# ITS AND TSMO STRATEGIC PLAN

February 2024

Regional - OKC

OKLAHOMA Transportation

# ITS and TSMO Strategic Plan (Regional - OKC)

OKLAHOMA Transportation

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## List of Acronyms

**ACOG** Association of Central Oklahoma Governments
**ADAS** Advanced Driver Assistance System
**ASCT** Adaptive System Control Technology
**API** Application Programmer Interface
**ASCT** Adaptive System Control Technology
**ATMA** Autonomous Truck-mounted Attenuators
**ATMS** Advanced Traffic Management System
**ATR** Automatic Traffic Recorder
**AV** Automated Vehicles
**CAD** Computer–aided Dispatch
**CAV** Connected and Autonomous Vehicles
**CCTV** Closed Circuit Television
**CIP** Capital Improvement Plan
**CMM** Capability and Maturity Model
**CVISN** Commercial Vehicle Information Systems
**DMS** Dynamic Message Signs
**DOT** Department of Transportation
**DPS** Oklahoma Department of Public Safety
**FEMA** Federal Emergency Management Agency
**FHWA** Federal Highway Administration
**FMS** Freeway Management System
**HAR** Highway Advisory Radio
**HOT** High Occupancy Toll
**HQ** Headquarters
**ICM** Integrated Corridor Management
**ICS** Incident Command System
**IMO** Integrating Mobile Observations
**IT** Information Technology
**ITE** Institute of Transportation Engineers
**ITS** Intelligent Transportation Systems
**LMR** Land Mobile Radio
**MOE** Measures of Effectiveness
**MPO** Metropolitan Planning Organization
**MSA** Metropolitan Statistical Area
**MTBF** Mean Time Between Failure
**NCHRP** National Cooperative Highway Research Program
**NHS** National Highway System
**NHTSA** National Highway Traffic Safety Administration
**ODOT** Oklahoma Department of Transportation
**OHP** Oklahoma Highway Patrol
**OHSO** Oklahoma Highway Safety Office
**OKC** Oklahoma City
**OMES** Office of Management & Enterprise Services
**OMPT** Office of Mobility and Public Transit
**ORI** Office of Research and Innovation
**OTA** Oklahoma Turnpike Authority
**OU** Oklahoma University
**PTZ** Pan-tilt-Zoom
**RTKS** Real-time Kinematics Systems
**RTMC** Regional Transportation Management Centers
**RWIS** Roadway Weather Information System
**RWM** Road Weather Management
**SaaS** Software as a Service
**SAFE-T** Statewide Analysis for Engineering & Technology
**SLA** Service-level Agreement
**SSO** State Safety Oversight

| | |
|---|---|
| **STIP** | Statewide Transportation Improvement Plan |
| **SWZ** | Smart Work Zone |
| **TI** | Traveler information |
| **TIM** | Traffic Incident Management |
| **TM** | Traffic Management |
| **TMA** | Truck-mounted Attenuator |
| **TMC** | Transportation Management Center |
| **TOC** | Traffic Operations Center |
| **TRPS** | Traffic Responsive Plan Selection |
| **TSCC** | Traffic Signal Control Center |
| **TSM** | Traffic Signal Management |
| **TSMO** | Transportation Systems Management and Operations |
| **UAV** | Unmanned Aerial Vehicle |
| **USDOT** | U.S. Department of Transportation |
| **VMS** | Variable Message Sign |
| **VMT** | Vehicle Miles Traveled |
| **VOT** | Value of Time |
| **VSL** | Variable Speed Limit |
| **WZDX** | Work Zone Data Exchange |
| **WZM** | Work Zone Management |


## 1 Executive Summary

The Oklahoma City Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TSMO) Regional Strategic Plan represents a thorough blueprint for the future evolution of the region's ITS deployments in the area. This extensive strategy has been crafted through a collaborative effort, involving stakeholders from various agencies and organizations, including the City of Oklahoma City, the Oklahoma Department of Transportation (ODOT), and other nearby agencies and counties. In parallel, the plan aligns with the Statewide ITS and TSMO Strategic Plan and is similar in approach to the regional plan for the Tulsa area. The rationale for this plan is clear:

*ITS technologies harbor the potential to significantly enhance the safety, efficiency, and reliability of Oklahoma City's regional transportation system.*

The implementation of these cutting-edge technologies holds the promise of reducing congestion, enhancing mobility, supporting safety, and elevating the overall quality of life in the region.

This strategic plan's development commenced with a thorough evaluation of the current state of the ITS program in the Oklahoma City region. This effort involved an in-depth examination of existing ITS technologies and services and an assessment of the strengths and weaknesses of the ongoing initiatives. Grounded in this analysis, a set of priorities and a road map for advancing ITS were outlined. The existing ITS program in Oklahoma City encompasses a wide array of technologies and services, spanning traffic management, public transportation, traveler information, and emergency response. Notably, the plan emphasizes the elevation of TSMO programs, which are geared toward optimizing the use of existing transportation infrastructure and resources through advanced technologies and data analytics.

To facilitate the effective implementation of the TSMO programs, the plan delineates a series of business processes and resource allocation strategies. Oklahoma City has made significant investments in personnel, systems, and infrastructure to support its focus on TSMO and allow for the integration of these technologies into the current organizational structure and processes. However, with the growing emphasis on operations, the organization may need to consider further adjustments to its structure and processes to fully support the advancement of TSMO. The proposed system will encompass a set of metrics and targets to gauge the plan's effectiveness and implement regular reporting and feedback mechanisms to assure alignment with objectives. The region is behind the Tulsa region in terms of technology on the ground and overall coordination but stands to benefit from the current funding climate and the fast pace of technology in this field.

Additionally, the plan lays out a comprehensive implementation road map, detailing the specific actions and milestones essential for realizing the goals of the TSMO programs. This road map encompasses the establishment of a dedicated ITS governance structure, forging partnerships, and collaborations with other agencies and organizations, and identifying funding sources to underwrite the plan's execution.

The Oklahoma City ITS and TSMO Regional Strategic Plan offers a lucid and comprehensive vision for the future of the region's ITS program; it is also a road map for realizing that vision through the implementation of TSMO programs and the integration of other innovative technologies and services.

## 2 Business Case

The Oklahoma Department of Transportation (ODOT) and the Association of Central Oklahoma Governments (ACOG) have identified critical needs in the Oklahoma City Metropolitan Statistical Area (OKC MSA) that can be addressed through the Intelligent Transportation System (ITS) and Transportation Systems Management and Operations (TSMO) Regional Strategic Plan. ODOT, as the state's transportation agency, recognizes the importance of enhancing infrastructure efficiency and safety through technological advancements.

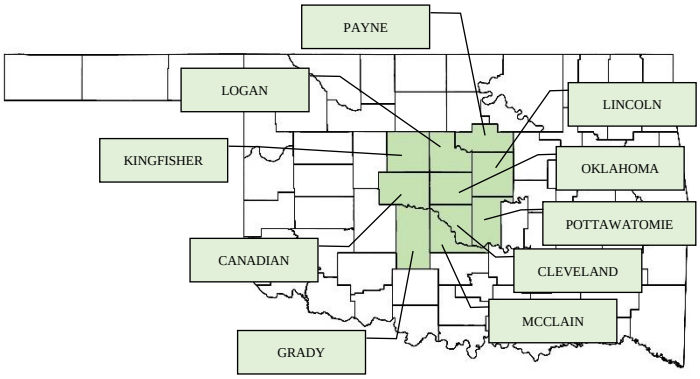


**Figure 1.** Oklahoma City (OKC) Metropolitan Statistical Area (MSA) Region.

The OKC MSA is a region in the central part of the state, encompassing Oklahoma City and its surrounding counties (**Figure 1**). Known for its diverse economy and cultural attractions, the OKC MSA plays a crucial role in the state's development. The ITS TSMO Regional Strategic Plan aims to enhance transportation efficiency and safety in the OKC MSA by leveraging advanced technologies and smart management strategies. This plan focuses on identifying existing infrastructure and providing recommended actions to create a more seamless and sustainable transportation network.

ACOG, as a regional planning organization, understands the necessity of optimizing traffic flow and reducing congestion to support the growing demands of the area[1]. ODOT and ACOG both share common goals when it comes to addressing transportation challenges in the Oklahoma City region.

Both entities independently identify the pressing need for data-driven insights, advanced technologies, and proactive management strategies to achieve these objectives. By aligning their efforts, ODOT and ACOG assure that their individual expertise and resources are directed toward a shared vision of alleviating traffic congestion, improving emergency response capabilities, and fostering better mobility throughout the Oklahoma City region. This joint pursuit of common goals underscores their commitment to meeting the evolving transportation needs of the region effectively and efficiently.

[1] Source: Encompass 2045: https://www.acogok.org/transportation-planning/encompass-2045-plan/

## 2.1 Oklahoma City Region Challenges

The region faces several critical transportation challenges that require strategic attention and innovative solutions in the realm of ITS and TSMO. These challenges serve as the driving force behind this plan. By addressing these challenges, the goal is to increase the efficiency, safety, and reliability of the transportation network across the region. The key challenges related to ITS and TSMO in the Oklahoma City region are summarized in four categories below:

1. Traffic Flow Optimization
   - Congestion Management: Addressing the challenge of heavy traffic during peak hours by implementing ITS solutions that monitor traffic conditions, predict congestion, and adjust signal timings to optimize traffic flow and reduce bottlenecks.
2. Emergency Response and Incident Management
   - Real-time Incident Response: Employing ITS technologies like traffic cameras and sensors to detect incidents in real time, enabling rapid responses and coordinated efforts by emergency services.
   - Automated Incident Detection: Uses ITS to automatically detect incidents such as accidents, breakdowns, or debris on roadways, enabling quicker incident response and reducing congestion.
3. Data-driven Solutions
   - Data-driven Decision Making: Leveraging real-time data collected from ITS technologies to make informed decisions about traffic management strategies, helping to predict traffic patterns, manage congestion, and optimize road usage.
   - Weather-responsive Systems: Integrating ITS solutions with weather data to adapt traffic management strategies to changing weather conditions, assuring safer travel during adverse weather events.
4. Integrated Mobility and Communication
   - Traveler Information Systems: Implementing ITS technologies to provide travelers with real-time information about traffic conditions, alternative routes, and travel times, enabling informed decision-making.
   - Connected Vehicle Technology: Using ITS to enable communication between vehicles and infrastructure, enhancing safety by sharing information about road conditions, traffic signals, and potential hazards.
   - Multimodal Integration: Integrating various modes of transportation, such as public transit, cycling, and walking, through ITS solutions to provide seamless connections and enhance overall mobility.

**Table 1** summarizes the Encompass 2045 Regional Transportation Goals. In line with these goals and by proactively addressing these challenges within the framework of ITS and TSMO, this plan aims to harness cutting-edge technology, data-driven insights, and innovative management strategies to cultivate a more efficient, secure, and resilient transportation network that aligns with the evolving demands of the region.

