

**CHAPTER 8 HIGHLIGHTS**

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# MEASURING OUR PROGRESS FOR THE FUTURE

The 2016 RTP/SCS uses a number of performance measures to help gauge progress toward meeting the goals and objectives of our region, as well as how the Plan meets federal requirements, including the intent of the current federal transportation authorization. The measures also address state requirements for reducing greenhouse gas emissions and planning for a more sustainable future. The 2016 RTP/SCS is expected to result in significant benefits to our region with respect to mobility and accessibility, air quality, economic growth and job creation, sustainability, and environmental justice. An extended discussion on how the Plan performs, along with the outcomes it achieves, is the topic of this chapter.

# PLAN PERFORMANCE RESULTS

This graphic highlights the key benefits of implementing the 2016 RTP/SCS in terms of mobility, economy, efficiency and air quality.

## Spending Less Time on the Road

**20.5 miles**

average daily vehicle miles driven per person



**7.4%**

**9.2 mins**

daily delay per capita (extra time spent in traffic)



**39%**

## More Economic Opportunities



**\$1.00 = \$2.00**

INVESTMENT

BENEFIT



**351,000**

additional jobs supported by improving competitiveness

## Efficiency Cost Savings

HOUSEHOLD COSTS (transportation/energy/water use)

**\$14,000/yr**

**12%**

REDUCTION IN BUILDING ENERGY COSTS

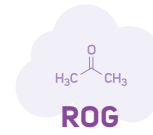


**4%**

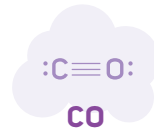
PASSENGER VEHICLE FUEL USE

**10%**

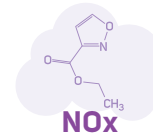
## Improved Air Quality



49.1 TONS  
**↓8%**  
45.0 TONS



338.6 TONS  
**↓9%**  
307.7 TONS



96.4 TONS  
**↓9%**  
88.2 TONS



13.3 TONS  
**↓5%**  
12.6 TONS

**GHG REDUCTIONS**

2020 **↓8%**  
2035 **↓18%**  
2040 **↓21%**

## EVALUATING THE PLAN'S PERFORMANCE: A SUMMARY

### COMPARING THE PLAN VS. NO PLAN

Implementation of the 2016 RTP/SCS will secure a safe, efficient, sustainable and prosperous future for our region. To demonstrate how effective the Plan would be toward achieving our regional goals, SCAG conducted a “Plan vs. No Build” (or Baseline) analysis—essentially comparing how the region would perform with and without implementation of the Plan. This analysis is summarized in this chapter. More details on this analysis and its results can be found in the Performance Measures Appendix.

First and foremost, the 2016 RTP/SCS meets all of the federal and state requirements. It meets all provisions for transportation conformity under the federal Clean Air Act. Cleaner fuels and new vehicle technologies will help significantly reduce many of the pollutants that contribute to smog and other airborne contaminants that may impact public health in the region. The Plan also performs well when it comes to meeting state-mandated targets for reducing greenhouse gas emissions from cars and light trucks. The state-determined targets for the SCAG region are an eight percent per capita reduction in greenhouse gas emissions from automobiles and light trucks by 2020, and a 13 percent reduction by 2035 (compared with 2005 levels). The Plan would result in an eight percent reduction in emissions by 2020, an 18 percent reduction by 2035, and a 21 percent reduction by 2040 as compared to 2005 levels.

Overall, the analysis clearly demonstrates that implementing the 2016 RTP/SCS would result in a regional transportation network that improves travel conditions and air quality, while also promoting an equitable distribution of benefits—that is, social equity. Trips to work, schools and other key destinations would be quicker and more efficient under the Plan. The 2016 RTP/SCS integrates multiple transportation modes, leading to increases in carpooling, demand for transit and use of active transportation modes for trips during peak travel hours and at other times. More specifically, our analysis found that, in

comparison to the Baseline, the Plan will:

- Increase the combined percentage of work trips made by active transportation and public transit by about four percent, with a commensurate reduction in the share of commuters traveling by single occupant vehicle.
- Reduce Vehicle Miles Traveled (VMT) per capita by 7.4 percent and Vehicle Hours Traveled (VHT) per capita by about 17 percent (for automobiles and light/medium duty trucks) as a result of more location efficient land use patterns and improved transit service.
- Increase daily transit travel by nearly one-third, as a result of improved transit service and more transit-oriented development patterns.
- Reduce delay per capita by 39 percent.
- Reduce total heavy duty truck delay by 40 percent.
- Create an estimated 351,000 (or more) additional new jobs annually, due the region's increased competitiveness and improved economic performance that will result from congestion reduction and improvements in regional amenities with implementation of the Plan.
- Reduce the amount of previously undeveloped (greenfield) lands converted to more urbanized use by 23 percent. Conservation of open space and other rural lands is achieved by focusing new residential and commercial development in higher density areas. Through this strategy of conservation, the Plan provides a solid foundation for more sustainable development in the SCAG region.

The 2016 RTP/SCS also focuses on improving public health outcomes in the SCAG region. Some key performance results include a reduction in our regional obesity rate and reductions in the share of our population that suffers with hypertension and type 2 diabetes. The total annual health costs for respiratory disease will be reduced under the Plan more than 13 percent compared with the Baseline. These public health improvements are the result of investments in active transportation, more walkable communities and improved regional air quality as promoted in the 2016 RTP/SCS.



## PERFORMANCE OUTCOMES AND PERFORMANCE MEASURES

This section summarizes how well the 2016 RTP/SCS is expected to perform when fully implemented. [TABLE 8.1](#) lists the 2016 RTP/SCS performance outcomes and the associated measures used to evaluate performance, using the SCAG Regional Travel Demand Model (RTDM) and other tools. The table also includes specific performance results for both the Baseline and the Plan for each of the measures. Additional performance measures that will be used for ongoing regional monitoring are discussed in the Performance Measures Appendix.

In the discussion of performance outcomes, three scenarios are referenced: Base Year, Baseline and Plan.

- **Base Year** represents existing conditions as of 2012—that is, our region as it was in 2012: our transportation system, land use patterns and socio-economic characteristics (e.g., households and employment). The year 2012 was selected as the Base Year for this analysis because it is the year of the previous RTP/SCS.
- **Baseline** assumes a continuation of the development trends of recent decades, with local General Plans not including the intensified policies regarding growth distribution as promoted in the Plan. This scenario represents a future in 2040 in which only the following have been implemented: transportation projects currently under construction or undergoing right-of-way acquisition; those transportation programs and projects programmed and committed to in the 2015 Federal Transportation Improvement Program (FTIP); and/or transportation projects that have already received environmental clearance.
- **Plan** represents future conditions in 2040, in which the transportation investments and strategies detailed in the 2016 RTP/SCS are fully realized.

The Base Year, Baseline and Plan scenarios discussed in this chapter were developed to help evaluate the performance of the strategies, programs and projects presented in Chapter 5—the core of the 2016 RTP/SCS—and to meet various state and federal requirements.

On the following pages, a summary is provided of the Plan’s performance outcomes, along with their associated performance measures. Some of the significant co-benefits provided by the Plan are summarized in [TABLE 8.2](#).

## LOCATION EFFICIENCY

The Location Efficiency outcome reflects the degree to which improved coordination of land use and transportation planning impacts the movement of people and goods in the SCAG region. This outcome has several associated performance measures that will be used for monitoring the degree to which the region is advancing toward our Location Efficiency goals:

1. Share of Growth in High Quality Transit Areas (HQTAs)
2. Land Consumption
3. Vehicle Miles Traveled (VMT)
4. Transit Mode Share
5. Average Distance for Work and Non-Work Trips
6. Percent of Trips Less than Three Miles
7. Work Trip Length Distribution

In addition to these seven metrics, measures of mobility and accessibility also serve to further reinforce the importance of the location efficiency outcome. Measures supporting the Mobility and Accessibility outcome are discussed in the next section of this chapter.

The following is a summary of the Location Efficiency performance measures:

### SHARE OF GROWTH IN HIGH QUALITY TRANSIT AREAS (HQTAS)

Between 2012 and 2040, growth in the regional share of both households and employment in the HQTAs is projected to increase from the Baseline scenario to the Plan scenario.

### LAND CONSUMPTION

The land consumption metric measures the amount of agricultural land that has changed from rural to more intensive development patterns to accommodate new growth. Greenfield land consumption refers to development that occurs on land that has not previously been developed for, or otherwise impacted by, urban uses, including agricultural lands, forests, deserts and other undeveloped sites. As shown in [TABLE 8.2](#), new land consumption under the Plan would be substantially less than what would occur under the Baseline.

