

WORKING TOGETHER TO SUPPORT TRANSPORTATION EFFICIENT COMMUNITIES



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WASHINGTON STATE
DEPARTMENT OF
ECOLOGY



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WHAT IS A TRANSPORTATION EFFICIENT COMMUNITY?

Transportation efficient communities support health, prosperous economies, energy conservation and a sustainable environment by requiring less driving to meet daily needs.

How can cities and counties plan using transportation system management?

What is Transportation System Management and Operations?

Transportation Systems Management and Operations (TSMO) refers to multimodal transportation strategies intended to maximize the efficiency, safety, and utility of the transportation infrastructure. TSMO considers the full range of options for maximizing the performance of existing transportation infrastructure without expanding the infrastructure itself (e.g. adding general purpose lanes, constructing a new interchange, etc.). TSMO strategies can include physical changes to the roadway, changes to how the roadway is used, and efforts aimed at reducing demand for use of the roadway (also known as Transportation Demand Management, or TDM).

Examples of physical changes include turn lanes, signage, roundabouts, striping, and traffic calming measures. Changes to how the roadway is used include incident response, ramp metering, transit signal prioritization, highway access management, and managed lanes (High Occupancy Vehicle (HOV),



Example of a transportation system management strategy using Intelligent Transportation Systems

congestion pricing, etc.). Strategies to reduce demand include all efforts that reduce single occupancy trips, from increasing the use of transit, ride-sharing, vanpools, biking, and walking, to managing parking and park and ride lots, to teleworking and working alternative schedules. This redistribution of travel demand decreases the number of vehicles contributing to congestion while increasing person throughput.

What are the benefits of TSMO?

Transportation agencies frequently lack the resources or the ability to relieve traffic congestion by expanding the roadway. In response to those limitations, TSMO activities are intended to improve person and freight mobility by maximizing the performance of available facilities, taking advantage of low-cost improvement alternatives, and informing travelers and shippers of expected travel performance and their options. By improving mobility, TSMO activities have a wide-ranging impact on travel accessibility, safety, and reliability, as well as economic vitality, and

KEY TAKEAWAYS

- The TSMO website provides strategies to improve traffic flow in communities.
- Strategies to reduce demand include all efforts that decrease single occupancy trips, from increasing the use of transit, ride-sharing, vanpools, biking, and walking, to managing parking and park and ride lots, to teleworking and using alternative work hours.
- TSMO activities have a wide-ranging impact on travel accessibility, safety, and reliability, as well as economic vitality, and environmental quality.
- The effectiveness and applicability of TSMO measures should be considered as part of an overall analysis.
- TSMO strategies include innovative technologies.

environmental quality. ([Transportation Systems Operations: Planning and Implementation website, WSDOT and TRAC](#))

How Should Planners Choose a Transportation System Management and Operations Strategy?

A number of innovative strategies can be used to manage traffic congestion, including Travel Demand Management (TDM). The Washington State Transportation Center (TRAC), in conjunction with the Washington State Department of Transportation (WSDOT), developed a useful [website](#) that identifies “Problems,” “Strategies,” “Intelligent Transportation Systems,” and “Contacts for Learning More” to help WSDOT executives, non-engineers, planners, and engineers to walk through each of these components:

- **Why:** Problems provide a transportation issue and determine which TSMO strategies might be applicable.
- **Where, When, Why:** Strategies briefly overview the application of solutions, organized by TSMO categories, to address transportation issues.
- **What:** ITS Components lists the strategies that rely on intelligent transportation systems in order to function. It includes links to individual Strategies that provide more detail.
- **How:** Learn More sections provide quick links to scoping and design resources and training classes that cover the strategies’ use in detail.

Though developed for WSDOT, the information contained in this website is a useful resource for exploring strategies to improve traffic flow in communities. The website is designed to help planners and engineers navigate TSMO strategies, beginning with an identified “Problem,” or a desired “Intelligent Transportation Systems” solution, or recommended “Strategies”—from any useful starting point.

