



NDOT TSMO Implementation

TSMO Planning and Financial Resources Processes and Procedures

Nevada Department of Transportation
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ATKINS
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ACRONYMS

ADA	Americans with Disabilities Act
ADOT	Arizona Department of Transportation
AIM	Accelerating Innovative Mobility
ATCMTD	Advanced Transportation and Congestion Management Technologies Deployment
ATDM	Active Transportation and Demand Management
AWG	Advisory Working Group
AWP	Annual Work Program
B/C	Benefit/Cost
BUILD	Better Utilizing Investments to Leverage Development
CAT	Cooperative Automated Transportation
CMAQ	Congestion Mitigation and Air Quality
CMM	Capability Maturity Model
CVSP	Commercial Vehicle Safety Plan
DOT	Department of Transportation
DPS-OTS	Department of Public Safety, Office of Traffic Safety
ELT	Executive Leadership Team
FAC	Freight Advisory Committee
FAST	Fixing America's Surface Transportation
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GARVEEs	Grant Anticipation Revenue Vehicles
GST	Governmental Service Tax
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
ICE-OPS	Interstate Condition Evaluation for Operations
IDOT	Iowa Department of Transportation
IIJA	Infrastructure Investment and Jobs Act
IMI	Initiative and Integrated Mobility Innovation
INFRA	Infrastructure Rebuilding America
IPT	Investment Prioritization Tool
ITS	Intelligent Transportation System
KSA	Knowledge, Skills, and Abilities
LCP	Life Cycle Planning
MDOT	Maryland Department of Transportation

MDTA	Maryland Transportation Authority
MODA	Multiple-Objective Decision Analysis
MPO	Metropolitan Planning Organization
NBI	National Bridge Inventory
NDOT	Nevada Department of Transportation
NHP	Nevada Highway Patrol
NHPP	National Highway Performance Program
ODOT	Ohio Department of Transportation
OTO	Office of Traffic Operations
OTS	Office of Traffic Safety
PennDOT	Pennsylvania Department of Transportation
PMS	Pavement Management System
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation
PSI	Present Serviceability Index
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RMCA	Resort Corridor Mobility Association
RRR	Resurfacing, Restoration, and Rehabilitation
RTCSNV	Regional Transportation Commission of Southern Nevada
RUC	Road Usage Charge
SDP	Strategic Deployment Plan
SEPIA	Stakeholder Engagement Plan and Interagency Agreements
SHA	State Highway Administration
SMART	Strengthening Mobility and Revolutionizing Transportation
S RTP	Short Range Transit Plan
STBG	Surface Transportation Block Grant programs
STIP	Statewide Transportation Improvement Program
TAMP	Transportation Asset Management Plan
TIGER	Transportation Investment Generating Economic Recovery
TIM	Traffic Incident Management
TIP	Transportation Improvement Program
TMC	Traffic Management Center
TOAST	Transportation Operations Assessment System Tool
TSMO	Transportation Systems Management and Operations
WP	Work Program
WSFC	Western States Freight Coalition
ZEV	Zero-Emission Vehicle

1. Introduction

Transportation Systems Management and Operations (TSMO) is an integrated set of strategies to optimize the performance of existing infrastructure by implementing different multi-modal systems, services, and projects to preserve capacity and improve the safety, security, and reliability of the transportation system while minimizing environmental impact. The goal of TSMO is to implement different cost-effective solutions to address the identified transportation challenges considering future capacity and infrastructure requirements.

TSMO has the potential to be included in any stage of a project in any department of an agency to enable informed decision-making and optimize the existing and planned strategies. Starting from the scoping stage of a project to managing funds, planning, design, construction, and maintenance, TSMO can be integrated in multiple phases of a project.

Nevada Department of Transportation (NDOT) Formally adopted the Statewide TSMO Program in January 2020. Currently, the NDOT Traffic Operations Division is leading the implementation of the TSMO Program and is responsible for TSMO implementation activities. However, input from the Division and relevant stakeholders is required to integrate TSMO in a more formal manner.

NDOT identified various action plans to implement an integrated TSMO program, including the development of a TSMO Planning and Financial Resources Processes and Procedures Plan. This plan aims to help NDOT incorporate TSMO activities into the existing planning, programming, and project development processes. Moreover, considering the current funding, the financial resources plan would support NDOT in identifying targeted funding sources for TSMO activities as well as developing effective funding strategies.

2. Research Methodology

Developing a comprehensive and systematic framework for TSMO planning and financial resources processes and procedures will help optimize the implementation of the NDOT TSMO program. In order to formulate this framework, current planning and financial practices within Nevada should be reviewed and compared with nationwide best practices. By taking this approach, potential gaps and opportunities can be identified, which can be used to build a solid foundation for suggestions.

To do so, Nevada's state, regional, and local financial programs with planning and financial processes and procedures were reviewed and their planning and financial resources policies and practices were summarized. [Appendix A](#) presents a detailed description of the NDOT state of practice.

Furthermore, to develop relevant and effective suggestions, national best practices for planning and financial processes were studied. The national state of practice contains information from five Departments of Transportation (DOT) programs, including Arizona DOT (ADOT), Iowa DOT (IDOT), Maryland DOT (MDOT), Pennsylvania DOT (PennDOT), and Ohio DOT (ODOT). The review of these programs led to the identification of successful strategies and policies, which can assist in formulating an effective plan. Appendix B discusses national best practices for TSMO planning and financial resources processes and procedures.

2.1 Analysis of NDOT Planning Processes and Procedures

[Table 1](#) maps the existing NDOT planning processes and procedures against the nationwide state of practice. This table can assist NDOT in identifying the strength areas as well as the potential opportunities to further advance its TSMO planning processes and procedures. The findings in this table are divided into three categories: developed and implemented; developed, with areas for improvement; and not developed.

Table 1: Identified Strengths and Opportunities in the NDOT Planning Processes and Procedures

STATE DOTS PLANNING PROCESSES AND PROCEDURES				
Practice	Description	Developed and Implemented		
		Developed, with Areas for Improvement	Not Developed	
		↓	↓	↓
Create TSMO-Specific Positions	The TSMO program planning can be strengthened by incorporating TSMO-specific positions within the State DOT's organizational chart. This would improve the project efficiency, facilitate planning and development processes, and create project momentum and enthusiasm.			
Create TSMO Advisory / Steering Committees	TSMO Steering Committees lead and guide the TSMO program's planning, programming, and implementation processes and evaluate the project performance. These Committees could provide practical input regarding the residents' and stakeholders' needs and concerns, which could result in the development of relevant and effective TSMO strategies.			
Set TSMO Specific Goals	Developing and implementing specific TSMO goals would result in incorporating TSMO into the existing planning, programming, and project development processes. For creating a successful planning and implementing procedure, identified program goals should cover transportation challenges and opportunities as well as reflect the priorities of public and the partners. TSMO goals provide direction for the program's development, planning, implementation, and management.			
Create Plans For Specific TSMO Workstreams	There can be significant differences in the planning procedure for various TSMO workstreams. TSMO planning practices can be implemented more effectively and efficiently by creating specific plans for each workstream. In addition to providing insight into challenges and opportunities, this approach can assist in developing suggestions and potential actions for each project.			
Share Success Stories Through TSMO Program Marketing	Through the promotion of the success of TSMO, internal and external stakeholders will become aware of its value and significance, making them more likely to incorporate it into their work. TSMO marketing can also help to secure voluntary collaboration and demonstrate TSMO dedication at the agency level.			

2.2 The Analysis of the NDOT Financial Resources Processes and Procedures

Table 2 compares the existing NDOT financial resources processes and procedures against the state of practice in other DOTs. This table illustrates the areas of strength as well as future opportunities for enhancing NDOT TSMO financial processes and procedures. The practices are divided into three categories based on their status: developed and implemented; developed, with areas for improvement; and not developed.

