CONNECT SOCAL

The 2024–2050 Regional Transportation Plan/Sustainable Communities Strategy of the Southern California Association of Governments

Congestion Management

TECHNICAL REPORT

DRAFT | NOVEMBER 2, 2023

SCAG™

INNOVATING FOR A BETTER TOMORROW

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EXECUTIVE SUMMARY

This technical report details SCAG's responsibilities and its actions and programs to fulfill state and federal congestion management requirements. This report details the state and federal regulatory framework, tracks and discusses congestion performance measures, describes strategies to reduce congestion, and finishes with next steps and implementing the congestion management goals and objectives of Connect SoCal 2024, the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

1. INTRODUCTION

With one of the most congested metropolitan areas in the United States and the world, SCAG has long recognized that roadway capacity expansion by itself is not the solution. Studies have shown that long commutes are linked with worse physical and mental health, including higher rates of obesity, stress and depression. People of color, particularly Black and Indigenous populations, experience higher commute times by all modes of travel. Therefore, in addressing its federal and state congestion management requirements, SCAG employs an array of congestion management and reduction techniques that are critical components of the RTP/SCS development, and these strategies are fully integrated into Connect SoCal 2024. This technical report measures the congestion in our region and describes different actions and programs to manage and reduce congestion. Connect SoCal 2024 showcases an array of transportation investments across all transportation modes to reduce congestion and create a more mobile and sustainable future in our region through 2050 and beyond.

ORGANIZATION OF THE REPORT

This report is organized as follows:

- Regulatory Framework
- Congestion Management Process (CMP) and Connect SoCal
- Analytical Approach
- Existing Conditions
- Strategies
- Next Steps
- Conclusion

LINK TO MAIN PLAN AND OTHER REPORTS

SCAG's CMP is also discussed in Chapter 2, Chapter 3, and Chapter 5 in the main Connect SoCal 2024 report. In addition, more detailed information on the different transportation modes and their role in congestion management as discussed in this report, such as transit/rail and active transportation can be found in the Mobility Technical Report.

2. REGULATORY FRAMEWORK

Federal regulations for Metropolitan Transportation Planning and Programming require the development, establishment and implementation of a CMP which is fully integrated into the regional planning process (23 CFR Section 450.322). The Federal Highway Administration (FHWA) defines the CMP as a "systematic approach… that provides for effective management and operation, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities eligible for funding under title 23 U.S.C., and title 49 U.S.C., through the use of operational management strategies."

In compliance with Federal law (23 U.S.C. 134 and 49 U.S.C. 5303–5305), SCAG has made the CMP an integral part of the regional transportation planning process, including the RTP/SCS and the Federal Transportation Improvement Program (FTIP). The CMP is part of SCAG's integrated approach to improving and optimizing the transportation system, shown graphically as the Mobility Pyramid (FIGURE 1), to provide for the safe and effective management of the regional transportation system through the use of monitoring and maintenance, demand reduction, land use, operational management strategies and strategic capacity enhancements.

Figure 1. Mobility Pyramid

Source: SCAG

2.1 FEDERAL PERFORMANCE MANAGEMENT

The Moving Ahead for Progress in the 21st Century Act, MAP-21, required the FHWA to establish rules for implementing transportation system performance management planning at a national level. FHWA rulemaking in support of MAP-21, and the subsequent Fixing America's Surface Transportation (FAST) Act, has provided performance management and target-setting guidance through three performance management (PM) packages:

- PM 1: Transportation System Safety
- PM 2: Pavement and Bridge Condition (National Highway System)
- PM 3: National Highway System, Freight Movement, and Congestion Mitigation and Air Quality (CMAQ)

The Analytical Approach Section of this report discusses this process in more detail.

2.2 FEDERAL PERFORMANCE MANAGEMENT PROCESS AND CONNECT SOCAL

The FHWA's CMP Guidebook outlines eight actions that are considered to be the core of the CMP. SCAG, as the Metropolitan Planning Organization (MPO), implements, monitors, and evaluates these actions as part of its RTP/SCS process. These eight actions and how SCAG implements them are described below.

1. **Develop Regional Objectives for Congestion Management** – CMP objectives should be developed in coordination with the MPO's long-range plan and should guide the decisions made throughout the CMP and the broader MPO planning process.

   - **SCAG's Implementation:** As part of each RTP/SCS development process, SCAG meets CMP requirements by performing an exhaustive objectives development effort with hundreds of stakeholders across the region to identify regional objectives for a host of transportation planning areas, including congestion management. RTP/SCS goals are adopted every four years and consistently address mobility, accessibility, and reliability.

2. **Define CMP Network –** This step defines the geographic area to be covered by the CMP, as well as the CMP network and its transportation facilities that will be analyzed, including transit, bicycle, pedestrian and freight facilities.

   - **SCAG's Implementation:** As part of each RTP/SCS development process, SCAG meets the CMP requirements by defining the six-county geographic area to be covered by the RTP/SCS, and all transportation facilities that will be analyzed, including freeway, highway, arterial, transit/rail, bicycle, pedestrian, and freight facilities.

3. **Develop Multimodal Performance Measures –** The performance measures an MPO selects for use in the CMP should address the congestion management objectives identified above, including a wide variety of congestion-related issues.

   - **SCAG's Implementation:** As part of each RTP/SCS development process, SCAG meets the CMP requirements by developing multimodal performance measures addressing a wide

variety of congestion-related issues, including but not limited to mobility, accessibility, location efficiency, air quality, and public health. Regarding congestion, SCAG evaluates person delay, truck delay and travel time.

4. **Collect Data/Monitor System Performance –** This step involves collecting and monitoring data to assess the CMP network's performance.

   - **SCAG's Implementation:** As part of each RTP/SCS development process, SCAG meets the CMP requirements by updating and calibrating the regional travel demand and activity-based models process utilizing existing conditions, allowing SCAG to provide an accurate representation of the performance of the existing highway and arterial system. Data sources include Caltrans freeway Performance Monitoring System (PeMS), Caltrans Highway Performance Monitoring Program (HPMS), Mobility Performance Report (MPR), and private sector data sources. In addition, SCAG collects a host of data on the performance of other modes of transportation, including transit/rail and goods movement.

5. **Analyze Congestion Problems and Needs –** This step identifies the congestion problems that are present in the region, and those that are anticipated based on the data collected for the RTP/SCS. This step also identifies sources of "unacceptable" congestion.

   - **SCAG's Implementation:** As part of each RTP/SCS development process, SCAG meets the CMP requirements by performing an assessment of congestion levels in the base year (2019 for the 2024 RTP/SCS) as existing conditions and also for the horizon year of 2050. SCAG then performs model runs to test the transportation improvements and their ability to address the identified congestion issues.

6. **Identify and Assess Strategies –** This step involves developing strategies that are appropriate to mitigate the congestion identified in Steps 4 and 5. A wide variety of strategies should be considered, including transportation demand management, operational improvements, and multimodal facilities and services.

   - **SCAG's Implementation:** As part of each RTP/SCS development process, SCAG meets the CMP requirements by considering a comprehensive range of strategies, including transportation systems management, transportation demand management, and investments in multimodal capital and operational improvements.

7. **Program and Implement Strategies –** This step involves programming and implementing fiscally constrained projects through the Metropolitan Transportation Plan and TIP processes, to mitigate the identified congestion. CMP performance measures should be used as a tool for project prioritization.

   - **SCAG's Implementation:** As part of each FTIP update and amendment development process, SCAG meets the CMP requirements by implementing projects and strategies identified in the FTIP and RTP/SCS in collaboration with the County Transportation Commissions (CTCs).

8. **Evaluate Strategy Effectiveness –** This step involves the evaluation of how well the CMP strategies are working, whether further improvements are needed, and whether the strategies should be implemented elsewhere in the region.

   – **SCAG's Implementation:** SCAG meets the CMP requirements by evaluating how its implemented strategies mitigate and reduce the identified congestion over time at the system level, using performance measures and monitoring.

3. STATE CONGESTION MANAGEMENT PROGRAM AND CONNECT SOCAL

Under California law passed in 1990, urbanized areas must prepare a Congestion Management Program. These are comprised of several elements which are described in this section and must be updated every two years. In the SCAG region the Los Angeles County Metropolitan Transportation Authority (Metro), Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), San Bernardino County Transportation Authority (SBCTA) and Ventura County Transportation Commission (VCTC) are the designated Congestion Management Agencies (CMAs) for their respective counties and are subject to the state requirements. While Imperial County is not participating in the state program, CMP-related activities there are accomplished through the development of the RTP/SCS and the FTIP by the Imperial County Transportation Commission (ICTC).

California Government Code Section 65088.3 provides that if most local jurisdictions representing a majority of a county's population adopts resolutions requesting to opt out of the state Congestion Management Program, they may do so without penalty. In August 2019, Metro announced that 55 local jurisdictions representing 8.4 million people had adopted resolutions electing to be exempt from the state Congestion Management Program requirements, thereby satisfying the threshold. While the provisions of the state program are no longer applicable to Los Angeles County, SCAG continues to work cooperatively with Metro on monitoring congestion and identifying solutions to manage and reduce congestion in Los Angeles County.

SCAG has a state-mandated role in reviewing the county programs for inter-county compatibility and consistency, as well as for consistency with the adopted RTP/SCS. Because the magnitude of congestion and degree of urbanization differ among the counties in SCAG's region, each county program differs slightly in form and local procedure. The required program elements are described below.

- **Roadway Performance –** Each CMA monitors the performance of a county-designated freeway, highway and arterial system. This monitoring allows each county to track how their system, and its individual components, is performing against established standards, and how performance changes over time.

- **Multi-Modal Performance –** In addition to roadway performance, each county program contains an element to evaluate the performance of other transportation modes, especially transit/rail.

- **Transportation Demand Management (TDM) –** Each county program contains a TDM component geared at reducing travel demand and promoting alternative transportation methods.

- **Land Use Programs and Analysis –** Each county program incorporates a program for analyzing the effects of local land use decisions on the regional transportation system.

- **Capital Improvement Program (CIP) –** Using data and performance measures developed through the activities identified above, each county program develops a CIP. This becomes the first step in developing the County Transportation Improvement Program (TIP).

- **Deficiency Plans –** The county programs contain provisions for "deficiency plans" to address unacceptable levels of congestion. Deficiency plans can be developed for specific problem areas or on a system-wide basis. Projects implemented through the deficiency plans must, by statute, have both mobility and air quality benefits. In many cases, the deficiency plans capture the benefits of transportation improvements that occur outside the county TIPs and FTIP such as non-traditional strategies and/or non-regionally significant projects.

The regional transportation planning process and the county congestion management process should be compatible with one another. To ensure consistency, SCAG and the CMAs have developed the Regional Consistency and Compatibility Criteria. Information on the county activities and resulting data is updated on a biennial basis by each CMA and supplied to SCAG and air quality management districts.

3.1 SCAG REGIONAL CMP NETWORK

Each CMA monitors the performance of their identified program network. This allows each county to track how their network and its individual components are performing against its established performance measures, and how the network's performance changes over time. At a minimum, all freeways and state highways are required to be monitored. The California Department of Transportation (Caltrans) monitors state highways and the Interstate system within the SCAG region. All the CMAs include major arterials in their networks as well.

The SCAG regional CMP Network consists of all the county networks combined. It includes all freeways, state highways and key arterials. In each county's program, the level of service is recorded for all roadways in the CMP network in accordance with California Government Code Section 65089. Imperial County also includes levels of service on major roadways in its Long-Range Transportation Plan. Each county is required to update its program every two years.

3.2 SCAG CMP'S RELATION TO OTHER DOCUMENTS

Through Connect SoCal, SCAG identifies strategies to reduce and mitigate congestion which are incorporated into the FTIP. These FTIP projects are programmed through the CTCs, as all of these projects are incorporated in CTC long-range plans.

The SCAG CMP is also an important part of the South Coast Air Quality Management District's (South Coast AQMD) Air Quality Management Plan (AQMP). The FTIP and RTP/SCS contain congestion-mitigating projects that are transportation control measures (TCMs) which are incorporated into the AQMP to reduce air pollution emissions or concentrations from transportation sources by modifying vehicle use, changing traffic flow, or mitigating traffic congestion conditions. These measures contribute toward attaining the National Ambient Air Quality Standards (NAAQS). Federal funds may not be programmed in the ozone non-attainment areas of Transportation Management Areas (TMAs) for any

project resulting in significant increases in single-occupancy vehicle (SOV) capacity unless that project is addressed through the CMP. SCAG's FTIP process flags these SOV capacity-enhancing projects upon submittal by the CTCs and has a process to ensure that these projects meet the CMP requirements.

Riverside and San Bernardino Counties are designated as ozone non-attainment areas. In addition, the entire South Coast Air Basin (SCAB), which comprises urbanized portions of Los Angeles, Riverside, and San Bernardino Counties and all of Orange County, is designated as an ozone and PM2.5 non-attainment area and carbon monoxide and PM10 maintenance area.

3.3 ROLES AND RESPONSIBILITIES OF PARTNER AGENCIES

Five of the six counties in the SCAG region (all but Imperial County) fall under the state congestion management requirements and are responsible for monitoring their respective networks and producing a report every two years. SCAG in turn has a state-mandated role in reviewing the county programs for inter-county compatibility and consistency, as well as for consistency with the adopted RTP/SCS. In the SCAG region, Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties are contained within the TMA. The CTCs also work with SCAG to program their projects incorporated in their long-range plans in to the FTIP and RTP/SCS. Many of these projects are TCMs that are incorporated in to the AQMP, and the South Coast AQMD and SCAG work together to ensure the region improves its air quality. Finally, the FHWA monitors and reviews SCAG to make sure it meets CMP requirements.

Outside of state congestion management requirements, federal regulations require establishment of a traffic monitoring system (TMS). It is the responsibility of the state and Caltrans, working with the MPOs and local agencies, to develop a TMS. Caltrans, in accordance with AB 1963 (Katz), is required to monitor the level of service (LOS) on the federal interstate and state highway systems. LOS on arterials that are part of county networks or otherwise are provided by CMAs or local agencies. Immigration and Customs Enforcement monitors border crossings.

Caltrans, in conjunction with the California Highway Patrol (CHP), has created Transportation Management Centers (TMCs) to monitor daily traffic conditions and non-recurring congestion. With the help of electronic technologies such as electronic sensors in the pavement, freeway call boxes, video cameras, 911 calls, officers on patrol, Caltrans highway crews, ramp meter sensors, earthquake monitors, motorist cellular calls and commercial traffic reports, the TMC provides coordinated transportation management for normal commutes, special events and incidents affecting traffic. Much of the data is archived through Los Angeles County's Regional Integration of ITS Systems (RIITS) which should provide greater accuracy in the data collected and modeled. The TMCs are operated within each Caltrans district. For the SCAG region, Districts 7, 8, 11, and 12 all have TMCs.

The CMP Is integral in the work that SCAG does and in forming the RTP/SCS because it is the culmination of so many aspects of the work that our member cities and counties do. While SCAG is not an implementing agency, it is an agency that coordinates and funds the works of local implementers. It's critical for the region's cities and counties to be working in concert to reduce congestion, vehicle miles traveled (VMT) and greenhouse gas emissions. While each locality is committed to these goals, there would be discrepancies without coordination. SCAG's CMP work ensures that there are no such discrepancies and that each county is supported in its work.

3.4 THE FEDERAL TRANSPORTATION IMPROVEMENT PROGRAM (FTIP) – SINGLE OCCUPANCY VEHICLE (SOV) CAPACITY-ENHANCING PROJECTS

All federally funded congestion relief strategies (projects and programs) in the SCAG region are programmed into the Federal Transportation Improvement Program (FTIP). Under state law, the Congestion Management Program projects must be incorporated into the FTIP to receive federal and state funds. Under federal law, the FTIP must be updated every two years for funding.

In non-attainment and maintenance areas, projects included in the FTIP as a whole, including congestion relief projects, must be analyzed for the transportation conformity requirements unless the projects are exempt from the transportation conformity requirements. In project-level analysis, projects requiring federal action (funding or approval) are subject to requirements of the National Environmental Policy Act (NEPA). In California, projects are also subject to requirements of the California Environmental Quality Act (CEQA).

The federal government regulates the monitoring of projects that significantly increase SOV capacity in the region through Title 23, Code of Federal Regulations sections 450.322(e) and (f), which state, in part:

> (e) In a TMA designated as non-attainment area for ozone or carbon monoxide pursuant to the Clean Air Act, federal funds may not be programmed for any project that will result in a significant increase in the carrying capacity for SOVs (i.e., a new general purpose highway on a new location or adding general purpose lanes, with the exception of safety improvements or the elimination of bottlenecks), unless the project is addressed through a congestion management process meeting the requirements of this section.
>
> (f) In TMAs designated as non-attainment for ozone or carbon monoxide, the congestion management process shall provide an appropriate analysis of 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 (as described in paragraph (d) of this section) is proposed to be advanced with Federal funds.

All identified reasonable travel demand reduction and operational management strategies shall be incorporated into the SOV project or committed to by the State and MPO for implementation.

3.5 MONITORING PROJECTS FOR COMPLIANCE WITH THE CMP

SCAG uses the following process to monitor compliance with the CMP.

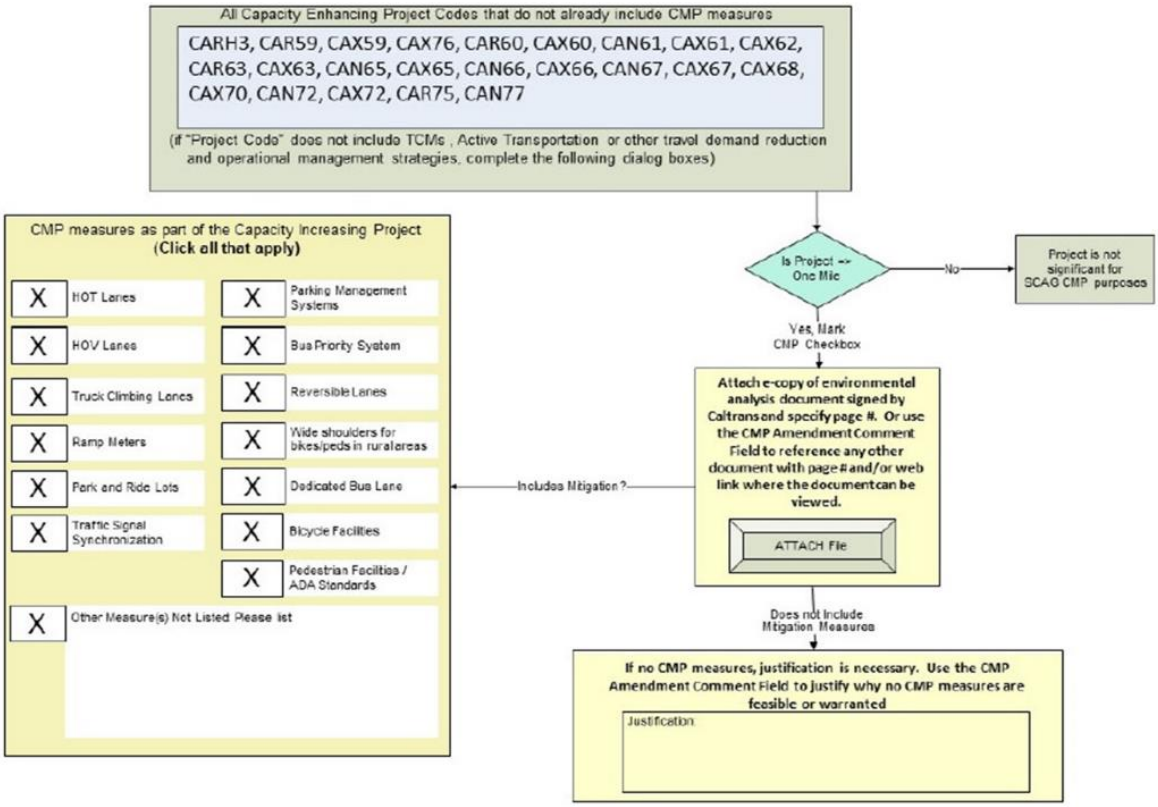
1. Identify all SOV capacity increasing projects that are fully or partially funded by federal sources.
2. Identify and determine projects that are a) safety and/or operational improvements and b) bottleneck relief projects, as these are exempted from the CMP process.
3. Identify SOV capacity increasing projects that are at least one mile in length, as this is the primary criterion that determines the need for CMP review.
4. Collect from the SOV capacity increasing project sponsors documentation upon project submittal that demonstrates that alternative Transportation Systems Management/Transportation Demand Management (TSM/TDM) strategies were considered for

the project in question during the alternatives analysis process. Acceptable documentation includes:

- Alternatives Analysis study and/or other relevant project planning study with specific reference to
- Environmental Impact Statement/Environmental Impact Report (EIS/EIR)
- Statement of overriding consideration explaining why consideration of TSM/TDM strategies were irrelevant, infeasible, or impractical (e.g., arterial widening in rural area)
- Create a list of all SOV capacity increasing projects subject to the CMP. The list will include a description of the project along with its submitted documentation with a link.

All SOV capacity increasing projects are incorporated into an appendix of the biennial FTIPs. FIGURE 2 is a flowchart showing the required information needed for projects subject to the CMP.

Figure 2. FTIP Congestion Management Process Diagram



Source: SCAG Federal Transportation Improvement Program (FTIP)

4. ANALYTICAL APPROACH

4.1 PERFORMANCE MEASURES FOR CONNECT SOCAL 2024

SCAG uses a variety of multimodal performance measures at both the regional and local levels to measure congestion, including congestion metrics specific to roadways, the regional transit/rail system, and active transportation. Connect SoCal 2024 is designed as a performance-based plan, and SCAG has developed a comprehensive set of quantitative performance measures to evaluate how well Connect SoCal 2024 meets the adopted goals and performance outcomes of the Plan. Please see TABLE 1 and the Connect SoCal 2024 Performance Monitoring Technical Report for more information.

Table 1. Connect SoCal 2024 Performance Measures

Connect SoCal Goal	Outcome	Performance Measure	Description
Mobility	Accessibility	Average Trip Distance	Average distance traveled for work & for all trips, including trip lengths 10 miles or less & 25 miles or less.
Mobility	Accessibility	Travel Mode Share	Share of total work trips & all trips by travel mode: auto, transit, non-motorized, & other.
Mobility	Accessibility	Person Hours of Delay by Facility Type	Excess travel time resulting from the difference between a reference speed & actual speed (mixed flow, HOV, & arterials).
Mobility	Accessibility	Person-Delay per Capita	Daily amount of delay experienced per capita due to traffic congestion.
Mobility	Accessibility	Truck Delay by Facility Type	Excess heavy duty truck travel time based on difference between reference speed & actual speed (highways/arterials).
Mobility	Accessibility	Travel Time Distribution by Mode	Travel time distribution by mode: single occupancy vehicle (SOV), high-occupancy vehicle (HOV), & transit.
Mobility	Accessibility	Access to Jobs	Share of regional employment centers accessible during peak travel periods. Considering auto/transit/local bus accessibility & timeframes.
Mobility	Accessibility	Average Travel Time	Average travel time (work & non-work trips) by travel mode: single occupancy vehicle (SOV), high-occupancy vehicle (HOV). walk, bike, & transit.
Mobility	Accessibility	Major Destination Accessibility	Share of major destinations accessible within 30 minutes by automobile or 45 minutes by transit.
Mobility	Transit	Transit Boardings per Capita	Number of annual transit boardings per capita.
Communities	Public Health	Physical Activity-Related Public Health Incidence & Costs	Public health incidences & costs related to lack of physical activity.

Connect SoCal Goal	Outcome	Performance Measure	Description
Communities	Public Health	Air Pollution-Related Public Health Incidence & Costs	Public health incidences & costs related to air pollution.
Communities	Public Health	Park Accessibility	Share of park acreage reachable within 30 minutes by automobile or 45 minutes by transit.
Communities	Sustainability	Percent of Trips Less than 3 Miles	Share of work & non-work trips less than 3 miles in length.
Communities	Sustainability	Share of Regional Households Located in Priority Development Areas (PDAs)	Percent of total regional households located within PDAs.
Environment	Climate Resilience	Vehicle Miles Traveled (VMT) per Capita	Daily vehicle miles traveled (VMT) per capita.
Environment	Climate Resilience	Greenhouse Gas (GHG) Emissions	Percent reduction in GHG emissions per capita (from 2005 levels).
Environment	Climate Resilience	Land Conversion to Urban Purposes	Total square miles of greenfield & rural lands converted to urban use.
Environment	Climate Resilience	Criteria Air Pollutant Emissions	ROG, CO, NOx, PM10, & PM2.5 emissions (tons per day).
Environment	Resource Efficiency	Energy Consumption	Energy (electricity, natural gas, vehicle fuel) consumption per capita.
Environment	Resource Efficiency	Water Consumption	Urban water consumption per capita.
Economy	Competitiveness	New Jobs Added Due to Improved Regional Economic Competitiveness	Number of new jobs added to the regional economy as a result of improved transportation system conditions.
Economy	Competitiveness	Transportation System Investment Benefit/Cost Ratio	Ratio of monetized user & social benefits to transportation system investment costs.

Connect SoCal Goal	Outcome	Performance Measure	Description
Economy	Jobs	New Jobs Added Due to Transportation System Investments	Number of new jobs added to regional economy directly related to plan transportation system investments.
Economy	Jobs	Share of Employment Growth Occurring in Priority Development Areas (PDAs)	Percent of total regional employment growth occurring within PDAs.

4.1.1 ROADWAYS PERFORMANCE MEASURES

The five CMA counties in the SCAG region each have a state congestion management program-defined roadway network that is monitored for Levels of Service (LOS) every two years. The roadway network includes freeways, state highways and arterials, and their volume to capacity (V/C) ratio is calculated to assign an LOS grade. The LOS is a required measure by California Government Code Section 65089.