**Table 1.** Encompass 2045 Regional Transportation Plan Goals.[2]

| Goal | Objectives |
|---|---|
| **Connectivity** | Develop connections among all types and modes of transportation. |
| **Economic Strength** | Promote economic vitality through enhanced mobility. |
| **Equity + Options** | Provide transportation options and access for the movement of all people and goods. |
| **Healthy Communities** | Improve the connection between land use and transportation to enable residents to live healthier lives and reduce the environmental impact from vehicle travel. |
| **Performance** | Increase the efficiency and reliability of the transportation system (Objectives specifically call out future investments in intelligent transportation systems). |
| **Safety + Security** | Provide a safe and secure transportation system for all users. |
| **System Preservation** | Maintain and improve the quality of the transportation system (calls for investments that enhance the existing infrastructure and improved technologies). |

### 2.1.1 Safety

To gain a deeper understanding of the safety-related challenges experienced in the region, a review of the available crash data was conducted. Historical crash data was evaluated by using the ODOT Collision Database (SAFE-T) in combination with ODOT's crash dashboard tools to produce a regional crash chart. **Figure 2** shows five-year crash data for the Oklahoma City region.

[2] Source: Encompass 2045 Metropolitan Transportation Plan, 2023 (Encompass 2045 Plan - ACOG (acogok.org))

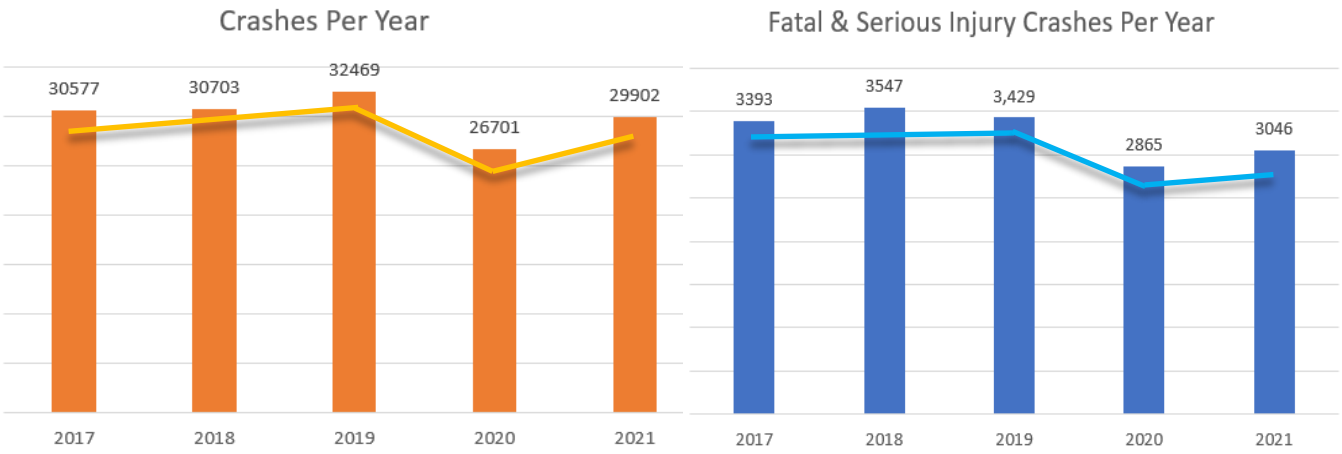


**Figure 2.** Oklahoma Department of Transportation (ODOT) Total Crashes and Fatal/Injury Crashes per Year (2017-2021).

The overall data for total crashes between 2017 and 2021 shows a slight increase between 2017 and 2019, followed by a dramatic drop of nearly 7,000 crashes in 2020, and only a slight uptick from that level in 2021. Though some of this data was likely affected by work-from-home policies and fewer cars on the road, it is notable to point out that for several regions, 2020 and 2021 saw a substantial uptick in overall crashes. This demonstrates the fact that when the system is uncongested, as was likely the case for those years, drivers in the region generally adhered to safe speeds resulting in lower vehicle miles traveled (VMT) and fewer cars on the road. Because TSMO and ITS can assist in reducing congestion, this "trial year" in reduced congestion suggests that an efficient TSMO and ITS system could help reduce congestion and improve free flow without an uptick in speeding or regional crash rates.

The Oklahoma Highway Safety office (OHSO) has also provided recent injury and fatal crash data counts for years 2017 thru 2021 for the six counties in the region[3]. The reports suggest that there has been a general trend of a slight decrease in crashes in the region, with a slight decrease in crashes in 2020 when the total number of crashes was reported at its lowest level at 2,865 crashes, compared with a high of 3,547 crashes in 2018. It is important to note that the trends in years 2020 and 2021 may be influenced by various factors, which include reduced VMT or fewer vehicles on the roads because of the COVID-19 pandemic[4]. With that in mind, it's unfortunately fair to assume that without additional interventions, fatal and serious injury crash rates may work

[3] Source: Oklahoma Highway Safety Crash Data, 2018-2021: Crash Data | Oklahoma Highway Safety Office
[4] Source: Overview of Motor Vehicle Crashes in 2020
https://crashstats.nhtsa.dot.gov/Api/Public/Publication/813266

their way back up to pre-COVID-19 pandemic levels. Fortunately, TSMO and ITS technologies can play a significant role in improving safety and reducing crashes in the region by optimizing the use of existing infrastructure and improving communication and coordination among the region's key stakeholders. Key locations of bicycle/pedestrian counters can also be incorporated as part of an ITS program to assess where bicycle and pedestrian improvements would provide the largest safety benefits based on existing volumes.

For an area to be considered urban in this analysis, the area where the crash occurred must have a population of 5,000 or more, as designated by the U.S. Bureau of the Census. For an area to be considered rural, the area where the crash occurred must have a population is 4,999 or fewer. Both terms are defined in the 2020 Oklahoma Highway Safety Crash Facts Book[5].

**Figure *3*** shows the rural/urban breakdown of VMT in the Oklahoma City region, including Oklahoma City, Norman, Midwest City, Moore, Edmond, and the six (6) MSA counties (Canadian, Cleveland, Grady, McClain, Oklahoma, and Pottawatomie). This is significant because it shows how much of the annual VMT is made up of urban and suburban traffic, which stands to benefit from a well-planned and executed TSMO and ITS program when it comes to traffic incidents, reroutes, real time message board, and Advanced Traffic Management Systems (ATMS) to assure signals are coordinated and traffic can move efficiently on arterials at peak times. Additionally, Oklahoma City highways in urban areas account for the highest frequency and highest severity of crashes at nearly 97 percent[6]. Even after normalizing for VMT, the urban areas within the Oklahoma City region still account for 90 percent of all crashes. A good regional TSMO plan can help mitigate these incidents. Emergency vehicles can respond to crashes more rapidly and effectively. Digital message boards can reroute commuters before they approach any crash-related backups. Meanwhile, a robust ITS network allows traffic operations to push out updated signal plans for adjacent arterial routes that are moving twice as much traffic, which reduces related backups, and reducing the added risk for related crashes.

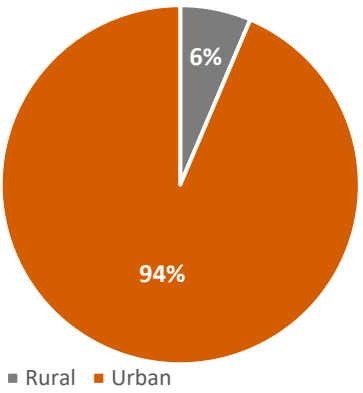


**Figure 3.** Oklahoma City Vehicle Miles Traveled (VMT; Rural vs. Urban).

[5] Source: 2020 Oklahoma Crash Facts, Fall 2021 (2020_s1_summarybackground.pdf (ok.gov), Accessed on November, 2022)
[6] Source: Oklahoma Interactive Crash Maps, https://ohso.ok.gov/crash-data2, summarized October 18, 2023

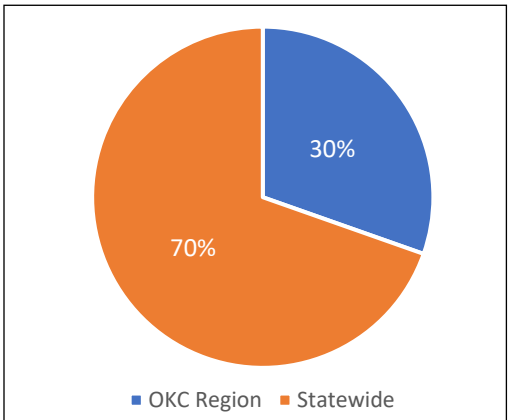


**Figure 4.** Serious Injury and Fatal Nonmotorized Crashes.

**Figure *4*** illustrates the distribution of crash frequencies of bicyclists and pedestrians from the most recently available one year of crash data for the region (2021). In that year there were 610 fatal and serious injury bicyclist and pedestrian crashes, which accounts for 30 percent of the state total; it's clear that pedestrian and bicyclist injuries are a serious problem area for the region. Though TSMO may not be directly related to bicycle and pedestrian safety improvements, it can allow for adjacent changes that enhance safety and planning for nonmotorized and/or active modes of transportation. Updated signal systems can provide targeted safety countermeasures at intersections that experience a lot of pedestrian activity. For instance, the city can prioritize pedestrians by allowing the walk signal and through movement on the first phase and moving left-turn arrows on the second phase. Similarly, updated signal systems can give cyclists and pedestrians a leading green light or head-start so they can cross ahead of likely turning movements. The TSMO interviews for the Oklahoma City region mentioned the importance of addressing crash safety with the ITS and TSMO Regional Strategic Plan, and updating signal systems is one way this might be accomplished. Additionally, the Encompass 2045 Regional Transportation Plan calls for improvements to bicycle/pedestrian and multimodal options in general, and the two may be able to make progress with such improvements. ITS can also include the installation of pedestrian counters. As part of the ITS initiatives for the region, for pedestrian facilities, ACOG plans to mandate counters on all federally funded projects. These pedestrian counters can be used to prioritize safety improvements like traffic calming and crossing enhancements at the busiest/highest-risk intersections.

In addressing concerns to vehicle pedestrian detection, it's crucial to discuss a method for timely identification and resolution, because detection issues can lead to substantial traffic signal delays. For example, the City of Edmond commonly employs software that reveals detector faults in both the on and off states. Transportation management center (TMC) operators promptly initiate work orders when the issue is identified, assuring efficient rectification of detected problems.

### 2.1.2 Mobility

Mobility challenges in the Oklahoma City region - that can be addressed through TSMO and ITS - are caused by both recurring and nonrecurring congestion experienced by all road users. Recurring congestion is caused by an ongoing problem, such as bottlenecks. Nonrecurring congestion is caused by a one-time or limited-time event, such as a large concert, a traffic

accident, or construction. Recurring congestion poses significant challenges in urban areas, resulting in driver delay and increased pollution. Fortunately, as alluded to above, both types of congestion can be addressed and improved through a well-executed TSMO program.

At a national level, it has been estimated that 55 percent of congestion is caused by nonrecurring events[7]. As shown in **Table 2**, it is currently estimated that nearly 3.4 million vehicle-hours of delay were experienced by Oklahoma City area motorists in 2019. Congestion was 62 percent nonrecurring and 38 percent recurring. TSMO can help provide greater efficiency for both instances of congestion currently experienced in the region, and as part of this plan, our team aims to strike a useful balance between reducing time spent in congestion for drivers and providing cost-efficient congestion solutions for taxpayers.

**Figure *5*** illustrates recurring and nonrecurring incidents in rural and urban areas. This analysis revealed that the urban region experiences the bulk of both recurring and nonrecurring congestion. Also, interesting to note, the Oklahoma City region sees higher levels of congestion on its National Highway System (NHS) network compared with the Tulsa region. Urban congestion makes up 70 percent of all congestion experienced in the Oklahoma City region; urban, nonrecurring congestion takes the biggest slice at 43 percent. Recurring congestion makes up about a quarter of congestion in the Oklahoma City region at 26 percent. It is interesting that so much of the congestion for the Oklahoma City region is nonrecurring; this could point to large construction impacts in 2019 and impacts related to wrecks and stalled vehicles.