What are Intelligent Transportation Systems?

Intelligent transportation systems (ITS) rely on modern detection, communication, data collection, and control technologies and algorithms to improve transportation system performance. They achieve this by increasing efficiency of roadway facility operations and informing travelers of changes in their travel routes. This enables freight hauling and the traveling public to make safer, more coordinated, and smarter use of transportation networks.

([Transportation Systems Operations: Planning and Implementation website, WSDOT and TRAC](#))



Variable Message Sign used at the U.S./Canada border

Best Practice Actions

The WSDOT/TRAC [website](#) identifies several TSMO Best Practices, including this project example that utilized low cost engineering improvements to relieve traffic congestion:

Low Cost Engineering Improvements Detroit and Grand Rapids, Michigan

To reduce collisions and improve roadway operating conditions, the AAA Club of Michigan examined the region’s intersections and recommended and implemented a variety of low cost safety improvements where needed. These low-cost solutions include:

- Replacement and relocation of signal heads for improved visibility.

Tools and Resources

- [Transportation Systems Operations: Planning and Implementation](#) (WSDOT and TRAC)
- [ODOT Regional Transportation System Management](#)
- [WSDOT, Traffic Signal Coordination](#)
- [WSDOT, Transit Signal Priority](#)
- [WSDOT, Access Control on State Highways](#)
- [Integrating Operations into Planning and Programming](#) (FHWA)
- [Active Traffic Management Feasibility and Screening Guide](#) (FHWA)
- [Planning for TSMO Within Corridors](#) (FHWA)

TSMO Examples

- **Responsive traffic signal systems reduce delays and travel times**
The City of Gresham upgraded traffic signals along East Burnside Road to adaptive signal timing, which adjusts to real-time traffic flow. As a result, average travel time along the corridor decreased by 16 percent, benefiting automobiles, trucks and buses.
- **Coordinated traffic signals decrease vehicle emissions and fuel consumption**
The City of Portland updated signal timings for 145 traffic signals and realized significant CO₂ reductions, resulting in health and environmental benefits across the region.
- **Transit signal priority treatments lead to improved on-time transit performance**
A study of transit signal priority performance showed that transit signal priority improved on-time performance by 14 percent and reduced route run time by 11 minutes (TriMet’s Line 12 from Sandy to Barbur).
- **Cyclists and pedestrians benefit from improved detection and countdown pedestrian timers**
Projects that upgrade traffic signal timing and equipment also benefit bicyclists and pedestrians. Bicycle detection can be installed with signal upgrades along facilities classified as bike routes. This helps reduce delay for bicyclists. Pedestrian countdown timers can also be installed to provide better crossing information.

- Installation of left turn lanes.
- Re-striping.
- Exclusive left turn phases.

As a result of these efforts, these two jurisdictions have seen 50% reduction in total crashes and a benefit-cost ratio of 15:1 return on investment for these improvements.

Innovative Technologies

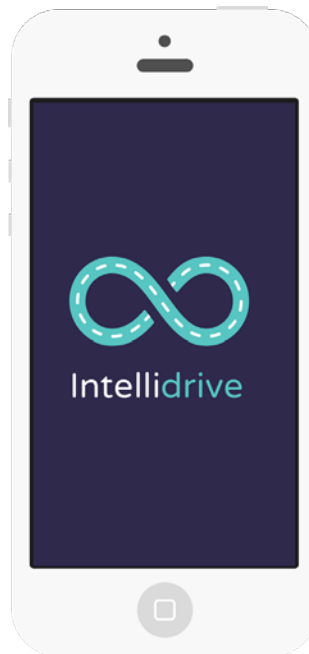
Emerging Technology and TSM Initiatives (Alameda County Transportation Commission)

Integrated Corridor Management (ICM) Initiative

The USDOT's ICM Initiative is multimodal and multi-agency approach to TSM. The initiative is designed to promote the development of innovative approaches to managing traffic operations through an integrated network-based transportation management system. The goal is to develop a framework for linking transportation hardware, databases, and decision-support software across multiple jurisdictions and agencies to better manage traffic congestion, provide improved real-time traveler information, and develop a dynamic, adaptive transportation corridor that will efficiently respond to both recurrent and non-recurrent forms of traffic congestion. The ICM initiative enhances TSM practice through an integrated approach to operations, maintenance, monitoring, detection, and response. ICM combines a variety of ITS strategies such as adaptive ramp metering, traffic light synchronization, traffic surveillance and monitoring, and advanced traveler information systems.

