Congestion Management Systems: Innovative Practices

Task 1 Report

Prepared for:

New York State Association of MPOs

Submitted by:

ICF Consulting
9300 Lee Highway
Fairfax, VA 22031

Contact: Michael Grant or Chester Fung
(703) 218-2692, (703) 218-2754

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1. Introduction

1.1 Background

Federal requirements state that regions with more than 200,000 people must maintain a Congestion Management System (CMS) and use it to inform transportation planning and decision-making. For some metropolitan planning organizations (MPOs), the CMS is an important tool for addressing persistent congestion problems and for prioritizing investments. In other cases, the CMS is a collection of data and performance measures regarding traffic congestion but does not link closely with the planning process. Federal guidance is not prescriptive regarding how a CMS must be implemented, and practices vary widely from MPO to MPO.

Some of New York's medium and smaller-sized MPOs are not experiencing rapid growth and have few persistent congestion problems. For these MPOs, the CMS has not developed a close fit with existing planning practices and appears to offer limited benefits while consuming significant staff resources. Even in regions that have congestion and air quality problems, the CMS may not be utilized to its full extent within the planning process. MPO staff from around the state have limited staff resources and budgets, and want to make sure that they are using their resources as efficiently and effectively as possible. As a result, New York State MPOs are seeking information on how to make the CMS a more useful planning tool to help address a diversity of transportation planning challenges while satisfying Federal requirements.

1.2 Purpose

The purpose of this report is to identify innovative CMS practices that may help NYS MPOs identify approaches that could be incorporated into their own CMSs. This document is designed to highlight best practices that have been identified from MPOs outside of New York State. The report will be used to inform a Peer Forum of NYSMPO staff and as a basis for developing a menu of options for CMS process innovations.

1.3 Methodology

This report draws information from several sources. First, a review of existing literature was conducted. This review included relevant articles, presentations, reports, and research papers, as well as CMS documents collected from several regions. Second, based on this review, interviews with staff from ten MPOs outside of New York State were conducted. The MPOs were selected to fulfill a number of objectives, including gathering information on noteworthy CMS practices nationwide, and identifying the practices of peer areas to NYS MPOs, particularly those outside the New York City metropolitan area. Finally, the report draws upon information obtained through a discussion with Brian Betlyon of FHWA.

1.4 Report Organization

The remainder of this report is divided into the following:

Section 2: An overview of CMS requirements;

Section 3: Existing CMS practices and challenges faced by NYS MPOs;

Section 4: Exemplary practices at meeting CMS requirements;

Section 5: Making the CMS a more useful part of the transportation planning process;

Section 6: Other CMS-related topics, including resource requirements and certification experience

Section 7: Bibliography and list of interviews conducted

2. Overview of CMS Requirements

A CMS is required in metropolitan areas with populations exceeding 200,000, known as Transportation Management Areas (TMAs). The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 initially mandated the development of CMSs for states and metropolitan areas, but the National Highway System Act of 1995 removed the requirement at the statewide level while maintaining it for TMAs. Federal planning requirements stipulate that in all TMAs, the CMS must be developed and implemented as part of the metropolitan planning process.

Specifically, the Federal requirements (23 CFR Part 500 Sec.109) state that a congestion management system must include:

1. Methods to monitor and evaluate the performance of the multimodal transportation system, identify the causes of congestion, identify and evaluate alternative actions, provide information supporting the implementation of actions, and evaluate the efficiency and effectiveness of implemented actions;

2. Definitions of the parameters for measuring the extent of congestion and for supporting the evaluation of the effectiveness of congestion reduction strategies for the movement of people and goods;

3. Establishment of a program for data collection and system performance monitoring to define the extent and duration of congestion, to help determine the causes of congestion, and to evaluate the efficiency and effectiveness of implemented actions;

4. Identification and evaluation of the anticipated performance and expected benefits of appropriate traditional and nontraditional congestion management strategies;

5. Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy; and

6. Implementation of a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures.

At the core, a CMS should include a system for data collection and performance monitoring, performance measures or criteria for identifying when action is needed, a range of strategies for addressing congestion, and a system for prioritizing which congestion management strategies would be most effective.

In TMAs designated as ozone or carbon monoxide non-attainment areas, the CMS takes on greater significance. Federal guidelines prohibit projects that increase capacity for single occupant vehicles (SOVs) unless the project comes from a CMS. Moreover, the CMS shall provide an appropriate analysis of all reasonable (including multimodal) travel demand reduction and operational management strategies for the corridor in which a project that will result in a significant increase in capacity for SOVs is proposed. If the analysis demonstrates that travel demand reduction and operational management strategies cannot fully satisfy the need for additional capacity in the corridor, the CMS shall identify all reasonable strategies to manage the SOV facility effectively.

A CMS can take a variety of forms. Federal requirements do not specify that a separate CMS document must be developed; some MPOs document their CMS as part of the documentation of their Transportation Improvement Program (TIP). However, FHWA encourages MPOs to develop a CMS report as a means to bring attention to the role of congestion management strategies.

Compliance with the CMS requirement is addressed during the metropolitan planning process certification reviews for TMAs. FHWA has indicated that CMS requirements have become a focus of greater attention in recent years, since congestion was identified as one of FHWA's three "Vital Few" goals. These goals have been identified by FHWA leadership as priority areas where the agency intends to take action to close key performance gaps.

3. New York State MPOs' Existing CMS Practices and Needs

In order to inform our investigation of best practices, ICF Consulting reviewed CMS documents available from the MPOs in New York State. We also asked each of the NYS MPOs to respond to several questions regarding their existing CMS—if one has been completed—and their most important transportation challenges, which the CMS might potentially be able to help address. We received responses from eight MPOs representing all five of the TMAs in New York State that currently have CMSs in place.[1] Below is a summary of key findings.

3.1 Performance Measures Used and Data Collection

Most of the NYS MPOs that currently have CMSs utilize volume-to-capacity (V/C) ratios or volume-based level of service (LOS) as one of their performance measures. For instance, SMTC uses V/C ratios and intersection delay LOS (based on traffic count data and turning movement counts) as its performance measures. SMTC is interested in utilizing speed data as a more effective measure of congestion than V/C ratios, in response to FHWA input, but identified lack of guidance on how to utilize and incorporate speed data as an impediment to incorporating this measure.

Several NYS MPOs have incorporated additional performance measures into their CMS. These performance measures include a variety of travel speed and delay measures, such as: congested speeds (GTC), average travel speeds (NYMTC), vehicle hours of delay (GTC, GBNRTC, NYMTC), person hours of delay (GBNRTC, NYMTC), lane-miles of congestion (NYMTC), travel time index (ratio of peak travel time to free-flow travel time, NYMTC), and roadway congestion index (NYMTC). GBNRTC also uses transit load factor as a performance measure to track levels of transit congestion. CDTC ties the CMS directly to its long-range transportation plan, using congestion measures – hours of excess delay, recurring and nonrecurring, by mode – balanced with other aspects of system performance, including access to travel alternatives, travel times, flexibility (e.g., reserve capacity on system, percent of person trips that could be accommodated by modes other than auto in an emergency, etc.), safety, and others.

Most of the NYS MPOs rely upon traffic count data from NYSDOT, as well as other data collection conducted by the MPO itself, such as intersection turning movement counts and on-board transit ridership

[1] Responses were received from the following MPOs: the New York Metropolitan Transportation Council (NYMTC), Greater Buffalo-Niagara Frontier Transportation Committee (GBNFTC), Genesee Transportation Council (GTC), Syracuse Metropolitan Transportation Council (SMTC), Capital District Transportation Committee (CDTC), Poughkeepsie-Dutchess County Transportation Council (PDCTC), Binghamton Metropolitan Transportation Study (BMTS), and Ithaca-Thompkins County Transportation Council (ITCTC). The five MPOs in NYS that currently have CMSs include: NYMTC, GBNFTC, GTC, SMTC, and CDTC.

counts. In some cases, the MPOs also conduct speed/delay analysis and use the regional travel demand model to develop data for each of the performance measures. In addition, CDTC has started mining the Management Information System for Transportation (MIST) data set from NYSDOT, which counts volumes and operating speed by lane on the expressway system continuously. The following table summarizes the performance measures and primary sources of data used by each of the NYS MPOs with existing CMSs.

Congestion Performance Measures and Primary Data Sources used by NYS MPOs

NYMTC	• Level of service (for segments) • Vehicle hours of delay, person hours of delay (county level) • Average travel speed • Lane miles of congestion • Travel time index, roadway congestion index	• Traffic counts • Travel demand model • Speed data and transit data (to calibrate model)
GBNRTC	• Level of service (for segments) • Vehicle hours of delay, person hours of delay • Transit load factor	• Traffic counts (NYSDOT and MPO) • Intersection turning movement counts (MPO) • Vehicle classification counts • On-board transit ridership surveys and automated counts • Travel demand model
GTC	• Volume-to-capacity ratio (for segments) • Volume per hour/estimated capacity (for intersections) • Congested speed • Vehicle hours of delay, person hours of delay, other measures	• Traffic counts (from NYSDOT and counties) • Travel demand model
SMTC	• Volume-to-capacity ratio and excess delay (for segments) • Level of service (for intersections)	• Traffic counts (NYSDOT) • Intersection turning movement counts (MPO)
CDTC	• Excess Delay (for intersections) • Excess Delay (for segments) • System measures, such as access (travel alternatives), accessibility (travel time), and flexibility (reserve capacity, alternatives)	• Traffic counts • Travel demand model

3.2 Challenges in Addressing CMS Requirements

A wide range of challenges were identified by the MPOs in meeting CMS requirements. However, the most often-cited challenges among the NYS MPOs were developing performance measures and collecting data. Specifically:

- GTC noted a lack of specific guidance for deciding on the set of performance measures to include;

- SMTC noted the lack of federal guidelines, the recommendation to utilize speed data as a measure of congestion but lack of guidance on how to do this, and the cost of obtaining traffic counts if NYSDOT is unable to assist;
- GBNRTC identified specific challenges related to developing data and performance measures related to freight movement and non-motorized modes, as well as coordination of data collected by various regional agencies and integration of bi-national data, especially related to Intelligent Transportation System (ITS) elements and border crossings.