Table 2: Identified Strengths and Opportunities in the NDOT Financial Resources Processes and Procedures

STATE DOTs FINANCIAL RESOURCES PROCESSES AND PROCEDURES				
Practice	Description	Developed and Implemented		
		Developed, with Areas for Improvement	Not Developed	
		↓	↓	↓
Identify TSMO Funding Sources	Identifying all possible funding sources ensures the effective and continuous implementation of TSMO strategies. The development of sustainable, reliable, and sufficient funding sources is the most significant challenge in transforming transportation into reality, and it must be addressed in order to implement the TSMO program successfully.		●	
Create Unique Funding Streams for TSMO Programs	Creating unique funding streams for TSMO programs and sub-programs can facilitate the implementation of TSMO strategies and ensure their longevity within the work of the State DOT.	●		
Start with a Pilot Program for Dedicated TSMO Funding	A pilot program can assist TSMO projects in getting started and moving forward. With the temporary nature of a pilot program, its upfront costs will be lower, which will allow time for funding to be secured for the full implementation of TSMO.	●		
Develop a Metric for Project Prioritization	Funding decisions in a timely manner require an effective project prioritization mechanism. By creating an objective data-based system to rank projects and analyze their benefits and costs, State DOTs can allocate limited funding in a fair way.		●	

3. Plan Suggestions

Based on the overview of the NDOT and national state of practice, this section provides several suggestions that could be applicable to the NDOT TSMO Implementation Program with respect to planning and financial resources processes and procedures.

3.1 Suggestions for Planning Processes and Procedures

3.1.1 STRENGTHEN TSMO EVALUATION TOOL INTEGRATION

The TSMO Evaluation tool is a key aspect of the TSMO Implementation Program, which supports NDOT in formal adoption and integration of TSMO in the project planning and scoping phase. Based on the assessment of the tool and the state of practice of other State DOTs, the following suggestions are provided for NDOT to move forward:

- Actively introduce TSMO Evaluation Tool to other NDOT divisions and encourage the integration of this tool into the project scoping phase. This ensures the successful integration of TSMO strategies across NDOT, and it will also enable the divisions to share resources and maximize internal and external collaboration. In addition to the TSMO Evaluation Tool, create a TSMO project development checklist to track whether the project managers have utilized the TSMO Evaluation Tool at each stage of project development.
- Develop and/or update a database of all TSMO Evaluations, allowing the recommendations to be searchable and located on a map. The purpose of the database is to provide a timely, coordinated, and easily accessible platform for recommendations.
- Develop a smartphone- and tablet-compatible web-tool for project managers who work in the field. This tool should allow data upload and file attachment. When project managers have access to the tool on any device, they will be more motivated to document their work at every phase of the project.
- Develop a dashboard to monitor and track TSMO Evaluations.

The current version of the tool has been revised to expand the evaluation scope. With further improvements, the tool will allow access to a variety of resources within the application, which enables a more efficient evaluation process. The improvements could be developed and implemented through internal coordination between the NDOT Traffic Operations Division and other NDOT Divisions.

3.1.2 INTEGRATE THE TSMO WORKFORCE DEVELOPMENT PLAN INTO THE EXISTING PLANNING PROCESSES

NDOT has developed a comprehensive Staffing and Workforce Development Plan, which is an essential component of implementing an integrated TSMO Program. The plan is developed based on the latest research on the nationwide best practices as well as evaluating the existing conditions within NDOT. The following policies are suggested to further improve the TSMO planning processes:

- Incorporate TSMO positions into the organizational chart based on the need. The Benefit/Cost (B/C) analysis could be utilized to determine the necessity of these positions. The roles and responsibilities and the contribution of these positions to the agency's mission and vision should be clearly articulated.
- Provide training and information to all relevant NDOT team members on TSMO.
- Expand the partnership with universities to maintain engagement with students and familiarize them with current and future TSMO projects.

3.1.3 IMPROVE EXTERNAL COORDINATION WITH STAKEHOLDERS

Partnership with stakeholders is critical to the successful implementation of TSMO strategies. External collaboration and partnership will result in operating an effective transportation system that addresses the needs of various groups. As a part of the NDOT TSMO Implementation Program, TSMO Stakeholder Engagement Plan and Interagency Agreements (SEPIA) is developed to enhance collaboration with stakeholders. The main components of this plan are stakeholders' feedback, existing interagency agreements, and federal guidance documents. Based on the review of these resources, a framework is developed to achieve the TSMO Program Plan goals and objectives through enhanced collaboration. The implementation of this plan helps NDOT maximize coordination and cooperation between NDOT divisions and partnering agencies.

Based on the review of the state of practice in other State Departments of Transportation (DOT), NDOT could consider the following suggestions to improve external engagement:

- Design surveys to identify their concerns and needs. These surveys would ensure that the strategies address the key priorities of stakeholders. As a part of the NDOT TSMO SEPIA, an online questionnaire as well as a virtual interview were developed to gather feedback from stakeholders. This approach could be used to collect updated information on the needs and concerns of stakeholders.
- Assist external agencies and partners with coordinating TSMO projects and funding through the SEPIA. When stakeholders are informed about and engaged in financial decisions, they are more likely to support funding initiatives and understand the decisions when the service may be cut.

- Implement processes and programs for meetings with stakeholders in alignment with SEPIA. The benefits of these meetings include periodic communication and collaboration, opportunities to share information about the achievements and problems, and assessment of the progress toward the TSMO program's goals.
- Provide TSMO training and information to external partners. This may encourage some stakeholders to become actively involved in TSMO activities as they are more familiar with the associated benefits.
- Share the database of all TSMO Evaluations with internal and external stakeholders.
- Develop a public-facing dashboard.

3.1.4 ADVANCE MARKETING STRATEGIES

By promoting the success of the TSMO program, stakeholders can gain a better understanding of its significant role in improving the performance of transportation systems and become more inclined to incorporate it into their project development processes. NDOT has already developed strong marketing strategies to promote TSMO-focused projects and plans. However, further actions could be taken to improve these strategies. Based on the analysis of existing strategies within NDOT as well as other State DOT's marketing practices, some suggestions for future actions include:

- NDOT has developed and implemented several formalized outreach programs. These programs include the TSMO Streeting Committee meetings (which are held quarterly), developing and maintaining the NDOT TSMO website, and publishing case studies. The following strategies are suggested for the next steps:
 - Hold frequent outreach events for both public and stakeholders to understand their expectations and needs. This will build support for the operational solutions of the program. The frequency could be defined as needed or based on the scope and timeline of projects.
 - Exchange data with stakeholders.
 - Develop dashboards to share information with the public and stakeholders, as suggested previously.
 - Use of social media platforms to share information about the TSMO strategies. This provides a highly accessible outreach medium to travelers, without much investment.
 - Continue the development of case studies to garner support for more TSMO projects and plans.

The continuous and targeted marketing strategies substantially promote the use of TSMO solutions within the NDOT business processes. The suggested marketing strategies should be reviewed and updated frequently based on their performance as well as the feedback received from the audience.

3.1.5 IMPROVE INTERNAL COORDINATION WITHIN DIVISIONS

The implementation of TSMO activities requires significant coordination and collaboration between NDOT divisions. The review of the NDOT TSMO program plan indicates that, currently, the majority of coordination occurs after the project planning processes and scoping of Resurfacing, Restoration, and Rehabilitation (RRR) projects (which usually does not take operations into consideration). This results in limited integration of TSMO activities. Hence, there is an opportunity to identify approaches to incorporate TSMO strategies into divisions' projects and programs. Based on the review of the NDOT state of practice as well as best practices from other State DOTs, some suggestions for future actions include:

- Consider TSMO topics in regular division head meetings and project development meetings. This strategy is intended to educate executive management and NDOT team members about TSMO and garner support for future projects.
- The addition of TSMO topics to the manuals and guides that are currently used within the agency.

The effectiveness of TSMO activities relies on continuous collaboration and communication between divisions. Internal collaboration provides insight from all disciplines and streamlines the project development process, leading to strategies that address the most critical transportation challenges.

3.2 Implementation Roadmap for Planning Processes and Procedures Suggestions

[Table 3](#) presents the timeframe for project planning processes and procedures for TSMO at NDOT. Besides the suggested strategies, the table also includes various action items derived from the NDOT 2020 Capability Maturity Model (CMM) Workshop Technical Memorandum. The action items for the CMM workshop are based on the NDOT plan to achieve a CMM Level 3 by the end of 2024 (NDOT 2020 CMM Workshop Technical Memorandum, 2021).

