOT capital program update process is not consistent across regions or from one program update cycle to the next.

### Capability to Leverage Data for TSMO is Still Emerging

- Data management systems are not highly integrated. Use of data is inconsistent for performance measurement and reporting.
- Regional data sharing systems exist but are used to varying degrees within Regions.

### Varying Capacity to Monitor and Report System Condition and Status

- Expectations for coordinated operational responsiveness and situational awareness are currently met by applying a significant level of human intervention and manual effort.

### Managing Public Expectations and Communications about Travel Conditions

- Effective public outreach before, during, and after disruptions in travel continues to be a challenge with diversity of travel conditions across the state.
- Working with regional and local partners on consistent messaging during events is not standardized.

## Need for a Strategic Approach

A strategic TSMO approach will allow NYSDOT to take a holistic look at addressing mobility and reliability challenges. It will also provide for better management of the transportation system to reduce congestion and increase reliability among NYSDOT's core objectives and programs. Applying an enterprise-wide strategic lens, there are opportunities to:

**Create Enterprise-level Solutions for Common Requirements**

- Create enterprise-level solutions to address common requirements like situational awareness, traveler information, and performance measurement.
- Address operations & maintenance (O&M) and IT issues associated with TSMO assets (ITS infrastructure, back-office systems, traffic signal infrastructure, and priority treatments).
- Improve procurement, deployment, and use of equipment and systems statewide.
- Create an approach to effective life-cycle management of TSMO assets.

**Increase Deployment of Proven TSMO Strategies**

- Integrate TSMO into transportation planning, programming, scoping, and in particular engineering, with more collaboration between highway design and operations.
- Create a stable funding source for TSMO strategies and programs.

**Improve Ability to Respond to Unplanned Events and Emerging Priorities**

- Promote greater consistency in collection and management of operational data.
- Develop and deploy tools that improve situational awareness of ongoing events.
- Improve partnerships with other operating entities around the state, as well as create new partnerships with the private sector to help manage the system.

**Improve Ability to Share Information as NYSDOT's Responses to Events Increase in Scale and Complexity**

- Create more consistency in processes for TSMO during events/conditions that impact multiple regions.
- Continue to work with regional partners to develop a consistent message about conditions as they unfold.

## BENEFITS OF A STRATEGIC APPROACH TO TSMO FOR NYSDOT

The following are example scenarios illustrating the benefits of a strategic enterprise-wide TSMO approach.

**A winter storm event that spans multiple regions within the state.** When the scale of an event spans multiple regions across the state, the differences in processes, systems, and messaging may lead to inconsistent reporting on situational awareness, which results in fragmented messaging to travelers and decision makers. Improving and standardizing situational awareness (real-time data collection and analysis) and reporting tools across the state will streamline decision-making and provide faster, more consistent, and reliable information to travelers.

**Procurement of common ITS infrastructure.** Challenges in statewide interoperability and integration occur when regions require the same ITS infrastructure (e.g., road weather information systems, cameras), but specify and procure these items independently. Establishing enterprise-wide standardized asset procurement, deployment, and inventory systems creates economies of scale in how ITS assets are procured and managed. This allows NYSDOT to ensure that ITS infrastructure is consistent and interoperable across the state.

**Development of common performance measures.** While each region is unique in its ITS needs and context for TSMO, a core set of performance measures for TSMO across the state that encapsulates mobility, reliability, and safety will enable all regions to align their core services and projects to demonstrate progress both regionally and statewide.

**Connecting various new initiatives/projects.** The ability to link initiatives to statewide goals (be it Integrated Corridor Management [ICM], adaptive signal control, or over-height warning systems) creates economies of scale using enterprise systems. It also improves the ability of NYSDOT to replicate strategies with proven successes across the state.

**Adapting or incorporating new technology.** Creating the ability to rapidly assess the potential of emerging technology (be it drones, connected infrastructure, artificial intelligence, or Internet of Things), coupled with identifying early applications and use-cases and testing them in the regions, allows NYSDOT to adapt and mainstream emerging technology to day to day operations across the state in a sustainable and responsible manner.

# THE STRATEGIC PLAN FOR TSMO

Similar to NYSDOT's Strategic Highway Safety Plan (SHSP), which brings together a wide range of stakeholders involved in traffic safety across Department functional areas and external partners, this strategic plan enables NYSDOT to create a similar focus for improving mobility, reliability, and travel choices.

The TSMO Strategic Plan:

- Describes the importance of TSMO to the organization's mission and develops the linkage between TSMO activities and a set of goals and objectives.
- Describes the connections between TSMO activities and other agency activities.
- Identifies a set of immediate and near-term actions to support more effective and successful TSMO outcomes.

## Vision

The vision for TSMO builds upon and supports NYSDOT's overall mission as an organization:

> *"It is the mission of the New York State Department of Transportation to ensure our customers—those who live, work and travel in New York State—have a safe, efficient, balanced and environmentally sound transportation system."*

The following vision statement for NYSDOT's TSMO initiatives captures TSMO's contribution to the overall departmental mission:

NYSDOT's TSMO Vision

**"Enhance travel safety, reliability, and efficiency throughout New York State."**

Although a simple statement, this vision guides NYSDOT's efforts, recognizing that as an organization the agency is focused on managing and operating the multimodal transportation system so that travelers—including residents, employees, visitors, and freight shippers—can reliably and efficiently meet their travel needs. This system involves coordination across roads and highways, transit, rail, and options for bicycling and walking, so that the entire multimodal transportation system is seamless, predictable, and resilient to disruptions.

This vision also supports the agency's overall mission of providing a safe, efficient, balanced, and environmentally sound transportation system by operating the system in ways that reduce crashes, enhance seamless movement across modes and jurisdictions, and reduce traffic delays that contribute to air pollution.

## Goals and Priorities

As an organization, six goals drive NYSDOT's TSMO efforts. These goals address outcomes for the ***customers***—the traveling public—and goals for how NYSDOT as ***an organization*** operates. Note that these goals are not in priority order, but each represents an important NYSDOT priority.

Each goal includes associated objectives and necessary actions identified during the stakeholder engagement activities. In the following tables:

- Hyperlinked items are near-term actions, identified for immediate initiation or ongoing efforts. More information on these actions are in the document in Appendix A and B.
- Items that are not hyperlinked are medium-term actions that will be refined and implemented in the two- to three-year timeframe.

It is important to note that the tables provide a list of actions for each objective. The list of actions does not cover all ongoing NYSDOT activities to support a given objective.

**How we support our customers**

**Goal 1. Enhance system safety and reliability by minimizing the impacts of travel disruptions.**

Support effective coordination, management, and communications in the event of a wide array of emergency management situations, including disruptions to transportation infrastructure or services, and evacuations.

**Goal 2. Move people efficiently.**

Implement advanced techniques, applying technology and coordination approaches, to effectively manage congestion and provide a seamless travel experience across all modes of travel and jurisdictional boundaries.

**Goal 3. Support reliable and efficient freight movement.**

Build on the New York State Freight Transportation Plan to support efficient, reliable, and safe freight movement while addressing the unique challenges and issues of the freight community.

**Goal 4. Serve as a trusted source of multimodal travel information.**

Provide travel information that is trusted by system users, particularly during times of disruptions such as weather emergencies, and in relation to special events, work zones, and other causes of congestion where the public looks to established government sources of information.

**How we operate as an organization**

**Goal 5. Strengthen partnerships with internal and external stakeholders.**

Strengthen partnerships, both internally within the agency as well as with a wide array of state, regional, and local-level agencies, around TSMO to help support TSMO project development, data management and sharing, coordinated decision-making, and access to information across partners.

**Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.**

Establish and ensure the availability of reliable real-time data sources, expert staff, and clear performance measures to effectively collect, report, and share data and to monitor performance.

## Goal 1. Enhance system safety and reliability by minimizing the impacts of travel disruptions.

| Objectives | Identified Actions |
|---|---|
| 1.1. Enhance situational awareness and capabilities of Transportation Management Centers to effectively manage and communicate travel conditions. | • Expand and enhance situational awareness tools.<br>• Develop and deploy an integrated data environment for TSMO, a "TSMO Engine." |
| 1.2. Minimize the impacts of construction work zones and infrastructure maintenance on travelers. | • Expand work zone management programs and practices.<br>• Implement smart work zone management techniques that include enhanced work zone safety management strategies, application of temporary traffic control changes, queue detection, and project coordination activities. |
| 1.3. Reduce delays from traffic incidents. | • Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts.<br>• Expand coverage of the Highway Emergency Local Patrol (HELP) program.<br>• Continue to expand TIM collaboration with New York State Police, including TIM training. |
| 1.4. Ensure effective system management during emergency transportation operations. | • Improve NYSDOT and Partner Agency Transportation Operations Emergency Management Capabilities.<br>• Support enhanced tools and capabilities for the Statewide Transportation Information & Coordination Center (STICC). |
| 1.5. Minimize the impacts of adverse weather conditions on transportation system operations. | • Enable effective Snow and Ice Operations and Weather Response Management Practices.<br>• Re-establish a statewide Road Weather Information System (RWIS) program for road condition monitoring.<br>• Continue to adopt vehicle-based technologies to gather probe-based information for road conditions and maintenance data.<br>• Develop more consistent messaging before, during, and after weather events to motorists and the freight community. |

**Tracking Progress and Measuring Success**

- Track statewide and regional performance measures, including percent of person-miles traveled with reliable travel times, average incident clearance times, secondary incident rates, and response times.
- Track corridor and project-level measures, including travel times and delays associated with work zones and weather in selected corridors.

