

NDOT Statewide TSMO Program

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ATKINS

Member of the SNC-Lavalin Group



Why are we here?

- Update on TSMO Progress
- Update on our TSMO Program Plan Development
- Next steps

What is TSMO?

Transportation Systems Management & Operations


“Integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system”



TSMO is necessary, because:




Population growth to 4.3 million by 2026




Driest state of the nation



16% of roads maintained by NDOT



Projection of over \$24 million for bridge preservation by 2020



Tourism based economy



80% federal owned lands



VMT
Minimum increase of 24 billion by 2028



Fatality rate between 20% to 40% above national rate



Population centers are spread across many miles

“The Silver State is nation’s **fastest growing state.**”

The U.S. Census Bureau

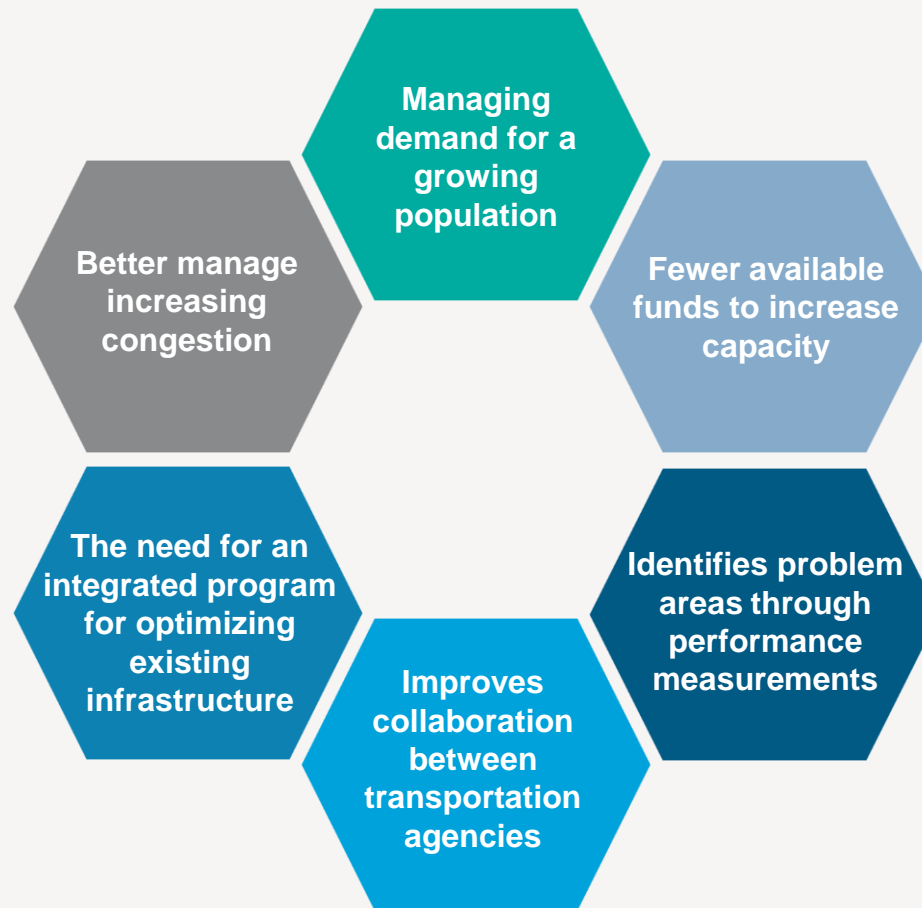
“Regardless of whether it is a focus or not, the way in which **transportation systems** are operated **affects how people and communities interact** with those systems [and it is] linked to **livability and sustainability concerns.**”

Source: <https://ops.fhwa.dot.gov/publications/fhwahop12004/c1.htm#s4>

“NDOT recognizes that **we cannot continue to build our way out of congestion**, we need to find ways to make our existing transportation system work better.”

Source: Nevada STP through 2028

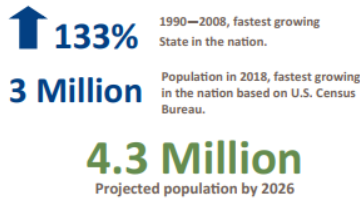
Why TSMO?