While LOS is still used to measure performance in county CMPs, recent state legislation (SB 743) and emerging best practices have shepherded a shift towards measuring VMT – vehicle miles traveled. SB 743 required a change in CEQA transportation impact assessment methodology from a metric based on vehicle delay/level of service (LOS) to a VMT-based measure. VMT is more focused on greenhouse gas emissions and the efficient movement of people rather than on motor vehicle delay. Using the VMT metric to assess transportation impacts, it is possible that a compliant roadway might carry more people with a worse LOS, and vice versa, depending on how many people are in each vehicle. VMT does a better job indicating how efficient a roadway is, rather than simply how fast vehicles are moving. Also, regionally, the South Coast AQMD is in the process of updating its Rule 2202 employer-based worksite trip reduction regulation and is studying replacing the average vehicle ridership (AVR) statistic with a VMT criterion.

SCAG uses additional performance measures to determine congestion levels of the roadway network in its travel demand model which include:

- Average daily speed
- Average daily delay
- Average daily heavy duty truck delay
- Average person trip length

This technical report also identifies and reports on the top congested corridors in the SCAG region, including major bottleneck areas, congestion trends, and non-recurring congestion at the regional and county level.

4.1.2 TRANSIT/RAIL PERFORMANCE MEASURES

Each county examines performance measures related to transit/rail performance as well. Orange County Transportation Authority (OCTA) uses four performance indicators which include vehicle headway, to measure how often service is available to transit patrons; load factor, measuring how many standees there are on a transit vehicle; on-time performance (OTP); and service accessibility, which measures the percentage of the population that has access to their service. Metro has a "mobility index" that is a composite index of passenger throughput times speed.

For Connect SoCal 2024, SCAG's congestion performance analysis measures include mode share, average travel time, and accessibility to jobs, major destinations, and parks. SCAG also assesses miles of transit/rail facilities. More details on the Connect SoCal performance analysis and its results may be found in the Performance Monitoring Technical Report.

4.1.3 CAUSES OF CONGESTION – GENERAL

There are many causes of congestion, but paramount among them is a dependence on SOV travel in our region. Based on the most recent data available from 2019, SOV mode share is approximately 36.8

percent for all trips and 68.7 percent for work trips. The number of vehicles on our roadways and the consistent demand for their use results in congested conditions. Additional factors include the jobs/housing ratio, natural impediments such as mountains and waterways, and outdated road technology. In the SCAG region, the jobs/housing ratio is particularly an issue given the geographic extent and urban sprawl. Many residents have continued to move inland to access affordable housing, thereby adding to the total VMT generated in our region. Other causes of congestion are gaps in the regional road network and the presence of bottlenecks where roadway capacity is reduced at pinch points.

The FHWA defines four different types of congestion[1]:

- **Intensity –** The relative severity of congestion that affects travel. Intensity has traditionally been measured through indicators such as V/C ratios or LOS measures that consistently relate the different levels of congestion experienced on roadways.
- **Duration –** The amount of time the congested conditions persist before returning to an uncongested state.
- **Extent –** The number of system users or components (e.g., vehicles, pedestrians, transit routes, lane miles) affected by congestion, for example the proportion of system network components (roads, bus lines, etc.) that exceed a defined performance measure target.
- **Variability –** The changes in congestion that occur on different days or at different times of day. When congestion is highly variable due to non-recurring conditions, such as a roadway with a high number of traffic accidents causing delays, this has an impact on the reliability of the system.

4.1.4 CAUSES OF CONGESTION – SCAG REGION

AGGREGATE REGIONAL AND COUNTY TRENDS

Caltrans publishes an annual traffic congestion report called the Mobility Performance Report (MPR). Data are presented here for the Caltrans Districts 7, 8, and 12 (covering Los Angeles-Ventura, Riverside-San Bernardino, and Orange Counties, respectively) with respect to traffic congestion, in terms of vehicle hours of delay (VHD), and productivity, in terms of equivalent lost lane miles. The performance results are based on data collected by automated vehicle detector stations on the state highway system. Congestion is presented at two thresholds established by Caltrans based on engineering experience: severe congestion delay from vehicles traveling below 35 mph, and all congestion delay from vehicles traveling below 60 mph. Lost productivity represents the conversion of lost vehicle throughput, where speeds drop below 35 mph, into equivalent lost lane-miles. As described in the Mobility Planning Report, these lost lane-miles "represent a theoretical level of capacity that would be needed to achieve maximum throughput during the most congested time periods."

FIGURE 3 and TABLE 2 depict the vehicle hours of delay experienced in the SCAG region at 35 mph on an average weekday from 2005 to 2022. The graphics show that congestion declined from 2006 to 2009, reflecting the Great Recession and a region-wide decline in travel. However, yearly data shows that congestion had been increasing year over year since 2011 until the COVID-19 pandemic in 2020, at which time there was a sizeable decrease in delay, observed in all three Caltrans districts (Imperial County, which is part of Caltrans District 11 with San Diego County, is not included in this report) The years 2021 and 2022 show vehicle hours of delay increasing again. However, levels are significantly less than 2019.

Figure 3. Annual Vehicle Hours of Delay (Millions) at 35mph, SCAG Region

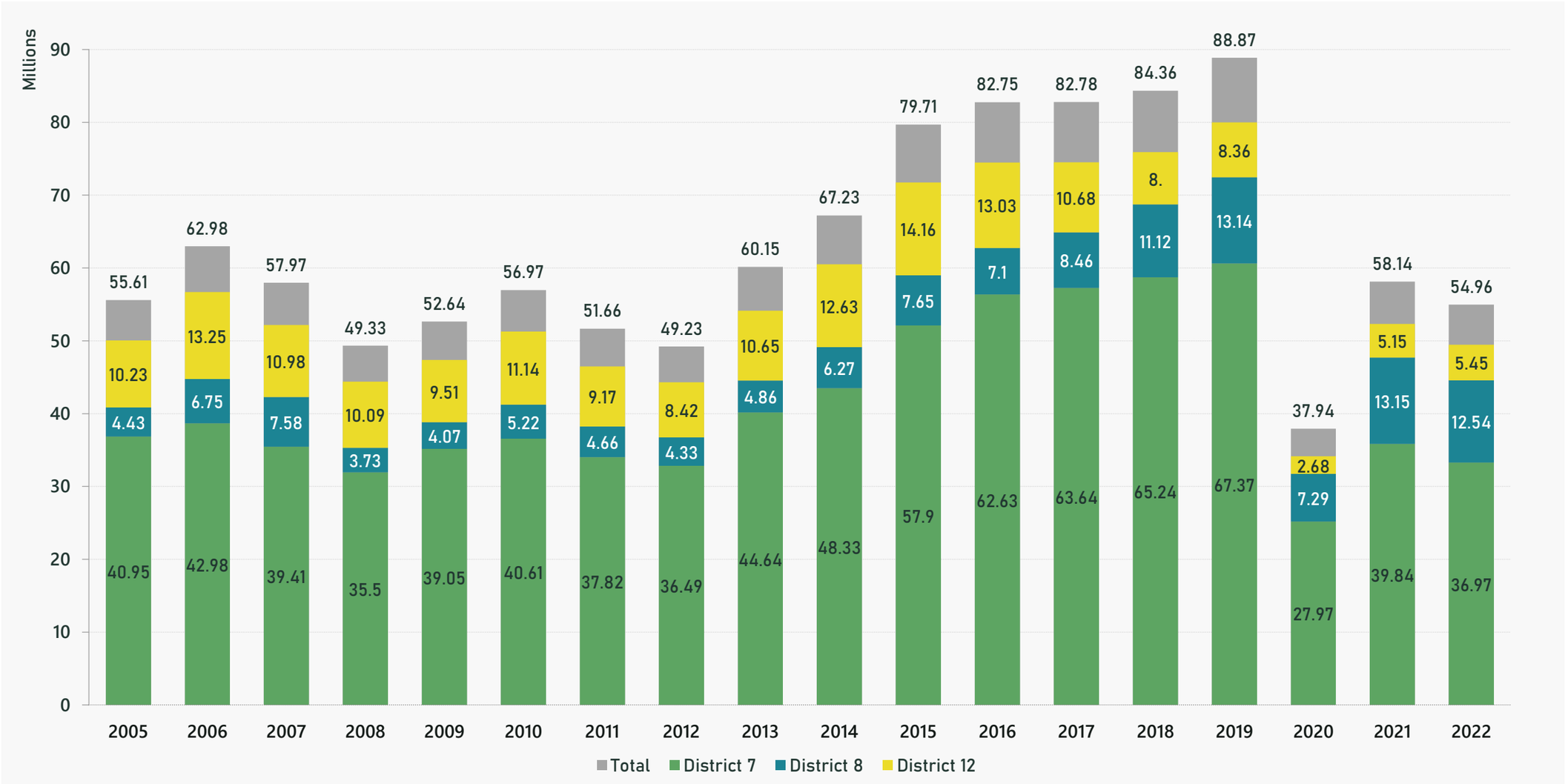
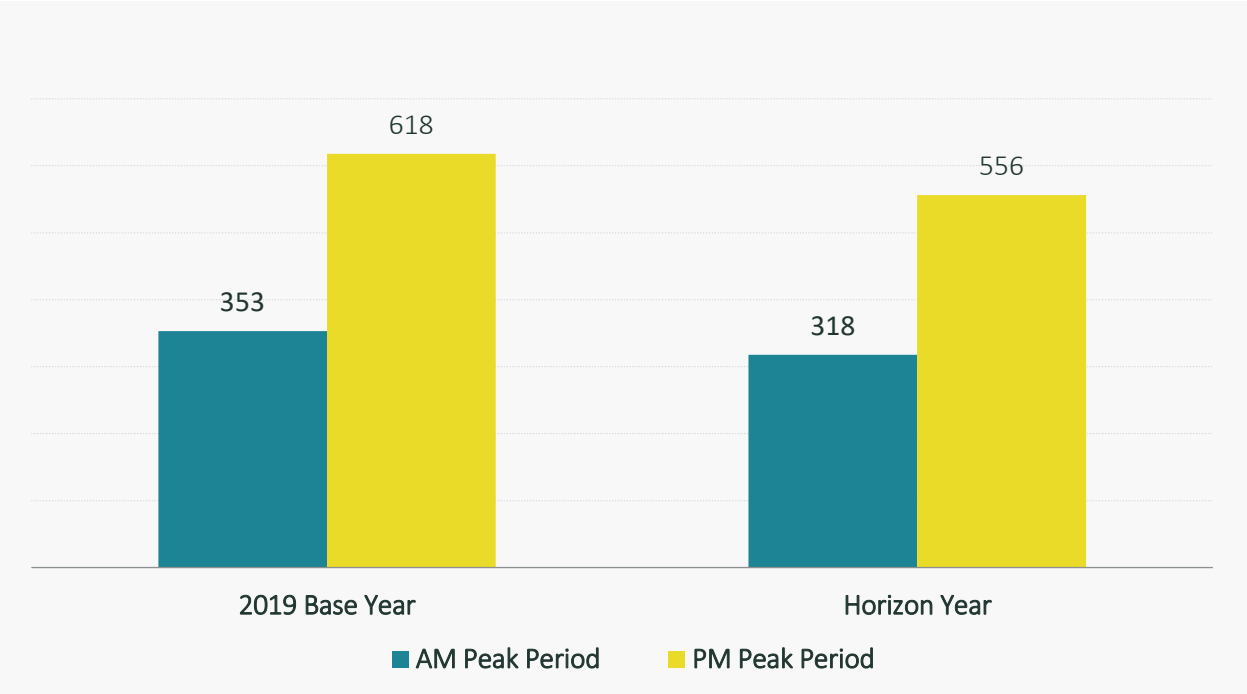


Table 2. Annual Vehicle Hours of Delay (Millions) at 35mph by Caltrans District, SCAG Region

Year	Los Angeles/ Ventura District 7	San Bernardino/ Riverside District 8	Orange District 12	Total
2005	40.95	4.43	10.23	55.61
2006	42.98	6.75	13.25	62.98
2007	39.41	7.58	10.98	57.97
2008	35.5	3.73	10.09	49.33
2009	39.05	4.07	9.51	52.64
2010	40.61	5.22	11.14	56.97
2011	37.82	4.66	9.17	51.66
2012	36.49	4.33	8.42	49.23
2013	44.64	4.86	10.65	60.15
2014	48.33	6.27	12.63	67.23
2015	57.9	7.65	14.16	79.71
2016	62.63	7.1	13.03	82.75
2017	63.64	8.46	10.68	82.78
2018	65.24	11.12	8.00	84.36
2019	67.37	13.14	8.36	88.87
2020	27.97	7.29	2.68	37.94
2021	39.84	13.15	5.15	58.14
2022	36.97	12.54	5.45	54.96

FIGURE 4 depicts lost lane-miles in the 2019 base year and the 2050 horizon year. In the 2019 base year, the SCAG region lost an equivalent of 971 lane-miles of highway capacity on an average weekday in the AM and PM peak periods due to congestion. This is very significant as it compares to 10,820 total lane miles in the SCAG region, or nine percent (excluding HOV lane miles). The 2050 Plan increases productivity by 11 percent in the AM/PM periods. The AM peak period is from 6:00 AM to 9:00 AM and the PM peak period is from 3:00 PM to 7:00 PM.

Figure 4. Weekday Average Equivalent Lost Lane-Miles



5. EXISTING CONDITIONS

5.1 MAJOR BOTTLENECKS

There are many major bottlenecks in the SCAG region that further increase congestion and delay. According to the US Department of Transportation, a bottleneck is a localized constriction of traffic flow. Specifically, it is a section of a highway that is experiencing reduced speeds and delays due to recurring or nonrecurring issues.[2] An analysis was done using Caltrans Performance Measurement System PeMS data for 2019. The analysis categorized congestion into five categories from less than or equal to 20 percent of all daily recurring congestion to greater than or equal to 80 percent of all daily recurring congestion. The top 100 locations were ranked by annual hours of vehicle delay and are illustrated in **TABLE 3** and **MAP 1**.

Most bottlenecks are active in the AM or PM peak periods, or both, and active mid-day as well. The most active time for bottlenecks is the PM peak period. Eighteen of the top 20 ranked bottlenecks in the SCAG region are located in Los Angeles County. The top ranked bottleneck is where the Hollywood Freeway (US 101) meets the Golden State Freeway (I-5) in Los Angeles. It results in just under 2 million annual hours of vehicle delay. The second ranked bottleneck is where the San Diego Freeway (I-405) intersects with the Santa Monica Freeway (I-10), and the third ranked bottleneck is where the Golden State Freeway (I-5) intersects with the Glendale Freeway (SR 2), both in Los Angeles. They represent 1.93 million and 1.56 million hours of annual vehicle delay, respectively. The top ranked (20th overall) bottleneck in Orange County is where the San Diego Freeway intersects with Brookhurst Street in Fountain Valley. The top ranked (7th overall) bottleneck in Riverside County is at the intersection of the Riverside Freeway (SR 91) and Green River Road in Corona and the top ranked (41st overall) bottleneck in San Bernardino County is at the intersection of the Ontario Freeway (I-15) and Jurupa Road in Ontario. The length of the bottleneck queues also varies, with severity and lane configuration as major factors to take into account. The bottlenecks are widespread in the SCAG region, but with an emphasis on Los Angeles County where there are more freeways and freeway lane miles. Many of the bottlenecks impact Priority Equity Communities, especially in regard to the air pollution congestion produces and its negative health effects such as higher rates of asthma and cancer. For more information on emissions impacts in Priority Equity Communities, see the SCAG Equity Analysis. Southern California also has a history of building freeways and freeway junctions through communities of color, resulting in the destruction and displacement of entire communities. A recent report from UCLA's Institute of Transportation Studies quantifies the historical impacts of freeways on communities of color in California, including two case studies in the SCAG region. Apart from the thousands of people and businesses estimated to be displaced, the construction of freeways through existing neighborhoods lowered home values, depressed relative rents, and emphasized the lack of power that communities of color had in planning decisions. (Note: there are no bottlenecks in Imperial and Ventura Counties that rank in the top 100.)

Table 3. Top 100 Bottlenecks

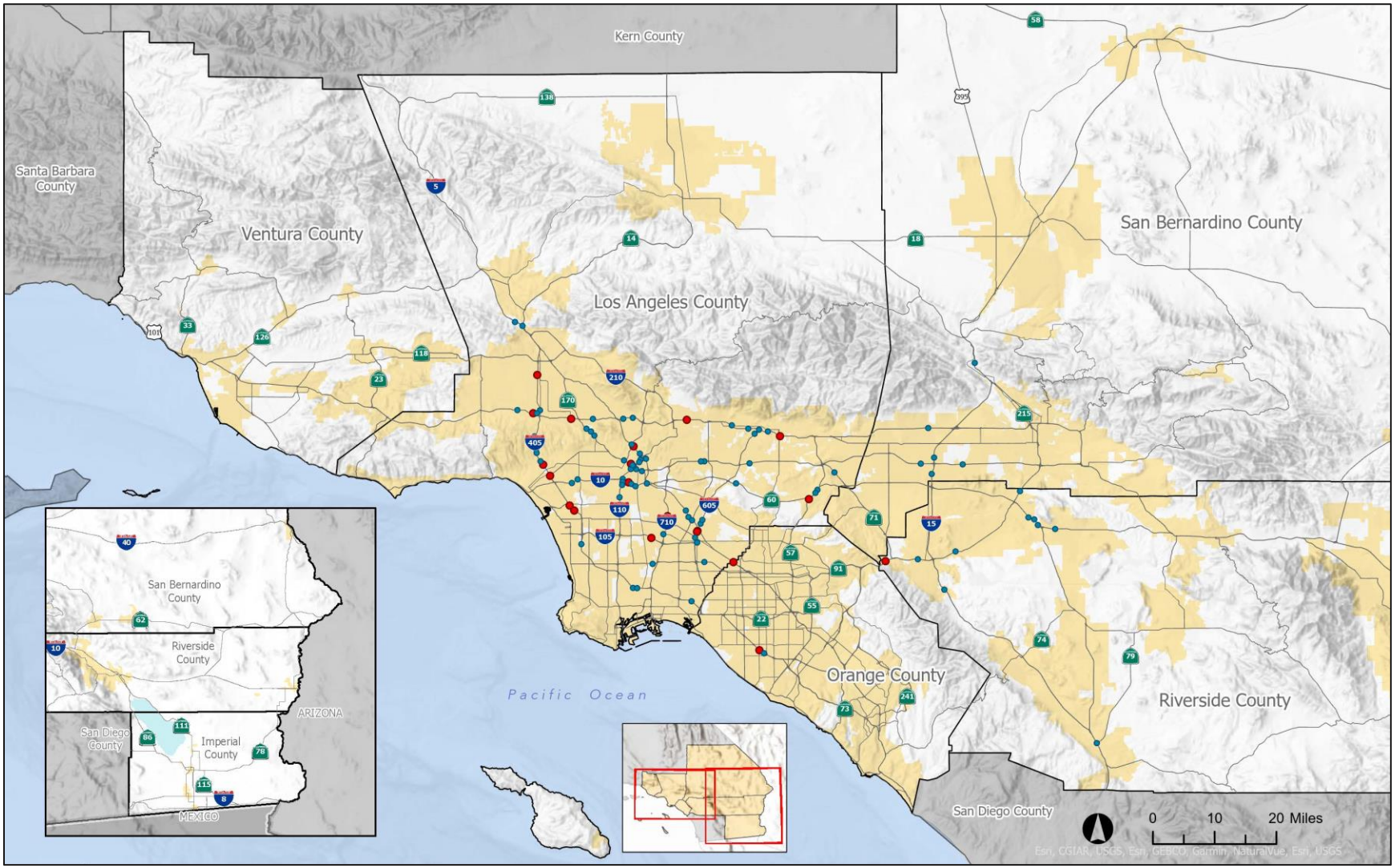
Rank	County	Route	Direction	Validated Location	City	Queue	Validated Bottleneck	Bottleneck AbsPM	Queue AbsPM	Validated Lat/Long	Total Delay	Weekday Delay	Active-AM	Active-MD	Active-PM
1	LA	101	S	I-5	Los Angeles	3.5	3.4	3.4	7.0	34.067022, -118.254556	1,980,900	68%	◔	◑	◔
2	LA	405	N	I-10/Santa Monica Blvd	Los Angeles	4.0	54.4	52.3	50.4	34.04384,-118.443848	1,932,800	82%	●	◕	○
3	LA	5	N	SR-2	Los Angeles	3.7	139.0	139.0	135.3	34.100954, -118.248419	1,560,600	84%	●	○	◑
4	LA	405	S	Howard Hughes Pkwy	Los Angeles	5.9	48.7	48.7	54.6	33.976541, -118.387273	1,456,100	95%	○	○	●
5	LA	101	S	Laurel Canyon	Los Angeles	3.1	14.1	14.1	17.2	34.154314, -118.394541	1,443,400	85%	○	◑	●
6	LA	405	N	Nordhoff St	Los Angeles	6.0	68.8	68.6	62.7	34.2392, -118.473891	1,428,300	98%	○	○	●
7	RIV	91	W	Green River Rd	Corona	4.3	38.3	38.3	42.6	33.878243, -117.658393	1,242,100	95%	●	○	○
8	LA	10	E	Los Angeles St	Los Angeles	5.7	13.6	13.6	7.9	34.031145, -118.260012	1,239,600	90%	○	○	●
9	LA	405	N	Wilshire/Sunset Blvd	Los Angeles	3.0	56.1	55.9	53.1	34.065403, -118.459976	1,192,500	93%	○	○	●
10	LA	210	W	Hill Ave	Pasadena	6.8	26.8	26.8	33.6	34.152357, -118.123714	1,121,000	90%	◑	◔	◔
11	LA	105	E	Long Beach	Lynwood	4.2	11.9	11.9	7.7	33.923331, -118.206725	1,072,800	89%	○	◔	◕
12	LA	57	N	Pathfinder	Diamond Bar	3.5	15.8	15.8	12.3	33.998678, -117.837798	886,400	94%	○	◔	◕
13	LA	605	N	Florence	Norwalk	2.2	11.4	11.4	9.2	33.936927, -118.098751	871,800	88%	◔	◔	◔
14	LA	605	S	Florence	Downey	5.6	11.2	11.2	16.8	33.935212, -118.099885	858,000	89%	○	○	◕
15	LA	101	S	Woodley	Los Angeles	3.8	19.4	19.4	23.2	34.165169, -118.483356	850,200	87%	◕	○	○
16	LA	5	S	Osmond	La Mirada	12.7	116.8	116.8	129.5	33.876316, -118.014605	839,000	98%		○	●
17	LA	210	E	Azusa	Azusa	6.3	40.2	40.2	33.9	34.120681, -117.905474	836,900	83%	○	○	●
18	LA	710	S	Florence	South Gate	4.9	14.5	14.5	19.4	33.965575, -118.168759	813,500	92%	○	○	◕
19	LA	405	S	Jefferson	Westchester	4.0	49.6	49.6	53.6	33.986242, -118.398076	799,600	67%	○	◑	◔
20	ORA	405	N	Brookhurst	Fountain Valley	3.3	13.5	13.5	10.2	33.704947, -117.953701	780,400	92%	○	○	●
21	LA	101	S	I-10	Los Angeles	2.1	1.4	1.8	3.5	34.053003, -118.228802	769,900	94%	○	○	●
22	LA	405	S	Getty - Sepulveda	Los Angeles	5.4	58.5	58.5	63.9	34.096057, -118.47685	756,900	92%	◕	◔	○
23	LA	101	N	Alvarado St/Rampart	Los Angeles	4.6	4.6	4.6	0.0	34.073801, -118.270751	735,900	80%	◕	◔	○
24	LA	210	E	Mountain	Duarte	5.6	35.4	35.4	29.8	34.135219, -117.979798	718,600	85%	○	○	●
25	RIV	15	N	Winchester Rd	Temecula	4.4	61.3	61.3	56.9	33.523991, -117.163759	693,700	89%	○	○	●
26	LA	101	N	Highland	Los Angeles	3.8	9.9	9.9	6.1	34.121951, -118.34017	678,200	99%	○	○	●
27	LA	10	E	I-110	Los Angeles	6.0	12.8	12.8	6.8	34.037923, -118.27362	633,800	85%	◑	◔	◔

