PERFORMANCE MEASURES APPENDIX

REGIONAL TRANSPORTATION PLAN
2012–2035
SUSTAINABLE COMMUNITIES STRATEGY
Towards a Sustainable Future
RTP

Southern California Association of Governments

ADOPTED APRIL 2012

PERFORMANCE MEASURES

Introduction

The 2012–2035 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) is a performance-based plan, and this technical appendix expands upon the performance results presented in Chapter 5 of the RTP/SCS main document. The performance measures are used to evaluate how well the RTP/SCS addresses the adopted goals and performance outcomes. SCAG encourages, but does not require, agencies to be consistent with the RTP/SCS performance measures to the extent practical in their subregional and project-level planning studies.

SCAG has a relatively long history of using performance measurement in developing the RTP, going back to the 1998 RTP. For the 2004 RTP, SCAG developed a set of measurable goals and outcomes that included the principal of sustainability, which is not limited only to the environment and the transportation-land use connection, but also has important implications on how the region meets its critical system preservation needs.

SCAG has been committed to building on past successes by refining and enhancing performance measures to meet the region's expanding policy outcomes. In the Spring of 2011, the SCAG Plans and Programs Technical Advisory Committee (P&P TAC) formed a subcommittee to review and expand performance measures as needed for the 2012–2035 RTP/SCS. The subcommittee reviewed other performance measurement studies from around the state and relied on extensive feedback from regional stakeholders and advocacy groups, including:

- American Lung Association (with a health coalition of 11 other organizations),
- Gateway Cities Council of Governments (GCCOG),
- Los Angeles County Metropolitan Transportation Authority (Metro),
- National Resources Defense Council (NRDC) and Move LA,
- Orange County Transportation Authority (OCTA),
- San Bernardino Associated Governments (SANBAG),
- South Bay Cities Council of Governments (SBCCOG), and
- Southern California Safe Routes to School Network and Los Angeles County Bicycle Coalition.

With this input, SCAG developed revised performance goals, outcomes, and supporting performance measures. Major changes to the 2012–2035 RTP/SCS goals include a focus on outcomes that strengthen the land-use transportation connection and the physical health of the region's residents. In September 2011, the P&P TAC-recommended goals and outcomes for the RTP/SCS were presented to the Transportation Committee of the Regional Council. The Regional Council will formally adopt the goals and outcomes as part of the final 2012–2035 RTP/SCS. The 2012–2035 RTP/SCS goals are listed in **TABLE 1**.

TABLE 1 RTP Goals

RTP Goals
▪ Align the plan investments and policies with improving regional economic development and competitiveness
▪ Maximize mobility and accessibility for all people and goods in the region
▪ Ensure travel safety and reliability for all people and goods in the region
▪ Preserve and ensure a sustainable regional transportation system
▪ Maximize the productivity of our transportation system
▪ Protect the environment and health for our residents by improving air quality and encouraging active transportation (non-motorized transportation, such as bicycling and walking)
▪ Actively encourage and create incentives for energy efficiency, where possible
▪ Encourage land use and growth patterns that facilitate transit and non-motorized transportation
▪ Maximize the security of the regional transportation system through improved system monitoring, rapid recovery planning, and coordination with other security agencies

The P&P TAC also reviewed the RTP guiding policies that help to focus future investments on the best-performing projects and strategies that seek to preserve, maintain, and optimize the performance of the existing system policies (see Chapter 1 of the RTP/SCS main document for a detailed discussion of these system policies). The first of those policies states that "transportation investments shall be based on SCAG's adopted Regional Performance Indicators."

The 2012–2035 RTP/SCS recognizes that two general types of performance measures are needed. One type of measure relies on readily available data that can be forecasted into the future, and can be used for evaluating 2012–2035 RTP/SCS alternatives. A second type of measure is valuable for on-going system monitoring. This type of measure typically cannot be readily forecast, but allows the region to monitor how well goals are being met. In this group are additional measures that will be investigated for future integration into SCAG's performance monitoring efforts when data becomes available to reliably use the measure.

The regional performance outcomes and associated measures are presented in **TABLES 2** and **3** below. **TABLE 2** lists the outcomes and measures used to forecast performance using the SCAG Regional Travel Demand Model (RTDM). **TABLE 3** shows the additional measures that will be used for on-going monitoring of the transportation system. Each measure will be discussed below with results presented where data is available.

In addition to enhancements to existing measures from the 2008 RTP, two new outcomes have been included in the 2012–2035 RTP/SCS: location efficiency and public health. The location efficiency outcome reflects the degree to which improved land use and transportation coordination measures impact efficient movement of people and goods. The health outcome captures the physical well-being of residents in Southern California by monitoring access to parks and open space as well as transportation related pollution impacts on asthma and pre-mature deaths.

Note that some regionally important measures are discussed in other areas of the RTP. Transportation market measures (e.g., mode shares, vehicle and truck demand) are discussed in the mode-specific technical appendices. Other measures (e.g., percent funding used for transit and non-motorized transportation) are addressed as part of the investment allocations descriptions in the RTP financial plan.

In the discussion of performance and outcomes, three scenarios are referenced: Base Year, Baseline, and Plan. The 2008 Base Year represents existing conditions, and is based on the transportation system on the ground and in service in 2008. The 2035 Baseline assumes current land use trends and represents a future in which only committed programs and projects are implemented, based on projects in the 2011 Federal Transportation Improvement Program (FTIP) that have received environmental clearance. The 2035 Plan represents future conditions in which the 2012–2035 RTP/SCS investments and strategies are fully realized. The specific projects associated with Baseline and Plan are identified in the 2012–2035 RTP/SCS Project List report.

TABLE 2 2012 RTP Outcomes and Performance Measures/Indicators

Outcome	Performance Measure/ Indicator	Definition	Performance Target	Data Sources Used
Location Efficiency	Share of growth in High Quality Transit Areas (HQTAs)	Share of the region's growth in households and employment in HQTAs	Improvement over No Project Baseline	Census (including annual American Community Survey), InfoUSA
	Land consumption	Additional land needed for development that has not previously been developed or otherwise impacted, including agricultural land, forest land, desert land, and other virgin sites	Improvement over No Project Baseline	Rapid Fire Model
	Average distance for work or non-work trips	The average distance traveled for work or non-work trips separately	Improvement over No Project Baseline	Travel Demand Model
	Percent of work trips less than 3 miles	The share of total work trips which are fewer than 3 miles	Improvement over No Project Baseline	Travel Demand Model
	Work trip length distribution	The statistical distribution of work trip length in the region	Improvement over No Project Baseline	Travel Demand Model

Outcome	Performance Measure/ Indicator	Definition	Performance Target	Data Sources Used
Mobility and Accessibility	Person delay per capita	Delay per capita can be used as a supplemental measure to account for population growth impacts on delay	Improvement over No Project Baseline	Travel Demand Model
	Person delay by facility type (mixed flow, HOV, arterials)	Delay – excess travel time resulting from the difference between a reference speed and actual speed	Improvement over No Project Baseline	Travel Demand Model
	Truck delay by facility type (Highway, Arterials)	Delay – excess travel time resulting from the difference between a reference speed and actual speed	Improvement over No Project Baseline	Travel Demand Model
	Travel time distribution for transit, SOV, HOV for work and non-work trips	Travel time distribution for transit, SOV, HOV for work and non-work trips	Improvement over No Project Baseline	Travel Demand Model
Safety and Health	Collision/accident rates by severity by mode	Accident rates per million vehicle miles by mode (all, bicycle/pedestrian and fatality/killed)	Improvement over Base Year	CHP Accident Data Base, Travel Demand Model Mode Split Outputs
	Criteria pollutants emissions	CO, NO_X, $PM_{2.5}$, PM_{10}, and VOC	Meet Transportation Conformity requirements	Travel Demand Model /ARB EMFAC Model
Environmental Quality	Criteria pollutant and greenhouse gas emissions	CO, NO_X, $PM_{2.5}$, PM_{10}, and VOC Per capita greenhouse gas emissions (CO_2)	Meet Transportation Conformity requirements and SB 375 per capita GHG reduction targets	Travel Demand Model /ARB EMFAC Model
Economic Well Being	Additional jobs supported by improving competitiveness	Number of jobs added to the economy as a result of improved transportation conditions which make the region more competitive	Improvement over No Project Baseline	Regional Economic Model REMI
	Additional jobs supported by transportation investment	Total number of jobs supported in the economy as a result of transportation expenditures	Improvement over No Project Baseline	Regional Economic Model REMI
	Net contribution to Gross Regional Product	Gross Regional Product due to transportation investments and increased competitiveness	Improvement over No Project Baseline	Regional Economic Model REMI
Investment Effectiveness	Benefit/Cost Ratio	Ratio of monetized user and societal benefits to the agency transportation costs	Greater than 1.0	California Benefit Cost Model
System Sustainability	Cost per capita to preserve multi-modal system to current and state of good repair conditions	Annual costs per capita required to preserve the multi-modal system to current conditions	Improvement over Base Year	Estimated using SHOPP Plan and recent California Transportation Commission 10-Year Needs Assessment