Other challenges identified by NYS MPOs included limited staff, implementation and monitoring of CMS strategies and projects, and establishment of a CMS program within member agencies. The PDCTC noted the unique challenges based on the structure of its TMA, which includes three MPOs—PDCTC, OCTC, and UCTC.

3.3 Coordination of CMS with Other Activities

Several of the NYS MPOs indicated that the data from the CMS are used in air quality analyses and in the project selection stages of the Regional Transportation Plan (RTP), TIP, and Unified Planning Work Program (UPWP). GBNRTC also identified additional activities coordinated with the CMS, including Geographic Information Systems (GIS) mapping, Transportation System Management (TSM) improvements, cost-benefit analysis of competing projects, and Congestion Mitigation Air Quality (CMAQ) program project selection. Some NYS MPOs indicated they would like to better coordinate these activities and more effectively utilize the CMS in these processes. Also, SMTC is interested in coordinating the CMS with its newly developed travel demand model.

3.4 Key Transportation Challenges

The transportation challenges facing NYS MPOs are an important context for considering how the CMS could be used to address broader issues, particularly in metropolitan areas that do not experience a great deal of traffic congestion. The most common transportation challenge identified by the seven MPOs was limited funding to support needed transportation infrastructure. Other key transportation challenges differed among the areas. The challenges identified by each of the MPOs are summarized in the table below.

Key Transportation Challenges Facing NYS MPOs

NYMTC	• High cost of bringing transportation infrastructure to state of good repair • Meeting the air quality conformity requirement • Improving mobility in a highly urbanized area
GBNRTC	• Limited funding available for transportation projects • Reaching regional consensus on most needed transportation projects • Reinvigorating the central cities
GTC	• Inadequate funding • Improving mobility for those persons without access to a car • Ensuring that the transportation system supports the economic and social vitality of the metropolitan area
SMTC	• Outcome of the DestiNY project and its implications • Limited TIP funding for any projects other than maintenance projects

PDCTC	• Population growth, with associated impacts on land use patterns and vehicle use • Mobility needs of the growing senior citizen population • Aging transportation infrastructure
BMTS	• Inadequate funding for deteriorating local transportation infrastructure • Lack of local political support for transit, and result lack of local funding • Lack of State support for ITS initiatives
ITCTC	• Peak-hour congestion in the urban area • Providing facilities for alternative modes • The limited funding for transit
CDTC	• Pursuing economic growth while maintaining high quality of life • Urban reinvestment • Integrating multimodal transportation systems—walking, transit, auto, cycling—with public and private investments

The nearly universal concern about limited funding for needed transportation infrastructure highlights the potential value of the CMS as a mechanism for prioritizing projects in the RTP and TIP. Moreover, the high level of concern expressed about transit, mobility in the urbanized areas, and non-motorized transportation suggests that it would be beneficial if the CMS could play a greater role in addressing these issues.

4. Exemplary Practices Addressing CMS Requirements

The CMS has not been a prominent focus for many TMAs since around the time the requirement was initiated in the early 1990s. As such, few CMS have fully incorporated advances in data collection, data management, and ITS/operations technologies. However, in recent years, FHWA has placed additional attention on the CMS, since congestion has been established as one of its “Vital Few” goals. Consequently, a number of MPOs have begun to revisit their CMS procedures in recent years.

This section briefly describes several innovative approaches, focusing on four main elements of the CMS:

1) establishing performance measures,

2) collecting data and monitoring system performance,

3) identifying and evaluating improvement strategies, and

4) monitoring effectiveness.

For each of these elements, innovative approaches are summarized, and examples from MPOs outside of New York State are provided.[2]

[2] Innovative practices have also been developed by NYS MPOs, but these are not highlighted here since this research focused on practices outside of New York State. Information on NYS MPOs approaches will be shared in a peer exchange forum as part of this project.

4.1 Establishing Performance Measures

A range of performance measures have been incorporated into CMSs by MPOs across the country. These measures can be broadly grouped into four categories: 1) traditional-volume-and-capacity-related measures; 2) travel-time-based measures; 3) non-recurring congestion measures, and 4) other congestion-related measures.

Traditional measures. Measures such as volume to capacity (V/C) ratio, average intersection delay, and level of service (LOS) have traditionally been used by MPOs and are common performance measures in CMSs. These measures are frequently used because of the relative ease of data collection and access to data on traffic volumes and because measures such as LOS can be derived from V/C ratios. Although these are well-defined and reasonable measures of congestion, they have several limitations. In particular, these measures tend to focus only on the movement of vehicles rather than the movement of people. They also are somewhat engineering-focused and not necessarily readily understood by the public. Finally, they tend to be most appropriate for individual highway segments or intersections, rather than for corridors or region-wide analysis – although composite or index measures can be calculated based on these measures, such as percent of the roadway network operating at LOS F. It should also be noted that sometimes these traditional volume-capacity-based measures are related to travel time through a series of theoretical relationships, and that derivative indicators that address travel time—such as Excess Delay—are sometimes calculated from volume-based measures.

Travel time measures. There has been a shift in emphasis at the Federal level and by many MPOs to use travel-time measures in the CMS. A wide range of travel time measures can be used, including:

- travel time (total time required to traverse a roadway segment or corridor),
- travel speed (the length of the segment divided by the travel time),
- delay (difference between travel time and acceptable or free flow travel time),
- travel time index (ratio of peak period to non-peak period travel time)

Travel time-based measures are easy to understand by both transportation professionals and the traveling public, and they are flexible enough to describe traffic conditions at various levels of resolution (e.g., specific road segments, intersections, corridors, or regional-level). Sometimes, regional measures are also reported, often based on data from the Texas Transportation Institute's (TTI) Urban Mobility Study. Travel time-based measures can also be translated easily into other measures like user costs, and can be used to validate travel demand forecasting models. However, travel time studies must be completed, and budget limitations often severely restrict the amount and coverage of these studies, although recent technological advances (discussed further below in the section on data collection and monitoring) are making travel time data collection more affordable and reliable.

Recognizing that the public views acceptable travel times and speeds differently in different conditions (e.g., the public accepts slower travel speeds on arterials in urban areas than in rural areas, and for peak travel periods compared to off-peak periods), some congestion measures attempt to develop different performance standards for these different types of circumstances. Moreover, in some very highly congested regions, planners recognize that it will not be possible to eliminate peak period travel congestion, but rather, to reduce the duration of congestion. Consequently, some MPOs have incorporated other variations of travel time measures, accounting for the intensity, scope, and duration of congestion.

Non-recurring congestion measures. Some MPOs have investigated the potential for monitoring non-recurring congestion. These measures describe the effects of incidents, special events, construction, weather, and other factors that vary from day to day, which are estimated by FHWA to be responsible for nearly half of traveler delays. Sources of data for non-recurring congestion measures tend not to be readily available, so while many MPOs are considering these measures, few have actually been able to implement them, generally for lack of data. Reliability measures that quantify the amount of variation in travel conditions from day to day are generally the most difficult to implement, requiring large amounts of traffic volume and/or speed data collected on a continual basis throughout the analysis period. As ITS infrastructure becomes operational, this kind of data will become more readily available for use in monitoring non-recurring congestion. Without these continuous data sets, MPOs have also considered other non-recurring congestion measures, including the number or extent of construction activities, the number of incidents such as breakdowns and accidents, and the average clearance time for incidents. In time-series comparisons, these measures can give some insights to the extent of non-recurring congestion, even if they do not measure congestion directly.

Other congestion-related measures. In addition to the measures above, several MPOs have tracked related aspects of transportation system performance. While these measures do not address roadway congestion directly, they do characterize other aspects of the system that relate to congestion. Examples of such types of measures follow.

- Accessibility – This category is a broad set of measures aimed at describing the ability to reach the labor force, employment sites, retail centers, activity centers, and other land uses that produce or attract travel demand. The idea of accessibility measures is that travel be seen as a means to access desired goods, services, and activities that is affected by a number of factors, including proximity and travel mobility. Accessibility measures can involve the amount of time required to travel between desired destinations in a number of ways, and can be used for different travel modes. For instance, a measure might take the form of the percentage of the labor force within 40 minutes of employment centers by vehicle travel, or the percentage of employment in the region with transit service.

- Transit - Transit performance measures are qualitative or quantitative factors used to evaluate a particular aspect of transit service, usually perceived as the passenger’s point of view, in terms of availability, comfort, convenience, and travel time. Transit measures include: availability or accessibility of transit service, service frequency, passenger loads, hours of service and route segment reliability.

- Availability and use of alternatives – These measures indicate the extent to which travelers are able to choose an alternative mode of travel to single-occupancy vehicles, which relates to managing congestion by curbing demand for roadway use. Measures might include the extent of the bicycle network, pedestrian network, or transit network, and usage of those networks relative to their capacity.

- Freight – Recognizing the importance of freight to the economy, some MPOs have developed performance measures that focus on goods movement in addition to the common measures that focus on the movement of vehicles and people. These measures typically involve use of traditional volume-to-capacity measures, but focus on roadways with a high volume of trucks or designed freight corridors.

Although a wide range of measures are available, several MPOs noted that they selected performance measures for their CMS with a clear recognition of their data limitations and the need to keep it simple. As a result, while some MPOs utilize a wide range of performance measures in their CMS, others specifically noted that they try not to include too many measures but to focus on the most important measures, and to collect data on those.

The following examples discuss several of the performance measures used by MPOs in their CMS, as well as some approaches for selecting performance measures.

Atlanta Regional Council (ARC), Atlanta, Georgia

The Atlanta Regional Commission (ARC) has refined its CMS through several iterations, and has expanded the set of performance measures used in the CMS well beyond the traditional volume-to-capacity ratios. Additional measures include goods movement, land use connectivity, intermodal connectivity, transit service, commuter-potential transit, safety, environmental justice, and committed investments. While congestion measures such as volume-to-capacity ratio are still the dominant performance category, these broader measures are used for identifying high-priority corridors. Prioritization is accomplished by combining these measures with pre-determined weights to obtain an overall score for a particular corridor.