## Goal 2. Move people efficiently.

| Objectives | Identified Actions |
|---|---|
| 2.1. Enhance traffic signal coordination to reduce unnecessary delay. | • Support statewide traffic signal improvement and optimization program.<br>• Develop congestion mitigation plans for priority intersections.<br>• Implement workforce training for design, simulation, performance measurement, and maintenance of traffic signals. |
| 2.2. Advance ICM, including application of innovative strategies to improve traffic flow and multimodal options. | • Implement Integrated Corridor Management (ICM) in selected corridors.<br>• Advance active traffic management strategies such as ramp metering and lane control systems. |
| 2.3. Support use of high-occupancy modes. | • Implement priority treatments for high-occupancy modes, such as transit signal priority and hard shoulder running for transit where applicable.<br>• Support efforts to incentivize high-occupancy travel modes. |
| 2.4. Support safe and accessible bicycle and pedestrian travel. | • Expand accessible information on safe bicycle routes and options through an on-line information resource.<br>• Ensure that system operations strategies incorporate the needs for safe travel by bicyclists and pedestrians. |
| 2.5. Provide more seamless travel across modes and options. | • Partner with transit agencies to support enhanced mobility options in the marketplace.<br>• Share real-time data to support private sector applications that advance more seamless access to information by travelers.<br>• Continue to support and enhance NYSDOT's Mobility and Travel Demand Management programs across New York State. |
| 2.6. Advance applications of CAVs and other advanced technologies to support safer, more efficient travel. | • Support Connected and Automated Vehicles (CAV) Readiness Assessment.<br>• Integrate connected vehicle considerations into planning and project development efforts, especially in terms of traffic signal controller upgrades for signal phase and timing. |

**Tracking Progress and Measuring Success**

- Track statewide and regional performance measures, including:
  - Percent non-single occupant vehicle travel for work trips, annual hours per capita of peak hour excessive delay, modal splits, annual crashes involving bikes and pedestrians.
- Track corridor and project-level measures, including:
  - Travel times on corridors before and after traffic signal upgrades.
  - Travel times and speeds along major corridors; transit travel time reliability.

## Goal 3. Support reliable and efficient freight movement.

| Objectives | Identified Actions |
|---|---|
| 3.1. Ensure trucks are using the appropriate roadway infrastructure. | • Support and implement a program to reduce bridge hits across the state.<br>• Integrate traffic operations with the permitting system so that changes to road operations can be communicated with freight partners with oversize/overweight permits.<br>• Develop partnerships with Trucking Association of New York (TANY) and other freight stakeholders to improve communications about truck operations during adverse weather and emergency events. |
| 3.2. Apply ITS and emerging technology applications to support freight services. | • Develop an approach to providing information for emergency truck parking options.<br>• Enhance permit programs and expand the Highway Oversize/Overweight Credentialing System (HOOCS) statewide to provide permit automation.<br>• Develop Traffic Incident Management plans specifically for freight vehicles, recognizing the challenges of re-routing trucks onto alternative routes.<br>• Use TSMO strategies like freight signal priority and freight-specific queue jumpers to improve local access to freight hubs.<br>• Pilot test potential automation of DOT roadside safety inspections. |
| 3.3. Advance efforts to support Connected Automated Vehicle plans for freight. | • Support Connected and Automated Vehicles (CAV) Readiness Assessment. |

**Tracking Progress and Measuring Success**

- Track statewide and regional performance measures for freight including travel time and travel time reliability on significant corridors for freight, border crossing delays, and bridge hits, before and after deployment of ITS devices and systems.

## Goal 4. Serve as a trusted source of multimodal travel information.

| Objectives | Identified Actions |
|---|---|
| 4.1. Provide accurate, real-time travel information of road conditions. | • Foster more and better partnerships with the private sector, such as Waze, or use of crowdsourcing for Traffic Incident Management and traffic information.<br>• Enhance real-time information on construction management and emergency operations.<br>• Support enterprise-wide streaming video sharing. |
| 4.2. Enhance communication to more effectively reach partners and all customers. | • Develop next-generation of traveler information systems.<br>• Establish stronger cross-communication between local agencies and NYSDOT.<br>• Stratify the message and delivery methods for traveler information channels (e.g., Quebec 511 and Ontario 511 for cross-border communications).<br>• Create opportunities to link NYSDOT's TSMO-related programs and data with transit providers in New York State.<br>• Ensure equitable access to travel options, including working with service providers to enhance the efficiency of paratransit mobility on-demand and "first-mile, last-mile" connections to fixed route transit. |

**Tracking Progress and Measuring Success**

- Track statewide and regional performance measures, including:
  - Use of 511NY.
  - Customer satisfaction with traveler information measured through customer surveys.
- Gather ongoing input from partner agencies about the accuracy of information.
- Assess the success of partnerships with private data providers.

## Goal 5. Strengthen partnerships with internal and external stakeholders.

| Objectives | Identified Actions |
|---|---|
| 5.1. Integrate TSMO into planning, design and construction activities. | • Integrate TSMO into NYSDOT's planning and project development.<br>• Adopt construction coordination tools for work zone project coordination.<br>• Update NYSDOT Project Development Manual ITS guidance, including the PS&E Checklist, to provide guidance on how and when TSMO needs will be included.<br>• Develop TSMO Hotspot identification and prioritization tool for identifying where and what TSMO strategies are best use to solve congestion/reliability issues on a transportation link.<br>• Customize and use federal cost-benefit tools for TSMO project development. |
| 5.2. Align organizational resources for TSMO. | • Establish a statewide TSMO Steering Committee for project funding and decision-making.<br>• Document regional and Main Office roles and responsibilities for TSMO.<br>• Establish a technical support capability at the Main Office for use by regions for TSMO deployment. |
| 5.3. Build new internal and external partnerships for TSMO. | • Expand Public Information Officer (PIO) engagement and role in TSMO.<br>• Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts.<br>• Explore private sector partnerships and roles for data services and transit coordination (such as paratransit and non-emergency medical transport).<br>• Establish a team/model for seeking federal grant opportunities.<br>• Engage NYS universities for TSMO research through a formal program.<br>• Create a pilot program to advance innovative TSMO ideas. |

**Tracking Progress and Measuring Success**

- Formalize Steering Committee and assess its role in supporting TSMO.
- Conduct ongoing reviews of staff capabilities to meet emerging needs.
- Track and document progress in developing pilot projects and other initiatives.

## Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

| Objectives | Identified Actions |
|---|---|
| 6.1. Ensure sustainable, programmatic, and stable funding for TSMO. | • Identify available funding options for TSMO projects within the agency.<br>• Develop a multi-year integrated statewide and regional template for defining TSMO systems and projects as a basis for capital program funding decisions.<br>• Establish a statewide Steering Committee for TSMO project funding decision-making.<br>• Establish TSMO funding priorities based on goals. |
| 6.2. Leverage data for performance-driven approach to TSMO. | • Define performance measures for TSMO and develop performance dashboards.<br>• Develop a needs assessment and draft a concept and procurement strategy for a TSMO Engine.<br>• Develop a data governance strategy for TSMO-related data for NYSDOT. |
| 6.3. Apply enterprise-level solutions for common problems and deployment of systems and technology. | • Develop and deploy an integrated data environment for TSMO, a "TSMO Engine."<br>• Start TSMO inventory and develop transition plan to enterprise asset management system.<br>• Adopt a statewide situational awareness tool that is able to report ongoing conditions on the transportation system. |
| 6.4. Ensure TSMO systems and technology investments are secure and resilient. | • Conduct a cybersecurity vulnerability assessment for TSMO. |
| 6.5. Enhance workforce capabilities for TSMO. | • Develop position descriptions and qualifications for emerging TSMO functions (data management, connected and automated vehicles) for NYSDOT.<br>• Develop a knowledge management system for TSMO projects, resources, and inventory. |

**Tracking Progress and Measuring Success**

- Track the use of enterprise-wide tools that use performance measures of reliability and mobility of TSMO strategies. Growth in such tools can help justify report outcomes and investments.
- Track funding availability for TSMO activities.

# DELIVERING THE TSMO PROGRAM

Delivering an enterprise-wide strategic TSMO program involves coordinating with many diverse groups and stakeholders within the Department who need to be involved with both program development and day-to-day operations (see Table 1, page 3). This section outlines a pathway to better align these crosscutting roles, responsibilities, and functions to streamline TSMO program delivery and efficiency.

This pathway begins with forming a TSMO Steering Committee and making a few minor organizational adjustments. These modifications set the framework for initial and ongoing integration with appropriate program areas to evolve current and future TSMO activities to a more clearly defined coordinated TSMO program while maintaining flexibility and preserving existing regional capabilities.

