TECHNICAL WORKING GROUP

Thursday, April 18, 2019
10:00 a.m. – 12:00 p.m.

SCAG OFFICES
900 Wilshire Blvd., Ste. 1700
Room Policy B
Los Angeles, CA 90017
(213) 236-1800

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ON NEXT PAGE

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Technical Working Group

April 18, 2019
10:00 a.m. – 12:00 p.m.

SCAG Downtown Office – Policy Room B
900 Wilshire Blvd., 17th Floor
Los Angeles 90017

Agenda

Introductions

Discussion Items

1.	Geographic Data Release for Bottom-Up Local Input and Envisioning Process	Kimberly Clark	
2.	Job Centers, Growth Priority Area Technical Methodology	Kevin Kane Jung Seo	Attachment
3.	Neighborhood Mobility Area, Growth Priority Area Technical Methodology	Joseph Cryer Ariel Pepper	Attachment
4.	ARB Final Draft SCS Guidelines & SCAG Preliminary Draft Technical Methodology	Ping Chang Rongsheng Luo	Attachment
5.	Issues and Potential Risks of Anticipated Final Federal Action on Safe Affordable Fuel-Efficient (SAFE) Vehicle Rule	Rongsheng Luo	Attachment
6.	RHNA Methodology Update: Existing Needs	Ma'Ayn Johnson	Attachment
7.	Connect SoCal Schedule	Naresh Amatya	
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Technical Working Group
April 18, 2019

Attendees March 21, 2019

Mike Behen	Palmdale
Carlene Saxton	Palmdale
Deborah Diep	Center for Demographic Research, California State University Fullerton
Martha Eros	City of Beverly Hills
Ashley Hefner	Culver City
Shirley Medina	RCTC
Miles Mitchell	City of Los Angeles
Marika Poynter	City of Irvine
Marnie Primmer	Orange County Council of Governments
Gail Shiomoto-Lohr	Mission Viejo
Steve Smith	SBCTA
Jack Tsao	City of Los Angeles
Mark Yamarone	Los Angles MTA
Lori Huddleston	Los Angeles MTA
Jason Rosenblum	
Sam Sharvini	
Angela Chang	
Lin Bai	
Marisa Creter	SGVCOG
Josh Lee	

Technical Working Group

Agenda Item 2

SCAG Job Centers Strategy
Technical Methodology
Kevin Kane, 3/5/2019

Summary

A novel methodology was adapted in order to identify job centers, also referred to as "subcenters," in the SCAG region for the 2020 RTP/SCS. This methodology is built on:

Kane, K., Hipp, J. R., & Kim, J. H. 2018. Los Angeles employment centers in the twenty-first century. Urban Studies 55:4, 844-869. *See* *https://cloudfront.escholarship.org/dist/prd/content/qt3d55p4zt/qt3d55p4zt.pdf*

A report, web mapping application, and informative video on this research can also be found at https://mfi.soceco.uci.edu/category/quarterly-report/detecting-job-density-over-time/.

The rationale for SCAG's job centers methodology is to identify spaces in the SCAG region whose **job density is significantly higher than the areas around them**. The purpose is not to identify where most jobs are or where the *absolute* highest density is; rather, the method identifies localized areas which are denser than the areas surrounding them. The outcome is a more dispersed distribution of job centers than prior methodologies[1] which can serve as local centers of activity and more closely resembling "suburban downtowns." The traditional methodology, from Giuliano and Small (1991) is to define centers are areas with more than 10,000 jobs and more than 10 jobs per acre.

Data Source

The primary data source used for this analysis are point-level business establishment data from InfoUSA. This commercial database produced by *InfoGroup* provides a comprehensive list of businesses in the SCAG region, including their industrial classification, number of employees, and several additional fields. Data have been post-processed for accuracy by SCAG staff and have an effective date of 2016.

Methodology

Locally-weighted regression

First, the SCAG region is overlaid with a grid, or fishnet, of 1km, 2km, and ½-km per cell. At the 1km cell size, there are 16,959 cells covering the SCAG region. Using the Spatial Join feature in ArcGIS, a sum total of business establishments and total employees (i.e., not separated by industrial classification)

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[1] See:
Giuliano, Genevieve, and K. A. Small. 1991. Subcenters in the Los Angeles region. *Regional Science and Urban Economics* 21, p. 163-182.
Giuliano, Genevieve, C. Redfearn, A. Agarwal, C. Li, and D. Zhuang. 2007. Employment concentrations in Los Angeles, 1980-2000. *Environment and Planning A* 39, p. 2935-2957.

were joined to each grid cell. Note that since cells are of a standard size, the employment total in a cell is the equivalent of the employment density.

A locally-weighted regression (LWR) procedure was developed using the R Statistical Software package in order to identify subcenters, which can be found in the attached file, *subcenters_SCAG_lwr_code.R.* The below procedure is described for 1km grid cells, but was repeated for 2km and 1/2km cells.

1.) <u>Identify local maxima candidates.</u> Using R's lwr package, each cell's 120 nearest neighbors, corresponding to roughly 5.5 km in each direction, was explored to identify high outliers or *local maxima* based on the total employment field. Cells with a z-score of above 2.58 were considered local maxima candidates.

2.) <u>Identify local maxima</u>. LWR can result in local maxima existing within close proximity. This step used a .dbf-format spatial weights matrix (knn=120 nearest neighbors) to identify only cells which are higher than all of their 120 nearest neighbors. At the 1km scale, 84 local maxima were found, which will form the "peak" of each individual subcenter.

3.) <u>Search adjacent cells to include as part of each subcenter</u>. In order to find which cells also are part of each local maximum's subcenter, we use a queen (adjacency) contiguity matrix to search adjacent cells up to 120 nearest neighbors, adding cells if they are also greater than the average density in their neighborhood. A total of 695 cells comprise subcenters at the 1km scale.

A challenge arises in that using 1km grid cells may fail to identify the correct local maximum for a particularly large employment center whose experience of high density occurs over a larger area. The process was repeated at a 2km scale, resulting in 54 "coarse scaled" subcenters. Similarly, some centers may exist with a particularly tightly-packed area of dense employment which is not detectable at the medium, 1km scale. The process was repeated again with ½-km grid cells, resulting in 95 "fine scaled" subcenters. In many instances, boundaries of fine, medium, and coarse scaled subcenters were similar, but in many instances they were in entirely different places.

The final step involved qualitatively comparing results at each scale to create the final map of 69 job centers across the region. Most centers are medium scale, but some known areas of especially employment density were better captured at the 2km scale while . Giuliano and Small's (1991) "ten jobs per acre" threshold was used as a rough guide to test for reasonableness when choosing a larger or smaller scale. For example, in some instances, a 1km scale included much additional land which reduced job density well below 10 jobs per acre. In this instance, an overlapping or nearby 1/2km scaled center provided a better reflection of the local employment peak. When judgment calls needed to be made, the purpose of the analysis was used as a guide: to identify areas with job density which are distinct from the areas nearby.

Summary of SCAG Region Job Centers

A list of job centers can be found in the table below:

- There are 69 total centers
    - o   21 fine scaled (derived from 1/2km cells)
    - o   34 medium scaled (derived from 1km cells)
    - o   14 coarse scaled (derived from 2km cells)
- Centers cover 2,351,520 jobs, about 1/3 of regional employment, and 842 acres, roughly 5% of the region's land area.

- Centers range from "LA Westside," the largest at 265,820 jobs to "Holtville," with 1,561 jobs.
- 23 centers are below Giuliano and Small's "10,000 jobs" cutoff--these are concentrated places of employment, just smaller.
- Loma Linda's tiny center is actually the densest at 46 jobs/acre, while downtown Los Angeles is second with 38 and Desert Hot Springs is the lowest at 1.67.
- 40 centers are below Giuliano's 10 jobs/acre cutoff, but are subregionally significant nonetheless.
- 104 cities in the SCAG region have at least part of a job center in them.
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	Name	Spatial Scale	Total Jobs	Jobs per acre	Center size (sq km)
	List of SCAG Region Job Centers, in Descending Size Order				
1	LA Westside	Coarse	265,820	33.58	32.04
2	Downtown Los Angeles	Coarse	225,753	38.03	24.02
3	Irvine - SNA	Coarse	198,863	20.10	40.04
4	Woodland Hills - Canoga Park - Chatsworth	Medium	98,456	14.21	28.04
5	Anaheim - Fullerton	Coarse	96,590	12.20	32.04
6	Torrance-Carson	Coarse	95,715	12.09	32.04
7	Glendale-Burbank	Coarse	93,011	15.66	24.04
8	LAX	Coarse	89,203	15.02	24.03
9	Rancho Cucamonga - ONT	Coarse	82,204	6.93	48.04
10	Pasadena	Medium	63,765	23.42	11.02
11	Irvine - Spectrum	Medium	61,670	20.76	12.02
12	Long Beach	Medium	51,251	17.25	12.02
13	Ventura	Coarse	51,022	6.45	32.00
14	Santa Clarita	Medium	45,755	5.78	32.04
15	Downtown Riverside	Coarse	39,839	8.06	20.00
16	Sherman Oaks	Medium	39,196	14.39	11.02
17	Commerce - Montebello	Medium	39,154	12.17	13.02
18	Temecula - Murietta	Medium	32,456	8.74	15.03
19	Downey	Medium	31,690	10.67	12.02
20	North Hollywood	Fine	29,863	25.33	4.77
21	Thousand Oaks - Westlake Village	Medium	29,442	9.91	12.02
22	Chino	Medium	28,859	7.77	15.02
23	El Monte	Medium	27,901	8.05	14.03
24	Industry - Rowland Heights	Medium	27,164	12.19	9.02
25	Corona	Medium	25,680	9.43	11.02
26	Newport Mesa	Fine	25,541	22.89	4.52
27	Palm Desert	Coarse	24,188	4.89	20.03
28	Brea	Medium	23,925	12.08	8.01
29	Lancaster	Medium	21,349	5.39	16.03
30	Redlands	Medium	20,906	7.04	12.02

