



# What Transportation Systems Management & Operations (TSMO) Means to My Local Transportation Agency

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**A**s agencies look to more innovative and customer-focused ways to maximize the efficiency and reliability of the existing transportation system while balancing other important factors such as environmental sustainability, livability, and equity, Transportation Systems Management and Operations (TSMO) has become more important than ever as an overarching philosophy that local agencies are embracing.

Conversations around TSMO strategy development and implementation have typically been focused at the state and regional levels, but local agencies are also taking great strides in advancing TSMO, and the Federal Highway Administration (FHWA) wanted to take an opportunity to highlight some of those activities. Local agencies are often on the front lines and are closest to the public in terms of applying local Travel Demand Management (TDM) strategies, first- and last-mile and micromobility solutions, and system operations strategies such as traffic signal control and parking management initiatives.

Representatives from the City of Madison in Wisconsin, USA; Monmouth County in New Jersey, USA; the Contra Costa Transportation Authority (CCTA) in California, USA; and Houston TranStar in Texas, USA were interviewed to discuss what TSMO means to each agency and how TSMO efforts are helping them achieve their agency goals and better serve the traveling public. Each agency was asked five questions. Their respective answers are listed below.

“[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. Code § 101(a)(30)

**Question 1: What were your reasons for initiating your TSMO effort or program?**

**Yang Tao, City Traffic Engineer for Madison, WI:** “Madison is a medium-sized city that serves a much larger population from the surrounding communities—it is the fastest growing region in Wisconsin, so there is lots of pressure on the transportation system with limited availability for expansion due to the geography (lakes, etc.). The local community also chooses not to expand the highway system, but rather to invest in multimodal transportation since environmental sustainability is a huge community value. So, since the city can’t and doesn’t want to build its way out of congestion, there was the recognition that maximizing the productivity and efficiency of the existing system, along with managing demand, is key.”

**David Schmetterer, Assistant Planning Director for Monmouth Co., NJ:** “Monmouth County has traffic congestion due to tourism and events—we have a lot of residents living in vibrant downtown areas and along the shore in year-round communities, plus

## Communities Represented

**Contra Costa County, CA**  
Population: 1,165,927

**Monmouth County, NJ**  
Population: 643,615

**Harris County, TX**  
Population: 4,731,145

**City of Madison, WI**  
Population: 269,840



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year-round tourism due to having the closest Jersey Shore beaches to Manhattan. We wanted to make recommendations to improve transportation for the people who live in Monmouth County and for the people who visit, since tourism is essential to our local economy. In terms of planning for TSMO, we realized we needed to focus on TDM because we can't build our way out of congestion. TDM is lower-cost, easier to implement, and can include a variety of actions that involve both public and private partners in innovative ways. We received a grant from our Metropolitan Planning Organization (MPO) to perform this study, which has been key."

**Tim Haile, Executive Director for the Contra Costa Transportation Authority (CCTA) in CA:** "From local and Bay Area perspectives, we realized that we can't widen our way out of congestion. In Contra Costa County, many corridors are constrained geographically, and we have statewide emissions reductions, climate change, and environmental sustainability goals to achieve. These statewide goals, coupled with local safety, accessibility, and connectivity goals requires a holistic approach to transportation. For CCTA, this means subscribing to the TSMO philosophy and taking comprehensive, multimodal approaches that provides seamless end-to-end journeys through travel options for the public. We've conducted a travel behavior study that showed Contra Costa residents want to shift modes. As an agency, we need to be responsive to the public who want more modal options and care about the environment—and we see TSMO and the innovative use of technology as means to get there."