Table 3: Timeframe for Project Planning Processes and Procedures

Category Suggestions	Near-Term (1-2 Years)	Long-Term (3-5 Years)	Ongoing
Strengthen TSMO Evaluation Tool Integration			
Actively introduce TSMO Evaluation Tool to other NDOT divisions and encourage integration of this tool into project scoping phase.			
Develop and/or update a database of all TSMO Evaluations.			
Develop a smartphone- and tablet-compatible web-tool.			
Develop a dashboard to monitor and track TSMO Evaluations.			
Integrate the TSMO Workforce Development Plan into the Existing Planning Processes			
Provide training and information to all relevant NDOT team members on TSMO.			
Incorporate TSMO positions into the organizational chart based on the need.			
Expand partnership with universities to maintain engagement with students and familiarize them with current and future TSMO projects.			
Improve External Coordination with Stakeholders			
Assist external agencies and partners with coordinating TSMO projects and funding through the SEPIA.			
Implement processes and programs for meetings with stakeholders in alignment with SEPIA.			
Provide TSMO training and information to external partners.			
Share the database of all TSMO Evaluations with internal and external stakeholders.			
Design surveys to identify priorities, concerns, and needs.			
Develop a public-facing dashboard.			
Advance Marketing Strategies			
Hold frequent outreach events for both public and stakeholders.			
Use of social media platforms to share information about the TSMO strategies.			
Continue the development of case studies.			
Exchange data with stakeholders.			
Develop dashboards to share information with the public and stakeholders.			
Improve Internal Coordination with Divisions			
Consider TSMO topics in regular division head meetings and project development meetings.			
Addition of TSMO topics to the manuals and guides that are currently used within the agency.			

Category

Suggestions

**Near-Term
(1-2 Years)****Long-Term
(3-5 Years)****Ongoing****NDOT 2020 CMM Workshop****Business Processes**

Communicate the TSMO Business Case at the state legislative level.

Integrate the Regional ITS Architecture and Systems Engineering Process with the TSMO Project Evaluation Tool, and document before/after lessons learned from Project Evaluation Tool deployment.

Update agency planning documents to refer to/formalize TSMO Program Plan and applications.

Performance Measurement

Gain consensus on regional TSMO performance measures and document performance metric criteria.

Document TSMO performance-based project deployment processes and procedures that are aligned region-wide.

Coordinate with regional partners for sharing performance measure data.

Gain buy-in and support from ELT to revise processes in support of performance measure needs.

Collaboration

The planning group should collaborate with Traffic Operations when planning projects for the future.

Planners should incorporate TSMO strategies into traffic modeling and other corridor study activities.

Document roles and responsibilities for TSMO implementation to be carried out by other NDOT Divisions in collaboration with the Traffic Operations Division.

Hold regular meetings with the regional working committee (with partnering stakeholders) to discuss collaborative activities such as TIM, data sharing, integrated management, and other collaborative TSMO strategies.

Established roles and responsibilities among partners should be documented and performance is tracked.

Organization & Workforce

Continuously update TSMO training with new initiatives or deployed strategies.

Include the measures of effectiveness for TSMO roles and responsibilities with annual performance development reviews.

3.3 Suggestions for Financial Resources Processes and Procedures

This section summarizes the suggestions for the NDOT five-year financial plan based on the review of nationwide state of practice and the existing financial resources processes at NDOT.

3.3.1 EVALUATE PROJECT BENEFITS

Financial evaluation is a central element of TSMO development, and B/C analysis is one of the most common approaches for this evaluation. The B/C estimation process requires careful analysis and documentation, even when considering several competing TSMO alternatives. NDOT has incorporated a B/C ratio criterion into its TSMO Investment Prioritization Tool (IPT), which is divided into three categories: Low (0-4), Mid (5-8), and High (9-12) based on the proven ratio of the proposed technology. According to the analysis of the nationwide state of practice, NDOT could consider the following suggestions for a more accurate B/C analysis:

- Develop a standalone TSMO B/C tool (which could have an Excel-based format) for the financial evaluation of recommended TSMO strategies.
- The tool could contain various benefit metrics based on the project goals and objectives.
- The tool could be designed to accept inputs, perform calculations, and provide summary outputs.
- Review and update the TSMO B/C tool to take the latest changes into account.

3.3.2 IDENTIFY FUNDING SOURCES

NDOT has not currently adopted a formalized funding process for TSMO projects and activities. Traditionally, budget allocation is project-focused; however, TSMO demands a new priority to include funding for ongoing services, deployment, operations, and maintenance of transportation systems and assets. A targeted TSMO budget allocation is one of the key components of ensuring efficient, smooth, and continuous TSMO implementation. The following sections outline the potential funding sources for TSMO programs.

3.3.2.1 FEDERAL DISCRETIONARY GRANTS FOR TSMO

The federal government provides many discretionary funding programs for projects, including TSMO improvements. There are several federal discretionary grant programs announced through the Infrastructure Investment and Jobs Act (IIJA), which is a generational investment in our nation's infrastructure and competitiveness. It provides approximately \$350 billion for federal highway programs over a five-year period (fiscal years 2022 through 2026). These grants are nothing new but the expansion of previous federal discretionary grants, including Transportation Investment Generating Economic Recovery (TIGER), Better Utilizing Investments to Leverage Development (BUILD), and Infrastructure for Rebuilding America (INFRA).

NDOT can tap into these programs for potential TSMO projects. Funding programs included in IIJA are:

- Nationally Significant Multimodal Freight and Highway project program INFRA grants
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants
- Bridge Investment Program
- Rural Surface Transportation program
- Congestion Relief program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) program
- Competitive Resilience Improvement Grants
- Healthy Streets program
- Grants for Charging and Fueling Infrastructure
- Active Transportation Infrastructure Investment program
- Reduction of Truck Emissions at Port Facilities
- Reconnecting Communities Pilot program
- Safe Streets and Roads for All program
- Strengthening Mobility and Revolutionizing Transportation (SMART) grant program

A larger project that includes TSMO components is a potential candidate for INFRA grants as it emphasizes innovation/innovative technology such as broadband deployment and Intelligent Transportation Systems (ITS). RAISE grants are for planning studies and capital investment projects in surface transportation infrastructure that will have significant impact on regional or local community. Therefore, it is a potential funding source for TSMO projects or TSMO components in planning and infrastructure investment. As TSMO components are becoming an integral part of projects, other grant programs mentioned above are well suited to be a potential funding source.

Additional grant programs including Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) and Federal Transit Administration's Accelerating Innovative Mobility (AIM) are potential grants that involve innovative ITS system strategies as TSMO components. Initiative and Integrated Mobility Innovation (IMI) grant programs are also suitable as these grants are available to deploy and demonstrate operation of advanced technologies to improve safety, efficiency, system performance, and infrastructure return on investment which is consistent with TSMO definition.

3.3.2.2 FEDERAL FORMULA GRANTS FOR TSMO

Federal formula grant programs fund various types of projects, including projects relevant to TSMO. Formula grant programs include training, education, and workforce development activities as eligible expenditures which are in line with TSMO's CMM process. Federal formula grant programs can be pursued separately or in combination with federal discretionary grants. In most of the formula funding grants, federal participation will be around 80% of total capital costs and the rest (20%) should be local match. In general, formula grant funding can be allocated to State DOTs or Metropolitan Planning Organizations (MPO), based on their application.

Some of the funding sources that NDOT has access to from the Federal Highway Administration (FHWA) which are appropriate for TSMO projects are:

- Congestion Mitigation and Air Quality (CMAQ) – TSMO projects that improve traffic flow and signalization, construct High Occupancy Vehicle (HOV)/High Occupancy Toll (HOT) lanes, and projects with TSMO strategies that mitigate congestion, improve air quality, and improve incident and emergency response time.
- Surface Transportation Block Grant programs (STBG) – TSMO projects including highway operational improvements, traffic management projects, ITS capital improvements, and employee work force and training programs.
- STBG: Transportation Alternatives Subcategory – TSMO projects supporting non-motorized elements can be eligible as part of larger project.
- National Highway Performance Program (NHPP) – TSMO components or projects that support operational improvements on the National Highway System would be eligible for this funding. Some of the project or project component examples include traveler information systems, integrated traffic control systems, incident management programs, and traffic surveillance and control equipment.
- Highway Safety Improvement Program (HSIP) – TSMO projects eligible for funding under this program include projects which involve collecting, analyzing, and improving safety data, projects which involve installation of priority control system for emergency vehicles at signalized intersections, and projects which involve traffic enforcement programs and work-zone safety related programs.