**Table 2** points to some of these factors but leaves other categories unknown or unclear. Nonrecurring congestion has a large impact on the region, which points toward potential ITS and TSMO solutions that would be well-suited. Real-time message boards and coordinated reroutes via a central operations center, for instance, could be used as part of the TSMO plan to help reduce the overall impacts from these types of nonrecurring congestion. Congestion in rural areas makes up about one quarter of all regional congestion, at 31 percent. Like the urban network, nonrecurring congestion is slightly higher for rural surroundings at 19 percent (likely also a mixture of construction and traffic incident delays on rural highways and interstates). Recurring rural congestion has the region's lowest impact to overall congestion at 12 percent.

[7] Source: https://ops.fhwa.dot.gov/aboutus/opstory.htm

**Table 2.** Oklahoma City Metropolitan Area Congestion by Source (2019).

| Source of Congestion | Estimated Vehicle-hours of Delay[8] | % Of Total |
|---|---|---|
| **Recurring** | **1,289,257** | **39%** |
| **Holiday** | 58,681 | 2% |
| **Recurrent** | 564,187 | 17% |
| **Signals** | 240,826 | 7% |
| **Unclassified** | 425,563 | 13% |
| **Nonrecurring** | **2,073,081** | **61%** |
| **Incident** | 690,343 | 21% |
| **Incident & Weather** | 140,525 | 4% |
| **Incident & Work Zone** | 150,329 | 4% |
| **Other Multiple Causes** | 322,299 | 10% |
| **Recurrent & Incident** | 117,564 | 3% |
| **Signal & Weather** | 18,466 | 1% |
| **Unclassified** | 425,563 | 13% |
| **Weather** | 110,019 | 2% |
| **Work Zone** | 97,973 | 3% |
| **Total** | **3,362,338** | **100%** |

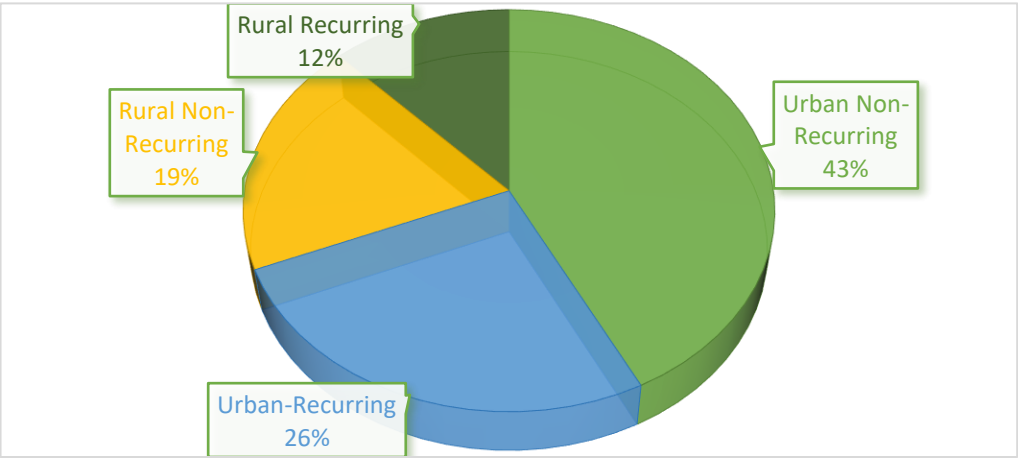


**Figure 5.** Oklahoma City Region Approximate Congestion Sources (Rural vs. Urban; 2019) Freight.

[8] Source: RITIS, Congestion Causes for the National Highway System (NHS), www.ritis.org/archive/congestion, accessed January 18, 2022)

### 2.1.3 Freight

The Oklahoma City region is facing several transportation freight challenges. The Encompass 2045 Regional Transportation Plan seeks to address a growing demand for goods movement, including planning for increased multimodal capacity and flexibility. The most pressing challenge is the lack of efficient freight transportation options and access to freight terminals through intermodal connectors. Currently, most freight is shipped by truck, which can be more costly and time-consuming. To make the most of the region's resources, there must be an enhanced integration and connectivity of the transportation system for freight as defined in the regional goals for roadways, highways, and intermodal facilities. In this plan, it is recommended to advance regional connectivity and economic competitiveness by actively working with regional freight partners to identify and prioritize the most critical improvements.

Another challenge facing the Oklahoma City region is the increasing demand for goods and services and planning for future infrastructure needs. The Oklahoma City region is home to several manufacturing, distribution, and retail businesses, which all employ a reliable and predictable transportation network to transport goods and materials. This demand is expected to continue to grow, putting pressure on the region's existing infrastructure.

To address these challenges, the Oklahoma City region is turning to ITS and TSMO. ITS technologies, such as traffic sensors and ATMS, can help improve the efficiency and safety of the region's roads and highways. The Encompass 2045 Regional Transportation Plan recommends working with ODOT and other agencies to continue development and maintenance of the roadway and bridges of the area and support development of regional ITS applications for truck facilities and operations in the region.

### 2.1.4 Active Transportation

The Oklahoma City region is also facing significant challenges when it comes to active transportation and the potential for utilizing ITS and TSMO. The Encompass 2045 Regional Transportation Plan is an important step in addressing these challenges and assuring that the city can support the needs of all road users, regardless of their mode of transportation. To enhance safety and address the growing needs of pedestrians and cyclists, the plan includes the implementation of SS4 reports by OKC, ACOG, and the City of Guthrie. These reports will serve as valuable tools for enabling the implementation of targeted safety projects.

One of the key challenges facing the Oklahoma City region is the need to balance the competing demands and vulnerabilities of different transportation modes. The region has a growing number of pedestrians and cyclists who are seeking improved options. This demand has led to a need for infrastructure updates, such as bike lanes and more pedestrian-oriented and prioritized streets and intersections.

In addition to these initiatives, the Encompass 2045 Plan includes a strong emphasis on the integration of ITS technologies and TSMO in meeting some of these goals. By continuing to invest in these technologies and strategies, the Oklahoma City region hopes to create a transportation network that is efficient, safe, and sustainable. A good TSMO strategy and smart infrastructure tweaks and updates can help support the region's continued growth and development and provide improved active transportation options.

### 2.1.5 Cost

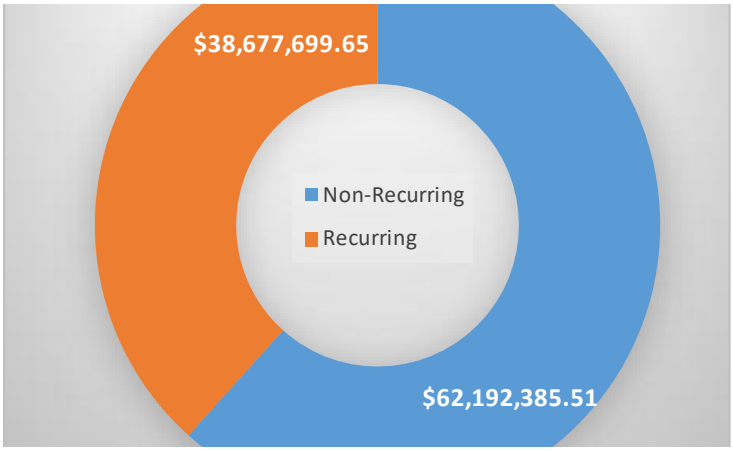


**Figure 6.** Estimated Annual Cost of Congestion (2019).

An average value of time (VOT) road users expend because of congestion is broken down by cause of congestion in Table 2. This data facilitates an understanding of the monetary impact of congestion to the Oklahoma City region roadway users. **Figure 6** depicts the Oklahoma City region's cost of congestion, totaling an estimated $101 million annually for both recurring and nonrecurring congestion. An estimated VOT of $30 per hour was applied for all vehicles, including passenger vehicles and commercial trucks[9].

A total of 187 ODOT construction projects, totaling $1.5 billion, are currently budgeted for the Oklahoma City region for 2021 to 2028[10]. Each of these projects represents an opportunity to incorporate TSMO strategies. **Figure 7** shows the project locations in green for each of the counties that are part of the Oklahoma City region.

[9] https://*www.fhwa.dot.gov/policyinformation/statistics.cfm

[10] Source: ODOT ESRI shapefile data downloaded September 2022 from the 2021-2028 Roads Work Plan, at https://gis-okdot.opendata.arcgis.com/datasets/okdot::odot-workplan-roads-2021to2028/about

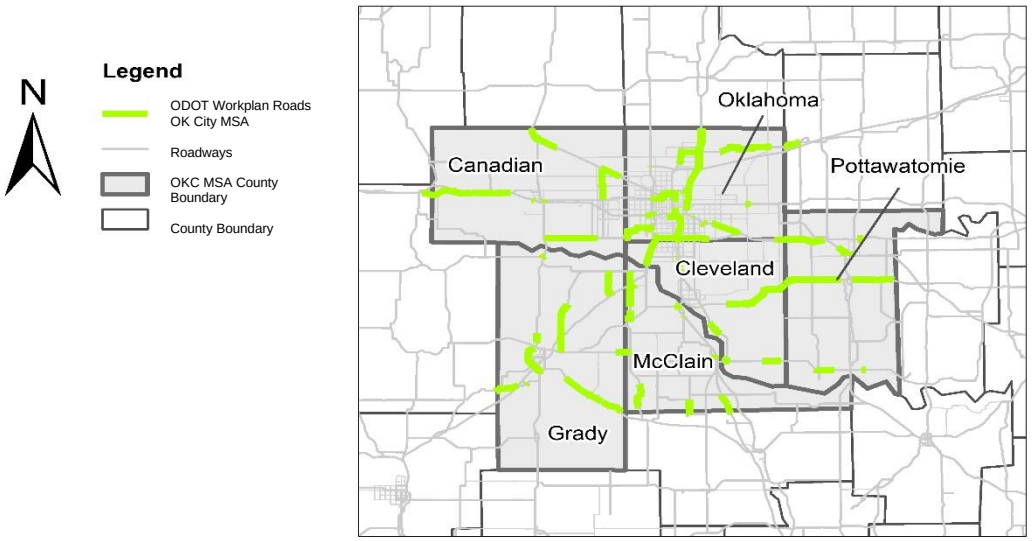


**Figure 7.** Oklahoma City Metropolitan Statistical Area (OKC MSA) Eight-year Construction Plan Projects.

According to data from the National Highway Traffic Safety Administration (NHTSA), nearly 50 percent of all traffic fatalities occur in rural areas[11]. The data also points out that rural areas face several transportation challenges related to safety, usage, and infrastructure condition. The cost of these fatalities in rural areas can be significant, both in terms of the human toll and the financial cost. For example, the lifetime costs to society for each fatality is $1.4 million[12]. Considering the human toll and financial implications, it becomes important to address fatal collisions on a case-by-case basis. Often, these incidents involve factors such as driver fatigue or inattention and are in areas where technology, excluding self-driving vehicles, may have limitations in preventing such occurrences. Examining preventive measures on an individual basis is essential to developing targeted strategies to mitigate the impact of fatal collisions in rural areas.

One way to help reduce traffic fatalities in rural areas is with ITS. These systems use technology to improve the efficiency and safety of transportation networks. For example, ITS can include traffic cameras, sensors, and other technologies that help to monitor and control traffic flow. This can help to reduce the risk of accidents and improve the safety of rural roads.