NDOT TSMO Business Case

Current Challenges

Populations



Need:

- Increase in demand, congestion, and delay
- Reduction of capacity, transportation safety, and reliability

Benefit: Implement solutions on existing roadways and collaborate within NDOT to include TSMO strategies such as Traffic Incident Management, Work Zone Management, Special Event Management, and Road Weather Management as well as the design of new infrastructure that can increase efficiency, reduce congestion and crashes, and increase the reliability of NDOT roadways to help to accommodate this growing population.

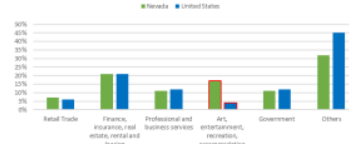
Ohio—Kentucky—Indiana Regional Council of Governments benefits from TSMO strategies:

- Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) program yielded a benefit of 12:1, while the capacity-adding project would have had a benefit of only 1:1:1.
- Additionally, the ARTIMIS program cost was 1/20 the cost of the capacity-adding project.

Tourism-Based Economy

Service sector employs about **half of Nevada's workers**

17.5% of Nevada GDP



Need:

- NDOT must provide, maintain, and operate a safe, reliable, and efficient transportation network for its workers and tourists.

Benefit: Easily implementable and cost-effective TSMO strategies such as real-time traffic information to plan efficient and reliable work trips, encouraging ridership on public transportation to reduce the number of vehicles on the road, and providing safe alternatives such as connected pedestrian and bicycle paths will help to reduce congestion and subsequent crashes.

The **Colorado DOT** benefits from TSMO strategies:

- High benefit-cost ratios typically 10:1 and as much as 40:1
- Readily implementable in less time (usually within 12 months) and for less money than adding lanes
- Highly visible, many times but not always, and noticeable improvements
- Quantifiable reduction in delay and improvement in travel time reliability
- Measurable safety-related improvements
- Improvements that continue to provide value even when long-term construction projects are completed

Congestion and Associated Costs

\$121 B In wasted time and fuel cost in U.S. per year.

\$1,400 & 60 hrs Cost of congestion to average driver in Nevada annually.

\$1.6 Billion Value of lost time and fuel in Nevada



Roadway incidents account for: 25% of travel delay, 4 minutes for every minute of congestion, and 2.8% increased chance of secondary incident.

Need:

- Billions in wasted time and vehicle operating cost
- Hundreds of lost lives
- Increased chance of secondary incidents

Benefit: TSMO focuses on easily implementable and cost-effective solutions that have measurable benefits to existing roadways and maximize the efficiency of new infrastructure. Solutions such as Traffic Responsive Freeway Ramp Metering can decrease delay and increase trip reliability, which in turn reduce traffic crashes.

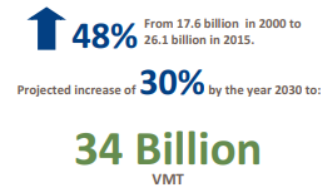
The **Pennsylvania DOT** benefits from TSMO strategies:

- Incident Response Management reduced incident response times by 8.7 minutes, incident clearance times by 8.3 minutes, and hours of delay by 547,000 hours per year, with a total monetary savings of \$6.5 million per year.

Nevada WayCare pilot program:

- The WayCare Pilot Project aims to reduce incident response times by leveraging real-time predictive analytics to identify high-risk incident locations so that agencies such as NDOT, DPS-NHP, and RTC FAST can take proactive preventative measures accordingly.

Vehicle Miles Traveled (VMT)



Need:

- With VMT demands increasing at an alarming rate, the need for efficient and reliable roads to accommodate this demand is paramount.

Benefit: Improvements to non-motorized facilities (pedestrian and bicycle paths) to reduce the demand on motorized facilities, switching mode choices (bus rider or ride share) to reduce the number of vehicles on the roadway, real-time traffic information to help with trip pre-planning, and trip rerouting due to congestion or incidents will help to make the roadway more efficient and reduce the potential for traffic crashes.

Washington DC Multimodal Transportation:

- Washington DC area decreased daily VMT by approximately 14,000 miles through the use of TSMO strategies such as Multimodal Transportation Management.