HOV = high occupancy vehicle, SOV = single occupancy vehicle

TABLE 3 2012–2035 RTP/SCS Outcomes and Performance Measures/Indicators for On-Going Monitoring

Outcome	Performance Measure/ Indicator	Definition	Performance Target	Data Sources Used
Location Efficiency	Annual household transportation cost	Annual household spending on transportation Including costs of vehicle ownership, operation and maintenance, and public transportation	Improvement over Base Year	Center for Neighborhood Technology
	Daily amount of walking and biking related to work and non-work trips	New measure, but further research needed	Improvement over Base Year	N/A
	Annual household energy use (transportation + space heating)	Annual household energy consumption in transportation and residential uses	Improvement over Base Year	Pending availability of data
	Annual household water consumption	Annual household water consumption in number of gallons	Improvement over Base Year	Pending availability of data
	Number of acres of parks/open space for every 1,000 residents	Number of parks (including beach parks and developed local and regional parks) for every 1,000 residents	Improvement over Base Year	SCAG GIS database
	Share of growth in High Quality Transit Areas	Share of the region's households and employment in High Quality Transit Areas	Improvement over Base Year	SCAG GIS database
	Percent of households with walk access to neighborhood services	New measure, but further research needed	Improvement over Base Year	N/A
	Percent of existing and new below-market rental housing units in Transit Oriented Development (TOD) area	New measure, but further research needed	Improvement over Base Year	N/A
	Percent of income spent on housing and transportation	The share of household income spent on both housing and transportation	Improvement over Base Year	U.S. Bureau of Labor Statistics and American Community Survey
	Percent of jobs within 15 minutes' walk of transit	Pending availability of data	Improvement over Base Year	N/A
	Percent of population within ½ mile (or 10 minute walk) of high frequency transit stop (every 10 minutes during peak periods)	Pending availability of data	Improvement over Base Year	SCAG GIS database
	Percent of residents within ½ mile walk to parks and open space	Pending availability of data	Improvement over Base Year	N/A

Outcome	Performance Measure/ Indicator	Definition	Performance Target	Data Sources Used
Mobility and Accessibility	Highway non-recurrent delay for mixed flow and high occupancy lanes	Delay that is caused by accidents, incidents, weather, planned lane closures, special events, or other atypical traffic patterns	Improvement over Base Year	Caltrans Performance Measurement System (PeMS)
Reliability	Variability of travel time for auto	Day-to-day change in travel times experienced by auto travelers	Improvement over Base Year	Caltrans Performance Measurement System (PeMS)
	Variability of travel time for trucks	Day-to-day change in travel times experienced by trucks	Improvement over Base Year	Caltrans Performance Measurement System (PeMS)
Safety and Health	Collision/accident rates by severity by mode	Injury and fatality rates per million vehicle miles	"0" for all accident types and modes	Caltrans Performance Measurement System (PeMS), Traffic Accident Surveillance and Analysis System (TASAS)
	Asthma incidence and exacerbations	The share of population in the region who are ever diagnosed with asthma	Improvement over Base Year	California Health Interview Survey
	Percent of households living >65 decibels noise	New measure, but further research needed	Improvement over Base Year	N/A
	Percent of households living <500 feet from high-volume roadways	The share of total households that live within 500 feet from a high volume roadway which is defined as traffic volume of over 100,000 vehicles per day in urban areas and 50,000 vehicles per day in rural areas.	Improvement over Base Year	SCAG GIS database
	Pre-mature deaths due to $PM_{2.5}$	The number of pre-mature deaths due to long-term population exposure to $PM_{2.5}$ which is estimated from monitored or modeled concentration of $PM_{2.5}$	Improvement over Base Year	California Air Resources Board
	Percent of residents within ½ mile walk to parks and open space	New measure, but further research needed	Improvement over Base Year	N/A
Productivity	Lost lane miles for highways, percent seat miles utilized for transit	Percent utilization during peak demand conditions	Improvement over Base Year	N/A
Environmental Quality	Ambient air quality conditions	The existing condition of air quality in the various air basins	Improvement over Base Year	Pending availability of data

The following sections describe each of the performance outcomes in detail along with the associated performance measures. The first section discusses the performance outcomes and measures used to evaluate alternatives and to forecast the performance of the system as a result of implementing the 2012–2035 RTP/SCS. The second section discusses the outcomes and measures used for on-going system monitoring.

RTP/SCS Alternatives Analysis Measures

Location Efficiency

This is a new outcome for the 2012–2035 RTP/SCS. This outcome has several associated performance measures that reflect the impact of improved land use and transportation coordination in support of the Sustainable Community Strategies (SCS) required under SB 375.

This outcome reflects the degree to which improved land use and transportation coordination measures impact the efficient movement of people and goods. The measures used to describe this outcome include:

- Share of growth in High Quality Transit Areas,
- Land consumption (total and per capita),
- Average distance for work and non-work trips,
- Percent of work trips less than three miles, and
- Work trip length distribution.

There are several additional measures that will be used for on-going monitoring, and these will be discussed in the technical appendix.

SHARE OF GROWTH IN HIGH-QUALITY TRANSIT AREAS (HQTA)

This is a new measure for the 2012 RTP, and it will also be used in an on-going manner to assess land use in the region.

Between 2008 and 2035, growth in both household and employment in the HQTAs are projected to increase from the Baseline scenario to the Plan scenario. Specifically, the share of growth in households in HQTAs increases from 24 percent under the Baseline to 51 percent under the Plan. During the same period, the share of growth in employment in HQTAs increases from 31 percent under the Baseline to 53 percent under the Plan.

LAND CONSUMPTION

This is a new measure for the 2012–2035 RTP/SCS that examines the amount of land used in total and per person for transportation. This measure will also be used in an on-going manner to assess land use in the region.

Greenfield land consumption refers to development that occurs on land that has not previously been developed or otherwise impacted, including agricultural land, forest land, desert land, and other virgin sites. As discussed above, the Plan directs more growth into the HQTAs than the Baseline. The vast majority of HQTAs are within the existing urbanized areas. Accordingly, the Plan consumes 408 square miles less “greenfield” land than the Baseline, 334 square miles compared to 742 square miles.

AVERAGE DISTANCE FOR WORK AND NON-WORK TRIPS

The average distance for work trips is projected in 2035 to decrease from 14.8 miles under the Baseline to 14.7 miles under the Plan. The average distance for non-work trips is projected to increase from 7.3 miles under the Baseline to 7.5 miles under the Plan.

PERCENT OF WORK TRIPS LESS THAN THREE MILES

The vast majority of work trips in Southern California have consistently relied on the single-occupant automobile. When the work trip length becomes shorter, particularly within a few miles, it increases the likelihood of using alternative modes such as transit or biking. By 2035, the share of work trips less than three miles is projected to increase from 14.8 percent under the Baseline to 15.4 percent under the Plan, which accounts for effects of landuse and investment in active transportation.

WORK TRIP LENGTH DISTRIBUTION

Under the Plan, more than half (51 percent) of the total work trips are less than 10 miles (**TABLE 4**). Thirteen percent of the total work trips are longer than 25 miles.

TABLE 4 Work Trip Length Distribution (Plan 2035)

Distance (miles)	Work Trips	Percent of Total
0.0 <= DIST < 5.0	3,286,000	27.01%
5.0 <= DIST < 10.0	2,954,000	24.28%
10.0 <= DIST < 15.0	1,805,000	14.84%
15.0 <= DIST < 20.0	1,148,000	9.44%
20.0 <= DIST < 25.0	786,000	6.46%
25.0 <= DIST < 30.0	559,000	4.60%
30.0 <= DIST < 35.0	438,000	3.60%
35.0 <= DIST < 40.0	352,000	2.89%
40.0 <= DIST < 45.0	265,000	2.18%
45.0 <= DIST < 50.0	200,000	1.65%
50.0 <= DIST < 55.0	139,000	1.14%
55.0 <= DIST < 60.0	85,000	0.70%
60.0 <= DIST < 65.0	47,000	0.39%
65.0 <= DIST < 70.0	23,000	0.19%
70.0 <= DIST < 75.0	13,000	0.10%
75.0 <= DIST < 80.0	10,000	0.08%
80.0 <= DIST < 85.0	8,000	0.07%
85.0 <= DIST < 90.0	7,000	0.06%
90.0 <= DIST < 95.0	6,000	0.05%
95.0 <= DIST < 100.0	4,000	0.04%
DIST >= 100.0	30,000	0.25%
Total	12,165,000	100.00%

Numbers may not sum to total due to rounding.

