

**Draft Technical Methodology to
Estimate Greenhouse Gas Emissions for Connect SoCal
(2024-2050 Regional Transportation Plan/Sustainable Communities Strategy)**

DRAFT

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Southern California Association of Governments

Table of Contents

1	Introduction.....	4
1.1	Purpose of Technical Methodology	4
1.2	GHG Emission Reduction Targets.....	4
1.3	Overview of analysis years	4
1.4	Overview of the RTP/SCS schedule	5
1.5	CARB Recommendations in the Previous SCS Evaluation	6
2	Overview of Existing Conditions	10
2.1	Notable Changes to the Existing Planning Contexts	10
2.2	Key Regional Issues influencing RTP/SCS Policy Framework and Discussions.....	20
	Equity.....	20
	Resilience	20
	Economy and Broadband.....	21
3	Population, Household, and Employment Growth Forecasts.....	23
3.1	Updated regional growth forecast information.....	23
3.2	Changes to the regional growth forecast methodology	23
4	Quantification Approaches	30
4.1	Quantification Approaches for Each of Potential SCS Strategies under Consideration	30
4.2	Assumptions and Methods for Estimating Interregional Travel.....	34
4.3	CARB’s Mobile-Source Emission Factor Model for Estimating GHG Emissions	35
5	Travel Demand Modeling.....	36
5.1	Travel Demand Models	36
5.2	Model Inputs used in Activity Based Model	38
5.3	Commitments to Provide Sensitivity Tests for SCS Strategies under Consideration	39
5.4	Induced Demand Analysis	40
6	List of Exogenous Variables and Assumptions for Use in Proposed RTP/SCS	40
6.1	Assumptions for Exogenous Variables to Travel Demand Modeling	40
6.2	Assumptions to Derive Cost of Travel	41
7	Per Capita GHG Emissions from Prior 2020 RTP/SCS.....	43
8	Off-Model Strategies.....	43
	Changes to Off-Model Strategies Since Last Cycle	43
8.1	Improved Pedestrian Infrastructure	45
8.2	Mobility Hubs.....	49

8.3	Safe Routes to School Strategies	50
8.4	Parking Deregulation.....	53
8.5	Electric Vehicle Charging Infrastructure.....	56
8.6	Electric Vehicle Incentives	59
8.7	Co-working.....	61
8.8	AVR for Job Centers.....	64
9	Other Data Collection Efforts	66

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1 Introduction

1.1 Purpose of Technical Methodology

Pursuant to California Government Code Section § 65080(b)(2)(J)(i), prior to starting the formal public participation process required by Senate Bill (SB) 375, a Metropolitan Planning Organization (MPO) must develop and submit to the California Air Resources Board (CARB) the technical methodology it intends to use to estimate the greenhouse gas (GHG) emissions from its Sustainable Communities Strategy (SCS). Upon receipt of the technical methodology, CARB is required to respond to the MPO with timely written comments, including a specific description of any aspect of the technical methodology that it concludes will not yield accurate estimates of the GHG emissions and remedies. The MPO is encouraged to work with CARB until the state board concludes that the technical methodology operates accurately.

The Southern California Association of Governments (SCAG) began developing Connect SoCal 2024, its mandated Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), in Spring 2021. Fulfilling the state requirement, SCAG submitted a draft of its Technical Methodology to CARB on February [DATE TBD], 2023 before initiating the SB 375 required formal public participation process by holding the first public workshop on March [DATE TBD], 2023.

1.2 GHG Emission Reduction Targets

On March 22, 2018, the CARB Board adopted the following per capita GHG emissions reduction targets from 2005 levels for the SCAG region effective October 1, 2018¹:

2020 Target: -8%

2035 Target: -19%

These per capita GHG targets apply to both Connect SoCal 2020 and Connect SoCal 2024. The previous RTP/SCS, Connect SoCal 2020, was estimated by SCAG’s model to achieve GHG emission reductions relative to 2005 levels of 8 percent in 2020, and 19 percent in 2035, thereby meeting the GHG reduction targets set for the SCAG region.

Observed 2020 GHG Reductions

Since the adoption of the last RTP/SCS, SCAG is analyzing observed vehicle miles traveled (VMT) data for the year 2020 from the Highway Performance Monitoring System (HPMS). HPMS data shows that total VMT for SCAG region in 2020 is 10.9% lower than in 2019. SCAG will use the 2020 observed VMT data to report on actual GHG reductions in relation to the CARB-adopted 8 percent 2020 target. SCAG plans to use validated year 2019 (base year) model to calculate GHG emission rate per VMT and apply the rate to estimate per capita GHG emissions reduction for 2020.

Note: The observed 2020 GHG reductions will be added here when the analysis is complete.

1.3 Overview of analysis years

For the Connect SoCal 2024 evaluation and analysis, 2019 is the base year, 2024 is the first year of the plan, and 2050 is the planning horizon year. To fulfill various federal and state planning requirements,

¹ <https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets>

SCAG will perform analyses including modeling for multiple years in addition to the base year and the planning horizon year. Table 1 below provides a summary of the applicable analysis years, including their respective purposes, for the Technical Methodology to estimate GHG emissions for Connect SoCal 2024.

Due to the impact of the COVID-19 pandemic on regional travel behavior and data, SCAG chose a base year of 2019 instead of 2020. The pandemic has significantly disrupted both demand and supply of the regional transportation system. For instance, in the SCAG region, there was an 80 percent decline in the VMT observed in April 2020 when compared to January 2020. A similar decline was also observed in the use of public transportation in the SCAG region. Bus ridership in the region declined by 71 percent in April 2020 compared to April 2019. The year 2019 is the closest normal year for accurate representation and point of comparison of the transportation system.

Table 1. Analysis Years Considered in SCAG's Connect SoCal 2024

Analysis Year	Purpose
2005	Base Year for SB 375 GHG emissions reduction target setting
2019	Base Year for Connect SoCal 2024
2020	SB 375 GHG emissions reduction target year
2035	SB 375 GHG emissions reduction target year
2050	Planning horizon year for Connect SoCal 2024

1.4 Overview of the RTP/SCS schedule

SCAG began the Connect SoCal 2024 update and development process in Spring 2021, starting with development of the framework for the new RTP/SCS. SCAG is working towards adoption of the plan in Spring 2024.



Phase	Timeframe	Milestones
Foundations and Frameworks	Spring 2021	<ul style="list-style-type: none"> April: 2024 RTP/SCS Framework
	Fall 2021	<ul style="list-style-type: none"> October: Subregional Sustainable Communities Strategy Framework and Guidelines Regional Growth Forecast Framework and Expert Panel
Data Collection and Policy Development	Winter 2022	<ul style="list-style-type: none"> February: Joint Policy Committee: Updated Trends and Emerging Issues Preliminary Regional and County Growth Projections
	Spring 2022	<ul style="list-style-type: none"> April: Adopted Public Participation Plan May: Local Data Exchange launch
	Summer 2022	<ul style="list-style-type: none"> September: Start of Special Connect SoCal 2024 Policy Subcommittees

Outreach and Analysis	Fall 2022	<ul style="list-style-type: none"> • Early Public Engagement on Goals and Vision • Deadline for County Transportation Commission Project List submissions • Deadline for Local Data Exchange submissions
	Winter 2023	<ul style="list-style-type: none"> • Presentation of Subcommittee recommendations to Joint Policy Committee
	Spring 2023	<ul style="list-style-type: none"> • Public Engagement Workshops • Policy Committee Discussion of Connect SoCal Strategies and Policies
	Summer 2023	<ul style="list-style-type: none"> • Plan Modeling, Analysis and Production
Draft Plan and Adoption	Fall 2023	<ul style="list-style-type: none"> • Release of Draft Connect SoCal 2024; Transportation Conformity Determination and Draft Program Environmental Impact Report (PEIR)
	Spring 2024	<ul style="list-style-type: none"> • Approval of Final Connect SoCal 2024, Transportation Conformity Determination and PEIR

1.5 CARB Recommendations in the Previous SCS Evaluation

As part of CARB’s Evaluation and Acceptance of the GHG Quantification Determination for SCAG’s 2020 SCS, (CARB Executive Order G-20-239), CARB staff made recommendations for SCAG based on concerns regarding implementation. The following section summarizes the recommendations from CARB staff and how SCAG has worked to address the recommendations in conjunction with the development of Connect SoCal 2024.

CARB Recommendation: Deprogram Capacity Expansion Projects and Prioritize Funding for Transportation Projects that Advance SCS Implementation and Goals

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

SCAG considers a wide range of goals in vetting projects. The projects included in Connect SoCal 2024 are collected from each of the six County Transportation Commissions. While SCAG does prioritize projects that advance SCS implementation, it must also prioritize projects that meet other critical goals of the RTP/SCS including but not limited to safety and mobility. While the SCS is focused on reducing passenger vehicle trips, SCAG’s RTP/SCS must also plan for the movement of freight which has grown exponentially. For example, the San Pedro Bay Ports (Ports of Los Angeles and Long Beach) have witnessed 26 consecutive months of growth from 2019 monthly levels with only 5 months seeing growth levels below 10 percent. This growth in containerized cargo volume has had a domino effect across the regional transportation system with equivalent increases for freight rail traffic, truck demand, air cargo growth, and manufacturing/warehouse imbalances across facilities. The scale of freight activities in the SCAG region is massive and is a direct result of global and national supply chain importance.

Local planning processes have more recently resulted in the reconsideration and deprogramming of some pipeline capacity projects. However, deprogramming of these projects does not mean that funds

are available for reprogramming as projects are often phased depending on funding availability, and many of these projects require new sources of funding for project construction and completion.

For example, since the 2020 RTP/SCS, the planned \$6 billion widening of the 710 freeway from Long Beach to South Los Angeles is no longer being pursued. The funding for this project was to be phased in, therefore, the elimination of this project will not result in available funding to be reprogrammed. In addition, the 63-mile High Desert Corridor project between Palmdale and Victorville which proposed widening state route 138 and creating a freeway is now being envisioned as a multi-purpose corridor combining high-speed rail and bikeways. In Orange County, over \$1 billion in toll-financed freeway widening is being removed and replaced by signal synchronization projects. SCAG is continuing to enhance the region's ability to analyze the equity impacts of transportation projects under consideration for programming. Additionally, SCAG is currently in the process of developing a new project selection process impacting over \$500 million in federal funds annually with an emphasis on implementing Connect SoCal and achieving performance-based targets.

Lastly, SCAG is currently working with Los Angeles Department of Transportation (LADOT) on development of a VMT banking pilot program. This pilot would consider a "programmatic approach" to VMT mitigation and expand the feasible VMT mitigation options to include off-site strategies that can extend from the project site neighborhood to the regional scale. SCAG is also collaborating with LA Metro on a county-scale VMT mitigation program that focuses more specifically on opportunities for programmatic mitigation of transportation projects.

CARB Recommendation: Monitor Implementation of the Adopted SCS Strategies, Actions, and Transportation Project List

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

Since the adoption of Connect SoCal 2020, SCAG staff have been tracking the progress and development of each adopted SCS strategy. While robust data-supported metrics are labor and cost prohibitive, this quarterly tracking has enabled staff to better document actions by both SCAG and local jurisdiction partners related to each strategy. These summaries are then shared with CARB staff on a quarterly basis.

As part of SCAG's REAP 2.0 Program, SCAG is expanding access to data-driven decision-making tools through enhancements to the Regional Data Platform (RDP). SCAG will be integrating new tools into the RDP to expand local capacity and opportunities to access big data for planning and performance monitoring, active transportation, and transportation safety resources. Additionally, SCAG will be providing technical assistance to utilize the new tools on the local level to support planning and project development to align local and regional planning.

Since the adoption of the 2020 RTP/SCS, there have been two amendments as a result of changes to the projects in the RTP. The resulting GHG emissions was recalculated for each amendment, and it was

determined that GHG targets would still be achieved (See pg. 83 of Amendment #1² and pg. 36 of Amendment #2³).

CARB Recommendation: Accelerating Infill to Further SCS Implementation and Goals

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

In its most recent Regional Housing Needs Assessment (RHNA) process, SCAG allocated housing units in alignment with the goals and policies of the SCS which should result in accelerating infill development. Read more about the RHNA process in Section 2.1.

Furthermore, SCAG was awarded \$47 million in State Regional Early Action Planning 1.0 (REAP) funding to support local governments and stakeholders with housing planning activities that accelerate housing production and meet the region's need for 1.3 million new units of housing by 2029, as determined by the 6th Cycle Regional Housing Needs Assessment (RHNA). SCAG is administering the REAP funds through a combination of direct technical assistance, including housing element data components and policy assessments, subregional partnerships with councils of government, community-based partnership grants in collaboration with philanthropic organizations, and planning support offered through the Sustainable Communities Program to local jurisdictions or entities serving single or multiple jurisdictions.

In 2021, the State allocated an additional \$246 million to SCAG for the REAP 2.0 program. SCAG is in the process of developing its full program application and individual program guidelines focused on opportunities to implement the Key Connections identified in Connect SoCal 2020. The Key Connections accounted for nearly 30% of the plan's GHG reductions. REAP 2.0 programs must meet 3 program objectives that will further implementation of the SCS: Accelerating infill development, reducing VMT, and affirmatively furthering fair housing.

As part of this recommendation, CARB also asked that SCAG fully develop its Open Space and Natural Lands Mitigation Program. SCAG has been working at the direction of the Regional Council to develop an Advanced Mitigation Program (RAMP) and has drafted a RAMP Policy Framework for public feedback. Further, the establishment of a RAMP initiative was programmed in SCAG's FY 23 budget. For the Connect SoCal 2024 Plan, SCAG utilized data on the region's natural assets, risks from climate change, and other areas where future growth could result in negative environmental impacts if left unaddressed in the formation of the Plan's Preliminary Growth Forecast.

Development by distinct place types will be included in the final SCS Submittal Package after adoption of Connect SoCal 2024 as part of Determination Component 2.3.

CARB Recommendation: State and Regional Partnership on Pricing Pilot Options

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

² <https://scag.ca.gov/sites/main/files/file-attachments/final-amendment-01-connect-social-110421.pdf?1636060850>

³ <https://scag.ca.gov/sites/main/files/file-attachments/proposed-final-amendment-02-connect-social.pdf?1661365700>

SCAG, SACOG, and SANDAG, in partnership with Caltrans, are collaborating to develop a common research design framework to test the effects of integrating mobility payment systems with demand management approaches (e.g., congestion and corridor fees together with incentives) to achieve policy outcomes: advancing equity in underserved communities; reducing VMT and greenhouse gas emissions; managing roadway congestion; and providing sustainable revenues from fees for reinvestment. This project seeks to design pilot testing that would put MPOs in a position to implement valuable policy-driven facility pricing systems and incentives that magnify desirable environmental and equity outcomes (supporting Executive Order N-19-19 and the Caltrans Equity Statement) while minimizing negative impacts, especially on underserved communities. Further progress updates will be forthcoming, as project solicitation and procurement activities advance. This common design framework is anticipated to be deployed as a pilot (Mobility Wallet Pilot Program) under SCAG's REAP 2.0 transportation initiatives that will connect infill housing to daily services and increase travel options that support multimodal communities to shift travel modes.

SCAG has allocated \$95 million to REAP 2.0 transportation initiatives and is developing two programs to implement projects. The first is an \$80 million CTC Partnership Program, focused on a robust partnership program between SCAG and County Transportation Commissions (CTCs) to fund county-specific pilots and projects aligned with Key Connection Strategies in Connect SoCal. The second is a \$15 million Regional Pilot Initiatives Program (RPI Program), which will identify, evaluate, and award funding for regional or local pilots and projects that complement the CTC Partnership Program in furthering transformative concepts for reducing VMT/GHGs and advancing Connect SoCal. Initial program development work under the RPI Program has focused on early exploration of pilot concepts, particularly those that cross jurisdictional boundaries and help further scale localized initiatives. Work is anticipated to entail partnerships with industry including private transportation service providers, technology companies, and universities in addition to communities and traditional public transportation partners.

CARB Recommendation: Improve GHG Benefit Estimates for 2020 SCS New Strategies

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

Please see Sections 4 and 8 of this document for discussion of local data, existing level of participation and implementation status of various strategies.

Details of supporting actions will be included in the final SCS Submittal Package after adoption of Connect SoCal 2024 as part of Determination Component 2.1.

CARB Recommendation: Provide All Trend Analysis Metrics

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

SCAG will report on all eight trends analysis metrics requested by CARB, including transit seat utilization data in the final SCS Submittal Package after adoption of Connect SoCal 2024 as part of Determination Component 1.

CARB Recommendation: Improve Modeling and Data

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

SCAG will improve model sensitivity as suggested (to household income and pricing strategies). For autonomous vehicles, SCAG plans to develop a new add-on component to the ABM (activity-based model). SCAG has been working with UCLA on an effort in understanding the impact of new mobility technologies and services (e.g., automated vehicle technologies and sharing services) using travel data and demand modeling. Though it is a research project, it will create a foundation for future enhancement once travel behavior data is available. SCAG is also working with consultants to potentially add shared micromobility as a mode in the model.

For Off -Model analyses: SCAG will provide detailed documentation on VMT and GHG emissions reduction for each strategy and will make assumptions consistent across both modeling and off-model quantifications. The availability and application of local data varies with each strategy, see Section 8 of this document for more details.

For baseline adjustments: SCAG worked with UC Davis to conduct a survey regarding the travel activity patterns before/after the COVID-19 pandemic. The data will be used as basis for baseline adjustment. SCAG will also check other local data for the analysis of baseline adjustment, such as the California Health Interview Survey.

CARB Recommendation: Analyze Induced Travel Demand

SCAG Response: Staff Actions and Changes to Connect SoCal 2024

SCAG will continue to explore studies/research to assess the long-term effect of induced travel. More information about SCAG's Induced Demand Analysis is in Section 5.4.

SCAG has also been coordinating with Caltrans on the assessment of elasticities relative to transportation improvement projects. SCAG can update CARB on these coordination efforts as they progress.

2 Overview of Existing Conditions

2.1 Notable Changes to the Existing Planning Contexts

Regional and Local Planning Context

Since 2020 when SCAG adopted the last RTP/SCS, there been several major changes to the existing regional and local planning contexts.