NDOT Advanced Traffic Management:

- NDOT is currently implementing an Advanced Traffic Management System on I-15 as part of Project Neon. This system will inform drivers of incidents on the corridor, helping them make informed decisions to choose a safer and shorter route to their destination, thereby reducing the chance of secondary crashes. Similar systems have seen a reduction in secondary accidents of up to 20%.

TSMO's Contribution

NDOT TSMO Business Case

Current Challenges

Deficient Roads and Bridges

\$3.2 Billion

Annual cost to Nevada motorists due to inadequate roads.



\$24 M

Deficit has been projected in bridge preservation by 2020.

Need:

- NDOT's yearly operating budget is not sufficient to keep up with operations and maintenance, let alone to keep up with the demands for new infrastructure.

Benefit: TSMO tries to focus on easily implementable, low-cost, high-return solutions with highly visible results. When these low-cost solutions produce the desired results, it has the potential to save money, which then can be reallocated to help solve more problems.

NDOT I-515/215 Restriping:

- In 2018, NDOT restriped the I-515/I-215 interchange for the southbound to westbound movement. This solution improved roadway efficiency, delayed the need for major rehabilitation and reconstruction, increased safety, and improved mobility at the cost of approximately \$800,000, which was substantially lower than the cost to rebuild the entire interchange.

Safety

According to STP in 2008, Nevada's fatality rate was **More than 20%** above national rate.



329 People died in Nevada in 2016.

\$2.4 B

Economic cost of traffic crashes in 2014.

\$906 M

Annual cost to Nevada motorists from medical costs, lost productivity, etc.

Need:

- Traffic crashes have a demonstrable negative effect on the operations of NDOT roadways and cost billions of dollars to the economy.

Benefit: TSMO focuses on increasing the efficiency of roadways, reducing congestion, and helping to eliminate the causal factors of these crashes. It is most effective on reducing the secondary crashes that are associated with the congestion that results from the primary crash. Through Integrated Statewide Traffic Incident Management Programs and real-time traffic monitoring, these primary crashes can be identified and cleared quickly.

Traffic Incident Management (TIM):

- Nevada DOT implemented this effective TSMO strategy to more efficiently detect, respond to, and resolve traffic incidents to restore traffic capacity as safely and quickly as possible through planned and coordinated processes between various public agencies and private sectors.

Trucks and Freight Movement

The efficiency of the transportation system is critical to the health of the state's economy in Nevada. The key to success is the level of access and convenience for customers and markets.

\$144 Billion

Goods and products are shipped mostly by truck to and from the state of Nevada.

73%

of goods and products are carried by trucks annually.

Need:

- Negative effect on the economy of Nevada.
- Delay has a negative effect on the cost of goods and products.

Benefit: Several TSMO strategies can be implemented to help provide a reliable and efficient roadway system for trucks. Each dollar spent on typical road, highway, and bridge improvements results in an average benefit of **\$5.20** in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs, and reduced emissions. TSMO strategies are expected to greatly increase this average benefit.

Wyoming Freight:

- Truckers use a dedicated radio band on SiriusXM Radio that provides them with Real-Time Traffic Information on WYDOT roads. This service increases trip reliability and allows the industry to make informed decisions on their routes.

Smart Truck Parking Systems:

- These types of real-time systems allow truckers to more efficiently plan their routes and determine where they can safely park and rest between pick-ups and deliveries. The State of Michigan is currently implementing this TSMO strategy with much success throughout the state. To view this parking data from MDOT, please visit [MiDrive](#).

Asset & Performance Management

NDOT Asset Management Program has identified

\$23 Billion

replacement cost for pavements, bridges, and ITS assets.

Over 20%

of state pavements are more than 10 years old.

Most of the state bridges have already or will soon exceed their design life of **50 years**

\$1.21 B

or approximately 24% of the NDOT's annual budget in preservation activities between 2017 to 2027 to extend the assets' lives.

Need:

- Cost to maintain is increasing while funding is stagnant.
- To efficiently maintain infrastructure, NDOT needs to develop a comprehensive database and management strategies to establish priorities.