# PLAN PERFORMANCE RESULTS IN THE SCAG REGION

## Daily Vehicle Miles Traveled (VMT) *per capita*



Baseline to Plan Comparison  
**-7.4%**



Base Year to Plan Comparison  
**-10.2%**

## Daily Minutes of Delay *per capita*



Baseline to Plan Comparison  
**-39%**



Base Year to Plan Comparison  
**-22%**

	2012 BASE YEAR	2040 BASELINE	2040 PLAN	
DAILY VMT <i>per capita</i>	24.8 MILES	26.3 MILES	25.1 MILES	IMPERIAL COUNTY
DAILY DELAY <i>per capita</i>	0.7 MINUTES	2.7 MINUTES	2.0 MINUTES	
DAILY VMT <i>per capita</i>	21.5 MILES	20.2 MILES	18.4 MILES	LOS ANGELES COUNTY
DAILY DELAY <i>per capita</i>	14.7 MINUTES	16.4 MINUTES	11.5 MINUTES	
DAILY VMT <i>per capita</i>	23.8 MILES	22.8 MILES	21.4 MILES	ORANGE COUNTY
DAILY DELAY <i>per capita</i>	11.9 MINUTES	13.2 MINUTES	7.9 MINUTES	
DAILY VMT <i>per capita</i>	23.3 MILES	23.7 MILES	21.7 MILES	RIVERSIDE COUNTY
DAILY DELAY <i>per capita</i>	5.9 MINUTES	12.3 MINUTES	5.6 MINUTES	
DAILY VMT <i>per capita</i>	26.6 MILES	27.1 MILES	25.9 MILES	SAN BERNARDINO COUNTY
DAILY DELAY <i>per capita</i>	7.6 MINUTES	17.1 MINUTES	7.4 MINUTES	
DAILY VMT <i>per capita</i>	22.4 MILES	21.9 MILES	20.2 MILES	VENTURA COUNTY
DAILY DELAY <i>per capita</i>	7.0 MINUTES	11.5 MINUTES	5.7 MINUTES	

TABLE 8.1 2016 RTP/SCS PERFORMANCE MEASURES AND RESULTS (IN THOUSANDS OF HOURS)

PERFORMANCE MEASURE	DEFINITION	OBJECTIVE	CATEGORY	2040 BASELINE	2040 PLAN	INDICATOR
<b>OUTCOME: LOCATION EFFICIENCY</b>						
Share of growth in High Quality Transit Areas (HQTAs)	Share of the region's growth in households and employment in HQTAs	Improvement (increase) over No Project Baseline	Percent of households in HQTAs	36%	46%	↑
			Percent of jobs in HQTAs	44%	55%	↑
Land consumption	Greenfield land consumed and refill land consumed	Improvement (decrease) over No Project Baseline	Greenfield land consumed	154 sq miles	118 sq miles	↓
Vehicle Miles Traveled (VMT) per capita	Average daily vehicle miles driven per person	Improvement (decrease) over No Project Baseline	Automobiles and light-duty trucks	22.1 miles	20.5 miles	↓
Transit mode share	The share of total trips that use transit for work and non-work trips	Improvement (increase) over No Project Baseline	All Trips	2.2%	3.1%	↑
			Work Trips	5.6%	8.2%	↑
Average distance traveled for work and non-work trips	The average distance traveled for work or non-work trips	Improvement (decrease) over No Project Baseline	Work Trips	15.1 miles	15.5 miles	↑
			Non-Work Trips	7.8 miles	7.9 miles	↑
Percent of trips less than 3 miles	The share of work and non-work trips which are fewer than 3 miles	Improvement (increase) over No Project Baseline	Work Trips	20.4%	20.3%	↑
			Non-Work Trips	41.7%	41.9%	↑
Work trip length distribution	The statistical distribution of work trip length in the region	Improvement (increase) over No Project Baseline	Trip Length: 10 miles or Less	51.6%	50.9%	↓
			Trip Length: 25 miles or Less	81.8%	81.0%	↓
<b>OUTCOME: MOBILITY AND ACCESSIBILITY</b>						
Person delay per capita*	Delay per capita can be used as a supplemental measure to account for population growth impacts on delay	Improvement (decrease) over No Project Baseline	Daily minutes of delay per capita	15.0 mins	9.2 mins	↓
Person delay by facility type*	Delay: Excess travel time resulting from the difference between a reference speed and actual speed	Improvement (decrease) over No Project Baseline	Highway	3,035,105 hrs	2,023,417 hrs	↓
			HOV	251,547 hrs	42,590 hrs	↓
			Arterial	2,254,896 hrs	1,327,235 hrs	↓
Truck delay by facility type*	Delay: Excess travel time resulting from the difference between a reference speed and actual speed	Improvement (decrease) over No Project Baseline	Highway	274,456 hrs	171,828 hrs	↓
			Arterial	47,561 hrs	20,998 hrs	↓
Travel time distribution for transit, SOV and HOV modes for work and non-work trips*	Travel time distribution for transit, SOV and HOV for work and non-work trips	Improvement (increase) over No Project Baseline	% of PM peak transit trips <45 minutes	22%	26%	↑
			% of PM peak HOV trips <45 minutes	72%	79%	↑
			% of PM peak SOV trips <45 minutes	82%	89%	↑

TABLE 8.1 CONTINUED

PERFORMANCE MEASURE	DEFINITION	OBJECTIVE	CATEGORY	2040 BASELINE	2040 PLAN	INDICATOR
<b>OUTCOME: SAFETY AND HEALTH</b>						
Collision rates by severity by mode (per 100 million vehicle miles)*	Collision rate per 100 million vehicle miles by mode and number of fatalities and serious injuries by mode (all, bicycle/pedestrian)	Improvement (decrease) over No Project Baseline	Serious injuries	N/A	1.60	
			Fatalities	N/A	0.31	
Criteria pollutants emissions (tons per day)	CO, NOx, PM 2.5, PM 10 and VOC	Meet Federal air quality conformity requirements (FR)	Reactive organic gases (ROG)	49.1 tons	45.0 tons	↓
			Carbon monoxide (CO)	338.6 tons	307.7 tons	↓
			Oxides of nitrogen (NOx)	96.4 tons	88.2 tons	↓
			Particulate matter (PM 10)	32.6 tons	30.8 tons	↓
			Particulate matter (PM 2.5)	13.3 tons	12.6 tons	↓
			Nitrogen dioxide (NO2)	94.6 tons	86.8 tons	↓
Air pollution-related health measures	Pollution-related respiratory disease incidence and cost	Improvement (decrease) over No Project Baseline	Pollution-related health incidences (annual)	270,328	234,363	↓
			Pollution-related health costs (annual)	\$4.48 billion	\$3.88 billion	↓
Physical activity-related health measures	Physical activity/weight related health issues and costs	Improvement over No Project Baseline	Daily per capita walking	12.1 mins	16.0 mins	↑
			Daily per capita biking	1.6 mins	2.0 mins	↑
			Daily per capita driving	64.8 mins	61.9 mins	↓
			Obese population (%)**	26.3%	25.6%	↓
			High blood pressure (%)**	21.5%	20.8%	↓
			Heart disease (%)**	4.4%	4.2%	↓
			Diabetes Type 2 (%)**	6.1%	6.0%	↓
Mode share of walking and bicycling	Mode share of walking and biking for work trips, non-work trips and all trips	Improvement (increase) over No Project Baseline	Walk share (Work)	4.4%	5.6%	↑
			Bike share (Work)	0.5%	0.7%	↑
			Walk share (Non-Work)	12.0%	15.0%	↑
			Bike share (Non-Work)	1.8%	2.5%	↑
			Walk share (All Trips)	10.7%	13.5%	↑
			Bike share (All Trips)	1.6%	2.2%	↑



TABLE 8.1 CONTINUED

PERFORMANCE MEASURE	DEFINITION	OBJECTIVE	CATEGORY	2040 BASELINE	2040 PLAN	INDICATOR
<b>OUTCOME: ENVIRONMENTAL QUALITY</b>						
Greenhouse gas emissions	CO, NOx, PM 2.5, PM 10 and VOC emissions; and per capita greenhouse gas emissions (CO2)	Meet state greenhouse gas reduction targets (SR)	Reduction in per capita greenhouse gas emissions from 2005 levels	N/A	8% in 2020 18% in 2035 21% in 2040	
<b>OUTCOME: ECONOMIC OPPORTUNITY</b>						
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 economically competitive	Improvement (increase) over No Project Baseline	Annual number of new jobs generated	N/A	351,000+	
Additional jobs supported by transportation investments	Total number of jobs supported in the economy as a result of transportation expenditures	Improvement (increase) over No Project Baseline	Annual number of new jobs generated	N/A	188,000+	
<b>OUTCOME: INVESTMENT EFFECTIVENESS</b>						
Benefit/Cost Ratio	Ratio of monetized user and societal benefits to the agency transportation costs	Greater than 1.0	Benefit ratio per \$1 investment	N/A	2.0	
<b>OUTCOME: TRANSPORTATION SYSTEM SUSTAINABILITY</b>						
Cost to preserve multimodal system to current and state of good repair	Annual cost per capita required to preserve the regional multimodal transportation system to current conditions	Improvement (decrease) over Base Year	Cost per capita (per year)	N/A	\$368	
<b>OUTCOME: ENVIRONMENTAL JUSTICE</b>						
See Table 8.4: Performance Measures: Environmental Justice		Meet Federal requirements. No unaddressed disproportionately high and adverse effects for low income or minority communities (FR)				

**Notes:**

(FR) Federal requirement

(SR) State requirement

\* MAP-21 calls for performance measures and targets associated with congestion, safety, reliability, freight movement, infrastructure condition, environment and project delivery. However, federal rule-making in support of MAP-21 performance measures is still in progress.