## TSMO Steering Committee for Program Development

The key to deploying an effective TSMO program is to establish a TSMO Steering Committee with representatives from the regions and Main Office. The Steering Committee will provide oversight and coordination between regional and statewide programs and projects. Core Steering Committee responsibilities are:

- **Integration** – The TSMO Steering Committee will identify, set, track, and report program measures; identify program and project integration opportunities; develop TSMO program systems, guidance, and standards; and review project proposals submitted by the regions.
- **Update existing NYSDOT TSMO practices** – The TSMO Steering Committee will identify and update TSMO components in project development and design manuals to include up-to-date practices, specifications, and guidance.
- **Capital Program Input** – The TSMO Steering Committee needs to be an integral component of the capital program update process by becoming part of the Comprehensive Program Team (CPT).
- **Funding and Resources** – The TSMO Steering Committee will identify the various funding and resource needs to deliver the proposed regional and enterprise-wide work plans.

## Program Integration, Structure, and Organizational Linkages

Currently, the Main Office, Office of Traffic Safety and Mobility (working closely with the Office of Transportation Maintenance) leads TSMO program development and implementation support, while each region has responsibility for implementation, service operation, and system and device maintenance. In an integrated approach, the Steering Committee will provide program oversight and coordination between regional and statewide programs and projects. It will also

identify, set, track, report program measures, identify program and project integration opportunities, and develop TSMO program systems, guidance, and standards. For the Steering Committee to fulfill this role, some Main Office and regional organizational realignments and linkages need to be addressed.

## Main Office – Anticipated TSMO Functions and Realignments

Table 2 identifies existing and proposed Main Office TSMO roles, functions, opportunities for better TSMO program alignment, and the benefits of these improved alignments. Roles in the table are closely but not perfectly aligned with existing Main Office organizational structure.

**Table 2. Main Office TSMO Roles, Functions, Alignments & Benefits**

| Role | Existing Functions | TSMO Program Alignment Opportunities | Alignment Benefits |
|---|---|---|---|
| **TSMO Program Development (New Crosscutting Role)** | Project development | Guidance for consideration of TSMO project elements | Institutionalization of TSMO into project development process |
| | Regional capital project review | Guidance for review and scoring of TSMO projects | Consistency across regions |
| | Annual funding plans | Identification of dedicated TSMO funding sources | Predictability of TSMO funding |
| | Regional, multi-state, multi-jurisdictional, and MPO coordination | TSMO committee participation | Regional and local buy-in to TSMO program |
| | Statewide ITS architecture | Updates to reflect new statewide TSMO systems | Comprehensive regional and local TSMO integration deployments into statewide architecture |
| **Planning and Traffic Engineering** | Traffic engineering studies | Guidance for consideration of TSMO project elements | Consistency across regions |
| | Standards and specifications | Development of ITS specification packages | Consistency/efficiency across regions |
| | Signage and MUTCD | Updates to Traffic Control Devices | Preparation for connected and automated vehicles |
| | Signal lab and testing | Statewide traffic signal modernization | Ability to improve signal operations and develop expertise |
| **TSMO Operations** | TSMO system management | Development of statewide operating policies for TSMO system management tools | Enhanced and consistent coordination between central office and regions |
| | Traveler information | Consideration of new TSMO tools in future statewide 511 management | Consistency/efficiency across regions |
| | Incident management | Development of new and enhanced TMC incident and event management procedures | Enhanced incident response enabled by new statewide TSMO systems |
| | Special event planning and coordination | | Consistency across regions and reduced data entry |

| Role | Existing Functions | TSMO Program Alignment Opportunities | Alignment Benefits |
|---|---|---|---|
| | TSMO enterprise systems | Development of TSMO dashboards and analytics tools | Consistent and actionable performance reporting to public and executive leadership |
| | Workforce development | Operations and Maintenance TSMO training | Consistency/efficiency across regions |
| **ITS Field Equipment** | Maintenance and field support | Policies and procedures for maintenance staff | Consistency/efficiency across regions |
| **Communications** | NYSDOT radio system | Planning for overall ITS communication needs<br>Procedures for securing FCC license for new field equipment | Improved communication backbone for ITS |
| | Mobile command post | | |
| | Communications equipment licensing | | |
| **Emergency Transportation Operations** | STICC operations | Improved situational awareness tools<br><br>Greater integration with ATMS and other TSMO systems<br><br>Playbooks and consistent training | Improved coordination within and outside the agency<br><br>Consistent and actionable performance reporting to public and executive leadership |
| | Emergency coordination | | |
| | Incident command structure | | |
| | After-action reviews | | |
| **Safety Program Delivery** | Work zone safety | Adoption of smart work zone strategies | Enhanced work zone safety and situational awareness |
| | Work zone permits | Data entry and reporting policies and standards | Consistency across regions and reduced data entry |
| | Bike and pedestrian safety | TSMO bike and pedestrian treatments | TSMO safety benefits for vulnerable roadway users |
| **Research and Innovation** | Federal grant support and coordination | Funding for emerging technology pilots and deployments | CAV readiness |
| **Transportation Maintenance** | Snow & ice control policy and management | More comprehensive weather response traffic management program | Supports enhanced level of road condition and traveler info services |
| | Manage assets; infrastructure & facilities | Integration of situational awareness tools with asset management tools | Increased workforce and traveler safety and traffic mitigation |
| | Work zone safety policy & management | Drivers First and MP&T enhancements | Increased workforce and traveler safety and construction traffic mitigation |

## Regions – Anticipated TSMO Functions and Realignments

Regions are and will continue to be at the forefront of TSMO program delivery. They are responsible for delivering and managing core TSMO services as well as leading necessary regional specific projects and initiatives. These include ongoing investments in Traffic Management Centers, arterial management programs, Traffic Incident Management (e.g.,

HELP), and ITS infrastructure that need to be sustained on a continuous basis for each region. Regional work plans will include modernization, expansion, and upkeep of these services based on needs.

In addition to core services, unique regional TSMO projects and initiatives provide opportunities to deploy targeted TSMO strategies to address both regionally specific and statewide problems. These projects and initiatives linked to an enterprise strategy provide an opportunity to enhance core services statewide. Examples of such projects include:

- Corridor-focused efforts (e.g., the Integrated Corridor Management, signal optimization)
- Advanced technology deployments (e.g., over-height warning systems, wrong way driving detection, ramp meters, border crossing delay monitoring).
- Regional initiatives (e.g., support for construction coordination, traffic signal coordination, and regional TIM committees)
- Localized bottleneck mitigation practices (including intersection and geometric improvements)

As in the Main Office, the TSMO program is expected to encompass a range of roles within each region. Table 3 presents the existing functions and new opportunities for alignment with the TSMO program, along with the benefits associated with each function.

**Table 3. Regional TSMO Roles, Functions, Alignments & Benefits**

| Role | Existing Functions | TSMO Program Alignment Opportunities | Alignment Benefits |
|---|---|---|---|
| **Planning and Traffic Engineering** | Traffic engineering studies and project design | Execution of guidance for consideration of TSMO project elements | Enhanced methods for evaluating TSMO countermeasures |
| | Integrated corridor management (ICM) | Integration of ICM tools and best practices into TSMO systems | Consistent guidance, support for efficient deployment |
| | Connected corridors | Implementation of traffic signal optimization, ramp metering, pedestrian and transit priority | Enhanced toolbox applying for safety and mobility countermeasures |
| **TSMO Operations** | Transportation Management Centers | Application of statewide operating policies for TSMO system management tools | Consistent guidance, support for efficient deployment |
| | TIM and Safety | Incident response, HELP, detours, over-height vehicle detection, wrong way driving detection | Enhanced toolbox applying for safety and mobility countermeasures |
| | Traveler information coordination | Consideration of new TSMO tools in future Regional 511 management | Consistent guidance, support for efficient operations |

| Role | Existing Functions | TSMO Program Alignment Opportunities | Alignment Benefits |
|---|---|---|---|
| | Work zone management | Application of smart work zone strategies, coordination of work zones across region | Enhanced work zone safety and situational awareness |
| | Special event planning and coordination | Development and use of improved data entry/sharing tools and playbooks | Consistent guidance, support for efficient operations |
| **Traffic Signal Operations** | Signal design and re-timing | Signal optimization support | Consistent guidance, support for efficient deployment and operations |
| **Transportation Maintenance** | Snow and ice control | Incorporation of new road weather data/vehicle location tracking tools | Enhanced situational awareness and efficient operations |
| | Operation, maintenance, and repair of highway and bridge assets | Enhanced tools and training for maintenance staff | Consistent guidance, support for efficient operations |
| | Maintenance as a secondary responder | TIM strategies for maintenance to enhance efficiency and effectiveness of response techniques | Increased workforce and traveler safety and traffic mitigation |
| **Regional Mobility Coordination** | Multi-state/multi-jurisdictional coalitions (TRANSCOM, NITTEC, etc.) | Participation in multi-jurisdictional coalitions | Consistent guidance, support for efficient operations |
| | Regional TIM coordination | Application of enhanced incident management procedures | Consistent guidance, support for efficient operations |
| | Co-location of TMCs | Multi-agency regional TSMO collaboration | Reduced costs, and improved efficiencies and response times |
| | Modal coordination | Incorporating transit and modal priority strategies within TSMO | Improved efficiency in managing travel demand |
| **Border Crossing** | Border crossing management and coordination | Improved communication and coordination tools and procedures | Improved efficiency in managing travel demand |

## Support Updates to Existing NYSDOT Practices

Integrating TSMO strategies at the project level is critical to realizing the benefits of this plan. In every project phase, from planning through construction, current and accessible project development guidance that incorporates TSMO is critical.