Benefit: TSMO strategies will help NDOT to more efficiently spend their limited funds on their aging infrastructure. The benefits of Asset Management include:

- Improves and embraces decision-making based on long-term life-cycle cost considerations.
- Allows NDOT to efficiently prioritize maintenance projects.
- Increases safety and reliability of the transportation system.

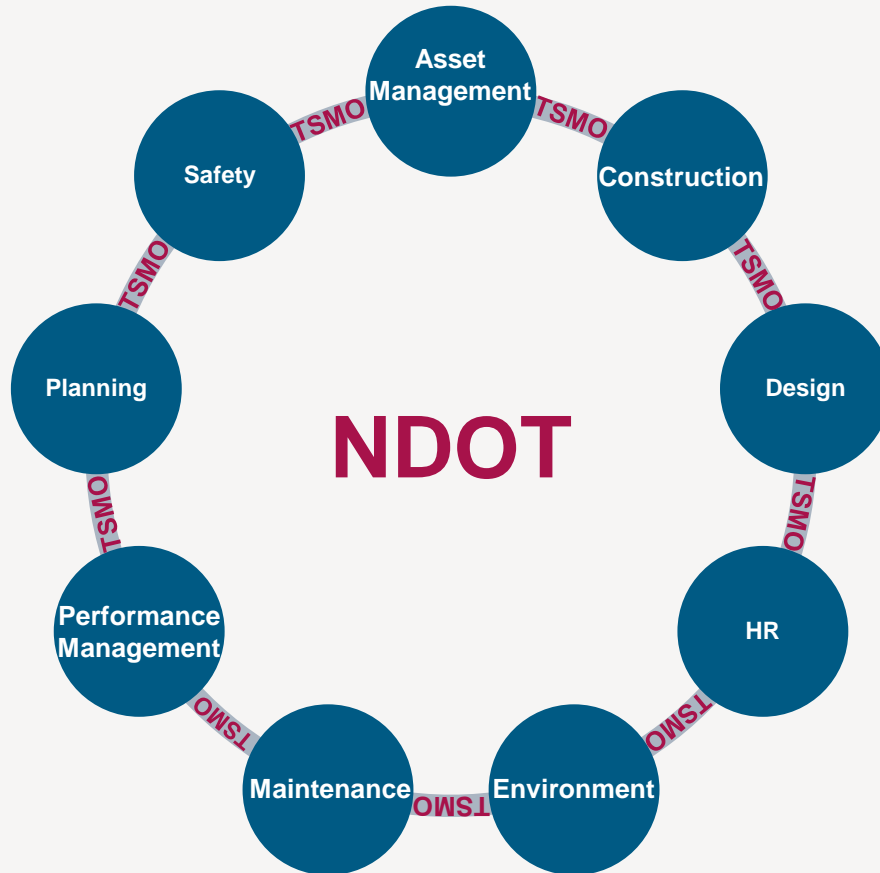
NDOT ITS Asset Management Database and Dashboard:

- NDOT's Traffic Operations developed a comprehensive database of ITS and communication devices. This database provides real-time information on the conditions and performance of ITS assets that helps to efficiently operate NDOT roadways.
- NDOT Transportation Asset Management Plan (TAMP):**
- NDOT developed the TAMP that has prioritized roadway, bridge, and ITS maintenance projects and outlines specific performance measurements and metrics to maintain assets more efficiently.