- Regional Housing Needs Assessment (RHNA) – In March 2020, SCAG adopted its 6th cycle RHNA allocation plan, which covers the planning period of October 2021 through October 2029. The 1.3 million units allocated to SCAG for this cycle is three times higher than the 412,000 allocated in the 5th cycle, largely due to inclusion of units to address existing unmet demand, overcrowding and cost burdened households in addition to simply meeting projected population growth. SCAG codified its commitment to aligning transportation access and housing production through the 6th cycle allocation methodology, with cities and counties with the greatest job and transit access receiving larger shares of the RHNA allocation. The 6th cycle RHNA requires the SCAG region to identify available sites for nearly as much housing in the next

eight years as the whole region produced in the last twenty years. Achieving this sustainable and equitable land-use vision requires cities and counties to pave the way with land use planning and regulatory reforms, and investments in public infrastructure to accommodate growth, coupled with an aggressive private sector.

- Through the process, SCAG learned that jurisdictions in the region need more tools to help with housing element updates, and for tools beyond planning to fund and implement affordable housing and supportive infrastructure. SCAG has been supporting jurisdictions by developing the Housing Element Parcel Tool (HELPR) and hosting workshops for local jurisdictions. The support that SCAG has been able to provide has expanded thanks to new funding through the Regional Early Action Planning (REAP) Grant program.
- As of December 15, 2022, 81 jurisdictions are considered in compliance, meaning they have adopted housing element updates that have been found in compliance by HCD. Of the 116 jurisdictions that are considered out of compliance, 29 are currently under review, and 5 have yet to submit a housing element.
- Climate Adaptation and Resilience Planning – SCAG provided support to jurisdictions in the region in incorporating climate adaptation and resilience into the general plan safety element or other planning documents and thus complying with SB 379.
 - Recognizing the limited guidance at the local or regional level on integrating climate adaptation and resilience strategies into general plan safety elements, SCAG published a curriculum in June 2021 that provides stepwise guidance to local jurisdictions on SB 379 compliance. The SB 379 Compliance Curriculum for Local Jurisdictions⁴ (or “SB 379 Guidebook”) links existing SCAG tools, data, and resources to support local safety element updates, as well as updates other plans (e.g., climate action/adaptation plan, local hazard mitigation plans) to meet SB379 compliance requirements.
 - Following production of the SB 379 Guidebook, SCAG launched the *SB 379 General Plan Safety Element Technical Assistance Program* (“SB 379 TA Program”) to engage with jurisdictions on a one-on-one basis.
 - To further support jurisdictions with SB 379 compliance, SCAG developed the Climate Risk and Vulnerability Assessment Tool (CRVAT)⁵. Launching in February 2022, the CRVAT consolidates climate hazard data and allows users to more easily preview the types of climate hazards a jurisdiction is likely to face. The tool builds upon the SB 379 Guidebook, outlining the steps to achieve compliance through conducting a vulnerability assessment, to providing publicly available data on climate impacts and vulnerabilities across the SCAG region, and, ultimately, making relevant resources easily accessible through a centralized platform.
 - SCAG conducted a climate resilience landscape analysis to capture the status of SB 379 compliance within the SCAG region, as well as the status of broader climate and resilience planning efforts across the region. Through the landscape analysis, completed in March 2022, SCAG found that 22 jurisdictions (20 local jurisdictions and two counties) had achieved SB 379 compliance either through direct updates to a general plan safety

⁴ https://scag.ca.gov/sites/main/files/file-attachments/3000_sb379guidebook_final.pdf

⁵ <https://maps.scag.ca.gov/climate/>

element or by reference to another planning document containing climate adaptation and resilience strategies (i.e., local hazard mitigation plan).

- COVID-19 has impacted the ability for local jurisdictions to move planning efforts forward.
 - During the pandemic, many cities around the country including those in the SCAG region^{6 7} experienced declines in revenue from tourism and sales taxes leading to severe municipal budget deficits, pay cuts, and layoffs.⁸
 - The pandemic impacted local planning projects funded through SCAG's Sustainable Communities Program (SCP). As schools transitioned to online formats and many cities experienced reduced staff capacity, several projects were delayed and had to pivot approaches, including engagement tactics and transportation analysis methods due to the change in travel patterns. Additionally, project delays impacted outcomes needed to secure competitive grant funding and created misalignments with parallel efforts, such as city General Plan updates. Safe Routes to School projects were among those that experienced significant impacts due to school closures, as many in-person activities were delayed because of COVID-19.

State Planning Context

There have also been state policies and regulations that have impacts to RTP/SCS implementation and the planning context for SCAG and partner agencies during the preparation of Connect SoCal.

- Implementation of SB 743 – In July 2020, updated California Environmental Quality Act (CEQA) Guidelines went into effect in order to formally implement the shift from using level of service (LOS) to VMT to determine transportation impact of projects in the environmental review process.
- Climate Action Plan for Transportation Infrastructure (CAPTI)⁹ – Adopted in July 2021, CAPTI details how the state recommends investing billions of discretionary transportation dollars annually to aggressively combat and adapt to climate change while supporting public health, safety and equity. It builds on Executive Order N-19-19 and Executive Order N-79-20.
 - The development of CAPTI provides regions the certainty that the State will be a funding partner in delivering innovative solutions and plans to address climate change.
- AB 285 Transportation Assessment Report¹⁰ – The AB 285 report by the Strategic Growth Council presents highway projects, regardless of the multi-modal or systemwide benefits, as uniformly counter to the state's climate goals. The report's methodology also does not adequately account for investments in the multimodal transportation system, overlooking the significant regional investment in transit operations and complete streets projects which are frequently funded through local dollars or integrated into larger corridor improvement projects that may be classified generally as highway or local roadway improvements in the program listing.

⁶ <https://smdp.com/2020/04/29/city-of-santa-monica-to-merge-departments-and-lay-off-staff/>

⁷ <https://www.latimes.com/california/story/2020-09-11/mayor-eric-garcetti-budget-crisis-potential-layoff-scenario>

⁸ <https://www.npr.org/2020/05/20/859713720/american-cities-and-towns-face-financial-challenges-during-the-pandemic>

⁹ <https://calsta.ca.gov/subject-areas/climate-action-plan>

¹⁰ https://sgc.ca.gov/resources/docs/20220218-AB_285_REPORT.pdf

- While infrastructure planning and investment decisions will continue to be a significant element of the RTP/SCS, SCAG anticipates significantly higher GHG emission reduction benefits from the Connect SoCal 2024's policies and programs. This highlights the importance of wraparound programs to support our infrastructure investments.
- 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan)¹¹ – Adopted in November 2022, the Scoping Plan provides science-based guidance from the state on how to reach GHG emission reductions targets. Several proposed actions to reduce VMT in the Scoping Plan align with the goals, investments and programs in SCAG's RTP/SCS, including implementing equitable pricing strategies, improving transit service, expanding high-quality active transportation infrastructure, integrated land use planning, and accelerating infill development.
- Advanced Clean Cars II¹² – This state regulation supports the goal of Executive Order N-79-20 to have all new passenger vehicles sold in California be zero emissions by 2035. These updated regulations have provided an opportunity for SCAG to rethink the region's RTP/SCS strategies related to electric vehicles.

Data and Trends Impacting Connect SoCal

As initially described in SCAG's 2020 Technical Methodology, the COVID-19 pandemic continues to disrupt transportation and impact our economy in various ways. While there was, and still is, uncertainty about the longer-term trajectory of recent trends, SCAG staff identified areas of input and analysis for Connect SoCal that would need continued review and assessment:

- Demographics and Growth Forecast: Population growth projections have adjusted downward, but not solely due to the impacts of the pandemic.
 - Even before the pandemic, new data suggested the last plan's optimistic growth outlook was no longer likely, and downward revisions were merited.

Fewer births, more deaths, and temporary pause of foreign immigration from the pandemic will result in a few years of near-zero or even negative population growth, however it is important to remember that Connect SoCal 2024 is forecasting growth to 2050. Additionally, while population growth will be slower, housing need will remain high due to latent demand, people living longer, and the region's continued strong employment growth outlook. While there are still unknowns, that is the nature of long-range forecasting. We have integrated brand new 2020 Census data and taken a deep, expert-driven dive into these challenges to deliver the most robust possible forecast for 2050 upon which to build the rest of Connect SoCal 2024. A more detailed discussion of the region's growth forecast can be found in the next section (“

- Population, Household, and Employment Growth Forecasts”).
- Transportation Finance: Economic conditions play a critical role in determining the level of revenues available for transportation. Initial concerns about impacts from an economic recession were less than anticipated and shortfalls have been partially compensated for by stimulus package funding and changing spending habits.

¹¹ <https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf>

¹² <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii>

- Our region relies heavily on local sources of revenue to fund transportation projects included in Connect SoCal. Local sources comprise 60 percent of core revenues for transportation improvements in the SCAG region, the majority of which comes from local sales taxes.
- Federal and state transportation sources are mostly based on excise taxes on gasoline and diesel fuels, which depend on fuel consumption. The near-term impact to these sources from the pandemic is dynamic, and current conditions are not indicative of long-term transportation funding conditions in the SCAG region. Concerns at the outset of the pandemic over a prolonged economic recession were less than anticipated, and partially assuaged by a change in spending habits. VMT reductions during the early pandemic have largely rebounded, and the resulting shortfall in gas tax and other revenues has been compensated for by stimulus package funding. Nevertheless, the infrastructure bill acknowledges the need to establish new and sustainable sources of future transportation revenues to bolster economic goals, including support for user pricing strategies included in Connect SoCal 2024.
- SCAG is monitoring potential fiscal impacts and working with agency partners to understand enduring long-term impacts on the region, and to reflect the new fiscal realities and investment priorities in Connect SoCal 2024.
- Congestion and Mode Share Changes: While VMT has almost resumed to pre-pandemic levels, transit ridership has rebounded unevenly between bus and rail but neither fully to 2019 levels. Unfortunately, changes to travel behavior during the pandemic have led to reduced safety both nationally and in the SCAG region.
 - Vehicle Miles Traveled: The stay-at-home orders issued in March 2020 led to large short-term reductions in VMT. Traffic congestion on the freeways throughout the SCAG region declined during March and April 2020 to reach levels nearly 85 percent below analogous weeks in 2019, before beginning a slow increase in May 2020 towards 35 percent below pre-pandemic levels by March 2021 (measured by vehicle hours of delay at 60 miles per hour, or VHD60 from Caltrans Performance Measurement System (PeMS) data).
 - The rebounding VMT alongside the continued higher telework rates highlight the multitude of factors that influence longer-term forecasts of VMT. Travelers switching modes from transit to personal car due to health concerns, personal safety, or possible service reductions can put upward pressure on VMT and increase congestion beyond pre-pandemic levels and contrary to the goals of Connect SoCal.
 - Transit: The pandemic exacerbated an existing trend of transit ridership decline in the SCAG region, driven primarily by increasing auto ownership particularly among historically transit dependent groups.¹³ By April 2020, with stay-at-home orders in place, bus ridership had fallen by 71 percent compared to April 2019.¹⁴ Metro Rail saw a similar drop in ridership, down 69 percent in April 2020 versus April 2019, while Metrolink ridership fell by 90 percent over the same period. Transit recovered somewhat in 2021 from the April 2020 low point, as bus and rail operators have tackled

¹³ <https://scag.ca.gov/post/falling-transit-ridership-california-and-southern-california>

¹⁴ <https://scag.ca.gov/post/snapshot-covid-19-transportation-impacts-scag-region>

challenges involving public health measures such as physical distancing, masking and disinfecting vehicles and facilities; fare collection; driver shortages; and restoring cuts in service amidst funding uncertainty particularly at the federal level. By June 2022, regional bus ridership was still down but only by 27 percent compared to pre-pandemic June 2019. Metro Rail ridership had recovered to 37 percent below 2019 levels, while Metrolink was at 60 percent below 2019 levels.¹⁵

- **Safety:** In Southern California, based on provisional data for 2021 compared to the prior year, collisions are up roughly 11 percent, fatal and serious injury collisions are up by about 2 percent, and VMT is up about 4 percent. Some experts believe that the increases in collisions are due to changed behaviors during the pandemic (e.g., higher rates of speeding, driving under the influence, and forgoing seatbelts).¹⁶ The federal infrastructure bill will encourage some safety improvements, including technology to prevent intoxicated people from operating a vehicle and better crash tests to address risk to people outside a vehicle. It also included new funding for road diet treatments and a 60 percent boost for funding for active transportation. However, a great deal of work remains for California, local jurisdictions, and other stakeholders.
- **Goods Movement:** The SCAG region has experienced sustained increases for all major international gateway facilities as demand for consumer goods has remained high.
 - The pandemic has continued to have an elevated impact across different freight modes and components of the global supply chain. This has presented significant issues for the SCAG region as freight supply chains have dealt with pandemic-related impacts for nearly two years running across the region's facilities and system. Demand for retail goods has exponentially increased from comparable months in 2019 resulting from sustained consumer demand and federal stimulus policies that have transcended the region's supply chain relationships.
 - The SCAG region has witnessed sustained increases for all the major international gateway facilities including the Ports of Los Angeles and Long Beach, Los Angeles International Airport and Ontario International Airport, Calexico and Calexico East border crossings, and Class I railroad traffic that provides substantial connections from the Los Angeles Basin to markets throughout the entire U.S. These increases have translated across the region's interstate/highway and local arterial roadway networks.
 - The supply chain continues to prove its resiliency in how it manages these challenges. However, longer term implications remain, such as more e-commerce online ordering, and shifting uses of current retail spaces throughout the region will have further impacts on the development of facilities and the flow of goods. Considerations of industrial, commercial, and retail square footage shifts will be highly important to analyze, especially as industrial uses add more capacity for fulfillment, sortation, and local delivery facilities to meet increasing online order demand. Other issues will continue to consider the dynamics between off-shoring, near-shoring, and re-shoring, which will also impact manufacturing and distribution systems. As these shifts occur holistically

¹⁵ <https://scag.igq2.com/Citizens/FileOpen.aspx?Type=1&ID=2347&Inline=True>

¹⁶ <https://www.latimes.com/world-nation/story/2021-12-08/traffic-deaths-surged-during-covid-19-pandemic-heres-why>

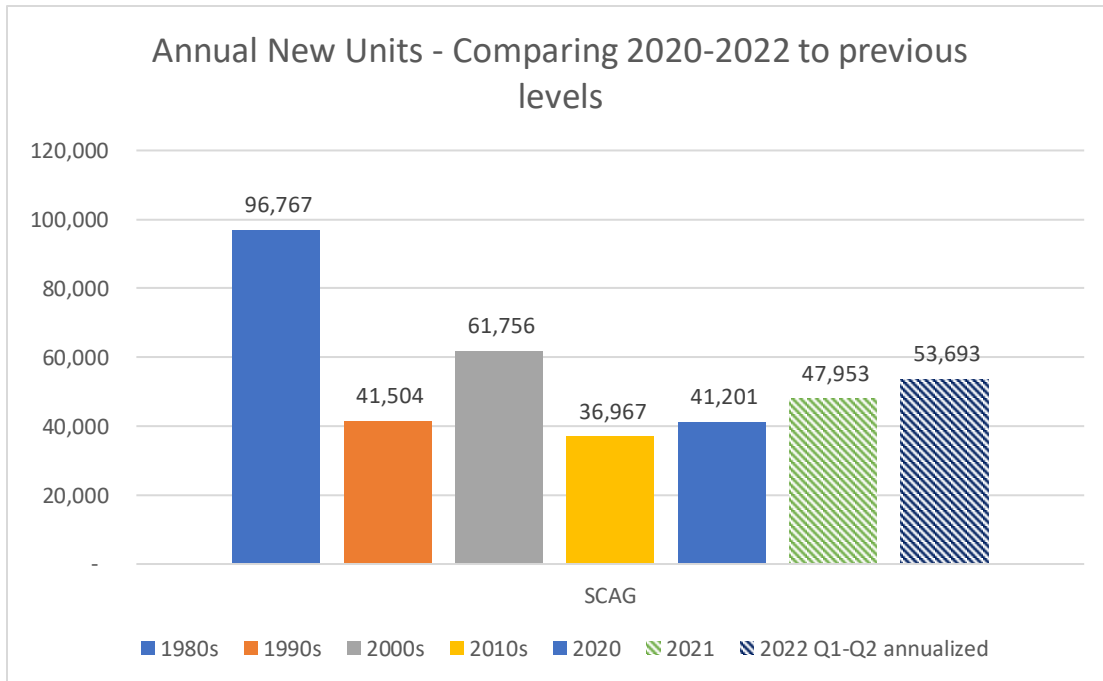
over time, each freight mode will be impacted differently, as will the infrastructure that they rely upon.

- SCAG is working closely with many key public and private goods movement stakeholders through ongoing programs, projects, and studies underway to continue to maintain a thorough understanding of the key challenges and issues, while also working towards strategies and policies to be considered in Connect SoCal 2024.
- **Housing Production:** While new unit construction dropped in 2020, new housing in 2021 and the first half of 2022 exceeded the post-recession period.

Early in the pandemic, many voiced concerns about the long-term impacts that the pandemic and economic downturn could have on housing production, both due to labor and material shortages as well as reduced local government budgets and related impacts to the permitting, review, and approval process. Many local jurisdictions successfully transitioned to online systems for document submittals, payments and inspections that will likely remain in place beyond the current pandemic. While new unit construction dropped in 2020 compared to prior levels, despite continued challenges the estimated total for 2021 exceeds the heavily multifamily post-recession 2015-2019 period and is roughly consistent with construction since 2000—a period which included several “boom” years characterized by rapid greenfield development in the Inland Empire (see Figure 1). Newer types of small unit types such as ADUs and split lot homes, enabled by recent state legislation, have increased dramatically in recent years— an increase which is both likely to continue and is consistent with the long-range demographic expectation of smaller household sizes (see

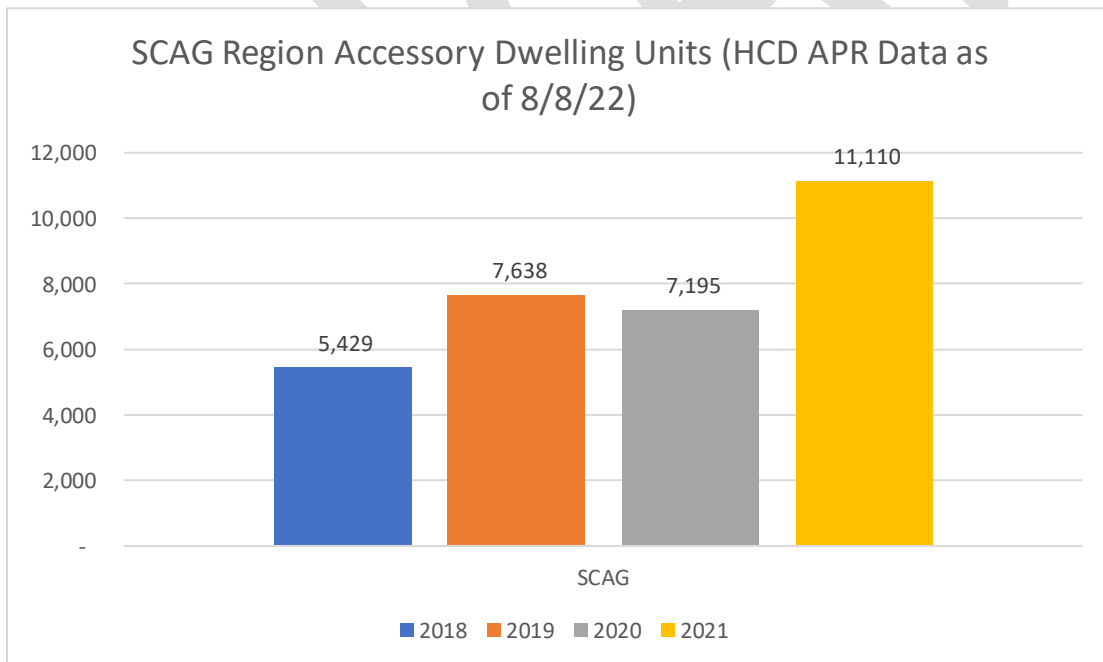
- Figure 2).
- Growth forecasts show a much slower population growth outlook than prior plans and reflect the fact the region lost population in 2020 and is not expected to grow appreciably in 2022. That housing production continues and appears to be on an upward trajectory despite lower population growth is a promising trend.

