# Regional Transportation System Management and Operations (TSMO) Vision and Regional ITS Architecture Update

## Transportation Coordinating Committee

02/21/2020

ARC

ICF

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# Agenda

**1. Project Status Update**

**2. Local Agency TSMO Deployment Guide**

**3. TSMO Strategic Plan Draft Review**

Initiatives

Action Plan

Priorities

**4. Next Steps/Wrap up**

# Project Status Update

## Stakeholder Engagement

### Developing a Common Vision

Establish a TSMO vision for the region

Develop operations goals and objectives

**Workshop #1: Visioning (December 2018)**

### Defining the Building Blocks

Develop a baseline inventory of ITS and ATMS infrastructure

Explore best practices in transportation data governance and data exchange

Update the regional ITS Architecture

Conduct technological assessment

**Workshop #2: ITS Architecture & Data Governance (March 2019)**

### Leading to Effective Deployment

Identify pilot concepts

**Develop ITS/TSMO Local Agency Deployment Guide**

**Develop Strategic Plan (5- and 10-year Action Plans)**

**Workshop #3: Technology - Pilot Projects & Local Agency Guide (July 2019)**

**Workshop #4: TSMO Strategic Plan (December 2019)**


# Local Agency Deployment Guide

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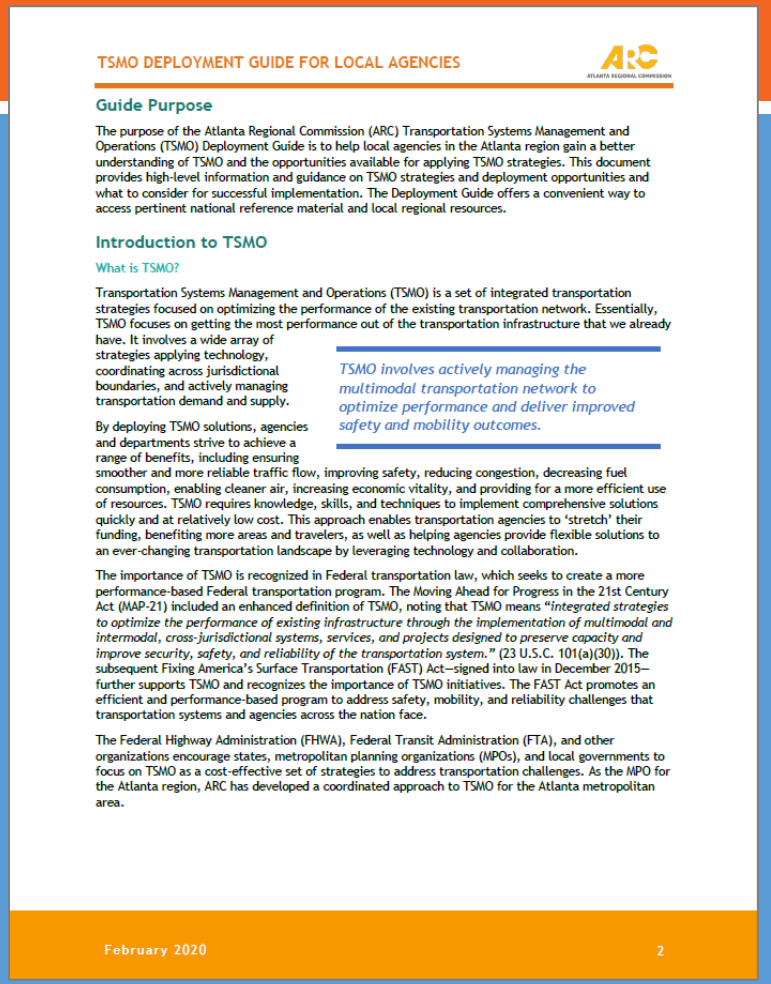
# Local Agency Deployment Guide - Guide Content

- Introduction to TSMO
- Regional TSMO Vision
- TSMO Strategies: A Menu of Options
- Implementation – Advancing Effective Deployments
- Reference Material



TSMO DEPLOYMENT GUIDE FOR LOCAL AGENCIES

ARC ATLANTA REGIONAL COMMISSION

## Guide Purpose

The purpose of the Atlanta Regional Commission (ARC) Transportation Systems Management and Operations (TSMO) Deployment Guide is to help local agencies in the Atlanta region gain a better understanding of TSMO and the opportunities available for applying TSMO strategies. This document provides high-level information and guidance on TSMO strategies and deployment opportunities and what to consider for successful implementation. The Deployment Guide offers a convenient way to access pertinent national reference material and local regional resources.