Capital Area Metropolitan Planning Organization (CAMPO), Austin, Texas (Study Participant)

CAMPO utilizes travel-speed-related measures to identify congested locations. For roadway segments, instead of holding all roads to the same standard, CAMPO has defined minimum threshold acceptable speeds, based on the type of road and the type of area through which that road travels. For instance, one might expect to find lower speeds more acceptable when in a central business district location than in a rural area. These thresholds are shown in the table below.

CAMPO's Established Speed Thresholds (miles per hour)

Area Type	Freeway Mainline	Freeway HOV	Major Arterial	Bus On Street	Rail In Street	Bicycle
CBD	32	60	18	9	10	9
CBD Fringe/ Urban Residential	40	60	24	12	15	10
Suburban	50	60	29	15	20	14
Rural	55	60	32	17	25	18

For intersections, CAMPO has defined 55 seconds as the maximum acceptable delay.

To collect data for these performance measures, CAMPO conducts travel time surveys yearly. The method uses GPS-enabled vehicles to measure travel times, using the floating car method. Travel routes are established, then divided into segments. The collected data are entered into the CMSGIS, a GIS-based database, for analysis by segment. Intersections are analyzed by calculating the delay experienced on the intersection approach surveyed. This calculation uses travel time survey data instead of volume traffic counts, allowing CAMPO to conduct both segment and intersection monitoring using only travel time surveys.

Hillsborough County MPO, Tampa, Florida

Hillsborough County MPO has developed a tiered structure for performance measures that is intended to monitor the transportation system effectively while expending monitoring resources strategically. The monitoring program measures performance by corridor. The first tier, called Primary Performance Measures, includes basic performance measures for roadway (volume-to-capacity), transit (ridership and frequency), bicycle (extent of corridor with bicycle facilities), and pedestrian travel (extent of corridor with sidewalks). For identified congested corridors, a more in-depth set of corridor performance measures is tracked, also for all modes and drawing on data such as travel time surveys, pedestrian counts, employer participation in rideshare programs, and transit on-time performance. Finally, Hillsborough County MPO tracks system-wide performance measures every three to five years, again for every mode, and most of these measures require only tapping into existing databases rather than new data collection.

Greenville, South Carolina

The Greenville, SC MPO conducts travel time surveys for 33 routes using GPS technologies. These surveys are then used to identify and categorize roadways based on percent of time at free flow speed, using the following standards:

Congestion Measures used in Greenville, SC

Percent of Time at Free Flow	Congestion Status
< 40%	Serious
>40% and <50%	Congested
>50% and <65%	Marginal
>65% and <80%	OK
>80%	Good

Roadways are grouped into tiers based on the severity of congestion, and the following classes of congestion mitigation strategies are examined:

- Transportation demand management
- Traffic operational improvements
- Transit improvements
- Access management
- Intelligent Transportation Systems
- Capacity expansion

Indian Nation Council of Governments (INCOG), Tulsa, Oklahoma

Ideally, a TMA should describe its rationale for selecting a particular set of performance measures. INCOG succinctly enumerates criteria for CMS performance measures as follows:

- Usable at the regional, subarea, or corridor level
- Usable for individual transportation projects
- Capable of discriminating between peak period, off-peak, and daily congestion levels
- Constitutes a direct measure of congestion
- Relatable to existing data collection and analysis methods
- Understandable to the transportation profession and the public
- Capable of supporting evaluation of congestion management and mobility enhancement strategies

INCOG surveyed local governments and transportation agencies in the region to determine the availability of congestion related data and to develop a list of measures that could be used. Based on this outreach and the criteria listed above, CMS staff defined five key questions that performance measures should answer:

1) What is the distance over which travelers are confronted by congested conditions?
2) What is the length of time that travelers are confronted by congested conditions?
3) How severely are the facilities clogged?
4) What is the impact of accidents on congestion?
5) How badly are travelers delayed?

For each of these areas, INCOG identified data needs.

Pioneer Valley Planning Council (PVPC), Springfield, Massachusetts (Study Participant)

PVPC uses its travel demand model to develop volume-to-capacity ratios for all corridors, but as a reality check, travel time runs are conducted on identified congested corridors. Using this information, PVPC calculates a delay measure and a congestion measure to compare segments and corridors:

Delay = (2nd Worst Travel Time / Roadway Length) - (2nd Best Travel Time / Roadway Length)

Congestion Ratio = 2nd Worst Travel Time / 2nd Best Travel Time

PVPC uses these measures to rank congested locations in terms of priority.

Regional Transportation Commission (RTC) of Southern Nevada, Las Vegas, Nevada

The Las Vegas valley CMS involves an analytical process for identifying congested links and corridors on the network, and a structured process to screen mitigation strategies for congestion areas. The CMS Working Group chose volume-to-capacity ratio as the best available source for the initial identification of roadway congestion, and established certain performance thresholds of V/C ratios for different functional classes of roadways operating in different types of environments (CBD, resort, urban, and suburban). For congested roadways, a Congestion Analysis System (CAS) involves calculation of four different components of congestion:

- Intensity – based on V/C ratio for freeways, interstates, and ramp links; based on percent reduction in speed for arterial and collector links;
- Duration – the number of hours congestion exceeds the intensity threshhold;
- Extent – the number of persons or vehicles affected by congestion, calculated based on car and truck volumes and an estimate of occupancy rate based on an occupancy study conducted by the University of Nevada;
- Reliability – a measure of the effects of non-recurrent congestion, calculated based on crash rates and non-crash related incidents, obtained from the Freeway Service Patrol operated by the Nevada Department of Transportation

The CMS Working Group determined weights for the four components and a scoring process for each component on a 0 to 100 scale, which helps to prioritize needs among corridors.

Rhode Island Statewide Planning, Providence, Rhode Island
(Study Participant)

Recognizing that congestion can mean different things to different people, the Rhode Island CMS developed the performance measures and congestion standards based on input from a CMS subcommittee and available data. The following two measures are used as measures of congestion:

- Percent under posted speed – this measure looks at the difference between peak period travel speeds and the roadway's posted speeds, and were used to define different levels of service thresholds for interstates/freeways and arterials.
- Speeds and volume-to-capacity ratio – field data were used to validate calculated speeds emanating from the travel demand model and formula.

One interesting aspect of the CMS is the use of three periods for evaluating congestion: peak, off-peak, and seasonal. Recognizing that the public perceives off-peak congestion differently than peak-period congestion, separate analysis was determined to be warranted. Moreover, Rhode Island has a lot of seasonal traffic in the summer heading toward Cape Code and the South Shore, with some roadway traffic volumes doubling during summer months due to tourist traffic.

In addition to these congestion measures, the CMS addresses various related measures at a system wide-level:

- Incident clearance time – this measure is used as a proxy for the effect of incidents on non-recurrent congestion;
- Travel time index – the ratio of average peak travel time to an off-peak (free flow) standard;
- Delay reduction – the delay period is proportional to the reduction in incident clearance time;
- Cost of delay – calculated in dollars, using Texas Transportation Institute formulas
- Percent of congestion travel – congested VMT divided by total VMT

4.2 Collecting Data and Monitoring System Performance

A CMS is expected to include a performance monitoring plan that defines a system for collecting data and applying performance measures. The monitoring plan specifies such things as which data should be collected, the frequency and locations of data collection, as well as database, analysis, and reporting techniques.

In general, travel time data are collected through two types of techniques: 1) roadside techniques, utilizing detecting devices physically located along study routes that obtain travel time data from vehicles traversing the route at predefined checkpoints; and 2) vehicle techniques, utilizing detection devices carried inside the vehicle (these range from traditional stopwatch and clipboard techniques to use of distance measuring instruments (DMI) to use of global positioning system (GPS) techniques).

Challenges faced by MPOs in developing their CMS relate largely to limitations in data and the costs of large-scale data collection. For instance, vehicle techniques are generally based on a limited number of probe vehicles, which means that coverage is often limited.

Roadside techniques for traffic monitoring are often incorporated into intelligent transportation systems (ITS) as part of traffic surveillance and control system deployments. The monitoring is usually conducted by traffic management centers (TMCs), which provide real-time travel time and speed data to the traveling public and law enforcement. Although these systems often collect a great deal of data, and offer great possibilities for incorporation of robust operational data (including information on recurring and nonrecurring congestion) into the CMS, many MPOs are only beginning to take advantage of these data sources for planning purposes. Coordination and collaboration between transportation operators and planners is required, and mechanisms for archiving data, sharing data, and dealing with issues such as data confidentiality are issues faced in working out data sharing arrangements.

The following locations provide examples of relatively robust performance monitoring plans and/or innovative approaches to data collection.

Baton Rouge, Louisiana

The Baton Rouge CMS was developed in the mid-1990s by a consultant under contract to the Louisiana State DOT, and was intended to serve as a prototype for New Orleans and Shreveport. As part of the CMS, travel-rate data were collected by Louisiana State University's Remote Sensing and Image Processing (RSIP) laboratory, which had developed a procedure whereby an inexpensive GPS receiver linked to a laptop computer was operated in a probe vehicle that was driven along the CMS network during AM and PM peak periods. The receiver gathered data describing vehicle location, travel rate, time of day, and date. The GPS data were then linked to the CMS network segments using a GIS program.

The travel-rate data was queried to calculate the average section speed during AM and PM peak periods, and these speeds were compared with free-flow speed to calculate the speed deficit experienced during peak period travel. The greater the speed difference, the more severe the congestion was determined to be. The sections were ranked by magnitude of congestion for project prioritization and strategy analysis.

Hampton Roads Planning District Commission (HRPDC), Hampton Roads, Virginia (Study Participant)

For the purposes of identifying congested locations in its CMS, HRPDC uses segment Level of Service as its main indicator. Data for the analysis are obtained from Virginia DOT. Travel time surveys are also conducted, but coverage of the entire area is not possible with the resources available. In the absence of the ability to collect data for the entire transportation system, HRPDC has concentrated on a portion of the system, with particular emphasis on a few critical 'choke points' such as major tunnels and bridges. For selected facilities, travel time surveys are conducted and compared with free-flow speeds to identify the extent of current congestion.