\*\* Results are for areas experiencing land use and population changes not the entire SCAG region.

**Acronyms**

HOV: High-Occupancy Vehicle

SOV: Single-Occupancy Vehicle

TABLE 8.2 2016 RTP/SCS KEY BENEFITS

BENEFIT CATEGORIES	BASELINE	RTP/SCS	SAVINGS	% SAVINGS
Local Infrastructure and Services Costs: Capital and Operations and Maintenance Costs to Support New Growth, 2012–2040 <sup>1</sup>	\$40.6 billion	\$37.3 billion	\$3.3 billion	8.1%
Household Costs: Transportation and Home Energy/Water Use, All Households, Annual (2040)	\$16,000	\$14,000	\$2,000	12.3%
Land Consumption: New (greenfield) Land Consumed to Accommodate New Growth 2012–2040	154 sq miles	118 sq miles	36 sq miles	23.4%
Building Energy Use: Residential and Commercial Buildings, Cumulative, 2012–2040 (measured in British Thermal Units (BTUs))	20,311 trillion	19,563 trillion	748 trillion	3.7%
Building Energy Costs: Residential and Commercial Buildings, Cumulative, 2012–2040	\$762 billion	\$735 billion	\$27 billion	3.5%
Building Water Use: Residential and Commercial Buildings, Cumulative, 2012–2040 (measured in Acre Feet (AF))	134 million	133.2 million	0.8 million	0.6%
Building Water Costs: Residential and Commercial Buildings, Cumulative, 2012–2040	\$186 billion	\$185 billion	\$1 billion	0.5%
Household Driving: Annual Passenger VMT, 2040	177.7 billion	150 billion	27.7 billion	15.6%

Note: <sup>1</sup> Operations and maintenance costs referenced here include costs beyond those for transportation (e.g., sewer and water operations and maintenance costs).

### VEHICLE MILES TRAVELED (VMT) PER CAPITA

This measure is new to the 2016 RTP/SCS. VMT (for automobiles and light trucks) per capita has become an increasingly significant metric since the passage of Senate Bill 375, which led to state-determined reduction targets for regional greenhouse gas emissions from automobiles and light trucks. Automobiles and light duty trucks are a major contributor to greenhouse gas emissions, producing more than 60 percent of transportation sector emissions. Therefore, VMT reduction is a critical component of a comprehensive regional strategy for reducing greenhouse gas emissions. By monitoring progress in reducing per capita VMT through implementation of the various transportation investments and land use strategies outlined in this Plan, we will be better able to accurately gauge our momentum toward achieving our goals for reducing regional greenhouse gas emissions. Daily per capita VMT in the SCAG region is projected to decrease significantly in 2040 under the Plan.

### TRANSIT MODE SHARE

Transit mode share is another new metric for the 2016 RTP/SCS. It measures the share of transit trips made throughout the region for work and non-work purposes. This new measure will help us to identify how well the transit strategies and improvements proposed in the 2016 RTP/SCS are working toward providing better and more diverse commuting options for the traveling public. Ideally, with better transit service, more commuters will choose that

**TABLE 8.3 TRANSIT MODE SHARE BY COUNTY**

(Plan 2040)

COUNTY	WORK TRIPS	ALL TRIPS
Imperial	0.6%	0.3%
Los Angeles	12.0%	4.7%
Orange	3.8%	1.7%
Riverside	1.1%	0.5%
San Bernardino	2.1%	0.7%
Ventura	1.6%	0.7%
SCAG Region	8.2%	3.1%

option over driving alone, further reducing VMT and regional greenhouse gas emissions. **TABLE 8.3** shows transit mode share by county for work trips and for all trips in 2040 as projected under the Plan.

### AVERAGE DISTANCE FOR WORK AND NON-WORK TRIPS

The average distance for work trips in 2040 is projected to increase slightly under the Plan. The average distance traveled for non-work trips in 2040 is projected to remain relatively constant between the Baseline and the Plan.

### PERCENT OF TRIPS LESS THAN THREE MILES

The vast majority of trips in Southern California today are made by people driving alone. As the length of trips becomes shorter, particularly to within a few miles, people are more likely to use transit, bike, walk or choose other alternatives to driving alone. By 2040, the share of work trips and non-work trips less than three miles is projected to remain relatively unchanged.

### WORK TRIP LENGTH DISTRIBUTION

The share of trips less than ten miles in 2040 is projected to be just over 50 percent under both the Baseline and the Plan. Likewise, the share of trips under 25 miles would be about 81 percent for both the Baseline and the Plan.

## MOBILITY AND ACCESSIBILITY

The Mobility and Accessibility outcome is defined as the ability to reach desired destinations with relative ease and within a reasonable time, using reasonably available transportation choices. This section discusses the mobility and accessibility performance measures for the 2016 RTP/SCS.

### MOBILITY

The Mobility performance measure relies on the commonly used measure of delay. Delay is defined as the difference between actual travel time and the travel time at a pre-defined reference or optimal speed for each modal alternative. It is measured in vehicle-hours of delay (VHD), which can then be used to derive person-hours of delay. The mobility measures used to evaluate alternatives for this outcome include:

- Person Delay by Facility Type (Highway, High Occupancy Vehicle (HOV) Lanes, Arterials)
- Person Delay per Capita
- Truck Delay by Facility Type (Highway, Arterial)

One additional measure for delay that is readily available for ongoing monitoring, but which cannot be readily forecast, is non-recurrent delay. Recurrent delay is the day-to-day delay that occurs because too many vehicles are on the road at the same time. Non-recurrent delay is the delay that is caused by collisions, weather, special events or other atypical incidents. Non-recurrent delay can be mitigated or reduced by improving incident management strategies. Other uses of intelligent transportation technologies, such as traffic signal coordination and the provision of real-time information about unexpected delays, allow travelers to make better informed decisions regarding the availability of transportation alternatives, including transit. Non-recurrent delay as an on-going regional monitoring measure is discussed in greater detail in the Performance Measures Appendix.

### **Person Delay by Facility Type (Highway, High Occupancy Vehicle (HOV) Lanes, Arterials)**

Since the 2012 RTP/SCS, the person delay measure has been expanded to differentiate between single-occupancy vehicle (SOV) and HOV delay. Person delay on our highways under the Plan would improve on Baseline conditions, while delay on HOV facilities will be reduced more dramatically. Delay on our regional arterial roadways would also improve between the Baseline and the Plan. [FIGURE 8.1](#) shows total person hours of delay by facility type.

### **Person Delay Per Capita**

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 Baseline conditions. However, implementation of the Plan would reduce per capita delay substantially to below 2012 levels.

### **Truck Delay by Facility Type (Highway, Arterial)**

This measure estimates the average daily truck delay by facility type for highways and arterials. The 2016 RTP/SCS includes significant investments in a regional freight corridor and other improvements to facilitate goods movement. It is estimated that the Plan would reduce heavy-duty truck delay on the highway and arterial systems. However, truck delay under the Plan would still be above Base Year levels, partly due to the projected growth in trade and associated truck traffic.

### **Highway Non-Recurrent Delay**

As indicated previously, this measure will be used only for ongoing regional monitoring, not for evaluation of alternatives for the 2016 RTP/SCS. Non-recurrent delay refers to the share of congestion that is considered to be atypical. [FIGURE 8.2](#) shows the relative proportion of highway congestion that is estimated to be caused by non-recurrent events by county.

### **Highway Speed Maps**

Maps illustrating highway speed conditions during the afternoon peak period (3 PM to 7 PM) based upon the SCAG RTDM results for the Base Year, Baseline and Plan are provided in the Performance Measures Appendix. Additional speed maps are provided in the Highways & Arterials Appendix.