[11] Source: NHTSA Rural Safety, Trends and Data. Rural Safety | NHTSA
[12] Source: NSC Injury Facts. Costs of Motor-Vehicle Crashes - Injury Facts (nsc.org)

Other potential solutions for reducing traffic fatalities in rural areas include increasing the use of public transportation, encouraging carpooling, and investing in infrastructure improvements. Ultimately, the key to reducing fatalities in rural areas is a combination of technology, education, and improved infrastructure.

## 2.2 How Transportation Systems Management and Operations and Intelligent Transportation Systems Can Help

ITS consists of advanced technologies used to improve the safety and efficiency of transportation systems. TSMO is a broader umbrella that includes ITS and other strategies and programs focused on optimizing the overall management and operations of the multimodal transportation network. ITS and TSMO are often used together to improve the efficiency of transportation systems. For example, technologies can be used to monitor traffic conditions and provide real-time information to drivers. This information can be used to help drivers make better decisions about their route to avoid congestion and delays. Under the overall TSMO program, regional partners will collaborate to make this information accurate and consistent across jurisdictional boundaries to provide a coordinated response to changing conditions and incidents.

TMSO program areas considered by the Oklahoma City region are described in **Table 3**.

**Table 3.** Common Transportation Systems Management and Operations (TSMO) Program Areas.[13]

| Example Transportation Systems Management and Operations (TSMO) Program Areas | Program Area Description | Oklahoma City Existing Program Areas | Oklahoma City Future Program Areas |
|---|---|---|---|
| Active Transportation & Demand Management | The dynamic management, control, and influence of travel demand and traffic flow | | ✓ |
| Arterial Management | The management of arterial streets that provides users with a safe, efficient, and reliable trip (e.g., access management, traffic signal timing) | ✓ | |
| Bottleneck Mitigation | Strategies that focus on recurring bottlenecks (sections of roadway that are routinely over capacity) | | ✓ |
| Congestion Pricing | A strategy that varies toll price by time of day and level of congestion | | ✓ |
| Integrated Corridor Management | An approach for collaborative management of all assets in a transportation corridor as a system (e.g., multiple roadways and transit facilities) rather than managing each asset individually to improve the overall operation of the corridor | | ✓ |
| Emergency Transportation Operations | Providing users with a safe and efficient transportation system during an emergency | ✓ | |
| Freeway Management | The implementation of policies, strategies, and technologies to improve freeway performance by minimizing congestion (and its side effects), improving safety, and enhancing overall mobility | ✓ | |
| Freight Technology & Operations | The effective management of the transportation system for freight to move goods safely, efficiently, and reliably throughout the region | | ✓ |

[13] Source: https://ops.fhwa.dot.gov/plan4ops/focus_areas/integrating/operations_strategies.htm

**Table 3.** Common Transportation Systems Management and Operations (TSMO) Program Areas (continued).

| Example Transportation Systems Management and Operations (TSMO) Program Areas | Program Area Description | Oklahoma City Existing Program Areas | Oklahoma City Future Program Areas |
|---|---|---|---|
| Planned Special Events Traffic Management | Special event management to provide users with a safe and efficiently managed transportation system during a planned special event | ✓ | |
| Road Weather Management | Systems and strategies focused on providing users with information before a weather event and a safe and efficient transportation system during and after weather events | ✓ | |
| Real-time Traveler Information | Information provided to travelers to help them choose the safest and most efficient mode and route of travel | ✓ | |
| Traffic Incident Management (TIM) | Verifying, responding to, and clearing traffic incidents in a manner that provides transportation system users with the least disruption | ✓ | |
| Traffic Signal Management (TSM) | Programs, processes, and systems for the effective monitoring and operation of traffic signals | ✓ | |
| Transit Management | Operation and management of a safe and efficient transit system | ✓ | |
| Travel Demand Management | Providing users with effective travel choices to shift or reduce the demand for travel in congested conditions | ✓ | |
| Work Zone Management | Organizing and operating areas affected by road or rail construction to minimize traffic delays, maintain safety for workers and travelers, and accomplish the work efficiently | ✓ | |

ODOT and ACOG already offer some programs that rely on ITS systems, such as Road Weather Information Systems (RWIS), Dynamic Message Signs (DMSs), Cameras, Regional Transportation Management Centers (RTMC), Data Collection Devices, Traffic Signal Management Systems, and more. These systems provide operational awareness about the state of the infrastructure, allowing ODOT to implement strategies that improve mobility and reduce congestion.

This Oklahoma City ITS and TSMO Regional Strategic Plan aims to improve the management and efficiency of the transportation system with existing and planned ITS programs that ODOT and ACOG already offer. These systems include advanced traffic signals, real-time data, and other technologies that can improve traffic flow, reduce congestion, and increase safety. For example, TSMO coupled with ITS technology deployment can help to improve the safety of the roads by providing real-time information on traffic conditions and road closures. This information can be used to alert drivers to potential hazards and help them make informed decisions about their route and reduce the amount of time vehicles spend idling in traffic.

ITS systems are essential in maintaining the smooth operation of roadways in the Oklahoma City region. They provide valuable data that helps inform decisions about traffic flow and congestion. These systems have a proven record of improving and reducing congestion.

## 2.3 Transportation Systems Management and Operations Mission, Goals, and Objectives

In alignment with the Oklahoma City 2045 Encompass Regional Transportation Plan, this strategic plan defines the vision, mission, and goals for TSMO and ITS in the Oklahoma City region.

The vision is to achieve the goals set forth in the Oklahoma City 2045 Encompass Regional Transportation Plan by creating a comprehensive transportation system based on coordination, sharing of information, and shared infrastructure. A future is envisioned where cybersecurity is a fundamental concern, and multiple agencies collaborate seamlessly to assure a reliable, efficient, and safe transportation network. These initiatives can be made possible by implementing the following:

- Investing in ITS technologies
- Implementing TSMO strategies
- Expanding and improving the region's freight transportation infrastructure
- Developing new freight corridors and intermodal facilities
- Working with local, state, and federal partners to promote the development of sustainable and resilient transportation systems

### Transportation Systems Management and Operations Mission

The mission is to execute the strategies outlined in the Oklahoma City 2045 Encompass Regional Transportation Plan, steering the Oklahoma City region toward a transportation system that exemplifies coordination, resources sharing, and advanced TSMO practices. Dedication to

*Collaborate to enhance the safety and efficiency of the Oklahoma City region's transportation system for all travelers and businesses through the effective implementation of TSMO strategies and the investment in cutting-edge ITS technology.*

enhancing safety, optimizing shared infrastructure, and fortifying cybersecurity throughout the transportation network is central. Collaborative efforts with multiple agencies aim to create a resilient, sustainable, and efficient transportation ecosystem. In line with this goal, the TSMO mission is the following:

Within the framework of the Oklahoma City 2045 Encompass Regional Transportation Plan, specific goals and objectives have been designed, with a central focus on ITS and TSMO. These objectives have been strategically devised to harness the potential of ITS and TSMO technologies, provide safety enhancements, emphasize collaboration, and assure transportation system reliability in alignment with the core values of the 2045 Encompass Regional Transportation Plan (**Table 4**).

**Table 4.** Oklahoma City Transportation Systems Management and Operations (TSMO) Goals and Objectives.

| Goals | Objectives |
|---|---|
| **Facilitate Coordination** | Establish a robust framework for coordination among local, state, and federal agencies, enabling a cohesive approach to transportation development. |
| **Promote Resource Sharing** | Encourage the sharing of resources, data, and best practices among all stakeholders to maximize the efficiency of the transportation network. |
| **Prioritize Safety** | Champion safety through the implementation of advanced technologies and strategies that reduce accidents and protect all road users. |
| **Enhance Shared Infrastructure** | Invest in the development and maintenance of shared transportation infrastructure to reduce redundancy and optimize resources. |
| **Strengthen Cybersecurity** | Implement state-of-the-art cybersecurity measures to safeguard transportation systems from potential threats and vulnerabilities. |
| **Assure Reliability** | Strive to create a transportation network that residents can consistently rely on, adapting to the changing needs of the region. |
| **Collaborate with Multiple Agencies** | Foster continued collaboration with multiple agencies, sharing insights and knowledge to create an integrated, seamless transportation network. |

# 3 Strategic Plan Development

Creating a strong strategic plan is critical for all organizations. ITS teams within public agencies especially need to stay informed of existing and emerging technologies and funding opportunities to build a smart path forward for deployment, operations, and maintenance. A well-structured and well-informed strategic plan helps provide that clear path forward.

Stakeholder engagement is a key component in formulating that strategic plan. It's important to involve everyone from top management to the front-line staff to regional partners. Engagement allows everyone to provide perspectives while building the regional vision and goals, resulting in a more comprehensive and effective plan. After designing the strategic plan, it's vital to review and update it regularly to keep it relevant for changing technologies and agency needs. During the Oklahoma City region stakeholder engagement, representatives from eight regional partners came together, and their responses and insights were incorporated into the plan.

## 3.1 Outreach

Key stakeholders participated in the Oklahoma City Regional ITS planning process to identify needs and direction, including the following:

1. City of Oklahoma City
2. City of Norman
3. City of Edmond
4. City of Midwest City
5. City of Moore
6. ODOT
7. ACOG
8. EMBARK

The stakeholders were invited to identify existing ITS elements and discuss their needs, requirements, and ongoing and planned ITS programs. Methods of gathering this information included meetings, online surveys, live feedback-sharing sessions, and take-home surveys.

## 3.2 Stakeholder Input

We gathered stakeholder input by conducting a stakeholder engagement meeting that involved key stakeholders as outlined in **Section 3.1**. This meeting took place virtually, with participants engaging through online tools like surveys. In addition to this effort, we distributed take-home worksheets to stakeholders after the virtual meeting to gather information about existing and proposed ITS elements.
This stakeholder engagement process effectively identified various needs and requirements for the ITS deployment in the Oklahoma City region. Some notable needs include enhancing traffic

management and incident response, better integration of ITS elements, improved data collection and analysis, improved regional communication and coordination, and greater safety considerations for all modes, including a way of prioritizing future safety-focused ITS projects. The active involvement of key stakeholders played a crucial role in the success of the TSMO and ITS outreach efforts in the Oklahoma City region. It assured that the region's transportation planning and investment decisions were well informed by a diverse array of perspectives and interests.

### 3.3 Intelligent Transportation Systems Architecture

The ITS architecture within the Oklahoma City region's ITS and TSMO Regional Strategic Plan delineates numerous essential components and systems required to enhance regional transportation operations. It establishes a shared vocabulary and framework for stakeholders to employ and execute related projects and initiatives across the region.

This ITS architecture aligns with the National ITS Architecture, a standardized model endorsed by the U.S. Department of Transportation that aims to promote interoperability among regional ITS systems for the purpose of forging a seamlessly integrated transportation system. Furthermore, the regional ITS architecture is expanding in parallel with the ongoing refinement of this strategic plan.