## Introduction to TSMO

### What is TSMO?

Transportation Systems Management and Operations (TSMO) is a set of integrated transportation strategies focused on optimizing the performance of the existing transportation network. Essentially, TSMO focuses on getting the most performance out of the transportation infrastructure that we already have. It involves a wide array of strategies applying technology, coordinating across jurisdictional boundaries, and actively managing transportation demand and supply.

*TSMO involves actively managing the multimodal transportation network to optimize performance and deliver improved safety and mobility outcomes.*

By deploying TSMO solutions, agencies and departments strive to achieve a range of benefits, including ensuring smoother and more reliable traffic flow, improving safety, reducing congestion, decreasing fuel consumption, enabling cleaner air, increasing economic vitality, and providing for a more efficient use of resources. TSMO requires knowledge, skills, and techniques to implement comprehensive solutions quickly and at relatively low cost. This approach enables transportation agencies to 'stretch' their funding, benefiting more areas and travelers, as well as helping agencies provide flexible solutions to an ever-changing transportation landscape by leveraging technology and collaboration.

The importance of TSMO is recognized in Federal transportation law, which seeks to create a more performance-based Federal transportation program. The Moving Ahead for Progress in the 21st Century Act (MAP-21) included an enhanced definition of TSMO, noting that TSMO means "*integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.*" (23 U.S.C. 101(a)(30)). The subsequent Fixing America's Surface Transportation (FAST) Act—signed into law in December 2015—further supports TSMO and recognizes the importance of TSMO initiatives. The FAST Act promotes an efficient and performance-based program to address safety, mobility, and reliability challenges that transportation systems and agencies across the nation face.

The Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and other organizations encourage states, metropolitan planning organizations (MPOs), and local governments to focus on TSMO as a cost-effective set of strategies to address transportation challenges. As the MPO for the Atlanta region, ARC has developed a coordinated approach to TSMO for the Atlanta metropolitan area.

# Local Agency Deployment Guide – TSMO Strategies

- Traffic Signal Management
- Work Zone Management
- Connected and Automated Vehicles
- Traffic Incident Management
- Emergency Transportation Operations
- Traveler Information
- Transportation Demand Management
- Integrated Corridor Management
- Event Management
- Freight Management
- Performance Management
- Supporting Deployments

# Local Agency Deployment Guide – Traffic Signal Management

## TRAFFIC SIGNAL MANAGEMENT

**Effective traffic signal management is proven to be one of the most cost-effective operational improvements; signal retiming typically provides a benefit to cost ratio ranging from 17:1 to 62:1.**

Traffic signals, the most common form of traffic control, are crucial to a transportation network and can enhance corridor operations. Efficiently managing traffic signals results in reduced congestion, reduced maintenance expenditures, and increased safety. FHWA defines traffic signal management as "organizing for the planning, maintenance, design, and operation of signalized intersections and traffic signal systems." Traffic signal timing programs can be basic and localized, such as to a single intersection, or more sophisticated, such as having various, advanced signal timing programs. Such systems require regular maintenance and frequent monitoring to maintain the efficiency of the signal system.

### Support for Regional TSMO Goals

#### Optimizing Safety

Safety is enhanced with the use of traffic signal management by enhancing progression through intersections, which requires less stop-and-go traffic to reduce the number of crashes. In addition, emergency vehicle preemption reduces the risk for crashes by allowing the emergency vehicle to progress through the intersection with the appropriate signal indication.

#### Reliable Travel Times

More reliable travel times are realized through traffic signal management by enhancing the operational efficiency of corridors—getting more cars through a given corridor more effectively.

#### Efficient, Seamless Travel

Traffic signal management supports efficient, seamless travel by synchronizing the movement of vehicles along the corridor, ideally to prevent things such as "hitting every red light." By maintaining the signal system as well as adjusting the system as needed through frequent monitoring, traffic system management can also support efficient seamless travel by reducing the number of down devices or mistimed intersections due to out-of-date cycles.

#### Environmental Benefits

Reducing the congestion of high-volumes routes results in fewer vehicles idling and producing emissions. Reducing the amount of starts and stops that a motorist experiences will also reduce the amount of emissions produced by each vehicle.

### Applications

Applications used to manage traffic signals vary widely in complexity and technology; from basic signal timings to coordinated systems that rely on real-time detection data and advanced software systems. With the use of coordination and communication between signals, traffic devices can adjust based on current traffic conditions—travel patterns along major corridors change significantly throughout the day due to commuter, school, shopping, special events, and other activities that generate traffic. Having signals and other supportive devices communicate with each other to respond to current conditions provide significant safety and mobility benefits and allows for a flexible system that responds to ever-changing corridor needs.

