NDOT STATEWIDE TSMO PROGRAM

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Transportation Systems Management and Operations Training

NDOT TSMO

TSMO Training Module 102

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Module 2

Transportation Systems Management and Operations

- Section 00 / **TSMO Overview**
- Section 01 / **Strategic Elements**
- Section 02 / **Programmatic Elements**
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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?

Section 01

Strategic Elements

NDOT TSMO Program Plan Components

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Where and When?

NDOT TSMO Business Case

- NDOT developed a TSMO Business Case in 2019 to help identify current and future transportation challenges.
- The TSMO Business Case was updated in 2023 to reflect the latest data and information.

WHY TSMO

POPULATIONS

CURRENT CHALLENGES

↑133% 1990—2008, fastest growing State in the nation.

3 Million Population in 2018, fastest growing in the nation based on U.S. Census Bureau.

4.1 Million
Projected population by 2040

NEED:

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

TSMO'S CONTRIBUTION

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

CURRENT CHALLENGES

Service sector employs about
half of Nevada's workers

Tourism sustains
22.4%
of all jobs in Nevada

NEED:

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

TSMO'S CONTRIBUTION

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 pedestrian and bicycle paths will help to reduce congestion and subsequent crashes.

The Colorado DOT benefits from TSMO strategies such as the Freeway Service Patrol, I-70 Peak Period Shoulder Lane, and Colorado Bottleneck Reduction Alternatives (COBRA) Project. These projects have:

- 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

CURRENT CHALLENGES

↑$101 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:

- Wasted time and vehicle operating costs
- Hundreds of lost lives
- Increased chance of secondary incidents

TSMO'S CONTRIBUTION

BENEFIT:

TSMO focuses on easily implementable and cost-effective solutions that have measurable benefits to existing roadways and maximizes the efficiency of new infrastructure. Solutions such as Traffic Responsive Freeway Ramp Metering can decrease delay and improve trip reliability, which in turn reduces 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 Incident Management Software:

- NDOT implemented the Incident Management Software as a common platform that facilitates multi-agency sharing of information through the FAST TMC. The Implementation of this shared incident management software in 2018 resulted in improvements with respect to incident identification, response times, and cross-agency collaboration.

VEHICLE MILES TRAVELED (VMT)

CURRENT CHALLENGES

↑57% From 17.6 billion in 2000 to 27.7 billion in 2021.

NEED:

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

TSMO'S CONTRIBUTION

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 DOT Commute Trip Reduction (CTR) Program:

- In 2009, WSDOT's CTR program implemented strategies such as encouraging vanpools, carpools, condensed work weeks and telecommuting to help shift commuters out of single-occupancy automobiles and into alternative modes. The program was implemented across the nine most populous counties within the State and is credited with reducing the average daily weekday morning peak-period trips by 28,000, congestion delays by 12,900 hours, annual VMT by 62 million, and fuel consumption by 3 million gallons. This equates to a reduction of approximately 27,500 metric tons of carbon dioxide emissions.

NDOT TSMO Business Case

WHY TSMO

DEFICIENT ROADS AND BRIDGES

CURRENT CHALLENGES

$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.

TSMO'S CONTRIBUTION

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

CURRENT CHALLENGES

386 People died in Nevada in 2021.

$2.6 B Economic cost of traffic crashes in 2021.

NEED:

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

TSMO'S CONTRIBUTION

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

CURRENT CHALLENGES

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.

$169.4 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.

TSMO'S CONTRIBUTION

BENEFIT:

Several TSMO strategies can be implemented to help provide a reliable and efficient roadway system for truckers. 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

CURRENT CHALLENGES

NDOT Asset Management Program has identified

$23 Billion

replacement cost for pavements, bridges, and ITS assets.

About 60% 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**

$1.15 B or approximately 22% 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.

TSMO'S CONTRIBUTION

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 its TAMP that includes pavement, bridge, and ITS assets. It outlines NDOT's planned investments over the next 10 years, placing priority on actively preserving these assets so they continue to operate as efficiently and effectively as possible.

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.

Section 02

Programmatic Elements

NDOT TSMO Program Plan Components

TSMO Program Plan

Strategic Elements
All levels of NDOT

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How?