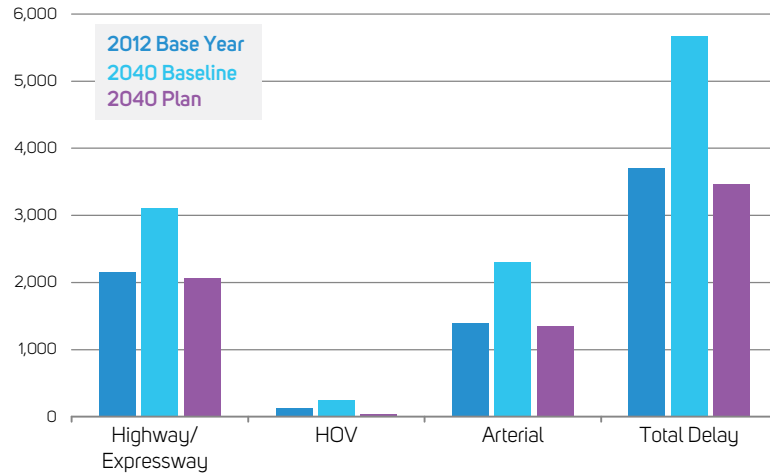
## **ACCESSIBILITY**

The Accessibility outcome is used to evaluate how well the transportation system performs in providing people access to opportunities. Opportunities may include jobs, education, medical care, recreation, shopping or any other activities that may help enhance a person's quality of life. For the 2016 RTP/SCS, accessibility is simply defined as the distribution of trips by mode by travel time.

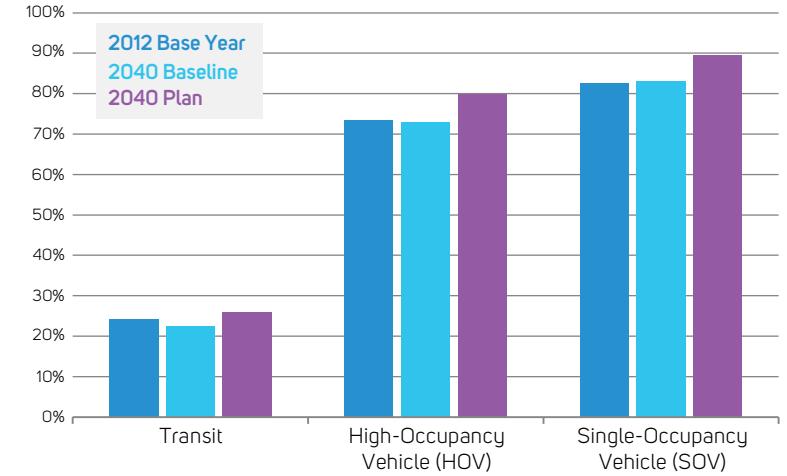
As with the 2012 RTP/SCS, accessibility is measured by taking afternoon or PM peak period travel demand model results for the base and forecast years and identifying the percentage of commute or home-based work trips that are completed within 45 minutes. Peak periods are those times during the weekday when commuting travel on regional roadways reaches its highest levels. Typically, peak periods occur twice daily, first during the morning commute when people are traveling to their workplaces and again in the late afternoon when people are returning home from work. [FIGURE 8.3](#) shows these results. In all cases, the 2040 Plan would improve accessibility for home-based work trips over the Baseline.

The 2016 RTP/SCS provides a comprehensive measure of accessibility, including the transit, SOV, and HOV modes, for both work and non-work trips. The results of these mode-specific accessibility analyses can be found in the Performance Measures Appendix.

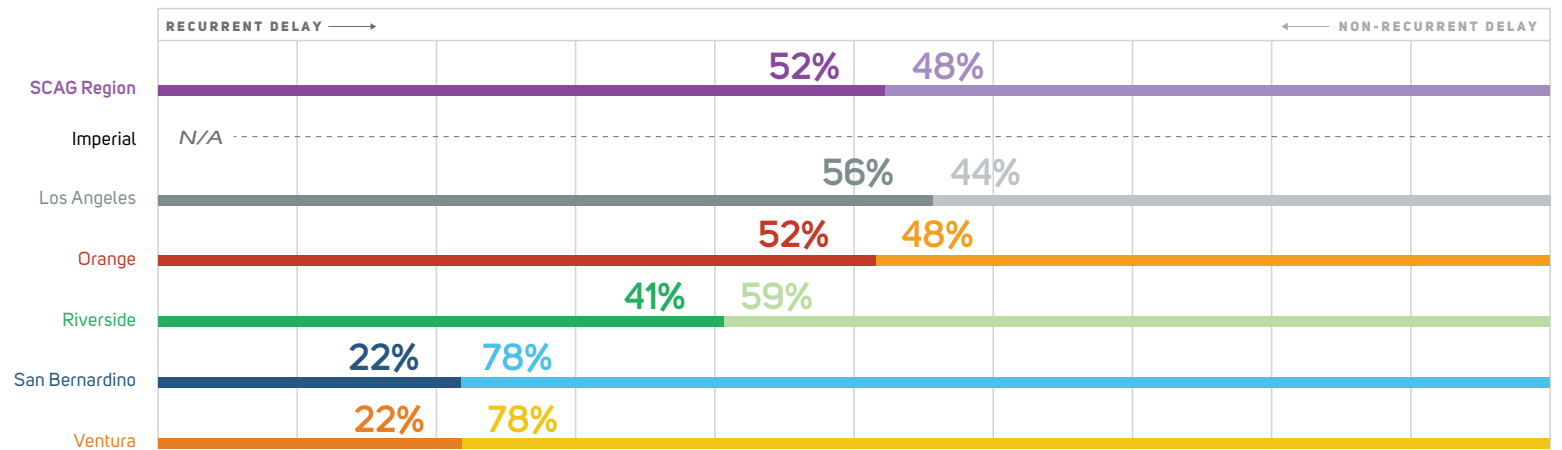
**FIGURE 8.1 DAILY PERSON-HOURS OF DELAY BY FACILITY TYPE (IN THOUSANDS)**



**FIGURE 8.3 WORK TRIPS COMPLETED WITHIN 45 MINUTES**



**FIGURE 8.2 RECURRENT AND NON-RECURRENT CONGESTION (2011)**





## SAFETY AND HEALTH

The Safety and Health outcomes have been carried over from the 2012 RTP/SCS. In addition, the 2016 RTP/SCS includes new measures to evaluate the health outcomes of the Plan, including three new measures discussed below. The safety and health impacts of regional transportation improvements cannot be easily forecast, but total collisions can show a reduction in future years, particularly if people shift from travel modes with higher collision risk to modes with lower collision risk. The total number of collisions is generally used as the performance measure for safety and it can be partially projected by using mode and facility specific collision rates (highways, arterials and transit). This approach is used for the 2016 RTP/SCS, but it is important to note that this methodology does not take into account safety improvements specific to each mode. It only reflects changes based on modal or facility shifts. For monitoring, this measure can be reported historically by time period (month) and by mode (including for active transportation). Safety and Health outcome trends are discussed in greater detail in the Performance Measures Appendix.

Recognizing that the RTP/SCS integrates transportation and land use and has impacts beyond those exclusively transportation-related, the 2016 RTP/SCS includes three new health-related measures: mode share for walking and biking, rates of physical activity and weight-related disease, and incidence of respiratory/pollution-related disease.<sup>1</sup>

The health benefits of an active lifestyle have become increasingly apparent in recent years, and there is growing support for improving the walkability and bikability of the communities where we live and work. The linkage between obesity and disease has been well documented, and providing the appropriate community design and infrastructure to support a more active lifestyle is an important first step toward promoting healthy communities. Walking and biking mode shares can be used to evaluate the 2016 RTP/SCS alternatives, while the disease-focused measures may also be useful for on-going regional monitoring.

A health measure carried over from the 2012 RTP/SCS is tons of criteria air pollutants, which is highly correlated to public health concerns such as asthma. There are six common air pollutants that are monitored in accordance with federal air quality regulations.<sup>2</sup> These criteria pollutants include particulate

matter (PM 10 and PM 2.5), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), and nitrogen dioxide (NO<sub>2</sub>). These pollutants require careful monitoring because of their known adverse effects on human health. While children, older residents and persons with existing respiratory illnesses are most vulnerable to the effects of air pollutants, the health effects of long-term exposure are a concern for everyone in the region. Some of the major health concerns of exposure to high levels of these criteria pollutants include respiratory irritation, reduced lung capacity, chest pain, and aggravation of asthma and other respiratory illnesses.<sup>3</sup>

Airborne particulate matter comes in all sizes. However, particles smaller than ten micrometers in diameter are considered the most dangerous to human health because they are small enough to be absorbed into the lungs. The finer the particle size, the more dangerous they are. Particulate matter smaller than 2.5 micrometers is a particularly serious concern for people with existing heart or lung disease, as even short-term exposure to high levels of PM 2.5 may aggravate symptoms. High levels of carbon monoxide (CO) is also considered a health hazard, especially for people with compromised respiratory or coronary function, as CO is known to reduce the flow of oxygen through the human body. Long-term exposure to high levels of nitrogen dioxide, which is produced primarily through the burning of fossil fuels, may cause a narrowing of the bronchial airways, resulting in chronic bronchitis or aggravation of asthma symptoms.<sup>4</sup> The criteria pollutant performance measure supports both the Safety and Health outcome and the Environmental Quality outcome.

The 2016 RTP/SCS would improve physical activity outcomes through improved location efficiency, which increases the share of short trips and through the provision of additional investments in active transportation networks including first/last mile improvements, Safe Routes to School projects and regional bikeway infrastructure. It would also increase access to natural lands and parks, which would further increase opportunities for physical activity.