Rank	County	Route	Direction	Validated Location	City	Queue	Validated Bottleneck	Bottleneck AbsPM	Queue AbsPM	Validated Lat/Long	Total Delay	Weekday Delay	Active-AM	Active-MD	Active-PM
28	LA	101	S	Barham	Los Angeles	4.2	10.7	10.7	14.9	34.129747, -118.348132	632,600	98%	●	○	○
29	LA	10	W	Robertson	Los Angeles	5.3	5.7	5.7	11.0	34.029948, -118.392928	627,300	89%	◕	◔	○
30	RIV	215	N	Central Ave	Unicorp (s/o UCR)	3.7	31.4	31.4	27.7	33.95936, -117.310123	576,400	75%	◑	◔	◔
31	LA	5	S	Paramount	Downey	6.1	125.5	125.5	131.6	33.963867, -118.11987	555,400	96%	○	○	●
32	LA	605	S	Firestone	Norwalk	6.4	10.4	10.4	16.8	33.923989, -118.104406	538,400	86%	○	○	◕
33	LA	110	S	Slauson	Los Angeles	4.4	17.8	17.8	22.2	33.987824, -118.280807	537,700	78%	○	◔	◕
34	LA	405	N	US-101/Burbank Blvd	Los Angeles	4.3	64.0	62.2	59.7	34.170877, -118.467555	527,900	90%	○	○	●
35	LA	5	N	Weldon Canyon	Unicorporated	3.5	163.2	163.2	159.7	34.341625, -118.526002	514,600	58%	○	◔	◑
36	RIV	91	W	Pierce	Riverside	1.7	48.2	48.2	49.9	33.897117, -117.494526	508,400	70%	◔	◔	◔
37	LA	405	S	I-105/Rosecrans	Hawthorne	1.7	43.3	43.3	45.0	33.911243, -118.370509	505,300	90%	○	◔	◕
38	LA	60	W	Crossroad Pkwy	Industry	2.4	13.0	13.0	15.4	34.029247, -118.008439	496,500	93%	◕	○	○
39	LA	405	S	Getty Center Dr	Los Angeles	6.5	58.0	58.0	64.5	34.088256, -118.475372	487,900	79%	◕	◔	○
40	LA	5	N	Pasadena	Los Angeles	4.8	136.6	136.6	131.8	34.076978, -118.219273	485,600	86%	○	○	◕
41	SBD	15	S	Jurupa	Ontario	1.6	107.7	107.7	109.3	34.047527, -117.550244	481,200	83%	○	◔	◑
42	LA	101	S	Broadway	Los Angeles	4.4	2.4	2.4	6.8	34.056861, -118.242427	480,800	97%	○	○	●
43	LA	210	W	Irwindale	Irwindale	5.6	38.1	38.1	43.7	34.129869, -117.933838	470,300	92%	●	○	○
44	LA	60	W	SR-57	Diamond Bar	3.4	25.1	25.1	28.5	34.016653, -117.81781	468,000	75%	◕	○	○
45	LA	110	S	Gage	Los Angeles	6.2	17.3	17.3	23.5	33.980182, -118.281036	462,000	98%	○	○	●
46	LA	10	E	Walnut Grove	Rosemead	3.8	24.8	24.8	21.0	34.071945, -118.082543	452,200	71%	○	◔	◕
47	LA	405	S	Lucerne St	Carson	2.9	33.8	33.8	36.7	33.826193, -118.24972	449,200	90%	○	○	◕
48	LA	110	N	21st St	Los Angeles	4.6	20.9	20.9	16.3	34.031804, -118.274441	438,400	90%	●	○	○
49	ORA	405	N	Euclid	Fountain Valley	2.4	12.9	12.9	10.5	33.699038, -117.94284	428,300	93%	○	○	●
50	LA	101	N	Haskell	Los Angeles	2.3	19.0	19.0	16.7	34.165132, -118.474715	426,200	86%	○	○	●
51	LA	71	N	Garey Ave	Pomona	2.9	2.3	2.3	-0.6	34.050545, -117.778066	425,900	82%	◑	○	◔
52	LA	134	E	Brand	Glendale	3.0	7.4	7.4	4.4	34.156268, -118.25012	415,800	99%	○	○	●
53	LA	110	S	Sunset	Los Angeles	3.8	23.7	23.7	27.5	34.063457, -118.247963	413,700	81%	●	○	○
54	LA	91	W	Long Beach	Compton	3.1	5.0	5.0	8.1	33.872905, -118.203748	408,800	100%	●	○	○
55	LA	10	W	La Cienega	Los Angeles	3.6	6.6	6.6	10.2	34.036959, -118.379466	398,300	85%	◕	◔	○
56	RIV	215	S	Box Springs Rd	Riverside	2.3	32.4	32.4	34.7	33.963064, -117.323788	393,500	84%	◔	◔	◑
57	LA	5	S	Lakewood	Downey	5.3	124.8	124.8	130.1	33.957561, -118.111461	391,200	61%	◔	◑	◔
58	LA	10	E	San Gabriel	Rosemead	3.5	24.4	24.4	20.9	34.07185, -118.09068	385,300	96%	○	○	●

Rank	County	Route	Direction	Validated Location	City	Queue	Validated Bottleneck	Bottleneck AbsPM	Queue AbsPM	Validated Lat/Long	Total Delay	Weekday Delay	Active-AM	Active-MD	Active-PM
59	LA	110	N	Solano Ave	Los Angeles	4.7	25.0	25.0	20.3	34.075092, -118.232059	382,900	88%	○	○	●
60	SBD	15	N	4th St	Rancho Cucamonga	1.3	110.0	110.0	108.7	34.079216, -117.544634	382,000	84%		○	●
61	LA	210	E	I-605	Irwindale	1.9	36.9	36.9	35.0	34.133397, -117.954412	372,400	85%	○	○	●
62	LA	91	W	Pioneer	Artesia	2.4	12.0	12.0	14.4	33.876553, -118.082611	366,100	84%	◔	◑	◔
63	LA	101	N	Lankershim	Los Angeles	1.5	11.4	11.4	9.9	34.135151, -118.358579	365,200	98%	○	○	●
64	LA	110	N	Stadium Way	Los Angeles	3.8	24.6	24.6	20.8	34.070398, -118.235253	364,700	96%	○	○	●
65	LA	110	S	Vernon	Los Angeles	2.7	18.8	18.8	21.5	34.002226, -118.28122	359,800	79%	○	◔	◕
66	LA	605	S	Telegraph	Santa Fe Springs	3.2	12.4	12.4	15.6	33.950974, -118.091381	349,700	89%	◕	◔	○
67	LA	110	N	Adams Ave	Los Angeles	4.9	20.5	20.5	15.6	34.026085, -118.275163	343,600	88%	◕	◔	○
68	RIV	15	S	Cajalco Rd	Corona	2.7	91.3	91.3	94.0	33.822803, -117.520623	336,600	85%	○	○	●
69	SBD	10	E	Fontana Rest	Fontana	3.3	60.6	60.6	57.3	34.066037, -117.477762	328,700	87%	○	○	●
70	LA	105	W	Wilton	Hawthorne	2.8	5.5	5.5	8.3	33.925579, -118.313116	323,300	96%	◕	◔	○
71	LA	5	S	Slauson	Commerce	6.2	126.4	126.4	132.6	33.97646, -118.125953	307,100	97%	○	○	●
72	LA	405	S	Sunset	Los Angeles	3.6	56.7	56.7	60.3	34.072134, -118.466201	306,400	87%	◑	◑	○
73	LA	5	S	SR-2	Los Angeles	1.6	139.3	139.3	140.9	34.104544, -118.252924	305,000	83%	○	◔	◑
74	LA	10	E	Francisquito Ave	Baldwin Park	1.3	31.0	31.0	29.7	34.068079, -117.976855	303,300	88%	○	○	◕
75	LA	5	S	Eighth	Los Angeles	2.0	133.1	133.1	135.1	34.029033, -118.217141	302,900	93%	◕	◔	
76	LA	10	E	San Pedro St	Los Angeles	7.5	14.1	14.1	6.6	34.028118, -118.253469	300,600	92%	○	○	●
77	LA	210	W	Huntington	Monrovia	2.4	33.0	33.0	35.4	34.141791, -118.018365	295,400	82%	◕	○	○
78	LA	405	S	Woodruff	Long Beach	2.8	25.4	25.4	28.2	33.800308, -118.112651	295,300	93%	○	○	●
79	LA	110	N	3rd St	Los Angeles	3.0	23.1	23.1	20.1	34.057029, -118.254921	293,100	70%	○	◑	◑
80	RIV	91	W	Lincoln Ave	Corona	4.2	42.6	42.6	46.8	33.881938, -117.582627	292,100	65%	●	○	○
81	LA	710	N	Imperial	Lynwood	1.7	12.1	12.1	10.4	33.93069, -118.178585	291,200	91%	◔	◔	◑
82	SBD	210	E	Milliken	Upland	5.3	60.4	60.4	55.1	34.136458, -117.558512	286,100	99%	○	○	●
83	LA	60	E	SR-57	Diamond Bar	1.3	24.7	24.7	23.4	34.010718, -117.82259	285,400	80%	○	◔	◕
84	LA	605	N	I-210	Irwindale	1.9	27.1	27.1	25.2	34.125482, -117.964907	281,200	94%	○	◔	◕
85	LA	134	E	San Fernando	Glendale	3.4	6.1	6.1	2.7	34.154438, -118.272455	279,900	99%	○	○	●
86	LA	101	N	I-110	Los Angeles	2.2	3.1	3.1	0.9	34.06459, -118.250774	279,500	52%	○	◑	◔
87	LA	14	S	Balboa	Los Angeles	5.9	0.0	0.0	5.9	34.334177, -118.508382	279,000	99%	●	○	
88	LA	134	W	Alameda	Los Angeles	3.1	1.9	1.9	5.0	34.154184, -118.343606	277,400	98%	○	○	●

Rank	County	Route	Direction	Validated Location	City	Queue	Validated Bottleneck	Bottleneck AbsPM	Queue AbsPM	Validated Lat/Long	Total Delay	Weekday Delay	Active-AM	Active-MD	Active-PM
89	LA	405	S	Skirball-Mulholland	Los Angeles	4.8	60.2	60.2	65.0	34.120212, -118.480582	273,400	72%	◕	◔	○
90	LA	105	E	Studebaker Rd/End of Freeway	Norwalk	1.6	18.1	18.1	16.5	33.914324, -118.099445	270,300	93%	◔	◔	◑
91	LA	605	S	Placita	Santa Fe Springs	2.0	13.0	13.0	15.0	33.958207, -118.087265	266,300	84%	◔	◔	◔
92	RIV	60	E	Pigeon Pass	Riverside	2.4	54.6	54.6	52.2	33.940734, -117.26129	264,300	94%	○	○	●
93	SBD	15	N	Oakie Flats	San Bernardo	3.1	126.8	126.8	123.7	34.262526, -117.449481	264,200	89%	○	○	●
94	LA	101	N	White Oak Ave	Los Angeles	3.6	21.7	21.7	18.1	34.171285, -118.520359	259,900	80%	○	◔	◕
95	SBD	10	E	Haven Ave	Ontario	2.3	54.9	54.9	52.6	34.067453, -117.575809	259,900	93%	○	◔	◕
96	LA	5	N	Riverside	Los Angeles	4.3	137.7	137.7	133.4	34.086881, -118.233611	257,800	77%	◕	◔	○
97	LA	10	E	Central Ave	Los Angeles	9.1	14.7	14.7	5.6	34.023654, -118.243938	257,300	97%	○	○	●
98	RIV	215	S	Box Springs Rd	Riverside	2.6	30.6	30.6	33.2	33.948275, -117.301644	256,200	88%	◑	◔	○
99	LA	405	S	Wilmington	Carson	3.8	33.2	33.2	37.0	33.825757, -118.24005	255,500	97%	○	○	●
100	RIV	215	S	Center St	Riverside	2.9	36.9	36.9	39.8	34.014115, -117.3435	254,200	84%	◑	◔	○

Map 1. Top 100 Bottlenecks



Source: SCAG 2022

5.2 PERFORMANCE MEASURES – METRICS AND STATISTICS

5.2.1 REGIONAL AND COUNTY CONGESTION TRENDS

Due to increased sprawl, continued dependence on single occupancy vehicles, and low unemployment in the region, congestion has continued to increase following the onset of the COVID-19 pandemic and adoption of Connect SoCal 2020. The pandemic resulted in increasing rates of work-from-home and hybrid work schedules that have altered congestion patterns. Research suggests that many telecommuters take daytime trips, resulting in different travel patterns. The traditional PM peak period is starting earlier due to these new patterns.[3] Congestion increased in all six counties of the SCAG region, resulting in lost productivity and hundreds of millions of hours of delay as **FIGURE 3** through **FIGURE 5** indicate. Los Angeles County contained the large majority of the region's congestion. The top ten bottlenecks all experienced significant increases in total annual delay, and many bottlenecks are active all day. The PM peak period has the worst congestion with recurring congestion virtually all day for many of the locations.

5.2.2 COUNTY CONGESTION MANAGEMENT PROGRAM TRENDS

Through the state Congestion Management Program, five of six counties in the SCAG region monitor a county-designated state Congestion Management Program network for LOS performance. In addition to freeways and state highways, which must be included in the network, the counties choose various arterials as part of the network. For example, OCTA includes the arterials that are part of its "Smart Street" network. The CMP biennial monitoring allows each county to track how their system and its individual components are performing against established baseline and historical standards, and how this performance changes over time. State statute requires that the LOS on the county network perform at a grade of E or better unless the baseline grade for that facility was not performing at that level.

OCTA is the latest CTC to have completed a state Congestion Management Program network analysis in 2021. Orange County's latest performance, using an average intersection capacity utilization (ICU) analysis rating, shows an improvement over their 1991 baseline. Between 1991 and 2021, the average AM peak period ICU improved from 0.67 to 0.43, a 36 percent improvement, and the average PM peak period ICU improved from 0.72 to 0.52, a 28 percent improvement.

RCTC completed its last state program analysis in December of 2011. Like OCTA, RCTC's minimum LOS standard is E. Its 2011 analysis indicated that four freeway segments (three on I-15 and one on I-215) and three arterial segments were operating at LOS F levels. All seven of these locations however had programmed projects in RCTC's Capital Improvement Program (CIP) where were expected to improve the LOS to E or better.

SBCTA completed its last CMP in 2016. This includes a novel web-based tool to allow users to monitor congestion levels on their county network. The 2016 CMP includes one freeway segment that is performing at LOS F. This segment is the northbound I-15 freeway between I-10 and Fourth Street in the City of Ontario and was at LOS C for the 2007 CMP. However, SBCTA has categorized this segment as exempt due to 1) its large volume of interregional trips (>65 percent for trucks and >40 percent for vehicles), and 2) it is impacted by Caltrans' ramp metering. In addition, this segment of I-15 is programmed for express lanes which will help manage and reduce congestion. SBCTA has performed an analysis of the 2016 CMP Roadway System with the 2007 CMP results and found that in general, the LOS has improved, especially on the freeway and highway portions.

In the late 2000s and early 2010s, LA Metro had been studying a congestion mitigation fee for possible implementation as part of their state program requirements. The potential fee would have linked the transportation/land use nexus in order to fund transportation improvements in the future. However, the Metro Board authorized its staff to pursue the CMP opt-out process in June 2018. Pursuant to California Government Code section 65088.3 (Attachment A, Govt. Code section 65000 et seq.), jurisdictions within a county may opt out of the CMP requirement without penalty, if a number of local jurisdictions representing a majority of the county's population formally adopt resolutions requesting to opt out of the program. As a result, Los Angeles County officially opted-out of the state requirements in the summer of 2019. This does not affect SCAG's state and federal congestion management responsibilities, as SCAG will continue to review and certify state Congestion Management Programs from the remaining counties in its region and will continue to perform its role in the federal CMP for all its counties including Los Angeles, as described in this technical report.

5.2.3 NON-RECURRENT AND RECURRENT CONGESTION

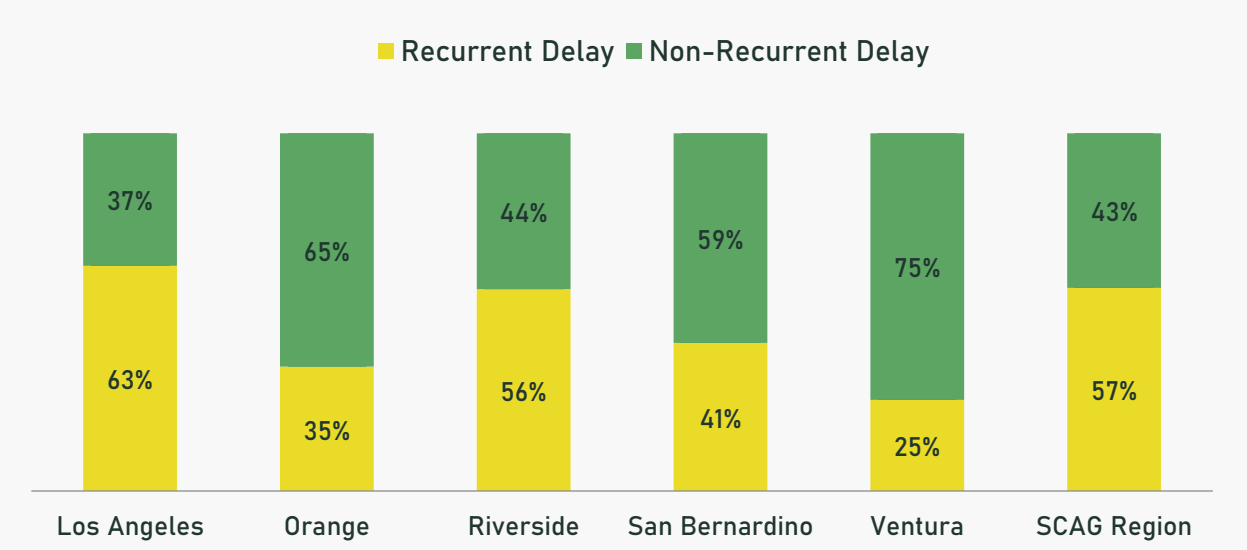
Non-recurrent delay refers to congestion caused by collisions, adverse weather, special events or other atypical incidents. PeMS data are used to assess the level of non-recurrent delay on regional freeways using the 'congestion pie' feature of PeMS. This module categorizes total reported freeway congestion into its recurrent and non-recurrent components. Non-recurrent congestion is further analyzed in PeMS by disaggregating the data into two categories: 'Accidents' and 'Miscellaneous.' Non–recurrent congestion due to collisions is estimated using the Caltrans 'Traffic Accident Surveillance and Analysis System' (TASAS). TASAS overlays highway congestion data reported by roadway sensors with collision data. If excessive congestion is reported at a time and location where TASAS indicates a collision occurred, that congestion is classified in the 'Accident' category. If roadway sensors report excessive congestion where there is no corresponding collision information, that supplemental congestion is classified in the 'Miscellaneous' category of non-recurrent congestion.

As depicted in **FIGURE 4,** about 43 percent of freeway congestion experienced in the SCAG region in 2019 (the year of the most recent data) was of the non-recurrent variety, although levels vary significantly by county. Accordingly, 57 percent of congestion in the SCAG region is recurrent. More suburban or rural areas with less overall congestion have a higher percentage of total congestion represented by non-recurring events. Ventura County, for example, was estimated to have the majority (75 percent) of its congestion caused by non-recurrent events. Non-recurrent congestion also comprises the majority of delay experienced in San Bernardino (59 percent) County. By contrast, the more intensively urbanized Los Angeles County had approximately 37 percent of its total congestion represented by non-recurring incidents.

Non-recurrent delay may be mitigated or reduced by improving highway incident management strategies. Other uses of intelligent transportation technologies, such as traffic signal coordination and the provision of real-time traffic information allow travelers to make better informed decisions regarding the availability of transportation alternatives, including transit. Primary strategies for ameliorating recurrent congestion focus on reducing dependency on single occupancy vehicle travel and on improving the coordination of regional land use and transportation planning efforts. Enhanced coordination of local and regional land use planning and decision-making with transportation system planning will provide the foundation for a more efficient and sustainable urban living and commuting environment.

Recurrent congestion refers to typical levels of delay experienced on a daily basis as a result of an excessive number of vehicles being on the road and traveling in the same direction at the same time. Fifty-seven percent of congestion in the SCAG region is recurrent. Los Angeles County has the greatest ratio of recurrent to non-current congestion in the region (63 percent compared to 37 percent), followed by Riverside County (56 percent compared to 44 percent). Ventura County has the least recurrent congestion at 25 percent.

Figure 5. Recurrent vs. Non-Recurrent Congestion



6. STRATEGIES

6.1 TRANSPORTATION SYSTEMS MANAGEMENT, ITS, CONNECTED AND AUTOMATED VEHICLES

6.1.1 TSM

Transportation Systems Management (TSM) employs a series of techniques designed to maximize the capacity and efficiency of the existing transportation system via Intelligent Transportation Systems (ITS) and Transportation Demand Management (TDM), and also to reduce dependence on single-occupancy vehicle (SOV) travel. The common goals of TSM are to reduce traffic congestion, improve air quality, and reduce or eliminate the need to construct new and expensive transportation infrastructure. As SCAG implements and evaluates TSM, ITS, and TDM strategies in the region, it places particular emphasis on Priority Equity Communities. The following sections describe TSM in the SCAG region, including ITS and TDM elements.

6.1.2 CORRIDOR SYSTEM MANAGEMENT PLANS

In 2006, California initiated the Corridor Mobility Improvement Account (CMIA) to improve the state highway system. CMIA program guidelines require the development of Corridor System Management Plans (CSMPs) for those projects receiving CMIA funding, to ensure that mobility improvements are maintained over time.

CSMPs provide a framework for long-term corridor management, with a focus on operational improvements. The intention of the CSMP effort is to continually monitor system performance and identify system improvements that are lower-cost, relatively quick to implement, and less capital-intensive than major corridor widening and expansion projects.

In the SCAG region, CSMPs were initially developed by Caltrans for I-5 (two segments), I-210 and I-405 in Los Angeles County; I-5, SR-57, SR-91, and SR-22/I-405/I-605 in Orange County; I-15, SR-91 and I-215 in Riverside County; I-15, I-10 and I-215 in San Bernardino County; and US-101 in Ventura County . SCAG contributed funding towards the I-405 CSMP in Los Angeles County, as well as towards the I-210 CSMP undertaken as part of the Governor's Go California initiative.

The CSMP development efforts began with a comprehensive assessment of corridor performance and the identification of congestion points called bottlenecks. This information was shared and verified with the stakeholders along the corridors. To address the bottlenecks, operational and minor capacity improvement projects were developed with input from stakeholders. These proposed improvements were analyzed using microsimulation models that were created specifically for the corridors. The potential improvements include ITS technologies, ramp metering, auxiliary lanes, ramp and interchange improvements, and incident management.

Most recently, the California Transportation Commission (CTC) established the 2022 Solutions for Congested Corridors Program as a two-year, $499,664,000 program for fiscal years 2023-24 and 2024-25. CTC staff recommended funding 10 projects for a total of $532,812,000 in the 2022 Solutions for Congested Corridors Program. The recommended program exceeds the identified capacity by $33,148,000 and will be supported by future Solutions for Congested Corridors Program project cost savings,

consistent with the Solutions for Congested Corridors Program Guidelines. Combined, the total project cost is more than $3.2 billion. For the SCAG region, these included the I-405 Corridor Community Bus Service Improvement Plan, the City of Inglewood Mobility Congestion Relief Program for I-105 and I-405, and the L.A. Metro Light Rail CORE Capacity and System Integration Project for those two freeway corridors as well.

Including improvements proposed in the CSMPs, Connect SoCal 2024 includes $11.9 billion for TSM improvements, including extensive advanced ramp metering, enhanced incident management, bottleneck removal to improve flow (e.g., auxiliary lanes), the expansion of the integration of our traffic signal synchronization network, and data collection to monitor system performance.

6.1.2 SYSTEM MANAGEMENT INITIATIVES

Caltrans, SCAG, and county partners have worked together to improve the efficiency of our highways and arterials. Initiatives related to maximizing the productivity of our roadways include:

- In southern Los Angeles County, SCAG completed a Caltrans-funded Corridor Sustainability Study on the multimodal performance of Interstate 105. This went beyond a typical freeway study to examine the surrounding corridor from a multimodal perspective, in an effort to improve overall mobility and safety. It incorporated complete streets concepts, transit alternatives, active transportation, managed lanes, arterial street improvements and advanced operational strategies.
- In Orange County, Caltrans completed the Corridor System Management Plans (CSMPs) which identify operational strategies to improve productivity on highway corridors. CSMPs were completed for State Route 55 and Interstate 5 in Orange County.
- In Los Angeles, Caltrans, in coordination with Los Angeles Metro and various cities have embarked on the first Integrated Corridor Management project on Interstate 210. This project aims to minimize congestion due to accidents and is referred to as the Connected Corridors initiative. Over the next 10 years, Caltrans plans to implement similar projects on 25 additional congested corridors statewide.
- Arterial Signal Synchronization projects have been completed on various arterials through the SCAG region to optimize traffic flow.

Various efforts have been completed to inform the traveling public of expected travel times to various destinations and in some cases provide travel time comparisons with transit.

6.1.3 INTELLIGENT TRANSPORTATION SYSTEMS

Intelligent Transportation Systems (ITS) make use of advanced detection, communications, and computing technology to improve the safety and efficiency of our surface transportation network. ITS is a program of technology applications and integration that allows system operators and users to better manage and optimize the use of transportation system capacity. ITS allows for the use of information technologies to collect data about the status of our highways, traffic signals, transit vehicles, freight vehicles, passenger trains and shared-ride vehicles and integrates that data in ways that affect and improve the efficiency of the system. Connect SoCal is consistent, to the maximum extent practicable, with the development of the regional ITS architecture (23 CFR 450.306(g)).

ITS IN THE SCAG REGION

ITS is not new to the SCAG region. Systems like the City of Los Angeles Automated Traffic Surveillance and Control (ATSAC) computer-based signal system have been in place since they were first installed around the LA Coliseum for the 1984 Olympics. ATSAC assists in optimizing signal timing to accommodate varying traffic demands throughout the day. Metro implemented its first Metro Rapid lines in 2000 that use Transit Signal Priority (TSP) technology in the City of Los Angeles and other areas in Los Angeles County. These technologies have advanced to provide Automatic Vehicle Location (AVL) services for dispatching and operations management of public transit buses, taxicabs, Uber, Lyft and many other transportation systems. They also now provide very accurate traffic speed and incident information for travel time and routing options, and provide transit and shared-ride users accurate, real-time arrival and departure information. In addition, the four Caltrans Districts (7, 8, 11, and 12) and most medium to large sized jurisdictions have Traffic Management Centers (TMCs) to monitor their traffic signal systems and ITS devices, and to manage natural and man-made disasters if that need were to arise.