Tactical Elements
Staff involved with TSMO

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

Where and When?

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 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.

Programmatic Elements

Element	Description
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 Evaluation 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.

Section 03

Tactical Elements

NDOT TSMO Program Plan Components

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Where and When?

TSMO Tactical Elements

TSMO Tactical Elements	Description
Real-time Traveler Information	A program with focus on information for all sorts of travel on our surface transportation networks—how the information is collected, how it's processed, how it's provided to consumers, and how it may be used by transportation system operators to improve travel for everyone. *Source: https://ops.fhwa.dot.gov/ travelinfo/about/aboutus.htm*
Connected and Automated Vehicles	Programs that consider opportunities to deploy Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) connectivity to improve safety, mobility, environmental performance, and organizational efficiency on major travel corridors. *Source: https://ops.fhwa.dot.gov/ publications/fhwahop17001/ch1.htm*
Active Traffic Management (ATM)	Provide the ability to dynamically manage recurring and non-recurring congestion based on prevailing and predicted traffic conditions and maximize the effectiveness and efficiency of the facility. *Source: https://ops.fhwa.dot.gov/ atdm/approaches/atm.htm*
Traffic Incident Management	A planned and coordinated program that develops a process to detect, respond to, and remove traffic incidents and restore capacity as safely and as quickly as possible. *Source: https://ops.fhwa.dot.gov/ eto_tim_pse/about/tim.htm*
Transportation Asset Management	Act as a focal point for information about the assets, their management strategies, long-term expenditure forecasts, and business management processes. *Source: https://www.fhwa.dot.gov/ asset/plans.cfm*
Transportation Performance Management	A strategic approach that uses system information/data to make investment and policy decisions to achieve national performance goals. *Source: https://www.fhwa.dot.gov/ tpm/about/tpm.cfm*
ITS Database and Communications	Includes, but is not limited to, mobile and fixed sensors, cameras, DMS, Highway Advisory Radio (HAR) Systems, Road Weather Information Systems (RWIS), ITS communication infrastructure, etc.

Section 04

Final Assessment

Click to access the
Final Assessment Quiz

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FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

Module 102 / NDOT TSMO

1. What are the core elements of TSMO Program Planning?

- ◯ Systematic, programmatic, and tactical
- ◯ Strategic, programmatic, and traffic
- ◯ Systems, programs, and training
- ◯ Strategic, programmatic, and tactical

FINAL QUIZ

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Module 102 / NDOT TSMO

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- ◯ Systems, programs, and training
- ● Strategic, programmatic, and tactical

Correct! Click for next question.

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

Module 102 / NDOT TSMO

2. In what year did NDOT formally adopt the Statewide TSMO Program Plan?

- ◯ 2014
- ◯ 2019
- ◯ 2020
- ◯ 2021

FINAL QUIZ

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- ◯ 2021

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NDOT STATEWIDE TSMO PROGRAM

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2. In what year did NDOT formally adopt the Statewide TSMO Program Plan?

- ◯ 2014
- ◯ 2019
- ◯ 2020
- ⊗ 2021

Incorrect. *Try again*

3. Which elements in the program plan focus on TSMO strategies?

- ◯ Strategic
- ◯ Programmatic
- ◯ Tactical
- ◯ None of the above

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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3. Which elements in the program plan focus on TSMO strategies?

- ⊗ Strategic
- ◯ Programmatic
- ◯ Tactical
- ◯ None of the above

Incorrect. *Try again*

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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Correct! Click for next question.

FINAL QUIZ

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3. Which elements in the program plan focus on TSMO strategies?

- ◯ Strategic
- ◯ Programmatic
- ◯ Tactical
- ⊗ None of the above

Incorrect. *Try again*

4. Which elements in the program plan set the direction for TSMO Program?

- ◯ Systematic
- ◯ Strategic
- ◯ Programmatic
- ◯ Tactical

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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4. Which elements in the program plan set the direction for TSMO Program?