Figure 1. New housing units based on building permits issued



Source: California Construction Industry Research Board New Units from Permits. First half of 2022 prorated based on historical share of annual housing growth taking place 1/1-6/30.

Figure 2. Accessory dwelling units in the SCAG region



Source: California Department of Housing and Community Development, Annual Progress Report

Accomplishments in the Region

Despite these issues and challenges, the region has seen several accomplishments in recent years:

- In the last five years alone, more than 500 bikeway miles have been added to the region's active transportation network.
- The transit backbone has been expanded to include the Metro L Line Foothill Extension and the new Metro K Line in Los Angeles County and the Downtown San Bernardino Passenger Rail Project in San Bernardino County.
- Major strides were made in establishing the regional express lane network with the expansion of the SR-91 Express Lanes between Orange and Riverside Counties. Additionally, the 15-mile, \$470 million I-15 Express Lanes began operation on April 10, 2021. The facility extends from SR-60 near the San Bernardino County line to Cajalco Road in Corona in Riverside County. The facility added two new express lanes in each direction to I-15 and is operated by Riverside County Transportation Commission.
- Complementary land-use changes, which have been supported through SCAG's Sustainable Communities Program, contributed to continued progress toward more compact development patterns as envisioned in our plan.
- SCAG has also completed a number of studies in support of Connect SoCal implementation:
 - SCAG completed a Broadband Study¹⁷ which concluded that increasing access to and adoption of high-speed internet service (broadband) has the potential to reduce VMT and GHGs by 1 to 15 percent when people use it to telework and access remote services. However, despite lower-income households having far less access to broadband itself, greater VMT and GHG reductions are seen from increased access to higher-income households. This is because a much higher proportion of low-income households work in "essential" fields that cannot be converted to teleworking. So, while achieving universal broadband is necessary to meeting equity goals, using it to reduce VMT is a much more complicated endeavor than just providing access.
 - In July 2022, SCAG completed a feasibility study for Mobility-as-a-Service (MaaS)¹⁸. MaaS was identified as a Key Connection in Connect SoCal and studying the feasibility of implementing a MaaS system in the region has been a priority for SCAG. The study resulted in a white paper that identifies areas within the SCAG region as having high potential for pilot projects for MaaS implementation as well as an implementation guide for agencies who are considering a pilot.
 - SCAG conducted a Regional Dedicated Transit Lanes Study to explore the opportunities, needs, challenges, and best practices for developing a regional network of dedicated bus lanes and other transit priority treatments that would enable enhanced transit services, improve mobility, accessibility and sustainability, and advance implementation of Connect SoCal. This resulted in the Transit Priority Best Practices Report¹⁹, a toolkit of potential priority treatments and supportive policies, tools, and practices, which can be tailored to a variety of local needs and constraints in Southern California communities.

¹⁷ https://scag.ca.gov/sites/main/files/file-attachments/transportation_broadband_strategies_to_reduce_vmt_and_ghg_final.pdf?1649987917

¹⁸ <https://scag.ca.gov/post/mobility-service-maas-feasibility-white-paper-final-report>

¹⁹ <https://scag.ca.gov/post/transit-priority-best-practices-report-0>

- The Mobility Innovations and Pricing (MIP)²⁰ Report, released in March 2022, focuses on the potential equity implications of road pricing and other innovative transportation policies in the six-county SCAG region. The initiative combines stakeholder engagement, technical analyses, and communications strategies to elevate equity considerations as a key touchstone in planning for road pricing—most critically leading with the concerns of underrepresented communities through dialogue with community stakeholder organizations. It includes an Equity Toolkit that provides strategies for designing pricing programs more fairly and for reinvesting pricing revenue more equitably.
- In the Summer of 2022, SCAG culminated the update of its 2016 Regional Express Lane Network Concept of Operations (ConOps), with the publication of the Regional Express Lane Network ConOps 2022 Update Report²¹. Over the course of several years, SCAG convened regular workshops with local, state, and federal stakeholders to conduct relevant policy discussions; refined the blueprint developed through the 2016 ConOps for integrating individual express lane projects into a regional system; and formulated a set of technical policy recommendations to serve as a framework for establishing consistent and/or compatible operating, design, and business rules for the Regional Network. Key issues addressed through the 2022 ConOps Update process included considerations related to setting and enforcing vehicle occupancy requirements, signage compliance, and degradation of existing facilities. This approach is particularly important as the regional system continues to expand from three operational facilities in 2016 providing 56 lane miles, to five facilities providing nearly 79 centerline miles of new express lane capacity in 2021 – representing nearly \$1.8 billion in new investment – and one express lane corridor extending across a county line. An additional \$3.2 billion in new express lane capacity is currently under construction in the region, which will add 26 centerline miles of new capacity and two direct connector facilities to the regional network.

New Funding Sources

Within the frame of the dynamic planning context and issues of concern for the region, SCAG is finding opportunities to support RTP/SCS strategies through new and expanded funding sources.

- The Regional Early Action Planning (REAP) Grant program started in 2019 has enabled SCAG to accelerate implementation of the SCS.
 - SCAG was awarded \$47 million in REAP 1.0 funding from Assembly Bill (AB) 101 to provide housing planning and process improvement services to cities and counties.
 - Under REAP 2.0 (2021), the State will allocate \$246 million to SCAG. REAP 2.0 allows for a broader set of eligible programs and can be spent on both planning and capital projects. These additional resources will provide support for meeting the sixth cycle RHNA goals and to test new mobility solutions that could reduce VMT.
- CAPTI led to increased funding to the Active Transportation Program (ATP) statewide, \$100 million per year in federal funding and a one-time \$1.05 billion increase in state funds to Cycle 6.

²⁰ <https://scag.ca.gov/mobility-innovations-and-pricing>

²¹ <https://scag.ca.gov/post/scag-region-value-pricing-regional-express-lane-network-concept-operations>

- In November 2021, Congress passed, and the President signed a \$1.2 trillion infrastructure bill, the Infrastructure Investment and Jobs Act. Initial analysis shows that the bill will increase infrastructure funding for the SCAG region, including funding for affordable housing.

2.2 Key Regional Issues influencing RTP/SCS Policy Framework and Discussions

Through the course of the development and implementation of Connect SoCal 2020, SCAG's Regional Council and Policy Committees identified core policy issues to further explore as part of SCAG's core work and to influence Connect SoCal 2024. After the adoption of Connect SoCal 2020, the SCAG Regional Council identified three policy areas that resulted in special resolutions, new research, and provide a policy foundation for the development of Connect SoCal 2024.

Equity

On July 2, 2020, the Regional Council adopted Resolution No. 20-623-2²² on Racial and Social Justice, affirming SCAG's commitment to meaningfully advance justice, equity, diversity and inclusion, and establishing the Special Committee on Equity and Social Justice to advance social justice throughout the agency.

On May 6, 2021, the Regional Council adopted the Racial Equity Early Action Plan²³, the purpose of which is to guide and sustain SCAG's regional leadership in service of equity and social justice. It reflects discussions and feedback provided to the Special Committee on the definition of equity and overarching goals and strategies to advance racial equity through SCAG's policies, practices, and activities. The Racial Equity Early Action Plan has launched a series of new research and work that will influence Connect SoCal 2024.

Resilience

Climate change continues to impact the SCAG region's health, safety and economic welfare as extended dry heat days and persistent aridity worsen severe drought in California, and these in turn the ability to manage and support healthy growth.

On January 7, 2021, the Regional Council adopted Resolution No. 21-628-1²⁴ on Climate Change Action that affirms a climate change crisis in Southern California and identifies actions for SCAG to undertake, including developing a regional resilience framework, initiating a regional climate planning network, and developing a regional advanced mitigation program (RAMP).

On October 6, 2022, the Regional Council passed resolution No. 22-647-3²⁵ calling on regional partners to improve water conservation, reuse and efficiency, and support investments in water infrastructure. The conservation and replenishment of water supplies, mitigation of future water supply shortages, and investment in sustainable water infrastructure are essential to ensuring the health, safety, and welfare of communities, agriculture, and the environment, and to supporting the projected economic and population growth of the region.

²² <https://scag.ca.gov/sites/main/files/file-attachments/rc070220agn01.pdf?1602368143>

²³ <https://scag.ca.gov/sites/main/files/file-attachments/rc050621fullpacket.pdf#page=91>

²⁴ <https://scag.ca.gov/sites/main/files/file-attachments/rc010721fullpacket.pdf#page=12>

²⁵ <https://scag.ca.gov/sites/main/files/file-attachments/scag-resolution-22-647-3-water-final.pdf>

The work resulting from both resolutions will influence strategies and recommendations in Connect SoCal 2024.

Economy and Broadband

On July 1, 2021, the Regional Council adopted the Inclusive Economic Recovery Strategy (IERS) Final Report and Recommendations²⁶, which identifies five core principles to drive SCAG's work and to act as a lens for identifying recommendations:

1. Center the economic recovery strategy on racial and gender equity; focusing in reducing the racial wealth gap;
2. Focus on rebuilding the middle class with high road employment;
3. Ensure that all strategies contribute to a climate ready region;
4. Tailor strategies to the needs of both industry sectors and geographic subregions; and
5. Bring new and diverse voices to the table.

SCAG was awarded a \$3.5 M state funding earmark to implement recommendations from the adopted IERS, and has launched 5 projects that will be completed by June 2024:

- 1. Supporting expansion of the number of, and access to, middle wage jobs.** This effort will produce six reports, one for each of SCAG's 6 counties, that is an action-oriented implementation plan for training and expanded access to family supporting jobs.
- 2. Addressing human capital needs.** This effort will produce a report with recommendations and best practices around core programmatic supports that expand access to training and employment, with an emphasis on lower income communities and communities of color.
- 3. Strengthening supply chains and access to contracting opportunities.** This effort will produce two best practice toolkits, which will be implementation oriented "how to" guides for (1) public sector and (2) anchor institutions to expand access to their supply chains and contracting opportunities to small, minority-, woman- and veteran-owned businesses.
- 4. Construction apprenticeships and training.** This effort will produce a set of recommendations and aim to create a pilot program to expand upon and improve training and apprenticeship programs with a focus on construction.
- 5. Providing Regional Data.** SCAG will develop at least three sets of regional data identified in the IERS, to support both State efforts and broader inclusive economic growth efforts:
 - a. Work with the State to develop a sub-regional job quality index, which was a recommendation in the California Future of Work Commission's March 2021 report, A New Social Compact for Work and Workers. The job quality index would analyze monthly wage data to understand growth of quality jobs by industry using a range of measures;
 - b. Produce county-level economic analyses to determine the local economic impact of racial and gender inequality; and
 - c. Partner with organizations that are made up of, and work in, tribal communities to conduct targeted engagement to better understand the unique needs of Indigenous communities in Southern California in terms of economic growth and opportunity.

²⁶ <https://scag.ca.gov/sites/main/files/file-attachments/rc070121fullpacket.pdf#page=13>

On February 4, 2021, the Regional Council adopted Resolution No. 21-629-227 to establish a Broadband Action Plan to assist in bridging the digital divide. Broadband is now considered essential infrastructure for the 21st century. Schools, offices, retail, entertainment, medical and public services and governments all rely on online platforms, offering people significant time savings and a digital avenue for economic prosperity. SCAG initial study of broadband has found that there can be tangible reduction in vehicle trips and associated decreases in VMT and GHG as a result of broadband ubiquitous deployment and universal adoption. However, broadband is still far from a universal service across the State. Within the SCAG region alone, approximately 15 percent of all households do not have access to adequate internet speeds or no internet access. The Broadband Action Plan includes incorporating broadband planning, data and research findings, and strategies, as appropriate, into existing SCAG programs and future Regional Transportation Plan/Sustainable Communities Strategies.

Special Connect SoCal 2024 Subcommittees

To dive deeper into related issues and help inform policy development for Connect SoCal 2024, SCAG established three special subcommittees. These three subcommittees are comprised of members from each county with participation from invited business or civic leaders with unique and valuable perspective on the given subcommittee focus area. Each subcommittee will develop a white paper that offers recommendations to SCAG Policy Committees on how to address these emerging issues within Connect SoCal 2024.

NEXT GENERATION INFRASTRUCTURE	RESILIENCE & CONSERVATION	RACIAL EQUITY & REGIONAL PLANNING
<p><i>Purpose:</i> Build on Connect SoCal 2020 and provide guidance on the priorities and strategies for Connect SoCal 2024, reflecting the rapidly-evolving developments across the region specific to the future of mobility and associated implications for public policy. The need for more comprehensive understanding of these developments and consensus building on key regional strategies and policies is even more evident today in preparation for Connect SoCal 2024 as we continue to grapple with the pandemic, a more challenging economic environment, and shifting state and federal priorities with increasing uncertainties across the planning horizon.</p>	<p><i>Purpose:</i> Advance the direction set in the SCAG Regional Council Resolution on Climate Change Action to consider opportunities for enhanced conservation and how can Connect SoCal support our communities in adapting to changing conditions or mitigating risks to become more resilient.</p>	<p><i>Purpose:</i> Identify opportunities to advance racial equity through the policies and strategies in Connect SoCal and guide how our planning and investments over the next 30 years can address and rectify the effects of racially discriminatory policies in SCAG's environmental justice communities.</p>

²⁷ <https://scag.ca.gov/sites/main/files/file-attachments/rc020421fullpacket.pdf#page=13>

3 Population, Household, and Employment Growth Forecasts

3.1 Updated regional growth forecast information

Even before the COVID-19 pandemic, emerging data suggested that the growth trajectory of Connect SoCal 2020 would require reassessment and that downward revisions were likely. Fewer births, more deaths, and a temporary slowdown of foreign immigration from the pandemic will result in a few years of zero or negative population growth near the beginning of this planning period. While these near-term shocks have been assessed and integrated into the forecast assumptions as robustly as possible, the objective of this forecast is to assess growth to 2050. This long-range exercise is more influenced by the strengths of Southern California compared to other U.S. regions. With a favorable mix of industries, strong innovation hubs, a welcoming culture, and desirable natural amenities, it is difficult to foresee Southern California decreasing in jobs compared to the U.S.

While population growth is expected to resume, albeit much more slowly than previously anticipated, there are two major reasons why the growth rate in households is expected to exceed the population growth rate. First, the population is aging even more quickly than previously anticipated, which increases the number of small households. Second, evidence continues to emerge that housing production will remain strong despite low population growth, allowing the region to address the previously existing housing shortage. This is reflected in the forecast through household formation rates which gradually return to more normal levels such as those seen in the mid-2000s. Following these changes, average household size is expected to fall in the SCAG region from 2.99 in 2019 to 2.64 in 2050. This is far below the 2045 expectation of 2.90 in the last RTP/SCS.

Table 2 shown below summarizes the differences in growth forecasts between Connect SoCal 2024 and the last RTP/SCS.

Table 2. Growth Forecasts Comparison: Connect SoCal 2020 vs. 2024

SCAG Region, Adopted Final Connect SoCal 2020					
	2016	2035	2045	2016-45 Growth	Percent
Population	18,832,000	21,443,000	22,504,000	3,672,000	19.5%
Households	6,012,000	6,902,500	7,633,000	1,621,000	27.0%
Employment	8,389,000	9,566,100	10,049,000	1,660,000	19.8%
SCAG Region, Preliminary Connect SoCal 2024					
	2019	2035	2050	2019-50 Growth	Percent
Population	18,832,000	19,780,000	20,551,000	1,719,000	9.1%
Households	6,192,000	7,259,000	7,652,000	1,460,000	23.6%
Employment	8,986,000	9,851,000	10,170,000	1,184,000	13.2%

3.2 Changes to the regional growth forecast methodology

SCAG's growth forecast methodology for Connect SoCal 2024 retains many similarities to the process established and followed during the 2012, 2016, and 2020 RTP/SCSs. The order of some steps has

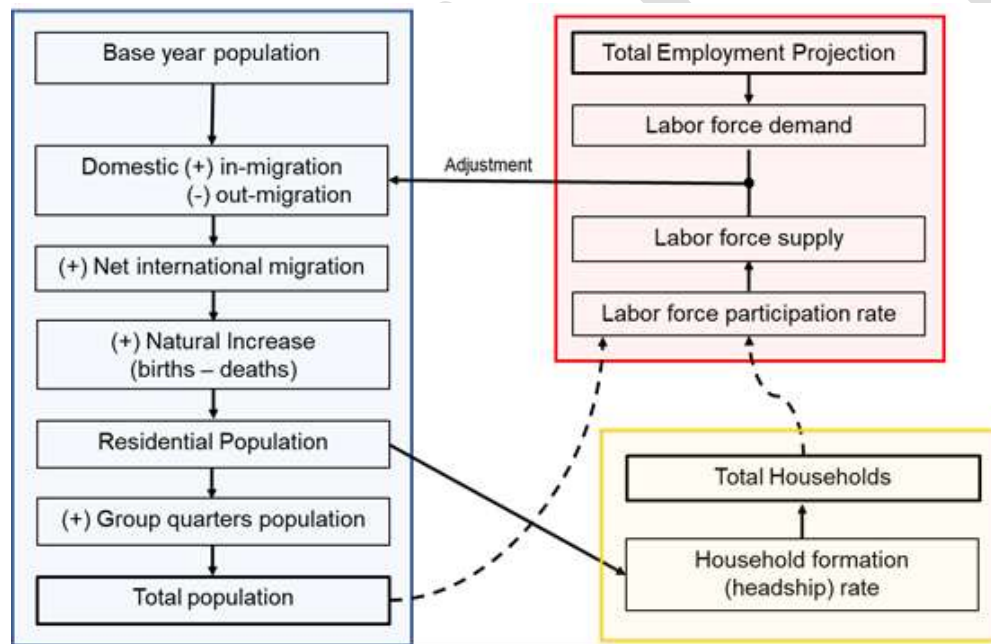
changed in order to better investigate how COVID-19 and the ongoing 6th cycle Housing Element Update process affects projections, and to allow for earlier stakeholder outreach regarding growth and land use.