In the future, HRPDC is planning to begin collecting ITS data to conduct travel time analysis on a system-wide basis. HRPDC anticipates that this analysis will be complex, involving issues such as accuracy, and will be constrained by the pace of ITS infrastructure deployment. Virginia DOT currently operates a regional Smart Traffic Center, providing coverage of 60 miles of the interstate system. Data from the Center are sent to the University of Virginia's Smart Travel Lab, where it is archived and made available to outside parties for research purposes. One issue with which they are grappling is that of accuracy; loop detectors can malfunction frequently enough to skew the data collected. Regardless, HRPDC is moving forward with coordinating ITS implementation on a regional basis so as to make ITS data available in the future.

Hartford TMA, Connecticut
(Study Participant)

The Hartford area TMA consists of three MPOs: the Capitol Region Council of Governments (CRCOG), the Central Connecticut Regional Planning Agency, and the Midstate Regional Planning Agency. The CMS was recently updated and incorporated a number of new methods to monitor and evaluate system performance. The CMS includes two components: a freeway analysis and an arterial analysis.

The freeway analysis relies on a freeway monitoring system that includes 144 traffic flow monitors, covering 60 centerline miles within the region, which was planned as part of the region's 1997 ITS Plan. When the ITS plan was developed, the freeway monitoring system was intended to serve planning purposes as well as operations.

Recently, FHWA encouraged the MPO to do more with its CMS to address arterial roadways. With a $12,000 Technology and Innovation Funding grant from FHWA, the CRCOG purchased GPS equipment to monitor travel times and speeds during peak hours on arterial roads. CRCOG evaluated various types of equipment and selected one called Bluelogger, which is a very simple and cost-effective GPS unit that allows direct download of the data to a GPS system. Rather than paying a consultant to conduct travel time studies, CRCOG has utilized its own staff to use the GPS units as part of their normal commute routines along several key arterial corridors. Some staff deviate from their normal routes in order to conduct the travel time study. Pilot tests have been completed for a key travel corridor in the region, and the MPO is in process of purchasing additional equipment.

The concept is to start with three different corridors, and decisions will be made in the future about how to expand on it. CRCOG staff expect to eventually buy multiple GPS units for each of the MPO agencies ($150 per unit), and may consider expanding it to other staff (e.g., Connecticut DOT, FHWA Division office) to assist in monitoring. One of the key aspects of this program has been to minimize the costs of monitoring, given tight budgets. Consequently, the monitoring program for arterials is attempting to use existing staff within their normal commute timeframe.

Miami Valley Regional Planning Commission (MVRPC), Dayton, Ohio

The CMS for MVRPC monitors both recurring and non-recurring congestion. Recurring congestion (i.e., predictable daily peak hour congestion) is monitored using the typical LOS and V/C ratio measures, as well as the following less common measures:

- Roadway Congestion Index (RCI)[3]
- Level of Service (LOS) and Volume to Capacity ratio (V/C)
- Vehicle delay
- Person delay
- Cost of delay

[3] The Roadway Congestion Index (RCI) identifies total freeways and arterials recurring delay. It excludes delay that results from accidents or disabled vehicles. Calculation of the index is based on the Texas Transportation Institute (TTI) mobility study.

MVRPC reports nonrecurring congestion (e.g., delay caused by accidents, construction zones, and weather-related problems) based on data for five major corridors in the Dayton Region. This information was reported through a voluntary program in which drivers call a local radio station about observed problems on the road. MVRPC organizes data received from the radio station into a database and links the data to its GIS. Other sources of data included articles in the Dayton Daily News and Ohio DOT's yearly construction database.

The data are then used to examine a variety of factors, such as sources of non-recurring congestion (accidents, construction, and disabled vehicles), year-to-year trends in non-recurring congestion, and the most common locations and times of year for each type of non-recurring congestion.

Puget Sound Regional Council (PSRC), Seattle, Washington

PSRC's CMS is exemplary in a number of areas, including its data collection and performance monitoring. The CMS defines a primary and secondary system, where the primary system includes a more comprehensive monitoring program. For the primary congestion monitoring network, the following measures are collected:

- V/C ratio
- Travel-time and speed for three modes: transit, general purpose lanes, and HOV lanes
- Transit frequency and ridership
- Ferry wait time
- Vehicle occupancy
- Major park-and-ride lot utilization
- Commute Trip Reduction (CTR) employer mode share
- Person throughput

Due to data limitations, a secondary network includes just V/C ratios as well as transit frequency and ridership.

PSRC used a number of particularly efficient data collection techniques, as described below:

- Travel time information was collected for general purpose and HOV lanes using a combination of global positioning system technology attached to probe vehicles, and a network of loop detectors that are linked through an automated data retrieval system. For future reports, PSRC plans to incorporate measures based on archive data from speed probes and loop detectors in order to evaluate travel time reliability. In addition, they are exploring the use of regular transit vehicles as routine speed probes on significant corridors.
- Lane occupancy data is gathered from traffic sensors installed in freeway lanes throughout the region.
- Person throughput estimates were determined by the University of Washington's Transportation Center (TRAC) by examining three vehicle types: passenger cars, vans and transit buses. The person throughput is calculated by multiplying vehicle volumes from loop detectors by corresponding mode split data (i.e., the percentage of all vehicles at a site that consists of cars, buses, vans) from HOV lane evaluation and monitoring projects, and by the average number of passengers per vehicle, determined by TRAC HOV monitoring and transit agency statistics.

In addition to effective performance monitoring, the PSRC CMS describes how the results inform the broader regional transportation planning and programming process, as well as an effective division between regional performance and subarea analysis.

Rhode Island Statewide Planning, Providence, Rhode Island
(Study Participant)

Rhode Island Statewide Planning (the MPO) recently developed a CMS for the first time during the last plan update (2004). The MPO utilizes archived ITS data, which enables the CMS to examine peak period, off-peak period, and seasonal/event related congestion, as well as speeds, incident clearance times and delay. Basically, all of the data collection is automated and collected by the State DOT, which minimizes data costs for the MPO (this was worked out as part of the state's ITS architecture, which called for archiving data for future use in evaluating the system); the MPO also runs the regional travel demand model to predict future congestion levels. There is a close linkage between the CMS and the planning process, with the CMS directly incorporated into the plan.

4.3 Identifying and Evaluating Improvement Strategies

The CMS must identify, screen, and evaluate strategies in terms of their predicted effectiveness in addressing the identified congestion problems and desired mobility enhancements. The evaluation may be conducted for the full CMS system, for corridors, or for subareas. Ideally, the CMS should address an approach to prioritizing strategies for implementation, including a discussion of anticipated costs. The following regions provide good examples of strategy identification, evaluation, and/or prioritization.

Chicago Area Transportation Study (CATS), Chicago, Illinois
(Study Participant)

As the MPO for the region, CATS is responsible for supporting implementation of CMS strategies. But because other agencies are involved in implementing transportation projects, such as local jurisdictions and Illinois DOT, CATS needed a way to foster inter-agency cooperation in coordinating transportation projects and congestion-related efforts. CATS created the *CMS Handbook* to support implementation of CMS strategies at all levels of implementation, from project to region, The *Handbook* provides a systematic approach for agencies in the Chicago area to address congestion. It describes 40 congestion strategies, divided into 12 classes, and describes how, when, and where the strategies are most effective, as well as how to measure effectiveness. With the *Handbook,* CATS can continue to take a regional approach to congestion with efforts such as regional rideshare support, as well as coordinate local corridor- and project-level implementation.

Harrisburg Area Transportation Study (HATS), Harrisburg, Pennsylvania

In its 2003 CMS, HATS identified eleven congestion related objectives and over two dozen potential strategies for consideration to help achieve these objectives. The objectives included: increasing use of non-motorized transportation modes, increasing auto occupancy, reducing congestion related to special events, reducing congestion related to incidents, and increasing the role of businesses in managing congestion, among others. Strategies were then grouped into three categories, based on an assessment of their potential use in the region: very practical strategies, practical strategies, and not presently practical strategies. For each CMS corridor, very practical and practical strategies were assessed and identified for potential application. The CMS report also includes a congestion summary for each CMS corridor, which describes the major sources of congestion (e.g., recurring peak period congestion, special events congestion), the key congestion points or congested areas within the corridor, current traffic conditions and transit services, planned and programmed improvements, and recommended strategies from the list of very practical and practical strategies.

Mid-America Regional Council (MARC), Kansas City, Missouri

MARC conducted a broad survey of strategy options for consideration within the CMS. The assessment was based largely on a publication titled *A Toolbox for Alleviating Traffic Congestion* (Cambridge Systematics and ITE). This survey discusses three to six strategies in each of the following eight categories (with an example listed for each):

- Highway projects (e.g., HOV lanes)
- Transit projects (e.g., implementing park-and-ride lots)
- Bicycle and pedestrian projects (e.g., design guidelines for pedestrian-oriented development)
- TDM strategies (e.g., telecommuting centers)
- ITS/Operations strategies (e.g., ramp metering)
- Access management strategies (e.g., curb cut restrictions)
- Land development strategies (e.g., mixed-use development incentives)
- Parking management strategies (e.g., reduced parking requirements in specific locations)

For each strategy listed, the survey briefly describes the strategy, congestion impacts, implementation costs, implementation timeframe, and appropriate tools for evaluation. The information is not provided in sufficient detail to make final decisions about such strategies, but it does provide enough information to create a short list of strategies worthy of more detailed investigation for a particular congestion or mobility challenge.

Regional Transportation Commission (RTC) of Southern Nevada, Las Vegas, Nevada

The Las Vegas valley CMS utilizes an analysis method that initially screens alternatives and develops a list of appropriate actions for corridors and subareas. The CMS strategy evaluation begins with a long list of different actions, arranged hierarchically according to the following groups:

- Group 1: Strategies that eliminate trips through land use changes or similar actions (e.g., growth management, telecommuting)
- Group 2: Strategies that cause a mode change, removing the trip as an auto trip
- Group 3: Strategies that increase auto occupancy by encouraging ridesharing
- Group 4: Strategies that improve the operation of the existing highway system
- Group 5: Strategies that add highway capacity

The screening method addresses these groups of strategies in order and applies the following three levels of screening: plausibility, feasibility, and effectiveness. The last two tiers are automated using an Excel spreadsheet and have been made economical in their need for data collection. Each strategy has feasibility and effectiveness thresholds. If a strategy does not pass the feasibility threshold, additional information does not need to be collected for effectiveness.