- ⊗ Systematic
- ◯ Strategic
- ◯ Programmatic
- ◯ Tactical

Incorrect. *Try again*

4. Which elements in the program plan set the direction for TSMO Program?

- ○ Systematic
- ● Strategic
- ○ Programmatic
- ○ Tactical

Correct! Click for next question.

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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4. Which elements in the program plan set the direction for TSMO Program?

- ◯ Systematic
- ◯ Strategic
- ⊗ Programmatic
- ◯ Tactical

Incorrect. *Try again*

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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4. Which elements in the program plan set the direction for TSMO Program?

- ◯ Systematic
- ◯ Strategic
- ◯ Programmatic
- ⊗ Tactical

Incorrect. *Try again*

5. NDOT's TSMO vision and mission have been developed to help advance NDOT's guiding principles and core values and therefore, reflect the state's transportation priorities.

- ◯ True
- ◯ False

FINAL QUIZ

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5. NDOT's TSMO vision and mission have been developed to help advance NDOT's guiding principles and core values and therefore, reflect the state's transportation priorities.

- (●) True
- ( ) False

Correct! Click for next question.

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5. NDOT's TSMO vision and mission have been developed to help advance NDOT's guiding principles and core values and therefore, reflect the state's transportation priorities.

- ◯ True
- ⊗ False

Incorrect. *Try again*

6. Actionable items roadmap outlines specific immediate, short-term and long-term action items to advance the programmatic elements.

- ◯ True
- ◯ False

FINAL QUIZ

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6. Actionable items roadmap outlines specific immediate, short-term and long-term action items to advance the programmatic elements.

- (●) True
- ( ) False

Correct! Click for next question.

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6. Actionable items roadmap outlines specific immediate, short-term and long-term action items to advance the programmatic elements.

- ◯ True
- ⊗ False

Incorrect. *Try again*

7. Which one of the following is NOT a NDOT TSMO Strategic Goal?

- ◯ Enhance reliability
- ◯ Preserve infrastructure
- ◯ Data management
- ◯ Optimize mobility

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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7. Which one of the following is <u>NOT</u> a NDOT TSMO Strategic Goal?

- ⊗ Enhance reliability
- ◯ Preserve infrastructure
- ◯ Data management
- ◯ Optimize mobility

Incorrect. *Try again*

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Correct! Click for next question.

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- ◯ Preserve infrastructure
- ◯ Data management
- ⊗ Optimize mobility

Incorrect. *Try again*

8. Which one of the following is <u>NOT</u> a TSMO Programmatic Element?

- ◯ TSMO tool
- ◯ Organizational structure
- ◯ Business case
- ◯ Resource management

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

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8. Which one of the following is <u>NOT</u> a TSMO Programmatic Element?

- ⊗ TSMO tool
- ◯ Organizational structure
- ◯ Business case
- ◯ Resource management

Incorrect. *Try again*

FINAL QUIZ

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Module 102 / NDOT TSMO

8. Which one of the following is NOT a TSMO Programmatic Element?

- ◯ TSMO tool
- ⊗ Organizational structure
- ◯ Business case
- ◯ Resource management

Incorrect. *Try again*

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- ○ TSMO tool
- ○ Organizational structure
- ● Business case
- ○ Resource management

Correct! Click for next question.

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

Module 102 / NDOT TSMO

8. Which one of the following is NOT a TSMO Programmatic Element?

- ◯ TSMO tool
- ◯ Organizational structure
- ◯ Business case
- ⊗ Resource management

Incorrect. *Try again*

9. Choose the correct statement:

- ◯ Investment prioritization tool Outlines a decision-making process to identify the priorities for project planning, design, and implementation.
- ◯ The strategic aspect of TSMO program planning gives us answers to questions of “why” TSMO is important, and a high-level vision of “what” the agency seeks to achieve, along with strategic goals and objectives.
- ◯ The programmatic elements of TSMO program planning address issues surrounding organizational structure and business processes for implementing TSMO activities.
- ◯ All of the above

FINAL QUIZ

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Incorrect. *Try again*

FINAL QUIZ

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Incorrect. *Try again*

FINAL QUIZ

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FINAL QUIZ

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Correct! Congratulations you’re done. Click to continue.

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THANK YOU

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