Mobility and Accessibility

In the 1998 California Transportation Plan, this outcome is defined as, "Reaching desired destinations with relative ease within a reasonable time, with reasonable choices." In prior RTPs, mobility and accessibility were included as separate outcomes. For the 2012–2035 RTP/SCS, these have been combined into a single outcome with multiple performance measures. This section discusses the mobility and accessibility performance indicators and provides results based on outputs from the SCAG RTDM.

MOBILITY

The mobility performance measure relies on the commonly used measure of delay. Delay is the difference between the actual travel time and the travel time at some pre-defined reference or "optimal" speed for each mode alternative under analysis. It is measured in vehicle-hours of delay (VHD), which can then be used to derive person hours of delay. This is a relatively straightforward measure to calculate using real-world and modeled data, is understandable by both transportation professionals and the general public, and can be forecasted for the 2035 future scenarios.

The mobility measures used to evaluate alternatives for this outcome are:

- Person movement delay by facility type,
- Person delay per capita, and
- Truck delay by facility type.

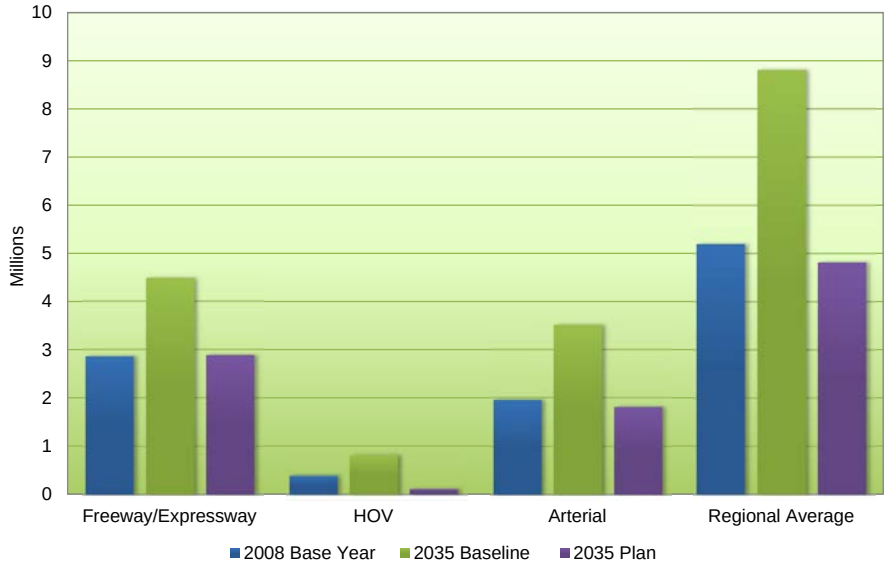
One additional measure for delay that is readily available for on-going monitoring, but that cannot be readily forecast, is non-recurrent delay. Recurrent congestion is the day-to-day congestion that occurs because too many vehicles are on the road at the same time. Non-recurrent congestion is the delay that is caused by accidents, incidents, weather, planned lane closure, special events, or other atypical traffic patterns"

Non-recurrent congestion can be mitigated or reduced by improving incident management strategies. Other smart uses of technologies such as traffic signal coordination and the provision of real-time information about unexpected delays allows travelers to make better decisions about available transit or other alternatives.

Person Delay by Facility Type (Mixed Flow Freeways, HOV, Arterials)

For the 2012–2035 RTP/SCS, this measure has been expanded to differentiate between single-occupancy vehicle (SOV) and high occupancy vehicle (HOV) delay. As shown in **FIGURE 1**, person-hours of delay is expected to increase from Base Year to Baseline, but overall the Plan will improve on Baseline conditions by 45 percent, to conditions that are better than what is experienced today.

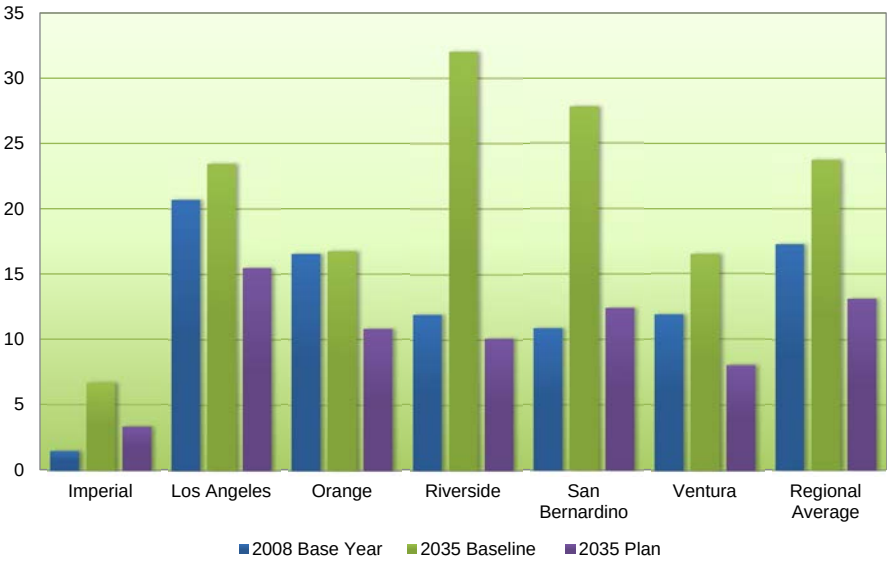
FIGURE 1 Daily Person-Hours of Delay by Facility Type



Person Delay per Capita

FIGURE 2 shows the person-hours of delay per capita for each of the six counties in the region and for the SCAG region as a whole. Normalizing delay by the number of people living in an area provides insight as to how well the region is mitigating traffic congestion in light of increasing population growth. Delay per capita is expected to grow considerably, particularly in the Inland Empire counties of Riverside and San Bernardino, under the Baseline conditions. However, implementation of the Plan is expected to reduce delay substantially, to below 2008 levels. The regional average delay per capita is expected to improve from over 20 minutes under the Baseline, to over 10 minutes under the Plan. Not only does this represent a 45 percent improvement over Baseline, but a 24 percent improvement over Base Year as well.

FIGURE 2 Daily Person Delay per Capita by County (minutes)



Truck Delay by Facility Type (Highway, Arterials)

This measure estimates the average daily truck delay by facility type for freeways and arterials (**FIGURE 3**). The RTP/SCS includes significant investments in a regional freight corridor and other improvements to facilitate goods movement. The Plan is estimated to reduce truck delay by approximately 40 percent over Baseline on the freeway system, and by approximately 55 percent on the arterial system. However, the truck delay under the Plan will still be above Base Year levels.

FIGURE 3 Daily Heavy-Duty Truck Hours of Delay

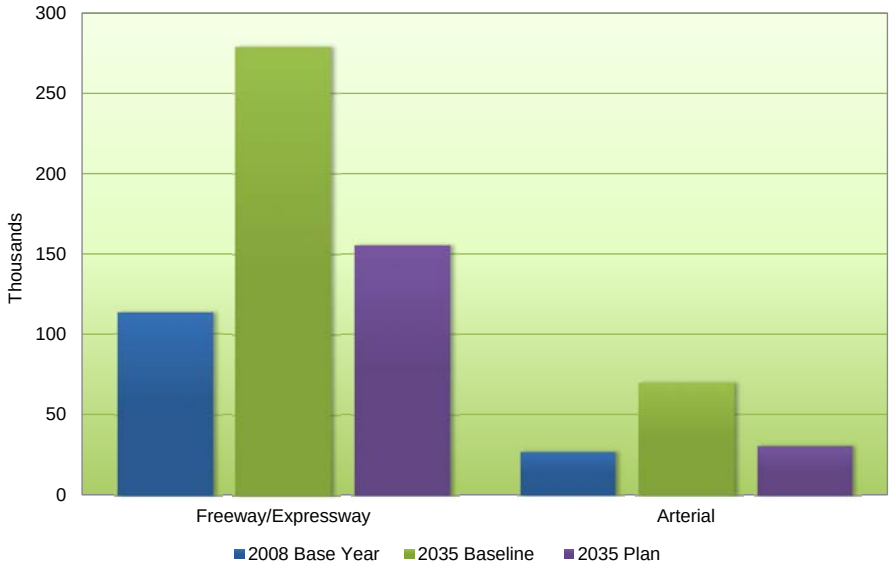
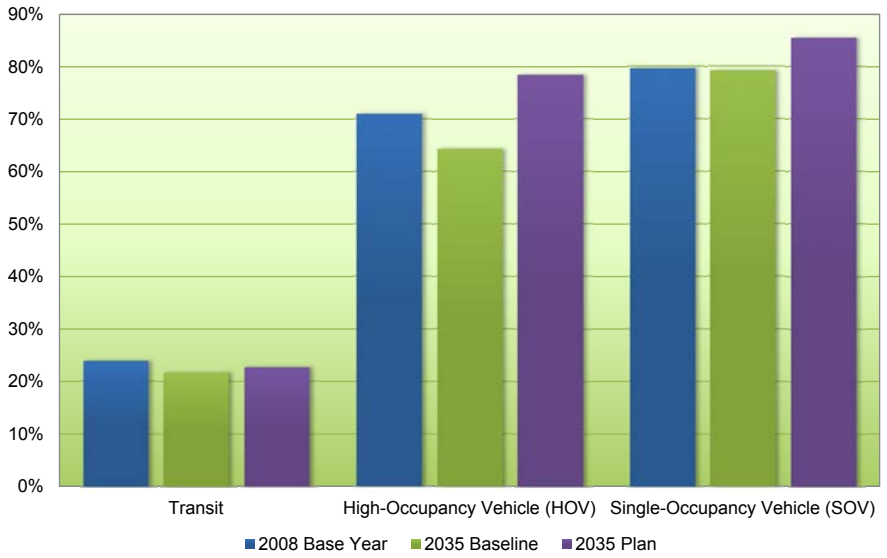