Several examples of ITS exist in the SCAG region, all of which are run by state or local agencies, such as transit agencies, counties, municipalities, and Caltrans. SCAG developed a Regional ITS Architecture in 2005, which was updated in 2019. Some examples of ITS in the SCAG region are:

- Changeable message (amber) signs
- Freeway ramp meters
- Transit signal priority
- Positive train control – GPS-enabled safety braking
- Goods movement, airport and seaport technology

A more exhaustive list of ITS examples in the SCAG region can be found in county ITS Architectures. For example, Los Angeles County's ITS Architecture, named "Connect-IT" has been updated and posted on a website for easy access. It is SCAG's role to not only coordinate, but also study and report upon these local and state activities to guide other agencies in making their ITS activities more effective and increase cooperation between cities and counties. Connect SoCal 2024 is consistent, to the maximum extent practicable, with the development of the regional ITS architecture." (23 CFR section 450.306(g))

SCAG'S ROLE

SCAG has a critical role in the development and management of ITS in the region. As the MPO, SCAG is charged with developing and maintaining the Southern California Regional ITS Architecture. This architecture is the regional planning tool for ensuring a cooperative process to prioritize and deploy ITS technologies and for identifying critical data connections between institutional stakeholders. This architecture assists the region in deploying ITS systems that are truly integrated and able to share information among many agencies in consistent and compatible formats to achieve improved safety and efficiency of transportation operations. SCAG works closely with the CTCs, local governments, and Caltrans Districts to update and maintain the regional architecture, and assure the use of required systems, engineering requirements, and applicable standards, which is required when federal funds are used on ITS projects.

As noted earlier, in 2019, SCAG completed an update of its multi-county Regional ITS Architecture. It is the product of coordination between major stakeholders in the region, including all six counties. It incorporates recent updates to the National ITS Architecture, which is now an integrated framework called

the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) and incorporates the previously separate Connected Vehicle Reference Implementation Architecture. The SCAG update effort took an exhaustive account of our current ITS security assets, as well as needs, challenges, opportunities and plans for the future of ITS security in the region.

At the same time, Metro debuted its update to the Los Angeles County ITS Architecture, called "Connect-IT," with an accompanying website that identifies all ITS projects in the county. Available on the website for all residents, local governments and other stakeholders to access are a report that takes a full view of the county's ITS architecture, a database that details the interconnectivity of the ITS elements and data flows, and an online search portal that serves as a way for anyone to access the basic elements of the ITS architecture and its interconnectivity.

ARTERIAL, HIGHWAY, FREEWAY, ACTIVE TRANSPORTATION ITS STRATEGIES

System Management - System Management is a multi-pronged approach to addressing congestion that includes maintaining existing infrastructure, investing in and encouraging the use of alternate modes such as transit and rail, and Transportation Management Systems (TMS) and strategies. System management aims to restore lost capacity by adopting operational improvement investments that control highway infrastructure to reduce bottlenecks.

Transportation Management Systems (TMS) - TMS strategies are essential for improved operations and include traffic control, traveler information, and incident management.

- **Ramp metering** is a signal control traffic strategy for managing traffic flow on freeways by regulating the entering of the freeway or moving from one freeway to another through the use of control devices on entrance ramps or freeway connectors.

- **Adaptive ramp metering** is a traffic response type of ramp metering that seeks to optimize a multiple-ramp section of a highway, often with the efficient management of flow through a bottleneck as the ultimate goal. In a coordinated metering plan, the metering rates of a ramp are determined based on the prevailing traffic conditions of an extended section of roadway.

- **Advanced Traffic Management systems** are operational improvement strategies with business processes that rely heavily on technology to manage growing congestion. These processes include traffic control, traveler information, and incident management.

- **Variable Speed Limits** are speed limits that change using electronic signs based on road, traffic, and weather conditions intended to reduce secondary collisions.

Integrated Corridor Management (ICM) - ICM is the integration and operational coordination of multiple transportation networks and cross-network connections comprising a corridor and the institutional coordination of those agencies and entities responsible for corridor mobility. It enables agencies to see the overall impact of multimodal transportation network management decisions and to optimize the movement of people and goods within the corridor instead of just on individual networks.

Active Traffic Management (ATM) is a congestion management approach that dynamically manages recurrent and non-recurrent congestion based on prevailing traffic conditions. This congestion management approach consists of a combination of operational strategies that, when implemented in

concert, fully optimize the existing infrastructure and provide measurable benefits to the transportation network and the motoring public. These strategies include speed harmonization, temporary shoulder use, junction control, and dynamic signing and rerouting.

Arterial Management Systems – Arterial Management Systems manage traffic along arterial roadways, employing traffic detectors, traffic signals, and various means of communicating information to travelers. These systems make use of information collected by traffic surveillance devices to smooth the flow of traffic along travel corridors.

Advanced Signal Actuation strategies include coordinated signal operations across neighboring jurisdictions with freeway ramp meters, as well as centralized control of traffic signals.

Coordinated Signal Timing/Signal Synchronization is a traffic signal operations strategy that promotes the smooth flow of traffic along an arterial to minimize stops, avoid congestion, and minimize fuel consumption and air quality impacts resulting from the acceleration and idling of vehicles. This is done by calculating the arrival time for a group of vehicles at each intersection traveling at a specified speed, and then the traffic signals are strategically timed to turn green just as the group of vehicles arrives at each intersection. In order for the traffic signals to be synchronized, a group of signals must all be set to run on the same cycle length.

Traffic Signal Priority and Preemption are strategies of giving special signal timing treatment to transit vehicles or emergency vehicles at signalized intersections. For signal preemption, normal operation of traffic lights is preempted green to allow emergency vehicles to help reduce response times and enhance safety. For signal priority, transit vehicles are allowed priority access through intersections or at crossings to prevent collisions and increase passenger throughput.

Central Traffic Control Systems are centralized adaptive traffic signal control systems used by most counties and many cities in the SCAG region, including the City of Los Angeles Automated Traffic Surveillance and Control (ATSAC) system. These systems provide real-time monitoring and adjustment of signal timing.

Incident Management Systems – Incident Management Systems are a combination of policies and strategies that effectively coordinate the available resources to reduce incident durations. Incident management strategies include enhanced incident management systems that entail upgrading or enhancing the current incident management system to include deployment of ITS field devices, central control/communications software, communications medium (e.g., fiber optics), advanced traveler information systems, and/or freeway service patrols to reduce time for incident detection, verification response, and clearance times.

Traveler Information Systems – Traveler Information Systems provide travelers with information in two categories: pre-trip and enroute using existing and evolving technologies, such as changeable message signs, weather detection/warning, information kiosks, highway advisory radio, etc. Advanced Traveler Information Systems (ATIS) include traveler information dispensed through 511 and other mobile systems that empower travelers to manage their trips in the most efficient manner.

Regional Integration of Intelligent Transportation Systems (RIITS) – RIITS compiles data from ITS systems throughout Southern California to produce data on multi-modal transportation operations across boundaries, agencies, and private partners. This supplemental data is sometimes known as a "system of

systems" because it combines other regional systems. Some of the systems that comprise RIITS are ports, commercial vehicles, freeway operations, transit, airports, and active transportation. The information can be tailored to virtually any consumer or agency's need. It is an important component of the panoply of data which agencies in the region may access.

Bicycle and Pedestrian ITS Technology - Bicycle and pedestrian detection technology have been growing in popularity throughout the SCAG region with the goal to protect vulnerable road users (VRUs) and further Vision Zero and Zero Deaths goals of reaching a future year when there will be no traffic-related fatalities. While walking and bicycling are important modes for short trips in the region, incidences of pedestrian and bicycle injuries and fatalities are on the rise, nationally and in the region. ITS offers innovative solutions to protect vulnerable road users and make the system safer for all.

Video detection is used to detect approaching bicycles and pedestrians, typically through cameras mounted on traffic signal mast arms. Newer smart cameras use Artificial Intelligence (AI)-based models, which can differentiate approaching bicycles and pedestrians from vehicles. While loop detection is an older and less advanced form of detection, it is often used for bicycle detection as a more cost-effective approach and often has less of a learning curve compared to video detection systems. In loop detectors an electric current is disrupted when a bicycle passes over the pavement, indicating the presence of a bicycle at the intersection. This generates an output to the controller to extend the green time for bicyclists.

Pedestrian detection technology such as leading pedestrian intervals (LPIs) increase safety and comfort for pedestrians, allowing them to enter the crosswalk without conflicting vehicle movement. This added pedestrian time allows for increased visibility of the pedestrians crossing the intersection and reduces conflict points. In 2022, Governor Newsom signed Assembly Bill 2264 (Bloom) into law, which requires local jurisdictions to incorporate LPI into traffic-actuated signals. Local jurisdictions must adjust the red/green cycle to include a "walk" signal lasting three to seven seconds that begins before the signal turns green for vehicular traffic. The goal is to give pedestrians a head start by allowing them to begin crossing the street while all vehicle approaches are stopped.

A Pedestrian Hybrid Beacon (PHB) or HAWK beacon increases pedestrian safety by alerting oncoming traffic of pedestrians crossing at midblock locations. These beacons start flashing when a pedestrian pushes the call button, change to red once the pedestrian is crossing the roadway, and turns off when the pedestrian finishes crossing the roadway. These technologies along with planned innovations in ITS technologies can enhance safety and comfort for vulnerable road users across the SCAG region.

RAIL ITS STRATEGIES

Positive Train Control (PTC) – PTC is a set of highly advanced technologies designed to automatically stop a train before certain types of accidents occur. Specifically, PTC, as mandated by Congress in the Rail Safety Improvement Act of 2008 (RSIA), must prevent train-to-train collisions, derailments caused by excessive speed, unauthorized incursions by trains onto sections of track where maintenance activities are taking place, and movement of a train through a track switch left in the wrong position. PTC will not prevent accidents caused because of track or equipment failure, improper vehicular movement through a grade crossing, trespassing on railroad tracks, and some types of train operator error.

PTC is a sophisticated, predictive system that works to prevent rail accidents. The technology must account for a number of factors to measure the appropriate train stopping distance, including train

information (weight, length), track composition (curvature, terrain), train speed and train authority (authorization to move across a stretch of track). There are three main elements of a PTC system, which are integrated by a wireless communications system:

- **Onboard or Locomotive System –** This system monitors the train's position and speed and activates braking as necessary to enforce speed restrictions and unauthorized train movement into new sections of track.

- **Wayside System –** The wayside system monitors railroad track signals, switches and track circuits to communicate authorization for movement to the locomotive.

- **Back Office Server (BOS) –** The BOS is the storehouse for all information related to the rail network and trains operating across it — speed limits, track composition, speed of individual locomotives, train composition, etc. — and transmits the authorization for individual trains to move into new segments of track.[4]

In the SCAG region, Metrolink has fully implemented its PTC system on all seven of its lines. As Metrolink operates on the LOSSAN corridor and freight-owned railroad, the Amtrak Pacific Surfliner, its long-distance services (e.g., Southwest Chief, Coast Starlight and Sunset Limited) and Union Pacific Railroad and Burlington Northern Santa Fe Railway are also under PTC protection.

TRANSIT ITS STRATEGIES

Automatic Vehicle Location (AVL) – AVL systems detect bus locations, direction, speed, and arrival and departure information. AVL systems enable:

- The monitoring of bus performance to increase operational efficiency,
- Improved safety and security, and
- Enhanced customer information such as real-time arrival and departure information and trip planning that increase ridership and customer satisfaction.

AVL systems are often used in conjunction with TSP systems to improve running times and reduce delays to reduce operational costs and inefficiencies and are a primary component of BRT and BRT Light systems.

Transit Signal Priority (TSP) – TSP gives transit vehicles signal priority to improve passenger throughput and bus speed. These are either hard-wired loop detection systems or wireless systems. Most commonly, the green phase is extended to allow a transit vehicle through the intersection.

Advanced Passenger Counting Systems (APCs) – These systems automatically count boarding and alighting passengers. The boardings are acquired through the fare payment transactions or with APCs, while the alightings must be acquired through APCs. APCs allow for a total population of boardings and alightings to be recorded by a transit operator, resulting in optimal route scheduling and planning.

Smart Cards/Electronic Fare Systems – Smart card systems speed boarding, reduce stop dwell time and reduce fraud and fare evasion. They also improve in origin/destination information for optimal planning and scheduling. Smart cards may also have a cash purse that can be used for non-transit, retail transactions.

Traveler Information Systems - Traveler Information Systems include trip planning software, and real-time arrival and departure information for the transit customer.

Mobility as a Service (MaaS) - MaaS integrates transportation services into a single mobility platform that provides competitive alternatives over private vehicles, to promote universal basic mobility, encourage mode shift, and foster sustainable travel choices. MaaS facilitates data standardization and policies that support secured data sharing by building on existing standards and principles including General Transit Feed Specification (GTFS), General Bikeshare Feed Specification (GBFS), mobility data specification and the mobility data interoperability principles.

CONNECTED AND AUTOMATED VEHICLES

Connected and automated vehicle technologies involve less driver input, and, in the future, completely driverless vehicles will have the potential to reduce congestion through better optimization of transportation facility supply by enabling more vehicles to use existing infrastructure. This will also have the potential to improve safety, as most collisions are due to human error. Some connected and automated vehicle technologies are already available, but these are only a fraction of what will be available in the future. Automated vehicle technology includes the ability to rely on digital maps and on-board sensing to operate with minimal or without any driver input, and connected vehicle operation is where vehicles communicate with each other and roadway infrastructure such as traffic signals and roadway sensors.

Connected vehicles are vehicles that use communication technologies to communicate with the driver, other vehicles (vehicle-to-vehicle), roadside infrastructure (vehicle-to-infrastructure), and the Cloud. Connected and automated vehicles improve vehicle efficiency, commute times and safety. The U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) has defined vehicle automation into five levels:

- **No-Automation (Level 0) -** The driver is in complete and sole control of the primary vehicle controls – brake, steering, throttle, and motive power – at all times.
- **Driver Assistance (Level 1) -** Automation at this level involves one or more specific control functions. Examples include electronic stability control or pre-charged brakes, where the vehicle automatically assists with braking to enable the driver to regain control of the vehicle or stop faster than possible by acting alone.
- **Partial Automation (Level 2) -** This level involves automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions. An example of combined functions enabling a Level 2 system is adaptive cruise control in combination with lane centering.
- **Conditional Automation (Level 3) -** Vehicles at this level of automation enable the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control but with sufficiently comfortable transition time.

- **High Automation (Level 4) -** The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input but is not expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles. Vehicles with Level 4 automation may also be referred to autonomous vehicles.

- **Full Automation (Level 5) –** The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

In the SCAG region, in February 2023, Waymo announced plans to begin testing driverless autonomous vehicles in Los Angeles. Waymo is one of four entities authorized by the California Department of Motor Vehicles to deploy AVs. The AV deployment permit that the DMV issues to entities is the most stringent of the three available AV permits. The three permit types are: testing with a driver, driverless testing, and deployment. As the DMV begins to issue more permits to test AVs, topics regarding safety and public perception will likely continue to be important issues within discussions.

ITS EXISTING SYSTEM PERFORMANCE AND EXAMPLES

Arterials, Highways and Freeways

The Southern California freeway system has an extensive ITS network that covers most of the urbanized portion of our region. Loop detectors in the pavement and video cameras provide information on speed and volume and identify congestion and incidents which are fed to Caltrans/California Highway Patrol (CHP) TMCs. The TMCs are staffed 24/7 by CHP and Caltrans personnel, and monitor and respond to changes in traffic conditions, including both planned events and emergencies. Information is conveyed to the public via radio, the Internet, and through changeable message signs located throughout the freeway system. These capabilities allow Caltrans to respond quickly to incidents and allow the public to adjust their travel plans. In addition to these "hard-wired" systems, freeway, highway and arterial speeds and incidents are provided by cell phone providers and companies such as Google.

One specific example of a freeway ITS project is the Interstate 105 (I-105) Integrated Corridor Management (ICM) project in Los Angeles County, which consists of enhancing the I-105 corridor between Sepulveda Blvd to I-110 which will mitigate the anticipated traffic demand by implementing ICM strategies. This corridor is a highly travelled corridor in the area and is an essential component of the regional transportation network. Enhancements will allow for efficient movement of people and goods in the area. Traffic Signal Synchronization technology will reduce idle time at traffic signals for a series of intersections, reducing the number of stops at intersections. This is significant in reducing incident response times and reducing congestion on incident response routes. Evacuation Flush routes will be used in case of one or more incidents in the surrounding areas causing a large influx of drivers to evacuate the area using major routes. Vehicles will be diverted to adjacent routes which have the capacity to handle large traffic volumes.

Arterial ITS networks are in place throughout the SCAG region as well. Local arterial systems include advanced signal synchronization capabilities to increase vehicular throughput which also have the ability to detect and respond to changes in traffic volume or direction of travel and manage incidents. Like the freeway network, these systems include loop and video detection and also rely on wireless data such as that provided by Google.

A specific example of a roadway ITS project is Orange County's Measure M2 Regional Traffic Signal Synchronization Program (RTSSP), also known as Project P, which provides funding and assistance to implement multi-agency signal synchronization. The target of the program is to regularly coordinate 2,000 signals along 750 miles of roadway as the basis for synchronized operation across Orange County. To date, OCTA and local agencies have synchronized more than 3,400 intersections along more than 886 miles of streets (98 completed projects). The OCTA Board of Directors, through a competitive process, have approved 12 rounds of M2 funding for Project P. On May 9, 2022, the Board awarded approximately $16.2 million dollars to five projects as part of the 2022 Call for Projects Regional Traffic Signal Synchronization Program (RTSSP). To date, OCTA has funded more than $157 million (including $25.5 million in external funding) to 128 projects.

Further inland, the Coachella Valley Association of Governments (CVAG) is implementing the Signal Synchronization Project in Riverside County as a regional ITS project. CVAG is engaging several local partners to focus on enhancing traffic management and operations in the Coachella Valley. Improvements include installing fiber optic broadband technology, upgrading traffic signal controllers, and installing sensors and cameras to capture real-time data. These connections will continue to grow the regional network allowing for future integration of ITS technologies such as Integrated Corridor Management (ICM) and connected and automated vehicle integration.

Finally, San Bernardino County has developed a Smart City Master Plan, which consists of implementing smart mobility solutions to enhance efficiency and sustainability in the region. Traffic Signal Synchronization technology will reduce idle time at traffic signals by syncing the green times for a series of intersections by corridor. This increases throughput at the intersection and reduces emissions through unnecessary stopping.

Transit

Most medium to large scale fixed-route and Dial-a-Ride operators have implemented four of the five transit ITS components, with the exception of TSP. TSP, however, was an integral part of LA Metro's Rapid program, which at one time had 24 routes. (Note: Metro's NextGen restructuring eliminated all but two of the Rapid lines in favor of more frequent local service.) Santa Monica's Big Blue Bus, Culver City Bus and Torrance Transit have Rapid or local lines that employ TSP as well. The Orange County Transportation Authority and Pasadena Transit have TSP in development for local lines. These TSP systems are a combination of hard-wired loop technology as well as wireless technology.

Metro has also implemented smart card technology through its "TAP Card" system. This includes most of the large municipal bus operators (Munis) in LA County that receive federal funding.
The region also has 511 traveler information systems in place (similar in concept to 911) administered by the CTCs which allow for a one-stop multi-media contact point for all traveler information services. The 511 system is part of a national initiative to create a national system of traveler information services.

The Imperial County Transportation Commission (ICTC) is implementing the Transit Technology Project, which consists of a regional bus stop inventory and proposed technology enhancements for bus vehicles in Imperial County. Automated Vehicle Location (AVL) systems which utilize global positioning system (GPS) to track real-time vehicle locations is recommended. Real-time arrival information for riders can be presented through various mechanisms including information kiosks at strategic stops or through mobile application development.

Rail

The Southern California Regional Rail Authority (SCRRA) implemented Positive Train Control (PTC) for its entire system in 2017—the first commuter railroad in the nation to do so. The two large freight companies in our region, Burlington Northern Santa Fe Railway (BNSF) and Union Pacific Railroad (UP), have also implemented it.

There also are existing programs between Los Angeles and our region's railroads (SCRRA, UP, and BNSF) that implemented an interface standard between the rail warning circuit controller and traffic signal controller (this interface standard is known as IEEE 1570-2002) for the purpose of establishing a "supervised communication circuit." This standard has been promulgated by California Public Utilities Commission (CPUC) and is now reflected in both the Manual on Uniform Traffic Control Devices (MUTCD) and American Railway Engineering and Maintenance-of-Way Association (AREMA).

An extended application of this standard involves the application of Advance Preemption, which allows the traffic signal to complete the pedestrian timing for conflicting crosswalks prior to trains arriving at the rail crossing. This extension, however, requires the railroad circuitry be designed in such a way, or be modified. This extended application is now common for active signalized intersections near rail crossings, including light-rail.

ITS technologies are not a separate transportation mode, but they are a means of assuring that our existing transportation system is being managed and operated at maximum effectiveness to increase capacity. An example is ramp metering of freeways, which is designed to assess the optimal flow rate (highest achievable capacity) of the facility and adjusts freeway on-ramp metering to administer incoming vehicles in such a way that minimizes flow disruption to the freeway facility. Today, sub-optimal flow on our freeways and arterials, so-called "stop and-go traffic," creates significant losses to design capacity and contributes to time delays and economic losses to travelers. ITS technologies allow us to observe, confirm and proactively address these losses in operational efficiency. This allows for rapid response to clear incidents and accidents, adjust ramp metering rates, identify bottlenecks and slow approaching traffic to reduce collisions that would further diminish the system's optimal flow rate capacity. Similarly, traffic signal systems on arterials are monitored for the proper timing of signal phases, traffic volumes and changes on arterials, and optimal timing plans are introduced to maximize arterial flow and minimize unnecessary delay. In addition to freeway on-ramp metering, Caltrans has installed freeway-to-freeway metering in some locations such as the I-210 and SR 57, and I-105 and I-605 interchanges.

Connected and Automated Vehicles

A variety of companies in California, such as General Motors' self-driving unit (Cruise) and Alphabet Inc.'s (Waymo), are actively developing and testing automated vehicles. Cruise and Waymo are permitted to use autonomous vehicles for passenger service (i.e., ride hailing) with safety drivers present. These companies envision that these autonomous vehicles will be used to transport people to the airport, entertainment venues, and work. In 2023, Waymo began officially testing driverless rides in Los Angeles. The expectation is that these vehicles will eventually become widespread, and they will support improved road safety, transportation efficiency, and accessibility for people who cannot drive due to factors such as age or abilities.

ITS IMPROVEMENTS

ITS plays a critical role in the operation and management strategies designed to increase the efficiency of the existing transportation system. Connect SoCal 2024 allocates $16.9 billion in TSM measures, which includes ITS.

The region will continue to update the capabilities of Caltrans TMCs, expand ramp metering and corridor management strategies, fill loop detection gaps, increase the use of signal system controls, and increase and improve the technical capabilities for transit bus and rail systems. ITS systems are not modeled directly as a mode in the regional travel demand model, but comparative studies of the impacts show significant travel time savings on arterials and highways, as well as improvement in the effective flow rates of our freeways. Transit ITS systems also help in increasing the OTP of public transit services through better scheduling.

ITS will play an increasing role in regional goods movement strategies. Advanced monitoring assists in achieving system efficiencies in the ports and intermodal operations, reducing delays, and waiting times at gates and destinations, and allowing for more flexible dispatching, all of which reduce emissions. Weigh-in motion systems and enhanced detection will allow for better enforcement of commercial vehicles rules, reducing pavement damage, and identifying critical paths for goods movement planning in the future. For more information on ITS strategies for goods movement, please see the Goods Movement Technical Report.

- ITS systems allow for enhanced capabilities to protect the transportation system and respond to emergencies. One goal of Connect SoCal 2024 is to integrate transportation system information into a shared use capacity with emergency service responders. Visual safety systems, detection, AVL, and the ability to share this information with public safety agencies will assist in deterring, preparing for, responding to, and recovering from man-made security events and natural disasters. These technologies, although in place to manage the transportation system, can assist in providing a deterrence to crime and terrorism, as well as assist in major incident responses such as road closure or other events requiring the close coordination of evacuation vehicles. This relates to recommendations from SCAG's *Resilience and Conservation Subcommittee, which* adopted several recommendations for Connect SoCal 2024 including: ***Prioritize the most vulnerable populations, communities, and infrastructure subject to climate hazards:*** *Help the people, places, and infrastructure that are most at risk for climate change impacts, recognizing that disadvantaged communities are often overburdened.*

Recommended Strategies

- Maintain and update the regional ITS architecture to ensure eligibility of federal funding.
- Implement ITS priorities to improve the safety and efficiency of the current transportation system.
- Develop regional Transportation System Management and Operations (TSMO) plan that integrates Intelligent Transportation System (ITS) strategies to maximize the efficiency of the existing and future transportation system.
- Further develop a Regional Configuration Management process among CTCs, Caltrans Districts, ports and local governments to ensure consistent and compatible integration of ITS technologies and interoperable operations.

- Develop a Smart Cities Vision Plan to inventory existing policies, evaluate emerging technologies, recommend best practices, implement ITS priorities, assess current trends and research, identify opportunities for pilot demonstrations and testing, and improve the safety and efficiency of the current transportation system.
-

Overview of Planned ITS Projects in the SCAG Region

SCAG's updated Regional ITS Architecture defines a number of planned elements, interfaces and information flows. As regional plans are developed, these parts of the Architecture will be implemented by a series of projects, including those related to connected vehicle applications, transit signal priority, emergency response, express lanes, and goods movement. TABLE 4 provides a summary of these regional projects that have been identified through the architecture update process. The full architecture contains many additional planned interfaces that represent possible future interfaces that have not yet been defined in projects. Over time, additional projects will be developed to address further aspects of the architecture. SCAG staff will work to ensure that equity towards disadvantaged communities and communities of color is incorporated into its ITS planning.

PLANNED ITS PROJECTS

SCAG's Congestion Management Process also includes managing transportation and trip demand on our region's transportation supply of freeways, highways and roadways to reduce the demand on them, especially during peak periods, as the supply is fixed at any given point in time. Transportation Demand Management reduces the amount of SOV trips by offering travelers muti-modal alternatives, such as transit, active transportation and working from home. The following section highlights SCAG's Transportation Demand Management programs and initiatives in the region.