The “forecasted regional development pattern” referenced in California Government Code 65080(b)(vii) involves four spatial scales: region, county, jurisdiction, and Tier2 Transportation Analysis Zone (TAZ).

Development of Regional and County-level Growth Projections

SCAG’s coupled regional economic-demographic forecast process is shown in **Error! Reference source not found.** SCAG projects regional population growth using a **cohort-component model**. This model computes population at a future point in time by adding to the existing population the number of group quarters population, births, and in-migrants during a projection period and subtracting the number of deaths and out-migrants. Age, sex, and race/ethnicity-specific population forecasts are multiplied by a set of household formation (headship) rate assumptions to generate a disaggregated forecast of households.

Figure 3. SGAG Regional Economic-Demographic Forecast Process



SCAG projects regional employment using a **shift-share model**. This model computes employment by industry sector at a future time using a region’s share of the nation’s employment. The regional employment forecasts are based on a set of national employment forecasts that provide total job projections and projections by sector. Regional jobs depend on national jobs as well as their distribution across various industries. The number of forecasted jobs in and the labor force participation rate determine the pattern of migration into and out of the region, yielding a combined forecast of population, households, and employment.

As shown in **Error! Reference source not found.**, a major emphasis of the county and regional projections is to ensure balance between population, households, and employment. As described above, headship rates are used to ensure a reasonable population-to-household ratio in future years. At the regional scale, the labor force supply derived from the population projection is compared with the

labor force demand derived from the employment projection. Double-jobbing and unemployment are projected; domestic in- and out-migration are adjusted accordingly in order to maintain the structural difference approximately the same.

While the forecast models have not changed, below are the notable differences of Connect SoCal 2020 as compared to Connect SoCal 2024:

- The forecast development is informed by a panel of experts *and* explicit scenario exercise.
- It uses Census 2020’s P.L. 94-171 redistricting file to benchmark the base year of 2019 using county population by race/ethnicity, broad age group (0-17 and 18 and older), group quarters and household population, and households to adjust single-year-of-age populations to match 2020 Census totals. Detailed demographic and housing data from Census 2020 are not expected to be available until mid-2023, which would be too late in order to conduct local review and adequate stakeholder engagement prior to plan adoption.
- County models are also assessed based on the difference between labor force supply (population) and labor force demand (employment). A goal is for this ratio to remain stable over the projection period in each county. A secondary goal is to maintain or decrease the absolute value of the sum of this difference across the region’s six counties. This goal would indicate that home and workplace locations are not increasing in different counties. More details about employment forecasting methodology can be found in the February 3, 2022 staff report to the SCAG Executive/Administration Committee and Regional Council.²⁸
- While county-level projections are developed at 5-year intervals from 2019-2050, SCAG staff prepared city and TAZ-level projections for households and population in the years 2019, 2035, and 2050 only to streamline local review and increase participation. SCAG staff internally develops the remaining secondary variables and intermediate years as needed.

Below is the timeline for the development of regional and county-level growth projections:

- August 2021 – Demographic Panel of Experts. On August 5 and August 11, SCAG convened a forecast panel of experts to review trend predictions and assumptions. The 16 panelists included economists and demographers representing industry, academia, and government, as well as expertise across each of the six SCAG counties.
- September 2021 – SCAG developed a framework for Connect SoCal 2024’s regional growth forecast and presented it to policy committees.
- November 2021 – SCAG developed three regional growth scenarios varying by birth, death, household formation, migration, immigration, and job growth assumptions to help understand uncertainties surrounding COVID-19, housing cost increases, climate change, and demographic shifts.

Table 3. Regional Growth Scenarios, SCAG Region 2019-2050

	Low	Baseline	High
Population	686,815	1,968,641	3,090,258
Households	912,247	1,531,769	1,815,676
Employment	595,161	1,178,096	1,640,201

²⁸ <https://scag.ca.gov/sites/main/files/file-attachments/jpc020322agn04.pdf?1645556889>

- February 2022 – SCAG created preliminary regional and county projections based on updates to the middle scenario and provided them to SCAG’s Joint Policy Committee for review. These projections include total population, total households, and total employment in 5-year intervals from 2019-2050.

Creation of a Preliminary Forecasted Regional Development Pattern through the Local Data Exchange (LDX) process

In past cycles, SCAG had developed a preliminary projection at the city and TAZ levels based on an allocation of the county projections and available general plan/land use data. SCAG subsequently conducted one-on-one meetings with all 197 jurisdictions to review the projections and other data elements required by the SCS during which, edits and refinements were provided and integrated. Following this step, SCAG developed growth scenarios based on a set of land use development principles, priority growth areas, and policy objectives.

Instead of following that past practice, the Connect SoCal 2024 process aims to integrate land use development principles, priority growth areas, and policy objectives from Connect SoCal 2020 – in some cases with updated data and refined approaches – *prior* to local review.

The LDX was reframed around the statutory objective:

*“set forth a **forecasted development pattern for the region**, which, when integrated with the transportation network, and other transportation measures and policies, will reduce the greenhouse gas emissions from automobiles and light trucks to achieve, if there is a feasible way to do so, the greenhouse gas emission reduction targets approved by the state board, and (viii) allow the regional transportation plan to comply with Section 176 of the federal Clean Air Act (42 U.S.C. Sec. 7506).” California Government Code 65080(b)(vii)*

Its stated principles were that it be:

- Rooted in local planning policies
- Steered by a regional vision
- Aligned with state and federal policy

Projections at each lower level are consistent with higher aggregation levels, i.e., city totals sum to each county. Similarly, the combination of city boundaries and Tier 2 TAZs when summed to their respective city total must be consistent with their city’s projection. Jurisdictional boundaries from the Local Agency Formation Commissions (LAFCOs) have been incorporated and used to reflect annexations. The following datasets are incorporated into this process:

- SCAG’s existing land use data
- SCAG’s general plan database, processed based on the most recently available jurisdictional general plans
- SCAG’s Connect SoCal 2020 growth forecast
- 6th cycle Housing Element Update Site Inventory (if available)
- California Employment Development Department Quarterly Census of Employment and Wages (EDD QCEW)

- InfoGroup
- Intergovernmental Review
- Digital Map Products (DMP) parcel data
- 2020 Decennial Census + American Community Survey

The primary tool for developing preliminary jurisdiction and TAZ-level employment forecasts is a shift-share method that extrapolates today’s jobs by industry in smaller areas by the amount they are expected to grow county-wide. The employment projection methodology is consistent with prior plan cycles.

The preliminary household growth projection methodology has changed and involves the following steps:

1. Use local general plans and existing land use to estimate remaining general plan capacity
2. Add additional capacity, if available, from RHNA/housing element rezone sites list
3. Control to county household projection using a logistic regression
4. Develop household growth prioritization steps based on scenario concepts utilized in Connect SoCal 2020 (See Table 4 below):
 - a. Priority Development Areas (PDAs), which attribute values of 0-4 based on the degree of transportation or locational benefit available in each parcel
 - b. Green Region Resource Areas (GRRAs), which take attribute values of 0-13 based on the degree of environmental sensitivity to natural hazards and climate change risks to development.

In Connect SoCal 2020, SCAG’s preliminary small area allocation methodology used only steps 1 and 3 above. At that time, using a list of priority and constrained areas, staff integrated a variant of step 4 into a scenario development process that took place after local review had concluded.

Table 4. Determining Household Growth Prioritization Steps by Number of PDAs or GRRAs

Number of Priority Development Areas	4	3	2	1	0	4	3	2	1	0	4	3	2	1	0	4	3	2	1	0
Number of Green Region Resource Areas	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	3+	3+	3+	3+	3+
Step #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Local Data Exchange

After the initial growth forecast was developed, SCAG staff launched the LDX process seeking to meet one-on-one with all 197 local jurisdictions to review the data layers shown in Table 5.

Jurisdictions were provided with a Data Review and Verification form to help guide their review and to seek detail on changes made to the preliminary forecasted regional development pattern.

This process provided an opportunity for local jurisdictions to offer not only data updates, specifically related to land use input data, but also to include additional comments on growth strategies for Connect SoCal development.

Following the December 2022 input deadline, SCAG will prepare and assess the locally reviewed forecasted regional development pattern at the county scale against (1) the control totals in the preliminary county-level projection, and (2) the initial household distribution methodology to gauge the degree to which growth is anticipated in priority areas and resource areas. Updates, technical corrections, or other modifications may be made at this time to ensure the forecasted regional development pattern is likely to contribute to the GHG target prior to subsequent Activity-Based Model (ABM) runs²⁹.

Table 5. Data Layers for Local Jurisdiction Review

CATEGORY	LAYER NAME	REVIEW TYPE
Land Use	General Plan	Update/Corrections
	Zoning	Update/Corrections
	Existing Land Use	Update/Corrections
	Specific Plan Land Use	Update/Corrections
	Key Entitlements	Update/Corrections
Priority Development	Neighborhood Mobility Areas	Optional
	Livable Corridors	Optional
	Job Centers	Optional
	Housing Trajectory	Update/Corrections and site inventory upload
Transportation	High Quality Transit Areas	Reference Only
	Transit Priority Areas	Reference Only
	Regional Bikeways	Optional
	Regional Truck Routes	Optional
Green Region Resource Areas (SB 375)	Resilience (Flood areas, coastal inundation, wildfire risk)	Reference Only
	Open Space/Habitat (Open space and parks, endangered species and plants, sensitive habitat areas, natural community and habitat conservation plans)	Reference Only
	Administrative/Working Lands (Tribal nations, military installations, farmlands)	Reference Only
Geographical Boundaries	City Boundary and Sphere of Influence	Reference Only
	Census Tract	Reference Only
	TAZ (Tier2)	Reference Only
Growth (available May 2022)	Jurisdiction-level projections of households and employment (2019, 2035, 2050)	Update/Corrections
	Tier 2 TAZ-level projections of households and employment (2019, 2035, 2050)	Update/Corrections

²⁹ Note: SCAG does not use a land use model, but instead prepares socio-economic data as an input to the ABM and uses a Scenario Planning Model (SPM) for post-ABM data analysis.

Below is the timeline for the LDX process and development of the forecasted regional development pattern:

- February 2022 – Local Data Exchange Soft Launch. Review opportunity opens for land use, priority development, transportation, resource area, and geographic boundary data.
- May 2022 – Local Data Exchange Complete Launch. Preliminary forecast for total households and total employment in 2019, 2035, and 2050 at the city and Tier2 TAZ-level are available for local review.
- May – October 2022 – SCAG staff meet one-on-one with local jurisdictions to discuss data package and review opportunity, including the newly-released Regional Data Platform and online LDX Editor module.
- December 2, 2022 – Deadline for local jurisdictions to provide edits or feedback.
- February 2023 – SCAG staff assessment of locally-reviewed forecasted regional development pattern.
- Fall 2023 – Release draft forecasted regional development pattern along with draft RTP/SCS and PEIR for public review and comment.
- Spring 2024 – Adopt final forecasted regional development pattern as part of Connect SoCal 2024.

Note on the 6th cycle Housing Element Update

SCAG has undertaken an optimistic and reasonable forecast of housing production that reflects demand and follows recommendations from the Panel of Experts and the scenarios developed. Much of this is reflective of the 6th cycle RHNA process, in which the California Department of Housing and Community Development (HCD) determined that SCAG region jurisdictions must plan for an additional 1,341,827 housing units in their subsequent housing element updates.

Furthermore, SCAG's adopted RHNA plan allocated these units heavily on the basis of transit and job accessibility, which is likely to lead to increased infill capacity in the region's housing elements, and, upon subsequent update, general plan and zoning codes. This intentional linkage was built in order to strengthen the connection between RHNA process and past and future SCS plans. Following the passage of SB 197 in June 2022, housing element deadlines were extended to October 2022 and the deadline for subsequent general plan and zoning changes in most instances was pushed to February 2025.

As such, the data that could reflect local supply changes stemming from the 6th cycle of RHNA was incomplete during the development of the preliminary forecasted regional development. To better reflect supply changes at small area levels, local review is required to ensure the forecast is as updated as possible for the development of this plan.

Since the Connect SoCal projection is not a build-out scenario, regional supply is expected to exceed demand, especially in less developed, urban fringe, and unincorporated areas. Conversely, smaller and newer development types—such as accessory dwelling units, lot splits, and multifamily housing on repurposed commercial corridors, which comprise a large share of the infill development called for in the 6th cycle of RHNA—have less historical precedent which presents a challenge from a forecasting

point-of-view. It is likely that some combination of newly-enabled infill growth and more traditional forms of development will occur in the future.

4 Quantification Approaches

4.1 Quantification Approaches for Each of Potential SCS Strategies under Consideration

SCAG is maintaining all of the strategies included in the previous SCS. Based on further staff research and analysis since the 2020 SCS submission, there are changes to strategies, including the merger of similar strategies and the transition of select strategies from off-model in 2020 to on-model in 2024.

Table 6. Quantification Approach by SCS Strategy

RTP/SCS Strategy	Inclusion in Prior SCS?	Quantification Approach
<p>1) Congestion Pricing Congestion pricing may be applied to more efficiently utilize existing roadway capacity, improve travel time reliability, and increase person-throughput. Cordon/area pricing involves charging a variable or fixed fee to drive into or within a highly congested area. This cordon pricing strategy is included as one aspect of the Mobility Go Zone concept presented in Connect SoCal.</p>	Yes	<p>Travel Demand Model Geography: Downtown Los Angeles and West Los Angeles</p>
<p>2) Express Lane Pricing The SCAG regional express lane network integrates congestion pricing to optimize existing capacity on freeways & offer users greater travel time reliability & choices. When appropriately priced to reflect demand, express lanes may outperform non-priced lanes in terms of throughput, especially during congested periods. Express lanes operate on the principle of congestion pricing: when more vehicles are using those lanes, the price increases accordingly to manage congestion in the lanes. Express lanes generate revenues that may help fund construction & operation of the facilities, & relieve air pollution & GHG emissions associated with congestion.</p>	Yes	<p>Travel Demand Model Geography: Los Angeles, Orange, Riverside, and San Bernardino Counties</p>
<p>3) Improved Bike Infrastructure This strategy is expected to be applied at different intensities (network density, upgrade in class) to align with land use plans & transit investments. This strategy is also closely aligned with the first-last mile, technology & micro-mobility, & Safe Routes</p>	Yes	<p>Travel Demand Model Geography: Region wide</p>

<p>to School strategies. A key difference is that the bicycle infrastructure investments will be focused on the development of a base network of on-street facilities designed for the completion of short trips & network connections for longer bicycling trips.</p>		
<p>4) Infill development and increased density near transit infrastructure This strategy is embedded within several Priority Growth Areas such as Transit Priority Areas, High Quality Transit Areas, & Livable Corridors to reflect the benefits gained when development occurs near transit infrastructure.</p>	Yes	<p>Travel Demand Model</p> <p>Geography: Within Priority Growth Areas across the region</p>
<p>5) Mileage-Based User Fee Mileage-based user fees would be implemented to replace existing federal & state gas taxes. Analysis assumed an estimated 2.5 cents (2019 dollars) per mile starting in 2030 & indexed at a rate of 2.4 percent. As mileage-based user fee administrative technologies improve, we assume implementation of a regional road fee on a county basis. This road charge would provide a choice among multiple pricing options tailored to local needs, similar to the diverse expenditures in current local sales tax initiatives, thereby allowing local agencies the ability to better manage their transportation systems, especially as VMT increases with the introduction of connected & autonomous vehicles. In the SCAG region, analysis assumes a regional road charge of 1.5 cents (2019 dollars) per mile.</p>	Yes	<p>Travel Demand Model</p> <p>Geography: Region wide</p>
<p>6) New Transit Capital Projects Connect SoCal includes \$66.8 billion in transit capital improvements, including Metro Rail extensions; new urban & commuter rail services in Orange, Riverside, & San Bernardino Counties; new bus rapid transit & rapid bus routes across Los Angeles, Orange, Riverside & San Bernardino Counties; & high-quality transit corridors in all counties.</p>	Yes	<p>Travel Demand Model</p> <p>Geography: Region wide</p>
<p>7) Shorter trips through land use strategies such as job/housing balance This strategy aims to reduce the distance of vehicle trips by promoting growth in geographies beyond high quality transit areas</p>	Yes	<p>Travel Demand Model</p> <p>Geography: Region wide</p>

<p>such as neighborhood mobility areas & job centers. By enabling more housing growth near job centers & commercial corridors, trip lengths may be reduced.</p>		
<p>8) Transportation Demand Management This strategy includes alternatives to single occupancy vehicle travel, including but not limited to: ridesharing, carpooling/vanpooling, telecommuting, parking subsidies for carpoolers & others typically included in employer-based trip reduction strategies. Follows CAPCOA guidance for effectiveness of commute trip reduction programs, including avoiding double-counting impacts.</p>	<p>Yes</p>	<p>Travel Demand Model Geography: Region wide</p>
<p>9) Job Center Parking Strategy Increase parking price to all vehicles entering & parking to access activities in job centers, which will reduce use of SOV, & increase use of carpool & transit modes. Job centers are places in the region with generally higher existing employment density than the areas around them. Based on SCAG research, 21 job centers covering roughly 0.5 percent of the region's land area but about 22 percent of the region's employment are identified to take advantage of existing density & infrastructure. These centers were evaluated for parking pricing, assessing base rates & adjusting to grow parking rates starting in FY25.</p>	<p>Yes</p>	<p>Travel Demand Model Geography: Region wide</p>
<p>10) Multimodal Dedicated Lanes Conversion of traffic lanes to prioritize transit or active transportation modes. This strategy involves the conversion of auto traffic lanes to dedicated lanes for transit and/or bicycle travel. Complete streets is a policy & design approach where streets are planned, designed & operated for all users, not just automobiles. However, the implementation of complete streets varies depending on context & what is suitable for a particular location. Complete streets implementation may include dedicated bus lanes in some instances.</p>	<p>Yes</p>	<p>Travel Demand Model (Off-Model in prior RTP/SCS) Geography: City of Los Angeles</p>
<p>11) Improved Pedestrian Infrastructure Installation of pedestrian facilities to support safe conditions for walking trips & to</p>	<p>Yes</p>	<p>Off-Model Geography: Region wide,</p>