San Diego Association of Governments (SANDAG), San Diego, California (Study Participant)

SANDAG's CMS is noteworthy for research into developing and implementing CMS strategies, with a focus on helping individual jurisdictions implement strategies in a way that supports broader regional strategies. This CMS included a survey of existing congestion mitigation strategies and TDM programs from around the United States and abroad, followed by a regional workshop to identify the strategies of greatest interest to regional representatives. These efforts led to the development of three related products: 1) the CMS Toolbox, 2) the Trip Reduction Ordinance Framework, and 3) Trip Reduction Guidelines. These are described below:

The CMS Toolbox is an extensive menu of traditional and innovative congestion mitigation strategies. It seeks to provide information for local jurisdictions so that they may choose and apply the most appropriate strategies. The toolbox contains approximately 40 strategies to support the following objectives:

- Increase system capacity
- Enhance operational performance
- Shift travel away from drive alone mode
- Shift travel away from the peak periods
- Reduce vehicle trips

These strategies are organized into the following categories:

- Transit strategies to increase service and accessibility
- Land use strategies relating to site selection, design, and planning
- Travel demand management (TDM) strategies to better manage commuter traffic
- Transportation systems management (TSM) strategies focusing on efficient management and operation
- Capital strategies for construction of additional transportation facilities to increase capacity

For each strategy, the toolbox includes a functional description, a suggested unit to measure effectiveness (e.g., number of vehicle trips reduced), a statement on regional applicability (i.e., whether the strategy directly relates to regional goals and objectives), and implementation requirements (e.g., requires ongoing operating funds, or requires coordination with local transit agency).

The Trip Reduction Ordinance (TRO) Framework guides local jurisdictions in developing and implementing their own trip reduction ordinances. It recommends strategies for addressing local congestion mitigation that simultaneously support regional congestion mitigation goals. The TRO Framework provides examples of voluntary and mandatory TRO compliance and outlines an 11-step process for local jurisdictions to develop a TRO.

Finally, the Trip Reduction Guidelines provide methodologies for incorporating selected CMS Toolbox strategies into the traffic impact assessment process and estimating their effectiveness in terms of trip reduction potential. These guidelines focus on analysis of strategies deemed to be most applicable for the San Diego region. These include the following:

- Development near transit stations and transit corridors
- Mixed-use developments

- Transit service and operational enhancement strategies
- Travel demand management (TDM) programs

4.4 Monitoring CMS Strategy Effectiveness

Regulations require, “a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area’s established performance measures.” Monitoring the effectiveness of CMS strategies can serve two goals, 1) it can demonstrate whether operational or policy adjustments are needed to make the current strategies work better, and 2) it can provide information about how various strategies work in order to inform future approaches within the region.

Although a number of regions now systematically report about congested conditions, few focus any monitoring efforts on specific CMS strategies to determine whether they had the predicted or desired effect. Discussions with FHWA Resource Center staff confirmed that few regions have addressed this requirement in a substantive way. The following are examples that relate to CMS strategy monitoring.

East-West Gateway Coordinating Council (EWGCC), St Louis, Missouri

EWGCC does not currently evaluate strategies except for those strategies for which post-implementation evaluation is required under the Congestion Mitigation Air Quality (CMAQ) funding program. However, the region does provide guidance to localities on when a detailed or focused evaluation of strategy effectiveness may be warranted, and how to conduct such evaluations. EWGCC suggests that an effectiveness evaluation study is warranted under the following additional circumstances:

- Where there is little known about the actual benefits of the project. In these cases, effectiveness evaluation can determine whether such strategies should be implemented more broadly (e.g., a trip reduction program that has not previously been used in the region), or if changes are required in the implementation of the strategy to produce the desired benefits.
- Where there is a need to test the methodology used for evaluating the project. If there is limited prior experience and no established standard methodology, an effectiveness evaluation might be useful for testing or calibrating a new methodology.
- Where there is a significant community concern. For instance, formal evaluations can be useful in situations where the community is concerned about traffic and the effectiveness of promised trip reduction measures.

In addition to advice, the EWGCC’s *CMS Handbook* includes a useful appendix that describes analysis tools including appropriate simulation and travel demand modeling tools. Some of the specific tools are dated, but this example provides a helpful model for how to think about analysis tool criteria.

Lincoln MPO, Lincoln Nebraska

The City of Lincoln provides staff support to the Lincoln MPO. As part of their congestion management efforts, the City sought to maximize mobility by improving signal timing and synchronization. Along with a careful process to prioritize and implement signal improvements, the City conducted travel time runs through designated corridors, before and after implementation of the signal timing modifications. The recommended signal timing modifications were evaluated by conducting travel time studies along each of eight implementation corridors before and after signal timing improvements were made. Studies were also conducted before and after each of a total of 46 signalized intersections. This study closely followed procedures recommended for signalized intersection evaluation in the 2000 Highway Capacity Manual (HCM).

North Central Texas Council of Governments (NCTCOG), Dallas-Fort Worth, Texas

To effectively monitor strategy effectiveness, a CMS must be able to track the full array of roadway projects that have been implemented so that changes in the level of congestion take into account all significant system changes. NCTCOG maintains a database for tracking relevant projects being implemented by state, local, and metropolitan agencies so that the effect of specific CMS strategies on congestion can be disaggregated from the effect of new projects. Analysts use the database in order to establish data collection locations and time periods that will be suitable for before-and-after evaluation.

5. Using CMS to Inform Planning Processes and Meet Multiple Objectives

The intent of the Federal CMS requirement is to ensure that congestion is examined and addressed in the transportation planning process. As a result, the CMS should be coordinated with the regional planning and programming processes, and be a useful, not duplicative or ancillary, part of planning. By considering the CMS as an integral part of the transportation planning process, MPOs can make the CMS more useful to them and a more efficient use of resources. For instance, data gathered for CMS can be used to identify specific areas or corridors for further study. CMS performance measures and analysis activities can be used to prioritize project investments and screen alternative improvement strategies. Some CMS processes include predicting locations of future congestion using a travel demand model. Moreover, the travel time surveys and traffic counts sometimes taken as part of CMS can also be used to calibrate travel demand models for use in other planning efforts. In these ways, CMS activities can play an important role in the Regional Transportation Plan (RTP), the Transportation Improvement Program (TIP), and other planning activities.

At the same time, the transportation planning process takes into account a wide range of factors beyond congestion relief. In fact, the history of transportation planning in the U.S. demonstrates that a singular focus on eliminating traffic congestion may not produce effective or efficient transportation systems, and often can have harmful effects on the human and natural environment. ISTEA and TEA-21 emphasize the importance of considering multiple factors in establishing transportation investment priorities, in considering multimodal planning, and in considering accessibility, reducing the emphasis on highway congestion as the primary determinant of investment priorities. Consequently, MPOs recognize the importance of balancing congestion relief as one factor in the metropolitan transportation planning process, but not necessarily as a primary means to prioritize transportation investments.

Even though the focus of the CMS is on congestion management, the CMS provides an opportunity to examine a wide range of innovative solutions to mobility and accessibility problems. The process of collecting data, monitoring performance, and developing strategies can in turn lead to benefits in meeting non-congestion goals and in helping to inform considerations of other factors. For example, identification and evaluation of strategies (which may address shifts to alternative modes and other programs to reduce vehicle travel) can be used in prioritizing projects for CMAQ funding or in quantifying emissions reductions for conformity. These types of applications of the CMS can be particularly important in mid-sized metropolitan areas that may not experience a great deal of recurring traffic congestion.

This section explores some of the ways MPOs outside of New York State have integrated the CMS into their planning processes and have used the CMS to address transportation issues beyond traffic congestion.

5.1 Linkages to the Broader Transportation Planning Process / Use for Project Prioritization and Selection

Some MPOs develop an explicit role for the CMS within the broader planning process. Identifying clearly how the CMS fits can help planners consider what analysis and products will be most useful for making investment and policy decisions in the context of the broader regional agenda.

One way to link the long-range plan with the CMS is to require that the performance measures used in the CMS evaluation also be used to evaluate the performance of the long-range plan. The CMS can be linked to the TIP by prioritizing projects, in part, based on their performance in the CMS evaluation process. The approach can consist of screening transportation improvements based on a hierarchy of priorities that focus first on alternatives to increasing the physical capacity of the highway system. Moreover, CMS strategies can be included in the MPO's annual Unified Planning Work Program (UPWP). Many of the strategies discussed in a typical CMS are well suited to short-term MPO programmatic reporting. Similarly, strategies commonly addressed within the UPWP, such as TDM programs and ongoing regional management and operations programs, are appropriate for inclusion in a CMS.

Several MPOs, including the Wilmington Metropolitan Area Planning Commission, the Denver Regional Council of Governments, and Tucson's Pima Association of Governments have formally charted out relationships between processes that show CMS activities feeding into planning activities. Some MPOs, such as Rhode Island Statewide Planning (MPO for Providence, RI) have formally incorporated the CMS as an element of their long-range transportation plan. Phoenix's Maricopa Association of Governments, Metroplan Orlando, and several other MPOs have adopted approaches that utilize CMS data and performance measures in their evaluation of transportation investments. In these ways, these MPOs have incorporated CMS-related strategies, data, and prioritization processes into their other planning activities.

Other MPOs with less severe congestion problems may not want to formally prioritize projects using outputs of the CMS. However, the data from the CMS may be used for various planning purposes, such as to identify the need for specific corridor studies, to view targeted traffic management strategies in a broader systems context, or to define criteria for rapid allocation of funds to solve straightforward congestion problems.

Examples of some of these practices are described below:

<u>Ohio-Kentucky-Indiana Regional Council of Governments, Cincinnati, Ohio</u>

The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) has developed a scoring process intended to assist selection of worthy capacity related highway and transit projects for the 2030 Regional Transportation Plan. This process provides a systematic approach to ranking projects for the financially constrained region, and is an opportunity to incorporate the intent of TEA-21's seven planning factors. A numeric ranking for each project was determined for a relative comparison with other projects. Three sets of criteria; 1) overall, 2) roadway or transit, and 3) benefit cost, were added together for a maximum of 100 points. The scoring process was meant to provide information for decision-making and development of a recommended list of projects in the plan.