3.3.2.3 WORK PROGRAM FUNDING FOR TSMO

NDOT's Work Program (WP) includes list of transportation projects that are 100% state funded Investments. Annual Work Program (AWP) lists projects that NDOT intends to work on during the current fiscal year. The project types predominantly included are capital improvements and the typical projects included in WP are:
(Ref: <https://www.dot.nv.gov/home/showpublisheddocument/19746/637607212904670000>)

- Mobility
- Pavement – Preservation
- Bridge – Preservation
- Betterments
- Operations
- Safety
- Maintenance
- Environmental
- Road Transfers

TSMO components can be incorporated as part of any of the above-mentioned WP projects with some of them explicitly prioritizing TSMO projects, whereas others incorporate TSMO components in a broader scope of work.

3.3.2.4 ADVISORY WORKING GROUP (AWG) 2021 AB-413 FUNDING RECOMMENDATIONS

A 29-member AWG was formed to collectively offer to the Nevada Legislature (AB-413) an action plan to deploy numerous short-term and long-term funding mechanisms, capable to provide sustainable funding for the state beyond the fuel tax revenue. The AWG brainstormed and reviewed a wide range of possible revenue mechanisms (30 options), and finally provided a few recommendations on a course of action for the Nevada Legislature to consider. The funding mechanism was assessed based on guiding principles including financial sustainability, revenue sufficiency, user equity, social equity, flexibility considering the needs of system users across all modes of transportation, greenhouse gas reduction goals, and transparency/efficiency and ease of compliance. The details of all recommended revenue mechanism options, including important conditions or limitations were documented in the 2022 Nevada Sustainable Transportation Funding Study. The summary of recommended revenue mechanism options is:

- Mileage-based Road Usage Charge/fee (RUC) to capture road usage by zero-emission vehicles (ZEV). In the interim, Nevada should enact a special registration fee on ZEVs, collected at the time of vehicle registration renewal.
- Replace the fuel tax with a per-mile road usage charge on all new vehicles by 2035 to offset declining revenue from the gas tax.
- Increase fuel tax (which has not been increased since 1993), index portion of state and federal taxes that are not already indexed, enable county commissions to enact inflation adjustments to the county's portion of fuel taxes, increase vehicle registration fees for highway purposes, and 100% of the State portion of governmental services tax (GST) proceeds to go to the State Highway Fund.
- A special commission should be created to dive further.
- NDOT/MPOs and local governments should conduct assessments of current and future transportation projects and funding, and regularly share updates on funding with elected officials, stakeholders, and the public.

3.3.3 DEVELOP A PILOT PROGRAM FUNDING FOR TSMO

Moving forward, starting a pilot program with dedicated funding is the best strategy to integrate TSMO components into larger projects. Because of funding limitations, developing and integrating TSMO strategies into projects is a major challenge for local agencies. At the State DOT level, a targeted funding could be programmed to implement a pilot project to help MPOs, cities, and counties. Based on our review, some of the other state pilot programs include Mobility dashboards, smart lane program, freeway safety patrol, traffic incident management, systems/technology upgrades, and development of training programs.

3.4 Implementation Roadmap for Financial Resources Processes and Procedures Suggestion

[Table 4](#) demonstrates the timeframe for the 5-year financial plan for TSMO at NDOT. In addition, the table contains strategies from the NDOT 2020 CMM Workshop Technical Memorandum (NDOT 2020 CMM Workshop Technical Memorandum, 2021).

Table 4: Timeframe for Financial Resources Processes and Procedures

Category Suggestions	Near-Term (1-2 Years)	Long-Term (3-5 Years)	Ongoing
Evaluate The Project Benefits			
Develop a standalone TSMO B/C tool.			
Review and update the TSMO B/C tool.			
Identify Funding Sources			
Determine potential sources for dedicated TSMO funding.			
Develop Pilot Program Funding For TSMO			
Start a pilot program with dedicated funding.			
NDOT 2020 CMM Workshop			
Systems and Technology			
Prioritize ITS on all projects if they align with the regional ITS Architecture and track the performance of the projects.			
Implement functional performance-based criteria for the maintenance activities of deployed TSMO systems.			
Organization & Workforce			
Allocate funding to develop and implement new TSMO positions or roles to support ongoing and new TSMO efforts.			
Develop and share benefit/cost scenarios of new and existing TSMO roles.			

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Appendix A.

State of Practice: NDOT

Successful TSMO programs substantially rely on comprehensive, systematic, and effective planning and financial resources procedures. A thorough and efficacious plan would enable the agency to advance TSMO projects and strategies that address the most significant transportation challenges. Moreover, a financial plan ensures the critical financial resources, strategies, and approaches are identified, developed, and managed throughout the project's life (FHWA, 2014). Numerous statewide, regional, and local projects and plans with robust planning and financial resources processes have been implemented within the state of Nevada. In order to provide suggestions for the NDOT TSMO Implementation Program, these documents are reviewed in this section, and the relevant best practices were utilized to develop suggestions for this plan.

A.1. Existing Relevant Planning Processes and Procedures (TSMO and Non-TSMO)

This section focuses on the review of best planning practices for both TSMO and non-TSMO programs. Even if TSMO is not directly mentioned in such plans, the plans are included in this section due to their relevant strategies and approaches to addressing transportation challenges.

A.1.A. Set Program Vision, Goals, and Performance Measures

The success of a TSMO program substantially depends on the establishment of a clear vision, as well as the development and implementation of specific goals and relevant performance measures. This would enable the agency to align the TSMO strategic values with the statewide strategic values. In addition, it determines the contribution of TSMO strategies and activities to the project planning and development processes.

- The One Nevada Transportation Plan defined the vision of developing a safe, connected, and multimodal transportation network that links Nevadans and supports the state's economic vitality. This program set six strategic goals based on this vision, including enhancing safety, preserving infrastructure, optimizing mobility, transforming economies, fostering sustainability, and connecting communities. Ongoing performance measurement, assessment, and improvement processes are also developed to measure the performance against goals and assist in selecting future activities (One Nevada Transportation Plan, 2020). The plan focuses on promoting multimodal transportation networks as well as enhancing the transportation systems' short-term and long-term reliability through improved system management and operations. These goals are directly in alignment with TSMO activities.

- The Nevada Strategic Highway Safety Plan developed the goal of zero roadway fatalities by 2050. For the plan, five performance measures are defined: number of fatalities, number of serious injuries, fatality rate, serious injury rate, and non-motorized fatalities and serious injuries. Furthermore, focusing on the 13 emphasis areas, four Key Areas were developed, including safer roads, vulnerable road users, safer drivers and passengers, and impaired driving (Nevada Strategic Highway Safety Plan, 2021). The plan contains strategies, such as promoting multimodal systems and traffic incident management, which are essential components of TSMO-focused strategies.
- The 2040 Regional Transportation Plan for Washoe County identified several goals for investment in urbanized areas. These goals include improving safety, integrating land use and economic development, promoting healthy communities and sustainability, managing existing systems efficiently, integrating all types of transportation, focusing on regional connectivity, promoting equity and environmental justice, improving freight and goods movement, and investing strategically. Relevant performance measures were also identified for these goals (2040 Regional Transportation Plan, 2017). The plan provides recommendations for the implementation of TSMO-related strategies, such as transit improvement strategies (e.g., developing the Short Range Transit Plan [SRTP]) and complete streets.
- The Nevada State Freight Plan has the vision to establish a competitive advantage by creating crossroads of national commerce within a multimodal system of superior safety, condition, and performance. For this vision, eight strategic goals were identified, which address economic competitiveness, mobility and reliability, safety, infrastructure preservation, technology, environmental sustainability and livability, funding, and collaboration. For each goal, pertinent objectives with performance measures and targets were determined (Nevada State Freight Plan, 2017). This plan contains TSMO-focused truck management strategies, such as autonomous/connected vehicle systems and freight truck parking expansion and Intelligent Transportation System (ITS) program. The program also argues that improving truck movements will result in a more integrated multimodal configuration that would increase Nevada's transportation capacity and efficiency.
- The vision for the NDOT Statewide TSMO Program Plan is to deliver a safe and connected multimodal transportation system that connects Nevadans and supports the state's economic vitality through TSMO solutions. For this vision, eight high-level goals are set. These goals include enhancing safety, preserving infrastructure, enhancing reliability, optimizing mobility, optimizing customer service, enhancing collaboration, fostering sustainability, and strengthening TSMO integration. The document also includes several performance measures associated with each goal (NDOT Statewide TSMO Program Plan, 2020). The analysis of the NDOT Statewide TSMO Program Plan could assist in identifying the strengths and opportunities of the existing TSMO planning and financial processes and provide valuable insights into potential improvement.