### 3.4 Existing Plans

This OKC regional ITS and TSMO plan is being developed at the same time as an Oklahoma statewide ITS and TSMO Plan and a Tulsa regional plan. Several additional documents have guided the Oklahoma City region in the past years, including the following:

- 2003 Oklahoma City Regional ITS Architecture[14]
- 2003 Oklahoma City Regional ITS Implementation Plan[15]
- 2023 Encompass 2045 Regional Transportation Plan[16]

[14] Oklahoma City Regional Intelligent Transportation Systems (ITS) Architecture, March 2003: https://www.odot.org/hqdiv/p-r-div/itscvo/pdfs/Oklahoma Cityarch.pdf
[15] Oklahoma City Regional Intelligent Transportation Systems (ITS) Implementation Plan, March 2003: https://www.odot.org/hqdiv/p-r-div/itscvo/pdfs/Oklahoma Cityimplplan.pdf
[16] https://www.acogok.org/transportation-planning/encompass-2045-plan/

## 3.5 Program Prioritization

The Oklahoma City ITS and TSMO Regional Strategic Plan included several program prioritization methods to assure that transportation projects and initiatives are carefully evaluated and prioritized based on their potential impact and feasibility. Through these steps, the program prioritization method used in this strategic plan helped assure that transportation projects and initiatives were carefully evaluated and prioritized and that resources were allocated in a way that maximized their impact on the region's ITS transportation system.

Research and assessments were conducted to gather data and information on the current transportation system, including traffic patterns, congestion, safety concerns, and existing infrastructure. This effort allows identification of areas of the region that may need improved transportation services or ITS technology deployments. A workshop with stakeholders was held to gather input and feedback on transportation priorities and needs. During this workshop, stakeholders shared their perspectives and ideas, which were incorporated into the prioritization process.

Based on the research and assessment and input from stakeholders, recommendations for existing programs and initiatives were made. Recommendations for new initiatives and projects that aligned with the region's TSMO and ITS transportation goals and priorities were also made and shown in this plan.

The prioritized recommendations found in **Section 5** were formed through a process of gathering ODOT and ACOG's existing capabilities, needs, and desired priorities and recommendations and best practices from the Federal Highway Administration (FHWA). This process resulted in the selection of six existing program areas and six potential future program areas.

## 4 Current Intelligent Transportation Systems Program

ACOG has dedicated its efforts to the development of transportation plans and programs that help improve operations of the transportation network serving 1.5 million area residents. Within the transportation plan, ACOG has successfully identified, deployed, and operated a variety of ITS systems for the metropolitan community.

The Oklahoma City region currently has several ITS programs in place. These programs include the deployment of ITS technologies such as traffic management systems, incident management systems, and traveler information systems. These systems use a variety of technologies, including sensors, cameras, and GPS to collect data on traffic patterns, congestion, and accidents.

City of Norman is expected to have a functioning TMC in early 2025. The TMC will provide efficient traffic management and control of the city's roads. In addition to the TMC, the City of Norman is also planning to deploy cameras and DMSs.

### Existing Intelligent Transportation Systems

The Oklahoma City region ITS and TSMO Regional Strategic Plan consists of several existing ITS systems, including the following:

1. **Traffic Signal Control Centers (TSCC):** Oklahoma City hosts two centralized TSCCs that monitor and manage traffic flow across the region. These centers use real-time traffic data, video monitoring, and advanced algorithms to optimize traffic signals and divert traffic to alternate routes via message boards during congestion or incidents.
2. **Intelligent Transportation System (ITS):** The ITS system uses advanced technologies such as sensors, cameras, and communication systems to provide real-time information to drivers, transit agencies, and traffic management centers. It includes services such as traffic incident management (TIM), traffic signal coordination, and traveler information.
3. **Freeway Management System (FMS):** The FMS is a network of sensors, cameras, and variable message signs (VMS) that monitor and manage traffic flow on the region's freeways. It provides real-time traffic information and detour recommendations to drivers and alerts to congestion, incidents, and other potential hazards.
4. **Advanced Transportation Management System (ATMS):** The ATMS is a web-based platform that allows traffic managers to monitor and control traffic flow across the region in real time. It uses advanced algorithms to optimize traffic signals, adjust speed limits, and divert traffic to alternate routes during congestion or incidents.
5. **Traveler Information Services:** Traveler information services is a web-based service that provides real-time traffic information to drivers, which is provided by ODOT. It includes alerts on congestion, incidents, road closures, and construction projects and detour recommendations and alternative routes.

## Concepts of Operation and Field Devices

This section provides an overview of the types of devices and systems that have been deployed in the Oklahoma City region, including several that are currently being piloted. Each of the concepts of operation and field devices in this section was obtained from the 2003 Oklahoma City Regional ITS Implementation Plan and verified as existing programs from stakeholders' input. Each category described below includes subsets of elements and assets containing the ITS technology. Some existing ITS field devices in the Oklahoma City region for the ITS and TSMO Regional Strategic Plan include the following:

### *Broadcast Traveler Information*

The Oklahoma City region uses DMS to provide real-time traffic information to drivers on heavily transited roads. These electronic signs are placed in strategic locations to improve traffic flow and provide important updates, such as construction updates or accident alerts. The deployment tactics for DMS signs are determined based on the specific needs of the region. Stakeholders have verified the effectiveness of this program in improving safety and reducing congestion.

### *Network Monitoring*

Network monitoring consists of cameras, traffic signal control systems, and RWISs. The Oklahoma City region uses traffic signal control systems that use sensors and other technologies to detect traffic patterns and adjust signal timing to improve the flow of traffic. These systems can be also integrated with other ITS technologies, such as cameras and RWISs, to provide a more comprehensive view of traffic conditions and enable more effective traffic management.

In addition to these technologies, the Oklahoma City region relies on law enforcement communications to gather information about incidents that affect the transportation system. These communications include reports from drivers and other individuals who call in to report accidents, construction, or other incidents. Stakeholders have verified that these systems are critical components of the region's ITS infrastructure, enabling better detection and response to incidents, improved traffic management, and enhanced safety for all users.

### *Incident Management*

The incident management program in the Oklahoma City region aims to minimize the impact of traffic incidents on the transportation network through emergency response efforts. These efforts are carefully planned and coordinated to assure efficiency and effectiveness; emergency response teams have clear protocols for different types of incidents.
The incident management program includes both capital improvements and a management and operations element and is essential for the effective operation of the incident management system in the region. The program was implemented and runs in parallel with the ITS system's

deployment and operation. Stakeholders, including ODOT, the Oklahoma Highway Patrol (OHP), Regional Transportation Authority of Central Oklahoma (RTA), and other local agencies, have been involved in the development and implementation of the incident management program.

*Regional Transportation Management Center (RTMC)*

The RTMC is a central facility that coordinates and oversees the transportation system in the region. It uses various tactics, such as deploying ITS technologies and incident management systems and developing transportation demand management strategies, to improve efficiency, safety, and sustainability.

The RTMC is operated under the supervision of a board consisting of ODOT, ACOG, the Oklahoma Department of Public Safety (DPS), the City of Oklahoma City, the City of Edmond, and a rotating seat representing suburban communities. It is responsible for managing the regional freeway and arterials systems and sharing data and video with other agencies and the public through a regional communications network.

Within the Edmond TMC, operators use several monitoring tactics. These include dispatching emails with alarms to alert TMC operators, accessing closed circuit television (CCTV) cameras at each intersection, and controlling signal controllers. Depending on the situation, TMC operators can adjust signal timing or disable detection. Additionally, TMC operators can retrospectively analyze signal data to determine green time for specific movements, if needed.

*Traffic Operations*

The Oklahoma City region has implemented several traffic operations programs (including a surface street control program) to improve safety and efficiency on its roads, which local city public works departments continue to operate and maintain in their jurisdictions. These programs use traffic signals and cameras to monitor and control traffic flow on major surface streets in the region. The traffic signals are connected to two central traffic management systems that allow operators to adjust signal timing and settings in real time based on traffic conditions. Other functions include signal preemption for emergency vehicles and buses and highway/rail intersection controls. Positive feedback was received from stakeholders about these programs' effectiveness in reducing congestion and improving the region's overall driving experience.
Traveler Information Services.

The Oklahoma City region has implemented various traveler information systems, including DMS and highway advisory radio (HAR), to improve traffic flow and mobility.

The region has also deployed VMS and interactive traveler information kiosks at key locations to provide real-time traffic updates and access to a range of services. The program has been operated by RTMC staffing. Feedback from stakeholders suggests that these strategies have been successful in improving traffic flow and providing valuable information to travelers.

# 5 Transportation Systems Management and Operations Program Area Prioritization and Road Map

The Oklahoma City ITS and TSMO Regional Strategic Plan strategically aligns with the region's goals and objectives, placing a strong emphasis on ITS to enhance mobility and safety for all road users. Within each program area, a series of prioritized actions have been outlined that are purposefully directed toward achieving these objectives. These actions include developing innovative technologies and policies, launching pilot projects, and expanding existing programs. Collaboration with stakeholders and partners remains essential to assure these critical areas advance, thereby contributing to the overarching transportation goals.

## 5.1 Needs and Priorities

In congruence with regional objectives, stakeholders within the Oklahoma City region have identified fundamental needs and priorities specific to the implementation of ITS. These needs and priorities directly align with the goals and objectives of the region's ITS infrastructure, emphasizing the following.

- *Enhancing Safety and Reducing Accidents*: As a key objective, stakeholders prioritize safety improvements and the reduction of accidents. These objectives can be achieved through the use of advanced safety technologies like ITS and improved road design and enhanced driver education.
- *Improving Mobility and Congestion Management*: The focus on enhancing traffic flow, particularly in high-traffic areas, aligns with the goal of improving transportation efficiency. Achieving this objective entails implementing ITS solutions for real-time traffic management and congestion pricing and fostering alternative modes of transportation.
- *Promoting Economic Growth and Sustainability*: Stakeholders' commitment to supporting economic growth and sustainable development aligns with the objectives of enhancing transportation network efficiency and reducing environmental impacts through ITS technologies.
- *Enhancing Intermodal Connectivity*: The need for better integration between transportation modes reflects the region's objective to promote seamless intermodal connectivity through ITS technologies.

Stakeholders emphasize the importance of dedicated bike lanes and ITS solutions to improve biking safety and accessibility, aligning directly with the region's objectives. These identified priorities and needs underscore the concerted effort to reach transportation objectives and will be instrumental in guiding the region's TSMO efforts.

### 5.1.1 Program Area Prioritization

Guided by recommendations from the FHWA Office of Operations, a comprehensive assessment of six existing and six potential future TSMO program areas has been conducted, identifying the most pertinent areas for the Oklahoma City region. These program areas are detailed in **Table 5**.

**Table 5.** Existing and Potential Future Transportation Systems Management and Operations (TSMO) Program Areas.

| **Existing Transportation Systems Management and Operations (TSMO) Program Areas** | **Potential Future TSMO Program Areas** |
|---|---|
| A. Work Zone Management | G. Freight Management |
| B. Road Weather Management | H. Special Event Management |
| C. Traffic Incident Management | I. Transit Management |
| D. Traffic Management | J. Congestion Pricing |
| E. Traffic Signal Management | K. Integrated Corridor Management |
| F. Traveler Information | L. Connected / Autonomous Vehicles |

In the Oklahoma City region, the prioritization of ITS program areas has been established through an inclusive workshop involving stakeholders. The results, as depicted in **Table 6**, indicate that the priority levels for each program area span from medium to high. Notably, Traffic Management, Work Zone Management, and Traffic Signal Management services emerge as the foremost priorities for all stakeholders. Conversely, the Road Weather Management program area ranks lowest among existing programs.

In terms of future program areas, Traveler Information garners the highest priority, while initiatives such as Congestion Pricing and Freight Management rank lower. Importantly, these lower-ranking functions are managed by other agencies, which are poised to offer regional support for local efforts in these areas. This approach assures that the prioritization of ITS program areas aligns with both the expansion of services in existing program areas and the evolving needs and priorities of regional stakeholders.