Table 4. Planned ITS Projects

Project Name	Project Description	Project Status	Timeframe
Arterial Interfaces	Develop special event management systems to coordinate seasonal traffic, emergency management, disaster operations, and wide area evacuation by sharing of real-time traffic conditions across county boundaries by local agencies.	Planned	6+ years
Border Crossing Upgrades	ICTC/Caltrans - border crossings	Planned	1-6 years
Connected Vehicle Arterial Applications	Possible arterial connected vehicle V2I applications include Signal Phase and Timing (SPAT), Restricted Lane Warnings, Pedestrian Safety, Intersection Safety Warning and Collision Avoidance	Planned	6+ years
Connected Vehicle Highway Applications	Possible highway connected vehicle V2I applications include Queue Warning, Curve Speed Warning, Road Weather Motorist Alert and Warning, Speed Harmonization, and In-Vehicle Signing.	Planned	3-8 years
Critical Transportation Infrastructure Surveillance and Information Dissemination	Implement traffic management systems and field elements on corridors with security concern or significances and or identified critical transportation infrastructure that are monitored and controlled by local agencies including CCTV, RWIS, DMS, vehicle detection stations, communications infrastructure, related to surveillance or information dissemination.	Planned	1-6 years
Emergency Response Communication Infrastructure	Improve information sharing and communication between transit operators, law enforcement, transportation agencies, and emergency personnel during significant events or natural disasters. Provide the ability for local agencies to share data collected from local traffic management systems with other agencies, transit operators, emergency services, and law enforcement.	Planned	6+ years
Evacuation and Emergency Response Resource Management	Utilized ITS to facilitate enhanced regional evacuation and emergency response by: Developing sub-regional focal points to refer all citizens during emergency events Providing the ability for Caltrans, EMC, and TMC's to track all response resources including maintenance and construction vehicles Developing a database of regional resources to monitor and track all response resources including vehicles and all assets that are necessary during an emergency event such as food, water, medical supplies, temporary shelters, etc.	Planned	6+ years
Express Lane Back Office Reconciliation	Express lanes for SoCal - back office reconciliation for common transponder through accounts with different agencies (OCTA, Metro, TCA, RCTC, SBCTA?)	Planned	1-6 years
Express Lane Development	This project represents the development of new express lane projects in the region.	Planned	1-6 years
Express Lane Integration with PEMS	PeMS collects and reports performance data for general purpose and HOV lanes. This project will report performance data for Southern California Express Lane and toll road facilities.	Planned	1-6 years

Project Name	Project Description	Project Status	Timeframe
Express Lane Integration with Regional Trip Planners	This project will allow travelers to plan cross county trips that use Express Lane facilities. The user can access trip cost based on the tolling schedules for the Express Lane operators involved.	Planned	6+ years
Express Lanes- Automated Enforcement Technologies	This project will implement technologies to automatically detect the occupancy of vehicles in a reliable manner.	Planned	1-6 years
Express Lanes-Archived Congestion Pricing Performance Data	This project will archive sources of dynamic pricing data - parking and Express Lanes to support regional congestion pricing and planning	Planned	1-6 years
Express Lanes-Integrated Account Services	This project allows Express Lane users to manage accounts for different operating agencies under a single point of access by phone or online.	Planned	1-6 years
Drayage, Freight, and Logistics Exchange - DrayFLEX (Formerly known as FRATIS Expansion)	Drayage, Freight, and Logistics Exchange (DrayFLEX) - Development of a goods movement optimization tool to improve container movements. In addition, the development of a freight travel application for real-time route guidance and congestion alerts.	Existing	Ongoing
Goods Movement- Container Tracking System	This project establishes a centralized and standardized system for scheduling the pickup and delivery of containers.	Planned	6+ years
Goods Movement-Commercial Vehicle Clearance System	This project creates a data clearinghouse that provides vehicle carrier, vehicle safety and credentialing information from federal and state agency databases to fixed and mobile roadside inspection stations and other 3rd party users	Planned	6+ years
Goods Movement-Disseminate Real Time CVO Information	Delivers real time information from multiple data sources and ITS services that is tailored to trucks. Information such as incident and road closures and terminal queue times supports the coordination of vehicle dispatch and route guidance to make turn times more reliable and predictable.	Planned	1-6 years
Goods Movement-Truck Fleet Communications Program	This project outfits truck fleets with two-way communications and mobile data terminals to collect and disseminate truck specific data to enhance commercial vehicle operations and provide public agencies with data for performance monitoring and incident management.	Planned	1-6 years
Goods Movement-Truck Fleet Data Integration	As part of the truck fleet communications program, this project integrates various data sources and companies providing technology to monitor truck location, speed and other valuable truck specific data.	Planned	1-6 years
Goods Movement-Truck Inspection Stations (Physical and Virtual)	Deployment of truck inspection stations in the SCAG region. These may include physical and/or virtual stations, over time.	Planned	6+ years

Project Name	Project Description	Project Status	Timeframe
IE511 Upgrades	Expansion of Inland Empire 511 capabilities	Planned	1-6 years
Integrated Corridor Management (ICM)	Integrated multimodal transportation management and traveler information.	Existing/Planned	1-6 years
ITS Data Repository	Develop and implement a web-based regional education tool for transit agencies, transportation agencies, law enforcement, and emergency responders to provide relevant data, links, and contact information to enhance awareness and use of existing ITS related data including traffic information, emergency preparedness and response, and evacuation plans.	Planned	1-6 years
Local Transit System TSP	Expansion of TSP for local transit systems	Existing/Planned	1-6 years
Metro BRT	Expansion of BRT with TSP	Ongoing	Ongoing
Multi Transportation Agency Regional Interfaces	Develop special event management systems to coordinate seasonal traffic, emergency management, disaster operations, and wide area evacuation by sharing traffic information among the Southern California Caltrans districts and transportation agencies to support a regional control strategy. Provide the ability to relinquish control of local agency signals to regional TMC during significant events or natural disasters to maintain regional traffic flows.	Planned	6+ years
Multi-agency Video Sharing and Distribution	Establish a common web enabled and secure clearing house for transportation video surveillance for use by multiple transportation and security agencies for security and event preparation, response, and evacuation. Provide the ability for images to be converted to a common selected and web capable format and then distributed through secure Internet and commercial wireless channels.	Planned	6+ years
Non- Motorized Vehicles	This project covers traffic management related efforts to provide support for non-motorized vehicles such as bicycles.	Planned	1-6 years
Ports Security	Enhance existing Port security systems through sensor and surveillance equipment to monitor all entrance points, critical infrastructure, perimeter security, and to track commercial vehicles/freight equipment, monitoring identities, monitoring freight equipment, and monitor commercial vehicles.	Existing	Ongoing
Ports Traffic Information	Enhance existing Port traffic information dissemination through Closed Circuit Television (CCTV) cameras, Changeable Message Signs (CMS), and gate queue detectors. Enable the ports to receive real-time traffic conditions from local agencies and disseminating real-time port information and traffic conditions to local agencies and to Commercial Vehicle Operators.	Planned	6+ years
Rail Automated Maintenance Support	Long-term goal as funding becomes available. Relationship to PTC: This project would be supported by the restriction of train movements in work zone areas.	Planned	6+ years

Project Name	Project Description	Project Status	Timeframe
Rail GPS Train Location System	Project is underway and will be on-going for some time. The completion of the fiber communication is of importance. Human interpretation of information remains of importance in understanding train delays before posting of information. There is no fully automated on-time performance system. Relationship to PTC: This project would be supported by the deployment of onboard PTC equipment.	Existing	Ongoing
Rail Information Dissemination	Future real-time information projects including PDAs, e-mail and displays in trains. The current website has only static displays. Relationship to PTC: This project could be supported by data collected on real-time train movements.	Planned	6+ years
Rail Infrastructure Security	Install ITS devices including communication backbone to monitor and secure trains, rail cars, fixed assets (tracks, wayside equipment), highway-rail intersections and personnel with interfaces to traffic and emergency management centers. Relationship to PTC: This project would access data collected from various onboard and wayside PTC devices. Data shared using communication interfaces between the railroad operations centers and regional TMCs.	Ongoing	Ongoing
Rail Location and Notification	Provide the ability for rail operators (UP, BNSF) to notify public agencies in SCAG region of manifest data within 24hrs of receiving the data to allow first responders to properly respond in an emergency event. Implement necessary ITS elements to share train location and ID data with public agencies.	Existing	Ongoing
Rail Quad Gate Synchronization	Investigate alternate means of clearing the crossing by detecting vehicles that are still in the crossing as the first barrier is lowered and synchronize actions with traffic signal systems in the vicinity. Relationship to PTC: This project would be supported by PTC devices that monitor at-grade crossing safety. Events could trigger alerts that are communicated to the train operator by the computer aided dispatch (CAD) system or wayside signaling system. Onboard computers on the locomotives could apply brakes automatically if alerts or warnings are not acted on.	Planned	1-6 years
Regional Integrated GIS Database	SCAG shall offer a regional repository of GIS data for use by local agencies in emergency planning, and response, in a standardized format.	Existing	Ongoing
Regional Rail Grade Crossing Security	Improve rail grade crossing security and response to emergency events by: " Using sensors and surveillance to monitor at-grade rail crossings " Improving highway-railroad intersections with train detectors, advance warning systems and link train detectors to traffic signal system and EMS dispatch " Utilizing ITS elements to direct vehicles to alternate routes at and in advance of blocked at-grade rail crossings on major arterials during train events (HAZMAT, derailment, train-vehicle collision) " Providing the ability to view and control CCTV through a Windows based system that is compatible with Intelligent Roadway / Rail Interface System (IR/RIS) program and sub-regional ATMS and ATIS. Relationship to PTC: This project would be supported by PTC monitoring of at-grade crossing safety. Regional emergency response could be coordinated by exchanging data between the rail operations centers and regional TMCs.	Planned	6+ years

Project Name	Project Description	Project Status	Timeframe
Regional Traveler Information	A general project category that covers potential multi-agency initiatives to increase integrated dissemination of traveler information as widely as possible throughout the Southern California Region. Relationship to PTC: This project would integrate real-time train location and predictive train arrival data obtained from PTC components.	Existing	Ongoing
Regional Traveler Information for Evacuation Routing and Emergency Diversion	This project should provide the ability to implement a multi-jurisdictional Advanced Traveler Information System (ATIS) to collect, process, validate, and disseminate both pre-trip and en route real-time information to public agencies, private stakeholders, and the public including: -Emergency and evacuation information regionally to inform travelers of an emergency event, affected areas, and evacuation instructions -Freeway/arterial congestion, video images, and links to alternative transportation services via web page(s) -Interstate/inter-region traveler information covering a wide area (targeted to CVO).	Existing	1-6 years
RIITS	The Regional Integration of Intelligent Transportation System (RIITS) network is the core project within the LA County Regional ITS Architecture that integrates different sources of transportation data from multiple agencies. The RIITS network features interfaces with MTA Bus, MTA Rail and Long Beach Transit for real-time transit arrival times and static schedules. The interface with Caltrans District 7 provides freeway and incident data. The RIITS network distributes the data to users through an XML data feed. The RIITS network currently supplies data to the MATIS traveler information service, local agencies, and information services providers who distribute the data to the public through a variety of applications. Future plans include data interfaces with Caltrans District 8 and 12 in neighboring counties, the Los Angeles County IEN, CHP, Foothill Transit and an archived data management system. LA Metro is currently developing an Archived Data Management Service (ADMS) that that will capture real-time data transmitted through the RIITS network. The ADMS will store three years of historical data for all modes of transportation from the various participating agencies. The ADMS database could be used to monitor system performance, support regional and corridor-level planning efforts and provide input for project funding applications. The ADMS is expected to support the MATIS program and support performance evaluation for future Express Lane operations.	Existing/Planned	Ongoing
Security Threat and Guidance Clearinghouse	Develop a SCAG database and GIS resources with a security threat and response guidance expert system and information process. Allow for the receipt of generalized threat information from federal, state, and regional law enforcement and security agencies, and then translate it into meaningful areas of security focus for transportation agencies. Include a combination of upfront threat identification and risk classification to allow for generalized threats as an input. Provide a series of guidelines and expert input to boil threats down into key focus areas and suggestions distributed to transportation agencies via e-mail, fax, and/or web.	Planned	6+ years
Smart Parking	Technology initiatives to improve on street and garage parking	Planned	1-6 years

Project Name	Project Description	Project Status	Timeframe
SoCal511 Upgrades	Expansion of 511 capabilities	Ongoing	Ongoing
Traffic Control and Management Systems	Implement traffic control and management systems to enhance emergency response and evacuation including: -Providing centralized traffic control systems (TCS) to cities for signal monitoring and control, incident management, event management, transit coordination, ITS element control and provide connection to sub-regional TMC and adjacent cities. -Implement an Advanced Traffic Management System (ATMS) to detect and monitor signal status, identify traffic congestion and incidents, and display information through a fully integrated mapping function. -Provide ATMS data sharing capability to coordinate operations with Caltrans and adjacent cities and provide arterial information to a traveler information system covering a larger area and multiple modes.	Existing/Planned	1-6 years
Universal Fare System (UFS)	The UFS will consolidate fare and revenue collection for Metro bus, Metro rail and municipal transit operators throughout Los Angeles County. The Transit Access Pass (TAP) will serve as the regional smartcard that transit users could use to pay for fares on services operated by agencies participating in the UFS. The UFS deployment includes TAP readers on buses, barrier gates / TAP readers at Metro Rail stations and a clearinghouse service center to process fare transactions. Though the TAP program serves transit users in Los Angeles County, there is potential for future interactions with Metrolink or transit providers in neighboring counties.	Existing	Ongoing
Upgraded Rail Passenger Information Signs	Includes future capital projects entailing the following: Electronic passenger information system Relationship to PTC: This project would use real-time train location data to provide predictive train arrival information. The information could be distributed to the public through regional traveler information services such as Go511 and Inland Empire 511.		Ongoing

6.2 TRANSPORTATION DEMAND MANAGEMENT

The Federal Highway Administration (FHWA) defines Transportation Demand Management (TDM) as "a set of strategies aimed at reducing the demand for roadway travel, particularly in single occupancy vehicles (SOVs)." TDM investments reduce congestion and shift trips from SOVs to other modes through projects that often cost significantly less than roadway or transit capital expansion projects. TDM strategies and options facilitate transportation choices that improve sustainability, public health, and the quality of life by reducing congestion, air pollution and greenhouse gases.

TDM and the related Transportation Systems Management (TSM) rose to prominence in the 1970s and 1980s as cost-effective alternatives to road capacity expansions. TDM strategies are of two kinds: voluntary, or "soft," strategies— like preferential parking for carpoolers—that aim to lure some to alter their travel behavior in response to voluntary inducements, and "hard" strategies—like increased parking pricing—that shift the behavior of a large number of travelers by changing the price of travel. TDM also can include regulatory strategies, such as regional employer ridesharing mandates. The SCAG region has been home to some of the more innovative and successful TDM efforts over the years. Some examples include rideshare programs, parking cash out and park-and-ride lots.

Careful evaluations of these efforts, and others around the U.S., have shown that soft TDM strategies can be very effective in reducing SOV travel at the scale of a large employment site, but that the staying power of soft TDM strategies can fade over time without constant attention from employers or the accompaniment of hard TDM strategies. Hard TDM strategies, like road and parking pricing, have been shown to influence travel behavior more durably and, depending on the application, over much larger geographies. It is important to note that pricing strategies have equity implications and potential unintended consequences that need to be analyzed and mitigated (e.g., parking spillover, redistribution of traffic to non-toll roads, etc.) and that is why in 2020, SCAG conducted the Mobility Innovations and Pricing (MIP) Study, which was focused on the potential equity implications of road pricing and other innovative transportation policies in the SCAG region. The MIP Study showed that a pricing strategy, done the right way, can be a tool to help underserved communities.

With all that said, TDM soft strategies should not be dismissed. Precisely because the travel behavior effects are so significant, hard strategies can be controversial and require significant analysis, consensus building, and public education prior to implementation. However, pricing benefits have proven to be more sustainable over time and complement the integrated land use strategies adopted by the region.

In general, most TDM strategies complement each other. More employees might use a transit subsidy or carpool and vanpool if a guaranteed ride home (GRH) program was in place in the event of a family emergency or unscheduled overtime. If the employer were to also implement a parking cash-out program, the number of transit users would likely increase further.

Effective TDM programs can increase choices for travelers and reduce per capita non-renewable energy consumption and emissions. When transit usage, carpooling, biking, and walking increase, transportation system efficiency tends to increase, bringing many benefits to the region. Thus, these benefits can justify substantial public expenditures on effectively implemented soft TDM programs, even absent regional congestion benefits. The biggest promise of TDM is that it can move more people with the existing infrastructure. A TDM Toolbox is included as an appendix to this report, which was created as part of the TDM Strategic Plan and was recently refreshed. The Toolbox is meant to function as a guide for TDM professionals and practitioners that can be applied across Southern California.

Connect SoCal commits $7.3 billion through 2050 to fully implement TDM strategies throughout the region. In addition to the TDM Strategic Plan implementation strategies, Connect SoCal 2024 TDM implementation strategies are as follows:

- Incentivize and promote the development of more Transportation Management Agencies/Organizations (TMAs/TMOs).
- Facilitate partnerships between public and private sector TDM practitioners and stakeholders.
- Develop and promote the use of a regional TDM data clearinghouse. Leverage data and TDM Toolbox best practices to identify cost-effective strategies.
- Provide a forum for TDM practitioners and stakeholders to develop and implement TDM policies, plans, and
- Collaborate to develop regional and localized marketing campaigns to promote TDM modes such as transit, carpool, walking, and biking to school and programs designed to encourage the use of a wider range of transportation alternatives.

Recent efforts further support the expansion of TDM in the SCAG region. In 2018, SCAG initiated a study to develop a TDM Strategic Plan that provided an objectives-driven, performance-based planning process to identify and promote TDM strategies and programs that increase the efficiency of the transportation system through alternative modes of travel to the SOV. More details on this study, as well as work that has transpired since, are discussed below. Also in 2018, California enacted AB 2548, which authorizes Metro to adopt a commute benefit ordinance that requires employers in Los Angeles County with 50 or more employees to offer employee commute benefits covering transit passes and vanpool charges.

6.2.1 TDM STRATEGIC PLAN

SCAG adopted the region's first TDM Strategic Plan in 2019. A TDM technical advisory committee that included county transportation commissions (CTCs), local jurisdictions and TDM practitioners and professionals to provide feedback and expertise in development of the plan. The study focused on assessing the current state of TDM planning and implementation in the region; identifying best practices and opportunities for improvement and expansion of TDM; understanding the impact and opportunities provided by new mobility and technology innovations; developing regional TDM goals and objectives that align with state and federal mandates including congestion reduction, air quality, and sustainability; and developing performance measures to evaluate the effectiveness of corridor level, local and regional TDM strategies

An existing conditions and strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted for the strategic plan which resulted in several key findings, including: regulation, when enforced, is a major driver in shaping TDM strategy and the level of investment put forth by both the public and private sectors; lack of sufficient of standardized data collection makes evaluation of program effectiveness very difficult; and technological advances provide an opportunity to collect better data and improve user experience for TDM programs in the SCAG region.

Strategies to address these issues include establishing a regional standard for performance measurement and helping agencies collect useful data; providing guidance to municipalities and transit agencies that want to partner with the private sector; and supporting updates to municipal programs that require regular monitoring and enforcement of TDM requirements. The completed TDM Strategic Plan offered recommendations to improve TDM practice and prevalence in the SCAG region. They are categorized into five subject areas that are detailed below along with a note on their progress.

DISSEMINATION

1. Create a dedicated page on SCAG's website to share the TDM Strategic Plan's deliverables, such as the updated TDM Toolbox of Strategies, their potential application to congested corridors and areas, and TDM best practices (completed).
2. Convene periodic TDM training sessions/seminars in each of SCAG's six counties for various stakeholders including city and employer staff (completed).

MEASUREMENT

1. Establish a TDM regional data clearinghouse (in-progress).
2. Formalize performance metrics and facilitate data collection and reporting (in-progress).

PARTNERSHIPS

1. Convene regional forums designed for TDM policymakers and implementers (future effort).
2. Support county efforts to consolidate ridematching databases (future effort).
3. Facilitate partnerships between the public and private sectors, through trainings and template agreements, to support collaboration between local governments/agencies and private providers of technology and new mobility services (future effort).
4. Facilitate the development of Transportation Management Agencies (TMAs) and Transportation Management Organizations (TMOs) (future effort).

POLICY

1. Provide training workshops for local jurisdictions on best practices to incorporate TDM into different policy instruments such as general plans, specific plans and overlay districts, and how to update legacy TDM ordinances. Also provide training workshops to developers and property managers who must comply with local requirements (future effort).
2. Support development of new or updated TDM ordinances with stronger monitoring and enforcement elements, and share best practices and lessons learned (in-progress).
3. Support development of state and national policy to encourage TDM delivery (future effort).

PROGRAMMING

1. Conduct a study to develop a comprehensive understanding of incentives on mode choice and behavior change to support identification of the most effective TDM incentive programs (future effort).
2. Encouragement of telework policy in the region (future effort).
3. Recognize successful TDM programs through an annual TDM award (future effort).
4. Support the consideration of goods movement/delivery services in TDM planning (future effort).
5. Provide and promote TDM grant opportunities (in-progress).

6.2.2 TDM STRATEGIC PLAN IMPLEMENTATION

As briefly noted above, SCAG has been working towards implementing these recommendations. In 2021 and 2022, SCAG held TDM training sessions to implement the recommendation: *Convene periodic TDM training sessions/seminars in each of SCAG's six counties for various stakeholders including city and employer staff*, under the Dissemination category. SCAG held a series of workshops entitled "TDM 101" in all six member counties that were open to the public as an introduction to TDM. These were followed by six more TDM training sessions that had specific subject matter within the TDM realm and were predominantly attended by TDM professionals and practitioners. This training was followed by a study working towards implementing the Measurement recommendation. This study arrived at recommendations on how to standardize, collect and report TDM data at a regional level through a data clearinghouse to evaluate TDM programs more effectively in the short- and long-term. This responds to general consensus among TDM practitioners and professionals on the lack of consistent and standardized data to assess the current state of TDM programs and the impact of TDM strategies in the region in the short- and long-term. The study provided short- and long-term recommendations for SCAG to standardize TDM data and implement a database clearinghouse. Key recommendations included:

1. **Develop a TDM Data Clearinghouse.** SCAG should develop a data clearinghouse in a phased approach, focusing first on the most important data that is currently being collected in the region. In future phases, SCAG can develop additional modules for collecting disaggregated data and calculating program outcomes. SCAG is in the process of identifying funding for this effort.
2. **Encourage Data Sharing**. SCAG should explore ways to encourage data sharing by reducing data system complexity and increasing the value to participants. Strategies include offering tutorials and trainings, addressing privacy concerns, and producing best practices and case studies using the data.
3. **Promote Standardized Data Collection.** SCAG should encourage consistent data collection. This can be achieved through the use of the data clearinghouse, continued collaboration with TDM stakeholders, and working with South Coast AQMD as it makes updates to the Rule 2202 employer survey.
4. **Establish Baseline Travel Data**. SCAG should help benchmark the TDM data in the clearinghouse by collecting baseline data on travel mode share as well as other data to help estimate the effectiveness of TDM strategies. TDM data can be improved by having access to overall travel trend data as well as travel behavior data.

6.2.3 TDM STRATEGIES

RIDE SHARING

The SCAG region continues to invest heavily in High Occupancy Vehicle (HOV) and express lane (High Occupancy Toll) infrastructure that provide incentives for commuters to share rides with others or take express transit services. CTCs, TMAs/TMOs and large employers in our region provide carpool and vanpool matching services, guaranteed ride home (GRH) programs and sometimes subsidies. GRH programs act as an insurance policy and are an additional incentive for employees to carpool and vanpool. If an employee needs to get home early due to an emergency or for some other reason, or have to stay late, they don't have to worry about not having their car at work.

CARPOOLING AND VANPOOLING

Carpooling is commonly defined as when two or more people share a ride, traditionally to work, but also for other trip purposes. Carpooling has been a TDM strategy for a long time and can save people significant amounts of financial resources since one car is being used instead of two or three. In the case where two people would be using two cars for the same trip, VMTs are reduced by half, with the resulting decrease in congestion and air pollution and VMTs. CTCs in our region provide carpool matching services through their 511 databases. Many employers also provide employees with a financial incentive such as a monthly stipend.

Vanpooling is similar to carpooling, but vanpools generally involve more people. A vanpool is generally a group of five to 15 people who regularly travel together to work usually around 30 miles or more (roundtrip) in a comfortable van at least 13 days out of the month. Typically, riders pay a monthly fare and maintenance fee, while drivers ride at a discounted rate in exchange for driving and maintaining the van. Many employers and CTCs have vanpool programs and subsidize them. Subsidy rates typically range from 20 percent to 50 percent of the vanpool lease cost, or up to $400 in the case of Los Angeles and Orange counties.

CAR SHARE

Car share involves membership-based programs where individuals can sign up to have hourly or daily access to a pool of vehicles and then return them to the same or a different place from where they were picked up. Unlike traditional car rentals, vehicles can be picked up at designated spots around the city, usually in public parking lots. Zipcar is one of the more popular roundtrip platforms. One-way car share allows members to take a vehicle and leave it at a different station, or anywhere within allowed boundaries. BlueLA is an electric car share provider currently operating in Los Angeles.