Presently, NYSDOT project development guidance (manuals, specifications, and procedures) do not reflect up-to-date practices and techniques in mobility, ITS infrastructure, and integrated TSMO strategies. Many TSMO-related sections in these documents are a decade old.

The Steering Committee's role is to support and facilitate the update and maintenance of Department TSMO guidance in planning and design manuals, appendices, checklists, specifications, and supporting documentation. For this, the Steering Committee is to review existing documentation to identify what information is current and should be kept, what information is outdated that should be either updated or deleted, and what information is missing that should be added into existing documentation, policy, or procedures.

## Capital Program Input

The TSMO Steering Committee needs to be fully engaged in the capital program update process and become part of the Comprehensive Program Team (CPT). Currently, CPT has representation from each of these four asset management teams: Structures, Pavement, Safety & System Optimization, and Sustainability.

One possible approach to integrating TSMO into the capital program process is to form a new TSMO asset management team. Following standard CPT framework, both statewide and regional TSMO asset management teams would be formed.

Another approach to explore is to combine the Safety and Sustainability teams and add the TSMO responsibilities to this combined team to form one single mobility asset management team. Many responsibilities in these three areas overlap with each other, such as: pedestrian/bike safety, ADA compliance, signal optimization, transit access, complete streets, system reliability, multimodal access, active travel demand management, traveler information services, and ATMS.

Combining all these, along with other related responsibilities, into one team would provide TSMO CPT representation within the established statewide and regional asset management team framework.

## Funding Needs

Presently, each region is responsible for developing, funding, deploying, and maintaining TSMO infrastructure, services and functions, which differ from region to region based on their specific needs and program resources. Several funding sources are used for regional programs and each region must research, apply, justify, and manage the funding over time. Under this current process, each region supports significant infrastructure and operating costs through a variety of sources, such as: CMAQ, Surface Transportation Block Grant Program, and dedicated state funds.

This largely decentralized funding approach, in which each regional TSMO needs to compete for program funding absent statewide guidance and prioritization, does not fully achieve efficiencies from statewide purchasing and procurement practices.

As an example, each region currently must fund two aspects of an Intelligent Transportation System: infrastructure and operations. Infrastructure costs include the hardware and

transportation management software needed to run NYSDOT's transportation networks. Operations include costs for TMC facilities, 24/7 staffing, and ongoing maintenance of communications and field equipment. This practice of having each region procure these systems and infrastructure separately has led to non-standardized, incompatible infrastructure and software across regions. This disparate procurement limits statewide interoperability and, in some instances, provides inconsistent traveler service and experience between NYSDOT regions.

A more consistent, standardized, centrally managed and funded TSMO approach can streamline and stabilize TSMO program funding and activities across the Department. This approach is currently in practice for the statewide ATMS, Skyline video sharing, and 511NY contracts.

In this process, the Main Office would identify known funding sources and use uniform criteria and standards to make necessary allocations to the regions. This process provides consistent, predictable funding and the flexibility to meet regional TSMO program goals. Other benefits of this approach include realizing purchase and procurement economies of scale and more efficient use of regional staff and ensuring best practices are implemented statewide.

## Resource Needs

As investments in TSMO increase, funding for system maintenance and staffing for reliable consistent operations is critical. Program funding and staffing will need to evolve to support wider TSMO deployment and maintenance. Addressing statewide TSMO resource needs will require:

- The use of enterprise-level procurement for TSMO systems to ensure interoperability and improve asset management practices

- A small Advanced TSMO Technology Team of NYSDOT staff to support unique and crosscutting TSMO practices, such as:
    - Technical expertise on evolving TSMO technology practices
    - Design and update of TMC and ITS infrastructure
    - Training to regions and Main Office

The Advanced TSMO Technology Team will ideally consist of professionals with the knowledge, skills, and abilities (KSAs) to support evolving TSMO technologies and system standards. This team will also contribute to consistent long-term vital institutional knowledge. These staff services can be developed in-house and/or through consultant service contracts. In addition, the team will coordinate with state IT services.

# MOVING FORWARD

This plan's ultimate success relies on the effective adoption of TSMO strategies across many organizational levels. The establishment of a TSMO Steering Committee will enable this goal by providing necessary strategic guidance and setting performance metrics to integrate TSMO into agency-wide policies and procedures. Regional involvement will be essential to building consistent and widespread acceptance and deployment. In addition, regions possess the practical experience and necessary skills to adjust to a wide range of existing and evolving services and technologies in deploying TSMO.

Another critical element to the plan's success is establishing a strategy for dedicated funding. Predictable funding, across multiple fiscal years, will better equip the Department to evaluate, implement, and sustain current and new program initiatives. A stabilized TSMO program funding strategy must consider system procurement, operations, maintenance, and support staff. This proposed strategic plan moves NYSDOT beyond its current reactive trend of managing growth in TSMO costs to a more programmatic approach that will maximize the return on investment in TSMO-related funding.

As TSMO practices, technology, and capabilities evolve, staff resources will also need to evolve to deploy, manage, and maintain these systems and equipment. Creation of TSMO technical support service contracts, managed through the Main Office, to support regional and Main Office functions is key to maintain ongoing operations. This initiative will include a small, dedicated support team that will focus on designing and updating TMC and ITS infrastructure systems and support multiple, specialized TSMO and IT disciplines. This initiative will also cultivate long-term institutional knowledge and consistency within the Department for systems deployment, integration, and data management.

Overall, establishing the Steering Committee with capital program integration, supported by known funding sources and specialized resource staff, will better equip NYSDOT to move forward with the near-term actions identified in this plan. These actions will streamline Department TSMO functions; provide tangible near-term benefits to the traveling public, and better position the Department for delivering future sustainable TSMO services.

### Preparing for the Future

The actions and recommendations in this plan will ensure NYSDOT is poised to take full advantage of technology to support safe, efficient, and reliable mobility for the traveling public in the rapidly changing transportation marketplace. NYSDOT's operation of the multimodal transportation system over the next decade will depend on the nimble use of data, technology, and the future workforce—and will require partnership with private sector service providers, other state and local agencies, and communities. An enterprise-level approach to Transportation System Management and Operations, as proposed in this plan, is a critical foundation for NYSDOT to meet the challenge of providing sustainable mobility tomorrow and in the decades ahead.

# APPENDIX A – NEAR-TERM ACTONS

# NEAR-TERM ACTIONS

This appendix catalogs the steps necessary to support the TSMO Strategic Plan implementation as identified through ongoing stakeholder engagement. Table 4 lists 18 near-term actions and Table 5 shows a timeline for these actions. Table 6, Table 7, and Table 8 categorize the 18 near-term action items into three action groupings: ongoing, under development, and upcoming.

**Table 4. Near-Term Implementation Actions**

| Near-Term Priority Action | Goal 1 | Goal 2 | Goal 3 | Goal 4 | Goal 5 | Goal 6 |
|---|---|---|---|---|---|---|
| Expand and enhance situational awareness tools | ✓ | | | | | ✓ |
| Support statewide traffic signal improvement and optimization program | | ✓ | | | ✓ | |
| Expand work zone management programs and practices | ✓ | | | | | |
| Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts | ✓ | | | | ✓ | |
| Support and implement a program to reduce bridge hits in New York State | ✓ | | ✓ | | | |
| Improve NYSDOT and partner agency's emergency transportation management | ✓ | | | | ✓ | ✓ |
| Develop next-generation of traveler information systems | | ✓ | ✓ | ✓ | | |
| Develop and deploy an integrated data environment for TSMO, a "TSMO Engine." | ✓ | | | | | ✓ |
| Start TSMO inventory and develop transition plan to enterprise asset management systems | | | | | ✓ | ✓ |
| Enable Snow and Ice Operations and Weather Responsive Traffic Management (WRTM) in the Agency | ✓ | | | | | ✓ |
| Define performance measures for TSMO and develop performance dashboards | | | | | | ✓ |
| Implement Integrated Corridor Management (ICM) in selected corridors | | ✓ | | ✓ | | |
| Establish a statewide TSMO Steering Committee for project funding and decision-making | | | | | ✓ | ✓ |
| Create opportunities to link NYSDOT's TSMO-related programs and data with transit providers in New York State | | ✓ | | ✓ | ✓ | |
| Conduct a cybersecurity vulnerability assessment for TSMO | | | | | | ✓ |
| Integrate TSMO into NYSDOT's planning and project development | | | | | ✓ | ✓ |
| Expand Public Information Officer (PIO) engagement and role in TSMO | ✓ | | | | ✓ | |
| Support Connected and Automated Vehicles (CAV) Readiness Assessment | ✓ | ✓ | ✓ | | | |

## Table 5. Timeline for Near-Term Implementation Actions

| Near-Term Priority Actions | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| Expand and enhance situational awareness tools | | | | | |
| Support statewide traffic signal improvement and optimization program | | | | | |
| Expand work zone management programs and practices | | | | | |
| Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts | | | | | |
| Support and implement a program to reduce bridge hits in New York State | | | | | |
| Improve NYSDOT and partner agency's emergency transportation management | | | | | |
| Develop next-generation of traveler information systems | | | | | |
| Develop and deploy an integrated data environment for TSMO, a "TSMO Engine. | | | | | |
| Start TSMO inventory and develop transition plan to enterprise asset management systems | | | | | |
| Enable Snow and Ice Operations and Weather Responsive Traffic Management (WRTM) in the Agency | | | | | |
| Define performance measures for TSMO and develop performance dashboards | | | | | |
| Implement Integrated Corridor Management (ICM) in selected corridors | | | | | |
| Establish a statewide TSMO Steering Committee for project funding and decision-making | | | | | |
| Create opportunities to link NYSDOT's TSMO-related programs and data with transit providers in New York State | | | | | |
| Conduct a cybersecurity vulnerability assessment for TSMO | | | | | |
| Integrate TSMO into NYSDOT's planning and project development | | | | | |
| Expand Public Information Officer (PIO) engagement and role in TSMO | | | | | |
| Support Connected and Automated Vehicles (CAV) Readiness Assessment | | | | | |

## Ongoing Actions

Table 6 identifies a set of actions that are currently ongoing in NYSDOT, current status of these actions, and next steps.