A.1.B. Develop a Robust TSMO Workforce

Hiring employees with a wide range of expertise, as well as training, educating, and retaining new and existing workforce, would improve the TSMO program's efficiency and facilitate its planning and implementation process.

- The NDOT TSMO Staffing and Workforce Development Plan includes the steps for creating a robust TSMO workforce. The Plan includes suggestions on recruiting a TSMO workforce, training and educating new hires and existing team members, retaining the expert workforce, and collaborating with educational institutes. To expand the TSMO workforce, five TSMO-specific positions were also defined, which will be added to the next phase (Phase 3) of the NDOT organizational structure update. The addition of these positions could substantially support the implementation of TSMO strategies (NDOT TSMO Staffing and Workforce Development Plan, Under Revision).

A.1.C. Create Technical/Advisory/Steering Committees

Technical, advisory, or steering committees can significantly enhance the success of a TSMO program. These committees, which typically are responsible for planning, programming, and implementing the projects, could support the development of plans that address the needs and concerns of a broader range of stakeholders, agencies, and the public.

- For the One Nevada Transportation Plan, The Transportation Planning Advisory Committee, which includes state and local agencies serving as the Steering Committee, was formed. This committee recommended on main plan components and ensured the plan addresses the needs of more than just transportation agencies. Moreover, The Planning Executive Group, consisting of all four of the state's Metropolitan Planning Organization (MPO) partners, as well as Federal Highway Administration (FHWA) representatives, was formed for this program to serve as the Technical Advisory Committee. This committee ensured the plan has the ability to represent Nevada's general transportation system (One Nevada Transportation Plan, 2020).
- The Nevada Strategic Highway Safety Plan established separate task forces for four Key Areas (safer roads, vulnerable road users, safer drivers and passengers, and impaired driving). The task forces, which include members from various agencies, will oversee the collaboration and monitor progress in implementing strategies and action steps. Strategies and action steps were developed by gathering input from Chairs, Vice Chairs, Action Step Leaders, and all members of the Task Forces (Nevada Strategic Highway Safety Plan, 2021).
- For the Regional Transportation Commission of Southern Nevada (RTC SNV) Transportation Investment Business Plan, the Long Range Plan and Finance Committee was formed with two responsibilities. The first role is to review the financial status of the Resort Corridor Mobility Association (RMCA) to help and guide the Executive Director and direct the Association's Treasurer on the financial standing, budgets, expenditures, etc., and to develop the annual budget. The committee's second role is to develop, monitor, and review the annual Association's Long Range Plan (Transportation Investment Business Plan, 2016).

- The Nevada State Freight Plan created a significant stakeholder involvement plan to gather input during the program's development. The involvement includes meetings and interviews with approximately 75 public agencies and private organizations. The outcome of this outreach was the formation of the Freight Advisory Committee (FAC) (the representative cross-section of public and private freight stakeholders within Nevada), the Western States Freight Coalition (WSFC) (a coalition for peer exchange between the State DOT freight program leads of 11 Western states), and regional focus groups (Nevada State Freight Plan, 2017).
- As a part of the NDOT Statewide TSMO Program Plan, the NDOT TSMO Champion Team, composed of employees from various disciplines within NDOT as well as other agencies, was formed. This committee, which now continues its duties as the TSMO Steering Committee, is responsible for the implementation and administration of the TSMO Program in collaboration with Executive Leadership Team (ELT) (NDOT Statewide TSMO Program Plan, 2020).

A.1.D. Coordinate with NDOT Divisions

As stated before, the NDOT Traffic Operations Division is currently leading TSMO activities. However, the TSMO program should be implemented in coordination with other NDOT divisions to ensure alignment with the existing and future statewide planning documents and programs.

- The One Nevada Transportation Plan was led by NDOT Planning Division and involved meaningful input and collaboration from key partners and other agency partners usually not represented in transportation planning (One Nevada Transportation Plan, 2020).
- The Nevada Strategic Highway Safety Plan is directed by NDOT in coordination with the key stakeholder including Nevada Department of Public Safety and Office of Traffic Safety (DPSOTS). The program is in line with other statewide planning programs and provides recommendations for statewide traffic safety plans and local plans. The plan also directs the fund investment for three federally-funded programs. These programs include Highway Safety Improvement Program (HSIP) managed by NDOT, Highway Safety Plan (HSP) managed by the Office of Traffic Safety (OTS), and Commercial Vehicle Safety Plan (CVSP) managed by the Nevada Highway Patrol (NHP) (Nevada Strategic Highway Safety Plan, 2021).
- For the NDOT Transit Plan, NDOT Multimodal Planning Division's Transit Office contributes to the corridor- and long-range planning studies to make sure that the rural transit providers' needs are addressed and required projects are developed (NDOT Transit, 2020).
- The Nevada State Freight Plan was developed in close partnership with NDOT and the FAC, which was formed as part of the planning process. The plan is also aligned with previous programs conducted by the state of Nevada in evaluating and planning the freight infrastructure (Nevada State Freight Plan, 2017).

A.1.E. Create a Stakeholder/Public Involvement Plan

Engaging agency partners, private-sector stakeholders, and residents establishes a crucial foundation for the success of TSMO program. Interaction and involvement with these groups throughout the planning process will help ensure the plan accurately reflects the input of diverse communities, industries, transportation providers, and traveling public.

- As a part of the One Nevada Transportation Plan, 13 mobile outreach meetings were conducted across the state where residents, stakeholders, and policymakers were asked to join the focused discussions about the future of Nevada's transportation systems. Furthermore, a survey with more than 1,700 respondents from all areas of the state was conducted. The survey asked about the most critical trends for individuals as well as their preferred One Nevada Transportation Plan goals. Moreover, several focus groups with subject-matter experts were gathered to identify how future changes affect Nevada's society and transportation needs. They also discussed the strategies to help prepare Nevada for these upcoming changes (One Nevada Transportation Plan, 2020).
- The NDOT Transit Plan also emphasizes the need for support from stakeholders, local governments, local businesses, medical communities, and residents to develop an efficient rural public transportation system. For this program, the plan development is reached with a formal contribution of other state agencies, regional and local governments, local transportation entities, and the public (NDOT Transit, 2020).

A.1.F. Determine the Opportunities for TSMO Program Integration

A systematic approach or tool should be developed to identify the opportunities for the integration of the TSMO program's components into the agencies' short- and long-range plans and projects. This approach enables the agency to produce more holistically-designed projects during the project development process and promotes the creation of innovative and cost-effective solutions for transportation challenges while strengthening the agency's technical expertise.

- As a part of the NDOT Statewide TSMO Program Plan, NDOT TSMO Evaluation Tool was developed to determine opportunities for incorporating TSMO strategies into NDOT business processes. This process will support the formal consideration of the TSMO program and ensure every project will have maximum potential contribution toward accomplishing TSMO goals and objectives. NDOT has not officially utilized the tool; however, when the tool is officially adopted, the Traffic Operations Division will champion the evaluation efforts. The goal is that all NDOT divisions adopt and incorporate the evaluation tool into their business processes. (NDOT Statewide TSMO Program Plan, 2020).

A.1.G. Develop Marketing Strategies

Through TSMO marketing strategies, stakeholders will learn who benefits from the strategy, how they benefit, and how transportation systems will improve as a result. The targeted marketing strategies promote consistent TSMO-focused activities.