New to the 2016 RTP/SCS is the development of a new Public Health module for the Urban Footprint/Scenario Planning Model to measure the Plan's impact on physical activity. The model was evaluated by a statewide review panel consisting of representatives of state, regional and local agencies. The Plan is expected to result in 4.3 additional minutes of physical activity per capita over the Baseline in areas experiencing changes in land use, which would improve

<sup>1</sup> Ogden, Ph.D., C., & Carroll, M.S.P.H, M. (2010). Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults: United States, Trends 1960–1962 Through 2007–2008. Center for Disease Control and Prevention. Accessed at [http://www.cdc.gov/nchs/data/hestat/obesity\\_adult\\_07\\_08/obesity\\_adult\\_07\\_08.htm](http://www.cdc.gov/nchs/data/hestat/obesity_adult_07_08/obesity_adult_07_08.htm).

<sup>2</sup> For more information on Federal air quality standards, see U.S. Environmental Protection Agency, National Ambient Air Quality Standards (NAAQS): <http://www3.epa.gov/ttn/naaqs/criteria.html>.

<sup>3</sup> For more information on the health impacts of criteria air pollutants, see U.S. Environmental Protection Agency, Six Common Air Pollutants: <http://www3.epa.gov/airquality/urbanair/>.

<sup>4</sup> For more information on the health impacts of particulate matter, see U.S. Environmental Protection Agency, Particle Matter (PM) Health, Last Accessed October 7, 2015: <http://www3.epa.gov/pm/health.html>.

health outcomes related to obesity by 2.7 percent and high blood pressure by 3.3 percent for residents in those areas. For a broader discussion of the Scenario Planning Model, please see the SCS Background Documentation Appendix. For more detailed information on the connection between physical activity and health outcomes, please see the Public Health Appendix.

## ENVIRONMENTAL QUALITY

This outcome is measured in terms of criteria pollutant and greenhouse gas emissions. Emissions are estimated using the SCAG RTDM results, which are used as input to the California Air Resources Board's (ARB) Emission Factors (EMFAC) model. Pollutant emissions are reported in detail as part of the Transportation Conformity Analysis Appendix. The impact of air quality on public health is discussed in the Safety and Health outcome section of this chapter. Monitoring of regional greenhouse gas emissions is discussed in the Performance Measures Appendix.

## ECONOMIC OPPORTUNITY

The economic opportunity outcome is measured in terms of additional jobs created through improved regional economic competitiveness as a result of the transportation investments provided through the 2016 RTP/SCS. An annual average of more than 188,000 new jobs would be generated by the construction and operations expenditures in the 2016 RTP/SCS, in addition to more than 351,000 annual jobs that would 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. Additional economic benefits of the 2016 RTP/SCS are discussed in Chapter 7.

## INVESTMENT EFFECTIVENESS

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

The benefit/cost ratio is the measure used to evaluate the cost-effectiveness outcome, as it compares the incremental benefits with the incremental costs of multimodal transportation investments. The benefits are divided into several categories, including:

- Savings resulting from reduced travel delay
- Air quality improvements
- Safety improvements
- Reductions in vehicle operating costs

For these categories, travel demand and air quality models are used to estimate the benefits of the Plan compared with the Baseline. Most of these benefits are a function of changes in VMT and VHT. 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. The investments in the 2016 RTP/SCS would provide a return of \$2.00 for every dollar invested, for a benefit/cost ratio of 2.0. For this analysis, all benefits and costs are expressed in 2012 dollars. Benefits are estimated over the RTP/SCS planning period through 2040. The user benefits are estimated using California's Cal-B/C framework and incorporate SCAG's RTDM outputs. The costs include the incremental public expenditures over the entire 2016 RTP/SCS planning period.<sup>5</sup>

## TRANSPORTATION SYSTEM SUSTAINABILITY

A transportation system is sustainable if it maintains its overall performance over time in an equitable manner with minimum damage to the environment, and at the same time does not compromise the ability of future generations to address their transportation needs. Sustainability, therefore, pertains to how our decisions today impact future generations. One of the measures used to evaluate system sustainability is the total inflation-adjusted cost per capita to maintain our overall multimodal transportation system performance at current conditions. The 2016 RTP/SCS includes two additional new measures to support this outcome: State Highway System pavement condition and local roads pavement condition. These additional performance measures will strengthen the transportation system sustainability outcome and further support implementation of MAP-21.

<sup>5</sup> California Department of Transportation. (2009). California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C) User's Guide (Version 4.0). Accessed at [http://www.dot.ca.gov/hq/tpp/offices/eab/benefit\\_files/CalBC\\_User\\_Guide\\_v8.pdf](http://www.dot.ca.gov/hq/tpp/offices/eab/benefit_files/CalBC_User_Guide_v8.pdf).

The 2016 RTP/SCS is committed to maintaining a sustainable regional transportation system by allocating \$275.5 billion toward maintaining and operating the system in a state of good repair over the period of the Plan. This amounts to an average annual per capita investment of about \$368 (in 2015 dollars) for each year of the Plan period. More details on performance measures for the Transportation System Sustainability outcome are presented in the Performance Measures Appendix.

## LAND USE RELATED BENEFITS

Unlike the Plan, the Baseline scenario relies more heavily on growth in undeveloped lands at the edges of cities and beyond and focuses more new housing toward single-family developments in suburban settings. Using a different modeling process from that used for the mobility-based performance measures, additional land use related performance results were derived

using the single framework model as described in the SCS Background Documentation Appendix.

The land use strategy of the 2016 RTP/SCS promotes location efficiency by orienting new housing and job growth in areas served by high quality transit and in other targeted opportunity areas including existing main streets, downtowns and corridors where infrastructure already exists. This more compact land use pattern, combined with the transportation network improvements and strategies identified in the 2016 RTP/SCS, would result in improved pedestrian and bicycle access to community amenities, shorter average trip lengths and reduced vehicle miles traveled. This strategy also supports the development of more livable communities that provide more housing choices, conserve natural resources, offer more and better transportation options, and promote an overall better quality of life.

The more focused land use pattern promoted in the Plan also reduces the need for significant capital investments. Because new development is focused in areas where infrastructure already exists, there is not as much need to extend or build new local roads, water and sewer systems, and parks. However, in other instances, modernization of utilities needs to be considered and completed to accommodate the additional use. There are also operations and maintenance (O&M) cost savings. O&M costs include the ongoing local expenditures required to operate and maintain the infrastructure serving new residential growth. It is important to note the O&M costs referred to in this section are not the same O&M costs discussed in other sections of the 2016 RTP/SCS.

The 2016 RTP/SCS land use strategy also reduces the average household costs associated with driving and residential energy and water use. A land use pattern that contains more mixed-use/walkable and urban infill development accommodates a higher proportion of growth in more energy-efficient housing types like townhomes, apartments and smaller single-family homes, as well as more compact commercial building types. It should be noted that location is also an important factor in determining energy costs: buildings located in the warmer areas of the region use more energy each year, in part because they require more energy for cooling during the summer months.

As California is facing major constraints on water supplies due to ongoing drought conditions throughout the state, there is a strong emphasis on reducing residential water use. Residential water use is a function of both indoor and outdoor water needs, with outdoor use (landscape irrigation) accounting for the majority of the difference among housing types. Because homes with

## RTP/SCS GREENHOUSE GAS REDUCTIONS

Percent Reduction from 2005 Levels Per Capita

	2020	2035	2040
ARB TARGET	8%	13%	N/A
2016 RTP/SCS	8%	18%	21%
% DIFFERENCE	0%	5%	N/A

\* ARB has set GHG emissions reduction targets for 2020 and 2035, but not for 2040

larger yards require more water for landscape irrigation, lot size is generally highly correlated with a household's overall water consumption. Therefore, a land use pattern with a greater proportion of large lot single-family homes will require more water than a land use pattern that features a larger share of compact and urban infill development, which includes more attached and multifamily homes. And, as is the case for energy use, the location and type of new development has a significant bearing on water use: homes in the warmer and more arid locations of the region will consume more water to maintain lawns and other landscaping.

## SENATE BILL 375 AND GREENHOUSE GAS EMISSIONS REDUCTIONS

As discussed previously in this Plan, Senate Bill 375 requires that SCAG and other Metropolitan Planning Organizations (MPOs) throughout the state develop a Sustainable Communities Strategy to reduce per capita greenhouse gas emissions through integrated transportation, land use, housing and environmental planning.