**Table 6. Ongoing Actions**

| Action | NYSDOT Lead | Current Status | Next Steps |
|---|---|---|---|
| Support and implement a program to reduce bridge hits in New York State | System Optimization Bureau | • Identifying of critical bridge and tunnel infrastructure<br>• Developing toolbox of interventions that include a combination of technology and static messaging<br>• Establishing Bridge hit task force | • Standard template/procurement package for bridge hit systems<br>• Deploy bridge hit systems in identified priority locations |
| Develop next-generation of traveler information systems | System Optimization Bureau | • Conducting market research through a request for information (RFI) | • Procure next-generation traveler information services through a Request for Proposals (RFP) |
| Develop and deploy an integrated data environment for TSMO, a "TSMO Engine" | System Optimization Bureau | • Conducting market research through a request for information (RFI) | • Develop foundational systems engineering documents for the TSMO engine<br>• Procure and deploy TSMO engine |
| Start TSMO inventory and develop transition plan to enterprise asset management systems | System Optimization Bureau | • Developing prototype application for ITS Device Asset Management | • Enable access to ITS Device Management Application to all NYSDOT regions |
| Enable Snow and Ice Operations and Weather Responsive Traffic Management (WRTM) in the Agency | Office of Transportation Maintenance | • Planning for RWIS enhancements<br>• Testing vehicle-based observations and weather responsive strategies | • Pilot test integrated mobile observations from maintenance fleets<br>• Institute RWIS upgrades and enhancements |
| Expand work zone management programs and practices | Safety Program Management Bureau | • Gathering and reviewing lessons learned from the Drivers First program<br>• Improving internal communications within departments to ensure traffic disruptions are minimal | • Expand and enhance actions and smart work zone technologies<br>• Participate in the FHWA Work Zone Data Initiative (WZDI) |
| Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts | System Optimization Bureau | • Identifying key partners for near-, mid-, and long-term actions related to TIM collaboration, public outreach, policy | • Regional TIM Training Delivery<br>• Regional TIM workshops including tabletop exercises and drills<br>• Regional TIM Committee Meetings |

## Actions under Development

NYSDOT is working on developing the next set of actions to support the strategic plan. These include actions that are currently in scoping, planning, and development phases. Table 7 provides more context on these actions under development.

**Table 7. Actions under Development**

| Action | Lead | Current Status | Next Steps |
|---|---|---|---|
| Expand and enhance situational awareness tools | System Operations Bureau | • Exploring the needs and market potential of various situational awareness tools<br>• Field evaluation of existing tools (IIMS) | • Adopt a multi-purpose statewide situational awareness tool that can report ongoing conditions on the transportation system |
| Define performance measures and dashboards for TSMO | Policy, Planning, and Performance Measurement | • Identifying the TSMO Performance measures to monitor for operations | • Coordinate with SUNY Albany, TRANSCOM, and others for development of these dashboards |
| Implement Integrated Corridor Management (ICM) in selected corridors | Regional Office | • Planning efforts for ICM in several corridors around the state including the ICM-495 Corridor in New York City, I-90 in Buffalo, and I-287 in Hudson Valley | • Implement ICM in selected corridors around the state<br>• Identify other corridors with potential ICM solutions |
| Create opportunities to link NYSDOT's TSMO-related programs and data with transit providers in New York State | Policy, Planning, and Performance Measurement | • Identifying viable data and tech support tools that small and medium-scale transit agencies can use to enhance mobility for customers | • Engage directly with transit providers working closely with the NYSDOT transit bureau to build greater understanding of NYSDOT's TSMO tools and activities |

## Upcoming Actions

Progress on the following set of actions is expected to begin once the strategic plan is approved by NYSDOT. Table 8 provides more context on the upcoming actions that are expected in early 2020.

**Table 8. Upcoming Actions**

| Action | Lead | Rationale | Next Steps |
|---|---|---|---|
| Integrate TSMO into NYSDOT's planning and project development | Office of Traffic Safety and Mobility | • Further integrating TSMO into NYSDOT's planning and project development to ensure TSMO considerations are identified and examined from early in the process | • Update manuals for ITS/TSMO integration with NYSDOT product development |
| Establish a statewide TSMO Steering Committee for project funding and decision-making | Office of Traffic Safety and Mobility | • A TSMO steering and implementation committee with Regional and Main Office representatives will evaluate, develop, and update regional and MO TSMO deployment | • Establish a Steering Committee with formalized rules of operations |
| Support statewide traffic signal improvement and optimization program | Traffic Operations Bureau | • Opportunity to improve traffic signal management spanning from design, operations, management, and maintenance and replacement | • Develop a list of priority corridors and signal upgrade priorities |
| Improve NYSDOT and partner agency's emergency transportation management capabilities | Emergency Transportation Operations (under SOB) | • Improve the existing and required interfaces of multiple transportation condition reporting systems with emergency management platforms to support a multi-agency coordinated response | • Update and deploy tool sets, frameworks, and playbooks for emergency management coordination |
| Conduct a cybersecurity vulnerability assessment for TSMO | Emergency Transportation Operations (under SOB) | • Understanding the security risks and necessary countermeasures for TSMO field devices, traffic signals, and ITS back-office equipment | • Develop vulnerability assessment report and remediation plans (if necessary) for TSMO infrastructure |
| Expand Public Information Officer (PIO) engagement and role in TSMO | Office of Communications | • Provide proactive messaging to the public, create a two-way communication with travelers, and bring existing relationship and expertise with media outlets | • Conduct regular meetings with Main Office communications and regional PIOs |
| Support Connected and Automated Vehicles (CAV) Readiness Assessment | System Optimization Bureau | • Assess how CAVs fit with other plans/efforts (e.g., Vision Zero, TSMO) and the overall TSMO vision and goals, and will identify specific needs and priorities | • Document CAV Readiness Assessment and Deployment Approach |

# APPENDIX B – DETAILS OF NEAR-TERM ACTIONS

## 1. Expand and enhance situational awareness tools.

### Description

Continue to improve the tools necessary to collect, monitor, and share data to improve situational awareness on New York's transportation facilities. The use of statewide situational awareness tools would facilitate multi-agency collaboration to facilitate efficient use of resources.

### Goals Supported

- Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.
- Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Improve ability to respond to unplanned events or emerging priorities.
- Improve ability to share information as NYSDOT's responses increase in scale and complexity.

### Next Steps

- Explore the needs of transportation management center (TMC) operators for collecting and sharing situational awareness information, including looking at technology options like drones for special event management.
- Consider advancing and improving use of situational awareness tools used by various divisions including maintenance and the Statewide Transportation Information Coordination Center (STICC) as well as programs such as Winter Travel Advisory (WTA).
- Adopt a statewide situational awareness tool that can report ongoing conditions on the transportation system—e.g., expansion of the Integrated Incident Management System (IIMS) currently deployed in NYC Region (R11) or use of a third-party application.
- Prepare an outreach effort to encourage use by the partner agencies; public safety, emergency medical services, school districts, medical centers, etc. of the statewide traffic video cloud based system being deployed by NYSDOT in the spring of 2019; providing enhanced levels of situational awareness of road conditions at the, and to / from the incident scene.

### Benefits

- Ability to significantly improve response to system disruptions and enhance traveler information.

### Related Priorities

- Expand work zone management programs and practices.
- Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts.

| Organizational Lead | Supporting Resources |
|---|---|
| • System Optimization Bureau | • Regional TMCs, operations staff, Emergency Transportation Operations Bureau<br>• Emergency responders |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Statewide use of consistent situational awareness tools.<br>• Replacement for current use of OpenReach for manual event entry. | 2019–Ongoing |

## 2. Support statewide traffic signal improvement and optimization program.

### Description

Currently, NYSDOT maintains traffic signals that are dispersed across the state and managed with varying degrees of connectivity and operations protocols. There is an opportunity to improve traffic signal management spanning from design, operations, management, and maintenance to the ultimate replacement of deficient traffic signals. This includes upgrades to detection, communication and controller technology, and in some cases even establishing communications to signals in the first place. This action also includes coordination of traffic signals with local jurisdictions and introducing signal priority for emergency, transit, and commercial vehicles.