- As part of the NDOT Statewide TSMO Program Plan, a comprehensive TSMO Business Case for Divisions Fact Sheets was developed and designed to demonstrate TSMO's contribution in addressing existing and future statewide transportation challenges. Furthermore, various case studies have been published to promote the successful implementation of TSMO strategies. Five case studies have been prepared to date, and they are all intended to familiarize executive managers, stakeholders, and local residents with the advantages of TSMO Strategies and encourage the development of future TSMO-focused projects. As another marketing strategy, NDOT has developed and maintained the TSMO website (<https://nvtsmo.com/>) containing the case studies as well as other TSMO documents, initiatives and strategies, online sources, and training opportunities. This website ensures easy access for internal and external stakeholders to TSMO information (NDOT Statewide TSMO Program Plan, 2020).

A.1.H. Create an Asset Management Planning Program

Developing an asset management plan to preserve the existing and future investments in transportation infrastructure would improve the agencies' planning and programming capabilities and maximize the performance of the transportation systems.

- The Nevada Transportation Asset Management Plan (TAMP) discusses the planning process for maintaining, preserving, operating, and rehabilitating the state of Nevada infrastructures, including pavements, bridges, and ITS assets. NDOT is one of the few states that has incorporated ITS into the TAMP and has developed investment strategies for maintaining ITS assets. This plan intends to improve the ability to forecast asset deterioration and develop processes to determine the effectiveness of maintenance activities. A life cycle planning (LCP) analysis, which can result in pro-active maintenance of assets, was conducted to preserve asset value, extend ITS life cycle as long as possible, and minimize the total costs of preservation, repair, or maintenance of Nevada's Infrastructure (Fully-Compliant Transportation Asset Management Plan, 2019).
- To manage and maintain its infrastructure, NDOT has incorporated different means to optimize the performance of its assets. The Nevada State Preservation Report focuses on the performance of state-maintained roadways and bridges. For pavements, NDOT utilizes Pavement Management System (PMS) which includes the inventory of existing pavements and condition. This system enables users to make informed decisions about how to maintain and improve the condition of roadway. Along with PMS, Present Serviceability Index (PSI) is also used to evaluate the performance of different types of roadways and in turn identify repair needs. In case of bridges, NDOT uses the bridge inventory data and sufficiency rating to assess the condition of a bridge and prioritize preservation funds (Nevada State Preservation Report, 2021).

A.2. Existing Relevant Financial Resources Processes and Procedures (TSMO and Non-TSMO)

This section summarizes the best practices of TSMO plans as well as those programs that considered TSMO-related solutions as their policy for managing Nevada's transportation challenges.

A.2.A. Identify Potential Funding Sources

The development of sustainable, reliable, and sufficient transportation funding is the most significant challenge in transforming transportation to reality (Nevada State Freight Plan, 2017). Therefore, these challenges must be addressed in order to implement TSMO program in an effective and continuous manner.

- The One Nevada Transportation Plan listed the current funding sources in Nevada, which include State Highway Fund (e.g., state gas tax, impact fees, sales tax, etc.), Federal Aid Program (Fixing America's Surface Transportation [FAST] Act), and other sources (highway revenue bonds) (One Nevada Transportation Plan, 2020).
- RTCNV Transportation Investment Business discussed the available funding and financial sources for its Transportation Investment Business Plan. The funding sources include federal funding and financing (e.g., Federal Transit Administration (FTA) Urbanized Area Funding Program, FHWA Congestion Mitigation and Air Quality Improvement Program, etc.), state and local funding and financing (e.g., Governmental Services Tax, Sales Tax, etc.), and other funding sources (such as congestion pricing, Las Vegas Monorail Company, Farebox Revenue, etc.) (Transportation Investment Business Plan, 2016).
- The Nevada TAMP also discusses funding resources (State Highway Fund and Federal Aid Programs), expected revenue, and expected annual expenditures for construction, maintenance, and rehabilitation of assets, including pavements, bridges, and ITS assets (Fully-Compliant Transportation Asset Management Plan, 2019).
- The Nevada State Freight Plan discusses the current and potential funding sources at the state and local levels, such as state and local gas taxes, state and special fuel taxes, motor career fees, etc. The report also lists the available financing tools, such as Grant Anticipation Revenue Vehicles (GARVEEs), Tax Credit Bonds, Bank debt, etc. (Nevada State Freight Plan, 2017).

- The NDOT Statewide Transportation Improvement Program (STIP) specifies FHWA-funded programs and the associated budgets. These programs include National Highway Performance Program, the Surface Transportation Block Grant Program, the National Highway Freight Program, the Highway Safety Improvement Program, the Congestion Mitigation and Air Quality (CMAQ), and the Transportation Alternatives Program. The document also includes a list of FTA-funded programs (NDOT STIP, 2018).
- As stated in the Nevada State Preservation Report, various funding sources for Pavement and Bridge maintenance include Federal Aid, State resources like gasoline and special fuel taxes, vehicle registration fees, commercial carrier fees and driver license fees (Nevada State Preservation Report, 2021).

A.2.B. Determine Funding Strategies

To meet the transportation needs in the future, it is crucial to develop strategies that increase revenue generated from existing funding sources, create additional revenue sources, and maximize the benefit and use of current funds.

- The One Nevada Transportation Plan discusses how increasing population and tourism, potential reductions in future fuel tax revenue, and uncertainties around the operations and maintenance costs of emerging transportation technologies will probably result in a funding shortfall for NDOT. This highlights the need to identify funding strategies to meet performance targets in the future. These strategies include maximizing existing funding sources as well as innovative funding and financing mechanisms. The latter includes targeted grant programs in conjunction with other jurisdictions, enhanced fee system strategy successes, road usage charging, alternative-fuel vehicle fees, tolling or managed lanes, and corridor-wide projects for maximum impact (One Nevada Transportation Plan, 2020).
- The Nevada Sustainable Transportation Funding Study, developed by AWG, is a comprehensive study aimed at addressing the challenges faced by Nevada's transportation system in terms of funding and sustainability. The study focuses on identifying appropriate mechanisms for generating transportation revenue that are best suited for Nevada's unique transportation needs. The study includes a range of recommendations that collectively offer a blueprint for the Nevada Legislature to deploy multiple funding mechanisms. The recommendations provide a roadmap that can provide the desired financial sustainability for Nevada's transportation system over the course of the next 10 years or so years (Nevada Sustainable Transportation Funding Study, 2022).

A.2.C. Develop Project Prioritization/Investment Strategies

The available funding sources should be allocated in such a way that facilitates an efficient and need-based decision-making process. This could be accomplished by prioritizing projects based on the TSMO program's overall vision and goals as well as intended performance targets.

- TAMP contains extensive information on investment strategies for assets based on the type of activity (reconstruction, preservation, maintenance, and rehabilitation) for the 10-year period (2017-2026). This plan utilized a financial consequence-based project prioritization process for pavement management. The projects are prioritized based on the proactive strategy of maintaining pavements in Fair or Better condition rather than waiting until pavements deteriorate to Poor conditions. For bridges, a set of fiscal scenarios are developed to explore various alternatives for future total bridge reinvestment funding (i.e., bridge replacement expenditures, excluding routine maintenance costs). These scenarios determine the 10-year capital costs and the percentage of bridges falling into the category of Poor or Good Conditions under this budget. For ITS assets, the investment strategies forecast the deterioration of the devices and determine the 10-year investment needs to maintain the current levels of service (Fully-Compliant Transportation Asset Management Plan, 2019).
- The RTC SNV Transportation Investment Business Plan applied a two-tiered evaluation process to identify the transportation solutions most appropriate for the core area. The Tier 1 analysis identifies the most critical mobility areas (i.e., travel corridors that have the highest demand and those where mobility bottlenecks most impact the free flow). The Tier 2 analysis involves reviewing available travel demand data and other sources. Then, potential solutions for each mobility focus area are identified by weighing alternatives according to broadly crafted criteria (Transportation Investment Business Plan, 2016).
- The 2040 Regional Transportation Plan for Washoe County included four programmatic investments aligned with its principles and goals. These investments focus on accessibility improvements under the Americans with Disabilities Act (ADA), pedestrian and bicycle facility improvements, traffic signals and ITS operation, and pavement preservation. For each investment, annual funding will be programmed, and the potential improvement areas will be identified (2040 Regional Transportation Plan, 2017).
- The Nevada State Freight Plan used a Multiple-Objective Decision Analysis (MODA) tool to prioritize projects for four regions across the state— Las Vegas, Reno-Sparks, Carson City, and rural areas. The prioritized list was then revised based on the input from FAC, NDOT, public agency partners, and key industry stakeholders. The list also is separated into three prioritization categories: critical, very important, and important (Nevada State Freight Plan, 2017).