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	Name	Spatial Scale	Total Jobs	Jobs per acre	Center size (sq km)
31	Loma Linda	Fine	17,263	46.33	1.51
32	Thousand Oaks - Newbury Park	Fine	17,197	19.83	3.51
33	Arcadia	Medium	17,189	11.57	6.01
34	Victorville	Coarse	16,860	2.84	24.02
35	Simi Valley	Medium	16,760	6.77	10.02
36	San Bernardino	Fine	16,201	11.88	5.52
37	Laguna Niguel	Medium	16,197	10.90	6.01
38	Whittier	Fine	15,386	17.70	3.52
39	Oxnard - Port Hueneme	Coarse	15,361	5.18	12.00
40	El Centro	Medium	14,980	5.04	12.03
41	Camarillo	Medium	13,663	5.02	11.02
42	Fontana	Medium	13,468	6.80	8.02
43	Riverside - Arlington	Fine	12,655	12.01	4.26
44	Hemet	Medium	12,253	3.09	16.05
45	Glendora	Fine	10,505	13.03	3.26
46	Moreno Valley	Coarse	10,078	2.04	19.99
47	Palm Springs	Medium	9,855	5.68	7.02
48	Pomona	Medium	9,553	7.72	5.01
49	Sylmar	Medium	9,141	7.38	5.01
50	Moorpark	Medium	8,462	3.42	10.02
51	Calexico	Medium	8,283	3.35	10.01
52	San Pedro	Fine	8,028	8.63	3.76
53	Palmdale	Medium	7,827	6.32	5.01
54	Cabazon	Medium	7,762	10.44	3.01
55	Beaumont	Medium	7,536	2.17	14.05
56	Calabasas	Fine	7,220	15.54	1.88
57	San Clemente	Fine	7,134	8.86	3.26
58	Brawley	Fine	5,414	3.01	7.28
59	Bermuda Dunes - Palm Desert	Medium	5,311	5.36	4.01
60	Lake Elsinore	Medium	5,057	2.92	7.01
61	Barstow	Fine	3,703	4.26	3.51
62	Santa Paula	Fine	3,539	3.17	4.52
63	Blythe	Fine	2,753	2.96	3.76
64	Big Bear Lake	Fine	2,716	3.65	3.01
65	Coachella	Fine	2,548	10.25	1.01
66	Yucaipa	Fine	2,031	3.64	2.26
67	Desert Hot Springs	Fine	1,963	1.67	4.77
68	Fillmore	Fine	1,876	3.03	2.51
69	Holtville	Fine	1,561	2.29	2.76

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Agenda Item 3

Neighborhood Mobility Area
Technical Methodology
Joseph Cryer and Ariel Pepper

Summary:
This document summarizes the update to the Neighborhood Mobility Area (NMA) layer for Connect SoCal. NMAs were identified at the Tier 2 TAZ level based on a composite score of each TAZ's intersection density, density of low-speed streets, land use entropy, and accessibility to "everyday destinations."

Background and Purpose:
The analysis described in this document identifies Neighborhood Mobility Areas (NMAs) in the region. NMAs are a concept from the 2016 RTP/SCS defined as areas with high intersection density, low to moderate traffic speeds, and robust residential retail connections. In the 2016 RTP/SCS, NMAs were used to target areas for growth allocation strategies, encourage fuel-efficient modes of transport, and support active transportation:

> The land use strategies include shifting retail growth from large centralized retail strip malls to smaller distributed centers throughout an NMA. This strategy has shown to improve the use of active transportation or Neighborhood Electric Vehicles (NEVs) for short trips. Steps needed to support NEV use include providing state and regional incentives for purchases, local planning for charging stations, designating a local network of low speed roadways and adopting local regulations that allow smaller NEV parking stalls. NMAs are applicable in a wide range of settings in the SCAG region. The strategies associated with this concept are intended to provide sustainable transportation options for residents of the region who do not have convenient access to high frequency transit options. (pg. 79)

The methodology used to update the NMA layer retains the conception of NMAs with one refinement: the 2016 RTP/SCS NMA analysis excluded High Quality Transit Areas (HQTAs), whereas the current analysis did not exclude these or any other areas.

Methodology:
This analysis identifies locations in the region that have high access to destinations and street network connectivity for low-speed modes. These factors were identified using four measures: intersection density, density of low-speed streets, land use entropy, and accessibility to "everyday destinations." These measures and their identification are described in the subsections below.

The raw scores described below for each measure were assigned to Tier 2 TAZs via a spatial join (there are 11,267 Tier 2 TAZs in the region). Z-scores were subsequently assigned at the TAZ level to score each of the four measures. The Z-scores for all factors were then summed to yield an overall score for every Tier 2 TAZ in the region. These values ranged between -4.969 and 23.992. The TAZs that scored at the 75th percentile or higher for the composite score were considered NMAs.

NMA score =   sum of z-scores for four measures

Intersection Density

Intersection density was determined using an intersection layer obtained from the SCAG Modeling and Forecasting team. This layer includes all intersections in the region with the exception of intersections for streets within parking lots and the ends of dead-end streets such as cul-de-sacs. This layer was overlaid with the SCAG Tier 2 TAZ layer then the number of intersections were divided by each respective TAZ's area in square miles. The values ranged between 0 and 1,684. Z-scores for these values ranged from -1.1614 to 13.7184.

Intersection density =   number of intersections / square miles

Low-Speed Streets

Low-speed streets were determined using the TOMTOM street network file in the SCAG DataWarehouse (SDEADMIN.Street_line_scag). The data was filtered using the field *SPEEDCAT* to identify roadways with speed limits 32mph or lower (the next speed category in the file is 32.1 to 44mph, which includes streets with speed limits too high for NEVs and electric scooters). Further processing was required to remove some roadways inappropriate for the layer including highways, freeway onramps, and parking lots. This was accomplished by using the *RAMP* field to filter out ramps, using the *KPH* field to filter out roads with "calculated speeds" above 60, and the *FOW* field to exclude parking lots. In some locations roadways that are divided by a median are shown as two parallel facilities. This was not controlled for in this analysis.

The score for low-speed streets was calculated by creating a spatial join of the street network file with the Tier 2 TAZ file and summing road length in meters per TAZ. The summed lengths (m) of low-speed streets within each TAZ were then divided by the area in square miles of each respective TAZ. The values ranged between 0 and 136,954. Z-scores for these values ranged from -1.6411 to 5.5561.

Low-speed streets =   length of low-speed streets (m) / square miles

Land Use Entropy

Land use entropy, or the diversity and mix of land uses in an areas, was calculated for each Tier 2 TAZ based on their land use. The Existing Land Use data, collected from the 2020 RTP/SCS Bottom Up Local Input and Envisioning Process, was separated into three categories (i.e. Residential, Destinations, and Amenities/Open Space) and the total square meters for each category was calculated. Land use diversity was determined by executing an entropy python script which rated each Tier 2 TAZ independently on a scale from zero to one with a value of one representing the most diverse use of land and a value of zero representing no land use mix. Z-scores for these values ranged from -1.6411 to 2.2078.

Land use entropy =   land use entropy value between zero and one

Accessibility to "Everyday Destinations"
"Everyday Destinations" were determined by filtering business location data from InfoUSA (2016) to only represent the following three categories: 1) Apparel Retailing, 2) Restaurants, and 3) Grocery Stores. The number of "Everyday Destinations" within one mile of each census block (2010) was solved on the ESRI North America Streets street network. A python script calculated three other distance decay measures to ensure the First Law of Geography was followed (i.e., a power-law distance decay function with an alpha value of 1, a power-law distance decay function with an alpha value of 2, and 3, and an exponential distance decay function with a beta value of 0.2).
The sum value of the exponential distance decay for all three "Everyday Destinations" was spatially joined to the Tier 2 TAZ layer to produce an accessibility rating which ranged from 0 to 1,539. The accessibility to "Everyday Destinations" served as one of four components to calculate the overall viability of assigning an area as a potential Neighborhood Mobility Area. Z-scores for these values ranged from -0.5234 to 21.0589.

Accessibility to "everyday destinations" =   *sum value of exponential distance decay to apparel, restaurants, and grocery stores*

Results:
The analysis resulted in a layer that identifies scores for four factors at the Tier 2 TAZ level for the SCAG region. The data for the scores showed a high to medium correlation for some factors, including intersection density, slow-speed streets, and accessibility to "everyday destinations," as shown in
. Each of the four factors had a relatively normal distribution, which resulted in a normal distribution for the composite score as shown. **Figure 1** shows, starting at the top left, histograms of the distribution of scores for intersection density, density of slow-speed streets, land use entropy, and log of accessibility to "everyday destinations."