FIGURE 4 Percentage of PM Peak Period Home-Based Work Trips within 45 Minutes



ACCESSIBILITY

Accessibility is used to capture how well the transportation system performs in providing people access to opportunities. Opportunities can include anything from jobs, education, medical care, recreation, shopping, or another activity that helps improve a person's life. For the 2012–2035 RTP/SCS, accessibility is simply defined as the distribution of trips by mode by travel time.

As with the 2008 RTP, accessibility is measured by taking afternoon or PM peak period travel demand model results for the base and forecast years, and identifying the percentage of commute or home-based work trips that are completed within 45 minutes. **FIGURE 4** shows these results. In all cases, the 2035 Plan improves accessibility for home-based work trips over the baseline.

The 2012–2035 RTP/SCS provides a more comprehensive measure of accessibility by including transit and HOV accessibility as well as non-work and work trips in the indicator. Results for the following were added to the 2012–2035 RTP/SCS based upon stakeholder input:

- Distributions of travel time (i.e., not just percent completed within 45 minutes),
- High occupancy vehicles (HOV) for each of the three modeled years,
- AM, midday, evening and night accessibility for each of the three modeled years for all three modes (transit, SOV, and HOV), and
- Non work trips for each of the three modeled years for all three modes (transit, SOV, and HOV) for all five time periods.

TABLES 5–7 present the above results. **TABLE 5** depicts the transit travel time distribution, while **TABLE 6** shows the HOV distribution and **TABLE 7** shows the SOV distribution.

TABLE 5 Transit Trips – Distribution by Trip Type and Model Run

Trip Type	Time Period	Model	<=5 min.	<=10 min.	<=15 min.	<=30 min.	<=45 min.	<=60 min.	<=90 min.	>90 min.
Work	AM	2008 Base Year	0%	0%	0%	9%	30%	51%	78%	100%
		2035 Baseline	0%	0%	0%	8%	25%	43%	68%	100%
		2035 Plan	0%	0%	0%	9%	29%	50%	76%	100%
	Mid-day	2008 Base Year	0%	0%	0%	11%	37%	61%	87%	100%
		2035 Baseline	0%	0%	0%	11%	35%	59%	86%	100%
		2035 Plan	0%	0%	0%	11%	36%	61%	87%	100%
	PM	2008 Base Year	0%	0%	0%	7%	24%	44%	73%	100%
		2035 Baseline	0%	0%	0%	6%	22%	40%	67%	100%
		2035 Plan	0%	0%	0%	6%	23%	43%	71%	100%
	Evening	2008 Base Year	0%	0%	0%	11%	37%	61%	87%	100%
		2035 Baseline	0%	0%	0%	10%	34%	58%	85%	100%
		2035 Plan	0%	0%	0%	11%	37%	61%	87%	100%
	Night	2008 Base Year	0%	0%	0%	11%	37%	61%	87%	100%
		2035 Baseline	0%	0%	0%	10%	34%	58%	84%	100%
		2035 Plan	0%	0%	0%	11%	36%	61%	87%	100%
Other	AM	2008 Base Year	0%	0%	1%	19%	46%	65%	87%	100%
		2035 Baseline	0%	0%	1%	19%	44%	63%	85%	100%
		2035 Plan	0%	0%	1%	19%	45%	64%	86%	100%
	Mid-day	2008 Base Year	0%	0%	1%	21%	48%	67%	88%	100%
		2035 Baseline	0%	0%	1%	21%	47%	66%	88%	100%
		2035 Plan	0%	0%	1%	21%	48%	67%	89%	100%
	PM	2008 Base Year	0%	0%	1%	15%	36%	54%	78%	100%
		2035 Baseline	0%	0%	1%	15%	36%	53%	78%	100%
		2035 Plan	0%	0%	1%	15%	36%	53%	78%	100%
	Evening	2008 Base Year	0%	0%	1%	22%	48%	66%	88%	100%
		2035 Baseline	0%	0%	1%	21%	47%	66%	88%	100%
		2035 Plan	0%	0%	1%	21%	48%	67%	88%	100%
	Night	2008 Base Year	0%	0%	1%	22%	48%	66%	88%	100%
		2035 Baseline	0%	0%	1%	22%	47%	66%	87%	100%
		2035 Plan	0%	0%	1%	22%	48%	67%	88%	100%

TABLE 6 HOV Trips – Distribution by Trip Type and Model Run

Trip Type	Time Period	Model	<=5 min.	<=10 min.	<=15 min.	<=30 min.	<=45 min.	<=60 min.	<=90 min.	>90 min.
Work	AM	2008 Base Year	35%	56%	67%	83%	91%	95%	98%	100%
		2035 Baseline	33%	54%	65%	82%	90%	94%	97%	100%
		2035 Plan	34%	55%	67%	85%	93%	97%	99%	100%
	Mid-day	2008 Base Year	10%	23%	35%	60%	74%	84%	96%	100%
		2035 Baseline	10%	21%	31%	53%	66%	75%	87%	100%
		2035 Plan	11%	24%	37%	65%	81%	91%	97%	100%
	PM	2008 Base Year	11%	23%	34%	58%	71%	80%	92%	100%
		2035 Baseline	11%	21%	31%	53%	64%	73%	84%	100%
		2035 Plan	12%	25%	37%	64%	78%	88%	97%	100%
	Evening	2008 Base Year	17%	37%	56%	85%	95%	98%	100%	100%
		2035 Baseline	17%	36%	55%	82%	93%	97%	99%	100%
		2035 Plan	18%	38%	57%	84%	94%	98%	99%	100%
	Night	2008 Base Year	14%	34%	53%	84%	95%	99%	100%	100%
		2035 Baseline	14%	33%	52%	81%	93%	98%	99%	100%
		2035 Plan	15%	34%	53%	83%	94%	98%	99%	100%
Other	AM	2008 Base Year	35%	56%	67%	83%	91%	95%	98%	100%
		2035 Baseline	33%	54%	65%	82%	90%	94%	97%	100%
		2035 Plan	34%	55%	67%	85%	93%	97%	99%	100%
	Mid-day	2008 Base Year	31%	52%	64%	85%	93%	97%	99%	100%
		2035 Baseline	31%	53%	65%	85%	93%	97%	99%	100%
		2035 Plan	32%	53%	65%	87%	94%	97%	99%	100%
	PM	2008 Base Year	30%	49%	60%	76%	85%	91%	96%	100%
		2035 Baseline	29%	49%	60%	77%	85%	90%	96%	100%
		2035 Plan	30%	50%	61%	80%	90%	94%	98%	100%
	Evening	2008 Base Year	31%	52%	65%	86%	94%	97%	99%	100%
		2035 Baseline	31%	53%	66%	87%	95%	97%	99%	100%
		2035 Plan	31%	53%	66%	87%	95%	97%	99%	100%
	Night	2008 Base Year	30%	52%	65%	87%	95%	97%	99%	100%
		2035 Baseline	31%	53%	66%	88%	95%	98%	99%	100%
		2035 Plan	31%	53%	66%	88%	95%	97%	99%	100%