### Goals Supported

- Goal 2. Move people efficiently.
- Goal 5. Institutionalize partnerships with internal and external stakeholders.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Increase deployment of proven TSMO Strategies.

### Next Steps

- Develop a list of priority corridors and signal upgrade priorities.
- If needed, establish communications to priority corridors with a goal of connecting all of the signal systems to a centralized management system.
- Along with the upgrades, consider following key issues regarding advanced traffic signal control:
  - Priority treatments for emergency, transit, and commercial vehicles.
  - Multimodal considerations, including bike-ped safety.
  - Regional or corridor-level operations of traffic signals (cooperation with local city DOTs).
  - Real-time traffic signal performance measures.
  - Responsive traffic signal operations (weather, special events).
  - Incorporation of connected vehicle technology (SPaT, MAP).

### Benefits

- Statewide contracts will support standardization of the hardware, signal equipment, and operation of signal systems across the state promoting economies of scale.
- Standardizing signal systems across the state would aid in optimization traffic signal operations on corridors crossing multiple jurisdictions to minimize delays.

### Related Priorities

- Implement Integrated Corridor Management (ICM) in selected corridors.

| Organizational Lead | Supporting Resources |
|---|---|
| • Traffic Operations Bureau | • Regional traffic operations staff<br>• County, City Traffic Departments, City DOTs/DPWs, MPOs |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Priority corridors identified for traffic signal modernization<br>• Signals/signal systems connected to regional TMCs<br>• Percentage of NYSDOT signals per year upgraded though program | 2019–Ongoing |

## 3. Expand work zone management programs and practices.

### Description

Expand TSMO's role in work zone management to include the use of Smart Work Zones technology, work zone data collection and sharing, and performance measurement to enhance opportunities to reduce work zone-related delays and enhance the safety of NYSDOT maintenance and contractor's personnel.

### Goals Supported

- Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.

### Gaps Addressed

- Increase deployment of proven TSMO practices.

### Next Steps

- Gather and review lessons learned from the Drivers First program and from best practices across the nation to deploy and operate the programs and practices.
- Build on actions already in place to improve convenience to drivers during work zones.
- Improve internal communications within departments to ensure traffic disruptions are minimal.
- Expand and enhance actions and technologies supporting safety for NYSDOT and contractor personnel operating in and/or adjacent to work zones.
- Participate in the FHWA Work Zone Data Initiative (WZDI).
- Communicate with the traveling public through public outreach programs, as well as provide traffic conditions data to the traveling public through VMS signs, Highway Advisory Radio, social media, 511NY, and other private partners such as Google and Waze.

### Benefits

- Near-term effect of improving system reliability and customer experience.

### Related Priorities

- Expand and enhance situational awareness tools.
- Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts

| Organizational Lead | Supporting Resources |
|---|---|
| • Safety Program Management and Coordination Bureau | • Regional traffic safety and mobility staff, regional operations staff<br>• Private construction contractors and regional construction staff<br>• Regional TMCs<br>• Private partners such as Google, Waze, iOS, and utilities |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • External work zone data feed established<br>• Calculation of work zone performance measures<br>• Work zone coordination tools available to regions | 2019–2021 |

## 4. Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts.

### Description

NYSDOT is actively supporting Traffic Incident Management. In particular, strengthening regional TIM efforts, including committees related to training and coordination between NSYDOT, local agencies, and law enforcement, can yield benefits in terms of ensuring quick clearance of incidents, responder safety, and collection of performance measures.

### Goals Supported


Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.


Goal 5. Institutionalize partnerships with internal and external stakeholders.

### Gaps Addressed

- Increase deployment of proven TSMO Strategies.
- Improve ability to respond to unplanned events or emerging priorities.

### Next Steps

- Identify key partners for near-, mid-, and long-term actions related to collaboration, public outreach, policy and regulations, technology integration, system performance and evaluation, and training and education.
- Build support for TIM laws (Steer it Clear It) and TIM performance measurement.
- Support credentialing for tow truck services.
- Support ongoing/planned efforts and to perform after-action reviews.

### Benefits

- Reductions in incident clearance time, response times, and secondary accidents.

### Related Priorities

- Expand work zone management programs and practices.
- Expand and enhance situational awareness tools.

| Organizational Lead | Supporting Resources |
|---|---|
| • System Optimization Bureau | • Regional traffic safety and mobility staff, regional operations staff, regional emergency transportation ops staff (or regional emergency managers)<br>• Local fire and police departments<br>• Surface transportation control staff |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Regional TIM Training Delivery<br>• Regional TIM workshops including tabletop exercises and drills<br>• Regional TIM Committee Meetings | 2019–Ongoing |

## 5. Support and implement a program to reduce bridge hits across the state.

### Description

Bridge hits continue to be a major problem for NYSDOT. New York State parkways traditionally have bridges that are lower than the standard legal bridge clearance. Building on recent programs and Governor's initiatives to install warning systems at priority locations, this action continues the installation of these systems in a scalable, replicable, context-sensitive, and interoperable manner. As part of this program, locations will be prioritized, and appropriate interventions deployed to reduce the number of bridge hits.

### Goals Supported

- Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.
- Goal 3. Support reliable and efficient freight movement.

### Gaps Addressed

- Increase deployment of proven TSMO Strategies.

### Next Steps

- Identify critical bridge and tunnel infrastructure that would benefit from implementation of over-height warning systems.
- Develop toolbox of interventions that include a combination of technology and static messaging.
- Determine suitable locations to set up upstream detectors and variable message signs (VMS) with the electrical, structural, and space requirements for installing the system and the detector, controller, and VMS.
- Provide an actionable alternative to applicable vehicles on the VMS, such as "Take next exit," "Do not proceed to the bridge," etc.

### Benefits

- Reduction in number of accidents and associated delays to other motorists due to avoidance of over-height trucks colliding with low bridge and tunnel structures

### Related Priorities

- Expand work zone management programs and practices.

| Organizational Lead | Supporting Resources |
|---|---|
| • Regional Traffic Safety & Mobility<br>• Regional TMCs<br>• Emergency Transportation Operations Bureau<br>• Office of Structures<br>• Engineering Division | • System Optimization Bureau<br>• Office of Modal Safety & Security |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Establish Bridge hit task force.<br>• Standard template/procurement package for bridge hit systems.<br>• Deployment of bridge hit systems in identified priority locations. | 2019–2022 |

## 6. Improve NYSDOT and partner agency's emergency transportation management capabilities.

### Description

This action improves the existing and required interfaces of multiple transportation condition reporting systems with emergency management platforms such as the NYSDOT Emergency Response System. This will allow the development of coordinated multi-regional and multi-agency emergency response capabilities.

### Goals Supported

- Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.
- Goal 5. Institutionalize partnerships with internal and external stakeholders.
- Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Improve ability to respond to unplanned events or emerging priorities.

### Next Steps

- Develop and deploy tool sets that interface road condition reporting, emergency and asset management systems (multi-agencies) with the NYSDOT Emergency Response System (ERS), and RSDA functionalities.
- Expand current efforts to develop interfaces between transportation, public safety, and EMS field communication systems.
- Expand ICS training for regions and Main Office staff.
- Develop an emergency response management framework that outlines the requirements needed to support a phased deployment of both NYSDOT and agency partner vehicle operations to assist in communicating critical information on operations during emergency events.
- Update/develop a NYSDOT Emergency Operations Plan (EOP) and Continuity of Operations Plan.
- Work with the FHWA Peer to Peer program to support workshops and training with state DOTs.

### Benefits

- Enhancement of situational awareness, improvement of NYSDOT regional/MO coordinated response and asset management during emergencies; more effective levels of multi-agency collaboration in responding and managing incidents.

### Related Priorities

- Expand and enhance situational awareness tools.
- Enable Snow and Ice Operations and Weather Responsive Traffic Management (WRTM) in the Agency.

| Organizational Lead | Supporting Resources |
|---|---|
| • Emergency Transportation Operations Bureau | • Traffic Operations Bureau<br>• Regional directors, regional directors of operations, reginal emergency transportation operations staff (or regional emergency managers) |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • ICS training for NYSDOT Staff.<br>• Updated EOP. | 2019–2022 |

## 7. Develop next-generation of traveler information systems.

### Description

Traveler information is becoming personalized, multimodal, location-based, and assistive. This action develops the concept for the next generation of NYSDOT's traveler information system. This action involves exploring the current usage and insights associated with the 511NY system; exploring private sector information; and gathering input from peer agencies and the public to develop recommendations for advanced techniques for collecting real-time and predictive travel information and disseminating that most effectively to all audiences.

### Goals Supported


Goal 2. Move people efficiently.


Goal 3. Support reliable and efficient freight movement.


Goal 4. Serve as a trusted source of multimodal travel information.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Improve ability to share information as NYSDOT's responses increase in scale and complexity.