**Dinah Massie, Executive Director for Houston TranStar in TX:** "Houston TranStar has been doing TSMO activities since the creation of the agency by interlocal agreement back in 1993—way before 'TSMO' was a phrase. After the economic downturn in the 1980s, the Mayor of Houston brought local transportation leaders from the City of Houston, Harris County, the Texas Department of Transportation, and the Metropolitan Transit Authority of Harris County together to discuss the implications of near-term population growth. A formal interlocal agreement was signed in 1993, and a Transportation Management Center (TMC) was completed in 1996. Building a TMC that employed the latest technology on freeways and arterials was seen as a way to manage traffic incidents more effectively, reduce congestion, and optimize use of the existing roadways. The concept of adding emergency management to TranStar's mission soon followed, given the region's proximity to the Gulf of Mexico and presence of the Port of Houston and nearby chemical plants."

*Question 2: What are some of the effective TSMO strategies you've developed/delivered, and what are the benefits you've seen from these deployments?*

**Yang Tao, Madison, WI:** "The three examples I'll highlight are: 1) active traffic management to make automatic adjustments to signal

timing during special events and weather-related incidents like flooding to help move traffic along efficiently and get people to their destinations safely, 2) Intelligent Transportation System (ITS) asset and workflow management, which is often overlooked, but is an essential component of advancing TSMO that helps us to make sure that our investments in the transportation infrastructure are properly maintained and enables us to respond to public requests for improvements in local communities, and 3) partnerships with data providers...which help us to disseminate real-time information to end users so they can make informed decisions."

**David Schmetterer, Monmouth Co., NJ:** "Some of the most effective strategies we recommend have to do with improving communications with and providing information to the traveling public, such as additional signage and providing pre-event information via an app that people can use. We also recommend promoting traffic diversion through pre-determined routes, promoting the use of transit and active transportation through event-centered services, and improving parking management to prevent congestion on rural county roads. We understand that there is not one magic bullet that will solve our congestion problems, so we developed a suite of recommended strategies that will not be burdensome on residents or visitors."

**Tim Haile, Contra Costa Co., CA:** "CCTA is deploying numerous TSMO strategies, such as adaptive ramp metering, signal coordination, lane use management signage, and developing transit signal priority efforts. We want to maximize the safety and efficiency of the existing system and improve reliability for the traveling public. We are also looking at innovative technologies to incentivize carpooling and mode shift, and this is being done in partnership with app developers and micromobility providers, in addition to some of the more traditional transportation partners such as the transit agencies."

**Dinah Massie, Houston, TX:** "Among our biggest successes has been our closed-circuit television (CCTV) system, including along evacuation routes spanning 220 miles [354 kilometers] from the city center. Cameras are owned, shared, and maintained by Texas Department of Transportation (TxDOT), City of Houston, Fort Bend County, Galveston Ferry, the toll road authority, and other local jurisdictions. More than 1,000 cameras are in the system, with more being deployed now. We have installed dynamic message signs (DMS), which provide real-time information to the traveling public. Our website, [www.houstontranstar.org](http://www.houstontranstar.org), has a real-time traffic map that displays traffic speeds, incidents (including major construction), CCTV images, DMS locations and messages, and historic speed data. It has a roadway flood warning system, which shows local arterials likely to flood during rain events. Better information for the traveling public during commutes and evacuations and enhanced route planning information for the transit authority result

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in reduced congestion, less time sitting in traffic, potential crash avoidance, and reduced fuel costs.”

*Question 3: How do you select and fund TSMO strategies to address issues in your community, and how is long-term Operations and Maintenance (O&M) addressed?*

**Yang Tao, Madison, WI:** “We take a systematic approach—we look at what has been done in the past, what the current needs are, and what others are doing nationally that has proven successful in addressing similar issues. Some big priorities are to enhance multimodal safety while managing congestion and delay, which has led to us focusing on some specific projects, but we also have a big focus on asset management—including ITS elements—to ensure that our investments are maintained over time. Sustainable funding is always a challenge, but we do consider long-term O&M costs. We have a partnership with other city departments and the community to build and maintain a transportation network that benefits everyone.”