TSMO's Contribution

Connecting TSMO at all DOT Levels

Fact Sheets by FHWA

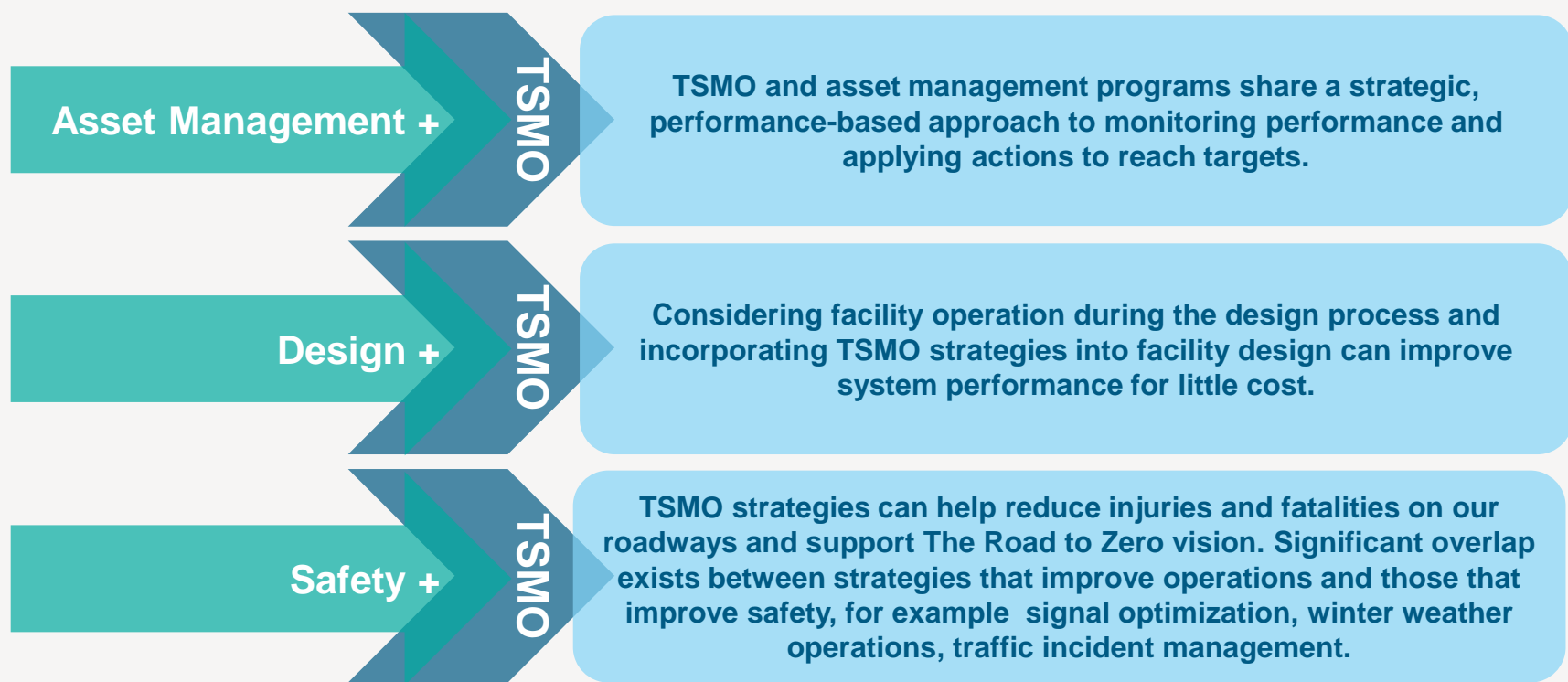


TSMO and these other disciplines can be carried out more effectively if the connections between these areas are strengthened.

Source: https://ops.fhwa.dot.gov/plan4ops/focus_areas/integrating/tsmo_factsheets.htm