- The One Nevada ELT Update discusses the One Nevada Process, which identifies and funds the best projects to achieve One Nevada Goals. This process includes long-range need identification, needs validation, mid-range program level prioritization, unconstrained project list, STIP and Annual Work Program (AWP) project prioritization, and STIP and AWP harmonization. The STIP/AWP Prioritization procedure ranks projects based on their ability to satisfy One Nevada Goals and Cost-Effectiveness. Then, using STIP/AWP Harmonization procedure, the projects' program is harmonized based on funding eligibility, readiness, performance, and geographic distribution (One Nevada ELT Update, 2021).
- The NDOT STIP Prioritization Criteria developed several criteria for the project prioritization based on One Nevada Goals. The document contains a detailed description of each criterion and, if applicable, the mathematical equation for the criterion (NDOT STIP Prioritization Criteria, 2021).
- As a part of the NDOT Statewide TSMO Program Plan, the TSMO Investment Prioritization Tool (IPT) was developed to enhance the project selection procedure by prioritization based on their relevance to NDOT TSMO goals and other criteria. The tool assigns an overall score to the project and prioritizes the projects from the highest to the lowest score. TSMO IPT has now been formally adopted by the NDOT Traffic Operations division. The TSMO IPT was developed as a part of the TSMO Program Plan and then formally adopted by the ITS Strategic Deployment Plan (SDP) for the first time, but it has also been integrated into other ITS Planning efforts and device-specific master plans, as well as the NDOT Smart Mobility Initiative.

NDOT utilizes different preservation strategies to maintain its pavements and bridges in good condition over time. Depending on the type of roadway (interstate, major arterial, minor arterial and local road) preservation priorities are identified. Interstate highways like I-15, I-80 and I-580 are given highest priority because of federal requirements, interstate importance, and high speeds. For other categories of roadways, based on PSI rating, preservation activities are prioritized and continued over time if it fails to meet performance goals. Like pavements, preserving bridge infrastructure is one of NDOT's highest priorities. Bridge preservation is determined based on National Bridge Inventory (NBI) data which includes location, condition, repair needs, and other relevant information. Along with this inventory, a list describing earthquake susceptibility and risks is also used. This data allows NDOT to determine preservation priorities and keep its bridges in good condition. (Nevada State Preservation Report, 2021).

Appendix B.

State of the Practice: Precedent from Other State Departments of Transportation

The ability to successfully implement a TSMO program is dependent upon effective procedures for both project planning and financial resources. Comprehensive and practical planning and financial resources programs help NDOT integrate TSMO activities into the existing planning and project development procedures, and it also ensures that sustainable funding sources and strategies are developed. Furthermore, the plan assists the agency in implementing the TSMO program in a continuous and timely manner. In order to craft the most supportive suggestions for planning and financial resources processes and procedures for the state of Nevada, the state of the practice was analyzed through the lens of five state Departments of Transportation (DOT) with developed planning and financial resources procedures for TSMO programs: Arizona DOT (ADOT), Iowa DOT (IDOT), Maryland DOT (MDOT), Pennsylvania DOT (PennDOT), and Ohio DOT (ODOT). Through this research, successful strategies and best practices were identified and used as the basis of suggestions for NDOT's TSMO implementation effort.

B.1. Best Practices for Project Planning Processes and Procedures

A well-designed planning program is essential for the successful implementation of the TSMO program. This section summarized the best nationwide planning practices for the TSMO program. The review of other State DOTs' practices could help NDOT learn about the potential challenges and opportunities to formulate an effective plan.

B.1.A. Create TSMO-Specific Positions

The success of a TSMO program can be elevated by developing organizational staffing within State DOTs, which is specific to TSMO activities. This can help to improve project efficiency and create project momentum and enthusiasm (FHWA, 2020).

- ADOT developed a TSMO division in 2015 which was comprised of seven different groups including: traffic maintenance; traffic management; systems management; business administration; operational traffic and safety; systems maintenance; and systems technology. The TSMO division has assisted NDOT in implementing TSMO through different aspects, and one of its main focuses was restructuring existing positions. The restructuring included training, maintaining, and retaining TSMO technical employees as well as developing new positions based on Knowledge, Skills, and Abilities (KSA). The restructure of existing positions and responsibilities supported ADOT's efforts to adjust the agency's priorities and objectives for TSMO planning and project development (FHWA, 2019).
- IDOT created the Office of Traffic Operations (OTO) which hosts the bulk of TSMO related responsibilities. The majority of TSMO planning and operations activities are centered within the OTO. The leaders in this office oversee four key areas, including traffic operations systems and technical services, traffic incident and emergency management, traffic management center services, and traffic operations research/ decision support. Based on the area type, leaders' responsibilities include plan development for stand-alone and mainstreamed ITS deployment, critical project planning and deployment, design TSMO-related training courses, and coordination with educational institutions to support operational decision making. (Iowa DOT, 2016).
- MDOT created a new senior position, the MDOT State Highway Administration (SHA) Program Manager. The responsibilities of this position would focus largely on facilitating institutional and programmatic integration of TSMO strategies into existing MDOT SHA offices and programs. This position also works in close coordination, collaboration, and communication with other MDOT SHA Offices, Districts, Maryland Transportation Authority (MDTA), and MDOT MTA in executing the TSMO Program. (Maryland DOT, 2018).
- ODOT created an Office of Traffic Management, which includes the statewide Traffic Management Center (TMC) and Operations Programs, a Performance Measures section, and a Planning for Operations section. The Planning for Operations section focuses on the capital improvements and is responsible for creating and managing the data-driven decision-making investment process for TSMO projects. (Ohio DOT, 2020).

B.1.B. Create TSMO Advisory/Steering Committees

State DOTs have implemented and utilized TSMO advisory and steering committees both in addition to, and in place of, dedicated TSMO offices or teams. These committees are generally composed of team members from a variety of departments and oversee and guide the TSMO program's planning, programming, and implementation processes and evaluate the project performance. These committees could provide valuable input regarding the needs and concerns of a wide range of residents as well as stakeholders, which could result in the development of more practical and effective TSMO strategies.

- To work in tandem with the Office of Traffic Management, ODOT implemented an advisory committee specific to TSMO project efforts which was made up of a diversity of ODOT employees from various disciplines. This committee attended several workshops for the development of the core product (Ohio DOT, 2020).
- In addition to the MDOT State Highway Administration (SHA) program manager position, MDOT has implemented a senior TSMO executive committee to identify and apply TSMO strategies where applicable. This executive committee works to analyze existing TSMO components in each discipline like operations, maintenance, planning, and construction and develops strategies to optimize project performance. In support of the executive committee, they created various multi-disciplinary task forces relevant to different program areas including business processes, technology, connected vehicles, work zones, etc. comprised of officials from different offices. These task forces will develop the implementation plans and present its recommendations to the executive committee which in-turn provide strategic guidance for those to be implemented (FHWA, 2019).

B.1.C. Set TSMO-Specific Goals

By developing and implementing specific TSMO goals, TSMO can be inserted into the existing planning, programming, and project development processes utilized within the organization (FHWA, 2020). For creating a successful planning and implementing procedure, identified program goals should cover transportation issues and opportunities and reflect the priorities of both public and the partners. TSMO goals provide direction for the program's development, planning, implementation, and management, and they are the key to achieving the future vision for the transportation system.

- ADOT developed a set of annual TSMO specific goals for each department. There are performance measures associated with each of these goals and based on these measures, scoring is performed to determine the level of completion for the identified target (FHWA, 2019).

- IDOT created and published a set of six high-level strategic goals and objectives intended to integrate TSMO practices throughout the work of IDOT. These goals included:
 - Safety – reduce crash frequency and severity
 - Reliability – improve transportation system reliability, increase system resiliency, and add highway capacity in critical corridors
 - Efficiency – minimize traffic delay and maximize transportation system efficiency to keep traffic moving
 - Convenience – provide ease of access and mobility choices to customers
 - Coordination – engage all State DOT’s disciplines, and external agencies and jurisdictions to proactively manage and operate the transportation system
 - Integration – incorporate TSMO strategies throughout State DOT’s transportation planning, design, construction, maintenance, and operations activities (Iowa DOT, 2016).