### Next Steps

- Examine current usage of the 511NY system and accompanying insights about the features and information that multimodal travelers find most important or useful.
- Conduct market research through a request for information (RFI).
- Develop a vision for a next-generation traveler information system.
- Procure next-generation traveler information services through an RFI and Request for Proposals (RFPs).

### Benefits

- Improved trust and use of NYSDOT traveler information methods and data by partners, private sector, and the traveling public.

### Related Priorities

- Implement Integrated Corridor Management (ICM) in selected corridors.

| Organizational Lead | Supporting Resources |
|---|---|
| • Office of Policy, Planning & Performance | • System Optimization Bureau<br>• Regional TMCs<br>• STICC |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • New procurement for next-generation traveler information systems | 2019–2021 |

## 8. Develop and deploy an integrated data environment for TSMO, a "TSMO Engine."

### Description

This action involves developing a "TSMO Engine," a data broker of NYSDOT data from all regions, as well as data from external sources, all accessed through standardized interfaces. This data broker will consume standard data inputs from applications, enable sharing of data among regions, make it easy to deploy best of breed applications without complex procurement specifications, and allow each region freedom to procure subsystems as desired. This proposed system will support consistent reporting of road conditions (for work zones, road weather, incidents) by transportation management center (TMC) operators and field personnel across the state. It will also provide an interface to TRANSCOM OpenReach to support both traveler information and traffic management needs.

### Goals Supported

- Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.
- Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Improve ability to respond to unplanned events or emerging priorities.
- Improve ability to share information as NYSDOT's responses increase in scale and complexity.

### Next Steps

- Develop foundational systems engineering documents for the TSMO engine including ConOps and System Requirements and procurement specifications.
- Procure and deploy TSMO engine.

### Benefits

- Greater degree of performance-based operations, and improved data sharing between partners.

### Related Priorities

- ATMS Upgrades, Integrated Corridor Management, Active Transportation Demand Management (ATDM Program).

| Organizational Lead | Supporting Resources |
|---|---|
| • Office of Policy, Planning & Performance<br>• Systems Optimization Bureau | • Regional TMCs<br>• Emergency Transportation Operations Bureau<br>• Office of Transportation Maintenance |
| **Anticipated Outputs/Deliverables** | **Timeline** |
| • RFI for TSMO Engine.<br>• Procurement package for TSMO Engine. | 2019–2020 |

## 9. Start TSMO inventory and develop transition plan to enterprise asset management system.

### Description

This action relates to getting a jump start on TSMO asset management. By leveraging existing work on the TAMS, a system developed for NYSDOT Region 11, this action assembles the available TSMO inventory across all the other regions of NYSDOT. The action will identify gaps in the inventory, work with regions to fill those gaps as much as possible, and develop a transition plan to migrate the TSMO asset inventory to NYSDOT's enterprise asset management system.

### Goals Supported

- Goal 5. Institutionalize partnerships with internal and external stakeholders.
- Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.

### Next Steps

- Enable access to an ITS Device Management Application to all NYSDOT regions.
- Collect a baseline inventory of TSMO assets.
- Develop a transition plan for migration into NYDOT enterprise asset management system.

### Benefits

- Life-cycle management of TSMO assets leads to cost efficiencies for NYSDOT.

### Related Priorities

- Enterprise asset management

| Organizational Lead | Supporting Resources |
|---|---|
| • System Optimization Bureau | • Regional traffic safety and mobility staff<br>• Office of Transportation Maintenance |
| **Anticipated Outputs/Deliverables** | **Timeline** |
| • Baseline TSMO Inventory.<br>• Transition plan for TSMO assets. | 2019–2021 |

## 10. Enable Snow and Ice Operations and Weather Responsive Traffic Management (WRTM) in the Agency.

### Description

This action enhances current snow and ice practices and weather response management tools needed to support deployment of WRTM technologies in NYSDOT. This includes both consideration of center, field and vehicle related assets and systems used for managing adverse weather conditions as well as the provision of traveler information through systems such as the Winter Travel Advisory.

### Goals Supported

Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Improve ability to respond to unplanned events or emerging priorities.
- Improve ability to share information as NYSDOT's responses increase in scale and complexity.

### Next Steps

- Develop a winter weather response management framework outlining common thresholds, performance expectations, and criteria for management of weather events.
- Pursue FHWA peer-to-peer workshops and training with experts that have deployed advanced weather response management systems.
- Continue evaluating and finalizing an approach for greater use of vehicle-based observations in snow and ice conditions.
- Work with the State University of New York (SUNY) to link the Mesonet weather forecasting system with the NPRMDS and the future TSMO engine.
- Expand and enhance the deployment of NYSDOT RWIS stations, integrated along travel corridors including the NYS Thruway.

### Benefits

- More effective and efficient response and management by NYSDOT and its Agency partners of all weather-related events.

### Related Priorities

- Expand and enhance situational awareness tools.
- Develop and deploy tool sets that interface road condition reporting with the NYSDOT Emergency Response System (ERS) which was deployed in 2018 and RSDA functionalities.
- Start TSMO inventory and develop transition plan to enterprise asset management system.

| Organizational Lead | Supporting Resources |
|---|---|
| • Office of Transportation Maintenance | • Office of Traffic Safety and Mobility<br>• Regional directors<br>• Regional directors of operations<br>• Regional TMCs<br>• Office of Fleet Administration and Support<br>• Office of Policy, Planning & Performance |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Pilot test collect of road weather and maintenance data from fleets.<br>• Plan for RWIS upgrades and enhancements. | 2019–2021 |

| 11. Define performance measures for TSMO and develop performance dashboards. | |
|---|---|
| **Description** | |
| Identifying performance measures and continually monitoring them is vital to effectively implement TMSO. The performance measures not only indicate how well the transportation system is performing, it also indicates the effectiveness of various TSMO strategies and actions. Regular monitoring of performance measures also helps determine whether changes need to be made to achieve the mobility and safety goals of TSMO. TSMO dashboards are very helpful to monitor performance measures and communicate the value of TSMO strategies and actions. | |
| **Goals Supported** | |
| Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO. | |
| **Gaps Addressed** | |
| • Create enterprise-level solutions for common requirements. | |
| **Next Steps** | |
| • Identify the TSMO Performance measures to monitor number of incidents/ incident clearance times, response time, travel time reliability, and user delay cost.<br>• Coordinate with SUNY Albany, TRANSCOM, and others for development of these performance measures and dashboards.<br>• Development of TSMO performance dashboards that are built on NYSDOT's TSMO data environment (TSMO engine). | |
| **Benefits** | |
| • Improved ability to monitor performance of TSMO across the state. | |
| **Related Priorities** | |
| • Develop and deploy an integrated data environment for TSMO, a "TSMO Engine. | |
| **Organizational Lead** | **Supporting Resources** |
| • Office of Policy, Planning & Performance | • Regional TMCs<br>• Emergency Transportation Operations Bureau<br>• System Optimization Bureau |
| **Anticipated Outputs/Deliverables** | **Timeline** |
| • Internal performance dashboard for TSMO.<br>• External performance reporting for TSMO-related performance measures. | 2019–2020 |

## 12. Implement Integrated Corridor Management (ICM) in selected corridors.

### Description

ICM brings NYSDOT together with regional partners to increase reliability, safety, and person throughput on selected high-priority corridors. Planning efforts for ICM have been underway in several corridors around the state including the ICM-495 Corridor in New York City, I-190 in Buffalo, and I-287 in Hudson Valley. The I-287 ICM effort is currently operating and can provide a model for applying these strategies in other corridors such as I-81. Further expansion of ICM deployment will provide the foundation to accelerate the adoption of TSMO data environments and decision support tools across NYSDOT.

### Goals Supported


Goal 2. Move people efficiently.


Goal 4. Serve as a trusted source of multimodal travel information.

### Gaps Addressed

- Increase deployment of proven TSMO Strategies.

### Next Steps

- Identify corridors that could benefit from implementation of ICM and coordinate with stakeholders to understand the system needs.
- Develop goals and measurable objectives, and conduct feasibility assessment.
- Develop a project management plan (PMP), System Engineering Management plan (SEMP), and concept of operations (ConOps) for the selected corridors.
- Provide technical services to support deployment of ICM strategies.

### Benefits

- Supports dynamic management of congestion and optimizing throughput.
- Encourages collaboration between various corridor agencies to manage the system.
- Supports improvements in travel time reliability on the corridor.

### Related Priorities

- Strengthen and advance capabilities of regional Traffic Incident Management (TIM) efforts.
- Integrate TSMO into NYSDOT's planning and project development.

| Organizational Lead | Supporting Resources |
|---|---|
| • System Optimization Bureau | • Office of Policy, Planning & Performance<br>• Region Traffic Safety and Mobility<br>• Regional Transit Agencies<br>• Regional TMCs |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Operational ICM systems in the state. | 2019–2023 |

## 13. Establish a statewide TSMO Steering Committee for project funding and decision-making.

### Description

A TSMO steering/implementation committee with regional and Main Office representatives will evaluate, develop, and update regional and MO roles and responsibilities including:

- Identify and coordinate a variety of funding sources to provide a more stable, sustainable, and equitable funding approach across all regions.
- Seek integration opportunities through consistent enterprise-wide standards for inventory, procurement, and deployment of TSMO equipment and services.
- Establish enterprise-wide criteria for identifying, evaluating, and selecting ITS capital projects for inclusion in the capital program across the state.
- Be TSMO champions in broader NYSDOT planning and programming decision-making.
- Oversee the implementation and updating of the Department's ITS architecture.
- Provide guidance on operational and programmatic management and direction when requested (contract approvals, project selection, and management issues and other operating decisions).
- Provide guidance on TSMO performance metrics.