Table 1

	Int. Density	Slow-Speed Street Density	Access-ibility	Land Use Entropy	Overall Percentile Rank	Log of Access-ibility	Log of Land Use Entropy
Intersection Density	-	0.84	0.42	0.09	0.78	0.57	0.19
Slow-Speed Street Density	0.84	-	0.45	0.10	0.85	0.66	0.21
Accessibility	0.42	0.45	-	0.06	0.48	0.47	0.07
Land Use Entropy	0.09	0.10	0.06	-	0.47	0.25	0.87
Overall Percentile Rank	0.78	0.85	0.48	0.47	-	0.82	0.52
Log of Accessibility	0.57	0.66	0.47	0.25	0.82	-	0.31
Log of Land Use Entropy	0.19	0.21	0.07	0.87	0.52	0.31	-

Figure 1
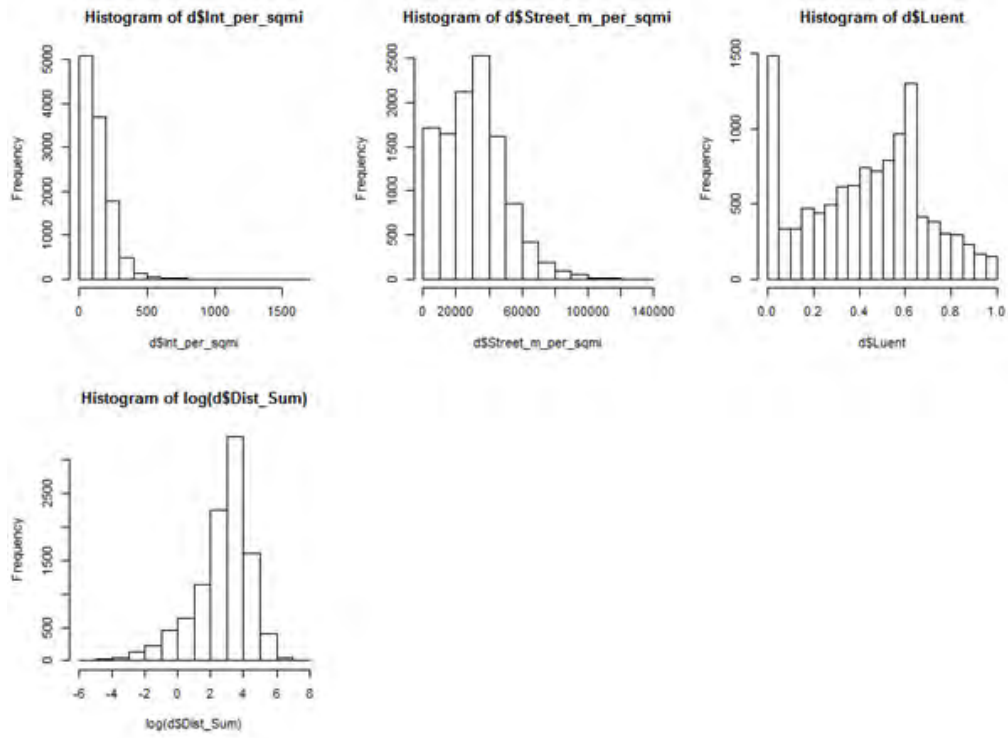
Technical Working Group

Agenda Item 4

Final Preliminary Draft Technical Methodology to Estimate Greenhouse Gas Emissions for Connect SoCal (2020-2045 Regional Transportation Plan/Sustainable Communities Strategy) from the Southern California Association of Governments

(April 18, 2019)

I. Introduction

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 SB 375, an Metropolitan Planning Organization (MPO) must develop and submit to the California Air Resources Board (ARB) for its approval of the technical methodology it intends to use to estimate the greenhouse gas (GHG) emissions from its Sustainable Communities Strategy (SCS) (and, if necessary, Alternative Planning Strategy). Upon receipt of the technical methodology, ARB is required to respond to the MPO with written comments timely, including specific description about any aspects of the methodology that it concludes will not yield accurate estimates of the GHG emissions and remedies.

The Southern California Association of Governments (SCAG) plans to start the SB 375 required formal public participation process in the third week of May 2019. Therefore, SCAG plans to submit its Technical Methodology to ARB around mid May before the first public workshop.

2. Applicable per capita GHG Emissions Reduction Targets Set by CARB

On March 22, 2018, the ARB Board adopted the following new and more stringent per capital GHG emissions reduction targets for the SCAG region beginning October 1, 2018[1]:

    2020 Target: -8%
    2035 Target: -19%

3. Overview of Analysis Years

Pursuant to current regional transportation planning regulations and consistent with past practices, 2016 has been chosen as the base year for Connect SoCal, 2020 as the first year, and 2045 as the planning horizon year. To fulfill various federal and state planning requirements, SCAG will perform analysis including modeling for many different years in addition to the base year and the planning horizon year. Table 1 below is a summary of the applicable analysis years including their respective purposes for the Technical Methodology to estimate GHG emissions for Connect SoCal.

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

Analysis Year	Purpose
2005	Base year for SB 375 GHG mission reduction target setting
2016	Base year for Connect SoCal

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

Analysis Year	Purpose
2020	SB 375 GHG emission reduction target
2035	SB 375 GHG emission reduction target
2045	Planning horizon year for Connect SoCal

4. Overview of SCS Schedule

SCAG's Sustainable Communities Strategy process kicked off with one on one meetings with each local jurisdiction in the region to update and verify our datasets for plan development. In May of 2018, SCAG launched a new working group, Sustainable Communities, to convene stakeholders from local jurisdictions and other organizations to solicit feedback on initial SCS development and other related issues.

The overall outreach timeline is below (future dates in *italics*):

October 2017:	Launched Local Input Process
May 2018:	Sustainable Communities Working Group Kickoff
August 2018:	Sustainable Communities Working Group Meeting
September 2018:	Concluded Local Input Process
October 2018:	Regional Council Approved Sustainable Communities Strategy Framework
November 2018:	Sustainable Communities Working Group Meeting
November 2018:	Deadline for County Transportation Commissions to provide initial input on transportation projects, strategies and programs
November-December 2018:	Select Planning and COG Director interview feedback on initial scenario concepts
April 2019:	*Launch Community Based Organization partnerships*
April 2019:	*Public pop-up events to solicit input on draft scenarios and/or strategies*
Mid-May 2019:	*Submittal of Technical Methodology to Estimate GHG Emissions to ARB*
Mid-May - June 2019:	*SB 375 Workshops (scenario development)*
October 2019:	*Release of Draft Connect SoCal*
Late 2019:	*SB 375 Public Hearings*
January-March 2020:	*SB 375 Elected Official Briefings*
April 2020:	*Adoption of Final Connect SoCal*

5. Outline of the Technical Methodology

ARB staff released the Final Draft Sustainable Communities Strategy Program and Evaluation Guidelines (https://ww2.arb.ca.gov/sites/default/files/2019-03/Draft_SCS_Evaluation_Guidelines_Report.pdf; and https://ww2.arb.ca.gov/sites/default/files/2019-03/Draft_SCS_Evaluation_Guidelines_Appendices.pdf) in late March and held a public workshop on the Final Draft Guidelines on April 3, 2019. The Final Draft Guidelines prescribes what should be included in the technical methodology. In accordance with the

ARB's Guidelines, SCAG's Final Preliminary Draft Technical Methodology consists of the following nine sections:

Section I. Introduction describes the purpose of the Technical Methodology, identifies the applicable per capita GHG emissions reduction target set by ARB, provides an overview of the analysis years, outlines the SCS schedule, and summarizes the organization of the Technical Methodology document.

Section II. Overview of Existing Conditions describes significant changes in existing regional and local planning contexts since the adoption of the last 2016 RTP/SCS and presents key regional issues that may influence the Connect SoCal policy framework and discussions.

Section III. Population and Employment Growth Forecast includes a description of the updated regional growth forecast as compared to the last SCS as well as major changes to the regional growth forecast methodology.

Section IV. Quantification Approaches lists quantification approaches, to the extent known and available by the completion date of this Technical Methodology, for each of the potential SCS strategies under consideration, details assumptions and method for estimating interregional travel, and specifies which version of ARB's EMFAC model was used for estimating GHG emissions from the 2016 RTP/SCS and which version will be used for Connect SoCal.

Section V. Travel Demand Modeling summarizes improvements made to the regional travel demand model, describes model inputs used in the activity-based model, includes SCAG's commitments to provide model sensitivity tests for SCS strategies under consideration, and explains whether and how travel model accounts for short- and long-run effects of reduced demand for new roadway capacity projects.

S*ection VI. List of Exogenous Variables and Assumptions for Use in Proposed SCS* presents assumptions for exogenous variables to travel demand modeling, to the extent known and available by the completion date of this Technical Methodology, as well as assumptions to derive cost of travel.