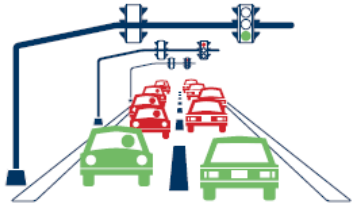


- Description
- Regional Goals
- Applications

## TRAFFIC SIGNAL MANAGEMENT

### Uncoordinated Signal Timings

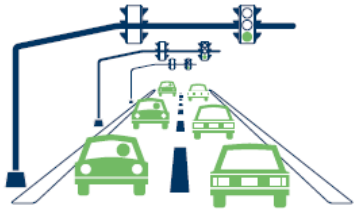
Uncoordinated signal timings serve movements at a single intersection based on current demand by using minimum and maximum timers and detection data. This signal timing works well with low volumes or large signal spacing. However, the lack of coordination can lead to increased stops, congestion, and driver frustration if a driver is required to stop at every traffic signal along a route.



### Coordinated Signal Timings

*Advanced Signal Timings*

Uncoordinated signal timings serve movements at a single intersection based on current demand by using minimum and maximum timers and detection data. This signal timing works well with low volumes or large signal spacing. However, the lack of coordination can lead to increased stops, congestion, and driver frustration if a driver is required to stop at every traffic signal along a route. Georgia Department of Transportation (GDOT) currently uses the MaxView/MaxTime traffic signal software throughout the state. It is the responsibility of the maintaining agency to deploy, operate, and maintain the advanced signal timing, but the software is made available to all agencies within the state free of charge.



*Responsive Signal Timings*

Responsive signal timings evaluate real-time data collected from detectors and adjust coordinated signal timings per cycle using parameters defined by *predetermined timing plans*. This signal timing is used when traffic patterns along a signalized corridor are variable and unpredictable, often times during special events, construction, or incidents.

*Adaptive Signal Timings*

Adaptive signal timings evaluate real-time data collected from detectors and adjust coordinated signal timings per cycle determined by *automated calculations of optimal signal timings*. The use of automated algorithms vs. predetermined timing plans is the key difference between responsive and adaptive signal timing. This signal timing is used when traffic patterns along a signalized corridor are variable and unpredictable, often during special events, construction, or incidents.

### Preemption and Priority

*Emergency Vehicle Preemption (EVP)*

Emergency vehicle *preemption* involves communication between an emergency vehicle and traffic signals. The emergency vehicle transmits a signal that is received by the traffic signal controller which then provides a green signal in the direction of travel so that the emergency vehicle can safely and quickly travel through the intersection. This application can be accomplished through a variety of methods:

- Station activation - when an emergency vehicle leaves a given station, the system is activated. The system sends a command to the traffic signals along a predetermined route that then cycle to provide green in the direction of emergency vehicle travel for a given amount of time.
- Dynamic activation - the emergency vehicles are equipped with an on-board unit or piece of hardware which sends a signal to a receiver at a traffic signal. The message is received and the signal cycles to provide green in the direction of emergency vehicle travel for a given amount of time.

# Local Agency Deployment Guide – Traffic Signal Management

## TRAFFIC SIGNAL MANAGEMENT

*Transit Signal Priority (TSP)*

Transit signal *priority* involves communication between a transit vehicle and traffic signals. The communication results in additional green time in the direction of travel so that the transit vehicle may progress through the signal without stopping.

### Contexts

#### Urban

Traffic signal management in an urban setting typically relies on pretimed operation as the signals are closely spaced and coordination is needed in several directions. Creating, updating, and implementing these plans can require significant effort and coordination between city, county, and state agencies. Urban settings also tend to include more modes of transportation than other areas, including public transit, biking, walking, and micro-mobility options. Keeping these modes in mind while planning timing strategies is critical.

#### Suburban

Suburban routes typically have heavy peak directional traffic, serving inbound and outbound commuters. Creating signal timings that optimize directional flow during these peaks will help reduced congestion and delay experienced by the motorists. Developing off-peak and balanced signal timing plans to operate during less congested times of the day will help support traffic flow throughout the area. Increased connectivity and advancing technology are making it easier to install and operated EVP and TSP systems at all intersections. Installing these devices can help decrease transit travel times and increase safety for emergency vehicles as well as the general public.

#### Rural

Traffic signal management in rural settings tend to have lower volumes, random vehicle arrivals, and large spacing between traffic signals. Focus is typically on individual signals, uncoordinated movements and intersections. Optimization of uncoordinated timings will help reduce delay for motorists traveling through these areas. New technologies can be installed at these locations to provide EVP opportunities or enhanced safety systems that provide additional time to allow for trucks to safely travel through the intersection.