### Goals Supported

Goal 5. Institutionalize partnerships with internal and external stakeholders.

Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Increase deployment of proven TSMO Strategies.

### Next Steps

- Identify NYSDOT staff for participation in the Steering Committee.
- Establish rules of practice and operating procedures for the committee.

### Benefits

- Improved cooperation between regions and Main Office in terms of TSMO projects.

### Related Priorities

- Integrate TSMO into NYSDOT's planning and project development.

| Organizational Lead | Supporting Resources |
|---|---|
| • Office of Traffic Safety and Mobility | • Office of Policy, Planning & Performance<br>• Regional Directors |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Establishment of a Steering Committee with formalized rules of operations. | 2019–2020 |

## 14. Create opportunities to link NYSDOT's TSMO-related programs and data with transit providers in New York State.

### Description

While the larger transit agencies are well established with their technology platforms and capabilities, there is a need to support small and medium-scale transit agencies as they seek to benefit from the mobility and data revolution. NYSDOT's statewide deployment of the open-source trip planner, bike maps, and park and ride lot maps provide valuable resources for transit agencies to use for their own planning and operational needs. NYSDOT's ATDM program may also provide resources in terms of marketing and outreach, which may be leveraged to support integrated mobility management for small to mid-size transit agencies.

### Goals Supported

- Goal 2. Move people efficiently.
- Goal 4. Serve as a trusted source of multimodal travel information.
- Goal 5. Institutionalize partnerships with internal and external stakeholders.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.

### Next Steps

- Identify viable support tools that small and medium-scale transit agencies can use to enhance mobility for customers.
- Engage directly with transit providers working closely with the NYSDOT transit bureau to build greater understanding of NYSDOT's TSMO tools and activities.
- Develop inventory of appropriate agencies as potential beneficiaries.

### Benefits

- Enhances planning and operational capabilities of all transit agencies.
- Expands information availability about travel choices for regional travelers.
- Supports multimodal trips and increases person throughput in critical corridors.

### Related Priorities

- Expand and enhance situational awareness tools
- Develop next-generation of traveler information systems
- Implement Integrated Corridor Management (ICM) in selected corridors
- Support Connected and Automated Vehicles (CAV) Readiness Assessment

| Organizational Lead | Supporting Resources |
|---|---|
| • Office of Policy, Planning & Performance | • Public Transportation Bureau<br>• Regional Transit Agencies<br>• Regional TMCs<br>• Office of Traffic Safety & Mobility |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Number of small and mid-size transit operators supported by NYSDOT with travel management tools including support for GTFS-RT data feeds, travel planning, and travel management support. | 2019–2020 |

## 15. Conduct a cybersecurity vulnerability assessment for TSMO assets.

### Description

Cybersecurity of TSMO assets and ITS is increasingly becoming a concern for DOTs across the nation. This action begins the process of understanding the security risks and necessary countermeasures for TSMO field devices, traffic signals, and ITS back-office equipment. This action is closely coordinated and will be conducted with the leadership of the New York State Office of Information Technology's Enterprise Information Security Office (EISO).

### Goals Supported

Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.
- Improve ability to respond to unplanned events or emerging priorities.

### Next Steps

- Work with NYSDOT OITS to identify an approach to conduct a cybersecurity assessment.
- Identify areas of concern and develop an action plan for remediation.
- Develop a process for integrating cyber security into TSMO project development and procurement specifications.

### Benefits

- Trust in TSMO infrastructure is maintained and NYSDOT's role as a trusted information provider is secured.

### Related Priorities

- Support Connected and Automated Vehicles (CAV) Readiness Assessment.
- Start TSMO inventory and develop transition plan to enterprise asset management system.
- Develop and deploy an integrated data environment for TSMO, a "TSMO Engine.

| Organizational Lead | Supporting Resources |
|---|---|
| • Emergency Transportation Operations Bureau | • New York State Office of Information Technology Services (OITS) Enterprise Information Security Office (EISO)<br>• System Optimization Bureau<br>• Regional Traffic Safety and Mobility<br>• Regional TMCs |
| **Anticipated Outputs/Deliverables** | **Timeline** |
| • Vulnerability assessment report and remediation plans (if necessary) for TSMO infrastructure. | 2019–2020 |

## 16. Integrate TSMO into NYSDOT's planning and project development.

### Description

This action involves further integrating TSMO into NYSDOT's planning and project development to ensure that as projects are planned, developed, and designed, TSMO considerations are identified and examined from early in the process. This action involves exploring business processes in planning and project development to better integrate consideration of TSMO strategies and ITS elements. For instance, design guidelines and project development templates can be updated to provide for consideration of TSMO strategies and approaches early in project development.

### Goals Supported

- Goal 5. Institutionalize partnerships with internal and external stakeholders.
- Goal 6. Support enterprise-level systems and data for a performance-driven approach to TSMO.

### Gaps Addressed

- Create enterprise-level solutions for common requirements.

### Next Steps

- Identify guidelines and manuals used in planning, project development, and design to identify opportunities to integrate TSMO and ITS considerations.
- Update relevant guidelines and manuals to reflect best practices; for instance, including a TSMO assessment as part of project design checklists.

### Benefits

- Greater consideration of TSMO in NYSDOT's project development leads to early identification of opportunities to manage the system.

### Related Priorities

- Establish a statewide TSMO Steering Committee for project funding and decision-making.

| Organizational Lead | Supporting Resources |
|---|---|
| • Office of Policy, Planning & Performance | • Systems Optimization Bureau, Engineering Division, Office of Design, Office of Construction<br>• Region Traffic Safety and Mobility |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Updated manuals for ITS/TSMO integration with NYSDOT product development. | 2019–2020 |

## 17. Expand Public Information Officer (PIO) engagement and role in TSMO.

### Description

An underutilized TSMO resource are the public information officers (PIOs) who can help provide proactive messaging to the public, explain concepts in a compelling manner to the travelers, create a two-way communication with travelers, and bring existing relationship and expertise with media outlets. The PIOs can use these capabilities to help promote TSMO strategies and educate all audiences (e.g., decision makers, users, operators, private sector).

### Goals Supported

- Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.
- Goal 5. Institutionalize partnerships with internal and external stakeholders.

### Gaps Addressed

- Improve ability to respond to unplanned events or emerging priorities.
- Improve ability to share information as NYSDOT's responses increase in scale and complexity.

### Next Steps

- Develop messaging guidelines with PIOs on weather events.
- Bring PIOs into day-to-day operations of a TMC to support information dissemination coordination.

### Benefits

- More consistent messaging before, during, and after weather events; improved public facing communications about TSMO.

### Related Priorities

- Develop next-generation of traveler information systems.

| Organizational Lead | Supporting Resources |
|---|---|
| • Main Office Communications | • Office of Policy, Planning & Performance<br>• System Optimization Bureau<br>• Regional TMC staff<br>• Regional PIOs |

| Anticipated Outputs/Deliverables | Timeline |
|---|---|
| • Regular meetings with regional PIOs on consistent messaging and communication about TSMO. Messaging will still be developed by Main Office Communications. | 2019–2020 |

| 18. Support Connected and Automated Vehicles (CAV) Readiness Assessment. | | |
|---|---|---|
| **Description** | | |
| NYSDOT, with support from partners will begin to assess how CAVs fit with other plans/efforts (e.g., Vision Zero, TSMO) and the overall TSMO vision and goals, and will identify specific needs and priorities. In particular, the effect of CAVs on existing actions (like traffic signal optimization, integrated corridor management) needs to be assessed. | | |
| **Goals Supported** | | |
| Goal 1. Enhance system safety and reliability by minimizing the impacts of weather, incidents, work zones, and emergencies.<br>Goal 2. Move people efficiently.<br>Goal 3. Support reliable and efficient freight movement. | | |
| **Gaps Addressed** | | |
| • Create enterprise-level solutions for common requirements. | | |
| **Next Steps** | | |
| • Identify TSMO areas that will eventually be affected by (or affect) CAVs, such as integrated corridor management (ICM), adaptive signal control technologies (ASCT), and active arterial management.<br>• Identify early opportunities and priorities CAV within the state, especially in the context of supporting other goals and objectives noted in this plan.<br>• Build support for interfaces for CAV data (for example integration of V2I and V2X systems with the TSMO "Engine.") | | |
| **Benefits** | | |
| • Improved safety of travel and adoption of new capabilities within the agency. | | |
| **Related Priorities** | | |
| • Integrate TSMO into NYSDOT's planning and project development. | | |
| **Organizational Lead** | **Supporting Resources** | |
| • Systems Optimization Bureau<br>• Office of Statewide Policy, Planning & Performance | • Regional traffic safety and mobility staff<br>• MPOs<br>• FHWA | |
| **Anticipated Outputs/Deliverables** | | **Timeline** |
| • CAV readiness assessment and deployment approach. | | 2019–2020 |