Section VII. Per Capita GHG Emissions from Prior SCS includes SCAG's commitment to working with ARB staff to conduct analysis for reporting on Incremental Progress

Section VIII. Off-Model Strategies details the off-model analysis methodology and assumptions to estimate GHG emission reduction from each of the potential SCS strategies under consideration that are not captured by the enhanced regional travel demand model.

Section IX. Other Data Collection Efforts documents SCAG's 2020 Local Input Survey to collect information from local jurisdictions related to the implementation of the 2012 and 2016 RTP/SCS as well as to assist in the development of Connect SoCal.

II. Overview of Existing Conditions

1. Notable Changes to Existing Regional or Local Planning Contexts

Since the 2016 RTP/SCS was adopted, there have been changes in the regional planning context for integrating the transportation network, measures and policies with land use strategies to achieve reduced greenhouse gas emissions. For Connect SoCal, SCAG will initiate a deliberative, collaborative scenario development process to engage the public on a range of regional planning topics and forecast a regional development pattern that will reduce GHG emissions from automobiles and light trucks to meet the ambitious 19% target set forth by CARB. Although the issues listed below are not necessarily new, associated assumptions may change and will need to be addressed in a nuanced way in the scenario process and SCS.

- New sources of revenue have started to impact transportation funding allocation priorities (e.g. SB1, Measure M)
- Attracting and retaining transit system riders has proven to be a challenge, and ridership decline has been exacerbated by a variety of exogenous factors (e.g. TNC expansion, increased vehicle efficiency and affordability, gentrification). (Link to https://www.scag.ca.gov/Documents/ITS_SCAG_Transit_Ridership.pdf)
- New and updated general plans and specific plans across several jurisdictions.

2. Key Regional Issues Influencing RTP/SCS Policy Framework and Discussions

Key Regional Issues that may influence RTP/SCS policy framework and discussion may include but are not limited to the following:

- Development of innovative mobility options (e.g. micromobility), technology, and Mobility as a Service are influencing travel behavior in ways that remain unpredictable.
- There are increased challenges for producing sufficient housing at multiple price ranges in locations that do not induce SOV travel and/or adversely impact essential resources (e.g. water supply, agricultural lands, critical habitats).
- Ambitious assumptions about shared mobility adoption rates and deployment strategies have not yet been borne out in reality.
- Transit oriented development, associated densities and active transportation infrastructure have not been implemented reliably region wide to encourage significant mode shift.
- The challenges of facing a rapidly changing climate have become more apparent with numerous extreme events including wildfires, floods, and heat events impacting transportation, housing and the regional economy.
- Public resistance to complete street design implementation sometimes results in piecemeal improvements that lack regional connectivity benefits.
- Changing consumer patterns and technology are impacting the acquisition, delivery and overall movement of goods into and through the region.
- Work at home and telecommuting rates have continued to increase, while the percentage of those who have opted to take public transportation to work has decreased.

III. Population and Employment Growth Forecasts

1. <u>Updated Regional Growth Forecast Compared to Last SCS</u>

SCAG's integrated growth forecast methodology for the Connect SoCal is largely similar to the process established and followed during the 2012 and 2016 RTP/SCS. The development of forecasts for employment, population, and household growth between 2016 and 2045 includes:

- Convening a panel of regional economic and demographic experts to provide technical and advisory assistance (June 2017).
- Producing a set of draft growth forecasts using dynamically-coupled regional and county-level models.
- Conducting one-on-one meetings with all 197 local jurisdictions to solicit input on the draft growth forecast and other data elements required by the SCS (meetings completed in July 2018).
- Provided additional in-person technical assistance to 80 local jurisdictions to complete their review, input and comments.
- Developing several growth scenarios based on a set of land use development principles and priority development areas and policy objectives (beginning Spring 2019)
  - Conduct additional local, subregional, and stakeholder review as well as soliciting comments and input in order to refine the growth scenarios (May-September 2019).
  - Releasing the draft growth forecast along with the draft RTP/SCS (October 2019) and PEIR (November 2019) for public review and comment.
- Adopting final jurisdictional growth forecasts as part of the RTP/SCS process (April 2020).

2. <u>Explanation of Changes to Regional Growth Forecast Methodology</u>

a. Regional/County Growth Forecast

SCAG's Regional Growth Forecast is the basis for developing the Regional Transportation Plan (RTP), Sustainable Communities Strategy (SCS), Program Environmental Impact Report (PEIR), and the Regional Housing Needs Assessment (RHNA). SCAG's 2016-2045 RTP/SCS growth forecast includes six counties' jurisdictional level population, household, and employment for years 2016, 2020, 2030, 2035, and 2045.

The following major data sources are considered and used in the development of the growth forecast:

- US Bureau of Labor Statistics (BLS) historical and projected labor force and employment by industry
- California Department of Finance (DOF) population and household estimates
- California Employment Development Department (EDD) jobs report by industry (ES202)
- Current (2016) existing land use and General Plans from local jurisdictions
- 2010 Census and 2015, 2016, and 2017 American Community Survey (ACS) data
- 2015 business establishment data from InfoGroup

SCAG's Regional Growth Forecast includes three major indicators: employment, population, and households which are dynamically coupled, meaning that changes in one indicator affect the forecast of the others. SCAG computes regional employment based on the region's share of national employment using a shift-share approach. A cohort-component model is used to project future population in which births, deaths, and gross migration are considered over the projection period. Households are projected

by using separate headship rates by age, sex, and racial/ethnic subgroups and applying them to the residential population.

The county growth forecast is also developed using the shift-share method, cohort-component model, and headship rate method, similar to the regional growth forecast method. The main difference is that the initial county population and employment forecasts are further adjusted using the county level population-employment ratio, with the consideration of labor supply and demand of each county and inter-county commuting patterns. The county growth forecast for Connect SoCal is derived reflecting the new draft regional growth forecast and each county's share from the 2016 RTP/SCS growth forecast.

This regional/county forecast was reviewed by a panel of experts in June 2017 and subsequently presented to SCAG's Community, Economic, and Human Development (CEHD) Committee in July 2017 for their consideration and endorsement.
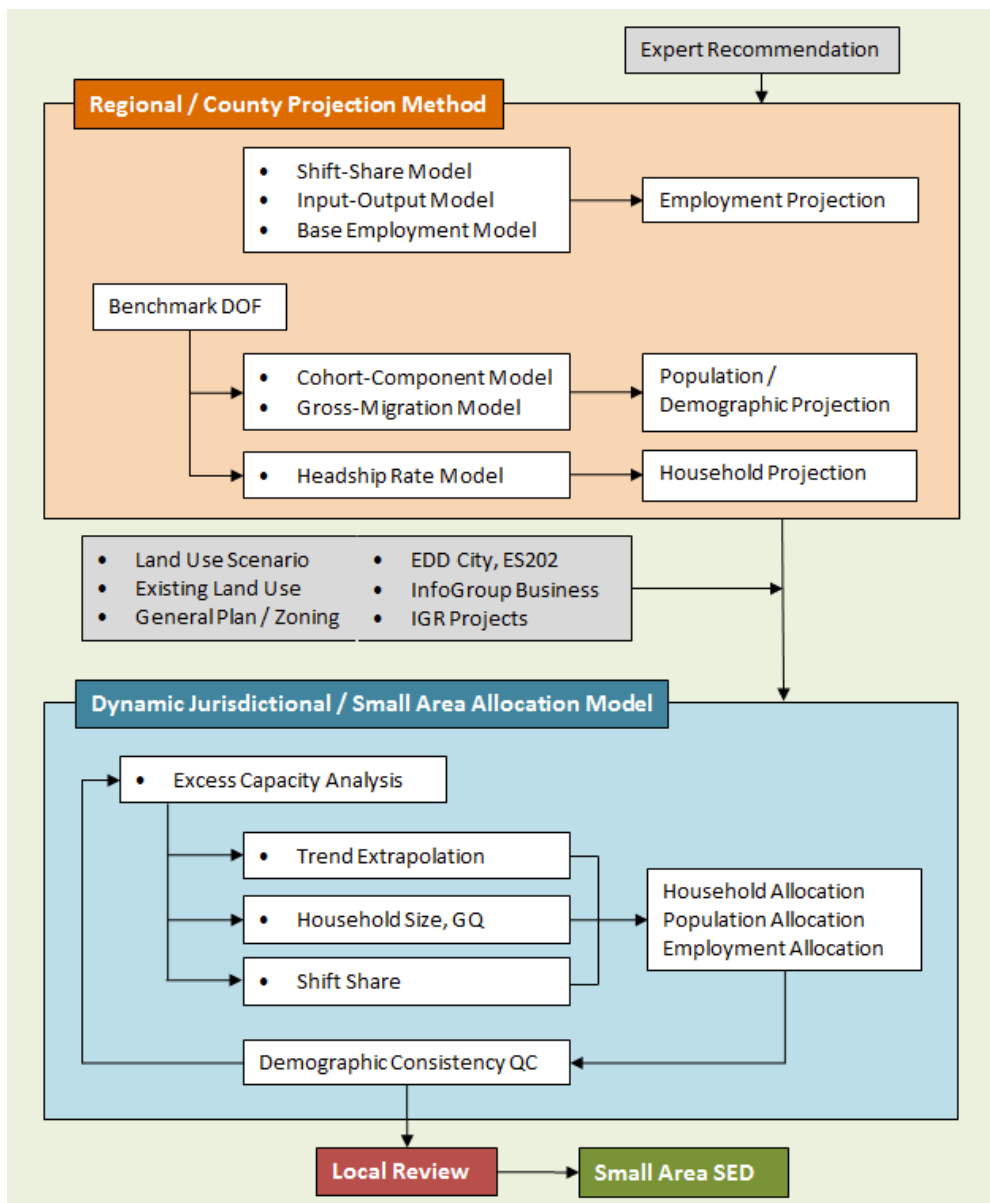
Figure 1: SCAG's Connect SoCal Integrated Growth Forecast Framework

b. *Jurisdictional/Small Area Growth Forecast*

Based on the county growth forecast, SCAG then projects jurisdictional level population, households, and employment using the jurisdictions' most recent existing and general plan land use data as the basis for future year allocations. Household growth rates and household size are estimated based on historical trends and developable capacity. Population projections are calculated based on household growth and household size. Future employment is estimated based on the jurisdiction's employment share of the county's employment by sector.