The level of congestion was a criterion in the roadway project scoring. Staff produced two maps to assist in scoring congestion. The first map was a V/C ratio plot of 2000 highway conditions for all links in the OKI travel demand model. The total delay results from the travel time study were also mapped. Both the model V/C data and delay data from the CMS study were categorized into three congestion categories: none or low, medium, and high. All projects under consideration for the Regional Transportation Plan were located on this map and given points corresponding to the congestion category. Projects in the little or none category were given 0 points, medium projects scored 3 points and projects in high congestion locations scored 5 points.

Maricopa Association of Governments (MAG), Phoenix, Arizona

MAG has implemented a project evaluation process that is used within the CMS and for TIP development. This process utilizes the concept of Mobility Zones, which defines four types of zones: Core Zones (the densest areas); Developed Zones (existing developed zones); Developing Zones (mixes of vacant and developed land); and Rural Zones (not expected to develop in the next 15 years). Within each zone, preference is given to particular kinds of transportation strategies. In this way, different kinds of congestion strategies receive different priorities based on the kind of land uses where the strategy will be applied, so that strategies can be applied to the places where MAG and its local government partners believe they will be the most effective. The rankings are shown in the table below.

MAG Congestion Management Strategy Priorities By Zone

	CMS Strategy Points Ranked by Mobility Zone:			
Preferred Transportation Mode:	Core Zones	Developed Zones	Developing Zones	Rural Zones
Arterials	2	1	6	6
Bike Lanes	3	3	3	4
Freeways	1	2	5	5
HOV Facilities	4	5	2	1
TDM/TSM Programs	5	6	1	2
Transit Lines	6	4	4	3

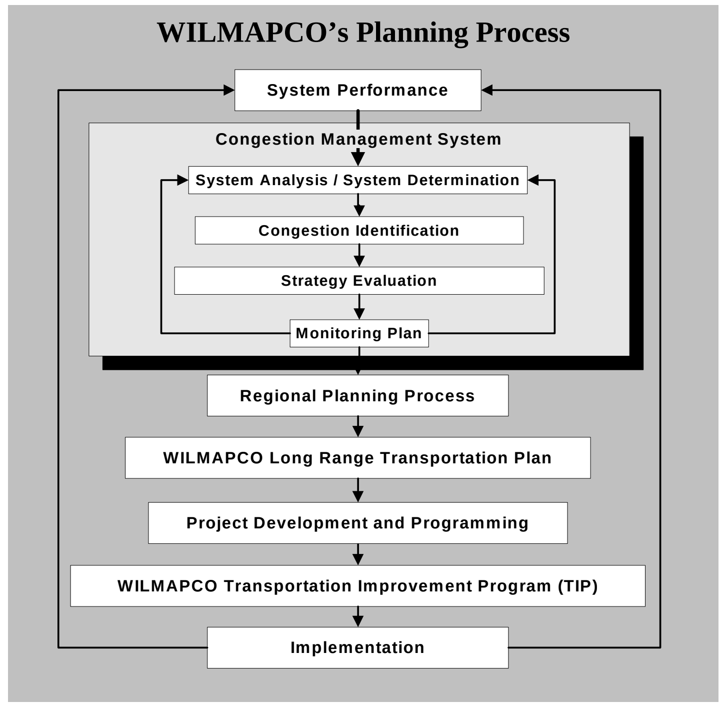
There are additional points within the Mobility Zone project evaluation system that are awarded based on particular kinds of land use planning. These points are awarded to encourage the kind of land use planning that MAG and its local partners believe to be most effective for supporting compact development and alternative-mode travel.

Mid-Region Council of Governments, Albuquerque, New Mexico

The Mid-Region Council of Governments is another region that specifically addresses how the CMS will inform the regional transportation planning process. The CMS report highlights how data gathered for congestion monitoring is used for regional plan development, and discusses how CMS performance measurement results will feed into project prioritization. The document includes two process diagrams to explain how the CMS integrates into the broader planning process for TIP/RTP development years (i.e., once every three years), as well as how the CMS should be coordinated in the "off years." This explicit discussion of process coordination increases the likelihood that the CMS analysis will be applied to inform investments and policy priorities.

Wilmington Area Planning Council (WILMAPCO), Wilmington, Delaware (Study Participant)

WILMAPCO has designed its CMS process to be a pre-cursor to its other planning activities, with a particular focus on its TIP development process. The CMS identifies congested locations, and WILMAPCO's 'toolbox' of congestion strategies is used to develop potential projects in high-priority congestion locations. Although WILMAPCO analyzes future congestion and includes congestion management in its long-range plan, its CMS is used mainly to identify current congestion and short-term CMS strategies. Since all agencies in the region are able to suggest any kind of transportation project for inclusion in the TIP, the TIP process involves a rigorous scoring evaluation to select the projects to be included. WILMAPCO's CMS serves as an additional source for project proposals that is focused explicitly on congestion management. The TIP evaluation process features CMS as a point category. Projects receive the maximum score in this category if they have been recommended in the CMS, some points if their location has been identified in the CMS as a congested location, and no points if neither condition is met. In this way, WILMAPCO's CMS activities feed directly into the TIP.



Capital Area Metropolitan Planning Organization (CAMPO), Austin, Texas (Study Participant)

CAMPO has integrated CMS into its Transportation Improvement Program (TIP) development process. Every project in the TIP must be 'CMS compliant', meaning that if a project receives federal funds through the TIP, it must be a stand-alone congestion strategy, or identify TDM/TSM strategies to be implemented with the project to receive federal funds, or have received a waiver. Waivers are granted for any of the following reasons:

- The project is not federally funded
- The project is a safety improvement only
- The project is a bottleneck elimination project only
- The project advanced beyond the National Environmental Policy Act (NEPA) prior to April 6, 1982 and has been actively advancing since then
- The project does not consist of a new general-purpose facility in a new location or the addition of general-purpose lanes to an existing facility

This CMS compliance requirement is a particularly important mechanism to ensure that projects are selected to help manage congestion, because in the Austin area, it is other agencies, rather than CAMPO itself, who submit projects for potential inclusion in the TIP.

Also, CAMPO's long-range transportation plan includes a congestion management section. Locations forecasted to be congested by CAMPO's travel demand model are given priority in the project selection process. CAMPO plans for congestion become a goal for the next plan.

Miami-Dade MPO, Miami, Florida

The CMS can be used to define criteria for rapid allocation of funds to solve straightforward congestion problems. This can be useful, not only to improving mobility, but to elevate the MPO's visibility among stakeholders that are primarily interested in short-term implementation, such as freight shippers and developers. The Miami, Florida region's RUSH (Resourceful Use of Streets and Highways) program addresses congestion bottlenecks that do not justify a full corridor study. Projects that cost less than $500,000 and that are determined to have insignificant environmental impacts are prioritized by member agencies. A lump sum of TIP money is set aside for projects that will be selected through the RUSH process, allowing for swift implementation of the designated improvements. The CMS is used to establish criteria for such funds and to conduct evaluations to determine eligible projects.

5.2 Use of CMS to Take a Broad Approach to Congestion and Address Goals beyond Congestion

CMS offers opportunities that go beyond mitigating traffic congestion. Examples of such opportunities include:

- Better characterizing multimodal transportation system performance, for investment planning and for communicating with the public;
- Strengthening understanding of the role of operations strategies and demand management, which often are less expensive than traditional infrastructure investment;
- Promoting and linking to asset management approaches, in terms of considering options to maximize the efficiency of existing infrastructure before constructing new facilities;
- Integrating ITS tools into project development and systems management; and
- Defining strategies to increase accessibility to services that reduce transportation demand.

While not all of these opportunities have been exploited in current CMS practice, MPOs that have approached the CMS process as an opportunity for innovation have had significant success in using their CMS to address their broader objectives. This section discusses several types of non-congestion related goals that the CMS can potentially help to address.

5.2.1 Land Use Integration

CMS land use evaluation activities can serve as opportunities to enhance coordination and cooperation among key stakeholders to better integrate transportation and land use planning. These activities can provide critical information to the MPO regarding short-term development activity that will affect congestion, allowing for evaluation and prioritization of short-range congestion problems. Enhanced coordination between land use jurisdictions and MPOs can also serve as a key relationship-building exercise that becomes particularly useful when such coordination is needed to craft and implement land-use- and demand-based congestion management strategies. Some examples of using the CMS to better integrate transportation and land use are described below.

Pima Association of Governments, Tucson, Arizona

The Pima Association of Governments (PAG) includes ongoing land use evaluation as part of its CMS activities. The evaluation is intended to provide information on the potential congestion impacts of proposed land developments on the CMS network. Land developers are responsible for preparing traffic impact assessments, which are submitted to PAG.

Tri-County Regional Planning Commission (TCRPC), Lansing, Michigan

Lansing, Michigan's Tri-County Regional Planning Commission (TCRPC) has gone a step further, employing land use integration as its primary CMS strategy. TCRPC considers CMS strategies on a spectrum, from area-wide strategies to local, project-level strategies. At the regional level, TCRPC has selected land use coordination as a CMS strategy.

To implement this strategy, TCRPC conducted a community-based growth visioning process called Choices For Our Future. This process created two future land use scenarios: one with 'business-as-usual' patterns, and one with 'wise growth' patterns. In coordination with its long-range planning activities, TCRPC analyzed eight different transportation strategy packages for the two land use scenarios, using a travel demand model to predict future performance indicators for each scenario. Based on the performance of the scenarios and input from the community, TCRPC then selected the 'wise growth' scenario as its preferred scenario. One end result of the process was the selection of projects for inclusion in the long-range transportation plan. Another result was an effort to secure the cooperation of the 78 local land use authorities, which have been called upon to sign onto the land use policy map depicting the 'wise growth' scenario and to revise land use policies to support these growth patterns. The land use strategy has become the over-arching direction for congestion management in the Lansing area; other CMS strategies grow out of the land use strategy, such as supporting transit and non-motorized travel, demand reduction, and access management.