IntelliDriveSM

IntelliDriveSM is a multimodal initiative that links vehicles, infrastructure, and passenger communications devices through wireless communications. The successful deployment of this research effort, which is sponsored by the USDOT, will ultimately enhance safety, mobility, and reduce environmental impact on surface transportation. There are several applications in development, including safety applications using vehicle-to-vehicle technology and vehicle infrastructure integration (VII) technology that enables wireless exchange of safety and operational data between vehicles and/or roadway infrastructure in order to inform drivers of potential hazards on the route. Mobility applications can update Traffic Management Center managers on the transportation system's performance and alert agencies and fleet operators of appropriate actions based on conditions. The system also has the ability to enhance real-time traveler information.



IntelliDriveSM app on a smart phone

Cooperative Intersection Collision Avoidance Systems (CICAS)

The USDOT sponsored CICAS is an optimized combination of vehicle-based and infrastructure-based systems used to address intersection crash problems. CICAS in-vehicle sensors and roadway sensors work cooperatively to warn drivers of potential collisions. The USDOT is partnering with automotive manufacturers and state and local transportation agencies to test the development of CICAS.

Performance Measures

The effectiveness and applicability of TSMO measures should be

More Examples

- Alameda County, California [Highways, Roadways TSM](#)
Major TSM programs in Alameda County include ramp metering on several segments of the freeway system and several signal coordination and phasing/timing optimization projects, including the East Bay Smart Corridors Program. The county also benefits from 511®/Advanced Traveler Information System (ATIS) service available throughout the Bay Area. Bay Area 511® is managed by a partnership of public agencies led by MTC, the California Highway Patrol, and the California Department of Transportation. 511® provides a phone and web source for real-time Bay Area traffic, transit, rideshare, and bicycling information. In addition to these established programs, the county has several notable TSM projects included in the report.
- FHWA [Transportation Systems Management and Operations Plans](#)
- Salem, Oregon, [Transportation System Management Element](#)

For More Information

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considered as part of an overall analysis that also includes transit, transportation demand management, and street or highway capacity increases. The different strategies should be mutually supportive.

TSMO performance monitoring programs include identifying potential locations of concern along roadways. Once flagged, locations are ranked according to their needs for capacity and/or safety improvements. The monitoring efforts are then used to influence future transportation improvement projects and strategies.

The following are recommended key performance measures for the Oregon DOT:

- Traffic Congestion: Annual hours of travel delay per capita in urban areas.
- Special Transit Rides: Annual average number of special transit rides per each elderly and/or disabled rider.
- Passenger Rail Ridership: Annual number of state-supported rail service passengers.
- Intercity Passenger Service: Estimated annual ridership on scheduled intercity bus and rail passenger services.
- Bike Lanes and Sidewalks: Percent of urban state highway miles with bike lanes and sidewalks.
- Travel Reliability: Travel Time Index on interstate and state highways
- Percentage of commuters who travel to work by transit, bicycle, walking, or HOV in select cities.
- Percentage of state-owned roadway centerline miles with a bicycle level of comfort (BLOC) grade “D” or better.
- Number of miles of bike lanes and sidewalk and pedestrian paths that are connected by gap-closure projects (annual).
- Roadway Clearance Duration: The median time to clear all lanes when a lane blocking crash occurs.
- Highway Closure Duration: The median time to open a single lane or establish a detour when a crash causes a full highway closure.
- Intercity Passenger Service: Percent of communities of 2,500 or more with intercity bus or rail passenger service.

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