<p>encourage additional walking trips. This includes the installation of new sidewalks, repair of existing sidewalks, improvement of intersection designs, installation of ADA compliant infrastructure, walking paths, traffic control devices, crosswalks, curb extensions/bulb outs, ADA requirements, tree canopy coverage, & other traffic calming projects that reduce vehicle speeds.</p>		<p>at varying levels depending on the place type classification of the TAZs</p>
<p>12) Mobility Hubs This strategy combines microtransit, car share, bike share and micromobility. Each of these mobility services have a car-free or car-light common-user type that expands upon existing transit services.</p>	<p>Yes, previously three separate strategies</p>	<p>Off-Model Geography: Region wide</p>
<p>13) Safe Routes to School The Safe Routes to School strategy seeks to reduce the number of vehicle trips to schools & shorten commute trips where one stop of the trip is at a school. It focuses on encouragement programs based on the Es of Encouragement, Education, Evaluation, Enforcement, & Equity.</p>	<p>Yes</p>	<p>Off-Model Geography: Region wide</p>
<p>14) Parking Deregulation Provide support to local jurisdictions in eliminating parking minimums within half a mile of high-quality transit stops, excluding transit priority areas – consistent with AB 2097 (in the same fashion as adopted by the City of San Diego & City of Santa Monica).</p>	<p>Yes</p>	<p>Off-Model Geography: Within a half mile of high-quality transits stops that are not Transit Priority Areas (TPAs) Note: in previous cycle, geography was TPAs throughout the region</p>
<p>15) Electric Vehicle Charging Infrastructure This strategy aims to increase the number of total EV chargers in the region. There are three ways that this will increase VMT driven in all electric range. First, more chargers will create consumer confidence and encourage additional EV purchases. Second, additional charging will increase confidence for consumers who want to drive in longer trips with their EV. With more infrastructure available, consumers will more frequently opt to use their electric vehicle. Third, as described in 2020, additional infrastructure will support plug in hybrid electric vehicles</p>	<p>Yes</p>	<p>Off-Model Geography: Region wide</p>

(PHEV) drivers in going longer distances in EV mode.		
16) Electric Vehicle Incentives Facilitate the purchase of new plug-in or fully electric vehicles (PEVs) by offering incentives in the form of rebates to offset the additional initial purchase cost versus non-PEV. This strategy creates a funding source and a program to provide incentives above and beyond state programs.	Yes	Off-Model Geography: Region wide
17) Co-working at Strategic Locations Co-working refers to the shared use of an office space by employees of several different firms as an alternative to a home office or traditional fixed workplace location. This strategy includes outreach, policy, & financial support of the strategic development of co-working spaces in the region. For long-distance commuters in certain industries, co-working sites are closer alternatives to fixed workplaces that may reduce VMT.	Yes	Off-Model Geography: Region wide
18) Average Vehicle Ridership (AVR) for Job Centers Additional TDM incentives & strategies intended to reduce SOV travel to key locations & increase AVR to 1.5. Note that AVR is a measure used by South Coast AQMD that is generally calculated as the total trips to a location such as a worksite, divided by the total vehicles arriving at that location.	Yes	Off-Model Geography: <i>Note: In previous RTP/SCS, this was 21 select job centers in the region, mostly in Los Angeles and Orange counties. Staff is reevaluating to determine if geography should be updated.</i>

4.2 Assumptions and Methods for Estimating Interregional Travel

SCAG designates 40 cordon stations along the perimeter of the modeling area to identify interregional or external trips. To estimate the external trips of light-and-medium (LM) duty vehicles for the base year 2019, SCAG staff used two steps:

- 1) The first step involved collecting traffic counts passing through each cordon. Two data sources were available. For freeway cordons, we used Caltrans' Annual Average Daily Traffic (AADT) after subtracting Caltrans' Annual Average Daily Truck Traffic (AADTT). For arterial cordons, since Caltrans' AADT is not available, SCAG decided to use AADT provided by the StreetLight InSight platform. To extract LM duty vehicles from the StreetLight AADT, we utilized the previous traffic count survey conducted by SCAG in 2017, which includes 13 FHWA vehicle classification data. Both Caltrans AADT and StreetLight AADT were further processed to have the Average Daily Traffic (ADT) for a typical weekday by applying a weekday factor for each cordon. The day distribution feature of PeMS and StreetLight was useful to estimate the weekday factors.

- 2) The second step was to allocate the base year 2019 cordon traffic counts to 4,109 TAZs based on observed origin-destination (O-D) distribution patterns. Previously, a regional cordon survey conducted by SCAG during 2002 and 2003 was used to estimate the observed O-D distribution of external trips. For 2024 RTP, we decided to update the observed external O-D distribution, using transportation big data from StreetLight. It is important to note that the StreetLight O-D data were customized by including trips in the same long-distance travel if there is less than 90 minutes and 1 kilometer between consecutive trip stops. We think that this customization could detect the final stop of a long-distance interregional travel, rather than interim stops for lunch, shopping, or break. SCAG staff carefully reviewed and revised the customized StreetLight O-D distribution by comparing with the previous cordon survey results at the level of 56 Regional Statistical Areas (RSAs). The external O-D matrix at the RSA level was first disaggregated to 369 Community Statistical Areas (CSAs) to maximize observed patterns from StreetLight data that were collected at the CSA level. Next, the external O-D matrix at the CSA level was disaggregated to 4,109 TAZs based on population and employment. Finally, the TAZ-level O-D matrix was further disaggregated by 5 time periods (AM Peak, Midday, PM Peak, Evening, and Night) and 3 auto modes (Drive Alone, Share Ride 2, and Share Ride 3+).

Note: For future-year forecasts, SCAG is still updating the methodology for estimating interregional travel. SCAG will add the future-year methodology in a later draft.

4.3 CARB's Mobile-Source Emission Factor Model for Estimating GHG Emissions

EMFAC2014 was used for estimating GHG emissions for the 2020 RTP/SCS. SCAG used this same model for estimating GHG emissions for Connect SoCal 2024.

To calculate GHG emissions from travel demand model, SCAG staff uses assignment output, VMT by speed bin, as input to run EMFAC2014. Since external-external vehicle trips are excluded from SB375 VMT calculation, assignment output is adjusted by excluding VMT associated with inter-regional passing through (X-X) trips for light-duty and medium-duty vehicles.

A similar approach is applied for calculating GHG emissions with off-model strategies. Since most off-model strategies reduce VMT, total VMT reduction from off-model strategies are calculated and aggregated. Assignment output, including link VMT and speed, from the transportation model is further adjusted by excluding VMT associated with both inter-regional passing through trips and off-model strategies. SCAG staff runs EMFAC2014 to calculate GHG emissions excluding VMT from off-model strategies.

Since electric vehicles should be included into the vehicle fleet that will affect speed on the road network, GHG emissions reduction for strategies such as electric vehicle incentives or electric vehicle charging infrastructure is calculated by multiplying VMT reduction of EV program by GHG emissions per vehicle mile.

In order to provide an equivalent comparison to the 2012 RTP/SCS, where emissions were established with EMFAC2007, the same adjustment factors from the 2016 RTP/SCS (2.2% and 1.9% for 2020 and 2035, respectively) will be added to the percentage reduction in GHG per capita calculated with EMFAC2014. GHG emissions rate, which is GHG emissions per vehicle mile, is calculated from EMFAC2014.

5 Travel Demand Modeling

5.1 Travel Demand Models

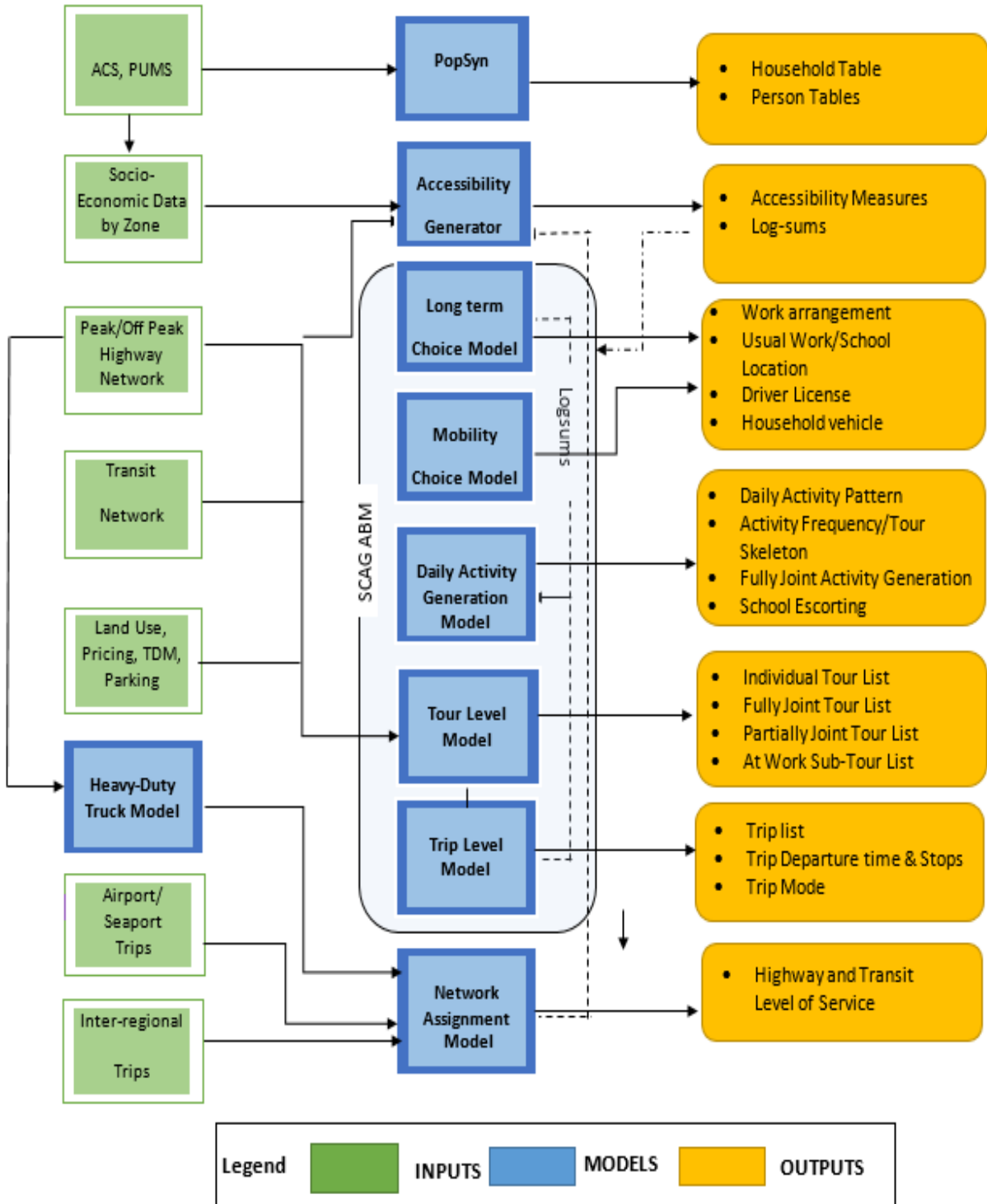
SCAG Regional Travel Demand Model, or SCAG Activity- Based Model (SCAG ABM) was developed and used for the analysis in Connect SoCal 2020. It will be used again for the 2024 RTP/SCS cycle.

SCAG ABM is composed of two main components:

- 1) CT-RAMP2 (Coordinated Travel-Regional Activity Modeling Platform – 2nd version) which simulates daily activity participation and scheduling for each individual, with travel being viewed as a derivative of out-of-home activity participation and scheduling decisions.
- 2) A network assignment model that estimates traffic data of all vehicle modes, using O-D (Origin-Destination) input matrices generated by CT-RAMP2 (passenger vehicles); and other pre-calculated OD input matrices (airport, seaport, inter-regional; by passenger vehicles and heavy-duty trucks).

Regarding model software, CT-RAMP2 is written in Java programming, and is based on Object-Oriented Programming modular design. SCAG ABM covers the entire SCAG region which encompasses six counties and 11,267 Tier 2 Transportation Analysis Zones (TAZs). The flow chart on the next page (Figure 4) illustrates SCAG's travel demand modeling process.

Figure 4. SCAG Travel Demand Process



The major enhancements to SCAG ABM include:

- Sub-model refinement re-estimated coefficients of several key sub-models, by using currently available data (July 2021- August 2022)
- New sub-model development (July 2021- August 2022)
 - Trip departure time – Improved the prediction of trip departure time. This enhancement improves the model sensitivity to policy analysis such as pricing or peak hour congestion.
 - In-home/out-home choice – For non-mandatory activities, estimates in-home/out-home activity engagements, such as telemedicine and online shopping.
- Updated existing add-on components with new data and assumptions (April 2022- June 2023)
- Extension of add-on components- to incorporate input of transportation strategies to estimate travel impact: AVR, co-working (April 2022- June 2023)
- Calibration and validation using the most recent data sources: California Household Travel Survey (2019 weight), 2017 National Household Travel Survey, 2019 American Community Survey (ACS), 2019 Transit on Board survey, 2018 LEHD (April 2022- June 2023)
- Model software optimization and run-time improvement (July 2021- June 2024)
- Update of heavy-duty truck model-external-internal truck flows

5.2 Model Inputs used in Activity Based Model

Socioeconomic data

Socioeconomic data (SED) describes both demographic and economic characteristics of the region by TAZ. The base year 2019 SED was developed using diverse public and private sources: 2019 Census, American Community Survey (ACS), California Department of Finance (DOF), California Employment Development (EDD), firm based InfoGroup data, 2019 Land use, and county accessors' parcel databases. SCAG ABM predicts travel for each person in the region. The population synthesis sub-module creates a list of households and persons for the entire model area that represents the region population for each horizon year.

Transportation Network

SCAG's model includes both highway network and transit network:

- Highway network: SCAG highway network was prepared using the TransCAD Transportation Planning Software. Highway network includes detailed coding of the region's freeway system (e.g., mixed-flow lane, auxiliary lane, HOV lane, toll lane, and truck lane), arterials, major collectors, and some minor collectors.
- Transit network: SCAG transit network covers the entire SCAG region, with nearly 3,000 transit route patterns operated by more than 70 transit carriers in the six-county model area. Transit routes are characterized by attributes such as route ID, route name, route head sign, transit operator, route distance, direction, transit modes, and fares. Stops are placed along the route with information such as route ID, stop coordinates, milepost, and corresponding highway node ID.

Auto Travel Cost

- Auto Operating Cost (AOC): accounts for fuel and non-fuel cost (maintenance). AOC is expressed in cents per mile in 2011-dollar value. Fuel cost per mile is based on forecasts for how much gas will cost and how fuel-efficient vehicles will be (based on the 2019 U.S. Department of Energy's annual forecast of motor vehicle gasoline prices with historical information). The base year non-fuel-related costs from the American Automobile Association (AAA) were used to estimate forecast-year non-fuel-related costs. See Section 6.2 for more details.
- Parking Cost: In 2013, SCAG purchased parking cost data from Parkme.com. The data includes on and off-street parking locations and parking prices (hourly, daily, and monthly) in the SCAG region. Off-street parking data has 2,548 entities and on-street parking data has 2,102 entities in it. In March 2017, SCAG staff manually collected data from Parkme.com. About 2,500 records were collected. SCAG staff combined 2013 and 2017 data and processed parking cost by TAZs, including a) daily average for commuter (early bird), b) one hour parking, c) extra hour parking, and d) daily maximum.
 - SCAG ABM developed an add-on function on model choice model to reflect the input for percent increase of parking costs with pre-defined TAZs by job centers. Based on planning assumptions, parking cost can be input from free of charge to any percent increase from current parking price, and by different vehicle types (Drive alone, HOV 2 persons, HOV 3 person or more).

Worker Assumptions

- Work from Home (WfH): Percent of Work-from-Home Workers - The work arrangement sub-model of SCAG ABM incorporates assumptions for the percent of workers who work from home, including telecommuting, home office, or other strategies. Inputs can be either WfH workers as percent of total workers, or by eight different household income segments: <\$25K, \$25k-\$50k, \$50k-\$75k, \$75k-\$100k, \$100k-\$125k, \$125k-\$150k, \$150k-\$200k and >\$200k. It is noted that the rebound effect is included in the SCAG ABM. While a WfH worker saves commuting trip to/from workplace, the SCAG ABM includes additional non-work travel or business (work-related) travel by the worker.
- Travel Demand Management (TDM): SCAG ABM developed an add-on function to incorporate the assumptions for percent of workers who change commuting modes from driving a car to other modes. Inputs are based on the California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures report fact sheets regarding effectiveness of commute trip reduction programs, the City of Los Angeles VMT Calculator tool, and mode split data from the South Coast Air Quality Management District Rule 2202 Employee Commute Reduction Program. The input will apply to tour mode choice output for work tour. The reduction of vehicle-driving modes will be converted to other modes.

5.3 Commitments to Provide Sensitivity Tests for SCS Strategies under Consideration

SCAG commits to conducting model sensitivity tests with the enhanced SCAG Regional Travel Demand Model for SCS Strategies.

For Connect SoCal 2020, the following sensitivity tests were performed to demonstrate the effects of various inputs on VMT, mode choice, vehicle trips and transit boarding by using SCAG ABM.

1. Auto Operating Costs
2. Transit Capacity – Bus Frequency
3. Transit Capacity – Rail Frequency
4. Transit Capacity – (Bus & Rail, combined)
5. Transit Fare
6. Work-from-Home Worker
7. Freeway Capacity
8. Principle Arterial Capacity
9. Household Income
10. Neighborhood Household Density
11. Neighborhood Bike Lane Density
12. Job Center Parking Price
13. HOT Pricing
14. Population by Age Cohorts

SCAG expects to repeat the same sensitivity tests for Connect SoCal 2024 and complete them by [DATE TBD]. The complete list of sensitivity tests will be documented here in the final Technical Methodology to be submitted to CARB.