**David Schmetterer, Monmouth Co., NJ:** “We are performance-based, so we selected our recommended strategies by identifying operational needs through interaction with stakeholders and community members. The identified needs link directly to our master plan and are in line with the MPO’s regional transportation plan. We are looking into funding for ongoing O&M through a strategy implementation matrix, where we examine who would be implementing which components and what the cost would be to do so.”

**Tim Haile, Contra Costa Co., CA:** “We select TSMO strategies and resulting projects through extensive engagement with the stakeholders and communities. CCTA has a voter-approved local sales tax measure, and we have a responsibility to deliver certain projects to meet community needs. We also are performance-based and use quantitative and qualitative analyses to ensure we are properly identifying issues and developing projects that address those issues. Many of our TSMO-related efforts are supported by local funds; we also use regional and State funds to support our TSMO program. CCTA has also received an Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grant from FHWA, which implements a mobility on demand platform to incentivize travel behavior and connect people to other modes of transportation. Sustainable funding for O&M is a challenge, and we are addressing it innovatively as we look to break down institutional barriers that exist among system operators and develop strategic partnerships with additional public and private entities.”

**Dinah Massie, Houston, TX:** “Funding decisions are a combination of the Houston-Galveston Area Council’s (H-GAC, a metropolitan planning organization) 4-year program call for projects, as well as each

agency’s own budgetary allocations. Our partner agencies have seats on H-GAC’s committees and work together toward combined short- and long-term goals. Every agency has its own ‘pocket’ of money—for example, the operating budget of TranStar is only to house the people and for work-related support items. The agencies meet there to collaborate, but funding for TSMO projects comes from each agency. Houston is a non-attainment area, so Congestion Mitigation and Air Quality (CMAQ) Program money also supports a lot of the ITS and communications infrastructure efforts. Additional funding from the H-GAC metropolitan partners has supplemented that funding, thereby providing some dedicated funding for ongoing operations to TranStar. And in terms of project selection and prioritization—agencies have to show that they have the funding to maintain what they build.”

*Question 4: What sort of internal and external collaboration exists to support your TSMO efforts, and what techniques have you used to formalize or institutionalize those relationships?*

**Yang Tao, Madison, WI:** “We have learned to be open-minded and innovative when partnering, so we involve city departments, public agencies like the regional MPO and State Department of Transportation (DOT), academic institutions like the local university, and many private partners. We specifically partner with private vendors to help us test out the latest technologies and new products that can enhance our system. Most of our partnerships are organic, but there are some formal mechanisms for certain aspects of partnering, such as access to city data and data-sharing protocols.”

**David Schmetterer, Monmouth Co., NJ:** “There is a lot of internal and external coordination among our county departments, as well as the State DOT, MPO, NJ TRANSIT, the Turnpike Authority, and non-profit organizations, and we have several standing committees and councils that meet regularly to ensure the needed communication is taking place. For our TDM study, we convened several stakeholder groups and solicited their input—this was particularly challenging during the pandemic. We utilize our standing committees and identify opportunities to interact with stakeholders to make sure we are being thoughtful with our communications and engagement.”

**Tim Haile, Contra Costa Co., CA:** “Collaboration is essential to our TSMO efforts, and we make sure that CCTA maintains constant communication through informal efforts, such as fireside chats with local jurisdictions, as well as more formal and structured forums such as multi-agency policy and technical advisory committees. We have regional transportation planning committees for each sub-area of our county that meet regularly to have conversations related to TSMO deployments. CCTA is also involved with organizations that regularly partner with businesses and private sector partners, so that we can ensure we are looking at innovative ways to

advance some of our TSMO strategies. We often utilize cooperative agreements with some of our partner agencies to formalize roles and responsibilities with respect to specific projects, which has proven successful in terms of overall accountability.”