There are also private car rental services where owners rent out their cars for periods of a day or longer. Companies such as Turo and Getaround are facilitating this service. While car sharing does not necessarily result in a shared trip, car share users drive less and use alternative modes more than car owners. The most quoted analysis of the impact of car share services shows that nine to 13 vehicles are taken off the road for each car sharing vehicle.[5]

SCAG and its partners will strengthen their efforts to encourage ridesharing and other trip reducing strategies that aim to reduce vehicle trips, energy consumption, air pollution and greenhouse gas emissions. These efforts are detailed below.

- Encourage local governments to require parking cash out programs, where feasible.
- Encourage cities to reconsider minimum parking requirements in zoning ordinances.
- Encourage the development and viability of Transportation Management Organizations/Agencies at major employment locations throughout the region.
- Program public funds in the FTIP to educate employers and expand the Guaranteed Ride Home Program.
- Provide seamless intra- and inter-county vanpool and carpool services to the regional traveler.
- Encourage park-and-ride lots along suburban corridors, and in bedroom communities.
- Identify current dedicated funding sources and work with CTCs and partners on identifying additional new funding sources.
- Increase the number of commuter vanpools through more effective marketing and the provision of non-monetary public sector incentives.

- Maintain and sustain a regionally coordinated marketing strategy among the public and private sectors to enhance vanpool programs, increase ridership and improve outreach efforts.

INTELLIGENT PARKING

Intelligent parking assists drivers in efficiently locating parking spots through ITS and smart phone apps. Through a smart phone app, a driver can locate vacant or soon-to-be-vacant parking spots in parking facilities such as structures and on-street parking managed by cities. Intelligent parking can reduce traffic congestion, decrease air pollution and greenhouse gas emissions, and improve safety (drivers not distracted by hunting for spaces. Intelligent parking can also increase parking supply through variable peak period pricing. This variable peak period pricing coupled with advance information about parking availability may encourage mode shift to transit or active transportation as drivers may determine the price to be too high or learn in advance the challenge in finding available parking. In addition to parking location and supply information, intelligent parking smart apps can allow drivers to purchase parking remotely through their smart phones. Intelligent parking includes Automated Parking, which improves the efficiency of parking structures by increasing capacity versus conventional parking structures. While increasing parking supply alone could result in an increase in personal vehicles trips, it reduces the need for conventional parking spaces in high parking demand areas, thus freeing much-needed real estate for other uses. Automated parking systems can be implemented together with intelligent parking and pricing to minimize negative externalities associated with increasing parking supply. One example is the LAExpressPark system, which allows the city to adjust pricing based on demand and informs drivers of parking availability and cost via an app, website, 511, and electronic message signs. It is currently available in downtown Los Angeles, Hollywood, Venice, and Westwood.

TELECOMMUTING, WORK-AT-HOME AND FLEXIBLE WORK SCHEDULES

Telecommuting can be defined as working outside the traditional office or workplace, usually at home, but also remotely while traveling, at client/customer workplaces, libraries, co-working spaces, and other Internet accessible locations. Telecommuting from a place other than home is typically counted as a trip reduction strategy when the trip to the work location is at least 50 percent shorter than the trip to the work site would be.

Flexible work schedules involve adjusting the hours an employee works, for example working 7:00 AM to 3:30 PM, or 10:00AM to 6:30 PM instead of 9:00 AM to 5:30 PM. It also includes 9/80 and 10/40 schedules where employees work nine, nine-hour days a pay period or eight, ten-hour days per pay period.

Since Connect SoCal 2020 was adopted, the nation and region have continued to recover from the COVID-19 pandemic. During the early stages of the pandemic, California implemented multiple measures to mitigate the spread of the virus. Remote working rates rose abruptly and dramatically. Prior to the pandemic's start, most workers spent the bulk of their time working outside of their homes, but once the pandemic was well underway, at least half of all employees were working remotely. According to UCLA's research, across the US, remote work peaked at 62 percent in May 2020, but declined to 37 percent by the end of that same year.[6] Within Southern California, the share of jobs that can be performed at home are relatively high (38-52 percent) compared to the national estimate of 37 percent of U.S. jobs.[7] SCAG estimates that currently 19 percent of people are engaging in remote work compared to 6 percent prior to the pandemic. For the purposes of this Plan, SCAG is assuming roughly 20 percent of people will continue to work from home through 2050.

More people engaging in a balance of remote and in-person work has altered travel behavior in significant ways and created some challenges. Some literature suggests that while flexible work schedules and telecommuting may reduce (or, in the case of satellite offices, reroute) SOV commute trips, they may actually increase SOV trips for other trip purposes, such as errands and trips for lunch while an employee is working from home (although not necessarily during peak congestion periods). This is known as the rebound effect. It is also contended that telecommuting may encourage people to live farther from their workplaces than they would otherwise. Results of these studies vary significantly, and more analysis is needed to better understand changing trends specific to our region. Also, WFH and hybrid work schedules can result in disparities for people of color, as those populations are disproportionately represented in the essential workers' populations such as medical and service industries. The pandemic highlighted the stark disadvantages faced by unconnected individuals as California implemented measures to mitigate the spread of the virus and digital activities became a necessity for participating in daily life. Those who lacked access to healthcare, food services, remote work, and e-learning experienced severe hardships. Currently, across the region, 10 percent of residents lack broadband. More specifically, 13 percent of Black people, 12 percent of Hispanic/Latino people, 11 percent of Native Americans, 20 percent of adults aged 65 and older, and 70 percent of those without broadband are concentrated in low-income households.

TRANSIT ORIENTED DEVELOPMENT AND TRANSIT/RAIL INFRASTRUCTURE IMPROVEMENTS

Changes in land use patterns around our transit investments, notably Transit Oriented Development (TOD) where medium- to high-density residential development is placed within a one-mile buffer of a rail/transit center and/or major transit stop, reduce SOV travel and VMT through increased transit use and active transportation, and provide better access to local jobs and services. Many TOD projects have been built in our region since Connect SoCal 2020, and many more are under construction and planned. An example of a recent planning project is the SCAG and Metrolink Station TOD project that performed a systemwide scan of all 60+ Metrolink stations to determine which ones had the greatest opportunity for building TOD in the near future. These projects will play a significant role in reducing SOV travel and VMT.

Significant transit investment has been made since Connect SoCal 2020, primarily based on voter-approved county sales tax measures. Benefits of investing in transit and rail include:

- New and enhanced transit services that provide new commute choices for commuters and residents,
- Cleaner air and reduced congestion, VMT and greenhouse gas emissions,
- Facilitation of current and future smart growth and sustainable communities,
- The ability for residents to choose a healthier, more active lifestyle, and
- The ability for residents who do not own a vehicle to remain mobile and active.

The following are major transit projects which were completed since Connect SoCal 2020 was adopted or which are in various stages of planning and construction. Please refer to the Mobility Technical Report for more details.

- Metro's Purple Line extension to Westwood
- Metro's Gold Line extension to Pomona
- Metro's Regional Connector (opened)
- Metro's 28 by 28 Measure M-funded projects
- Metrolink SCORE Program

- California High Speed Rail Phase One
- Orange County Streetcar
- New BRT services in Orange, Riverside and San Bernardino Counties
- Redlands Rail Arrow Service (opened)

ACTIVE TRANSPORTATION AND FIRST/LAST MILE

Active Transportation and First/Last Mile strategies also play a crucial role in SCAG's Congestion Management Process. These include notable strategies like pedestrian facility and safety improvements, bikeshare, which continues to expand throughout our region, and wayfinding improvements. SCAG has funded many active transportation projects and First/Last Mile plans such as the Omnitrans' Bus Stop Safety Improvement Plan and the City of Montebello First/Last Mile Plan. SCAG has also supported efforts of agency partners to advance their own First/Last Mile Plans, such as Metrolink's Station Planning and Connectivity Study, which examined connectivity barriers by working with the community and local agencies throughout its service area to understand potential challenges and opportunities to improve access to Metrolink stations. For a detailed discussion of these strategies, please refer to the Mobility Technical Report.

MOBILITY HUBS

Mobility hubs are places where people can seamlessly connect with multiple modes of transportation in a safe, comfortable, and accessible environment. Mobility hubs are locations where there are a range of transportation options (but typically at least two) that connect and interact with each other. They are intended to serve as the nucleus of the physical infrastructure in a Mobility as a Service (MaaS) system, and may include public transit, active transportation, and shared vehicles. They are the infrastructure foundation for multimodal trip planning and promoting mode shift and are considered essential for a safe and convenient transfer between transportation modes.

The concept of mobility hubs has been developing in the SCAG region over the last decade. The development of mobility hubs varies by county within the SCAG region, as well as the naming convention and definitions of the mobility hubs. Terms like "mobility hubs," "multimodal transit center," and "regional transit center" have all been mentioned in documents published by agencies across the region. Only San Bernardino and Los Angeles Counties have operational transit hubs that are similar to the concept of mobility hubs. The Fontana Transit Center is a major intermodal transit hub in the Omnitrans' service area. This facility is regarded as a key link between high-frequency east-west routes. Parking is available at this location. In addition, Metrolink commuter rail stops at this location, providing transit users the opportunity to park-and-ride and transfer between bus and rail service. The other mobility hub is the Montclair Transit Center where commuter service, fixed-route service, and Metrolink service connect with a park-and-ride facility. Mobility hubs in Los Angeles County include central mobility hubs like the Wilshire/Vermont Station and Willowbrook/Rosa Parks Station which encompass amenities such as car share, bike share, bus shelters, and next bus information, or regional mobility hubs like Union Station and North Hollywood Station which offer amenities like secure bike parking, bus layover zones, and other infrastructure built into the station itself.

For Connect SoCal 2024, SCAG developed a regional mobility hubs strategy. For more information regarding the identified network, please review the Mobility Technical Report, Transit/Rail Chapter.

CONGESTION PRICING

Consistent with SCAG's emphasis on system management as embodied in the mobility pyramid, SCAG planning efforts have focused on strategies such as the integration of pricing to reduce congestion, more efficiently utilize existing capacity and offer travelers greater choices and improved travel time reliability. In 2013, SCAG conducted the Express Travel Choices Study, which reviewed a variety of congestion pricing options and their potential applicability to the SCAG region based on mobility, economic and equity impacts. Three promising strategies were identified, two of which were incorporated into the 2012 RTP/SCS and subsequent RTP/SCS updates:

1. A network of express lanes, which connects and expands express lanes already in place or in progress and can accommodate ever-growing inter-county travel, and
2. A mileage-based user fee to establish a structurally sound funding source for taking care of our aging infrastructure and expanding travel options.

The third promising strategy, cordon/area pricing, required additional analysis to identify the most promising geographic area and system design for initial testing. Cordon/area pricing involves charging a variable or fixed fee to drive into or within a highly congested area. This led in 2019 to SCAG's Mobility Go Zone & Pricing Feasibility Study, which examined the potential application of cordon pricing to the Westside, located in the Cities of Los Angeles and Santa Monica. The report states that historically, pricing of transportation facilities in the region has been used primarily to generate revenue for the operator of the facility to cover the costs of construction and/or ongoing operations. More recently, pricing has been implemented as a demand management tool. Pricing a transportation facility can make users more aware of the direct and indirect costs of their travel choices and encourage a change in travel behavior. Creating a more balanced transportation network through pricing can lead to improved mobility for all users.

Recent technological advancements related to fee collection have allowed for increasingly more sophisticated pricing strategies. Pricing strategies in the SCAG region began with the State Route (SR) 91 Express Lanes that employ variable time-of-day pricing along a single corridor so that paying customers can utilize the facility at a high level of service. Recent pricing tools in Los Angeles transportation enabled by technology are the Metro ExpressLanes, which employ dynamic pricing using FasTrak® transponders, and LA Express Park, which sets parking prices based on demand.

Pricing is an effective demand management tool because travelers will generally search for the quickest, cheapest, and most direct route to get to their destination. As traffic increases along preferred routes, travel time generally increases and makes those routes less desirable. Travelers will then alter their mode and/or take alternative routes that might be longer in distance. As these alternative routes become more utilized and thereby congested, they will lose their advantage over the preferred route. If improvements are made to the alternate routes, then travel times will be quickest on the new routes, until other travelers recognize this and shift their travel patterns to utilize the improved routes. Eventually, the improved routes will also become congested and provide no benefit compared to the original route. Transportation economist Anthony Downs calls this result "triple convergence" due to the (1) spatial convergence of drivers switching their routes to other roadways; (2) time convergence of drivers altering their time-of-day travel; and (3) modal convergence of travelers switching between driving and transit depending on the faster alternative. Congestion pricing can address this triple convergence by managing demand so that the relative advantages of the preferred and alternative routes remain consistent. Pricing also makes users more conscious of all the potential impacts that their travel choices may have on the entire transportation network.

Mobility Go Zone and Pricing Feasibility Study

In 2019, SCAG evaluated the concept of a Mobility Go Zone, a geographic area with a suite of mobility service options for commuters, visitors, and residents to reduce dependency on personal automobiles. This expanded mobility ecosystem can include increased local bus circulator routes including micro-transit options, express commuter buses, bike share and enhanced active transportation infrastructure, enhanced pedestrian infrastructure, and incentive methods including a decongestion fee on vehicles entering during peak traffic periods (particularly for single-occupant trips) to encourage drivers to shift travel patterns to shared modes; shift less time sensitive or lower value trips to off-peak times resulting in more evenly distributed daily congestion. Revenues collected from the fee would be used to fund local transportation improvements to help reduce congestion and carbon emissions, and offer improved travel options for residents, commuters, and other visitors to the area.

The Mobility Go Zone Program was studied based on economic-financial operations, equity considerations, public and stakeholder outreach and market research of employers, commuters, and visitors specific to the study area. During this evaluation phase, the Mobility Go Zone Program was further refined through the aid of a public outreach initiative including traditional meetings with stakeholders, focus groups, networking events, panels, and a social media campaign called 100 Hours. The 100 Hours public engagement campaign was the first of its kind led by SCAG to start a public conversation regarding decongestion fees and a Mobility Go Zone Program.

The study showed that a Westside Go Zone would reduce VMT by 21 percent and vehicle hours traveled (VHT) by 24 percent during peak travel times, saving $4 million annually in reduced greenhouse gas emissions and generating a net average of $69.2 million annually in revenues, which would go directly toward transportation improvements, pedestrian amenities, and economic development. SCAG also estimated a 22 percent reduction in single occupancy vehicles entering the area, and an increase in transit trips by nine percent and bike/walk trips by seven percent during peak periods. SCAG urged the creation of a pilot project to more deeply test the concept of Mobility Go Zones in reducing congestion and improving air quality.

Mobility Innovations and Pricing Initiative

In 2020, SCAG conducted the Mobility Innovations and Pricing (MIP) initiative focused on the potential equity implications of road pricing and other innovative transportation policies in the SCAG region. Under a pricing strategy, drivers pay a fee for the usage of certain roads, in some cases paying a lower rate or avoiding fees altogether based on traffic patterns at the time. Since heavily used transportation corridors are often located near disadvantaged communities, the concept of road pricing can provide benefits to underrepresented populations by reducing congestion and harmful vehicle emissions that come with it. At the same time, without a clear focus on equity, road pricing could put a disproportionate burden on those same populations.

The initiative combined stakeholder engagement, technical analyses, and communications strategies to elevate equity considerations as a key touchstone in planning for road pricing—most critically leading with the concerns of underrepresented communities through dialogue with community stakeholder organizations. The MIP study showed that a pricing strategy, done the right way, can be a tool to help underserved communities.

In addition to identifying transportation burdens and priority investments through a community-led engagement process, SCAG worked with CBOs to develop a methodology to quantify transportation-related inequities and identify communities most impacted across the SCAG region, which the study referred to as Transportation Equity Zones (TEZs). Understanding these travel patterns of people living in TEZs within the SCAG region will help planning and implementing agencies place equity at the forefront of any future mobility strategies.

The study highlighted CBO led workshops, which resulted in a series of recommendations that can increase equity, including financial relief for drivers who might be disproportionately burdened by road pricing programs and don't have access to other reliable travel options. Although infrastructure investments and system improvements funded by revenue reinvestment are also key to mitigating the impact of road pricing on underserved communities and gaining community support, the study's CBO led engagement surfaced the importance of exploring concepts like "community credits," providing transportation credits to low-income households residing within specific communities to use for any mode of transportation. Other options included a range from discounts or subsidies to exemptions for road users in low-income households, maximum daily charges for drivers that need to make multiple trips on a priced road each day, credits for those who use transit or other sustainable modes of transportation, and a waiver of fees associated with obtaining transponders or processing payments.

These concepts can potentially contribute to setting the framework for universal basic mobility for the SCAG region and help focus our future planning on designing an equitable transportation system that maximizes mobility and environmental benefits in places that need them most.

For Connect SoCal 2024, SCAG includes a local road charge program in the form of mileage-based user fees regionally, which can be adjusted by time-of-day at major activity centers. For analysis, SCAG assumed congestion pricing (peak period charges) in parts of Los Angeles, along with increases in parking pricing at major job centers as a part of the regional job centers strategy. Overall, the implementation of user-fees and pricing strategies can be structured to increase equity and mobility, and preserve the transportation system, while reducing environmental impacts.

7. NEXT STEPS

SCAG will continue to manage and monitor the congestion management programs and activities highlighted in the report. The federal congestion management process is continuously implemented in SCAG's FTIP and RTP/SCS documents. SCAG also will continue to monitor the state CMP as its member counties update their CMPs. Of particular importance are periodic updates to the regional ITS architecture. This will provide implementation and monitoring tools to better manage our freeway and arterial system. SCAG will also continue to implement the TDM Strategic Plan, working to increase TDM in the region and mode share of the different TDM elements. The TDM Toolbox of Strategies (Appendix 1) provides a valuable tool for stakeholders and jurisdictions in the SCAG region.

8. CONCLUSION

Taken together, SCAG's congestion management process, and its TSM, ITS, and TDM components, are an integral part of Connect SoCal 2024, and significantly manage and reduce congestion, VMT, air pollution and greenhouse gas emissions in the SCAG region. This Congestion Management report demonstrates a

path forward to meet the goals and objectives of Connect SoCal 2024, and meet goals of mobility, sustainability, and the quality of life in the SCAG region.

APPENDIX

1. TDM Toolbox of Strategies

9. ENDNOTES

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APPENDIX 1:
TDM TOOLBOX OF STRATEGIES

Safe Routes to School Programs

Safe Routes to School Programs (SRTS) involve working with schools and school districts to promote safe active transportation modes for students in order to reduce the number of parent drop-offs.

Implementors

Employers / Property Managers / TMAs

- TMAs/TMOs
- Educational institutions
- Property managers – residential

VMT Reduction: ■■□□□

Impact varies based on number of students and parents interacting with TMAs, schools and property managers.

Public Agencies / Transportation Providers

- School districts
- Municipalities
- Transit agencies
- Regional government/MPOs

VMT Reduction: ■■■□□

Impact varies based on size of school district and active transportation infrastructure.

Other stakeholders

- Students
- School administration
- Bicycle education organizations
- Law enforcement
- Parents
- Teachers
- Residents / businesses
- Planning and engineering departments
- Public Health Departments

Benefits →

- Reduces congestion during peak periods
- Increases safety for students
- Increases health/fitness

Challenges →

- Can require involvement from law enforcement
- Requires ongoing funding for modal change and effectiveness
- Coordination required among school districts, cities, and transit providers

Measurement

Outcomes

- Number of students participating in SRTS-related activities and events

Impacts

- Drop-off time
- Mode split among students

Methods

- Survey results
- Congestion monitoring on roadways surrounding schools

Congestion impacts

Parents dropping off and picking up children at school represents a significant level of local congestion. Increasing the number of students walking or bicycling can reduce congestion and improve air quality around schools.

Implementation tips

Safe Routes to School Programs can be implemented through events such as group bicycle or walking trips or bicycle safety workshops. Programs can also provide rewards to students or their parents for traveling by foot, bike, or in a carpool, and can leverage technology for trip tracking and incentive provision.

Costs

Typically funded through Federal and State grants specific to Safe Routes to School and Active Transportation. Additional costs may be incurred from associated events or promotional material.

Complementary strategies

- Bicycle infrastructure improvements
- Pedestrian infrastructure improvements

As seen in the SCAG region

Durfee Elementary School in El Monte operates "walking school buses," and uses the opportunity to teach students about environmental issues along the way.

SRTS-style programs can also be expanded to support non-school populations. **Los Angeles Walks** operates Safe Routes for Seniors program that helps seniors get around safely on foot.

Marketing Campaigns

Marketing campaigns can promote other TDM programs, as well as non-SOV travel itself. They often include the dispersion of printed material and web promotion through email and social media.

Implementors

Employers / Property Managers / TMAs

- Large employers
- TMAs/TMOs
- Educational institutions
- Property managers – office, retail, residential

VMT Reduction:

Impact varies by size and reach of campaigns.

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- Regional government/MPOs
- County transportation authorities

VMT Reduction:

Impact varies by size and reach of campaigns. Campaigns that target specific populations are more successful

Other stakeholders

- Employees
- Visitors to TMA areas
- Students
- Transit riders
- Residents
- ETCs

Benefits →

- Increases visibility of TDM programs and non-SOV modes
- Campaigns can be produced at a variety of price points
- Can support the return to transit ridership by highlighting new services and public health actions

Challenges →

- Can be difficult to measure impacts on congestion or air quality
- Requires ability to reach target audiences

Measurement

Outcomes

- Number of impressions or engagements

Impacts

- Participation in TDM programs
- Transit ridership

Methods

- Participant lists
- Transit ridership data

Congestion impacts

Successful campaigns that result in behavior change will decrease congestion.

Implementation tips

Some marketing campaigns target specific groups of travelers, such as tourists, cyclists or commuters from one community, or reach broader groups through platforms with high volumes of users such as 511 programs.

Costs

Cost varies by size and reach of the marketing campaign. Incurred costs may include graphic design, printing and ad space purchase, events or promotional material.

Complementary strategies

- Subsidization of non-SOV travel
- Mobility as a Service provision
- Employee commute programs

As seen in the SCAG region

Orange County Transportation Authority and **IE Commuter** in San Bernardino and Riverside counties develop marketing material for employee transportation coordinators (ETCs) in Orange County and the Inland Empire to present to their respective employees.

City of Santa Monica Big Blue Bus produced a video explaining how to ride bicycles on their buses.

Educational Events

Educational events provide an opportunity for TDM implementors to interact directly with travelers to encourage behavior change.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Property managers - office, retail, residential
- Educational institutions

VMT Reduction: ■■□□□

Impact varies by attendance and scope of event

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- County transportation authorities

VMT Reduction: ■■□□□

Impact varies by attendance and scope of event.

Other stakeholders

- Employees
- Residents
- Bicycle education organizations
- Students
- ETCs
- Public Health Departments
- Commuters
- Planning and engineering departments

Benefits →

- Increases the visibility of TDM programs and non-SOV modes
- Makes potential users more comfortable with new travel modes

Challenges →

- Can be difficult to measure impacts on congestion or air quality

Measurement

Outcomes

- Number of event attendees or persons spoken to at events
- Satisfaction

Impacts

- Mode split among attendees

Methods

- Survey results

Congestion impacts

Successful events that result in behavior change can decrease congestion.

Implementation tips

Educational events can take many forms, including:

Tabling events: ETC or agency rep sets up a table in a high-traffic area (cafeteria, transit station) and provides resources about TDM programs and travel options.

'Try Transit' events: Sometimes people are hesitant to try new modes because they don't know how to do it. Events that introduce them to taking the bus or riding bikes can help them feel more comfortable in the future.

Zip Code Parties: Help employees find others with whom they could carpool and vanpool by introducing them to others who live or work in the same zip code.

Costs

Costs vary based on size and scope of event.

Complementary strategies

- Guaranteed ride home programs
- Carpool coordination
- Individualized/personalized marketing

As seen in the SCAG region

National Bike Month is celebrated throughout the SCAG Region with events held by county organizations, municipalities, TMAs/TMOs, and individual employers.

SCAG hosts events throughout the region as a part of their **Go Human** campaign which encourages walking and biking.

Wayfinding Upgrades

Wayfinding is crucial to ensuring travelers can get where they need to go. It is particularly important to have thorough signage within transit stations and mobility hubs. On-street signage and mobile information can improve the visibility of transit, bicycle and pedestrian amenities.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- Parking lot owners/operators
- County transportation authorities

VMT Reduction:

Wayfinding can be impactful by increasing transit ridership, but may not show measureable impacts.

Other stakeholders

Transit agencies

Commuters

Graphic designers and sign vendors

Benefits →

- Increases the visibility of TDM programs and non-SOV modes
- Makes potential users more comfortable with new travel modes

Challenges →

- May have trouble reaching travelers who are vision impaired or cannot read the language used
- Impacts are difficult to measure

Measurement

Outcomes

- Inquiries to on-site personnel/ security/staff
- User feedback

Impacts

- Mode split
- Transit ridership
- Use of advertised first/last mile options

Methods

- Analysis of recorded feedback

Congestion impacts

Wayfinding that encourages repeat travelers on transit or other modes will reduce congestion.

Implementation tips

Wayfinding within a transit station can help encourage travelers to use alternative modes for their first and last mile. Bus stations and bicycle racks should be clearly marked and easy to access.

Costs

Costs often include design as well as signage itself.

Complementary strategies

- Bicycle transit integration
- Transit improvements
- Pedestrian infrastructure improvements

As seen in the SCAG region

The City of Santa Monica has provided window clings to local businesses highlighting the time required to reach major attractions by foot, reminding travelers they might be able to comfortably walk to their destinations.

Individualized/ Personalized Marketing

Individualized Marketing involves targeting travelers who are most likely to change their behavior and encouraging them to participate in a program or use a mode to travel. Talking points or marketing geared specifically toward those groups are developed.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Educational institutions
- Property managers - office, residential

VMT Reduction:

Individualized marketing can be quite successful, but requires resource to be impactful on a large scale.