**Table 6.** Transportation Systems Management and Operations (TSMO) Priorities of Existing and Future Program Areas.

| | Program Area | Oklahoma City Region (Stakeholder Scoring) |
|---|---|---|
| Existing | A. Work Zone Management | 4.5 |
| | B. Road Weather Management | 3.9 |
| | C. Traffic Incident Management | 4.5 |
| | D. Traffic Management | 4.8 |
| | E. Traffic Signal Management | 4.4 |
| | F. Traveler Information | 4.4 |
| Future | G. Freight Management | 3.0 |
| | H. Special Event Management | 3.6 |
| | I. Transit Management | 3.8 |
| | J. Congestion Pricing | 3.3 |
| | K. Integrated Corridor Management | 3.9 |
| | L. Connected / Autonomous Vehicles | 4.1 |

### 5.1.2 Program Area Needs

The Oklahoma City region currently has initiated several ITS initiatives, including a TMC, and a traveler information system. These programs are focused on improving traffic flow, reducing congestion, and providing real-time information to travelers. However, there are still areas that need improvement, such as enhancing the interoperability of these systems and increasing the availability of data to support decision-making. Additionally, there is a need for more robust incident management capabilities and advanced technology solutions to address emerging challenges, such as connected and autonomous vehicles (CAV).

## 5.2 Existing Programs

When assessing the future directions for the region's TSMO programs, it is essential to grasp the current organizational framework, envisioned program expansion, and associated roles. This section offers insights into the City of Oklahoma City's current operational, technological, and administrative practices for implementing and overseeing TSMO programs. These practices align with existing operational and safety initiatives.

A primary goal of this plan is to enhance both established and emerging TSMO programs by efficiently using technology to address congestion. This section details the current program areas, starting with the prioritization process and structure from stakeholders' perspectives. Subsequently, it presents a series of measures to extend these programs. Stakeholders' priorities for each potential new area are shown in **Figure 8**.

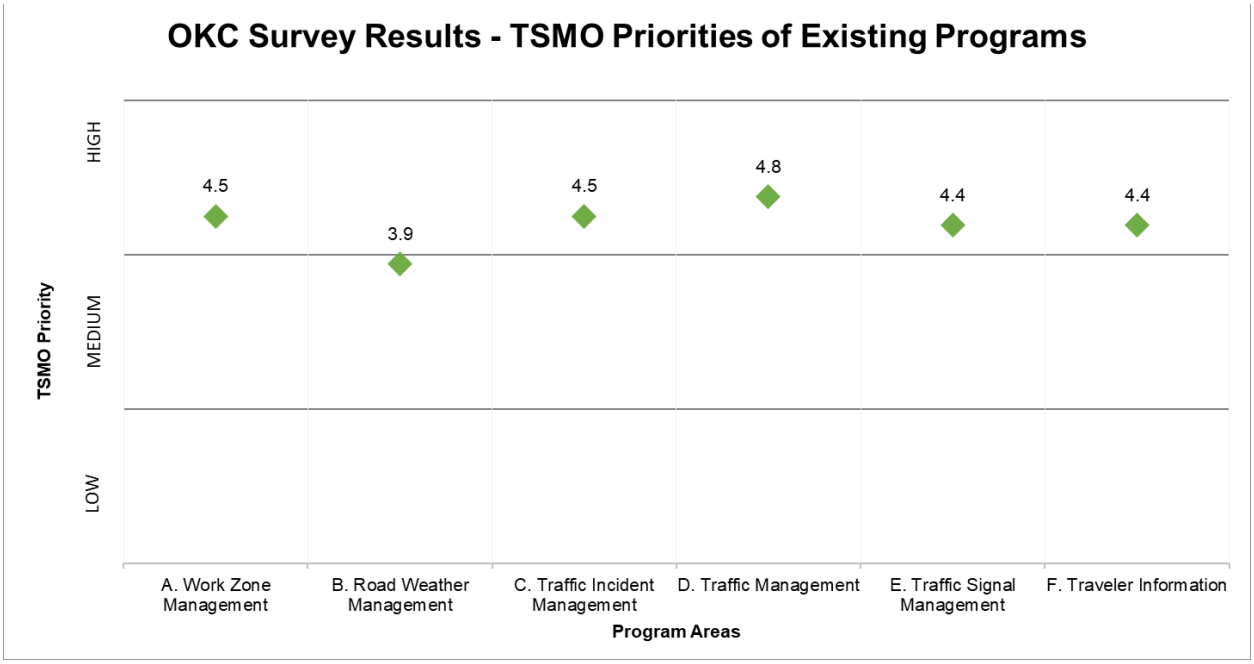


**Figure 8.** Existing Program Area Priorities.

### 5.2.1 Work Zone Management

| Work Zone Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • **Work zone management (WZM)** emphasizes the safety and operational efficiency of temporary construction and maintenance areas. Within the framework of Transportation Systems Management and Operations (TSMO), agencies are exploring technological and other strategies to enhance benefits for everyone within and passing through work zones.<br>• Oklahoma Department of Transportation (ODOT) has been integrating technology into the state's work zones for years. Despite previous efforts, there remains a need to thoroughly evaluate and develop new technologies and strategies, integrating them seamlessly into the region's regular operations. | • Collaborative efforts among the Oklahoma City regional staff have identified and prioritized various actions and focus areas to further advance WZM implementation, aiming to enhance traffic operations and elevate safety for both travelers and transportation workers. The table below highlights top-ranked action items, with comprehensive details provided in the Appendix. |

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Work Zone Policy Review –** Assess agency work zone policy on a regular basis to determine whether WZM safety and mobility impact mitigation goals and if objectives are still appropriate. | Ongoing | |
| **Develop Guidelines** – Develop advanced WZM strategy guidelines that can be used to select and budget for the most appropriate strategies during planning. | New | |
| **Formal Multiagency Approach** – Assess and develop formal multiagency approaches to collaboratively strategize WZM applications. | New | |
| **Assessment and Adoption of New WZM Technology and Procedures** – Establish analytical methods for assessing expected effectiveness of new WZM technologies and procedures. | Ongoing | |
| **Central WZM Performance Data Repository** – Create a repository of best practices and techniques for Work Zone Transportation Management plans, containing at minimum, definitions, methodologies, data needs, and resource links. | New | |

### 5.2.2 Road Weather Management

| Road Weather Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Road Weather Management (RWM) encompasses systems, procedures, and personnel actively engaged in monitoring, managing, and communicating road conditions during various weather events.<br>• The necessity for RWM extends beyond winter weather, being crucial year-round for scenarios like high winds, storms, floods, and other natural phenomena impacting travel in the Oklahoma City region. RWM plays a vital role as weather conditions not only lead to travel delays but can also pose potential threats. | • Within the Oklahoma City region, two new priority initiatives and three ongoing projects have been identified to enhance RWM. The table below highlights the top-ranked action items. Comprehensive details for all action items are available in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Coordinated Jurisdictional Boundaries** – Define operational procedures to allow TMC operators to provide coordinated responses across jurisdictional boundaries. | New | |
| **Adverse Weather Response Team** – Provide funding for multifunctional quick response teams within an agency that is available to respond to maintenance and operations issues during events on priority corridors. | Ongoing | |
| **Proactive Operations during Adverse Weather** – Define level of operator interaction and approvals required for automated messaging of weather alerts and other control strategies. | Ongoing | |
| **Identify Process Gaps and Institutional Issues** – For example, continue research to expand the study of identified flooding locations and the technologies required to detect and help mitigate the issue. | Ongoing | |
| **Develop Rerouting Software** – Pursue current efforts to develop a software capable of detecting debris and reroute/shut traffic down when needed. | New | |

### 5.2.3 Traffic Incident Management

| Traffic Incident Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Traffic Incident Management (TIM) involves multidisciplinary approaches to effectively plan and coordinate the swift detection, verification, response, and safe clearance of traffic incidents. The responsibility for assuring the safe and prompt resolution of traffic incidents disrupting normal traffic flow lies with transportation and public safety agencies. They manage the affected traffic until normal conditions are restored. | • The Oklahoma City region has identified several new priority initiatives aimed at enhancing TIM. Many of these initiatives emphasize optimizing information-sharing across the area to improve TIM services. The table below highlight the top-ranked action items, with detailed actions provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **TIM Documentation Review** – Review the material from National Traffic Incident Management Responder Training Program (SHRP 2 L12/L32) and the National Transportation Incident Management Coalition (NTIMC) including shared objectives related to responder safety, quick clearance, and interoperable communications. | Ongoing | |
| **Traffic Incident Working Group** – Establish a TIM/Systems Operations Working Group including an executive committee and technical committees as appropriate. Include both field and management personnel and identify leadership. | New | |
| **Standard Communication Protocol** – Identify a standardized, on-scene communications protocol to adopt an integrated organizational structure designed to aid in the management and operation of resources and personnel during incidents. For example, the Federal Emergency Management Agency (FEMA), offers an interactive online course about the use of incident command system (ICS) for on-scene response as a primary source of communication across agencies [1]. | Ongoing | |
| Automate the TIM related broadcast traveler information regarding presence of fleet vehicles with active HAAS Makeway system. | New | |
| **Organizational Chart** – Define respective roles and responsibilities by agencies. By doing this, commitment and organization of common resources and facilities can be allocated. | New | |

### 5.2.4 Traffic Management (TM)

| Traffic Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Traffic Management (TM) encompasses a diverse range of strategies aimed at actively monitoring and regulating travel through the implementation of appropriate policies, systems, and actions to assure safe and efficient transportation.<br>• Key strategy categories include real-time traffic condition monitoring, management of traffic control systems and data, communication with various stakeholders (field staff, management, partner agencies, emergency responders, media, and the public), and the digital connectivity of systems, devices, and partners through fiber-optic and wireless communications infrastructure. | • To optimize TM in the Oklahoma City region, three ongoing and two new initiatives have been identified. The table below highlights the top-ranked action items, while comprehensive details for all actions are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Standard Intelligent Transportation Systems (ITS) Plans and Specifications** – Develop ITS design standard plans and specifications promoting proactive incorporation of ITS into the planning, design, and construction process and workflow of a project. | Ongoing | |
| **Active Warning Systems** – Implement advisory strategies including active warning systems on travel times and incident notifications. | New | |
| **Organizational Structure** – Devise a training program that periodically cross-trains all staff on critical functions and is regularly updated as roles, responsibilities, duties, and/or functions change. | New | |
| **Traffic Infrastructure Inspection and Maintenance Priorities** – Support inspection and monitoring approach to identify maintenance issues with traffic infrastructure and equipment as a preventive method. | Ongoing | |
| **Preventive Maintenance Program** – Establish preventive maintenance program for assuring maximum performance for not only equipment but also operational settings. For instance, timing plans. | Ongoing | |

### 5.2.5 Traveler Information

| Traveler Information in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Traveler Information (TI) programs involve collecting and sharing valuable information with travelers to enable more informed route decisions. | • To enhance the distribution of TI in the region, the Oklahoma City area has prioritized several initiatives. The table below highlights the top-ranked action items. Comprehensive details for all actions are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Review Transit and Freight Operations for Appropriate Intermodal Interaction and Integration** – Continue to improve and expand mobility improvements to all elements of a regional transportation system that are part of a multimodal network with significant interdependence, including the region arterials and transit. | New | |
| **Develop Approach to Introducing Upgraded and State-of-the-practice Concepts and Systems** – Track state-of -the-art research and developments in advancing technology and applications. For example, vehicle-to -infrastructure wireless communications and probe data. | New | |
| **Identify Role of ITS and Traveler Information and System Performance Information to Road Users** – Identify and clarify in routine and special communications the current role of ITS and its value in providing traveler information and system performance information to costumers. | New | |
| **Identify the Range of Long-range Systems Developments** – Identify long-range developments including connected vehicles, automated traffic management, probe-based traveler information, location-based technology and services, vehicle miles of travel fees, road pricing, and other future developments. | New | |
| **Prioritization** – Define the **Oklahoma City** region's priorities for consistent implementation of TI. For example, en route updates for those who do not have access to a mobile. | New | |