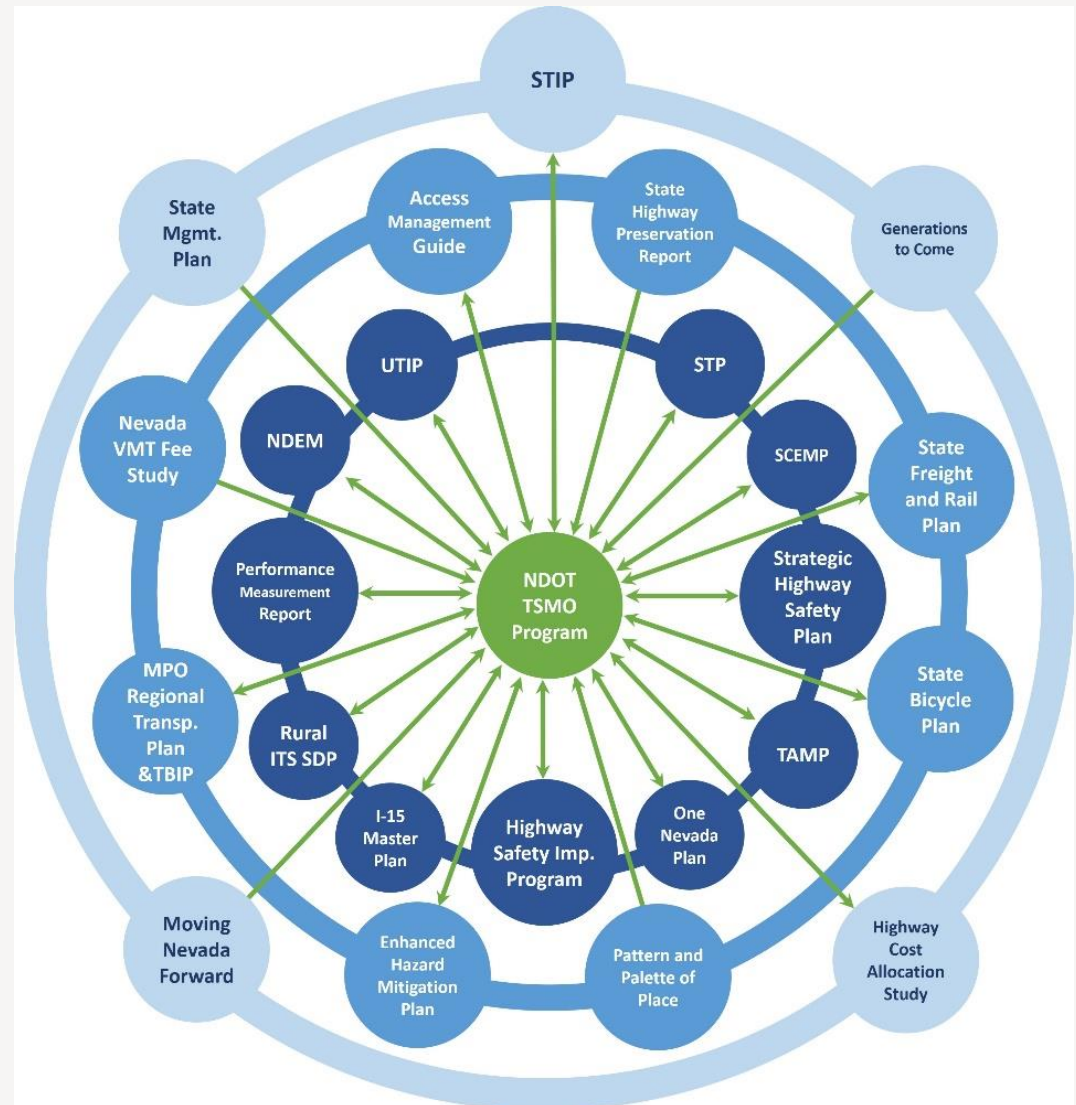
Connecting TSMO at all DOT Levels, Examples

Fact Sheets by FHWA



How Does TSMO Program Relate to Existing Plans and Documents

- Circles represent the relationship: *the darker the blue, the stronger the relationship*
- Arrows represent the flow of information: *either one way or both ways*



NDOT TSMO Program Plan Components

TSMO Program Plan

Strategic Elements

All levels of NDOT

- 1- Business Case for TSMO
- 2- TSMO Vision, Mission, Strategic Goals and Objectives

What?

Programmatic Elements

Agency Leadership

- 1- TSMO Program Objectives
- 2- Organizational Structure
- 3- Business Processes
- 4- Resource Management
- 5- Communication and collaboration
- 6- Actionable Items
- 7- Investment Prioritization Tool
- 8- TSMO relationship with existing long-range plans
- 9- TSMO Tool
- 10- TSMO Champion Team

How?

Tactical Elements

Staff involved with TSMO

- 1- TSMO Projects and Mobility Strategies
- 2- Funding, Locations, Implementation Timeframes, etc.

Where and When?

TSMO Vision and Mission

NDOT Vision:

To be a leader and partner in delivering effective transportation solutions for a safe and connected Nevada.

TSMO Vision:

Deliver a safe and connected multi-modal transportation system that links Nevadans and supports the state's economic vitality through TSMO solutions.

NDOT Mission:

Provide, operate, and preserve a transportation system that enhances safety, quality of life and economic development through innovation, environmental stewardship and a dedicated workforce.