Pursuant to Senate Bill 375, ARB set per capita greenhouse gas emissions reduction targets from passenger vehicles for each of the state's 18 MPOs. For the SCAG region, the targets are set at eight percent below 2005 per capita emissions levels by 2020 and 13 percent below 2005 per capita emissions levels by 2035. Although ARB has not adjusted SCAG's regional targets since the 2012 RTP/SCS, SCAG anticipates that the region's targets could change—considering the Governor's recent Executive Order.<sup>6</sup> Because the transportation sector is the largest contributor to California's greenhouse gas emissions (more than 36 percent), SCAG anticipates updated and more stringent regional greenhouse gas reduction targets may be forthcoming.<sup>7</sup>

In the meantime, the 2016 RTP/SCS achieves per capita greenhouse gas emissions reductions relative to 2005 of eight percent in 2020, 18 percent in 2035, and 21 percent in 2040—exceeding the reductions that ARB currently requires. For more detailed information and analysis regarding monitoring of air quality and greenhouse gas emissions in the SCAG region, please see the Transportation Conformity Analysis Appendix.

<sup>6</sup> California Air Resources Board. (2015). Frequently Asked Questions About Executive Order B-30-15 2030 Carbon Target and Adaptation. [Fact Sheet]. Retrieved from [http://www.arb.ca.gov/newsrel/2030\\_carbon\\_target\\_adaptation\\_faq.pdf](http://www.arb.ca.gov/newsrel/2030_carbon_target_adaptation_faq.pdf)

<sup>7</sup> California Air Resources Board. California Greenhouse Gas Emission Inventory. (2015) [Website]. Retrieved from <http://www.arb.ca.gov/cc/inventory/data/data.htm>.

## ENVIRONMENTAL JUSTICE

The concept of environmental justice is about equal and fair access to a healthy environment, with the goal of protecting minority and low-income communities from incurring disproportionate negative environmental impacts. SCAG's environmental justice program includes two main elements: technical analysis and public outreach. In the regional transportation-planning context, SCAG's role is to 1) ensure that when transportation decisions are made, low-income and minority communities have ample opportunity to participate in the decision-making process, and 2) identify whether such communities receive an equitable distribution of benefits and not a disproportionate share of burdens.

As such, SCAG adheres to all federal and state directives on environmental justice. All public agencies that use federal funding must make environmental justice part of their mission and adhere to three fundamental environmental justice principles:

1. To avoid, minimize or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
2. To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
3. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

The 2016 RTP/SCS program of environmental justice public outreach and analysis, described in detail in the Environmental Justice Appendix, reviews federal legislation pertaining to environmental justice; major equity issues specific to our region; SCAG policies and programs related to this important topic; outreach efforts in communities across the region; and SCAG's efforts to identify demographic groups to ensure environmental justice in all of our communities.

TABLE 8.4 2016 RTP/SCS PERFORMANCE MEASURES: ENVIRONMENTAL JUSTICE

PERFORMANCE MEASURE	DEFINITION	PERFORMANCE TARGET	SUMMARY OF IMPACTS
2016 RTP/SCS revenue sources in terms of tax burdens <sup>1</sup>	Proportion of 2016 RTP/SCS revenue sources (taxable sales, income, and gasoline taxes) for low income and minority populations	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—households in poverty will not contribute disproportionately to the overall funding of the Plan. Minority households will not pay a higher proportion of taxes to fund the 2016 RTP/SCS than their relative representation in the region as a whole
Share of transportation system usage <sup>1</sup>	Comparison of transportation system usage by mode for low income and minority households vs each group's population share in the greater region	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—low income and minority groups show a higher usage of transit and active transportation modes and positions these communities to benefit from the investments in the 2016 RTP/SCS
2016 RTP/SCS investments <sup>1</sup>	Allocation of Plan investments by mode (bus, HOV lanes, commuter/high speed rail, highways/arterials, and light/heavy rail transit)	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the share of transportation investments for low income and minority communities outpaces these groups' financial burdens for the 2016 RTP/SCS
Distribution of travel time savings and travel distance reductions <sup>1</sup>	Details what groups are overall benefiting as a result of the Plan in terms of travel time and distance savings	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan's travel time and person-mile savings for low income households and minority communities is in line with each group's usage of the transportation system
Geographic distribution of transportation investments	Examination of transit, roadway and active transportation infrastructure investments in various communities throughout the region	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan's transportation infrastructure investments are distributed throughout the region in proportion to population density
Jobs-housing imbalance <sup>1</sup>	Comparison of median earnings for intra-county vs inter-county commuters for each county in the SCAG region; analysis of relative housing affordability and jobs throughout the region	Establish existing conditions (not a performance measure for the Plan)	Existing conditions show that higher wage workers tend to commute longer distances than lower wage workers. Inland counties show a lower job-to-worker ratio than coastal counties, indicating that there are more long distance commuters in inland counties. Please refer to the Environmental Justice Appendix for potential strategies to improve conditions at the local level
Accessibility to employment and services <sup>1</sup>	Percentage of employment and shopping destinations within a one- and two-mile travel buffer from each neighborhood; also, share of employment and shopping destinations that can be reached within 30 minutes by auto or 45 minutes by bus or all transit modes during the evening peak period	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan will improve the number of accessible destinations within 45 minutes of travel and within short distances for low income and minority communities both by auto and transit
Accessibility to parks and schools	Share of population within a one- and two-mile travel buffer from a regional park or school; also, share of park acreage that can be reached within 30 minutes by auto or 45 minutes by bus or all transit modes during the evening peak period	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan will improve the number of destinations accessible within 45 minutes of travel and short distances for low income and minority communities both by auto and transit
Gentrification and displacement <sup>1</sup>	Examination of historical demographic and economic trends for areas surrounding rail transit stations	Establish existing conditions (not a performance measure for the Plan)	Historic trends from 2000 to 2012 show that population living in areas within a half mile of rail transit stations are not strongly influenced by the larger region's demographic and economic trends. For example, the growth of Hispanics and seniors (age 65 and above) in these areas has not kept pace with regional trends. Patterns in residents' income and housing prices suggest that gentrification may be happening and low income and minority households are at risk for displacement. Refer to the Environmental Justice Appendix for potential strategies to reduce impacts at the local level
Emissions Impact Analysis <sup>1</sup>	Comparison of Plan and Baseline scenarios; identification of areas that are lower performing as a result of the Plan, along with a breakdown of demographics for those areas	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan will result in reductions in carbon monoxide and particulate matter emissions for on-road vehicles and benefits will be experienced both by minority and low income households and in communities with a high concentration of minority and low income groups



TABLE 8.4 CONTINUED

PERFORMANCE MEASURE	DEFINITION	PERFORMANCE TARGET	SUMMARY OF IMPACTS
Air quality health impacts along highways and highly traveled corridors <sup>1</sup>	Comparison of Plan and Baseline scenarios and demographic analysis of communities in close proximity to highways and highly traveled corridors	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan will result in an overall reduction in emissions in areas that are near roadways, which have been seen to have a higher concentration of minority and low income groups than the region as a whole
Aviation noise impacts <sup>1</sup>	Comparison of Plan and Baseline scenarios; breakdown of population by race and ethnicity for low performing airport noise impacted areas	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan will result in aviation noise areas that are geographically smaller than the Baseline scenario, and will benefit minority and low income households as a result
Roadway noise impacts <sup>1</sup>	Comparison of Plan and Baseline scenarios, identification of areas that are low performing as a result of the Plan; breakdown of population for these impacted areas by race/ethnicity and income	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—the Plan results in a reduction of roadway noise when compared to the Baseline scenario, which has a benefit to minority and low income households who represent a higher share of population who live in close proximity to major roadways
Active transportation hazard	Breakdown of population by demographic group for areas that experience the highest rates of bicycle and pedestrian collisions	Establish existing conditions (not a performance measure for the Plan)	Collision data from 2012 shows that low income and minority communities incur a higher rate of bicycle and pedestrian risk. Improvements in active transportation infrastructure and Complete Streets measures, such as those proposed in the Plan, have been shown to reduce hazard to bicyclists and pedestrians. Refer to the Environmental Justice Appendix for potential strategies to reduce risk at the local level
Rail-related impacts <sup>1</sup>	Breakdown of population by demographic group for areas in close proximity to rail corridors and planned grade separations	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—there is no significant difference between the Plan and the Baseline in the concentration of minority and low income communities in areas directly adjacent to commercial and passenger railways
Public health analysis	Historical emissions and health data summarized for areas that have high concentrations of minority and low income population	Establish existing conditions (not a performance measure for the Plan)	Recent trends indicate that air quality is improving throughout the region. For select areas that show increase, there is sometimes a higher proportion of minority and low income population. When examining public health indicators from the CalEnviroScreen tool, it appears that areas with the highest concentrations of minority and low income population incur some of the highest risks in the region. Refer to the Environmental Justice Appendix for potential strategies to improve conditions at the local level
Climate vulnerability	Breakdown of population by demographic group for areas potentially impacted by substandard housing, sea level rise and wildfire risk	Establish existing conditions (not a performance measure for the Plan)	Existing conditions indicate that minority and low income populations are at a greater risk for experiencing negative impacts of climate change. Refer to the Environmental Justice Appendix for potential strategies to reduce impacts at the local level.
Proposed mileage-based user fee impacts	Examination of potential impacts from implementation of a mileage-based user fee on low income households in the region	No unaddressed disproportionately high and adverse effects for low income or minority communities	No unaddressed disproportionate impacts—results show that the mileage-based user fee is less regressive to low income residents than the current gasoline tax.