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- County transportation authorities
- Regional government/MPOs

VMT Reduction:

Individualized marketing can be quite successful, but requires resource to be impactful on a large scale.

Other stakeholders

- Employees
- Transit agencies
- Residents
- Commuters
- Students

Benefits →

- Likely to be more successful in changing behavior than other types of marketing
- Can be used to promote relevant company policies like flexible work schedules

Challenges →

- Can be resource intensive to run and may require external support
- Can run into privacy issues with using personal data

Measurement

Outcomes

- Number or percentage of engagements or individuals reached
- Number of individuals who changed their behavior

Impacts

- Transit ridership
- VMT reduction
- Program registrations

Methods

- Survey results

Congestion impacts

Successful campaigns that result in behavior change will decrease congestion.

Implementation tips

It can be beneficial to implement individualized marketing where infrastructure or service improvements have been made to ensure that potential users are aware of those improvements and how they can benefit from using them.

In an organizational setting it might be beneficial to target groups who have expressed an interest in trying out new modes of travel or those whose trips could be made easily with a non-SOV mode. These groups can be identified through survey results or personal data as it is available. Alternatively, personalized trip planning can remove barriers to using new modes of travel.

Costs

Costs for marketing campaigns may include staff time to speak to the target audience, as well as costs of information and incentives.

Complementary strategies

- Marketing campaigns
- Transit improvements
- Private shared transportation/ shuttles

As seen in the SCAG region

A major employer in the SCAG Region used zip code data to target the employees who would pilot their new commute program, complete with fully subsidized transit passes. They invited employees who lived along a major transit line to participate, as those employees would likely benefit most from their transit subsidy.

Carpool Coordination

Carpooling is an effective way to reduce congestion by using the available seating capacity in personal vehicles. Employers and public agencies can facilitate carpool formation through the provision of online ridematching platforms.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Educational institutions
- Property managers - office, residential

VMT Reduction:

Carpool coordination can be more successful at the site level where commuters are familiar with each other.

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- County transportation authorities
- Regional governments/MPOs
- Carpool platform operators

VMT Reduction:

Carpool coordination can be more difficult at an area-wide level where commuters are connected with strangers.

Other stakeholders

- Employees
- Students
- ETCs
- Residents
- Parking lot owners/operators

Benefits →

- Travelers interested in carpooling are often regularly traveling to one central location
- Carpooling reduces transportation costs for participants
- Travelers using public, open systems to find matches have a larger pool of users, and a better chance of finding a match

Challenges →

- Pool of employees or residents to create carpools may be too small in some locations
- Increased alternative work schedules can make formation more difficult

Measurement

Outcomes

- Number of participants who register for program or express interest in carpooling
- Number of carpool matches provided

Impacts

- Number of carpools created
- Number of people carpooling over time

Methods

- Survey results
- Data collected from trips logged or recorded on platforms

Congestion impacts

Successful campaigns that result in behavior change will decrease congestion.

Implementation tips

Carpool rides can be established in two manners:

Traditional Carpooling: Carpool partners find each other organically or through a ridematching platform and agree to drive together. Passengers may pay drivers based on their individual agreements.

Dynamic Carpooling: Carpool partners find each other through mobile applications and schedule each ride individually. This allows for travelers with irregular schedules to carpool without committing to one person every day.

Costs

Carpooling costs for riders usually offset the cost incurred by the driver. Agencies who wish to provide ridematching platforms may pay developers for access to their tools.

Complementary strategies

- Direct incentives for non-SOV travel
- Subsidization of non-SOV travel
- Parking facility design and curbside management (designated carpool parking spaces)
- Guaranteed Ride Home programs

As seen in the SCAG region

Los Angeles, Orange, San Bernardino, Riverside and Ventura Counties provide ridematching platforms for commuters and employers in their counties.

Vanpool Coordination

Vanpool coordination involves coordinating commuters who take similar trips and providing them access to a vehicle to travel together.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Property managers – office

VMT Reduction:

Vanpool coordination is impactful in reducing VMT as it works especially well for long-distance commuters.

Public Agencies / Transportation Providers

- School Districts
- Municipalities
- Transit Agencies
- County transportation authorities
- Regional Government/MPOs

VMT Reduction:

Public agencies can play a central role in working with vanpool operators and providing subsidies for vanpool travel, thus increasing impact.

Other stakeholders

- Employees
- ETCs
- Vanpool providers
- Parking lot owners/operators

Benefits →

- Vanpool riders and drivers save money they would otherwise spend on long commutes
- Riders can spend time on work or leisure instead of driving

Challenges →

- Requires agreements between the public and private sectors which may cause concerns with liability
- Post-2020, vanpools can take more time and be costly to form, especially if there are empty seats

Measurement

Outcomes

- Number of participants who register for program or express interest in vanpools
- Number of people riding in a vanpool

Impacts

- Number of vanpools created
- Number of participants using vanpools
- Mode split over time

Methods

- Survey results
- Data collected from vanpool providers or subsidy programs

Congestion impacts

Vanpool travel that reduces SOV trips will result in decreased congestion.

Implementation tips

Vanpooling provides a cost-effective means of travel for employees commuting long distances. Often, employers or public agencies will subsidize the cost of registered vanpools even further.

Costs

The cost of renting and operating a vanpool are split among users. Employers and public agencies often subsidize the cost of operating vanpools to make the mode more attractive to commuters

Complementary strategies

- Direct incentives for non-SOV travel
- Subsidization of non-SOV travel
- Parking facility design and curbside management (designated vanpool spaces)
- Guaranteed Ride Home programs

As seen in the SCAG region

Imperial, Los Angeles, Orange, San Bernardino, Riverside and Ventura Counties provide subsidies to vanpools operating through various approved vendors.

Telecommuting

Telecommuting describes the process of an employee working from home or a satellite office close to their home, rather than commuting to their traditional workplace.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Property managers - residential

VMT Reduction:

Telecommuting directly reduces trips and VMT.

Other stakeholders

Employees

Developers/ property managers

Benefits →

- Can reduce VMT and congestion, particularly during peak periods
- Provides time savings for employees
- Can reduce costs for employers and improve employee recruitment and retention.

Challenges →

- Telecommuting is only appropriate for some industries, may not work universally
- Can increase VMT for non-commute trips in some circumstances

Measurement

Outcomes

- Number of employees who telecommute
- Number of days employees telecommute

Impacts

- Trips reduced as a result of telecommuting
- VMT reduced

Methods

- Survey results
- Traffic data

Congestion impacts

Each trip not taken due to the ability to work or perform tasks remotely removes a car from the road during peak hours.

Implementation tips

Telecommuting can be blended with hybrid work environments to support alternative work schedules. Virtual meetings can be used for work and classroom environments to also cut back on daytime SOV travel, congestion and VMT.

Costs

The cost of supporting telecommuting includes initial costs (such as remote computers or policy formation) for employees but may reduce cost of office space, events or promotional material.

Complementary strategies

- Marketing campaigns
- Congestion pricing
- Parking pricing
- Employee commute programs

As seen in the SCAG region

In 2019, SCAG conducted a "Future of the Workplace" study to evaluate the nature of employment and the workplace and address its impact on greenhouse gas emissions in the Region.

Alternative Work Schedules

Alternative work schedules can reduce the number of vehicles traveling during peak periods by allowing employees to arrive at and leave the workplace outside of peak hours every day, and reduce overall trips through compressed schedules.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Property managers - residential

VMT Reduction:

Alternative work schedules that allow for off-peak travel can reduce congestion. Compressed work weeks can reduce trips and VMT.

Other stakeholders

Employees

Benefits →

- Decreases peak period VMT
- Improves travel time for participants
- Can save employers money by allowing them to reduce space through hot desking

Challenges →

- Minor employer costs to manage
- May not work universally
- Can increase VMT for non-commute trips in some circumstances

Measurement

Outcomes

- Number of employees who travel off-peak
- Number of off-peak trips taken
- Number of employees who work compressed schedules

Impacts

- Trips reduced as a result of alternative work schedules
- Peak hour trips reduced

Methods

- Survey results
- Traffic data

Congestion impacts

Peak hour VMT is improved and participants may see improved travel time.

Implementation tips

Alternative work schedules can take various forms:

Flexible Work Schedules: Employees are able to choose hours that are convenient to them, allowing them to commute outside of peak travel times or telework certain days.

Staggered Shifts: Employers provide regular staggered shifts for employees, leading to workplace coverage for longer during the day and reducing trips taken during peak travel times.

Compressed Work Weeks: Employees work longer days, fewer days per week. Longer days increase the chances that commutes will take place outside of peak hours, and fewer work days per week mean fewer trips taken by employees overall.

Costs

There is little direct cost associated with alternative work schedules, but minor costs may be associated with managing work schedules.

Complementary strategies

- Telecommuting
- Congestion Pricing

As seen in the SCAG region

The South Coast Air Quality Management District operates its entire facility on a four-day per week schedule, decreasing commute trips among employees by 20%.

Other employers throughout the region operate similar programs.

Direct Incentives for Non-SOV Travel

Employers and other agencies can encourage non-SOV travel by providing rewards such as financial incentives, gift cards, or entrance into raffles or drawings. Incentives are traditionally provided to employees for commute trips, but can be provided for all trips by larger public agencies.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Educational institutions
- Property managers - office, retail, residential

VMT Reduction: ■■■□□

Larger incentives are more effective, as are guaranteed incentives (as opposed to raffles). Employers are often better able to provide sufficient incentives on a site level

Public Agencies / Transportation Providers

- Municipalities
- Transit Agencies
- County transportation authorities
- Regional government/MPOs

VMT Reduction: ■■■□□

Public agencies are less likely to provide ongoing direct incentives, which are more effective.

Other stakeholders

Students

TNCs

Employees

ETCs

Benefits →

- Successful incentives reduce SOV trips, VMT and congestion
- Incentives are a benefit or work retention tool for employers

Challenges →

- Most programs require travelers to log trips daily
- Difficult to prove validity of logged trips

Measurement

Outcomes

- Number of participants in incentive programs
- Number of incentives provided

Impacts

- Trips reduced
- Mode split

Methods

- Survey results
- Trip data from platforms or recorded by employers

Congestion impacts

Incentives can reduce congestion by encouraging non-SOV travel.

Implementation tips

To create behavior change, incentives must be high enough to influence the target group.

Incentives are often monitored and distributed through trip-logging platforms which often require users to self-report their trips.

Some programs provide incentives for TNC trips, which may reduce VMT if trips are used for a first or last mile connection to transit or used in a shared capacity. Incentives can also be used to target SOV commuters who used to commute via a non-SOV mode.

Costs

Costs include cost of the incentives themselves, the subscription, purchase, or development of tracking tool, overall program management, the administration of incentives, and any tools used to support the program.

Complementary strategies

- Subsidization of non-SOV travel
- Marketing campaigns
- Mobility as a Service provision

As seen in the SCAG region

IE Commuter, the regional rideshare program for Riverside and San Bernardino Counties, provides incentives of up to $5 per day for the first three months that new non-SOV commuters log their trips on their platform.

Subsidization of Non-SOV Travel

Employers and other agencies can encourage non-SOV travel by subsidizing the cost of carpooling, vanpooling, transit or first/last mile trips.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Educational institutions
- Property managers - office, residential

VMT Reduction:

Impact varies based on subsidy amount.

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- County transportation authorities
- Regional government/MPOs

VMT Reduction:

Impact varies based on subsidy amount and populations targeted.

Other stakeholders

Employees

ETCs

Students

Benefits →

- Reduces SOV trips, VMT and congestion
- Subsidized travel is a benefit or work retention tool for employers
- Increases transit ridership (if targeted at transit)

Challenges →

- Subsidies provided by transit agencies can result in a decrease of revenue if not recaptured by increased ridership
- Programs can be costly, particularly for small employers

Measurement

Outcomes

- Number of participants registered to receive subsidies

Impacts

- Transit ridership
- VMT reduced

Methods

- Survey results
- Transit ridership data
- Data from first/last mile providers

Congestion impacts

Increased use of non-SOV modes through travel subsidization will reduce congestion.

Implementation tips

Travel subsidies can take place through reimbursements or through formal programs reducing the cost of travel. Many transit agencies and TNCs (often used for first/last mile trips or to provide Guaranteed Rides Home) provide the option for employers to cover all or part of the cost of their service for their employees.

Costs

Costs include cost of the subsidies, as well as the cost of administering subsidy programs on both the employer/property manager/TMA side and the side of the transit provider.

Complementary strategies

- Direct incentives for non-SOV travel
- Marketing campaigns
- Mobility as a Service provision

As seen in the SCAG region

Los Angeles Metro's U-Pass Pilot Program subsidizes the cost of monthly transit passes for university students, and facilitates the process by allowing students to purchase passes through their universities.

Guaranteed Ride Home Programs

Guaranteed Ride Home Programs (sometimes referred to as "Emergency Ride Home" or "Guaranteed Return Trip") provide complimentary door-to-door travel to commuters who use non-SOV modes but need to leave early, late or quickly due to unforeseen circumstances. This strategy addresses primarily commute trips for employees.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Property managers - office, residential

VMT Reduction:

Guaranteed Ride Home programs are a staple of any employee commute program. Employers and TMAs can provide up-front payment for employees.

Public Agencies / Transportation Providers

- Municipalities
- County transportation authorities
- Regional government/MPOs
- Transit agencies

VMT Reduction:

On a larger scale, municipal and regional organizations are more likely to be able to reimburse rides rather than provide up-front payment.

Other stakeholders

Employees

TNCs, taxis and rental car companies

Benefits →

- Increases desirability of non-SOV commute modes
- Rewards those who already use non-SOV modes

Challenges →

- Has the potential to be costly
- Is difficult to enforce on a municipal or regional level
- Employees enrolled in "reimbursement" style programs may not be able to pay up-front costs

Measurement

Outcomes

- Number of enrolled users
- Number of trips taken

Impacts

- Mode split or VMT across those who have access to the program

Methods

- Survey results

Congestion impacts

Guaranteed ride home programs indirectly impact congestion by encouraging non-SOV travel

Implementation tips

Some Guaranteed Ride Home programs provide free rides to participants up front through agreements with taxi, TNC and rental car companies, while others reimburse participants for the cost of their ride after the fact.

Costs

Cost per trip varies by trip length. Cost of program management varies by number of participants enrolled in and actively using the program.

Complementary strategies

- Carpool coordination
- Vanpool coordination
- Subsidization of non-SOV travel

As seen in the SCAG region

Through **Ridematch.info and IE Commuter,** County Transportation Authorities in Los Angeles, Orange, Riverside, San Bernardino and Ventura counties guarantee reimbursed rides home for employees who work with their partner employers throughout their counties.

Some private employers throughout the SCAG Region provide pre-paid rides through TNCs for employees who sign up for programs ahead of time and travel by non-SOV mode at least three days per week.

Mobility as a Service Provision (MaaS)

Mobility as a Service describes the process of allowing users to consume multiple aspects of transportation service through a single platform. It facilitates trip planning, payment and multimodal travel, so users can plan, hail or access, and pay for trips all in one place.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- TNCs
- Private transportation providers
- Regional governments/MPOs
- County transportation authorities

VMT Reduction:

MaaS has the potential to be very impactful as it will change the manner in which trips are planned, scheduled and paid for.

Other stakeholders

- Web and app developers
- Micromobility users
- Transit riders
- TNC riders

Benefits →

- Increases visibility of non-SOV modes through inclusion in the trip planning process
- Facilitates multimodal travel, decreasing need for SOV trips

Challenges →

- Public/private partnerships can be difficult to navigate
- Technology is evolving rapidly, and few industry standards have been set
- MaaS is difficult to implement as a public service.

Measurement

Outcomes

- Number of users
- Number of trips planned

Impacts

- Number of non-SOV trips taken
- VMT reduced

Methods

- Data received from MaaS providers

Congestion impacts

Mobility as a Service has the potential to reduce congestion by facilitating easier multimodal and non-SOV travel.

Implementation tips

Mobility as a Service tools are being developed and expanded at a rapid pace. Groups like the MaaS Alliance in Europe are convening public and private agencies to make further advancements in the MaaS field.

MaaS often involves TNC trips, which may reduce VMT if trips are used for a first or last mile connection to transit or used in a shared capacity.

Costs

Costs are difficult to predict as technology is constantly changing.

Complementary strategies

- Dockless/mobility/new mobility programs
- Bicycle transit integration
- Private shared transportation/ shuttles
- Subsidization of non-SOV travel

Carshare Provision

Carshare, or vehicles that are available for shared use, allow users to access a vehicle when it is needed decreasing the necessity for them to own their own vehicles.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Educational institutions
- Property managers - office, residential, retail

VMT Reduction: ■■□□□

Carshare on a site should be combined with other TDM strategies to be successful.

Public Agencies / Transportation Providers

- Municipalities
- Regional government/MPOs

VMT Reduction: ■■□□□

Easy access to affordable carshare in public spaces may encourage car-free lifestyles.

Other stakeholders

- Students
- Parking lot owners/operators
- Planning and engineering departments
- Employees
- Carshare companies
- Residents
- Developers/ property managers

Benefits →

- Reduces need for car ownership
- May reduce VMT from commuters who use carshare for lunchtime errands
- May reduce emissions if car fuel is alternative fuel source
- May be used as first, last mile strategy

Challenges →

- May still contribute to SOV travel
- May require dedicated curb space/ parking and revenue guarantees from vendors
- Cars need to be fueled for convenience
- May cause security issues, such as theft and vandalism

Measurement

Outcomes

- Number of people registered to use service
- Number of vehicles available

Impacts

- Rate of car ownership
- Mode split across all trips among users

Methods

- Survey results

Congestion impacts

A decrease in car ownership may result in decreased congestion.

Implementation tips

Carshare can be provided by the private sector at specific sites such as office buildings, apartment complexes or retail centers, or on-street for public use by public agencies.

Costs

Carshare companies often have the ability to charge partnering agencies, consumers, or a combination of the two for use of their vehicles. Cost is typically based on the amount of time that vehicles are reserved or in use.

Complementary strategies

- Marketing campaigns
- Educational events
- Guaranteed ride home programs

As seen in the SCAG region

The City of Los Angeles operates the "Blue LA" program, providing low- cost electric carshare vehicles in low-income neighborhoods within the City. It is aiming to expand to 300 cars and 100 stations by 2024.

Provision of or Proximity to Amenities

If employees have access to amenities on-site or within walking distance, they are less likely to use their vehicles to make a lunchtime trip, which reduces VMT, and may be less likely to need vehicles to make stops on their way to or from work, making non-SOV options more viable.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Educational institutions
- Property managers - office, retail, residential

VMT Reduction:

Impacts vary based on extent and accessibility of amenities.

Developers

- Developers - office, residential, retail

VMT Reduction:

Impacts vary based on extent and accessibility of amenities.

Other stakeholders

- Students
- Developers
- Employees
- Planning and engineering departments
- Residents

Benefits →

- Reduce need for SOV trips
- Increases attractiveness to potential tenants and employees
- Makes new development more marketable

Challenges →

- Ability to provide amenities subject to municipal regulation and zoning code
- May be expensive, particularly for smaller employers

Measurement

Outcomes

- Number and quality/ usefulness of amenities
- Use of amenities

Impacts

- Rate of car ownership among tenants/ employees
- Mode split across all trips among tenants/ employees

Methods

- Results from walk audits
- Lease information from property managers

Congestion impacts

A decrease in SOV trips for lunchtime and peak hour travel will reduce congestion.

Implementation tips

This strategy can be implemented on many levels at many stages. Developers can build space for multiple uses, large employers can often provide amenities on-site, and small employers can choose to locate where amenities are easily accessible.

Costs

Costs will vary extensively based on the manner in which this strategy is implemented.

Complementary strategies

- Pedestrian infrastructure improvements
- Marketing campaigns
- Direct incentives for non-SOV travel
- Wayfinding upgrades

As seen in the SCAG region

The Warner Center Towers office park in the San Fernando Valley provide on-site amenities for their tenants such as a cafeteria, restaurants, on-site banking, dry cleaning, and a gym. The property manager views these amenities as a tool to attract new tenants.

Riverside County hosts a weekly farmers market outside the County offices with fresh produce and lunch foods.

Employee Commute Programs

Employee Commute Programs are operated by employers, who utilize requirements and incentives to discourage SOV travel and encourage the use of alternate modes among their employees.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Property managers - office, retail
- TMAs/TMOs

VMT Reduction:

Employers can provide impactful programs that are tailored specifically to their worksites.

Public Agencies / Transportation Providers

- Municipalities
- County transportation authorities
- Regional government/MPOs

VMT Reduction:

Employer programs can be difficult for public agencies to support in a large area since programs need to be customized to each individual site.

Other stakeholders

Employees

ETCs

Benefits →

- Encourages non-SOV travel
- Programs operated by municipalities or TMAs reduce administrative burden of ETCs and financial burden of employers

Challenges →

- Requires administrative commitment
- Programs built to support all employers in municipality or region may be less effective than individual programs, and may discourage the development of individualized programs

Measurement

Outcomes

- Number of employers providing programs
- Number of employees participating in programs

Impacts

- Average Vehicle Ridership among employers providing programs
- Commute mode split among employees

Methods

- Survey results
- Data reported to comply with TDM regulations affecting employers (i.e. SCAQMD's Rule 2202)

Congestion impacts

Employee Commute Programs encourage alternative modes and/or trip reduction during peak hours, resulting in decreased congestion.

Implementation tips

The most successful Employee Commute Programs utilize a variety of strategies to encourage non-SOV travel. It is helpful to promote the program heavily to new employees before they have built up a habit of driving alone. All employer-provided incentives and programs should be organized within the Employee Commute Program.

Successful programs also make use of regular monitoring and evaluation to understand which services are successful in shifting behavior and which are not. This minimizes the risk of investing financially in unsuccessful strategies.

Costs

Costs will vary depending on size and scope of the program. Participation in TMA or public agency provided programs can reduce costs for employers.

Complementary strategies

- Marketing campaigns
- Direct incentives for non-SOV travel
- Carpool coordination
- Vanpool coordination
- TMAs/TMOs
- Telework and alternative work schedules

As seen in the SCAG region

County Transportation Authorities throughout the SCAG Region assist employers across their respective counties with their commute programs. They provide support to ETCs and directly to employees through tools like their commuter calculator and rideshare platform.

TMAs/TMOs

Transportation Management Associations or Organizations (TMAs/TMOs) are entities that promote and advocate for all forms of non-SOV travel. They are localized and provide service to a specific municipality, community, district or corridor.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Property managers - residential, office, retail

VMT Reduction: ■■■□□

Impact varies based on budget and service offering.

Public Agencies / Transportation Providers

- Municipalities
- Regional Government/MPOs

VMT Reduction: ■■■□□

Impact varies based on budget and service offering.

Developers

- Developers - office, residential, retail

VMT Reduction: ■■■□□

Partnerships between TMAs and developers can further TDM regulation.

Other stakeholders

- Employees
- Developers/ property managers
- Residents

Benefits →

- Facilitates employee commute programs
- Assists with regulation compliance, including facilitation of the SCAQMD Rule 2202 survey process for employers
- Helps to reduce congestion and improve air quality
- Advocates for improved transportation options and access to area

Challenges →

- It can be difficult to show direct impact on congestion and VMT reduction
- May require ongoing investment
- Success relies heavily on TMA/TMO programming

Measurement

Outcomes

- Number of TMAs in the region
- Number of TMA members

Impacts

- Average Vehicle Ridership and mode split among TMA members

Methods

- Survey results

Congestion impacts

TMAs can support congestion reduction through various forms of education and advocacy.

Implementation tips

Traditionally, TMAs and TMOs worked exclusively with employers to reduce SOV commute trips. TMAs can take many forms, however, and now often work closely with residents and visitors in their service areas to promote non-SOV travel and provide information and education.

When developing programming and services for TMAs/TMOs, consideration should be given to current programs offered by employers or county agencies.

Costs

Costs associated with developing a TMA or TMO often include research and data analysis to understand the most successful structure and programmatic offering for the organization. Once the organization has launched, costs vary by structure. Some TMAs are funded strictly through membership dues, and others through public subsidies. Many are funded with a combination of both.

Complementary strategies

- Marketing campaigns
- Educational events

As seen in the SCAG region

The SCAG Region is home to ten TMAs and TMOs, the majority of which are located in Los Angeles County. **Los Angeles Metro** convenes the Los Angeles County TMAs regularly to allow them to share knowledge and provide support to each other.

Commuter Tax Benefits

Federal code (Section 132(f) of the Internal Revenue Code) allows employers to provide tax-exempt funds to commuters for parking, transit and vanpool. These are considered to be tax-free benefits rather than employee wages, so employers also save on payroll taxes.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers

VMT Reduction: ■■□□□

Programs are more impactful when combined with other TDM strategies.

Public Agencies / Transportation Providers

- Federal Government

VMT Reduction: ■■□□□

The program is more impactful in localities where employers are required to provide this benefit.

Other stakeholders

Employees

Commuter benefit companies

Benefits →

- Encourages transit and vanpool travel by reducing costs
- Employers save money by removing funds from payroll, employees save money by not paying taxes on those funds.
- Potential reduction in VMT

Challenges →

- Requires small administrative and financial commitment from employer
- Government is not receiving tax on funds used
- If parking benefit is provided, it may encourage SOV behavior
- Employers may not know how to implement programs

Measurement

Outcomes

- Number of employers enrolled in the program

Impacts

- Number of employees receiving the benefit to purchase non-parking expenses

Methods

- Survey results
- Data from employers

Congestion impacts

Reduced cost of using non-SOV modes should reduce congestion.

Implementation tips

The regulation surrounding the Commuter Tax Benefit may change. The Association for Commuter Transportation is a valuable resource for employers who want more information.

Costs

There are minimal costs involved for employers who wish to provide the benefit by partnering with a vendor.