5.4 Induced Demand Analysis

According to the ‘Technical Advisory on Evaluating Transportation Impacts in CEQA’ report released in 2018 by the Governor’s Office of Planning and Research (OPR), induced travel occurs where roadway capacity is expanded in an area of existing or projected future congestion. The report describes that proper use of a travel demand model may capture the effects of induced travel, including the number of trips, trip length or VMT, and change in mode share for automobiles.

The SCAG ABM model does incorporate short-term induced demand, which will be shown in the model sensitivity test results with increasing roadway capacity.

For long-term induced travel, SCAG staff will work with CARB to develop a reasonable approach to examine long-term travel effects, such as applying long-term elasticity to policy input. Note that SCAG does not have a land use model for induced demand analysis.

6 List of Exogenous Variables and Assumptions for Use in Proposed RTP/SCS

6.1 Assumptions for Exogenous Variables to Travel Demand Modeling

Table 7 below is a list of exogenous variables to SCAG regional travel demand model and their assumptions.

Table 7. List of Exogenous Variables for Incremental Progress Analysis

Note: Assumptions highlighted in grey are pending until model runs are completed in 2023.

Category of Variables	Variables Specification in Model	Assumption in 2035
Auto Operating Cost	Fuel and non-fuel related costs (maintenance, repair, and tire wear)	\$\$\$ /mile Pending
Vehicle Fleet Efficiency	EMFAC model	EMFAC 2014
Demographics	Population and employment (included in socioeconomic input data)	Population: pending Employment: pending
Household Income	Median or distribution	Median Household Income: pending
Household Demographics	Household size, workers per household, age (included in socioeconomic input data)	Household Size: pending Household Worker: pending Median Age: pending
Inter-regional Travel	Share of external interregional VMT (Light-Medium Vehicles)	% of regional VMT (external-external) pending
Work-from-Home Workers	% of Work-from-Home Workers to Total Workers	% of Total Workers pending
Parking Cost	Daily Average Parking Cost (2011\$)	Average cost per TAZ pending
Travel demand model version		SCAG 2024 RTP/SCS ABM

6.2 Assumptions to Derive Cost of Travel

The assumptions and methods for auto operating cost calculation are described below.

Note: SCAG is in discussions with CARB on updating this methodology.

Fuel Price (FP)

SCAG calculated average fuel price based on price of four different types of fuels.

1. Gasoline and Diesel: Annual average price data is based on EIA (U.S. Energy Information Administration). Data between 1995 and 2021 for California was downloaded from the EIA website.
2. Gasoline Projection (2018-2050), Diesel projection (2018-2035), and Electricity (2018-2035): Data based on CEC (California Energy Commission)

Assumptions and Methods

1. To be consistent with SCAG model assumptions, all price data are converted to 2011-dollar value.

2. SCAG Gasoline Data (2022-2050): Check historical correlation between California gasoline price and SCAG gasoline price, then apply average percentage differences to California gasoline data from EIA website
3. California Diesel data (2036-2050): Compare California gasoline price to California diesel price and estimate California Diesel price from 2036 to 2050
4. SCAG Diesel data (2022-2050): Estimate SCAG diesel price based on California diesel price from Step 3
5. SCAG Electricity data for EV (2018-2050): Based on California electricity price for EV estimated by CEC (2018-2035), take average of commercial and residential electricity price then conduct linear regression. Calculate annual growth rate from the regression results and apply it to CEC estimated data

Table 8. CA Gasoline Prices

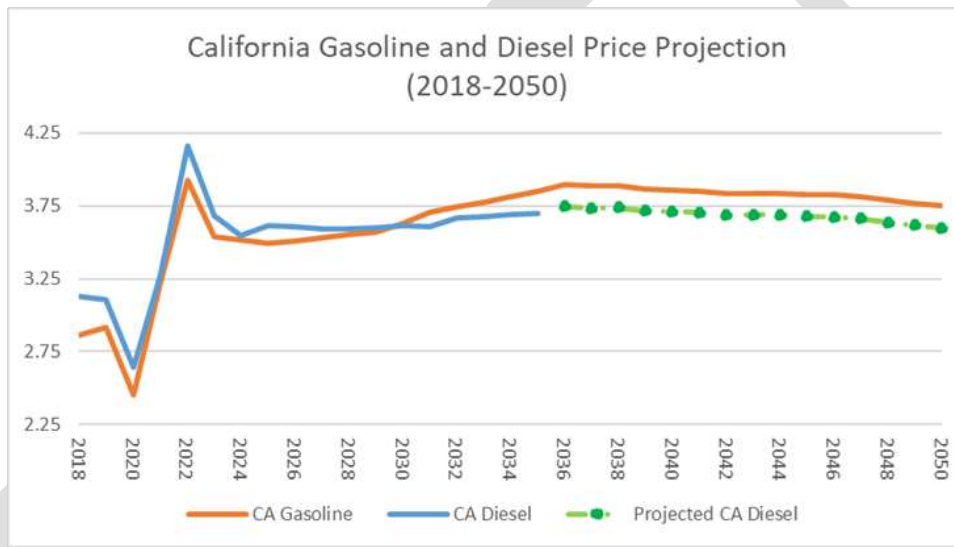
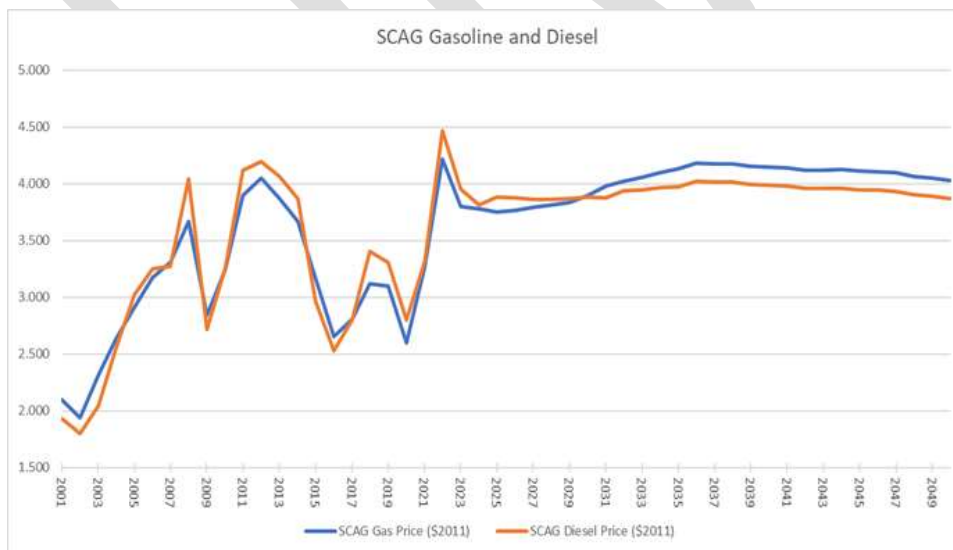


Table 9. SCAG Gasoline and Diesel Prices



Non-Fuel-Related Operating Costs (NF Cost)

The base year non-fuel-related costs from the American Automobile Association (AAA) were used to estimate forecast-year non-fuel-related costs. It is noted that AAA changed its methodology in 2006 and 2021.

Assumptions and Methods

1. All price data was converted to 2011-dollar value.
2. Apply linear regression based on data of past 12 years (2010-2021)
3. Apply the coefficient to calculated predicted data
4. Calculate annual growth rate and adjusted growth rate to 50% after 2031
5. Apply growth rate to the actual data

Average Fuel Efficiency (FE)

Fuel economy by fuel type of vehicles (gasoline, diesel, and electricity) are calculated based on VMT and fuel consumption data from EMFAC 2021.

Assumption and Methods

1. Average fuel efficiency is calculated as:

(Sum of total VMT by fuel type)/(Sum of total fuel consumption by fuel type)

2. Fuel economy for electric vehicles is assumed to be 130 Miles Per Gallon of Gasoline equivalent (MPGGe) based on the U.S. Department of Energy
3. Calculated composite fuel economy is weighted by VMT

Total Auto Operating Cost (AOC)

$$\text{AOC} = (\text{FP}/\text{FE}) + \text{NF Cost}$$

7 Per Capita GHG Emissions from Prior 2020 RTP/SCS

SCAG will use new exogenous variables developed for the 2024 RTP/SCS, including auto operating cost and interregional travel, to estimate SB 375 per capita VMT and GHG emissions from the prior 2020 RTP/SCS.

8 Off-Model Strategies

Changes to Off-Model Strategies Since Last Cycle

SCAG has made several changes to some of the off-model strategies in Connect SoCal 2020.

Strategy Now Reflected in Model

The following strategy is now reflected in the travel demand model, and will no longer be quantified off-model:

- Multimodal Dedicated Lanes

Merged Strategies

The following three strategies have been merged into one overarching Mobility Hubs strategy:

- Off-Model
 - Microtransit (replaces the previous Transit/TNC Partnership Program)
 - Bike Share and Micromobility
 - Car Share

Summary of Major Updates to Quantification Methodologies

Below is a summary of major updates to the quantification methodologies

- Improved Pedestrian Infrastructure: SCAG has added assumptions and methods to factor in the impact of investing in urban greening as part of this strategy.
- Safe Routes to School: This strategy previously included an education/encouragement component and infrastructure component. The infrastructure component has been removed to prevent double counting with bicycle and pedestrian improvement strategies.
- Parking Deregulation: The geography for this strategy has been updated from TPAs to the half-mile radius around high-quality transit stops that are not in TPAs.
- Electric Vehicle Charging Infrastructure: In its guidelines, CARB provided two method options for quantifying this strategy. For this RTP/SCS, SCAG has decided to switch to the alternative method in order to capture GHG reduction benefits from both hybrid and fully electric vehicles.
- Co-working: The methodology will be similar to last time but will apply a different market analysis to identify co-working site locations.

Current Off-Model Strategies

Of the strategies presented in Section 4.1 “Quantification Approaches for Each of Potential SCS Strategies under Consideration,” the following strategies rely on off-model analysis to quantify their GHG emissions reduction benefits:

- Improved Pedestrian Infrastructure
- Shared Mobility
- Safe Routes to School Strategies
- Parking Deregulation
- Electric Vehicle Charging Infrastructure
- Electric Vehicle Incentives
- Co-working
- Average Vehicle Ridership (AVR) for Job Centers

Descriptions of the strategies and details of their quantification methodologies are below. Following CARB’s Final SCS Evaluation Guidelines, each of the off-model strategies will consist of the five elements below:

1. Description
2. Objectives
3. Trip and Emissions Data Needs
4. Quantification Methodology
5. Challenges, Constraints, and Strategy Implementation Tracking

8.1 Improved Pedestrian Infrastructure

Description

This strategy will focus on installation of pedestrian facilities and urban greening to support safe conditions for walking trips and encourage additional walking trips. It includes investing in:

- Installation of new sidewalks
- Repair of existing sidewalks
- Intersection improvements
- Installation of ADA compliant infrastructure
- Walking paths
- Traffic control devices
- Crosswalks
- Curb extensions/bulb outs
- Urban greening (e.g., tree and shrub planting)
- Other traffic calming projects that reduce vehicle speeds

Through this strategy, SCAG will support local agencies in their development of pedestrian focused plans and urban greening plans (pedestrian master plans, active transportation plans, and Vision Zero plans). SCAG is also developing the SCAG Regional Active Transportation Program and an urban greening program in order to directly fund pedestrian and urban greening projects.

Implementation of this strategy will improve safety, access, and comfort for pedestrians and promotes active transportation trips and reduced VMT.

New to this strategy since the last cycle is the inclusion of urban greening strategies.

Reason for Off-Model Approach: This strategy must be quantified off-model because there is currently insufficient pedestrian volume data and geographic existing conditions data available to include on-model. It would take a lot of resources to develop sidewalk network and tree canopy coverage for the entire SCAG region.

Objectives

- Increased pedestrian plan and urban greening plan adoption
- Increased and/or improved pedestrian infrastructure miles and urban greening along pedestrian corridors
- Decreased collision patterns for pedestrians

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO₂ emission reductions.

Quantification Methodology

Assumptions and Inputs

Sidewalk Coverage

Initial sidewalk coverage assumptions and improvement elasticity values were developed by Fehr & Peers in 2015 (“SCAG Scenario Planning Model – Active Transportation Enhancement”).

Since many cities do not regularly collect data regarding the presence of sidewalks, SCAG estimates sidewalk coverage based on Place Type Groupings.

In the 2016 RTP/SCS, SCAG categorized place types in six place type groupings. Sidewalk investment and completion levels are based on the percent completed for different land use investment strategies (NMAs, TPAs, HQTAs, etc.). The percentage of sidewalk coverage is based on visual inspection by a consultant for each Place Type Grouping.

Table 9. Sidewalk Coverage by Place Type Grouping

Note: The sidewalk coverage assumptions are currently blank because they are being updated based on more recent visual inspection.

Place Type Grouping	Place Types	Low	Medium	High
1	City Mixed Used, City Residential, Town Mixed Use, Urban Commercial, Urban Mixed Use, High Intensity Activity Center	%	%	%
2	Village Commercial, Town Residential, Village Mixed Use, City Commercial, Town Commercial, Urban Residential, Industrial/Office/Residential Mixed High	%	%	%
3	Neighborhood Residential, Village Residential, Campus Residential, Institutional, Suburban Multi-Family	%	%	%
4	Neighborhood Low, Suburban Mixed Residential, Middle Intensity Activity Center, Industrial/Office/Residential Mixed Low, Office Focus	%	%	%
5	Residential Subdivision, Low Intensity Retail Centered Neighborhood, Parks Open Space, Mixed Office and R&D, Low Density Employment Park	%	%	%
6	Retail Strip Mall/Big Box, Office/Industrial, Industrial Focus, Large Lot Residential, Rural Residential, Rural Employment, Rural Ranchettes, Military	%	%	%

The assumed impact of sidewalk improvements is based on literature review which indicates elasticity values related to specific improvements (**Error! Reference source not found.**). Based on the research, the elasticity of walk share with respect to sidewalk enhancement is 0.18.

Table 10. Elasticity Values Related to Sidewalks

Note: The elasticity values are being re-evaluated considering new research.

Study Location	Authors	Influential Variable	Measures of Walking	Elasticity
Raleigh-Durham, NC	Fan 2007	Sidewalk length	Daily walking time per person	0.12
Portland, OR	Ewing et al., 2009	Sidewalk coverage	Walk mode choice	0.27
Seattle, WA	NCHRP 770, 2014	Percent no sidewalk	Walk mode choice	0.15
Average				0.18

Urban Greening Coverage and Improvements

With the addition of urban greening to the strategy, staff also established urban greening coverage assumptions by Place Type Groupings and identified an associated elasticity value based on literature.

Table 11. Tree Canopy Coverage by Place Type Grouping

Note: The tree canopy coverage assumptions are currently blank because they are being developed based on visual inspection.

Place Type Grouping	Place Types	Low	Medium	High
1	City Mixed Used, City Residential, Town Mixed Use, Urban Commercial, Urban Mixed Use, High Intensity Activity Center	%	%	%
2	Village Commercial, Town Residential, Village Mixed Use, City Commercial, Town Commercial, Urban Residential, Industrial/Office/Residential Mixed High	%	%	%
3	Neighborhood Residential, Village Residential, Campus Residential, Institutional, Suburban Multi-Family	%	%	%
4	Neighborhood Low, Suburban Mixed Residential, Middle Intensity Activity Center, Industrial/Office/Residential Mixed Low, Office Focus	%	%	%
5	Residential Subdivision, Low Intensity Retail Centered Neighborhood, Parks Open Space, Mixed Office and R&D, Low Density Employment Park	%	%	%
6	Retail Strip Mall/Big Box, Office/Industrial, Industrial Focus, Large Lot Residential, Rural Residential, Rural Employment, Rural Ranchettes, Military	%	%	%

The assumed impact of urban tree canopy coverage improvements is based on literature review that indicates elasticity values related to specific improvements (Table 12). **Note: Elasticity values are still blank as staff is still in the process of reviewing the literature.**

Table 12. Elasticity Values Related to Urban Greenery

Study Location	Authors	Influential Variable	Measures of Walking	Elasticity
Washington, D.C.	Marquet, et. al. 2022	Percentage of "greenness" from normalized difference vegetation index	Average number of steps a day	
London, England	Sarkar, et. al. 2015	Street tree density	Distance walked	
Hong Kong, China	Lu, et. al. 2018	Street-level greenery	Walking time	
			Average	

Quantification Steps

Step 1: Calculate percent of walk share increase by place type groups.

Step 2: Assign Place Type Grouping for each SCAG TAZ.

Step 3: Calculate walk share for each TAZ based on SCAG model outputs.

Step 4: Based on Steps 1 through 3, calculate increased walk share with sidewalk and tree canopy enhancements for each TAZ based on assigned Place Type Grouping.

It is assumed that through this strategy, future sidewalk improvement would result in a TAZ to move up a level in sidewalk and urban greening coverage. For example, a TAZ identified as "Medium" coverage would increase to "High."

Step 5. Due to the increase of walk share from sidewalk enhancement and increased tree canopy coverage, reduce mode share for vehicle trips in each TAZ.

- Calculate percent of vehicle trips reduction (reallocate based on original distribution)
- Calculate the number of vehicle trips reduction for each TAZ =
Total trips for each TAZ (model output) * percent of vehicle trip share reduction

Step 6. Calculate Average Walk Distance for each TAZ based on SCAG model output.

Step 7. Calculate VMT Reduction for each TAZ.

VMT Reduction of Each TAZ = Vehicle Trips Reduction * Average Walk distance for each TAZ

Step 8. Aggregate total VMT reduction from sidewalk enhancement and increased tree canopy coverage at the regional level.

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

One of the challenges in quantifying emissions reduction of this strategy is that there is currently a lack of consistent and regional pedestrian volume data. Most existing data collection is focused on project

implementation locations. In addition, there is not a complete dataset of existing sidewalks for the region, which is why the methodology includes sidewalk coverage assumptions by Place Type Grouping.

Urban greening data is available but is measured in various approaches in the studies identified. SCAG will need to have a standard method for the off-model methodology, and articles referenced provide methodologies for standardizing (i.e., conversion of normalized difference in vegetation index to street tree density).

Monitoring and Tracking

- Number of adopted pedestrian plans and urban greening plans
- Number of new pedestrian infrastructure miles and urban greening areas around pedestrian corridors
- Number of improved pedestrian infrastructure miles and miles of pedestrian corridors with urban greening infrastructure
- Number of pedestrian collisions in the region
- Dollars of Active Transportation and urban greening funding

In addition to tracking the above metrics, SCAG will continue to participate in the development of a Statewide Active Transportation Database (SATDB).