This process is not cheap; the total cost for the project came to $1.75 million, which TCRPC was able to fund through a number of sources, including a FHWA Transportation Community System Preservation (TCSP) grant.

California Congestion Management Programs

California's Congestion Management statute, enacted in 1991, created a fund source for transportation in the form of a statewide gas tax increase, and a system of county Congestion Management Agencies (CMAs) empowered to identify and implement transportation projects funded by the gas tax increase. In exchange, CMAs are charged with maintaining a Congestion Management Program (CMP) with State-required elements, including a performance measure—Level of Service—and a standard threshold—LOS D—to uphold throughout the congestion management network as defined by the CMA. The funding authority given to CMAs creates a large incentive for local governments to cooperate with CMA initiatives, including long-range transportation plans and programming processes.

As a result of this structure, California CMAs have met with considerable success in coordinating land use and transportation with local land use jurisdictions. One example is the common requirement that local jurisdictions must complete transportation impact analyses for any new land development proposals to the satisfaction of the CMA, with the withholding of gas tax money or transportation projects as a potential penalty for non-compliance. In this way, CMAs have been able to be involved more closely in the land planning and development process.

One acknowledged weakness of the CMP system is the pre-ordained Level of Service D standard that CMAs are required to uphold. In the case of major intersections, this requirement has the potential to promote dispersed development. The phenomenon at work here is the tendency for dense areas such as downtowns to experience high congestion. The CMP statute requires investments to uphold the LOS D standard, which has two effects: first, the requirement, if fulfilled by intersection widening, can turn dense areas into pedestrian-unfriendly places, an outcome counter to livability goals; and second, it creates a perverse incentive for developers to propose development on the urban fringes, where congestion is still low and where they are not called upon by municipalities to make major intersection investments. A partial solution to this dilemma has come in the form of a revision of the CMP statute to allow CMAs to accept LOS measures lower than D in cases where dense, transit- and pedestrian-friendly neighborhoods are desired.

5.2.2 ITS, Operations, and Emergency Preparedness

Using technology to improve operations is in the realm of strategies that can be employed in a CMS to help manage congestion. Several metropolitan areas have proposed and evaluated ITS projects as CMS strategies, including the Boston MPO, the Harrisburg Area Transportation Study, the Hampton Roads Planning District Commission (HRPDC), Philadelphia's Delaware Valley Regional Planning Commission, Pittsburgh's Southwestern Pennsylvania Commission, and Scranton's Lackawanna-Luzerne Transportation Study. Sometimes, ITS projects that would improve operations lack a high profile within the transportation and broader community, and, possibly as a result, do not receive high consideration in the investment planning process. Although the past few years have seen many MPOs devoting specific attention to ITS planning—in the form of ITS regional architectures and deployment plans—CMS may be an opportunity to plan for ITS if an ITS plan is not already in place.

Several MPOs, including the New York Metropolitan Transportation Council, have used the CMS process to establish a policy approach and develop tools for considering non-recurring congestion – a problem that frustrates travelers in even the smallest regions. Such efforts typically have ancillary benefits in terms of emergency preparedness and customer access to travel information.

Some examples of how the CMS can help integrate operations into the planning process are highlighted below:

Hampton Roads Planning District Commission (HRPDC), Hampton Roads, Virginia (Study Participant)

HRPDC has recognized incident management and ITS to be powerful congestion management tools, and has been working with Virginia DOT and local agencies to coordinate and deploy ITS infrastructure in the region. One success has been Virginia DOT's Regional Smart Traffic Center, covering 60 miles of the interstate system with ITS instruments. This center compiles volume and speed, sending archived data to the Smart Travel Lab at the University of Virginia for processing, storage, and management. HRPDC recently updated its ITS deployment plan, and in the process, began to hold monthly meetings with ITS stakeholders in the region, including commercial vehicle operations, incident management, fire, rescue, and police representatives, in order to introduce them to the concepts of ITS and operations. HRPDC has created an incident management plan for the region, and is developing a regional concept of operations.

Chicago Area Transportation Study (CATS), Chicago, Illinois (Study Participant)

While CATS has yet to incorporate non-recurring congestion into the CMS process proper, the agency is coordinating with other agencies so that ITS data becomes available as ITS infrastructure comes on-line. ITS opportunities in the area include the City of Chicago, which is planning a traffic management center (TMC), Illinois DOT, which operates multiple TMCs in the area, the transit agency, which operates a center to track their transit vehicles, some of the surrounding counties which also operate their own TMCs, and even the private sector, such as the private company that secured an agreement with the toll authority to install solar-powered towers to count and classify traffic. One big issue has been coordinating with TMC operators to archive data; generally, TMCs have been designed to track and respond to data in real-time, with little emphasis on archiving it. CATS is aiming to set up arrangements so that traffic data can be stored, managed, and shared among agencies.

CATS would advise other MPOs, especially in smaller areas, that although ITS can represent significant capital cost outlays—Chicago's new TMC will cost $25 million—it can also be done 'on-the-cheap', with nothing more elaborate than a few networked computers. Also, there is a strong connection between security and ITS; in fact, Chicago moved its TMC planning function to its emergency management department because there is now significant funding for security.

Rhode Island Statewide Planning, Providence, Rhode Island (Study Participant)

Through the process of examining incident response and alternatives route selection for various types of emergencies, the Rhode Island CMS has to some degree had benefits in terms of emergency management and homeland defense. The information from the CMS will help feed into other more targeted activities.

5.2.3 Safety

Improving safety clearly has overall public benefit, but can also help specifically to reduce incidents, thereby reducing incident-related, non-recurring congestion, one of the central purposes of a CMS. The CMS can facilitate safety planning. Crash analysis requires a defined network of roadways and basic information about those roadways, including traffic data. CMS activities such as defining a CMS network of major intersections and major highway segments, constructing an electronic database of this network, and maintaining traffic count data can support crash analysis on a regional basis.

Hampton Roads Planning District Commission (HRPDC), Hampton Roads, Virginia (Study Participant)

As part of its larger effort to address non-recurring congestion, HRPDC has analyzed crash data at the regional level with the objective of reducing crashes both for the sake of safety as well as for congestion reduction. The regional safety study aimed to identify high-incident locations, and required large amounts of investigation and coordination to simply obtain the data necessary to complete the study, since crash data were kept by several different jurisdictions in several different formats. Tapping into crash databases maintained by Virginia DOT and individual cities, HRPDC identified CMS highway segments and major intersections with the highest severity-adjusted crash rates and used CMS traffic data to control for varying amounts of traffic. HRPDC used the opportunity to create an integrated crash data management system for the region, and has been working with Virginia DOT to put in place automated data entry procedures.

HRPDC produced location maps, roadway geometry diagrams, collision diagrams, crash data summaries, observations, and remedies for the region's top ten high-crash interstate segments and the top intersection for each jurisdiction. Both local agencies and Virginia DOT have expressed that the study has been very useful. Several localities have since used the results of the safety analysis to initiate safety grant applications and propose projects for inclusion in the TIP. While HRPDC's CMS database is separate from the crash data management system, the CMS database allowed HRPDC to map the end results to look at congestion and safety simultaneously.

Indian Nation Council of Governments (INCOG), Tulsa, Oklahoma

In identifying the impact of accidents on congestion, INCOG developed a performance measure of accident rate (accidents per million vehicle miles traveled), calculated based on data on:

- Total number of accidents reported during the peak hour on a weekday,
- Peak hour traffic counts, and
- Length of roadways.

INCOG also developed a performance standard:

- below 1.5 accidents/million VMT = low accident rate
- 1.5 - 2.0 accidents/million VMT = medium accident rate
- above 2.0 accidents/million VMT = high accident rate

These data could then be used to identify high accident locations for safety enhancements.

5.2.4 Freight Planning

CMS can be used as a mechanism to bring freight concerns into the transportation planning process. For instance, through its Freight Roundtable, the Puget Sound Regional Council has developed emergency management and incident response for truck routes that are prioritized within the CMS. As another example, the Atlanta Regional Commission explicitly addresses freight priorities by defining prioritization criteria based on existing truck volumes and presence or absence of parallel rail service (with higher priority going to highway corridors that lack parallel rail service). Metroplan in Orlando, Florida, has monitored freight movement by designating truck routes and tracking congestion on those routes separately from non-freight-priority routes. Finally, the North Jersey Transportation Planning Authority has also taken freight concerns into account within its CMS performance measures and investment priorities.

5.2.5 Transit, Bicycle, and Pedestrian Modes

CMS can be a way to conduct a formal, rigorous analysis of what specific pedestrian and bicycle projects are needed and a rigorous prioritization of those projects to focus investment on the most critical pedestrian and bicycle infrastructure. Viewed this way, the CMS can be a process for formally identifying bicycle and pedestrian projects, which in some cases may not otherwise receive regional-level planning attention. One example is highlighted below:

North Central Florida Regional Planning Council (NCFRPC), Gainesville, FL

The North Central Florida Regional Planning Council (NCFRPC), which is the designated MPO for the Gainesville metropolitan area, developed pedestrian and bicycle level of service (LOS) measures to incorporate into its CMS. The bicycle measures account for characteristics such as the type of facility provided (e.g., routes, lanes, or paths), the number of potential conflicts (e.g., driveways), speed differential with neighboring traffic, vehicle LOS, roadway condition, and presence of intermodal opportunities. Pedestrian LOS measures are somewhat analogous, addressing the presence or absence of pedestrian facilities (e.g., sidewalks), amenities (e.g., benches and lighting), facility conditions, and presence of multimodal opportunities.

Some MPOs, notably the Wilmington Area Planning Council, have evaluated transit operating and capital projects by corridor in the context of CMS strategy evaluation. In this and other regions, however, transit investment planning is also carried out in the long-range planning process, pointing to potential overlap in planning activities and the need for close coordination.