Note: <sup>1</sup> Performance measures used in the Environmental Justice Analysis for the 2012 RTP/SCS

## ENVIRONMENTAL JUSTICE PERFORMANCE MEASURES

In the development of the analysis, SCAG identified 18 performance measures to analyze existing environmental justice parameters in the region and to address any potential impacts of the 2016 RTP/SCS on the various environmental justice population groups. SCAG also examined potential impacts at various geographies and specifically employed a community-based approach for the 2016 RTP/SCS based on guidance from stakeholders. A brief description of the environmental justice performance measures is provided in this section. A more detailed presentation of the results of the 2016 RTP/SCS environmental justice analysis can be found in the Environmental Justice Appendix. [TABLE 8.4](#) describes the 2016 RTP/SCS environmental justice performance measures and provides a summary of impacts for each of the measures.

### PERFORMANCE MEASURE 1: 2016 RTP/SCS REVENUE SOURCES IN TERMS OF TAX BURDENS

Different funding sources (i.e., income, property, sales and fuel taxes) can impose disproportionate burdens on lower-income and minority groups. Sales and gasoline taxes, which are the primary sources of funding for the region's transportation system, were evaluated for the purposes of this analysis. The amount of taxes paid was broken down to demonstrate how tax burdens fall on various demographic groups. As in previous RTP environmental justice reports, the 2016 RTP/SCS environmental justice analysis examined in detail the incidence, distribution and burden of taxation.

### PERFORMANCE MEASURE 2: SHARE OF TRANSPORTATION SYSTEM USAGE

SCAG analyzed the use of various transportation modes by race/ethnicity and by income quintile (an income quintile is a category into which 20 percent of households ranked by income fall).

### PERFORMANCE MEASURE 3: 2016 RTP/SCS INVESTMENTS

The strategy that public agencies pursue to invest in transportation has a huge impact on environmental justice. In short, it can determine what transportation choices will be available to low-income and minority communities. A disproportionate allocation of resources for various transit investments, for example, can indicate a pattern of discrimination.

### PERFORMANCE MEASURE 4: DISTRIBUTION OF TRAVEL TIME SAVINGS AND TRAVEL DISTANCE REDUCTIONS

SCAG assessed both the distribution of travel time and distance savings that are expected to result from implementing the 2016 RTP/SCS, by analyzing demographic data and the associated mode usage statistics for each Transportation Analysis Zone (TAZ) in the region. With this input, an estimate for the time savings for each income group and ethnic group can be identified for trips involving transit (bus and rail) and automobiles.

### PERFORMANCE MEASURE 5: GEOGRAPHIC DISTRIBUTION OF TRANSPORTATION INVESTMENTS

This section is a new addition to the environmental justice analysis for the 2016 RTP/SCS and examines where transportation investments are planned throughout the region. Building on the new community-based approach for the overall effort, a summary of investments for areas with a high concentration of minority population and/or low income population is included for roadway, transit and active transportation investments.

### PERFORMANCE MEASURE 6: JOBS-HOUSING IMBALANCE

An imbalance or mismatch between employment and housing in a community is considered to be a key contributor to local traffic congestion. Some argue that these imbalances and mismatches are also impediments to environmental justice. Driving is expensive and people who can't afford to own a car generally need to live near to their jobs so they can get to work using transit, or by walking or biking.

### PERFORMANCE MEASURE 7: ACCESSIBILITY TO EMPLOYMENT AND SERVICES

Accessibility is vital for social and economic interactions. As a measure, accessibility is determined by the spatial distribution of potential destinations; the ease of reaching each destination by various transportation modes; and the magnitude, quality and character of the activities at the destination sites. Travel costs are central: the lower the costs of travel, in terms of time and money, the more places people can reach within a certain budget—that is, the greater the accessibility. The number of destination choices that people have is equally crucial: the more destinations and the more varied the destinations, the higher the level of accessibility.

### PERFORMANCE MEASURE 8: ACCESSIBILITY TO PARKS AND NATURAL LANDS

Similar to the method used for measuring accessibility to jobs, accessibility to parks is defined as the percentage of park acreage reachable within a 30-minute travel time by auto and 45-minute travel time by local bus and all transit options. For this round of SCAG's environmental justice effort, analysis was included that measured accessibility to the recently designated San Gabriel Mountains National Monument. Also included in our accessibility analysis (for employment and services) is a measurement of the share of population within a one- and two-mile travel distance of all regional parks and open space under the Plan and Baseline scenario, based on the principle that shorter trips should be encouraged through implementation of the 2016 RTP/SCS.

### PERFORMANCE MEASURE 9: GENTRIFICATION AND DISPLACEMENT

The integration of transportation and land use planning has been recognized for its ability to reduce VMT, air pollution and greenhouse gases, while also increasing opportunities for physical activity. However, there has been some criticism of smart growth strategies in relation to housing affordability, specifically in regard to Transit-Oriented Development (TOD). In response to these concerns, SCAG developed a methodology to monitor demographic trends in and around transit-oriented communities. For the 2016 RTP/SCS, recent indicators show that emerging trends for areas in close proximity to rail transit stations (one half mile surrounding a rail transit stop) are not consistent with those for the greater region. From 2000 to 2012, the region experienced huge growth for certain cohorts, specifically the Hispanic population and seniors aged 65 and over. This same trend was also seen in areas near rail transit stations, but to a much lesser degree. At the same time, median household income has decreased less, and median gross rent has increased more, in these transit oriented communities than has been the trend for the greater region. These divergent growth patterns represent evidence indicating likely gentrification, which may lead to displacement for low income households.<sup>8</sup>

SCAG will continue to monitor growth in TOD areas and is committed to promoting affordable housing throughout the region. Additional tools that local jurisdictions may use to combat displacement of low income and minority residents are provided in the Environmental Justice Toolbox, located in the Plan's Environmental Justice Appendix.

<sup>8</sup> Environmental Justice Emerging Trends and Best Practices Guidebook, Document Number: FHWAHEP-11-024 (2011). U.S. Department of Transportation, Federal Highway Administration.

### PERFORMANCE MEASURE 10: EMISSIONS IMPACT ANALYSIS

Air pollution comes from many different sources and can be classified into two types: ozone and particulate matter. Ozone pollution takes a gaseous form and is generated as vapor emitted from fuels commonly used in motor vehicles and industrial processes. Ozone is formed by the reaction between volatile organic compounds (VOC) and oxides of nitrogen (NOx) in the presence of sunlight. Ozone negatively impacts the respiratory system. Particulate matter (PM 10 and PM 2.5) are very fine particles made up of materials such as soot, ash, chemicals, metals and fuel exhaust that are released into the atmosphere. Particulate pollution has been linked to significant health problems, including aggravated asthma, respiratory disease, chronic bronchitis, decreased lung function and premature death.

Transportation projects can have both positive and negative impacts on the environment. Conversely, appropriate transportation investments can motivate travelers to shift to less polluting modes (e.g., bus, train, carpooling or commuter rail). On the other hand, investments that increase traffic on a particular facility typically degrade air quality in the immediate vicinity of that facility. Low-income and minority groups may be at particular risk for health hazards resulting from air pollution, and the objective for this analysis is to assess impacts for these groups as a result of the Plan versus Baseline (no-build) scenario.

### PERFORMANCE MEASURE 11: AIR QUALITY HEALTH IMPACTS ALONG HIGHWAYS AND HIGHLY TRAVELED CORRIDORS

Exposure to air pollutants is considered an environmental justice issue due to the disproportionate share of minority and low-income populations living in close proximity to heavily traveled corridors, particularly near port and logistics activities. This exposure to unhealthy air results in nearly 5,000 premature deaths annually in the SCAG region, as well as 140,000 children with asthma and other respiratory symptoms. More than half of Americans exposed to PM 2.5 pollution that exceeds the national standard live in the SCAG region.<sup>9</sup> This measure examines the potential emissions impacts of the RTP/SCS for PM and ozone emissions that result from on-road vehicles both at the TAZ level and for areas in close proximity to highways and highly traveled corridors.

<sup>9</sup> California Air Resources Board, South Coast Air Quality Management District, and SCAG. (2011). Powering the Future: A Vision for Clean Energy, Clear Skies, and a Growing Economy. [Fact Sheet]. [http://www.arb.ca.gov/newsrel/2011/powering\\_the\\_future.pdf](http://www.arb.ca.gov/newsrel/2011/powering_the_future.pdf).

### PERFORMANCE MEASURE 12: AVIATION NOISE IMPACTS

The SCAG region supports the nation's largest regional airport system, in terms of the number of airports and overall aircraft operations operating in a very complex airspace environment. This system has six established air carrier airports, including Los Angeles International (LAX), Burbank Bob Hope, John Wayne, Long Beach, Ontario and Palm Springs. There are also four emerging air carrier airports within the Inland Empire and in North Los Angeles County. These include San Bernardino International Airport, March Inland Port (joint use with March Air Reserve Base), Southern California Logistics Airport and Palmdale Airport (joint use with Air Force Plant 42).