The goal of the small area growth forecasting methodology is to allocate jurisdictional level population, household, and employment into the smaller Transportation Analysis Zones (TAZs) utilized by SCAG's Transportation Model. Jurisdictional level household and employment forecasts are developed using an independent projection methodology and review process with SCAG's cities and counties. Population projections are tied to household growth. The city's forecast and the projection year are often referred to as the "control total" and the "target year," respectively.

The geographic levels utilized in the growth forecasting process range from the SCAG region as a whole to Tier 2 Transportation Analysis Zones. Each lower level is consistent with higher aggregation levels (i.e., the values of cities when collectively summed for their respective county will equal the county projection). Similarly, the combination of city boundaries and Tier 2 (T2) zones when summed to their respective city total must be consistent with their city's projections.

SCAG's small area growth forecasting process is applied to develop base year and future year socio-economic data at the Tier 2 zone level. Below is a list of the data sources incorporated in the process:

- SCAG's existing land use data
- SCAG's general plan database, processed based on the most recently available jurisdictional general plans
- SCAG's 2016 RTP/SCS growth forecast
- SCAG's draft Connect SoCal jurisdictional-level employment, population, and households
- 2015 Longitudinal Employer-Household Dynamics (LEHD) and Origin-Destination Employment Statistics (LODES) from the US Census Bureau
- 2016 California Employment Development Department (EDD) firm location data
- 2015 Business establishment data from InfoGroup
- SCAG Intergovernmental Review (IGR) data
- Digital Mapping Product (DMP) parcel-level land use data and new construction data (2014)
- 2010 Decennial Census and American Community Survey data (2012-2016 5-year sample)

The above approach distributes jurisdictional level population, household, and employment into city/T2 level zones (15,000+ city/T2 zones), which work with SCAG's current databases and zonal systems. It creates the first cut of the small area forecast. The draft Tier 2 level forecast is then shared with SCAG jurisdictions for further review and comment.

c. *Local Input*

After the initial growth forecast was developed, SCAG staff conducted the Connect SoCal Bottom-Up Local Input and Envisioning Process. Data/Map Books were prepared for each local jurisdiction (http://scagrtpscs.net/Pages/DataMapBooks.aspx) and one-on-one meetings with all 197 local jurisdictions to review and provide input on the jurisdictional growth forecast between October 2017

and July 2018. In addition to growth forecasts, the Data/Map Book also contains extensive GIS data—20 maps covering each jurisdiction's General Plan, zoning, existing land use, farmland, resource areas, jurisdictional boundaries, truck lanes, bike lanes, and high quality transit areas (HQTAs)which were provided for locals' review and input. Moreover, a map of potential infill parcels was also produced for each jurisdictions to identify potential available sites for future housing and other development.

This local input process provided an opportunity for jurisdictions to offer their local knowledge and input to inform SCAG's regional datasets. SCAG evaluated the comments and incorporated the adjustments into the population, household, and employment growth forecasts/distributions. The resulting Draft Connect SoCal growth forecast will serve as the basis for the initial Connect SoCal scenario assessment. Additional refinements may be made through the scenario planning process in the development of the final Connect SoCal growth alternative.

IV. Quantification Approaches

1. Quantification Approaches for Each of Potential SCS Strategies under Consideration

SCAG is considering a wide variety of potential SCS strategies for the Connect SoCal. Table 2 below is a summary list of these potential strategies and the anticipated approaches to quantify their respective GHG emission reductions.

Table 2. Quantification Approach by SCS Strategy

SCS Strategy	Quantification Approach
1) Congestion Pricing*	Travel Demand Model
2) Employer-based Trip Reduction*	Travel Demand Model
3) Express Lane Pricing*	Travel Demand Model
4) Improved Bike Infrastructure*	Travel Demand Model
5) Infill development and increased density near transit infrastructure*	Travel Demand Model
6) Mileage Based User Fee*	Travel Demand Model
7) New transit capital projects*	Travel Demand Model
8) Shorter trips through land use strategies such as jobs/housing balance and complete communities*	Travel Demand Model
9) Telecommute program*	Travel Demand Model
10) Transportation Demand Management Alternatives to single occupancy vehicle travel, including but not limited to: ridesharing, carpooling and vanpooling, parking subsidies for carpoolers and others	Travel Demand Model
11) Safe Routes to School*	Travel Demand Model
12) Bike Share and Micromobility Docked and dock-less bike sharing programs allow temporary and short-term bicycle rentals and increase share of bicycle trips. Policy development to support shared micromobility for short trips and first/last mile connections	Off-Model
13) Carshare*	Off-Model
14) Changing workplace: Automation, Coworking Broad policy support to steer workplace changes towards a lower VMT outcome. Future automation of tasks could enable adaptive re-use potential of building stock and related reduction in commuting in certain industries. Coworking full or part time when used to work remotely can decrease commute distances.	Off-Model

SCS Strategy	Quantification Approach
15) Electric Vehicle Charging Infrastructure Increasing the number of EV charging stations to encourage adoption of EV and extend the range of hybrid PEVs	Off-Model
16) First/Last Mile Improvements Increasing safety, improving infrastructure, and reducing time it takes to access the transit station for pedestrians and cyclists	TBD
17) Improved Pedestrian Infrastructure*	Off-Model
18) Parking management Both navigation and pricing tools to decrease cruising and incentivize mode shift (pricing). This includes real-time identification of open spaces and adaptive pricing.	Off-Model
19) Multimodal dedicated lanes Conversion of traffic lanes to prioritize transit or active transportation modes.	Off-Model

∗   General descriptions of these strategies can be found in the Air Resources Board Policy Briefs at: https://arb.ca.gov/cc/sb375/policies/policies.htm

2.   Assumptions and Methods for Estimating Interregional Travel

In the SCAG model, 40 cordon locations are defined to estimate external trips. The interregional or external trips for base year 2016 Light-and Medium duty vehicle cordon volumes are estimated by first obtained traffic counts from each cordon location. Then previous cordon surveys were used to split total external trip into: 1) Internal-External (I-E) trips, External-Internal (E-I) trips, and External-External (E-E) trips. Finally, the population growth rates were applied to base year volumes to estimate future years cordon volumes. SCAG includes 100 percent of the VMT associated with the internal-Internal (I-I), X-I and I-X trips and exclude all VMT associated with X-X trips when estimating the VMT used in SB 375 GHG emissions reduction target achievement.

3.   CARB's Mobile-source Emission Factor Model for Estimating GHG Emissions

EMFAC2014 was used for estimating GHG emissions from the last 2016 RTP/SCS. SCAG will use the same EMFAC2014 for estimating GHG emissions for Connect SoCal.

To determine regional and air basin GHG emissions, SCAG staff will run EMFAC2014 using the outputs from the regional transportation demand model including the HDT Model. After applying the same ARB's adjustment methodology, the final 2020 and 2035 Connect SoCal GHG emissions per capital will be compared with the 2005 GHG emissions per capital to derive the 2020 and 2035 plan reduction in GHG emission per capita to determine whether Connect SoCal meet the respective 2020 and 2035 regional GHG emission reduction targets for the SCAG region.

V. Travel Demand Modeling

1. <u>Travel Demand Models</u>

A. Improvement of Travel Demand Model – SCAG Activity-Based Model

SCAG is currently working on the transition of regional travel demand model to activity-based model (ABM) from trip-based model (TBM) that SCAG has been using for past decades. SCAG plans to use the newly developed and validated ABM for modeling analysis of SCAG's 2020 Regional Transportation Plan/ Sustainable Communities Strategy (Connect SoCal).

SCAG ABM is composed of three 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 3) 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. TransCAD version 8 is used for assignment modeling and skim calculation. SCAG ABM user interface along with scenario manager is built with the Geographic Information System Developer's Kit (GISDK), which is the script language of TransCAD.