Complementary strategies

- Transit improvements
- Vanpool coordination

As seen in the SCAG region

Signed by the governor in 2018, **Los Angeles Metro** sponsored state Assembly Bill 2548 which required Los Angeles County employers with 50-249 employees to provide a commuter benefit to their employees.

Pedestrian Infrastructure Improvements

Pedestrian Infrastructure Improvements include developing pedestrian facilities to reduce motorized vehicle use for short (<1/2 mile) all–purpose trips, as well as connections to transit

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Regional government/MPOs

VMT Reduction:

It can be difficult to measure direct impact on VMT from pedestrian improvements, but SOV trips replaced will reduce VMT.

Developers

- Developers - office, retail, residential

VMT Reduction:

It can be difficult to measure direct impact on VMT from pedestrian improvements, but SOV trips replaced will reduce VMT.

Other stakeholders

- Residents
- Public Health Departments
- Planning and engineering departments
- Local pedestrian advocates

Benefits →

- Improves public health for area
- Improves air quality for area
- Reduces congestion
- Improves access to development
- Contributes to neighborhood attractiveness

Challenges →

- May not be effective for some communities
- Requires investment by developers or municipalities

Measurement

Outcomes

- Decrease in accidents involving pedestrians
- Number of improvements made
- Dollars spent on improvements

Impacts

- Mode split: number of pedestrians

Methods

- Results from walk audits
- Community feedback
- Volume counts

Congestion impacts

Shifting short trips from driving to walking can decrease local congestion.

Implementation tips

Pedestrian improvements should aim to make walking safer and more pleasant. They can take many forms, including:

- Sidewalk widening
- Traffic signal adjustments
- Pedestrian scrambles
- Leading Pedestrian Intervals (LPIs)
- Planting of street trees and lights
- Inclusion of ground level retail

Costs

Costs vary by project, but include projects as extensive as sidewalk widening or ADA compliance, as well as smaller ones such as installation of amenities such as benches, lighting and foliage.

Complementary strategies

- Safe Routes to School programs
- Bicycle improvements

As seen in the SCAG region

In an effort to improve safety for pedestrians, many cities in the SCAG region, including the **City of Long Beach** and the **City of Riverside**, have instituted pedestrian scrambles at heavily trafficked intersections.

Bicycle Infrastructure Improvements

Bicycle Infrastructure Improvements include developing facilities that support trips by bicycle and personal mobility devices such as electric scooters to reduce motorized vehicle use for short (< 3 mile) and medium trips (<5 miles).

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Regional government/MPOs

VMT Reduction:

It can be difficult to measure direct impact on VMT from bicycle improvements, but SOV trips replaced will reduce VMT.

Developers

- Developers - office, retail, residential

VMT Reduction:

It can be difficult to measure direct impact on VMT from bicycle improvements, but SOV trips replaced will reduce VMT.

Other stakeholders

- Residents
- Public Health Departments
- Planning and engineering departments
- Bicycle education organizations

Benefits →

- Improves public health for area
- Improves air quality for area
- Reduces congestion
- Improves access to development projects
- Contributes to neighborhood attractiveness
- Improves safety of bicycle riders

Challenges →

- Some roadways may require widening or innovative solutions to be effective
- May involve utility relocation
- Requries investment by developers or municipalities

Measurement

Outcomes

- Number of improvements made
- Dollars spent on improvement
- Miles of bike lanes

Impacts

- Mode split: number of bicyclists

Methods

- Bicycle count data

Congestion impacts

Road diets can improve traffic flow, reduce collisions and reduce congestion.

Implementation tips

Bicyclist safety should be considered when implementing bicycle infrastructure improvements. For example, bike lanes should be wider if they are located next to parking to avoid collisions between bicyclists and doors of parked cars.

Costs

Cost may include road striping for bicycle lanes or more involved infrastructure changes such as separated bike lanes or bike paths.

Complementary strategies

- Wayfinding upgrades
- Safe Routes to School programs
- Pedestrian infrastructure improvements
- Bicycle transit integration

As seen in the SCAG region

The **MyFigueroa** project in Los Angeles has been designed to make a busy thoroughfare safer for bicyclists, pedestrians, transit riders and drivers. It includes a three-mile bikeway, as well as protected bicycle lanes in some areas.

In the Coachella Valley, the **CV Link** corridor provides a safe alternative to the 111 corridorfor pedestrians, cyclists and low-speed electric vehicles.

Motor Vehicle Restriction Zones

Motor vehicle restriction zones limit motor vehicles in a certain place, either temporarily or permanently.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- Regional government/MPOs

VMT Reduction:

Impact varies by size, location and temporal extent of restriction zone but can be very effective in the long term.

Other stakeholders

- Pedestrians
- Planning and engineering departments
- Bicyclists
- Local businesses

Benefits →

- Enables other modes of transportation in the affected areas
- Defers vehicle trips
- Reduces local emissions
- Can increase safety

Challenges →

- Potential motorist and business opposition
- Can temporarily increase congestion until confusion is resolved
- Can have a negative impact on area vitality if overall access is limited
- May incur political opposition

Measurement

Outcomes

- Number of restricted zones
- Length of restricted roadways
- Number of businesses affected

Impacts

- VMT reduced
- Business earnings/ success

Methods

- Survey results
- Traffic data
- Reports from local businesses

Congestion impacts

When effective, Motor Vehicle Restriction Zones can reduce traffic congestion, road and parking facility costs, crash risk, pollution emissions and local environmental impacts.

Implementation tips

Most vehicle restrictions are implemented by local or regional governments, often as part of a downtown revitalization program or neighborhood traffic management plan, or during a period of exceptional traffic congestion or pollution.

Costs

Costs for temporary events include set up and tear down, as well as security. Costs for permanent restriction zones include the cost of bollards or barriers.

Complementary strategies

- Pedestrian infrastructure improvements
- Safe Routes to School programs
- Transit improvements

As seen in the SCAG region

CicLAvia and **Open Streets** events are examples of temporary Motor Vehicle Restriction Zones, where major streets are closed down on the weekend for active transportation.

Permanent examples include the **3rd Street Promenade** in Santa Monica and **Main Street** in Riverside.

Bicycle Transit Integration

Bicycle Transit Integration includes bicycle infrastructure (e.g. bike racks, bike share options) at transit stations, as well as the ability to bring bicycles on transit through bus bike racks or bicycle areas on rail lines.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- Regional government/MPOs

VMT Reduction:

Impacts of bicycle transit integration can be difficult to measure.

Other stakeholders

- Bicycle education organizations
- Planning and engineering departments
- Bicyclists
- Residents / businesses

Benefits →

- Increases first/last mile connectivity within 3 miles
- Relatively low cost transportation enhancement to deploy

Challenges →

- More effective for longer distances that normally wouldn't be traveled by bicycle alone
- Difficult to ride on rail with bicycles during peak hour transit
- Commonly used trip planners, such as Google Maps, currently have no way of integrating bicycling as a first/last mile mode.

Measurement

Outcomes

- Number of integration projects
- Number of transit stations with bicycle infrastructure

Impacts

- Usage (bike hub parking, bicycle ridership)
- Mode split

Methods

- Survey results
- Bicycle traffic data

Congestion impacts

Bicycle Transit Integration should reduce vehicles on roadways, particularly during peak periods, as well as increase transit ridership.

Implementation tips

Bicycling, combined with transit, increases the effective range of transit users. Bicycle Transit Integration involves providing transit infrastructure (both aboard vehicles and at station areas) that support bicycling.

Costs

Bus racks cost between $500–$1,000 to install. Dedicated spaces on rail cost between $500–$5,000.

Complementary strategies

- Bicycle infrastructure improvements
- Transit improvements
- Dockless/micromobility/new mobility programs

As seen in the SCAG region

Los Angeles Metro provides Bike Hubs at five of their rail stations. Hubs provide secure bike parking and repair stations for bicyclists who want to ride their bikes to and from Metro rail.

Metrolink also provides integration for bicyclists by allowing bicycles on board their trains. Their regular cars can hold up to three bicycles, but most have one car that can hold up to nine.

Dockless/Micromobility/ New Mobility Programs

"Micromobility" and "New Mobility" are blanket terms used to describe shared bike and scooter programs, including both docked and dockless and electric and traditional options.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Regional governments/MPOs
- Transit agencies
- TNCs
- Private transportation companies

VMT Reduction:

Given accurate data collection and careful implementation, this strategy can be an impactful first/last mile solution.

Other stakeholders

Transit riders

MaaS users

Residents

Benefits →

- Expands the reach of first/last mile

Challenges →

- Dockless bikes and scooters can be hazardous if left in places where they block the sidewalk
- Some options require use of a smart phone, creating barriers to use for some

Measurement

Outcomes

- Number of rides taken
- Number of riders using system

Impacts

- Number of rides taken to/ from transit hubs
- Number of riders who would otherwise have driven alone

Methods

- Survey results
- Data collected from micromobility companies

Congestion impacts

The congestion impacts of these services are still yet to be determined. In Portland, OR , a study found that 34% of electric scooter trips would have been taken by car or individual TNC rides. The rest may have switched from other modes such as walking, bicycling and transit.

Implementation tips

Micromobility companies often enter into contracts with individual municipalities in order to operate their bicycles or scooters there. It is important to consider the use of these modes in the context of the broader transportation network for users who travel between municipalities. Similarily, usage data collected by municipalities can be used to influence the planning process regionally and locally.

Costs

As deployment of micromobiity options is currently in pilot phase in most locations, it is difficult to understand cost of operations on either the public or private side.

Complementary strategies

- Bicycle transit integration
- Mobility as a Service provision
- Bicycle infrastructure improvements

As seen in the SCAG region

Many cities within the SCAG Region have contracts with micromobility companies to deploy dockless options. The **City of Santa Monica** has built infrastructure for these options, providing dedicated space for dockless scooter parking.

Private Shared Transportation/Shuttles

Private transportation, such as employee or TMA operated shuttles, provide first/last mile solutions and fill in transit system gaps.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- TMAs/TMOs
- Property managers - office, retail, residential

VMT Reduction:

Depending on the potential pool of employees, shuttles can be a very direct solution to first/last mile challenges and reduce the need for on-site parking.

Public Agencies / Transportation Providers

- Municipalities

Developers

- Developers - office, retail, residential

VMT Reduction:

Larger groups of employers can pool resources to create a shared shuttle, however they should be careful of duplicating exitsing transit sercvice.

Other stakeholders

Tenants

Employees

Residents

Benefits →

- Improves site access
- Pooled services, such as those run by TMAs, are cheaper than a private employer shuttle

Challenges →

- Can be costly for employers
- If not developed correctly, can duplicate transit service

Measurement

Outcomes

- Shuttle ridership

Impacts

- Mode split among those who have access to the service

Methods

- Survey results
- Transit ridership data

Congestion impacts

Shuttle service contributes to non-SOV travel and directly reduces congestion.

Implementation tips

Privately operated shuttles are typically managed by employers (connecting employees to their worksite) or by TMAs (connecting employees to multiple worksites in close proximity to each other). These options can be preferable to transit for some because they will provide service directly to a worksite, when the transit system may not. Sometimes, public agencies will also form partnerships with private operators to provide shuttle service.

Costs

Cost of operating shuttle systems vary by size of the system.

Complementary strategies

- Transit Improvements
- Mobility as a Service Provision

As seen in the SCAG region

In the past, **Worthe Properties** in Burbank operated a morning and evening shuttle between the Downtown Burbank Metrolink station and their office campus. The shuttle was free for tenants and their employees and facilitates their use of non-SOV travel through Metrolink.

Transit Improvements

Improvements to the transit system such as service expansion and capital infrastructure improvements encourage ridership growth.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- Regional government/MPOs

VMT Reduction:

Depending on the magnitude of improvements, from increased frequency to new rail lines, impact can be very high on transit ridership.

Other stakeholders

- Transit riders
- Transit agencies
- Developers/ property managers
- Employees
- Residents / businesses

Benefits →

- Increases transit ridership
- Improves overall network accessibility

Challenges →

- It may be difficult to guage the extent to which improvements will increase ridership
- Improvements may be costly and even with ridership increases, farebox recovery may not offset cost

Measurement

Outcomes

- Number of improvements

Impacts

- Transit ridership
- Mode split

Methods

- Survey results
- Transit ridership data

Congestion impacts

Transit Improvements should reduce vehicles on roadways, particularly during peak periods, as well as increase transit ridership.

Implementation tips

Improvements to the transit system may include:

- optimized routing and increased coverage
- vehicle upgrades to improve comfort and safety
- improvements that contribute to ease of use such as electronic fare payment capabilities
- transit station upgrades, including provision of first/last mile options (e.g. Mobility Hubs)

Costs

Costs will vary depending on the type and scale of system upgrades.

Complementary strategies

- Bicycle Transit Integration
- Subsidization of Non-SOV Travel
- Mobility as a Service Provision
- Dockless/Micromobility/ New Mobility Programs

As seen in the SCAG region

Following the **Next Generation Bus Study**, Los Angeles Metro launched an on-demand rideshare service serving several zones in LA County. The service, **Metro Micro**, uses smaller vehicles than Metro's typical bus fleet and is booked in advance via an app.

Parking Pricing

The price of parking can impact decisions about whether to drive. This strategy can be successful in decreasing congestion in areas with sufficient alternative options, but may decrease access for everyone if alternative options do not exist.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Property managers - office, retail, residential
- Parking lot owners/operators

VMT Reduction:

Parking pricing is one of the most efficient and effective methods to alter trip choice to non-SOV modes in areas where parking is constrained.

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies

VMT Reduction:

Impact varies based on surrounding context, areas with large amounts of free parking may not find this stragegy as effective.

Other stakeholders

- Employees
- Visitors
- Tenants

Benefits →

- Encourages non-SOV travel
- Reduced congestion from circling

Challenges →

- Increase in cost of public parking may be unpopular politically
- Payment systems must be reliable and easy to use
- Enforement can be challenging or costly
- Impact depends on the availability of alternative transportation options

Measurement

Outcomes

- Parking availability

Impacts

- Mode split among travelers by site
- Congestion

Methods

- Survey results
- Traffic data

Congestion impacts

Pricing can directly impact local congestion through removal of circling trips, and overall congestion through shift in travel mode.

Implementation tips

Parking pricing can be used to curb congestion derived from circling and looking for parking spaces. "Dynamic" parking pricing involves raising the cost of parking based on demand, decreasing the likelihood that drivers will circle blocks waiting for the most in-demand spots, and instead encouraging them to travel further away to park for a smaller cost.

Costs

Costs of parking pricing include cost of parking infrastructure and administration involved in determining parking pricing and encorcing parking policies.

Complementary strategies

- Transit improvements
- Mobility as a Service provision
- Parking cash out
- Parking unbundling

As seen in the SCAG region

LA Express Park in Downtown Los Angeles and Hollywood uses demand-based pricing to better match the availability of parking spaces with their demand.

Parking Unbundling

Parking Unbundling describes the process of charging for parking separately from a regular lease for office or residential tenants.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Property managers - office, retail, residential
- Parking lot owners/operators

VMT Reduction:

Similar to Parking Pricing, this strategy can be very impactful depending on the number of people affected by the unbundling policy.

Developers

- Developers - office, retail, residential

VMT Reduction:

Similar to Parking Pricing, this strategy can be very impactful depending on the number of people affected by the unbundling policy.

Other stakeholders

Employees

Tenants

Benefits →

- Can discourage car ownership and car trips
- Reduces employer costs
- Reduces the cost of housing
- For developers, may reduce need to build large amounts of parking

Challenges →

- Developers may need to purchase payment systems
- Requires additional administrative effort for property managers
- Impact depends on the availability of transportation options

Measurement

Outcomes

- Reduction in parking spaces leased

Impacts

- Rate of car ownership among residential tenants
- Mode split among employees

Methods

- Survey results from tenants

Congestion impacts

Unbundling can discourage car ownership, reducing vehicle trips and congestion.

Implementation tips

Parking is expensive to build and maintain, and the cost of that is often translated to those who use buildings indirectly through leases or cost of goods and services. Unbundling parking requires that users consider the cost involved and decide for themselves whether or not to take advantage of it. This encourages residents not to own cars, and employers to charge their employees to park. This is best suited for transit-oriented developments and areas where street parking is priced and free parking is scarce.

Costs

Developers and property managers should not incur costs for parking unbundling.

Complementary strategies

- Parking pricing
- Parking cash out
- Direct incentives for non-SOV travel

As seen in the SCAG region

A study from UCLA determined that the provision of unbundled parking in **Downtown Los Angeles** allowed buildings to target individuals without access to cars, and provide housing for a lower cost.

Source: https://www.jtlu.org/index.php/jtlu/article/view/730

Parking Cash Out

Employer-paid parking subsidizes the cost of driving. By separating the cost of parking from a business, people have incentives to use other modes. Parking Cash Out involves subsidizing non-SOV modes for employees in lieu of providing them access to a parking space.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Small employers
- Educational institutions
- Property managers - office, retail, residential

VMT Reduction:

Parking Cash Out can be successful if marketed and implemented correctly. The state policy in California surrounding Parking Cash Out is not effective due to existence of loopholes and lack of enforcement.

Other stakeholders

- Employees
- Developers/ property managers
- Residents / businesses
- Students

Benefits →

- Encourages non-SOV travel through provision of "extra" money for employees
- Can provide more area for development/business use if business owns parking lot/structure

Challenges →

- Other modes of transportation must be available in order for it to be effective
- Works best when employer leases parking spaces (vs. owning lot)
- Enforcement of policies is challenging
- Employees may park elsewhere

Measurement

Outcomes

- Cash outs provided (number of employees not using parking spaces)

Impacts

- Mode split among employees

Methods

- Survey results
- Parking Data

Congestion impacts

Parking Cash Out can encourage non-SOV travel. A 2017 study by the Virginia Transport Policy Institute states that parking cash out affects employees' automobile commuting by 10-30%.

Implementation tips

Parking cash out rewards employees who choose non-SOV modes, and encourages others to do so. For employers who lease parking spaces individually, this program is essentially free.

Costs

Employers who lease individual parking spaces incur no cost from Parking Cash Out programs. Those who lease spaces in bulk may save money by not being required to purchase additional parking, or may incur the cost of paying out employees who would otherwise have spaces available.

Complementary strategies

- Parking pricing
- Parking unbundling
- Direct incentives for non-SOV travel
- Employee Commute Programs

As seen in the SCAG region

Parking Cash Out is required of all employers in the SCAG Region with the following attributes:

- Over 50 employees
- Have worksites in a nonattainment air basin for any state air quality standard
- Subsidizes employee parking that they don't own
- Can calculate out-of-pocket expense of parking subsidies provided
- Can reduce number of parking spaces without penalty in lease agreements

Parking Facility Design and Curbside Management

The design of parking facilities and management of curb space can influence travel behavior through designating space to non-SOV travel modes rather than personal vehicles.

Implementors

Employers / Property Managers / TMAs

- Large employers
- Property managers - office, retail, residential

VMT Reduction:

Impact depends on travel patterns and available parking/ curb space on site.

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies

VMT Reduction:

Impact depends on travel patterns and availablity of destinations to non-SOV Modes.

Other stakeholders

- Visitors
- Parking lot owners/ operators
- Residents / businesses
- Employees

Benefits →

- Encourages non-SOV Travel

Challenges →

- May decrease ease of access for drivers
- Decrease of individual parking spaces may be unpopular politically

Measurement

Outcomes

- Parking availability
- Use of designated spaces by non-SOV modes

Impacts

- Mode split among travelers by site

Methods

- Survey results
- Traffic Data

Congestion impacts

On private property, facility design to encourage non-SOV modes can reduce overall congestion. In the public realm, curbside management and designated space for non-SOV modes may reduce congestion caused by driver confusion, though may increase congestion slightly due to circling if parking options for drivers are eliminated.

Implementation tips

Employers, property managers, developers and public agencies can encourage non-SOV travel by designating spaces for carpools, vanpools or carshare vehicles and providing curb space for first/ last mile modes such as TNCs and micromobility options.

Monitoring and enforcement of curbside management strategies is key in making sure they are impactful.

Costs

Costs of facility design and curbside management can include signage and painting of parking spaces. Some curbside management may require cutouts or other sidewalk infrastructure improvements. There is also cost involved in enforcing policies.

Complementary strategies

- Transit improvements
- Mobility as a Service provision
- Parking pricing
- Parking unbundling
- Dockless/micromobility/new mobility programs

As seen in the SCAG region

Many employers throughout the SCAG Region provide designated spaces in their parking lots for employees who carpool. Usually, these spaces are in desirable locations, and are monitored and enforced the use of spaces through the use of hang tags for registered carpool riders.

TDM-Supportive Policy

Congestion Pricing

Congestion Pricing is the charging of fees for a vehicle to access certain high congestion areas, either during peak periods or other periods.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Transit agencies
- County transportation authorities
- Regional government/MPOs
- Caltrans

VMT Reduction:

Congestion Pricing has a proven record of reducing traffic and congestion in urban areas. Implementation of the strategy is important given the untested nature of this strategy in the U.S.

Other stakeholders

- Transit riders
- Planning and engineering departments
- TNCs, taxis and rental car companies
- Transit agencies

Benefits →

- Reduces congestion
- Pricing revenue can be used to fund transportation improvements in local area
- Increases reliaility for express bus routes

Challenges →

- Requires strong political leadership, extensive public outreach and education

Measurement

Outcomes

- Vehicles traveling during peak periods or in congested areas

Impacts

- Revenue collected
- VMT reduction
- Passenger throughput

Methods

- Data from tolls or other pricing hardware

Congestion impacts

Congestion pricing will result in targeted reduction in congestion.

Implementation tips

Congestion pricing reduces congestion along a corridor or in an area by discouraging SOV travel though a charge for drivers. Revenue from programs can be put back into a region, municipality or transit agency's transportation system. Investment into public transit or TDM measures in low-income areas can help to offset equity concerns.

Costs

Costs include ITS infrastructure to monitor, charge fees, and enforce violations.

Complementary strategies

- Transit improvements
- Private shared transportation/ Shuttles
- Bicycle infrastructure improvements
- Mobility as a Service Provision

As seen in the SCAG region

SCAG is in the process of developing a plan for a regional **Express Lanes** network and system.

TDM-Supportive Policy

Transit Oriented Development and Non-SOV Supportive Land Use

Land use such as Transit Oriented Development (TOD) can support non-SOV trips by placing travelers in close proximity to the locations they frequent, or to non-SOV modes that take them there easily, such as rail or bus rapid transit lines.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Regional government/MPOs

VMT Reduction:

Implementation of this strategy can greatly increase attractiveness of non-SOV modes to residents and visitors alike

Developers

- Developers - office, retail, residential

VMT Reduction:

Poor implementation of this strategy can displace transit riders for residents that primarily drive.

Other stakeholders

Developers/ property managers

Employees

Residents

Benefits →

- Reduces need for SOV trips
- Reduces need for car ownership
- Reduces parking demand

Challenges →

- TOD supportive policies can be politically unpopular if they allow increases in density
- Impacts on congestion may be difficult to measure
- Development pressure near transit infrastructure can lead to gentrification and displacement of existing, transit dependent users

Measurement

Outcomes

- Number of policies in place
- Number of developments

Impacts

- Number of housing units within 0.5 miles to amenities
- Rate of car ownership among residents

Methods

- Census data

Congestion impacts

Land use policies that support non-SOV trips can reduce congestion, but density can also increase auto congestion.

Implementation tips

Land use strategies that support non-SOV travel include:

- Transit Oriented Development and supportive zoning/regulation
- Mixed-use and denser development form based zoning or design guidelines supportive of pedestrian travel
- Reduction or elimination of parking minimums; and
- Anti-displacement policies.

Costs

Costs include planning and infrastructure investments at transit stations.

Complementary strategies

- Transit improvements
- Private shared transportation/ Shuttles
- Bicycle infrastructure improvements
- Parking unbundling

As seen in the SCAG region

Culver City developed a TOD Visioning Study for the Culver City Station on the Expo Line. They worked with community members to identify walkability constraints in order to ensure the station and its nearby development will be accessible.

Image source: www.ulvercity.org

TDM-Supportive Policy

TDM Ordinance and Policy Development

TDM ordinances typically require developers or employers to provide TDM strategies at their site or workplace to mitigate the congestion caused by trips to and from their sites.

Implementors

Public Agencies / Transportation Providers

- Municipalities
- Regional government/MPOs

VMT Reduction:

TDM Ordinance impacts can very depending on how the policies are written, implemented and enforced. Availability and quality of non-SOV modes can also effect ultimate impact.

Other stakeholders

Developers/ property managers

Employees

Residents

Benefits →

- Reduces need for SOV trips
- Reduces need for car ownership
- Informs developers and employers of TDM options

Challenges →

- TDM policies can be politically unpopular
- Impacts on congestion may be difficult to measure

Measurement

Outcomes

- Number of municipalities with active policies in place
- Number of developments or employers subject to policies

Impacts

- Mode split, VMT, or AVR among those sites affected by policies

Methods

- Survey results

Congestion impacts

TDM policy encourages non-SOV travel, which reduces congestion.

Implementation tips

While TDM requirements are often included for developers during a project's initial stages, these requirements are difficult to enforce after projects have been sold. Polices aimed at users of sites, such as employers or property managers, are often more successful in influencing the implementation of TDM strategies. Some policies require the surveying of employees or tenants annually, which provides data on travel habits.

Costs

Initial costs include planning for and development of policies. Ongoing costs include administrative staff time necessary to enforce the policy.

Complementary strategies

- Employee commute programs
- Marketing campaigns
- Educational events

As seen in the SCAG region

The **South Coast Air Quality Management District's Rule 2202** affects employers of four counties in the SCAG Region. The rule requires employers with 250 or more employees to mitigate the emissions produced from their employees' commutes by paying into a fund, purchasing emission reduction credits, or providing TDM programs on site.

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