The regional aviation system also includes more than 40 general aviation airports and two commuter airports—for a total of more than 55 public use airports. Although the projected demand for airport capacity has decreased in comparison with what was projected in the 2012 RTP/SCS, there is still moderate growth expected in the future. The challenge is striking a balance between the aviation capacity needs of Southern California and the quality of life for people living near airports. This measure evaluates the impact of aviation noise on neighborhoods close to airports and examines the potential impacts on environmental justice populations specifically.

### PERFORMANCE MEASURE 13: ROADWAY NOISE IMPACTS

The SCAG region has an extensive roadway system consisting of more than 70,000 lane miles. It includes one of the country's most extensive HOV lane systems and a growing network of toll lanes, as well as express lanes. The region also has a vast network of arterials and other minor roadways and noise may cause significant environmental concerns. Noise associated with highway traffic depends on a number of factors that include traffic volumes, vehicle speed, vehicle fleet mix (cars, trucks) and the location of the highway with respect to schools, daycare facilities, parks and other "sensitive receptors." According to FHWA guidance, noise impacts occur when noise levels increase substantially in comparison with existing levels. Impacts are assessed in this section by examining how the RTP/SCS affects roadway noise and by determining the population groups that could potentially be most impacted by roadway noise.

### PERFORMANCE MEASURE 14: ACTIVE TRANSPORTATION HAZARDS

Encouraging a healthier, more active lifestyle in all of our communities is one of the featured goals of this Plan. Making walking and bicycling safer

transportation options is key to attracting more people to choose these alternatives. Bicycling or walking along roadways in close proximity with motor vehicles is often perceived as dangerous, and reducing hazards in the pedestrian and cycling environment is a primary strategy toward achieving our goal of promoting healthier, more active communities.

As a new environmental justice indicator for the 2016 RTP/SCS, Active Transportation Hazards seeks to evaluate incidences of motor vehicle collisions involving bicyclists and pedestrians in our communities, with the goal of promoting an improved environment for active transportation users and encouraging more residents to make the choice to walk or bicycle in their communities. As with other environmental justice performance measures, this indicator will be used to identify patterns of active transportation hazards and potential disparities among our various communities.

### PERFORMANCE MEASURE 15: RAIL-RELATED IMPACTS

Freight rail emissions account for five percent of all NOx emissions and four percent of all PM emissions generated by regional goods movement activities, as described in the Goods Movement Appendix. When compared with all regional PM and NOx sources, the contributions by freight rail emissions is even lower. However, environmental pollution from locomotives, rail yards and other rail facilities must be considered, as concentrations of rail activities can cause localized rail-related pollution. In response to input from our federal partners, SCAG developed a summary analysis to address potential environmental justice impacts in areas adjacent to railroads and rail facilities, although further discussion and analysis is recommended. This outcome analyzes environmental justice communities adjacent to railroads and rail facilities, rail impacts to sensitive receptors, and examines environmental justice concerns that may potentially be alleviated by grade separation projects.

### PERFORMANCE MEASURE 16: PUBLIC HEALTH IMPACT

A new environmental justice indicator for the 2016 RTP/SCS, the Public Health measure seeks to evaluate the potential disparity among communities in the SCAG region in terms of public health issues that may be associated with historical toxic exposure and local transportation infrastructure. Like the Active Transportation Hazards measure discussed previously, inclusion of this new analysis is intended to further the goal of fostering healthier lifestyle choices in all of our communities. It is a key goal of this Plan to provide more and better opportunities for physical activity and other healthy lifestyle choices throughout the SCAG region.

### PERFORMANCE MEASURE 17: CLIMATE VULNERABILITY

This is another new environmental justice performance indicator that seeks to identify regional disparities in regard to vulnerability to the consequences of climate change among the various communities in the SCAG region. Of particular interest in this analysis will be relative risk for sea level rise, wildfires, and flooding. It is understood that climate change is expected to impact different regions in different ways. In Southern California, we may expect development of a general trend of warmer temperatures, less precipitation and higher sea levels along our coasts.

This combination of climatic changes will likely result in increased wildfire danger, particularly in the foothill areas where our cities adjoin our local mountains. Due to melting ice caps in the polar regions, a steady rise in global sea level is expected. This may impact the coastal regions of Southern California. This new measure will allow SCAG to obtain a better understanding of how these anticipated changes in our local climate may impact our more vulnerable communities.<sup>10</sup>

### PERFORMANCE MEASURE 18: PROPOSED MILEAGE-BASED USER FEE IMPACTS

This analysis is based on a proposed transportation improvement funding strategy that recommends implementation of a user fee based on VMT. If implemented, the mileage-based user fee would replace the current gasoline tax and is estimated to cost about four cents (2015 value) per mile and would be indexed to maintain its purchasing power beginning in 2025. Implementation of this financing strategy would require action by the California State Legislature and/or the U.S. Congress. This measure examines the impact of the gasoline tax on low income households and assesses the mileage-based user fee as a replacement option.

<sup>10</sup> For more information on potential climate change impact in Southern California, see Southern California Association of Governments and Dan Cayan, Climate Change: What Should Southern California Prepare for?: [http://www.scag.ca.gov/documents/climate-change\\_dancayan.pdf](http://www.scag.ca.gov/documents/climate-change_dancayan.pdf).

## TRANSPORTATION CONFORMITY

### REQUIREMENTS

The Federal Clean Air Act (CAA) establishes the National Ambient Air Quality Standards (NAAQS) and planning requirements for certain air pollutants. To comply with the CAA in achieving the national air quality standards, the ARB develops a State Implementation Plan (SIP) for each federal designated non-attainment and maintenance area within California. SIP development is a joint effort of the local air agencies and ARB working with federal, state and local agencies, including regional MPOs.

Transportation conformity is required under the CAA section 176(c) to ensure that federally supported highway and transit project activities “conform” to, or are consistent with, the purpose of the applicable SIP. Conformity for the purpose of the SIP means that transportation activities including regional transportation plans, transportation improvement programs and transportation projects will not cause new air quality violations, worsen existing air quality violations, or delay timely attainment of the relevant NAAQS. Conformity applies to areas that are designated by the U.S. Environmental Protection Agency (EPA) as being in non-attainment or maintenance for the following transportation related criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone, and particulate matter (PM 2.5 and PM 10).

Under the U.S. Department of Transportation Metropolitan Planning regulations and the EPA’s Transportation Conformity regulations, the 2016 RTP/SCS is required to pass the following four conformity tests in order to demonstrate transportation conformity:

- Regional Emissions
- Timely Implementation of Transportation Control Measures (TCMs)
- Financial Constraint
- Interagency Consultation and Public Involvement

The Regional Council adopts the initial transportation conformity determination, while FHWA/Federal Transit Administration (FTA) approves the final transportation conformity determination for the 2016 RTP/SCS.



## CONFORMITY ANALYSIS AND FINDINGS

As documented in the Transportation Conformity Analysis Appendix, the 2016 RTP/SCS meets all federal transportation conformity requirements and demonstrates transportation conformity. The findings associated with the conformity tests are described in detail in the Transportation Conformity Analysis Appendix.

## TRANSPORTATION CONFORMITY AND GREENHOUSE GAS EMISSION REDUCTION TARGETS

Although transportation conformity is a federal requirement and reducing greenhouse gas emissions is a state mandate, both requirements are highly interrelated. First of all, each of the 2016 RTP/SCS policies, strategies, programs and projects that contribute to transportation conformity are the same policies, strategies, programs and projects that help to meet state targets for reducing greenhouse gas emissions—and vice versa. Secondly, although transportation conformity addresses emissions of criteria pollutants and their precursors, such emissions originate from the same source as greenhouse gas emissions: the combustion of fossil fuels in motor vehicles.

Any strategies that result in reduction or elimination of use of fossil fuels in motor vehicles may help the 2016 RTP/SCS meet both federal transportation conformity requirements and state greenhouse gas emissions reduction targets. In addition, the regional emissions analysis used for transportation conformity and the emissions analysis conducted for meeting greenhouse gas reduction targets use the same regional transportation model and ARB's Emission Factors (EMFAC) model. Finally, there is greater awareness of the need for more concerted efforts at the federal, state and local levels to integrate the SIP development process with planning and actions to address climate change. As a result, transportation conformity and greenhouse gas emissions reductions will become even more interconnected and more mutually supportive.

## CONCLUSION

As we look toward mid-century, it is important to consider what the region can do beyond the transportation projects for which we expect to have funding. In our final chapter, 'Looking Ahead,' additional strategies and investments will be presented that would bring the SCAG region closer to achieving our goals for improved mobility and accessibility, a strong economic future, sustainable growth, and ultimately an enhanced quality of life for everyone in our region.