TSMO Mission:

Proactively manage, operate, and improve the transportation system through the integration of TSMO throughout NDOT.



TSMO Strategic Goals and Objectives



Enhance Safety

Reduce crashes, injuries, and fatalities.



Preserve Infrastructure

Maintain TSMO assets to preserve investments.



Optimize Mobility

Maximize system efficiency across all modes of transportation.



Foster Sustainability

Develop a sustainable transportation system through sustainable design, operations, and maintenance.



TSMO Strategic Goals and Objectives



Enhance Reliability

Improve economic competitiveness and enhance quality of life through consistent travel times.



Optimize Customer Service

Provide timely and accurate travel information to internal and external customers to enable informed decision-making.



Enhance Collaboration

Maximize coordination and cooperation between NDOT divisions and partnering agencies to proactively manage and operate an integrated transportation system.



Strengthen TSMO Integration

Incorporate and prioritize TSMO as a core objective in NDOT's planning, design, construction, operations, and maintenance activities.



Programmatic Elements

Element	Description
TSMO Program Objectives	Defines key program objectives and how they will be incorporated within NDOT's current business.
Organizational Structure	Provides a clear organizational and leadership structure to implement TSMO and advance a TSMO culture.
Business Processes	Includes the specific activities required for and related to decision making to deliver a successful TSMO program.
Resource Management	Includes consideration of the required staffing and financial resources to implement TSMO.
Communication and Collaboration	Identifies the essential strategies to develop and maintain both internal and external communication and collaboration with stakeholders.
Investment Prioritization Tool	Outlines a decision-making process to identify the priorities for project planning, design, and implementation.
Actionable Items	Outlines specific immediate, short-term and long-term action items.
TSMO Relationship with Existing Long Range Plans	Outlines how TSMO will be aligned and integrated into current plans and programs.
TSMO Tool	Evaluates all projects within NDOT to identify opportunities for integrating TSMO solutions.
TSMO Champion Team	Designated staff (TSMO champions) responsible for the implementation and administration of the TSMO Program.



TSMO Program Objectives



Enhance Safety

- Reduce the number of crashes.
- Reduce state's fatality rate.
- Reduce the number of secondary crashes.



Preserve Infrastructure

- Preserve and maintain the transportation system.



Optimize Mobility

- Optimize efficiency of the highway transportation system.
- Maximize efficiency of all modes of transportation.



Foster Sustainability

- Increase multi-modal travel.



TSMO Program Objectives



Enhance Reliability

- Improve and optimize travel time reliability.
- Increase transportation system resilience.
- Reduce delay during special events.



Optimize Customer Service

- Provide timely and accurate travel information to all transportation users.



Enhance Collaboration

- Collaborate across divisions and districts.
- Collaborate with external partner agencies.
- Coordinate with neighboring states to proactively manage common transportation routes.



Strengthen TSMO Integration

- Integrate TSMO into existing NDOT policies, plans, and procedures
- Coordinate TSMO strategies with external partners

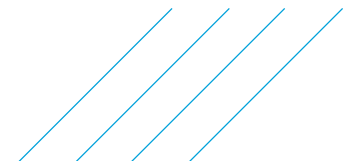


Programmatic Actionable Items

Programmatic Elements	Objective
Organizational Structure	To accommodate TSMO in a more formalized manner.
Business Processes	To develop TSMO processes and structured tasks related to performance-based and informed decision-making.
Resource Management	<ul style="list-style-type: none">• To develop staffing and workforce with appropriate TSMO knowledge and skills.• To ensure evaluation of both available and required resources to efficiently identify areas of investment for TSMO.
Communication and Collaboration	To appropriately coordinate TSMO activities in delivering TSMO goals and objectives.

Actionable items and implementation timeframes have been identified for each element. The timeframes include:

- Immediate: Actions to be completed in less than a year
- Short-term: Actions to be completed within a 2-year timeframe
- Long-term: Actions to be completed within a 5-year timeframe



TSMO Investment Prioritization Tool (IPT)



To prioritize projects efficiently, allocate resources, and ensure alignment of the division's efforts with the TSMO Vision, Mission, and Goals and Objectives.