TABLE 7 SOV Trips – Distribution by Trip Type and Model Run

Trip Type	Time Period	Model	<=5 min.	<=10 min.	<=15 min.	<=30 min.	<=45 min.	<=60 min.	<=90 min.	>90 min.
Work	AM	2008 Base Year	10%	26%	41%	69%	83%	90%	98%	100%
		2035 Baseline	10%	26%	41%	69%	82%	89%	96%	100%
		2035 Plan	11%	28%	44%	74%	88%	95%	99%	100%
	Mid-day	2008 Base Year	12%	31%	49%	81%	93%	98%	100%	100%
		2035 Baseline	12%	30%	48%	79%	91%	97%	100%	100%
		2035 Plan	12%	32%	52%	84%	95%	99%	100%	100%
	PM	2008 Base Year	11%	25%	39%	66%	80%	88%	96%	100%
		2035 Baseline	11%	25%	38%	66%	79%	87%	95%	100%
		2035 Plan	11%	27%	42%	72%	86%	93%	99%	100%
	Evening	2008 Base Year	16%	39%	59%	88%	97%	99%	100%	100%
		2035 Baseline	16%	39%	59%	86%	95%	99%	100%	100%
		2035 Plan	17%	40%	61%	89%	97%	99%	100%	100%
	Night	2008 Base Year	14%	37%	59%	89%	98%	99%	100%	100%
		2035 Baseline	14%	38%	59%	88%	97%	99%	100%	100%
		2035 Plan	14%	39%	60%	89%	97%	99%	100%	100%
Other	AM	2008 Base Year	39%	63%	75%	91%	97%	99%	100%	100%
		2035 Baseline	40%	65%	77%	92%	97%	99%	100%	100%
		2035 Plan	41%	66%	79%	94%	99%	100%	100%	100%
	Mid-day	2008 Base Year	44%	71%	82%	96%	99%	100%	100%	100%
		2035 Baseline	45%	72%	84%	96%	99%	100%	100%	100%
		2035 Plan	47%	74%	86%	98%	100%	100%	100%	100%
	PM	2008 Base Year	39%	63%	75%	90%	96%	98%	100%	100%
		2035 Baseline	39%	65%	77%	92%	97%	99%	100%	100%
		2035 Plan	41%	67%	80%	94%	98%	99%	100%	100%
	Evening	2008 Base Year	44%	71%	84%	97%	99%	100%	100%	100%
		2035 Baseline	45%	73%	85%	97%	99%	100%	100%	100%
		2035 Plan	47%	74%	86%	98%	100%	100%	100%	100%
	Night	2008 Base Year	43%	70%	82%	97%	99%	100%	100%	100%
		2035 Baseline	44%	72%	85%	97%	99%	100%	100%	100%
		2035 Plan	45%	72%	85%	97%	100%	100%	100%	100%

Safety and Health

The safety outcome for evaluating projects has been carried over from the 2008 RTP, but the 2012–2035 RTP/SCS effort also includes a new health outcome. Safety addresses how well the transportation system minimizes accidents and is measured in fatalities, injuries, and property damage accidents per million vehicle miles by mode.

Safety and health impacts of regional transportation improvements cannot be easily forecast, but total accidents can show a reduction in future years if people shift from higher accident modes to lower accident modes. Total number of accidents is generally used as the performance measure, and can be partially projected by using mode specific accident rates (e.g., for highways, arterials, transit). This approach is used for the 2012–2035 RTP/SCS, but it is important to note that this approach does not take into account safety improvements for each mode. It just reflects the changes based on modal or facility shifts. It is not possible to forecast this measure by ethnicity or income group.

Health is a new outcome to the 2012–2035 RTP/SCS. There are health measures that will be used for on-going monitoring for the region, but to evaluate alternatives, the health measure will be the tons of pollutants since these are highly correlated to health problems such as asthma. This measure supports both the Health outcome as well as the Environmental Quality outcome. Pollutant emissions are reported in detail as part of the Transportation Conformity technical appendix.

Environmental Quality

This outcome is defined as "Helping to maintain and enhance the quality of the natural and human environment." For the 2012–2035 RTP/SCS, the measures include criteria pollutant and GHG emissions, with the target of meeting transportation conformity and SB 375 requirements. The detailed emissions analysis for the Region's 14 non-attainment or maintenance areas is included as part of the Transportation Conformity technical appendix.

Pursuant to SB 375, ARB set per capita GHG emission reduction targets from passenger vehicles for each of the state's 18 MPOs. For the SCAG region, the targets set are eight percent below 2005 per capita emissions levels by 2020 and 13 percent below 2005 per capita emissions levels by 2035. The 2012–2035 RTP/SCS achieves per capita GHG reductions relative to 2005 of nine percent in 2020 and 16 percent in 2035 (**TABLE 8**).

TABLE 8 RTP/SCS Per Capita Greenhouse Gas Reductions

Year	CO2 Per Capita (lb/day)	CO2 Per Capita Reductions Compared to 2005		
		Travel Demand Model*	4D Model**	Total
2005	23.8	N/A	N/A	N/A
2020	21.6	-9%	N/A	-9%
2035	20.5	-14%	-2%	-16%

*Includes Transportation Demand Management (TDM), Transportation Systems Management (TSM), active transportation
**4D Model captures the benefits of land use and transportation coordination that are not captured directly by the Travel Demand Model.

DEVELOP AN ENHANCED SCAG LOCAL SUSTAINABILITY PLANNING TOOL

Like all of California's Metropolitan Planning Organizations (MPOs), SCAG is currently engaged in an effort to prepare its RTP and SCS within the context of the requirements of SB 375. As part of this effort, SCAG has developed the 4D- based Local Sustainability Planning Tool (LSPT) to analyze the performance of various land use and transportation strategies related to GHG reduction and help local jurisdictions to assess impacts from different land use configurations and scenarios.[1] The LSPT is a GIS-based sketch planning tool that allows users to create land use scenarios and analyze their impacts. SCAG made the LSPT available to each of its jurisdictions, trained hundreds of users, and worked one-on-one with planners to assist in their use of the tool. Provided with preliminary scenarios of their planning areas for the years 2008, 2020 and 2035, local planners were then able to create, modify and compare a variety of scenarios, and their subsequent impacts on vehicle ownership, vehicle miles traveled, mode-use, and GHG emissions.

[1] SCAG's Local Sustainability Planning Tool (LSPT) is a GIS based planning tool with built in travel behavior, vehicle ownership/uses, VMT and GHG related to the surrounding "D" variables (Density, Diversity, Accessibility, and Design) related to General Plan, Zoning and different land use designations.

SCAG evaluated potential strategies including changes to land use, transportation demand management, transit, and other related methods to reduce VMT through the Regional Travel Demand Model. The current SCAG travel demand model is an advanced 4-step model that currently includes a variety of "4D" factors such as transit and pedestrian accessibility to employment as well as housing and density. However, additional factors such as the impacts of mixed-use development (diversity) are not explicitly accounted for in the current model.

Therefore, an assessment was needed to better understand how well the Travel Demand Model accounts for or is sensitive to changes in land use at the local level. Further, the California Transportation Commission (CTC) 2010 California Regional Transportation Plan Guidelines recommend that on-model or off-model calculations be formulated to produce realistic sensitivities to these localized land use variations.

To better understand the co-benefits of mixed land uses and address the CTC's recommendation, an enhanced module based on National Household Travel Survey data (NHTS) was developed for the LSPT, as a supplement to SCAG's Regional Travel Demand Model. This enhanced NHTS module was derived from travel survey, land use, and travel model data to quantify the impacts of changes in local land use form related to vehicular travel. The enhanced NHTS module provides key input to the SCAG Local Sustainability Planning Tool such as the VMT and GHG impacts of land use variations. The module is also a tool to augment the Travel Demand Model to account for the potential impacts of changes in local land use conditions, which might result in changes in travel behavior. Based on analysis conducted with the NHTS Model, SCAG will adjust (subtract) between 2 percent to 3 percent of VMT estimated through the 4-step regional Travel Demand Model, which was not accounted for in the Regional Travel Demand Model.[2]

In addition to supplementing the Regional Travel Demand Model, this tool can help and address some environmental justice concerns. SCAG will also work with our partners in the region to apply the enhanced LSPT module, as feasible, to better understand how VMT reduction measures could impact minority and low-income groups, as well as additional Environmental Justice Communities.

[2] The technical report entitled, "Southern California Association of Governments NHTS Model Documentation," prepared by Fehr & Peers, (December 2011) is provided as a sub-appendix to this Appendix.

Economic Well-Being

This outcome is measured in terms of additional jobs created and net contribution to Gross Regional Product. An annual average of 174,500 new jobs will be generated by the construction and operations expenditures in the RTP/SCS, and an additional 354,000 annual jobs will be created in a broad cross-section of industries by the region's increased competitiveness and improved economic performance as a result of the improved transportation system. The economic benefits of the 2012–2035 RTP/SCS are discussed in further detail in Chapter 8 of the RTP/SCS.

Investment Effectiveness

The cost-effectiveness outcome indicates the degree to which the Plan's expenditures generate benefits that transportation users can experience directly. This outcome is important to the public because it describes how the Plan's transportation investments make productive use of scarce funds.

The benefit-cost ratio is the indicator for the cost-effectiveness outcome, and it compares the incremental benefits to the incremental costs of the modal investments. The benefits are divided into several categories, including:

- Delay savings,
- Air quality improvements, and
- Reductions in vehicle operating costs.