### 5.2.6 Traffic Signal Management

| Traffic Signal Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Traffic Signal Management (TSM) encompasses the planning, layout, integration, maintenance, and operation of an efficient traffic signal system to cater to the needs of motorists, traffic signal operators, transit agencies, emergency operations staff, and emergency personnel. | • To streamline the design and management of traffic signals in the Oklahoma City region, two ongoing and three new initiatives have been identified. The table below highlights the top-ranked action items. Comprehensive details for all actions are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Implement a Preventive Maintenance Program** – Implement a program that includes inspecting and/or replacing equipment before it fails. It generally includes semi-annual or annual inspection and testing of control equipment, intersection hardware, vehicle and pedestrian detection systems, signal poles, signal heads, and mounting hardware. | Ongoing | |
| **Establish a Program to Address Design and Operations at High-crash Intersections** – Develop a formal process of identifying and monitoring high-crash locations and identifying corrective actions to lower the crash potential at these locations. | New | |
| **Support integration of Transportation Systems Management and Operations (TSMO) considerations into regional plans** – Incorporate traffic signal systems management and transportation public safety communications interoperability elements into the regional long-range transportation plan, transportation improvement program, and transportation programming process. | New | |
| **Develop a Documented Policy for Processing and Responding to Requests for Traffic Signal Timing Plan Modifications** – A documented process describing the mechanism by which the progress of programs, including routine operational programs, is reported to agency management, policy makers, elected officials, and the public. | Ongoing | |
| **Develop Regional Standards for Maintaining Traffic Signal System Technologies and Systems in a State of Good Repair** – Work with regional partners to establish a minimum standard at which all traffic signals must be maintained. | New | |

## 5.3 New Program Areas

The stakeholders prioritized several new program areas for the region of Oklahoma City to pursue. The following sections describe and briefly address the actions recommended to advance each of the programs.

Stakeholder priorities for each potential new program area are shown in **Figure 9**.

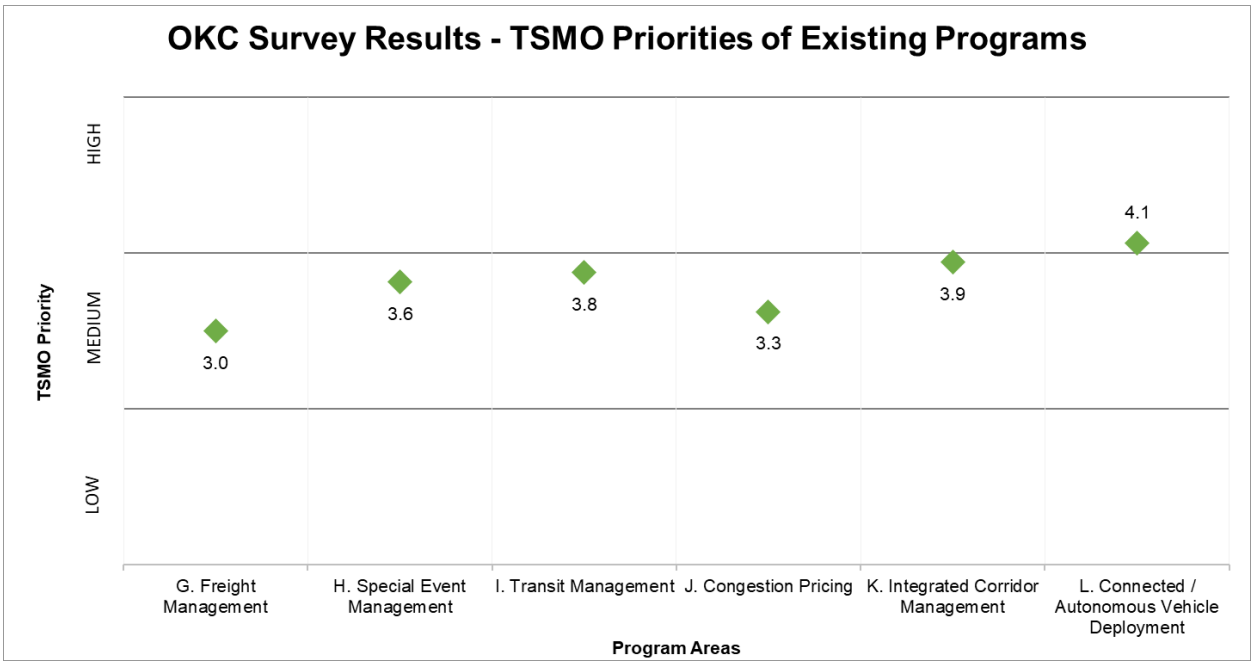


**Figure 9.** Future Program Area Priorities.

### 5.3.1 Freight Management

| Freight Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Assuring safe, dependable, and efficient freight transportation is essential for driving exports, fostering commerce, and fueling economic growth. A robust multimodal system in Oklahoma contributes to state and national economies by reducing costs for businesses and consumers, enhancing the competitiveness of goods globally. | • The Oklahoma City region has identified five new priorities initiatives to enhance freight management in the area. The table below highlights the top-ranked action items. Detailed action items are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Performance Measures** – Review transit and freight operations for appropriate intermodal interaction and integration, including preferences and specialized traveler information. | New | |
| **Level of Service** – Improve freight level of service both in terms of mobility and safety programs included in formal agency documents, including management of congestion, reduction of delay and improvement of reliability – especially in relationship to nonrecurring congestion. | New | |
| **Modernization Efforts** – Modernize freight-related security protocols and safety oversight. | New | |
| **Freight Safety Technologies** – Support the creation and uptake of new freight safety technologies, such as automation and communication. | New | |
| **Educational Outreach** – Develop outreach program to familiarize key stakeholder constituencies (freight and safety) with relevance of Intelligent Transportation Systems (ITS) technology deployment. | New | |

### 5.3.2 Special Event Management

| Special Event Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Planned special events create a sudden and intense surge in travel demand, often necessitating temporary traffic control measures to handle event-related traffic. These events impact freeway operations, arterial and street operations, transit operations, and pedestrian flow. Unlike construction activities or traffic incidents limited to a single corridor, planned special events influence travel across all corridors serving the event venue. | • The Oklahoma City region highlighted five ongoing initiatives to effectively handle special event traffic. The table below highlights the top-ranked action items. Detailed action items are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Schedule of Planned Special Events** – Establish and uphold a calendar of the region's planned special events. And follow an established event operations planning process. | Ongoing | |
| **Coordination for Special Events/ Work Zones** – Coordinate transit for special events / work zones. Adding extra services, for instance, during times of big events or while a roadway is under construction. | Ongoing | |
| **Improved Transit Network Operations** – Review opportunities for improved network operations across jurisdictional boundaries and facility types such as improved roadway network and corridor operations and related improvements supporting transit operations. | Ongoing | |
| **Planned Special Event Operational Costs** – Create a system for monitoring operational costs for upcoming special events. | Ongoing | |
| **Review of Operational Roles** – Identify all prospective operational entities and/or persons along with their responsibilities for planned special event activities. Include all expected operational entities in the planning process. | Ongoing | |

### 5.3.3 Transit Management

| Transit Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Effective management of transit systems is essential to address the growing demand for mobility, alleviate traffic congestion, minimize environmental impacts, and offer affordable and equitable transportation options in the **Oklahoma City** region. | • The Oklahoma City region highlighted five ongoing priority initiatives to elevate transit management in the area. The table below highlights the top-ranked action items. Detailed action items are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Coordination for Special Events/ Work Zones** – Coordinate transit for special events / work zones. Adding extra services, for instance, during times of big events or while a roadway is under construction. | Ongoing | |
| **Transit Network Operations** – Examine opportunities for better transit network operations across jurisdictional boundaries and facility type. For instance, improved roadway network and corridor operations and related improvements supporting transit operations. | Ongoing | |
| **Pilot Programs** – Promote the development of Connected and Autonomous Vehicle (CAV) and Microtransit-support pilot projects for autonomous transit vehicles and microtransit. | Ongoing | |
| **On-Demand Mobility Service** – Incentive efforts to improve the on-demand mobility service transit program. | Ongoing | |
| **Ridesharing** – Promote shared-ride service for efficiency. | Ongoing | |

### 5.3.4 Congestion Pricing

| Congestion Pricing in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Congestion pricing is a method employed to divert traffic from congested roadways by adjusting toll prices based on the current congestion level. | • In addressing congestion pricing for the Oklahoma City region, four ongoing initiatives and one new initiative were highlighted as potential candidate areas for implementing different pricing strategies. The table below highlights the top-ranked action items. Detailed action items are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Pricing Entire Toll Facilities** – Identify corridors that may benefit from pricing of entire roadway facilities | Ongoing | |
| **Parking** – Identify areas that may benefit from parking pricing. | Ongoing | |
| **Legal Framework for Pricing** – Identify the legal framework required for potential congestion pricing strategies and policies. | Ongoing | |
| **Agency Policy Objectives** – Determine the connections between the agency's policy goals and the present improvement efforts in terms of the possibility for enhanced Transportation Systems Management and Operations and Intelligent Transportation Systems to achieve goals with particular emphasis on congestion relief, reliability enhancement, and safety. | New | |
| **Vehicle and Ridesharing** – Identify areas that may benefit from priced vehicle sharing and dynamic ridesharing. | Ongoing | |

### 5.3.5 Integrated Corridor Management

| Integrated Corridor Management in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Transportation corridors often harbor underused capacity, with facilitates and services independently operated.<br>• Integrated Corridor Management (ICM) envisions substantial improvements in the efficient movement of people and goods through collaborative institutions and proactive integration of existing infrastructure along major corridors. | • The Oklahoma City region has outlined five new initiatives to promote integrated corridor management. The table below highlights the top-ranked action items. Detailed action items are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Joint State-local Projects** – Give explicit consideration to joint state-local projects on a corridor or network basis such as integrated corridor management and improved arterial signalization and coordination. | New | |
| **Review Opportunities for Interjurisdictional Cooperation on an Integrated Corridor Basis** – Review options for Intelligent Transportation Systems (ITS) networking and for coordinated or consolidated operations, including data collection burden sharing, data sharing, devolved operational responsibility, cost-sharing, etc. (including freeways and arterials). | New | |
| **Integrated Corridor Management Strategy Evaluations** – Evaluate strategies by combining management and information tools such as more intensive freeway management (ATM – Advanced Traffic Management) and/or multijurisdictional implications, and the integration of probe vehicles, remote sensing, image assessment and other technologies. | New | |
| **Cross-region Data Sharing** – Strengthen data sharing with key agencies, DMS control across the region. Promote additional coordination with agencies and traffic signals. | New | |
| **Active Management of Integrated Corridors** – Advance the level of active management and integration of each integrated corridor over time to increase the address corridor issues over time. | New | |

### 5.3.6 Connected and Autonomous Vehicles (CAV)

| Connected and Autonomous Vehicles in the Oklahoma City Region | Recommended Actions |
|---|---|
| • Oklahoma Department of Transportation (ODOT) is actively monitoring the developments in connected and autonomous vehicle (CAV) technologies. Emphasis is placed on proactive measures for both connected and automated vehicles to leverage anticipated benefits and address potential impacts on infrastructure and operations. | • To prepare for the integration of CAV in the region, the Oklahoma City area has outlined five new initiatives. The table below highlights the top-ranked action items. Detailed action items are provided in the Appendix. |

*Recommended Actions*

| Initiatives | Initiative Status | Assigned to |
|---|---|---|
| **Expanding Capabilities of Technology** – Leverage and address future mobility needs for the region, including connected and autonomous vehicles. | New | |
| **CAV Preparedness Plan for the Region** – Collaborate with current statewide CAV preparedness plan. The Oklahoma Advance Mobility Program is already in place and supported by broad stakeholders statewide. | New | |
| **Emerging Technologies Preparedness** – Prepare for addressing emerging technologies, including automated vehicles, third-party data advances, and others that have the potential to transform mobility. | New | |
| **Connected Autonomous Vehicles Impacts** – Identify potential connected and autonomous vehicles impacts on traffic signal operations, arterial operations, safety, and mobility. Use readily available real-time data to make real-time operational decisions. | New | |
| **Freeway/Highway Infrastructure** – Explore CAV technologies along freeway managed lanes. The challenge may include the testing of these innovative products. | New | |

# 6 Regional Considerations

The full potential of TSMO and ITS technologies can only be realized if it is supported by the right organizational structure, processes, and resources to administer them effectively. In recent years, various entities within the Oklahoma City region have invested in staffing, systems, and infrastructure to support its focus on TSMO, including ACOG, EMBARK, RTA, ODOT, and local municipalities.