8.2 Mobility Hubs

Description

Mobility hubs are locations where there are a range of transportation options that connect and interact with each other. A mobility hub includes a cluster of modes – public transit, active transportation and shared vehicles. This strategy combines microtransit, car share, bike share, and micromobility, and establishes existing and potential locations of these services as mobility hubs. Each of these mobility services have a car-free or car-light common-user type that expands upon existing transit services and provide additional mobility options at the mobility hub locations.

- Car share service allows for the temporary use of a vehicle. This is available in three varieties in the SCAG region: traditional roundtrip, one-way, & peer-to-peer car share.
- Docked & dock-less bike sharing programs allow temporary & short-term bicycle rentals & increase share of bicycle trips. Policy development to support shared micromobility, such as e-scooters for short trips & first/last mile connections.
- Microtransit provides on-demand rideshare service, offering trips including first/last mile connections to transit services and on-demand solution in areas underserved by fixed-route bus services. The service is usually for short local trips and uses small vehicles (some electric).

SCAG's role is to develop studies to identify best practices for local agencies and provide guidance to jurisdictions on how to identify and regulate shared mobility services in mobility hub locations. SCAG will also offer technical assistance and provide projects funding through Connect SoCal's innovative funding strategies.

The strategy supports car-free or car-light lifestyles to replace/reduce SOV polluting trips and decrease VMT/GHG. This strategy reduces GHG emissions by:

- Supporting car free and car-lite households (people with limited access to cars – can utilize shared mobility services)
- Reducing personally owned vehicles
- Providing first/last mile trips to transit hubs and other mobility services
- Utilizing electric vehicles and mobility devices

Reason for Off-Model Approach: Available data related to the components of this strategy are discrete and limited to study areas (FCPP, SCP Call 3/SCMI). In addition, traditional modeling does not capture microtransit services.

Objectives

- Encourage the use of shared modes to decrease single occupancy vehicle trips
- Provide basic mobility needs in areas with limited transit services
- Support car-free or car-lite households

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO₂ emission reductions.

Quantification Methodology

Note: CARB provides guidance on methodologies for quantifying GHG reduction benefits of car share and bike share/micromobility. This section is currently incomplete because SCAG is considering options to quantify components of this strategy through the model.

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

Note: SCAG is reassessing the challenges considering the merging of the formerly three separate strategies.

Monitoring and Tracking

- Car share member population
- Number of miles logged through bike sharing/micromobility programs
- Microtransit program ridership

8.3 Safe Routes to School Strategies

Description

The Safe Routes to School (SRTS) strategy seeks to reduce the number of vehicle trips to schools and shorten commute trips where one stop of the trip is at a school. It focuses on encouragement programs based on five of the six Es of Encouragement, Education, Evaluation, Enforcement, & Equity.

In the 2020 RTP/SCS, this strategy included active transportation infrastructure improvements to the bicycle and pedestrian network within a short distance of a school site. The infrastructure component has been removed in the 2024 RTP/SCS cycle to avoid potential overlap with other pedestrian and bicycle infrastructure improvement strategies. Through this strategy SCAG supports local agency (County, City, and School District) implementation through the development of SRTS Plans and the education/encouragement efforts of the Go Human program. Education/encouragement programs reduce dependency on parent vehicle drop-off and pick-up.

Reason for Off-Model Approach: An off-model approach is needed for this strategy because there is a limited local data. Connect SoCal 2020 identified the need for additional data collection on Safe Routes to Schools programming in the region, but these were unable to occur due to the pandemic.

Objectives

- Decrease the number of vehicle trips to schools
- Shorten commute trips where one stop of the trip is at a school
- Increased adoption of SRTS Plans
- Increased deployment of SRTS focused education and encouragement programs

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO₂ emission reductions.

Quantification Methodology

Students participating in Safe Routes to School program will change travel model to/from school from vehicle to transit, walking, or biking. Since most of school age students are not vehicle drivers, most of them are carpool passengers or walking/biking to school (transit share is very small). As students change travel mode from carpool to active transportation modes, vehicle travel will be reduced because parents or family adults will no longer need to pick up/drop off school kids.

Assumptions and Inputs

Three types of VMT saving will be estimated:

1. Pure escort trip: family adults driving school kids to school, then back to home; and family adults driving to school to pick up school kids, then back to home.
2. Share-ride: travel detour for adult workers to pick up or drop off school kids; and
3. Students who drove a car to school.

SCAG uses both household travel survey data and model output to calculate VMT saving described above.

Based on the literature³⁰, the increase of active travel mode share for school purpose trips from Safe Routes to School is listed in below tables. Half of students will start SRTS program from 2025; the other half will start from 2030. The programs are identical with the only difference being the start date of the funding availability.

Table 13. SRTS Education Program Assumed Increase in Active Travel Mode Share starting from 2025

Year	
2026	0.0%
2027	0.9%
2028	1.8%
2029	2.7%
2030	3.6%
2031	4.5%
2032	5.4%
2033	6.3%
2034	7.2%
2035	8.1%

Table 14. SRTS Education Program Assumed Increase in Active Travel Mode Share starting from 2030

Year	
2030	0.0%
2031	0.9%
2032	1.8%
2033	2.7%
2034	3.6%
2035	4.5%

Quantification Steps

Step 1: Input the number of students participating in the Safe Routes to School (SRTS) Program by year.

Step 2: Calculate the number of students who shift to active transportation modes from 1) driving to school, and 2) from carpooling with household adults.

- Use SCAG model outputs to calculate mode share of trips with school purpose.
- Apply mode share changes for active transportation modes to calculate the change of active modes from Safe Routes to School Program.

Step 3: Calculate VMT reduction for students' change on school mode from driving to active transportation

- Average driving distance to school for high school students (one-way)

³⁰ Noreen C. McDonald & Ruth L. Steiner & Chanam Lee & Tori Rhoulac Smith & Xuemei Zhu & Yizhao Yang, 2014. "Impact of the Safe Routes to School Program on Walking and Bicycling," Journal of the American Planning Association.

- $\text{VMT reduction} = \text{Number of students from driving to active transportation} * \text{average driving distance to school (one-way)} * 2 \text{ (round trip)}$

Step 4: Identify trip types for school trips with escorting by adult chauffeurs from model outputs.

Two types of school escorting:

1. Pure Escort: a household adult drops off students to school then drives back to home; or picks up students from school then drives back to home. Usually involves two trips (home-school-home).
2. Share Ride: a household worker drops off/picks up students on the way driving between home and work. Usually, a detour trip to an intermediate stop for school location.

Step 5: Calculate VMT reduction for chauffeurs who no longer will conduct a “Pure Escort” trip.

- Calculate VMT reduction from SCAG Model output directly.

Step 6: Calculate VMT reduction for chauffeurs who no longer for will conduct a “Share Ride” trip.

- Calculate total VMT for commuters who make “Share Ride” school escorting trip.
- By analyzing 2017 Household Survey, VMT is reduced by the percent of “Share Ride” commuters who do not need to detour to school.
 - Apply this percent deduction to commuting VMT with “Share Ride” school escorting trip.

Step 7: Total VMT reduction from Safe Routes to School

- Aggregate VMT reduction from Steps 3, 5, and 6.

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

There is currently no centralized database of Safe Routes to Schools efforts in the region. Caltrans is developing a Statewide Active Transportation Database that will likely include SRTS data (2025 estimated). As of 2022, Los Angeles Unified School District and Los Angeles Department of Transportation are now collecting student trip data annually.

Monitoring and Tracking

- Number of SOV trips to schools
- Average commute lengths where one stop of the trip is at a school
- Number of adopted SRTS plans in region
- Number of SRTS focused education and encouragement programs deployed in region

8.4 Parking Deregulation

Description

Through this strategy, SCAG will provide support to local jurisdictions in relaxing or eliminating parking minimums for proposed new development within half a mile of high-quality transit stops that are not part of Transit Priority Areas (TPAs). The geography of this strategy has expanded from the 2020

RTP/SCS, which focused on deregulation in TPAs. With the passage of AB 2097³¹ which eliminates parking minimums within a half mile of public transit, SCAG has updated the geography of this strategy for it to reach other transit accessible areas in the region beyond the law.

Required parking minimums for new housing developments increases the likelihood of auto ownership for residents in transit rich neighborhoods, decreases usage of alternative modes, makes housing less affordable, increases median income in transit rich neighborhoods, and contributes to underutilization of the transit system. Removing parking requirements within half a mile of high-quality transit stops ultimately will reduce available parking, since most areas in the region—especially near transit—provide more parking than is needed for residents. Less parking results in higher transit usage, as exhibited in the Connect SoCal 2020 off-model strategies.

Following examples from the cities of Seattle, Portland, San Diego, Sacramento, Santa Monica, and Oakland, SCAG will encourage the reduction or elimination of parking minimums in areas well served by transit. This will be done through grant programs to implement parking deregulation ordinances – like what has been accomplished in the City of Santa Monica in the SCAG Region. Through SCAG’s grant programs in the past, innovative parking strategies along these lines have been formulated and evaluated by the City of Long Beach and the City of Los Angeles.

Reason for Off-Model Approach: In the previous Technical Methodology, SCAG staff considered enhancing the vehicle ownership sub-model by adding new independent variables such as available parking space. In considering the potential model strategy since then, staff found that the sub-model enhancement would be challenging since it would require gathering information on parking availability, zoning code, and multi-family development data across the region. For this reason, the strategy continues to use an off-model methodology.

Objectives

- Reduce the parking requirements for new units resulting in billions of dollars in regional cost savings of multi-family construction costs.
- Reduce auto ownership for multi-family households by a significant factor.

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO₂ emission reductions.

Quantification Methodology

Assumptions and Inputs

Key inputs to be calculated:

- from model outputs:
 - Percent of multi-family households that own at least one car.

³¹ https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB2097

- Percent of multi-family households without a car.
- Average VMT per multi-family household.
- Growth of multi-family households in strategy geography

Assumption: According to research³², “access to reserved parking increases the odds for owning a car by a factor of more than 3.”

- Odd Ratios for access to reserved parking = $\text{Odd (access)} / \text{Odd (no access)} = 3.331$
- This number is from Table 5 of the research paper. The logistic regression analysis from the research was based on samples of total population in Norway. It is known that travel behavior and mode choice is different between Norway and Southern California. Since the market and planning area for this strategy is multi-family housing units within a half-mile of a high-quality transit stop, it is a reasonable approach to use the results from overall population from Norway to the target population in SCAG Region. Residents of multi-family housing are more likely to use transit; and the area in a half-mile of a high-quality transit stop has good access to transit services.

Quantification Steps

Step 1: Estimate the growth of households in multi-family housing from 2030 by each TAZ within half-mile of a high-quality transit stop not in TPAs and aggregate for entire region.

Step 2: For households in multi-family housing, calculate the following using model outputs:

- Percent of households with at least one car and without a car, by TAZs within a half-mile of a high-quality transit stops not in TPAs.
- Average VMT per household. The data will be used to calculate VMT reduction as a result of parking deregulation (reducing the number of households that own a car).

Step 3: Calculate the odds for accessing reserved parking *before parking deregulation*.

Assume all households have access to reserved parking.

Odds for accessing reserved parking before deregulation =
 Percent of households with cars / Percent of households without a car

Step 4: Calculate the odds for accessing reserved parking with a car *after parking deregulation*.

Odds for accessing reserved parking with a car after deregulation =

Odds for accessing reserved parking before deregulation [Step 3] / 3.331 [Odds ratio from literature]

Step 5: Calculate the percent of households with and without a car *after parking deregulation*.

- Percent of households without a car =
 $100 / (\text{Odds for accessing reserved parking after deregulation [Step 4]} + 1)$

³² Christiansen, P.; Fearnley, N.; Hanssen, J.U. & Skollerud, K. (2017) Household parking facilities: relationship to travel behaviour and car ownership, *Transportation Research Procedia*, 25, 4185-4195.

- Percent of households with a car =
Odds for accessing reserved parking after deregulation * Percent of households without a car after deregulation

Step 6: Calculate VMT reduction

VMT reduction = the increase of zero-vehicle households multiplying VMT per household from Step 2.

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

A challenge to this strategy is local opposition to removing parking minimums. Even in locations that are able to get relaxed parking requirements, an additional challenge may be that developers may not take full advantage of relaxed requirements because of market signals that suggest residents want more parking.

Monitoring and Tracking

- Number of high-quality transit stops with relaxed or eliminated parking minimums
- Auto ownership for multi-family households

8.5 Electric Vehicle Charging Infrastructure

Description

The goal of the electric vehicle (EV) Charging Infrastructure strategy is to increase the number of total EV chargers in the region. There are three ways that this will increase VMT driven in all electric range. First, more chargers will create consumer confidence and encourage additional EV purchases.

Second, additional charging will increase confidence for consumers who want to drive in longer trips with their EV. With more infrastructure available, consumers will more frequently opt to use their electric vehicle.

Third, as described in 2020, additional infrastructure will support plug in hybrid electric vehicles (PHEV) drivers in going longer distances in EV mode.

In Connect SoCal 2020, this strategy was focused on increasing plug-in hybrid vehicles (PHEVs) charging by employees. Since then, the state has issued numerous directives to increase the sale and use of fully electric zero-emission vehicles (ZEVs).

Reasoning for Off-Model Approach: Electric vehicle could be included in the vehicle ownership model, but current assignment cannot separate VMT by cVMT and eVMT.

Objectives

- Increase the number of new workplace EV charging stations

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current

and future level of deployment, roles, affected populations, and specific data needed to quantify CO₂ emission reductions.

Quantification Methodology

This methodology is based on Method b) as described in the Appendix D (Guidance on Technical Issues - Electric Vehicle Charging Infrastructure) of CARB's Final SCS Program and Evaluation Guidelines Report³³. SCAG previously used Method a) in the last RTP/SCS.

Method b) Estimate CO₂ emission reductions from reduced gasoline consumption based on estimated electricity consumption increase as a result of increased workplace and public charges and an estimation of a shift of cVMT to eVMT due to eVMT trips replacing cVMT trips because drivers can now charge mid trip and travel longer distances with an EV.

$$\text{CO}_2 \text{ Credit} = \text{Emission Factor}_{\text{Electricity}} * \text{Electricity}_{\text{Consump}}$$

Assumptions and Inputs

Key inputs needed for this methodology include:

- Power rating of charger type
- Charger efficiency

Key assumptions developed for this methodology include:

- Average number of EVs per charger installed by charger type
- Active hours charged by charger type, per charger, per day

Quantification Steps

Step 1: Estimate the CO₂ reductions per unit amount of electricity consumption (i.e., convert cVMT to eVMT) in the region.

$$\text{CO}_2 \text{ Credit} = \text{CO}_2 \text{ reductions per kW*hr charged at EV Charger (grams CO}_2 \text{ Credit/kW*hr)}$$

- Emission Factor_{Gas} = PHEV emission factor (grams CO₂/mile). Default is 240 grams/mile³⁴.
- Electricity_{eVMT} = Electric power used per eVMT (kW*hr/mile). Default is 0.36 kW*hr/mile³⁵

The default CO₂ credit is 666.66 g/kWhr (i.e., 240 grams/mile ÷ 0.36 kWhr/mile = 666.66 grams/kWhr).

Note: SCAG is researching studies and data to potentially estimate a regional-specific unit CO₂ credit rates.

Step 2: Estimate the electricity consumption per charger by charger type

$$\text{Electricity consumption}_i = H_i * P_i * n_i$$

³³ <https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Appendices.pdf>

³⁴ CARB. 2017 Unpublished. Internal CARB analysis of manufacturer sales data in California indicates the State-average CO₂ emissions for PHEV operation on gasoline as of 2016 is 240 grams/mile, PHEV tailpipe emissions on electricity are taken to be 0 g/mi, and electric power consumption is 360W*hr/mile.

³⁵ Ibid.

- Electricity consumption_i = Electricity consumption by charger type (e.g., Level 2 or DC Fast Charger)
- H_i = Active hours charged by charger type, per charger, per day (hours/charger)
- P_i = Power rating of charger type
- n_i = Charger efficiency (MPOs may need to provide supporting document for this parameter)

Table 15 is an example of power rating by charger type provided by NREL. MPOs may use regional data sources with more accurate estimates.

Table 15. Power Rating by Charger Type

	Home	Workplace	Public	Fast Charger
Power	1.1 to 3.3 kW	7.7 kW	7.7 kW	50+kW

Step 3: Identify the number of workplace EV chargers by charging type (Charger_i) installed in the region as part of strategy.

Step 4: Estimate the average number of EVs per charger installed by charger type (EV_{charger_i}).

Note: SCAG is researching regional data, studies, or other empirical data sources to develop this estimate.

Step 5: Determine the total regional electricity consumption from EVs associated with the installation of EV charging infrastructure using the data from Steps 2 through 4.

$$\text{Electricity consumption} = \sum \text{Electricity consumption}_i * \text{Charger}_i * \text{EV Charger}_i$$

- Electricity consumption = Total regional electricity consumption (kW-hr)
- Electricity consumption_i = Daily electricity consumption from one charger of type, i (Step 2)
- Charger_i = Number of workplace EV chargers (by type) in the region attributable to the strategy (Step 3)
- EV Charger_i = Average number of EVs per charger by charger (Step 4)

Step 6: Determine the total regional GHG emission reductions due to the installation of EV charging infrastructures using the CO₂ credit per unit electricity (Step 1), and the total electricity consumption (Step 5).

$$CO_{2\text{ region}} = CO_{2\text{ credit}} * \text{Electricity consumption}$$

- CO_{2 Region} = Total regional CO₂ emission reductions due to installation of EV charging infrastructure
- CO_{2 Credit} = CO₂ emission credit per unit amount of electricity consumption (grams CO₂/kW*hour) (Step 1)
- Electricity consumption = Total regional electricity consumption (kW-hr) (Step 5)

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

Local data on charging and electric use of PHEVs may be limited.

Monitoring and Tracking

- Number of electric vehicle charging stations in the region

8.6 Electric Vehicle Incentives

Description

This strategy will facilitate the purchase of new plug-in electric vehicles (PEVs) by offering incentives in the form of rebates to offset the additional initial purchase cost versus non-PEV. This strategy creates a funding source and a program to provide incentives above and beyond state programs.