For these categories, travel demand and air quality models are used to estimate the benefits of the Plan compared to the Baseline. Most of these benefits are a function of changes in Vehicle-Miles Traveled (VMT) and Vehicle-Hours Traveled (VHT). For example, a highway project that increases VMT would negatively impact air quality and vehicle operating costs, while a transit project that decreases VMT would have the opposite effect. Not all impacts are linear, so reductions in congestion can increase or decrease vehicle operating costs and emissions. Delay savings are reflected directly in the VHT statistics.

To estimate the benefit-cost ratio, the benefits in each category are converted into dollars and added together. These are divided by the total incremental costs of the Plan's

transportation improvements to produce a ratio. **FIGURE 5** summarizes the results of this analysis.

The investments in the 2012 RTP provide a return of $2.90 for every dollar invested. For this analysis, all benefits and costs are expressed in 2011 dollars. Benefits are estimated over the 25-year RTP planning period from 2011 to 2035. The user benefits are estimated using California's Cal-B/C benefit-cost framework and incorporate SCAG's RTDM outputs. The costs include the incremental public expenditures over the entire RTP planning period.

FIGURE 5 Results of Regional Benefit/Cost Analysis

System Sustainability

A transportation system is sustainable if it maintains its overall performance over time with the same costs for its users. Sustainability, therefore, reflects how our decisions today affect future generations. The indicator for sustainability is the total inflation-adjusted cost per capita to maintain overall system performance at current conditions.

This outcome reflects the cost per capita of preserving the multi-modal system to current conditions. It is also possible to estimate the cost for preserving the system to a state of good repair. As such, preservation can be viewed as a subset of sustainability. This measure and its trend over time will tell us whether our decisions are placing burdens on future generations. If the indicator grows over time, it suggests that our current resource limitations and decisions are creating a situation where future generations will have to pay more to get the same performance (or live with reduced performance).

The performance measures presented in this report show that the planned transportation system in 2035 will perform better compared to today. This RTP/SCS commits itself to maintaining a sustainable system by allocating $217 billion to maintaining the system in a state of good repair over the period of the plan. This is an average annual per capita investment of more than $400 per person for each year of the plan period.

RTP/SCS On-Going System Monitoring Measures

This section discusses those measures not directly or partially used for evaluating the performance of the 2035 RTP/SCS Plan, but rather are used for on-going monitoring of the Plan until the next update of the RTP/SCS occurs. The measures used for on-going monitoring are presented at the beginning of this technical appendix in **TABLE 3**. These on-going monitoring measures are not typically forecast, but they allow the SCAG region to monitor how well goals are being met. In this group are additional measures that will be investigated for future integration into SCAG's performance monitoring efforts when data becomes available to reliably use the measure.

Location Efficiency

This is a new outcome for the 2012–2035 RTP/SCS, and can be used to evaluate the RTP/SCS and for on-going system monitoring. This outcome has several associated performance measures that reflect the impact of improved land use and transportation coordination in support of Sustainable Community Strategies (SCS) required under SB 375.

This outcome reflects the degree to which improved land use and transportation coordination measures impact efficient movement of people and goods. The on-going monitoring measures used to describe this outcome are discussed below.

SHARE OF GROWTH IN HIGH-QUALITY TRANSIT AREAS (HQTA)

In 2008, 40 percent of the households and 49 percent of the employment in the region were located within the HQTAs. Because the transit infrastructure and services are concentrated primarily in Los Angeles County, about 63 percent of households and 71 percent of employment in that county were within the HQTAs in 2008. This was followed by Orange County, where 20 percent of the households and 30 percent of employment were within the HQTAs in 2008.

PERCENT OF INCOME SPENT ON HOUSING AND TRANSPORTATION

In 2007, households in the SCAG region were estimated to spend on average 53 percent of their incomes on housing and transportation. This is based on consumer expenditures survey data available in Los Angeles and Orange Counties and will be refined in the future if additional data is available.

ANNUAL HOUSEHOLD TRANSPORTATION COST

Annual household transportation costs range from $8,628 in Los Angeles County to $11,364 in Ventura County, with Orange County ($10,296) and Riverside/San Bernardino Counties ($10,464) in between.

PERCENT OF HOUSEHOLDS WITHIN ½ MILE (OR 10 MINUTE WALK) OF TRANSIT STATIONS

In 2008, approximately 5.6 percent of households were within ½ mile (or 10 minute walk) of stations for rail or bus rapid transit.

PERCENT OF JOBS WITHIN ½ MILE (OR 10 MINUTE WALK) OF TRANSIT STATIONS

In 2008, approximately 10.3 percent of jobs were within ½ mile (or 10 minute walk) of stations for rail or bus rapid transit.

MEASURES REQUIRING ADDITIONAL DATA OR RESEARCH

There are several additional measures that have been suggested by stakeholders for monitoring use. However, these measures require additional efforts for data collection or further research to determine their potential uses for monitoring. They will be included in future RTP/SCS updates if additional data and research are completed.

The following measures require additional efforts for data collection:

- Percent of residents within ½ mile walk to parks and open space,
- Annual household energy use (transportation + space heating),
- Annual household water consumption, and
- Number of acres of parks/open space for every 1,000 residents.

The following measures require further research to determine their potential uses for monitoring:

- Daily amount of walking and biking related to work and non-work trips
- Percent of households with walk access to neighborhood services
- Percent of existing and new below-market rental housing units in Transit Oriented Development (TOD) area

Mobility and Accessibility

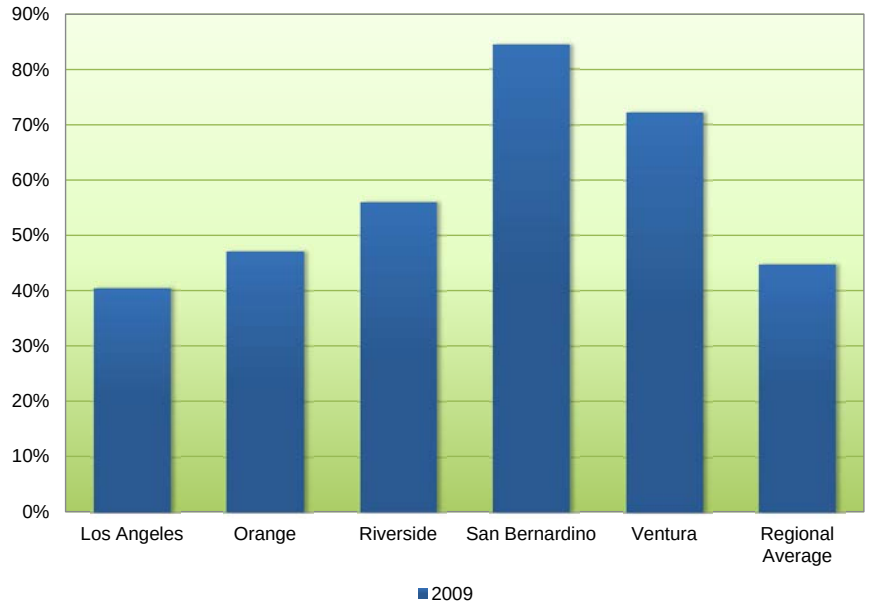
This section discusses the mobility performance measure that will be used for the ongoing monitoring of the regional transportation network. The measure used to monitor mobility is non-recurrent delay. This measure reflects feedback and input from the Federal Highway Administration (FHWA) during the development of the 2008 RTP.

Data from the Caltrans Performance Measurement System (PeMS) was used to assess the level of non-recurrent delay on regional freeways using the "congestion pie" feature of PeMS. This module breaks down congestion into recurrent and non-recurrent congestion, with recurrent congestion being that day-to-day delay that occurs when there are simply too many vehicles on the road at the same time. Non-recurrent congestion is congestion due to other causes such as accidents, special events, or weather.

For the 2012–2035 RTP/SCS, the mobility performance measure is non-recurrent congestion. This type of congestion also has two major components—"Accidents" and "Miscellaneous." Accident-related congestion is estimated by using the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) accident locations and comparing that to congestion levels reported by roadway sensors. If excess congestion beyond normal is reported at a location where TASAS reports that an accident occurred, then

that extra congestion is put in the accident-related congestion bucket. If congestion being reported by a sensor is above normal and there was no accident report, then that congestion falls into the miscellaneous bucket.