These investments have helped to integrate ITS and TSMO into each regional organization's existing structure and processes. However, as the focus on operations continues to grow, these organizations may need to consider adjustments to their structure and processes to support the advancement of TSMO and regional coordination and efficiencies that might be gained with approaches like consolidation. This section explores some of the organizational and process areas that may be affected by this increased focus on operations.

## 6.1 Regional Transportation Systems Management and Operations (TSMO) Coordination

This plan recognizes the need for strong regional coordination of TSMO efforts. To support this goal, the plan recommends establishing a regional TSMO steering and coordination committee responsible for coordinating all TSMO activities in the region. These activities include the following:

- Education and outreach to stakeholders
- Training for the transportation community
- Targeted education for senior management and elected officials
- Use of social media and conferences to promote TSMO

The committee should be representative of all regional agencies; the chair position should rotate through the member agencies. If the MPO is unable to take on the leadership role, ODOT or the City of Oklahoma City can spearhead the committee and establish bylaws. By implementing this coordination committee, the Oklahoma City region aims to foster a culture of innovation and collaboration within the transportation community and assure that TSMO is understood and embraced as a critical component of the region’s transportation system.

Collaboration among organizations is crucial for the success of TSMO strategies and involves verbal collaboration on projects, the development of collaborative procedures or software applications, the exchange of relevant operational data, and joint efforts to use multiple sources of data for better decision-making. It is recommended that this regional ITS committee be given a formal charter and meet regularly to advance TSMO and improve transportation operations throughout the region. External partners, such as ODOT, DPS, and other local agencies may also be invited to facilitate fully integrated transportation system operations.

To assure the success of the TSMO program in the greater Oklahoma City region, it is important for all key stakeholders to be fully committed to the program and work together to achieve its goals. This effort can involve providing the necessary resources and support, collaborating with other organizations, and regularly reviewing and adapting the program as needed. By working together and leveraging the strengths and expertise of all involved, the TSMO programs can effectively improve transportation operations throughout the region.

### 6.2 Workforce Development

Agencies within the Oklahoma City region understand the importance of a well-trained and specialized workforce for the success of ITS initiatives. To support this endeavor, the plan recommends investing in workforce development initiatives such as recruitment, training programs, and professional advancement paths specifically for ITS and TSMO staff. These initiatives will help attract and retain top talent and provide opportunities for professional growth. By building a highly skilled and specialized workforce, the region can bolster the success of TSMO/ITS efforts and broader transportation-related goals.

The region may also consider regional and interagency initiatives, such as having ACOG host regional training to enhance the skills of the workforce ranging from engineers to technicians, enabling them to effectively monitor traffic conditions. The National Cooperative Highway Research Program's (NCHRP) TSMO Workforce Guidebook (NCHRP-20-07) may be used to guide and inform these workforce and development efforts.

### 6.3 Programming and Budget

Programming and budget are crucial for achieving the Oklahoma City region's goals. To support this aspect, the region should work with ODOT to assure TSMO/ITS projects are included on the Statewide Transportation Improvement Program (STIP) and the Capital Improvement Plan (CIP). The region should also consider funding regional TSMO/ITS projects through the MPO. Each agency should allocate some funding for these projects and review its planning processes to give equal consideration to operational projects alongside capital improvement projects.

To assure the success of the organization, it is recommended to identify and allocate funding for specific training needs and opportunities for the TSMO workforce. This training should cover the systems, procedures, and technologies used by the organization and its regional partners and broader external training opportunities related to all aspects of TSMO and ITS operations.

Effective programming and budget management are essential for the success of these efforts in the Oklahoma City region. In addition to dedicated funding sources, the region should consider allowing larger ITS and TSMO initiatives to compete for funding through the STIP process,

potentially requiring accommodations to show the value and benefit of TSMO projects in similar terms to capital investment projects.

### 6.4 Performance Measurement and Management

Performance measurement and management are essential for effective transportation system management in the Oklahoma City region. By using data to develop and track performance measures, the region can inform operational decisions and optimize system operations. The Oklahoma City region has already used various TSMO-related data sources to monitor system performance, including data on roadway operations and various ITS devices and systems. Some examples of these data sources include the following:

- Volume/occupancy/classification data from permanent count stations with separate advance loops
- Travel times from the INRIX probe data product
- Incident response times from the ATMS
- Speed, volume, and occupancy data from detector stations connected to the ATMS

In addition to these measures, the region should continue to evaluate emerging data sources and performance management techniques for applicability to the TSMO program. It may also be beneficial to evaluate the feasibility and benefits of implementing a data repository and real-time data exchange system. This system could potentially be used to share data among different agencies and organizations within the region, enabling more effective collaboration and decision-making.

The Oklahoma City region should also consider the importance of data storage, analytics, and management in the field of TSMO and ITS. Currently, the region has typically stored its own data in on-site databases and accesses procured data through available data feeds and Application Programmer Interfaces (APIs). However, as data technology continues to advance, it is recommended that the region periodically evaluate the benefits and drawbacks of evolving data management strategies for each of its data sets and develop a data management plan that includes policies for storage, aggregation, and retention. This will assure that the region can keep its data up to date and easily accessible while also considering the various data and formatting needs of all divisions.

The Oklahoma City region should continue to use data to inform its TSMO and transportation system management decisions while also staying up to date on emerging data sources and technologies. By developing a data management plan and exploring the potential benefits of a data repository and real-time data exchange system, the region can effectively use data to support the ongoing improvement of transportation operations and support the mobility needs of the region.

## 6.5 Plan Implementation

To fully integrate TSMO and ITS into the Oklahoma City region, transportation agencies must prioritize the implementation of these technologies across their entire organization. This will require a dedicated effort over time, with regular review and updates to assure progress and effectiveness. By following these steps, transportation agencies can unlock the full potential of TSMO and ITS to improve mobility and safety across the region.

## 6.6 Organize for Implementation

The Oklahoma City region is considering implementing a TSMO/ITS program through the establishment of a regional steering committee. This committee will be responsible for overseeing the implementation of the program and will include representatives from key stakeholders' organizations within the region. The TSMO steering committee will work to assure that TSMO and ITS concepts are integrated into the practices and standards of each organization and will facilitate communication and collaboration among the various agencies involved.

## 6.7 Prioritize and Execute Tasks

For the Oklahoma City region, the recommended actions to advance the operational capability of the TSMO/ITS technology deployment in existing and new program areas are outlined in **Section 5**. As there are more actions than can be undertaken at once, the regional steering committee will prioritize and execute selected tasks in a systematic manner, starting with those that provide the greatest benefit given the available budget and resources.

The process will involve researching and adding detail to each task, estimating costs and benefits, prioritizing tasks, reviewing resources, developing an implementation schedule, assigning responsibility for implementation, establishing performance measures, and regularly reviewing resource needs and adjusting programming as needed.

## 6.8 Plan Maintenance

The region has seen significant TSMO/ITS advancements in recent years, and new technologies are constantly emerging and evolving. It is very important for the regional steering committee to regularly review and update the ITS and TSMO Regional Strategic Plan to reflect the latest progress and developments.

Therefore, recommended action items discussed in **Section 5** should be reviewed annually, and the plan should be assessed at least every five years, or sooner if necessary. This will assure that the region's TSMO and ITS program remains effective and responsive to the changing needs of the Oklahoma City area's transportation system.

## 7 Conclusion

The Oklahoma City region is at a pivotal moment in its pursuit of a safer, more efficient, and interconnected transportation network. The fusion of ITS and TSMO presents a unique opportunity to revitalize the region. ITS and TSMO Regional Strategic Plan outlines a visionary path that leverages the transformative potential of these systems.

At the core of this vision lies the spirit of cooperation, coordination, and a shared commitment to enhancing transportation for all. Aligned with the Oklahoma City 2045 Encompass Regional Transportation Plan, this plan charts a comprehensive course that advances the goals of ITS and TSMO, emphasizing the utmost importance of prioritizing safety, mobility, sustainability, and intermodal connectivity.

The mission at the heart of this vision is to elevate transportation systems through the facilitation of ITS technologies. These technologies serve as the linchpin, not merely for advanced traffic management, but also for establishing a robust framework for collaborative engagement among a myriad of agencies and stakeholders. This commitment to collaboration is a testament to the region's dedication to improving safety, alleviating congestion, and reducing environmental impacts, ultimately enhancing the quality of life for its residents.

The journey begins with prioritization, as stipulated in the Oklahoma City Regional ITS and TSMO Strategic Plan. Six existing and six future TSMO program areas have been identified, serving as the fundamental building blocks of this transformative endeavor. These program areas are designed to seamlessly align with the region's goals, focusing on the deployment of advanced safety technologies, efficient traffic management, and robust incident management capabilities. This commitment to a multidisciplinary approach assures that the progress is not only feasible, but also sustainable and comprehensive.

The prioritization of ITS program areas, reflecting the results of a workshop driven by stakeholders, further underscores the collective vision. Stakeholders, representing a diverse array of interests, converge on the shared priority of improving traffic management and signal control, acknowledging the immediate benefits to safety and congestion reduction.

Recognizing needs and priorities is integral to this vision. The acknowledgment that challenges persist, such as interoperability issues, data availability, traffic management, and emerging technologies, illustrates the region's proactive stance. The willingness to confront these challenges head-on showcases a readiness to innovate solutions that dovetail with the envisioned transformation. The need to reduce accidents and prioritize safety is a common thread that runs through all program areas and aligns with the goal of assuring that residents and businesses can depend on a safe and reliable transportation system.

The promotion of economic growth and sustainability is another crucial facet of the vision. This vision recognizes that transportation is not merely a means to get from point A to point B; it is a catalyst for economic development and environmental sustainability. By promoting economic growth and sustainable development through the efficient deployment of ITS technologies, the Oklahoma City region seeks to enhance the quality of life for its residents while minimizing its environmental footprint.