Reason for Off-Model Approach:

- GHG/VMT reduction calculated with MPO benefit fraction assumption is more appropriate with off-model approach;
- Electric vehicle could be modeled in the vehicle ownership model, but current assignment cannot separate VMT by cVMT and eVMT; and
- The main input, number of regional EV incentive, is from strategy assumption, which cannot be modeled. Additional model enhancement is needed.

Objectives

- Support replacement of conventional vehicles with PEVs
- Increase electric VMT while decreasing conventional VMT

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO₂ emission reductions.

Quantification Methodology

This methodology is from Appendix D (Guidance on Technical Issues - Electric Vehicle Incentives) of CARB's Final SCS Program and Evaluation Guidelines Report³⁶.

Assumptions and Inputs

Key inputs include:

- Total funding for EV incentive program
- Individual subsidy/rebate
- Other electric vehicle incentives

³⁶ <https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Appendices.pdf>

- Average trip length (model output)
- Daily usage for a vehicle (miles per day per vehicle) from EMFAC

A key assumption to the strategy is that a regional incentive program will be active a total 16 years between 2030 and 2045

Quantification Steps

The overall approach to quantifying reductions from the Electric Vehicle Incentive strategy is to first establish the total funding allocated to the subsidy/rebate program established by the MPO, as well as the amount(s) offered for individual subsidies/rebates.

Step 1: SCAG identifies the funding allocated for the subsidy/rebate program per year

$$\text{EV incentive per year} = \text{Total funding for program} / \text{Number of program years}$$

Step 2: SCAG identifies the individual subsidy/rebate amount (Subsidy/Rebate Amount) for the subsidy/rebate program

Once these two values have been set, the total number of new ZEVs that may be purchased under the incentive program can then be estimated. Based on the number of vehicles purchased under the incentive program and average trip lengths for the region, total VMT associated with the incentive program can be calculated.

Step 3: Identify the number of new ZEVs (Total Program ZEV) that could be purchased through the subsidy/rebate program established by the MPO

$$\text{Annual Total Program ZEV} = \text{Total Program Funds [Step 1]} / \text{Rebate Amount [Step 2]}$$

- Total Program ZEV through 2035 target year = Annual Total Program ZEV * 6 (years: 2030-2035)

Step 4: Identify the average trip length (Average Trip Length) - Estimated from SCAG model output and CHTS data

Step 5: Calculate average total VMT from all trip purposes (ZEV VMT) associated with new ZEV's purchased through the incentive program [Step 3 * Step 4]

$$\text{ZEV VMT} = \text{Total Program ZEV [Step 3]} * \text{Average Trip Length [Step 4]}$$

Step 6: Obtain average regional GHG emission factors for new non-ZEV's (Non-ZEV EF) replaced by new ZEV's purchased through the incentive program from the most recent version of EMFAC11 and Fuel Economy.gov for the new EV purchased.

- GHG emission factor for new non-ZEV: will be calculated from model output (EMFAC)
- GHG emission factor for new EV = 0 ton per mile

Step 7: In addition to MPO's incentive program, if other rebate or incentive programs are utilized for the Electric Vehicle Incentive strategy (e.g., CVRP), calculate the MPO's fraction of overall EV incentives provided.

$$\text{MPO Electric Vehicle Incentive Strategy Fraction} = \frac{\text{MPO Electric Vehicle Incentive amount [Step 2]}}{\text{Total incentive amount}}$$

- Total Incentive Amount = Regional Subsidy + Other Electric Vehicle Incentives

Step 8: Calculate GHG emission reductions from new non-ZEVs replaced by new ZEVs purchased through the incentive program

$$\text{GHG Reductions} = \text{ZEV eVMT [Step 5]} * \text{MPO Benefit Fraction [Step 7]} * (\text{Non ZEV EF} - \text{ZEV EF})$$

- ZEV eVMT = eVMT from ZEVs purchased through the rebate program [Step 5]
- Non-ZEV EF = Average regional GHG emission factor from EMFAC for new-non-ZEVs [Step 6]
- ZEV EF = Zero-emission vehicle emission factor [Step 6]

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

SCAG recognizes that when people get an electric vehicle, they are not necessarily replacing a gas-powered vehicle. It is assumed that all EVs from incentive program will be used because they are new cars and free of fuel cost. In addition, except for replacing current operating vehicles, some of those EVs will replace vehicles that are not currently used.

It is also important to recognize the fact that EVs tend to be more expensive than comparable internal combustion engine vehicles. Therefore, most EV incentive programs tend to favor wealthier households over lower income households. In the Technical Methodology for the 2020 RTP/SCS, SCAG acknowledged the need to develop equitable solutions for the incentive program to ensure that incentives go to middle- and lower-income households.

Monitoring and Tracking

- Number of vehicles replaced
- VMT that is driven in electric mode vs conventional

8.7 Co-working

Description

Co-working is the shared use of an office space by employees of multiple different firms as an alternative to a home office or traditional, fixed workplace location. This strategy includes outreach, policy, and financial support of the strategic development of co-working spaces in the region. For long-distance commuters in certain industries, co-working sites can provide an occasional substitute for fixed workplaces which may reduce VMT.

This strategy aims to promote the establishment of suitable co-working spaces across the region through a combination of community partnerships and grant programs. This strategy reduces emissions by reducing net travel by targeting strategic locations near the residences of potential co-working space users where they would otherwise have long-distance commutes.

Reason for Off-Model Approach: With co-working being a new phenomenon to the employment landscape, there was initially a lack of sufficient data to support reflection in land use and travel modeling tools.

Objectives

- Increase prevalence of co-working spaces in subregions or neighborhoods based on proximity of residents who are likely to co-work
- Substitute some long-distance trips to fixed workplaces with short trips to nearby, community-oriented shared co-working spaces
- Increase in publicly supported coworking spaces and programs

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO2 emission reductions.

Quantification Methodology

Assumptions and Inputs

Based on the survey of co-workers conducted in 2018, industries that are expected to have employees with a high likelihood of co-working are:

- Information (NAICS 51)
- Professional Services (NAICS 54)
- Management (NAICS 55)

Other industries that showed low or minimal representation amongst surveyed coworkers would be excluded.

As co-working space users tend to be higher income, those with household incomes below \$35,000/yr (in 2011\$ value) are also excluded from the market potential analysis (Steps 1 and 2).

Quantification Steps

A key consideration is to ensure that users of co-working space are distinct from teleworkers, which are counted elsewhere.

Step 1: Identify the “market potential” of co-working space users for each of Tier 2 Transportation Analysis Zones (TAZs).

Use SCAG model outputs to calculate the number of long-distance single-occupant vehicle commuters (>100 miles round trip) from each TAZ by those industries with a high likelihood of co-working.

Based on 2017 SCAG region NHTS telework data, long-distance (>100 mile) commuters telework 2 days per week. As co-working behavior shares commonalities with teleworking and overall home-based working in the SCAG region has increased substantially as of late (from 6 percent in 2019 to 19 percent in 2021 in the SCAG region, using ACS 1-year estimates), we assume that this limited subset of coworking space users will substitute 1 day/week of fixed location workplace with co-working. Thus, we multiply the number of nearby workers that meet the criteria from each TAZ by 20% to reflect “existing demand.”

This analysis yields a TAZ-level measure of the “market potential” for these types of co-working space users who are likely to reduce their VMT through co-working.

Since this off-model strategy uses SCAG model output data that includes the analysis for telework, there is no double counting between co-work and telework.

Step 2: Identify co-working locations with enough market potential and existing demand to justify pursuing development of a co-work location.

Step 3: Use model output to calculate average VMT for identified long-distance (>100 miles round trip) commuters in each selected co-working location.

Step 4: Deduct travel distance between home and the co-working space using average intra-TAZ commuting distance for each co-working location.

Step 5: Calculate the total VMT saving for those long-distance commuters who choose to work at co-working space based on capacity using data from Steps 2-4 (using round trip travel distance).

Step 6: A rebound effect should be considered for users of co-working spaces since substantial reduction in their work commute is likely to generate some additional travel, but slightly less than the 25% rebound effect often used for home workers. We apply a 15% deduction to reflect additional travel rebound as a result of commute time savings.

Step 7: Calculate total VMT saving based on data from Steps 3-6.

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

With collaboration from local partners and private-sector co-working space providers, this strategy would involve promoting the establishment of co-working sites in areas near the home location of long-distance commuters in industries with the highest co-work potential in order to capitalize on the potential VMT savings. This would take the form of financial incentives to known co-working site providers such as WeWork and Regus, in addition to connectivity improvements such as 5G in public spaces such as libraries and community centers, both of which may be able to function as co-working sites. SCAG is rapidly gaining experience in promoting regional initiatives whose VMT benefits are used to evaluate project suitability but are ultimately implemented by local partners. In particular, SCAG’s first round of “Future Communities Pilot Programs” distributed MSRC funding to eight localities who use data-oriented initiatives which demonstrably reduce VMT in municipal services. SCAG’s co-working space strategy would necessitate local collaboration and financial incentives in order to identify and work with public spaces, such as libraries or other municipal facilities with high opportunity. In other instances, the strategy would involve collaboration with and potential financial incentive for private-sector co-working space providers who are rapidly diversifying beyond the largest players in the market (e.g., WeWork and Regus) and could see value from the location strategy of focusing nearer to home locations. To ensure tracking, funding would be based on the ability to track progress, for example through periodic surveys of co-working location users.

This is a new endeavor and as to our knowledge, the growth in co-working sites has been driven by business opportunity in this sector rather than optimizing travel behavior which is the objective of this

strategy. SCAG’s network of contacts at existing co-working sites could be further leveraged to gauge the manner in which their business models could more proactively consider travel reduction. Co-working can also take place informally in places like coffee shops—this is necessarily excluded from this analysis as it needs to be bounded at a certain point for effective implementation. SCAG would be capable of collecting and analyzing implementation, metrics, and survey responses in a similar fashion to what was conducted in the development of the off-model methodology. Beyond the successful establishment of co-working centers in key locations, co-working space users who substitute a long-distance trip to a fixed, workplace location with a short trip to a co-working center near their home would indicate successful implementation.

Monitoring and Tracking

- Average trip length
- Number of co-working spaces within identified TAZs
- Number of publicly provided co-work spaces/programs

8.8 AVR for Job Centers

Description

Recent efforts in the SCAG region support the expansion of TDM implementation. In 2019, SCAG completed a TDM Strategic Plan for the region that provides an objectives-driven, performance-based planning process to identify and promote TDM strategies and programs that increase the efficiency of the transportation system through alternative modes of travel to the SOV. Also in 2018, California enacted AB 2548, which authorizes the Los Angeles County Metropolitan Transportation Authority (Metro) to adopt a commute benefit ordinance that requires employers in Los Angeles County with 50 or more employees to offer employee commute benefits covering transit passes and vanpool charges. TDM supportive policies and incentives such as those authorized by AB 2548 and those recommended in the SCAG TDM Strategic Plan lay the foundation for increased employee commute trip reduction programs leading to greater reduction of drive-alone work trips. *Note: SCAG is in the process of updating baseline assumptions regarding telework/hybrid work and its impact on VMT reduction. These will be considered in the finalization of the methodology for this strategy.*

The “AVR for Job Centers” strategy is a performance-based strategy that targets additional, more intensive TDM programs and incentives specifically at job centers in the region. The 72 defined job centers were chosen based on current and projected employment density. The outcome of this additional layer of TDM investment is a performance goal of 1.5 or greater AVR at the job center locations. Connect SoCal assumes substantial public subsidies targeted at employees within the larger, more dense job centers will leverage private sector investment in additional TDM programs including direct incentives to support mode shift to alternative modes of travel other than single occupancy vehicles. This intensification of TDM strategies at these job centers may involve the development and creation of Transportation Management Associations (TMAs) and local TDM ordinances beyond the few that currently exist. These additional TMAs and local TDM ordinances would facilitate additional TDM programs and incentives to support mode shift and achieve the 1.5 or greater AVR goal. Programs will vary by location, based on context-sensitive strategies SCAG is considering funding a study to investigate and incentivize the formation of new and more TMAs in the region.

Reason for Off-Model Approach: For TDM related strategies, SCAG added an analytical function for reduction of commuting vehicle trips to the SCAG regional model. SCAG could add an AVR condition as a TDM target for job centers. The development of an off-model approach for this strategy lays out a foundation for future model enhancement.

Objectives

- Attain an AVR of 1.5 or higher for the job center locations through a layering of additional TDM programs and incentives above other strategies included in Connect SoCal.

Trip and Emissions Data Needs

Note: Prior to submission of the final Technical Methodology, SCAG will prepare separate Trip and Emissions Data Needs documents for each of the off-model strategies. These will detail funding, current and future level of deployment, roles, affected populations, and specific data needed to quantify CO2 emission reductions.

Quantification Methodology

Assumptions and Inputs

Key inputs include:

- Job Center data
 - Current and projected employment
 - Estimates of baseline AVR
 - Total vehicle trips for work purpose
 - Total person trips for work purpose
 - Average work trip distance access to each job center

Quantification Steps

VMT reduction benefits are determined for each of the job centers and aggregated to a regional total. For each job center location, total person trips and total vehicle trips from model output are used to calculate the AVR resulting from other modeled Connect SoCal strategies including modeled TDM strategies. Next, the additional reduction of SOV trips are identified for each location to bring the job center AVR up to 1.5 or within a scale based on the size and density of the job center. For example, further investment to provide additional vanpool vehicles and routes serving additional employee residential locations would support additional workers to shift from SOV to vanpool, that otherwise would not have done so. Finally, these trips are multiplied by the average work trip distance of each job center to estimate VMT reduced.

Step 1: Calculate AVR for each job center with commuting purpose

Step 2: For those job centers with AVR lower than 1.5, calculate the number vehicle trip reduction in order to make AVR = 1.5

Step 3: Using model output, to calculate average travel distance to each job center

Step 4: Calculate VMT reduction for each job center with AVR lower than 1.5

- number of vehicle trip reduction * average commuting distance to each job center *2 (round trip)

Step 5: Calculate Total VMT reduction in region.

- Total VMT reduction = aggregation of VMT reduction for all job center - Total VMT reduction

Challenges, Constraints, and Strategy Implementation Tracking

Challenges and Constraints

As discussed in the TDM Strategic Plan, performance monitoring and reporting with respect to TDM implementation and outcomes is not always available and/or comprehensive and is an ongoing challenge. The Strategic Plan recommends action steps for improving performance measurement in the SCAG region, including the development of a regional clearinghouse for TDM data and the development of formalized metrics and regional data standards, such as those set in Rule 2202. The development of TMAs may also facilitate implementation tracking through improved monitoring and reporting. SCAG is making investments and has begun implementing recommendations from the TDM Strategic Plan.

Monitoring and Tracking

- AVR for job centers

SCAG is currently studying creating a TDM data clearinghouse for the region, including types of data, how they are standardized and incentives for TDM practitioners and professionals to use the database.

9 Other Data Collection Efforts

Local Data Exchange (LDX)

As discussed in Section 3.2, SCAG is using the LDX process to gather the most updated information available from local jurisdictions covering land use and growth to help understand how the region is developing and the extent to which we are meeting our climate goals.

UC Davis COVID-19 Mobility Study

Through a collaboration with researchers at the University of California at Davis Institute of Transportation Studies (UC Davis ITS), SCAG commissioned a survey and related summary report to investigate the changing activity patterns, travel choices, and individual attitudes towards mobility among various groups across the six-county SCAG region during the COVID-19 pandemic—including expectations for the future. The outcomes and findings from this study will inform future regional policymaking efforts aimed at maximizing sustainable, resilient, and equitable mobility to serve SCAG residents for generations to come. The publication of the final research is forthcoming.

California Department of Finance (DOF) population and household estimates

The Demographic Research Unit of the California Department of Finance (DOF) provides annual population and household estimates of the state, counties, and cities. The data are used in determining the annual appropriations limit for all California jurisdictions, to distribute state subventions to cities and counties, to comply with various state codes, and for research and planning purposes by federal, state, and local agencies, the academic community, and the private sector.

California Employment Development Department (EDD) jobs report by industry

California Employment Development Department (EDD) conducts the Quarterly Census of Employment and Wages (QCEW) program. It is a Federal-State cooperative program between the U.S. Department of Labor's Bureau of Labor Statistics (BLS) and the California EDD's Labor Market Information Division (LMID). The QCEW program produces a comprehensive tabulation of employment and wage information for workers covered by California Unemployment Insurance (UI) laws and Federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program. EDD uses QCEW data as the benchmark source for employment estimate.

Census and the latest American Community Survey (ACS) data

Census is decennial census data conducted by the Census Bureau. ACS data is the American Community Survey that is collected by the US Census Bureau. The ACS gathers information annually and for 5-year periods, and SCAG used 2019 ACS as the primary data source for the socio-economic data development. The socioeconomic inputs for year 2019 consist of zone-level data, household-level data, and person-level data.

Household Travel Surveys

The California Household Travel Survey (CHTS) is used as primary data for model estimation and model validation. Due to its rich information and large sample size, travel survey data is also used for the analysis of policy impact on travel behavior. SCAG developed 2019 weight to the CHTS and used for model estimation and validation. SCAG also collected 2017 National Household Travel Survey (NHTS) as supplemental data on travel behavior analysis. Both CHTS and NHTS are used in off-model analysis.

2019 Transit On-Board Survey

2019 SCAG transit network included three types of fares. Published full cash fares at the route level are used as a base for initial boarding fares. To take complex fare structures into account, such as one-way walkup fares, daily/weekly/monthly passes, senior/student/disabled fares, and other special fares, fare factors at the carrier level were estimated from boarding and revenue data that SCAG collected through the Year 2008 Transit Level of Service Data Collection Program. By applying fare factors to the published full cash fare, the resulting fares represent actual fares paid by an average passenger. Finally, all boarding fares (base fare and transfer fare) are converted to 2011 dollars using a Consumer Price Index (CPI) adjustment factor derived from the CPI factor published by the US Department of Labor for the Los Angeles-Riverside-Orange County metropolitan area.

Traffic Data

Traffic data is used for network validation, including volume, speed, VMT, and inter-regional travel. SCAG continues to collect and analyze traffic data from Caltrans Performance Measurement System (PeMS), National Performance Management Research Data Set (NPMRDS), and Inrix. For VMT validation, SCAG collected data from Caltrans Highway Performance Monitoring System (HPMS). For traffic data with either location based or GPS based from private vendors, SCAG purchased and worked with Streetlight on data analysis for O-D patterns and inter-regional travel.

Longitudinal Employer-Household Dynamics (LEHD)

SCAG used 2018 LEHD data to create supplemental validation data for work location and trip length distribution for work purpose.

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