FIGURE 6 Percent Non-Recurrent Congestion Share by County (2009)

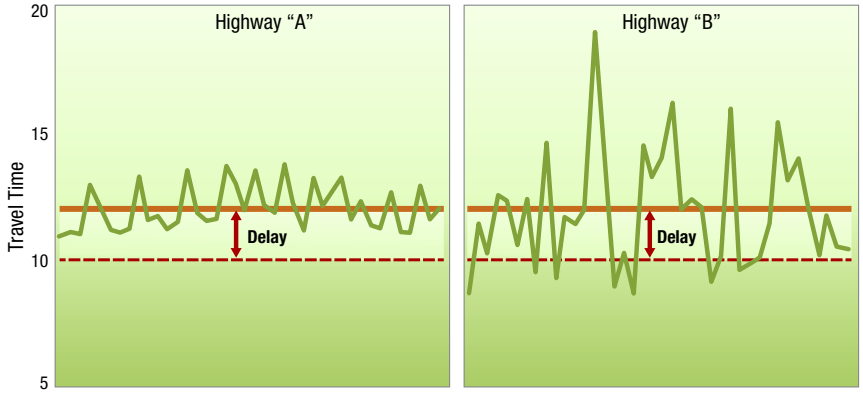


The most recent PeMS congestion classification data is for the year 2009. **FIGURE 6** shows the percentage of freeway congestion during a typical day (5:00 AM through 8:00 PM) for the year 2009. The data is reported for each county and for the region as a whole. In 2009, the estimated average percentage of congestion that was due to accidents or other incidents was around 45 percent. In San Bernardino County—with less congestion overall and more susceptible to incident-causing congestion—the data suggested that a majority of congestion was non-recurrent. (The actual percentage is likely exaggerated due to the manner in which PeMS handles some data; more research is needed to verify this assessment.) In the more urbanized Los Angeles County, the data reported that 40 percent of countywide congestion was non-recurrent.

Reliability

Reliability captures the relative predictability of the public's travel time. Unlike mobility, which measures how fast the transportation system is moving people/goods and accessibility which addresses how much time people must spend traveling in total, reliability focuses on how much mobility and accessibility vary from day to day. This variability is illustrated in **FIGURE 7**: Highway "A" and Highway "B" both have the same average travel time, meaning that they experience the same level of mobility. However, when each day's travel time is taken into account, one sees that Highway "A" has lower variability than Highway "B".

FIGURE 7 Difference Between Reliability and Mobility



Same Mobility (same travel time and delay), but Highway "A" is much more reliable

Reliability is the level of variability in transportation service between the expected travel time and the actual travel time between OD pairs. Reliability can be calculated by using statistical tools. The standard deviation is one such tool that provides an estimate of how much the travel time on any given day will "deviate" from the average travel time. It provides the probable range of time that a motorist will arrive within his or her scheduled time. Dividing the standard deviation by the average time spent traveling produces the percent variability for an OD pair.

Reliability can only be monitored and not forecasted. This is because travel demand models cannot evaluate variations in travel times, but can only estimate average travel times and delay (i.e., mobility). However, **TABLE 9** presents the estimated improvements in reliability for three different hours during the day. These improvements are expected as a result of the TSM investments, especially as they relate to incident management. These estimates are based in part on the recently completed Corridor System Management Plans (CSMPs) in the SCAG Region. The following CSMPs were used for this analysis: I-5 (Orange and Los Angeles Counties), I-10 (San Bernardino County), I-210 (Los Angeles County), I-405 (Orange and Los Angeles Counties), SR-22 (Orange County), SR-57 (Orange County), SR-91 (Orange and Riverside Counties).

TABLE 9 Estimated Improvements in Reliability

Hour	Average Travel Time (minutes)	Variability of Travel Time	Travel Time Based on Level of Confidence of Arriving on Time (minutes)		
			68%	95%	99%
8:00 AM	23	29%	30	37	43
Noon	20	16%	24	27	30
5:00 PM	27	38%	38	48	59

Safety and Health

For monitoring purposes, the safety measure can be reported historically by time period month and by mode (including for non-motorized transportation). **FIGURE 8** shows the accident rate per million vehicle miles for highways. **FIGURE 9** shows similar information for bicyclists and pedestrians.

FIGURE 8 Total Injury and Fatality Rates per Million Vehicle Miles

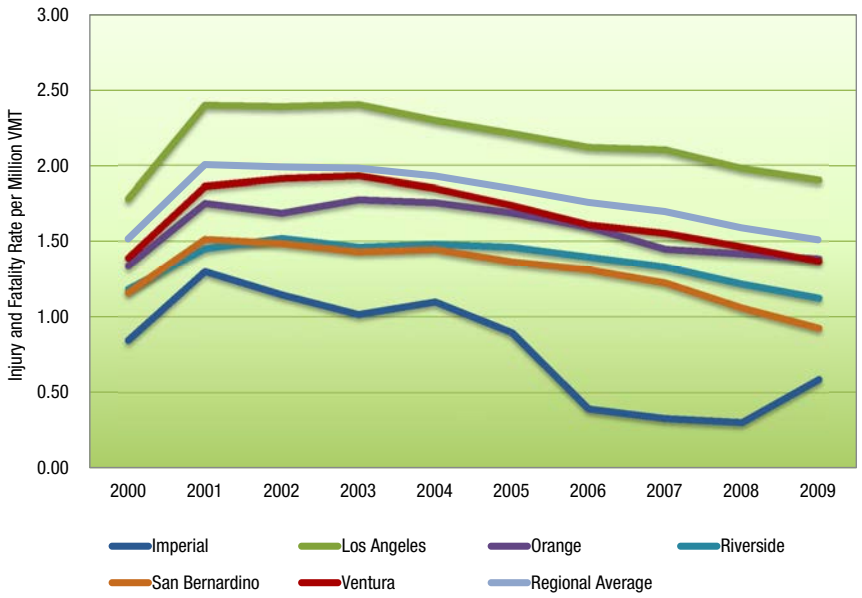
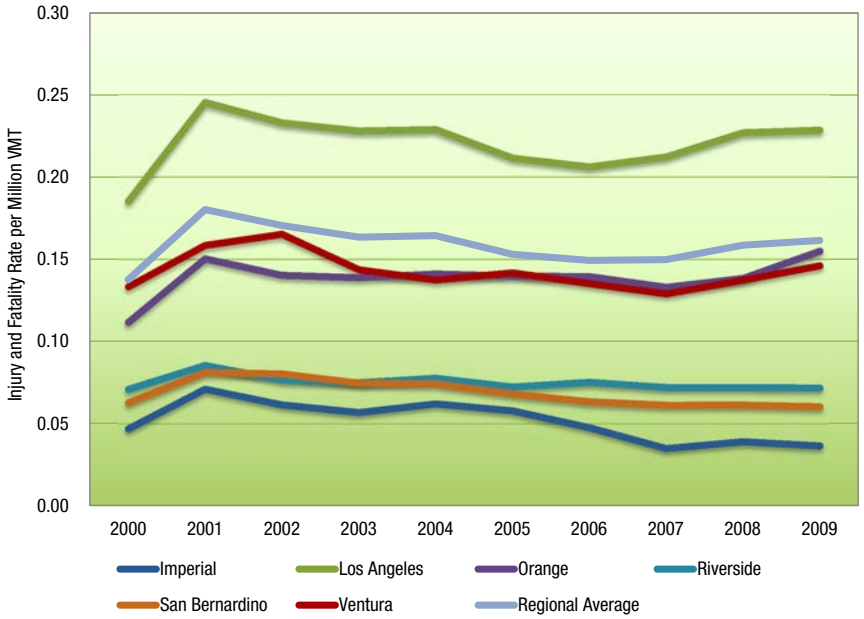


FIGURE 9 Bicycle and Pedestrian Injury and Fatality Rates per Million Vehicle Miles



The health measure is new to the 2012–2035 RTP/SCS, and for monitoring purposes this measure is reflected in terms of health effects of pollutant emissions, noise, and access to parks and open space.

ASTHMA INCIDENCE AND EXACERBATIONS

Based on the California Health Interview Survey, the share of population in the region that was ever diagnosed with asthma in 2009 was 12.8 percent. Among those who were ever diagnosed, over 90 percent had asthma symptoms in the previous 12 months and 10.5 percent visited the emergency room/urgent care for asthma in the previous 12 months. Over half of those were first diagnosed with asthma before nine years old and 42 percent take daily medication to control asthma.

PERCENT OF HOUSEHOLDS LIVING <500 FEET FROM HIGH-VOLUME ROADWAYS

High volume roads are defined as those with traffic volumes of over 100,000 vehicles per day in urban areas and 50,000 vehicles per day in rural areas. Generally, diesel particulate concentrations and the associated cancer risk drop off with distance from the pollution source, such as high-volume roadways. Specifically, based on the California Air Resources Board studies, air pollution levels can be significantly higher within 500 feet of high volume roads and then diminish rapidly.[3] In 2008, there were a total of approximately 337,000 households in the region living within 500 feet of high-volume roadways. These represented 5.8 percent of total households in the region.

PRE-MATURE DEATHS DUE TO $PM_{2.5}$

Using the U.S. Environmental Protection Agency's methodology, the estimated number of annual $PM_{2.5}$ related premature deaths in California is 9,200 in 2009 with an uncertainty range of 7,300 to 11,000.[4] Mortality estimates reflect the following three causes: cardiopulmonary, ischemic heart disease, and all-cause mortality. $PM_{2.5}$ exposure has been most closely associated with cardiopulmonary deaths, which are also the most frequent cause of deaths in the U.S. Because of high $PM_{2.5}$ concentrations and a large population (over 16 million), most of the estimated premature deaths (4,900) are in the South Coast Air Basin in the SCAG region.