IPT Criteria

- ✓ Strategic goals
- ✓ Project drivers
- ✓ Strategic value
- ✓ Return on Investment (ROI)—high, mid, low
- ✓ Available resources (including funds and staff)
- ✓ Dependencies and/or limitations
- ✓ Business risks
- ✓ Value to Internal and External Partners
- ✓ Value to Consumers and Service Users



IPT Table

Project/Services/Activities	Project Prioritization Criteria									
	Alignment with TSMO Strategic Goals and Objectives				Cost	Implementation	Dependencies, Business Risks, and Limitation	Risk Severity	Return on Investment	Comments
	Enhance Safety Reduce crashes, injuries and fatalities (0-1 Points)	Optimize Mobility Maximize system efficiency across all modes of transportation (0-1 Points)	Enhance Reliability Improve economic competitiveness and enhance quality of life through consistent travel times (0-1 Points)	Preserve Infrastructure Maintain TSMO assets to preserve investments (0-1 Points)	\$0 - \$2 Million = 3 Points \$2 - \$5 Million = 2 Points > \$5 Million = 1 Point	Short-Term (within one year) = 3 Points Intermediate (within 2 years) = 2 Points Long-Term (within 5 years) = 1 Point	What is the level of risks and degree of impact? Examples: legal compliance, operational, stakeholders/public involvement, timing, data sources, technology, etc.	High = -2 Point Moderate = -1 Points Low = 0 Points Based on Dependencies, Business Risk, and Limitations	(DO NOT FILL IN) The higher the score, the higher return on investment. (Max 10)	Are there other factor that need to be taken in consideration?
Smart Work Zone	1	1	1	0	3	3	Construction crews limited to manage smart work zone technologies. Performance measure reporting. Is there a good return on investment?	0	9	Not staffed appropriately to manage at HQ and district level. Should have standard specifications.
Road Weather Management Programs	1	1	1	1	2	3	Communications infrastructure, Connected Vehicles and standards	-1	8	
ITS Data Base		1	1	1	3	1	Data sources, Coordination with stakeholders,	0	7	If done in house TOTS does not have the staff
Freight Management	1	1	1	1	1	1	Communication infrastructure (including network dependencies), Technology, User culture	0	6	
Active travel demand management	1	1	1	0	1	1	Coordination with stakeholders, Data sources, Available infrastructure	0	5	
Transit Signal Priority		1	1	0	2	1	Technology, Coordination with stakeholders, Operational, Local master agreements.	-1	4	
Managed Lanes		1	1	0	1	1		-2	2	

Tactical Elements

Strategies	Project, Services, or Activities	Location (specific or district or statewide)	Year	Cost (\$ range)	Responsible Party/Parties	Targeted Strategic Goal	Targeted CMM Dimension
				< \$100,000			
				\$100,000 to \$500,000			
				\$500,000 to \$1Million			
				> \$1M			
Smart Work Zone	iCone in Southern Nevada	Interstate 215	2019	< \$100,000	NDOT/RTC	Safety, Reliability, Mobility, Customer Service, TSMO Integration	Collaboration, Systems & Technology, Performance Measurement
		Interstate 15	2020	< \$100,000			
		Interstate 95	2021	< \$100,000			
Wrong Way Driver Detection	Wrong Way Driver Detection System Installation	Interstate 80	2019	< \$100,000	NDOT	Safety, Customer Service, TSMO Integration	Collaboration, Systems & Technology, Performance Measurement
Roadside Design Improvements at Curves	Speed Warning and Active Flashing Chevrons	Interstate 80	2024	\$350,000	NDOT, D3	Safety, Reliability, Mobility	Systems and Technology, Collaboration



The path forward ...

- Review and comment on the Draft NDOT TSMO Program Plan document
- Finalize and adopt the TSMO Program Plan
- Formal internal training on TSMO
- Integration of the TSMO Program in NDOT

Thank you for your time

Want PDH's?

1. Name at least 3 of the 8 TSMO Strategic Goals
2. What does IPT stand for?
3. How many elements are in the NDOT TSMO Program Plan?
4. How many home wins will the Oakland Raiders have next year?