5.2.6 Air Quality

There is overlap between the strategies for mitigating congestion required of a CMS and strategies that can also reduce air pollution. CMS processes can therefore serve as ways to develop air quality improvement strategies such as Transportation Control Measures (TCMs) required in areas that are in non-attainment of federal air quality standards. Examples of overlapping strategies include those which support ridesharing, transit use, biking, and walking, as well as those which revise signal timing to minimize idling. Even if measures are not formally included in the State Implementation Plan as TCMs, quantifying their impacts can be important as part of the air quality conformity process for transportation or for submitting proposals for funding under the Congestion Mitigation and Air Quality Improvement (CMAQ) program.

5.2.7 Regional Coordination of Demand Management

The CMS can be a mechanism to coordinate regional TDM services, as well as to identify specific locations for more intensive TDM programs. In 1995, the Hampton Roads Planning District Commission adopted a TDM program entitled TRAFFIX to spearhead demand-related CMS strategies. TRAFFIX coordinates TDM activities on a regional basis, including carpool matching, employer-based carpool activities, van leasing, a guaranteed ride home program, and others. The Harrisburg Area Transportation Study (HATS) and many other MPOs maintain similar programs to address congestion from a demand management standpoint. The CMS in some cases has been a catalyst for these programs.

CMS can be used to support shared-ride facilities planning. For instance, the Pioneer Valley Planning Commission's (PVPC's) CMS includes monitoring of park and ride lots for usage and identifies issues for each lot, as well as any need for additional lots. PVPC was first requested to monitor the park and ride lot system by the Massachusetts Highway Department in the late 1990s, and determined that this system was worthwhile to include as part of the CMS. The monitoring has allowed PVPC to better track ridesharing patterns and can inform efforts to promote ridesharing.

6. Other CMS-Related Topics

6.1 CMS Resource Requirements

Many MPOs have limited staff and budgets with which to conduct required CMS activities. Consequently, several of the MPOs interviewed for this project indicated the need to keep performance measures relatively simple and understandable, and to utilize available data sources to the extent possible to minimize special data collection for the CMS. Use of ITS data collected by a State DOT was identified as an important source of data in several regions. Although some regions develop annual CMS reports, others incorporate the CMS as part of the long-range planning process, and update it on about a three-year cycle, while some have conducted periodic updates with less frequency.

The MPOs interviewed reported tracking CMS activity resource expenditures in terms of two kinds of activities: data collection and CMS documentation. The following are example expenditures of MPOs interviewed.

- Chicago Area Transportation Study: $170,000, not including data collection
- Hampton Roads Planning District Commission: $120,000, not including data collection, safety analysis
- Capital Area MPO, Austin, Texas: ½ Full-Time Equivalent staff, plus $100,000 in consultant data collection costs
- Pioneer Valley Planning Council, Springfield, Massachusetts: $80,000 for CMS update, data collection
- Wilmington Area Planning Council, Wilmington, Delaware: $50,000 for CMS update, data collection
- Rhode Island Statewide Planning: 2-3 MPO staff for several months for CMS update, plus consultant costs to run travel model

The not-insignificant cost of conducting CMS activities points to the importance of finding cost-effective ways to meet requirements, such as partnering with other agencies, the private sector, and academic institutions to obtain data, as well as of using these activities to accomplish other goals, such as supporting planning activities.

6.2 Certification Experience: Austin, Texas (Study Participant)

The Capital Area Metropolitan Planning Organization (CAMPO) received warnings regarding the adequacy of its CMS during two separate certification processes, specifically because there were concerns that CAMPO was not progressing toward meeting the goals of the certification process. Instead of submitting to penalties, CAMPO responded by agreeing to develop a CMS Work Plan and to produce Work Plan Status Updates on a regular basis. The Status Update requirement has since been dropped. However, CAMPO continues to complete a *CMS State of the System Report* every year to demonstrate compliance with federal requirements.

The work plan agreed to by CAMPO and FHWA required to fulfill CMS requirements was composed of the following elements.

- Develop Performance Measures
  - Create measures for current, future congestion
  - Create measures for effectiveness of strategies
- Collect, Analyze Data
  - Define collection program
  - Collect data
  - Define performance monitoring program
  - Identify current congestion
  - Identify future congestion
  - Identify causes
  - Maintain database
- Evaluate and Implement Strategies
  - Assist local jurisdictions in evaluating strategies

- Identify anticipated performance, expected benefits of strategies
- Evaluate efficiency, effectiveness of strategies
- Define plans for periodic assessment

7. Conclusions and Next Steps

The CMS is a systematic process for determining acceptable congestion levels in a region, measuring the extent of congestion, and prioritizing strategies for managing that congestion. Federal requirements define the required elements of a CMS and specify that TMAs (metropolitan areas with over 200,000 population) must implement and maintain a CMS. However, the Federal regulations are not specific in terms of how to implement these requirements. Consequently, a variety of practices have been implemented across the country.

Since the inception of CMS requirements, practice has evolved along a number of dimensions. For instance, there has been a migration away from volume-based measures toward ones that are based on travel time. Advances in technology also have created unprecedented opportunities to collect more data and do so more cost-effectively, through use of tools such as GPS and GIS applications and coordination with State DOTs and traffic management centers that are collecting data for traffic operations using ITS infrastructure. Several innovative practices are highlighted in this report, both in terms of how MPOs have implemented the required CMS activities and in how they use the results of the required CMS activities in their broader transportation planning and programming processes so as to make effective use of the CMS rather than conducting it as a stand alone activity.

Many of the MPOs in New York State – particularly those in smaller TMAs that have more limited traffic congestion – are very interested in identifying ways to meet the CMS requirements more cost-effectively and make the CMS more useful in their planning activities. The innovative practices highlighted in this report will serve as a foundation for a NYS MPO Peer Exchange Forum, where it will be presented as background for discussions among the NYS MPOs about potential CMS approaches that might be implemented within their jurisdictions.

A key consideration for NYS MPOs in selecting approaches will be to examine the benefits and costs of alternative approaches, given resource constraints and the unique circumstances of each MPO. For instance, while some innovative practices that involve more fine-grained analysis may be very valuable in some regions, other areas (particularly slow growing regions) may determine that a more modest CMS approach, well integrated into the comprehensive policy process, is more appropriate. Implementation issues, resource constraints, and the advantages and disadvantages of various approaches will be explored in the Peer Exchange Forum. Together, the information presented in this report and results of the Peer Exchange Forum will provide the basis for a CMS Process Innovations Guide, which will present a menu of CMS options for implementation in New York State.

8. Sources

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Tri-County Regional Planning Commission, *Congestion Management System for the Tri-County Region*, 2004.

Wilmington Area Planning Council, *2004 Regional Progress Report*.

8.2 Interviews Conducted

Interviews with the following individuals were conducted in June 2005.

Interviews Conducted on CMS Practices, June 2005

Organization	Location	Name
Capital Area Metropolitan Planning Organization	Austin, TX	Rachel Everidge-Clampffer
Capitol Region Council of Governments	Hartford, CT	Thomas Maziarz, Dan Czaja
Chicago Area Transportation Study	Chicago, IL	Mark Thomas
Erie Area Transportation Study	Erie, PA	Jake Welsh
Grand Valley Metropolitan Council	Grand Rapids, MI	Jim Snell
Hampton Roads Planning District Commission	Hampton Roads, VA	Camelia Ravanbakht
Pioneer Valley Planning Council	Springfield, MA	Gary Roux
Rhode Island Statewide Planning Program	Providence, RI	Michael Moan
San Diego Association of Governments	San Diego, CA	Mario Oropeza
Wilmington Area Planning Council	Wilmington, DE	Dan Blevins

9. Appendix: MPOs Cited

MPO Name	Urban Area	Website	Area Population
Atlanta Regional Council	Atlanta, GA	www.atlantaregional.com	3,720,000
Capital Area Metropolitan Planning Organization	Austin, TX	www.campotexas.org	1,270,000
Capital Region Council of Governments	Hartford, CT	www.crcog.org/	740,000
Chicago Area Transportation Study	Chicago, IL	www.catsmpo.com	8,150,000
East-West Gateway Coordinating Council	St. Louis, MO	www.ewgateway.org	2,560,000
Greenville County Planning Commission	Greenville, SC	www.greenvilleplanning.com/	400,000
Hampton Roads Planning District Commission	Hampton Roads, VA	www.hrpdc.org/	1,590,000
Harrisburg Area Transportation Study	Harrisburg, PA	www.tcrpc-pa.org/	520,000
Hillsborough County MPO	Tampa, FL	www.hillsboroughmpo.org	1,120,000
Indian Nation Council of Governments	Tulsa, OK	www.incog.org/	880,000
Lincoln MPO	Lincoln, NE	www.ci.lincoln.ne.us/city/plan/	260,000
Maricopa Association of Governments	Phoenix, AZ	www.mag.maricopa.gov	3,500,000
Miami Valley Regional Planning Commission	Dayton, OH	www.mvrpc.org/	1,570,000
Miami-Dade MPO	Miami, FL	www.miamidade.gov/mpo	2,250,000
Mid-America Regional Council	Kansas City, MO	www.marc.org	1,930,000
Mid-Region Council of Governments	Albuquerque, NM	www.mrcog-nm.gov/index.htm	750,000
North Central Florida Regional Planning Council	Gainesville, FL	ncfrpc.org/mtpo/index.html	130,000
North Central Texas Council of Governments	Dallas-Fort Worth, TX	www.nctcog.org/	6,010,000
Ohio-Kentucky-Indiana Regional Council of Governments	Cincinnati, OH	www.oki.org/	1,920,000
Pima Association of Governments	Tucson, AZ	www.pagnet.org	930,000
Pioneer Valley Planning Council	Springfield, MA	www.pvpc.org	620,000
Puget Sound Regional Council	Seattle, WA	www.psrc.org/	3,420,000
Regional Transportation Commission of Southern Nevada	Las Vegas, NV	www.rtcsouthernnevada.com/	1,650,000
Rhode Island Statewide Planning	Providence, RI	www.planning.state.ri.us/	1,040,000
San Diego Association of Governments	San Diego, CA	www.sandag.org	3,020,000
Tri-County Regional Planning Commission	Lansing, MI	www.tri-co.org	460,000
Wilmington Area Planning Council	Wilmington, DE	www.wilmapco.org	610,000