MEASURES REQUIRING ADDITIONAL DATA OR RESEARCH

There are several additional measures that have been suggested by stakeholders for monitoring use. However, these measures require additional efforts for data collection or further research to determine their potential uses for monitoring. They will be included in future RTP/SCS updates if additional data and research are completed.

[3] Source: Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning, South Coast Air Quality Management District, May 6, 2005

[4] Source: "Estimate of Premature Deaths Associated with Fine Particle Pollution ($PM_{2.5}$) in California Using a U.S. Environmental Protection Agency Methodology", California Air Resources Board, August 31, 2010

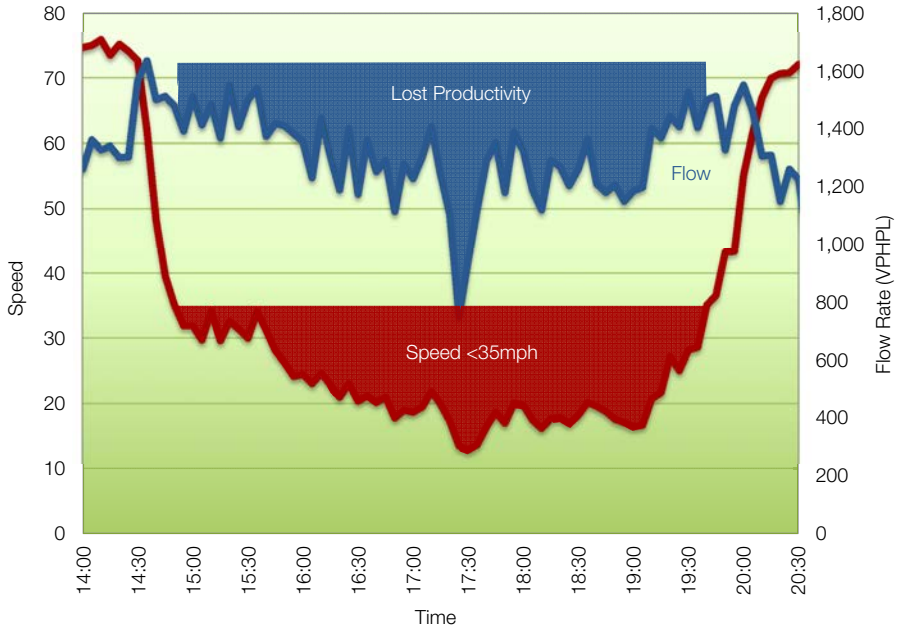
This measure requires additional effort in data collection: percent of residents within ½ mile walk to parks and open space. This measure requires additional research: percent of households living with noise >65 decibels.

Productivity

The productivity outcome is a system efficiency measure that reflects the degree to which the transportation system performs during peak demand conditions. The productivity indicator is defined as the percent utilization during peak demand conditions.

For highways, productivity is particularly important because when we need capacity the most, we often get the lowest "production" from our system. On some corridors throughput can decline as much as 50 percent during peak periods, and most congested urban corridors typically lose 25 percent of their capacity during rush hour. This lost productivity is depicted in **FIGURE 10**, which shows how much vehicle throughput declines (i.e., productivity is lost) during rush hour.

FIGURE 10 Illustrative Highway Productivity Losses



Source: Caltrans Freeway Performance Measurement System (PeMS) for Los Angeles I-5 southbound; post-mile 11.54, Washington Blvd; 10/19/2011; vehicle detector station 716924.

FIGURE 11 summarizes the current estimate for productivity losses on the region's freeway system and the expected improvements due to Plan investments. Maximizing the system's productivity is a critical goal of this RTP, and the overall system management approach aims to recapture lost productivity. The incremental investment of $6.2 billion to implement advanced operational strategies on our freeways and arterials is projected to recapture 20 percent of the lost productivity. These projections are based on recent studies indicating that investments in ramp metering, arterial signal coordination, traveler information, and incident management can achieve such improvements and more.

FIGURE 11 Highway System Productivity (Lost Lane-Miles)

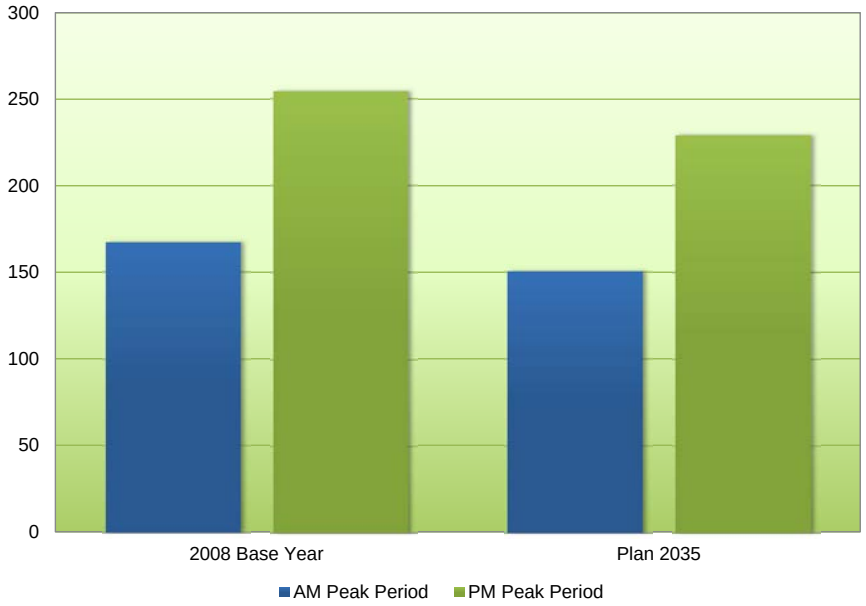
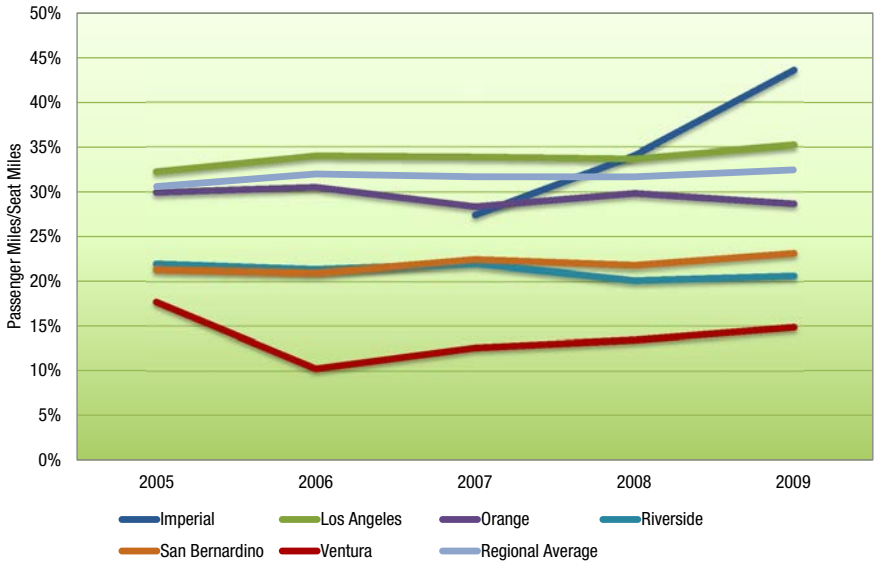


FIGURE 12 Ratio of Transit Passenger Miles/Seat Miles



The Plan improves productivity by committing to investments in state highway operations discussed in Chapter 2 of the main RTP/SCS document. Transit productivity will also improve through increased ridership, which maximizes the number of seats occupied during peak demand conditions.

FIGURE 12 shows the percent of transit passenger miles traveled compared to the total number of seat miles provided.

Environmental Quality

This outcome is measured in terms of ambient air quality. Ambient air quality monitoring is performed by the local air districts and the California Air Resource Board. The following are links to these agencies' websites.

- California Air Resources Board: www.arb.ca.gov/html/ds.htm
- South Coast Air Quality Management District: www.aqmd.gov
- Antelope Valley Air Quality Management District: www.avaqmd.ca.gov
- Imperial County Air Pollution Control District: imperialcounty.net/AirPollution/
- Mojave Desert Air Quality Management District: www.mdaqmd.ca.gov
- Ventura County Air Pollution Control District: www.vcapcd.org/monitoring.htm

REGIONAL TRANSPORTATION PLAN
2012–2035 RTP
SUSTAINABLE COMMUNITIES STRATEGY
Towards a Sustainable Future

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