### Regional Examples

The following chart provides a few regional examples of current traffic signal management applications:

| Application | Location and Deployment Type |
|---|---|
| Advanced Signal Timing | GDOT RTOP (throughout RTOP corridors): MaxView/Max Time<br>ARC Region: MaxView/MaxTime (primary)<br>Sandy Springs: TACTICS |
| Responsive Signal Timing | GDOT RTOP (key RTOP coordinated systems): MaxView/MaxTime |
| Adaptive Signal Timing | Sandy Springs: SCOOT<br>Marietta: SCATS<br>Johns Creek: CENTRACS<br>Cobb County: SCATS |
| Emergency Vehicle Preemption | Marietta: Glance<br>Atlanta: Glance |
| Transit Signal Priority | Marietta: Glance |



- Contexts
- Regional Examples
- References

## TRAFFIC SIGNAL MANAGEMENT

### References

The following references are useful for further understanding, planning, and implementing traffic signal management.

Georgia Department of Transportation (GDOT) Traffic Signals
http://www.dot.ga.gov/DS/SafetyOperation/TrafficSignals
*The GDOT provides resources, including, the Traffic Signal Design Guidelines, state Qualified Products List (QPL), and general information about current initiatives and Programs.*

FHWA Traffic Signal Timing Manual - Second Edition
http://www.trb.org/OperationsTrafficManagement/Blurbs/173121.aspx
*This manual offers information on fundamentals and advanced signal timing concepts. In addition, information about the systems engineering process, adaptive signal control, priority/preemption, and strategies for over-saturated conditions, special events, and inclement weather are included.*

FHWA Traffic Signal Management Plan Guidebook
https://ops.fhwa.dot.gov/publications/fhwahop15038/index.htm
*The FHWA Traffic Signal Management Plan Guidebook provides direction on how to better manage traffic signal systems through systematic alignment of maintenance, design, and operations activities and resources. A well-organized traffic signal management plan will provide multiple benefits to an agency. It will also:*

- *Document what traffic signal maintenance, operations, and design staff do, why they do it, and how their activities support the agency's goals and objectives.*
- *Provide a firm basis to support maintenance and operations as well as capital budgets.*
- *Facilitate succession planning and integration of new staff into the organization.*
- *Specify a logical framework within which staff training can be planned and organized.*
- *Help agencies become less dependent on key individuals, reduce ad hoc procedures and provide organization and structure for the agency's activities.*

USDOT ITS Knowledge Resources
https://www.itsbenefits.its.dot.gov/its/benecost.nsf/BenefitsHome
*This resource provides an expansive clearinghouse of cost and benefit information pertaining to traffic signal management as well as other transportation technology deployments. Agencies nationwide provide open access to their costs, evaluations, and lessons learned.*


# Regional TSMO Strategic Plan

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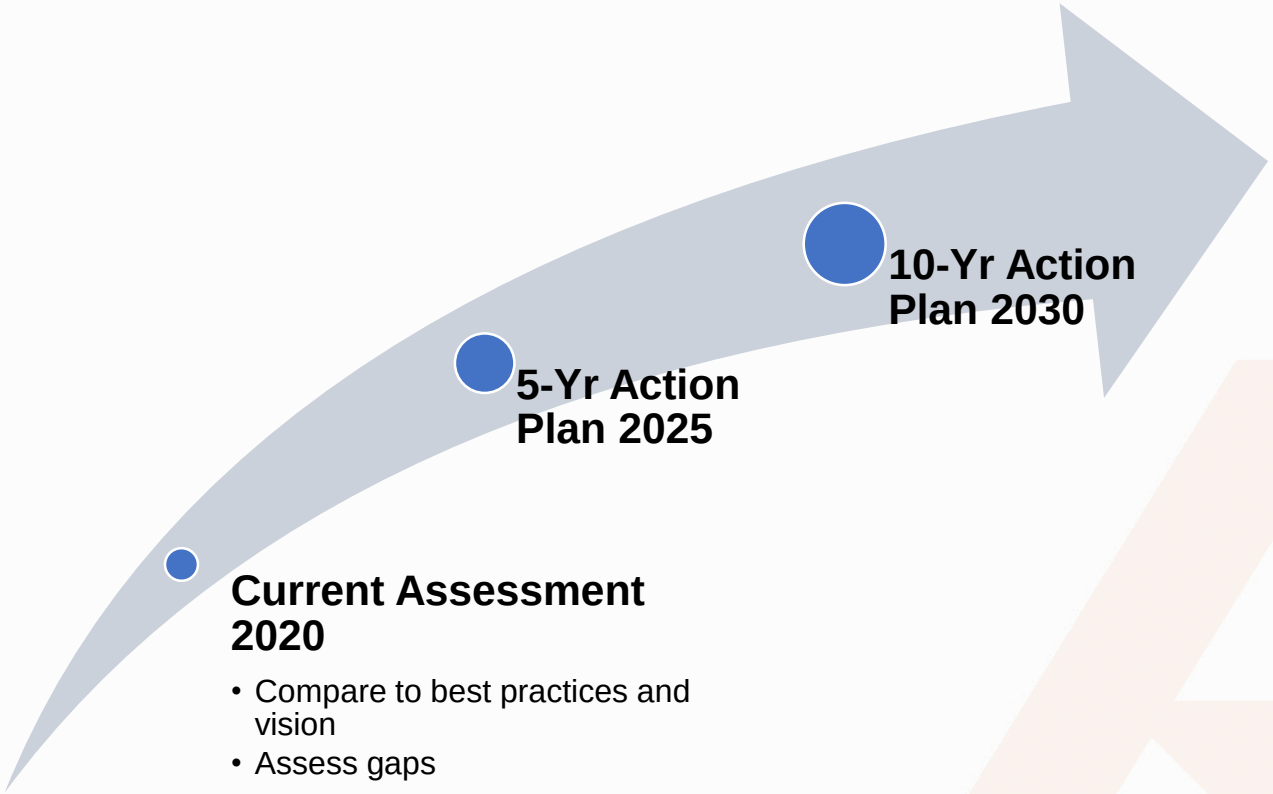
# Creating a Regional TSMO Strategic Plan