SCAG ABM covers the entire SCAG region which encompasses 6 counties and 11,267 Transportation Analysis Zones (TAZ). The network assignment uses static assignment model developed for SCAG TBM. SCAG ABM contains eight main model components and 39 sub-models that were estimated from the 2011-12 California Household Travel Survey. Below is a description of main SCAG ABM components and model flow chart:

1) Population Synthesis - creates a list of synthetic households and persons for the entire model area for each horizon year. It's primary input to SCAG ABM.
2) Accessibility Calculator - generates zonal accessibility measures that are used for different components of SCAG ABM.
3) Long Term Choice - estimates choices of work arrangements as well as usual location of the mandatory activity for each worker and student.
4) Mobility Choice - estimates individual decision of holding a driver's license and estimates the number of cars owned by each household.
5) Day-level models for activity generation, tour formation, and time allocation
   a. Coordinated daily activity travel pattern: generates daily travel pattern for each household member, including daily travel with mandatory activities, without mandatory activities (non-mandatory activities only), and no travel.
   b. Individual mandatory activities/tours for each household member: predicts frequency and scheduling of mandatory activities and tours, and decisions of escorting children to school.
   c. Fully joint activity generation and scheduling: predicts joint activity frequency, joint travel party, tour formation, stop frequency, and location of each joint tour.
   d. Maintenance activity generation: simulates the number of maintenance activities generated by each household and allocates to household member.

e. Individual discretionary activity generation: predicts the frequency of discretionary activities for each person.

f. Individual tour formation: (1) allocates individual non-mandatory activities by day segments; (2) predicts tour frequency and location of each activity/stop.

6) Tour-level models - estimates travel details related to each tour, including primary destination, stop location, time of day, and tour mode.

7) Trip-level models - estimates travel details of each trip, including trip mode, trip departure time, activity duration, and trip model.

8) Assignment – Static assignment for both traffic and transit assignment

B. Description of SCAG Model Components

1) Population Synthesizer
SCAG Population Synthesizer, pyPopSyn, is a module that generates a list of households (including GQ), and its associated household members within entire model area for each horizon year. The pyPopSyn is formed using the detailed household and person data from the American Community Survey Public Use Microdata Sample (ACS PUMS Year 2012-2016). The household sample weights from the PUMS are adjusted under the theory of the Entropy Maximization formulation to match the various controls externally provided for TAZ, county and the entire region simultaneously. Comparing to other synthetic population models based on iterative proportional fitting (IPF) methods that focus on few selected variables, pyPopSyn draws the samples from PUMS via its adjusted weights that the vast array of PUMS variables can be utilized for modeling their travel behavior.

2) Accessibility Calculator
Accessibility measures are important behavioral components of the ABM that express closeness of the modeled individual to potential locations where the activity "supply" (employment of the corresponding type) is present. Accessibility has a strong impact on individual activity patterns and travel behavior. Multiple sets of accessibility measures are used across different parts of the SCAG ABM. Each set corresponds to a given activity purpose and are sometimes further segmented by travel arrangement type, user class, and/or mode. The accessibilities are computed in a module that precedes the core demand components of the SCAG ABM, and known as the Accessibility Calculator.

3) Long Term Choices
Long-term choices include 4 models: work arrangement, work flexibility, work location, and school location.

Usual work arrangement model: The model simultaneously predicts three job characteristics of each worker – (i) the weekly work hours for the primary job, (ii) the number of jobs, and (iii) the primary workplace location type.

Usual work schedule flexibility model: The model simultaneously predicts three work schedule characteristics of each worker – (i) number of days per week working at primary job, (ii) work flexibility at primary job, and (iii) the availability of compressed week option at primary job.

Usual workplace location choice: The model assigns a workplace TAZ to each worker who does not work from home.

Usual school location model: The model predicts a school TAZ for every student in the population. The model is fully segmented by type of student, as follows: pre-school students, grade school students and college/university students.

4) Mobility Choices
Driver license model: The model predicts whether an individual holds a valid driver's license or not. It applies to all persons 16 years and over.

Auto ownership model: The model predicts the number of households by auto ownership level (0,1,2,3 and 4 or more). It applies to all households in the synthetic population.

5) Day-level Models for Activity Generation, Tour Formation and Time Allocation
Coordinated daily activity travel pattern: generates daily travel pattern for each household member, including daily travel with mandatory activities, without mandatory activities, and no travel.

Mandatory activity generation and tour skeleton formation: This model includes decisions that relate to the least flexible activities -- work, university, school, or any other business-related activity. Many of these activities are pre-planned before a person builds his or her daily activity pattern and schedule around them.

School escorting: The escorting model can be thought of as a matching model that predicts whether escorting occurs, and if so which adult household members are chauffeurs and which children are escorted to school.

Fully joint activity generation and scheduling: Shared intra-household non-mandatory activities are generated and are also considered prioritized activities. These activities are organized into fully-joint tours when all members of the travel party travel together and participate in all activities included in the tour.

Non-mandatory activity generation: The maintenance task generation model is a simultaneous choice of household task frequency by three maintenance activity types (escorting, shopping, and other maintenance). The discretionary activity generation model estimates frequency of individual discretionary activity episodes for each person by five discretionary activity types (eating out/breakfast, eating out/lunch, eating out/dinner, visiting relatives and friends, and other discretionary activity).

Preliminary tour formation: combines the outcomes of all prior sub-models into tours. These prior model outcomes include mandatory tour skeletons, fully joint tours, and non-mandatory activities, as well as the corresponding activity locations.

6) Tour and Trip Level Models
Combinatorial mode choice: Mode choice in most in most ABMs in practice is implemented in two steps. The first step relates to the entire tour mode and it is frequently solely based on the tour primary destination ignoring stop locations. The second step relates to trip mode choice conditional upon tour mode choice. The innovative mode choice structure implemented in the SCAG ABM is based on a different principle, where the tour-level and trip-level mode choices are fully integrated. The tour-level and trip-level mode choices are integrated in a network combinatorial representation. The tour mode is depend on the modes observed in all trips that comprise the tour, and is defined using predetermined priority rules.

Tour time of day: Tour time is a hybrid discrete-choice and duration construct that operates with tour departure-from-home and arrival-back-home time combinations as alternatives. The model utilizes direct availability rules for each subsequently scheduled tour, to be placed in the residual time window left after scheduling tours of higher priority. This conditionality ensures a full consistency for the individual entire-day activity and travel schedule as an outcome of the model.

Individual schedule consolidation with simulated travel times: Individual schedule consolidation process applied to each household and person with a special consideration of joint activities and trips that create intra-household linkages between schedules of different household members.

7) Network Assignment
Network assignment is the process of loading vehicle trips onto the appropriate networks. For highway assignment, SCAG ABM consists series of multi-class simultaneous equilibrium assignments for seven classes vehicles (drive alone, 2-person carpool, 3-person carpool, 4 or more-person carpool, light HDT, medium HDT, and heavy HDT) and by five time periods. During this assignment process, trucks are converted to Passenger Car Equivalent (PCE) for each link and each truck type is based on: 1) percentage of trucks, 2) percentage of grade, 3) length of the link, and 4) level of congestion (v/c ratios). Transit vehicles are also included in the highway assignment. In transit trip assignment, the final transit trips that is formed in the last loop of model choice model are aggregated by access model and time period, and then assigned to transit networks for each time period. The vehicle trip tables obtained from airports and Heavy-Duty Truck models are aggregated to the 4,109 zone system (Tier-1 zones) prior to network assignment

C. SCAG Travel Demand Modeling Flow Chart

The flow chart on the next page illustrates SCAG's travel demand modeling process.

2. Model Inputs used in Activity Based Model

A. Synthetic Population/Household

SCAG ABM uses synthetic population and household as main input to the model. Below describes main variables used in SCAG ABM.

1) For each synthesized household: household size, household income, housing type
2) For each synthesized person:
   a. Basic Variables: age, gender
   b. Worker/Student: worker's status (worker or not a worker), worker's industry, student's grade
   c. Person Type: SCAG ABM processes 8 person types as primary input to the model, including (1) full-time worker, (2) part-time worker, (3) college student, (4) non-working adult, (5) non-working senior, (6) driving age child, (7) pre-driving age child, and (8) pre-school child
3) Group Quarter Population: same as residential population

B. Zonal Variables

A set of zonal variables by SCAG TAZs are created for size term calculation and Accessibility Calculator:

1) Population: total/residential population
2) Households: total households, multiple-unit households
3) Employment: total employment, employment by 13 industries (aggregated 2-digit NAICS)