**Dinah Massie, Houston, TX:** “We have quarterly TSMO meetings that are coordinated by the local MPO. These meetings are the optimal discussion forum for cross-agency TSMO opportunities. We also have monthly Freeway Traffic Incident Management (TIM) meetings with local law enforcement, first responders, transportation management staff, and tow companies. The monthly TIM meetings have been in place for 20 years and are institutionalized simply by their longevity. In addition, for several of our efforts we have developed data- and fiber-sharing agreements between TxDOT and other local governments, as well as the media and ITS vendors.”

*Question 5: What are some of the most exciting things you see on the horizon for your TSMO efforts/deployments to address future operational issues?*

**Yang Tao, Madison, WI:** “We are looking at an institutionalized framework that focuses on overall system management and operations in order to move people safely and efficiently across all modes of transportation and to achieve our Vision Zero safety goals (i.e., zero fatalities and serious injuries from roadway crashes). Three project examples are 1) quick incident response efforts to help us deal with the impacts of climate change, such as major flooding on the isthmus due to the proximity to the lakes; 2) developing future technologies such as connected and autonomous vehicles to support multimodal corridor operations, including addressing the needs of disadvantaged communities; and 3) developing the capacity to support the City’s future Bus Rapid Transit (BRT) system with Transit Signal Priority (TSP) and enhanced pedestrian and bicycle infrastructure for people of all ages and abilities to further incentivize mode shift.”

**David Schmetterer, Monmouth Co., NJ:** “As a planner, I don’t get to put the actual shovel in the ground, but I do see huge opportunities for making data-driven and performance-based decisions moving forward. Big data sets are becoming available, and we can use location-based information to validate some of the anecdotal information we often receive from the public. This will help ensure we are responding the operational needs of the community.”

**Tim Haile, Contra Costa Co., CA:** “CCTA is very excited about connected and shared autonomous vehicles to help address the equity and mobility needs of the public, particularly some of the aging populations we serve. We see lots of opportunities for

incentivizing mode shift and improving multimodal safety through leveraging newer technologies, such as transit priority with smart signals, automated driving systems, express bus-on-shoulder services, shared mobility hubs, and on-demand transit. We also are excited to continue to partner with our local, regional, state, and federal partners to build the transportation system of the future that truly addresses the needs of all people on all modes.”

**Dinah Massie, Houston, TX:** “We see huge opportunities for technological advancements in using big data to assist with traffic planning and management. We are also excited about vehicle-to-vehicle (V2V) communications to prevent crashes, and roadside-to-vehicle (R2V) communications to alert vehicles of conditions ahead. Automated incident detection to notify responders and enhance our incident and emergency management efforts is also something we are looking forward to.”

TSMO enhances safety, mobility, and reliability for the traveling public while potentially supporting other goals such as climate change, equity, and economic vitality. Many local agencies are investing in TSMO strategies and are working collaboratively with their partners and local communities to ensure that these efforts meet the needs of the public, and that they are sustained over time. TSMO deployments at the local level often include a mix of TDM, first- and last-mile solutions, and system management strategies such as signal control and incident and emergency management activities. Local agencies, in particular, are therefore tasked with serving the public in a very focused and more direct manner, while still tying into the broader regional and statewide context. Developing partnerships for planning, funding, delivering, and sustaining ongoing O&M activities for TSMO strategies is essential. Local agencies are moving the needle on creating more of these innovative partnerships with both public and private agencies.

FHWA would like to thank all of our local agency TSMO champions for taking the time to discuss their TSMO programs and for their continued efforts to advance TSMO initiatives in their communities. If you have any questions about advancing TSMO efforts in your agency, please contact **Joe Gregory at FHWA (joseph.gregory@dot.gov)** for more information. [itej](#)



**Joe Gregory, P.E. (M)** has been with the Federal Highway Administration (FHWA) for more than 20 years and is currently in the Office of Operations where he leads initiatives that equip state and local transportation agencies to advance in their TSMO capabilities. His prior work includes leading the SHRP2 Organizing for Reliability efforts to advance the institutional capabilities of state and local agencies as they implement their TSMO programs.