Creating a plan to proactively advance the region's vision for ITS/TSMO



# Process of Developing Strategic Plan

- Developed Regional Vision
  - Used survey, initial workshop, and follow up feedback
- Conducted Technological Assessment
  - Assessed gap between current state and vision
  - Compared current state against national best practices
- Identified Strategic Initiatives (Focus Areas)
- Proposed Priority Actions

**Gathering input via stakeholder survey**

**86 RESPONSES!**

- Developing Action Plans
  - Including description of benefits, lead and supporting agencies responsible, steps, and timeframes

# Strategic Initiatives

Strengthen TSMO Planning and Institutions

*Example Action: Establish and sustain a diverse regional TSMO committee.*

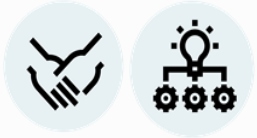
Encourage TSMO Innovation

*Example Action: Share information and develop structures to advance innovative procurement strategies.*

Enhance Data Sharing and Management

*Example Action: Develop a centralized data hub for safety and operations data.*

# Sample Actions:

| | Develop a centralized data hub for safety and operations data. | | |
|---|---|---|---|
| **Benefit to the Atlanta Region** | A centralized data hub creates easier access to data for regional planning, operational decisions, and performance assessment. The hub serves as both a data warehouse and a data broker for all data collected and shared in the region. | | |
| **Goals** |  | Foundational Elements |  |
| **Partners & Stakeholders** | | | |
| **Lead** | GDOT | **Supporting** | ARC, Private Data Providers, ATL Transit, local agencies |
| **Action Checklist** | | | |
| **Near Term** | N1 – Secure funding for the development of the integrated data hub.<br>N2 – Conducting market research through a request for information (RFI).<br>N3 – Develop foundational systems engineering documents for the data hub.<br>N4 – Develop initial data governance and management policies. | | |
| **Mid Term** | M1 – Procure, deploy and evaluate pilot integrated data hub.<br>M2 – Update data governance and management policies. | | |
| **Long Term** | L1 – Monitor data hub and update regulations as needed. | | |

# Strategic Initiatives

Deploy Connected and Automated Vehicle Technologies

*Example Action: Leverage connected vehicle technologies to improve safety for all roadway users, especially along arterials focusing on bicyclists and pedestrians.*

Advance Regional Coordination and Network Communications

*Example Action: Modernize the communications network architecture to provide redundancy and scalability.*

Strengthen Work Zone Management

*Example Action: Improve coordination of work zone activities among stakeholders and 3rd parties.*

# Strategic Initiatives

Enhance Transit

*Example Action: Advance implementation of transit signal priority (TSP) strategies.*

Advance Mobility on Demand

*Example Action: Develop integrated multimodal electronic payment and reservations systems.*

# Next Steps

- Refine Initiatives and Action Plan
- Draft Regional TSMO Strategic Plan – March
- Final Regional TSMO Strategic Plan – April

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