4) School Enrollment: K-8, 9-12, college

SCAG Travel Demand Modeling Process
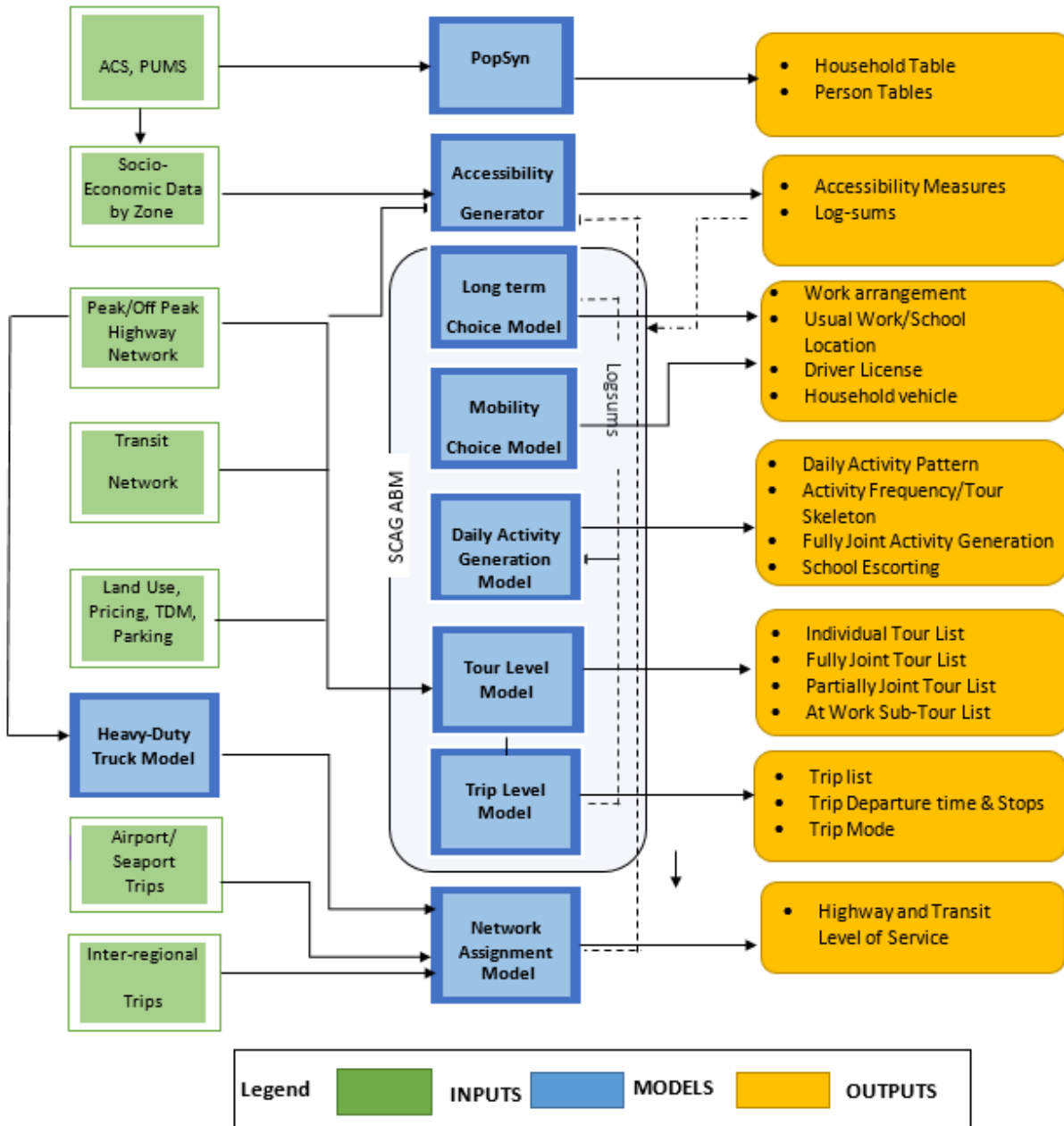
5) Median household income

C. Land Use & Built Environment (LUBE) Variables

A set of land use and built environment variables by TAZs are calculated in SCAG ABM.

1) Land use variables (calculated from zonal SED):

a. Density: by residential population, household, and employment density
   b. Diversity: land use mix indicator (population, commercial/industrial jobs, other jobs), jobs to households ratio
   c. Multiple housing: percentage of multiple household
2) Built Environment (calculated from network):
   a. Transit Access: transit stop density
   b. Street density: by higher-speed density (MPH>=35); lower-speed density (otherwise)
   c. Bike lane density (pre-processed)

D. Network

1) Highway network
2) Transit network

E. Travel Cost:

1) Auto Operating Cost
2) Parking Cost: SCAG developed a set of parking cost data by TAZs based on parkme.com (collected 2011 and 2017). Variables used in SCAG ABM include 1) daily average for commuter (early bird), 2) one hour parking, 3) extra hour parking, and 4) daily maximum.

F. Work from Home (WfH): % of Work-from-Home Workers

SCAG ABM developed a new function to incorporate the assumptions for % of workers who work from home, including telecommuting, home office, or other strategies. Inputs can be either WfH workers as % 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 SCAG ABM. While a WfH worker saves commuting trip to/from work place, SCAG ABM does not exclude additional non-work travel by the worker.

3. <u>Commitments to Provide Model Sensitivity Tests for SCS Strategies under Consideration</u>

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

4. <u>Whether and How Travel Model Accounts for Short- and Long-run Effects of Induced Demand for New Roadway Capacity Projects</u>

According to a "Technical Advisory on Evaluating Transportation Impacts in CEQA" report released in 2018 by California Governor's Office of Planning and Research, Induced travel occurs where roadway capacity is expanded in an area of present or projected future congestion. And the report describes that proper use of a travel demand model can capture the effects of induced travel, including the number of trips, trip length or VMT, and change in mode share for automobiles. SCAG travel demand model does incorporate induced demand, which will be shown in the model sensitivity test results with increasing in roadway capacity.

VI. List of Exogenous Variables and Assumptions for Use in Proposed SCS

1. Assumptions for Exogenous Variables to Travel Demand Modeling

Table 3 below is a list of exogenous variables to SCAG regional travel demand model. Assumptions for year 2035 will be provided when data is available.

Table 3. List of Exogenous Variables for Incremental Progress Analysis

Category of Variables[2]	Variables Specification in Model[3]	Assumption in 2035
Auto Operating Cost	Fuel and non-fuel related costs (maintenance, repair, and tire wear)	
Vehicle fleet efficiency	EMFAC model	
Demographics	Population and employment	
Household income	Median or distribution	
Household demographics	Household size, workers per household, age	
Interregional travel	Share of external interregional VMT	
Travel demand model version	Newly developed Activity-based Model	

2. Assumptions to Derive Cost of Travel

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

A. Fuel Price (FP)

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

1) Gasoline: annual average price data is based on EIA (U.S. Energy Information Administration). Data between 2002 and 2018 for California and U.S. was downloaded from EIA website.
2) Diesel: annual average price data is based on EIA (U.S. Energy Information Administration). Data between 2002 and 2018 for California and U.S. was downloaded from EIA website.
3) Gasoline and Diesel Projection (2019-2030): data based on CEC (California Energy Commission) - using ARB AOC Calculator to retrieve the data.
4) Gasoline and Diesel Projection (2031-2045): using growth pattern based on data from Annual Energy Outlook 2019 (EIA)

Assumptions and Methods:

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[2] As applicable.
[3] Cross-walking the relationship of certain variables back to the modeling conducted for the previous SCS may require MPO staff discretion and interpretation. For example, updated household demographic variables (such as household size) may result in a change to the regional population compared to the previous SCS. CARB staff expects a good-faith effort to construct a reasonable approximation. Exact accounting is not necessary.

1) To be consistent with SCAG model assumption, all price data are converted to 2011 dollar value.
2) Gasoline and Diesel data (2002-2018): based on California data from EIA website
3) Gasoline and Diesel data (2019-2030): based on 2018 data from step 2, apply annual growth based on CEC projection
4) Gasoline and Diesel data (2031-2045): based on 2030 data from step 3, apply annual growth based on US projection. Below charts show that the historical data and projection up to 2030 are quite consistent between CEC and EIA.

Gasoline Prices 2002-2045

Gasoline Price ($2011)
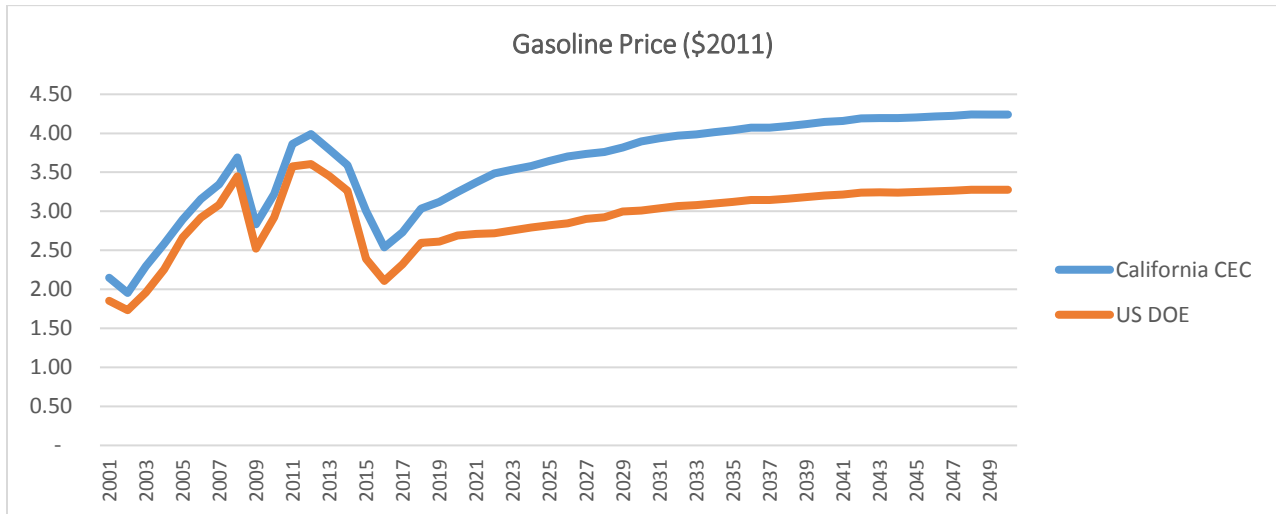
- CEC after 2030: SCAG estimate (based on DOE projection growth rate)