B.1.D. Create Plans for Specific TSMO Workstreams

The planning procedure for TSMO workstreams can be significantly different. By creating separate plans and guidebooks as needed, the TSMO planning process can be implemented more effectively and efficiently. The separate workstream can provide useful information on challenges, opportunities, recommendations, and actions for different projects (Iowa DOT, 2016). They could also encourage stakeholders to adopt TSMO strategies for their independent projects (Pennsylvania DOT, 2018).

- IDOT created a series of eight service layer plans which provide more detailed recommendations and actions specific to each identified service area which include: Traveler Information; Traffic Incident Management (TIM); ITS and Communications Systems; Work Zone Management; Emergency Management; Cooperative Automated Transportation (CAT); Active Transportation and Demand Management (ATDM); and the TMC. Each of the eight service layer plans includes a discussion and analysis of the specific opportunities and challenges; an existing conditions assessment; a gap analysis; recommendations; and a comprehensive five-year plan cost estimate (Iowa DOT, 2016).
- PennDOT developed the TSMO Guidebook, of which Part 1 is on the focus area of Planning. This document was designed to allow access to the various planning processes required for successful TSMO strategies. It lays out the typical documents for program development and planning which are utilized by Pennsylvania planning partners and describes how TSMO solutions can be integrated into each program. It shares how TSMO solutions can be implemented throughout a variety of independent projects and how project stakeholders could be encouraged to consider TSMO Solutions as part of their standard design process (Pennsylvania DOT, 2018).

B.1.E. Share Success Stories Through TSMO Program Marketing

Marketing the success of TSMO can help to make sure that key internal and external stakeholders all understand the value of this work and are willing work to integrate it into their work. This can help to secure voluntary cooperation and can demonstrate an agency-level commitment to TSMO (FHWA, 2020).

- ODOT created a platform to publicly market the success of its TSMO program, which includes the publication of project-specific case studies. These infographic documents were designed to develop an understanding of the importance of TSMO and garner support for the next project or program by demonstrating asset optimization to the public. These marketing materials are designed for a diverse audience including ODOT executive management, locals, and the general public (Ohio DOT, 2020).

B.2. Best Practices for Financial Resources Processes and Procedures

Developing a robust and comprehensive financial plan is inevitable for the successful implementation of the TSMO program. This section summarizes the best nationwide financial practices for the TSMO program. The review of other State DOTs' practices could help NDOT to be informed about the potential challenges, gaps, and opportunities.

B.2.A. Identify TSMO Funding Sources

Agencies utilize a variety of funding models to fund a considerable portion of their TSMO activities. They use variable funding sources for TSMO to achieve the goals of State DOTs. Agencies identified the following funding sources for various TSMO activities:

- Federal grants, CMAQ
- Highway Safety Improvement program
- Metropolitan Planning Funds
- General Fund
- Agency indirect Funds, Highway
- User Revenue Fund
- Surface Transportation Block Grant Program
- Sponsorships (safety service patrol)
- State Planning and Research Funds, Safety Funds
- Regional Taxes
- Fuel Tax
- AWG AB-413

An agency's determination of funding and distribution is based on agency structure and their funding models. Agencies primarily use three funding models, including (1) federal funds, (2) state and local funds, and (3) regional organizations (NOCOE TSMO Summit, 2019).

- **Funding Model utilizing Federal Funds** – the factors contributed to success in funding TSMO are: 1) dedicated funds for TSMO set aside within capital budget, 2) TSMO champions established at every phase of capital project, and 3) enhanced collaboration with State DOT divisions to ensure TSMO is adopted and maintained through budget approval process. Examples of State DOTs utilizing federal funds are Maryland, Tennessee, Michigan, and Pennsylvania.
- **Funding Model utilizing State and Local funds** – TSMO funding is based on the priorities of the governing body and the State DOTs. Some states, for example Delaware, which fund TSMO directly from their capital budget program have flexibility in how they integrate TSMO into their transportation systems. Other states, including Iowa DOT, Maricopa County DOT, and Washington DOT, are more reliant on the priorities of a governing body such as commissions, board of supervisors, and state legislature in how funds are allocated to TSMO projects.
- **Funding Model utilizing Regional Organizations** – regional organizations granted authority to distribute funds are key for the adoption of TSMO. Regional organizations hold the responsibility of implementing concepts inherently linked to TSMO, such as congestion management, congestion mitigations, and air quality programs. These organizations are able to adopt and adapt policies that prioritize the strategies of TSMO tied to the funding they distribute. Through this, local cities and counties receive funding and adopt TSMO. Atlanta Regional Commission, Mid-America Regional Council, and North Central Texas Council of Government have access to fund local initiatives or projects that are not federally funded. One example is using Transportation Planning funds for TSMO which allows adoption of TSMO practices early in the planning process.

B.2.B. Create Unique Funding Streams for TSMO Programs

FHWA has recommended that State DOTs invest 5% of their total budgets into TSMO related expenditures (FHWA, 2019). One way to successfully abide by this recommendation is to create unique funding streams for TSMO Programs and sub-programs. This can help to implement TSMO programs and ensure their longevity within the work of the State DOT (Pennsylvania DOT, 2018).

- ADOT created the Smart Highway Technology Investments sub-program as part of their five-year funding program. The Smart Highway Technology Investments sub-program is intended to support Information Technology Systems across the state, which directly feeds into ADOT's ITS master plan. Initial funding to be allocated is determined to be 5 million dollars per year (FHWA, 2019).

- PennDOT developed a dedicated and separate fund for TSMO related expenditures which has allowed for flexibility to plan for, construct, and implement TSMO projects. Several sources contribute to the fund for the TSMO program. For example, Pennsylvania State Planning and Research Program funds are used for program center and district funding as well as for the Regional Unified Planning Work Program, whereas federal and state capital Transportation Improvement Programs (TIP) funds in combination with Pennsylvania State Planning and Research Program funds are used to pay for TSMO related planning studies (Pennsylvania DOT, 2018).

B.2.C. Start with a Pilot Program for Dedicated TSMO Funding

Starting with a pilot program can help TSMO projects get started and move forward, and this can prove the need for a dedicated TSMO funding program. Because a pilot program is initially temporary, its upfront costs will be much lower, allowing time to secure a larger funding stream for the full TSMO Program.

- ODOT created a dedicated funding source for TSMO projects and project development costs. To gain support, it started with a pilot-type project (e.g., variable speed limit pilot, pilot project with DriveWyze to share safety critical messages to truck drivers in-cab) that included small amounts of initial funding which was intended to seed a series of pilot efforts and test the TSMO process (Ohio DOT, 2020).
- Maryland, Pennsylvania, and Tennessee each set a dedicated and separate fund for TSMO expenditures, allowing for the flexibility to plan, construct, and implement initial or separate TSMO projects needed for their systems.

B.2.D. Develop a Metric for Project Prioritization

Project prioritization is critical to help make key funding decisions quickly. By creating an objective data-based system to rank projects and analyze their benefits and costs, State DOTs can allocate limited funding in a fair way.

- IDOT developed the Interstate Condition Evaluation for Operations (ICE-OPS) tool which can be utilized to prioritize TSMO related investments in the state's interstate system by evaluating corridors based upon nine different operations-oriented criteria in order to determine which have operational challenges (Iowa DOT, 2016).
- ODOT created the Transportation Operations Assessment System Tool (TOAST) which is a data-driven metric for project prioritization that scores applicable roadway segments on a variety of factors. In the end, this identifies poor performing segments within the Ohio State Highway system to further examine for problems and potential countermeasures. Data points included: travel time performance, bottlenecks, incident clearance time, secondary crashes, volume per lane, freight corridors, and safety performance (Ohio DOT, 2021).
- ODOT is in the process of developing a complex yet easy to use TSMO Benefit/Cost spreadsheet tool that accepts inputs, performs calculations, and provides summary outputs to help understand the potential benefits of various TSMO projects (Ohio DOT, 2020).



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