Diesel Prices 2002-2045

Diesel Price ($2011)
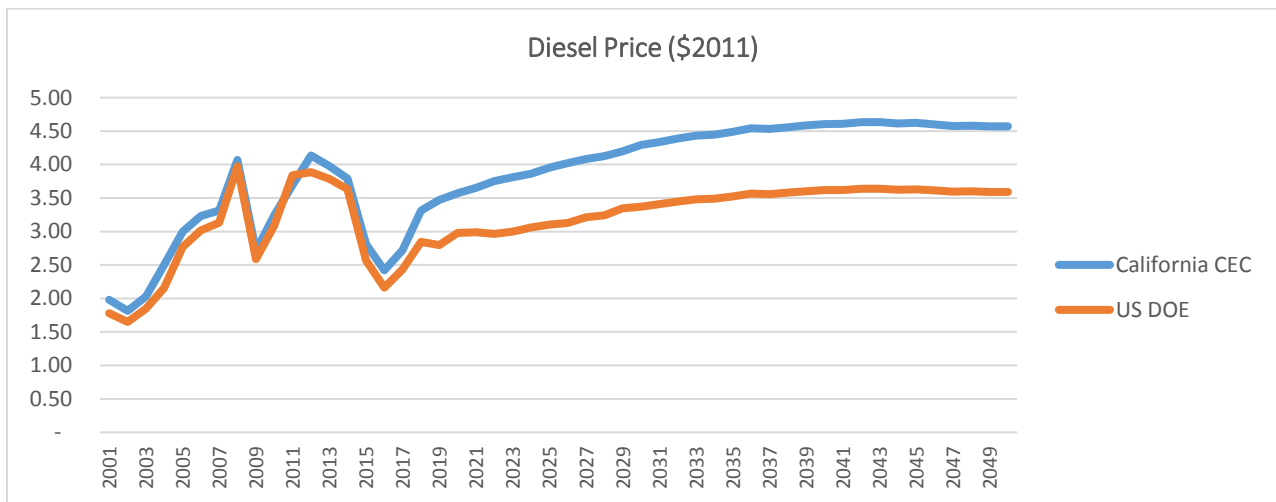
- CEC after 2030: SCAG estimate (based on DOE projection growth rate)
5) Electric and Hydrogen: using data from AOC Calculator for SCAG
6) Calculate average fuel price: for each year, calculating average price of the four types of fuel (gasoline, diesel, electric, and hydrogen) weighted by VMT of each type of fuel (data from AOC Calculator for SCAG region).

B. 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 the methodology in 2006 and 2017.

Assumptions and Methods:

1) All price data was converted to 2011 dollar value.
2) For year 2017 data, since the method was changed, SCAG assumed the price is the same as 2016.
3) For 2018 data, the growth rate from original data was applied to adjusted 2017 data.
4) SCAG applied linear regression based on data of past 10 years (2009-2018).

C. Effective Fleet-wide Fuel Efficiency (FE)

To be consistent with the use of EMFAC 2014 model for emission analysis, fuel efficiency derived from EMFAC 2014 was used.

D. Total Auto Operating Cost (AOC)

AOC = (FP/FE) + NF Cost

VII. Per Capita GHG Emissions from Prior 2016 RTP/SCS

SCAG has upgraded travel demand model from trip based model (used for the first two SCSs) to a newly developed activity based model. SCAG staff will work closely with CARB staff to conduct analysis for reporting on Incremental Progress.

VIII. Off-Model Strategies

Of the nineteen potential SCS strategies presented in Table 2 in *Section IV. Quantification Approaches*, the following eight[4] will rely on off-model analysis to quantify their GHG emissions reduction benefits:

1) Bike Share and Micromobility
2) Car Share
3) Changing workplace: Automation, Coworking
4) Electric Vehicle Charging Infrastructure
5) First/Last Mile Improvements
6) Improved Pedestrian Infrastructure
7) Parking management
8) Multimodal dedicated lanes

Following ARB's Final Draft SCS Evaluation Guidelines, each of the off-model analysis will be consisted of the five elements below:

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

1. Bike Share and Micromobility

1) Strategy Description

Bike Share & Micromobility is a mode of mobility that comprises a fleet of bicycles, electric bicycles (ebikes) or electric scooters (escooters) that are available for short term rental. There are three types of bike share services that are comprised of docked bicycles, dockless bicycles, or a hybrid. Docked bicycles are checked out from docking stations and must be returned to another docking station. Dockless bikes on the other hand feature locking mechanisms which lock the rear wheel. When a user checks out a bike using a smart phone app the wheel is released. The bike can be left anywhere within the service area. A hybrid system features docking stations however the locking mechanism is self-contained. In this case users are encouraged to return bicycles to the stations but they may be left locked to street furniture anywhere within the service area for a premium charge. eScooters are all operated as dockless systems. At night volunteers can take the escooters in and charge them and receive payment. Currently in the SCAG region Los Angeles County METRO operates docked bicycles in downtown Los Angeles, Venice, and San Pedro. Jump Bikes (formerly Social Bikes), which features a hybrid system, has operating agreements with the cities of Santa Monica, Beverly Hills, and West Hollywood. Finally there are numerous new entrants into the dockless bike share space including: Jump, Lime Bike, and Spin. There are also numerous new entrants into the escooter share space including: Lime, Jump, Spin, Bird, Razor, Skip, and others.

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[4] The quantification methodology for the First/Last Mile Improvements strategy is to be determined (TBD) but is included here in case off-model quantification methodology would be used

This strategy aims to reduce GHG emissions by providing access to bicycles and scooters, and replacing auto trips. Some bike share programs also include electric pedal-assist bikes to make it easier for members to go farther distances. eScooter sharing programs can follow the framework of quantification methodology in this section to estimate the potential GHG benefit.

2) Objectives

The objective of bike share systems are to provide flexible mobility for short to medium distances (1-5 miles). They reduce GHG by the following:

- Replacing short distance auto trips
- Reducing household vehicle ownership with subsequent reductions in VMT
- Supporting transit by providing a first/last mile connection option

3) Trip and Emissions Data Needs

Data needs include:

- Service Areas for bike share and escooter systems
- Ridership data from public partners
- Average bike share/scooter share one-way travel distance.

4) Quantification Methodology

SCAG has two options for quantifying GHG reductions from Bike share. The first option is to use an off-model excel-based calculator developed by SANDAG as part of a project under the four MPO Future Mobility Research Program.   The first option is to use the methodology laid out in the ARB Final Draft SCS Evaluation Guidelines Appendices (pages 62-64). Both work on the same premise of identifying different geographies where docked and dockless bikes will be operating, identifying a number of docking stations and bikes within those geographic areas, and assigning a participation rate within those respective areas. Based on the participation rate, staff will derive a VMT replacement figure and a subsequent GHG emissions reduction.

ARB Methodology:

Step 1: Identify service areas for each city with planned bike share program and determine the number of planned bike share stations and population for each service area.

Step 2: Calculate the number of bike share stations per square kilometer (km) for each service area by dividing the number of planned bike share stations by the land area of each service area.

$$Bike\ share\ stations_{skm} = \sum \frac{Bike\ share\ stations}{Service\ areas_{km}}$$

Bike share stations$_{skm}$ = Bike share stations per square km per service area
Bike share stations = Number of planned bike share stations per service area
Service area$_{skm}$ = Area of each service area (square km)

Step 3: Apply a regression formula derived from Institute for Transportation and Development Policy (ITDP) to estimate the number of daily bike share trips per 1,000 residents in each area:

Daily bike share trips per 1,000 residents = 1.74 * station density + 17.2

Step 4: Estimate the number of daily bike share trips in each service area by multiplying the number of residents in each service area by the number of daily bike share trips calculated in Step 3.

*Bike share trips$_{SA}$ = $\sum$ ResidentsSA * Daily bike share trips*
Bike share trips$_{SA}$ = Number of daily bike share trips per service area
Residents$_{SA}$ = Number residents in each service area
Daily bike share trips = Number of daily bike share trips per 1,000 residents

Step 5: Multiply total daily bike share trips by the average population growth for the scenario year to estimate future total daily bike share trips.

Step 6: Estimate average regional H-W trip lengths.

a) Preferred Approach: Use region-specific trip lengths from travel demand model, regional and/or local bicycling and pedestrian master plan, region-specific study, or other empirical data sources.
b) Alternate Approach: Use average distance of 1.8 miles for biking and 0.98 mile for walking based on National Household Transportation Survey data.

Step 7: Estimate mode shift VMT reductions from private automobiles to bike share by multiplying the daily bike share trips calculated in Step 4 by the average regional H-W trip lengths from Step 6.

*VMT = Bike share trips$_{SA}$ * TL*
Bike share trips$_{SA}$ = Number of daily bike share trips per service area
TL = Average regional H-W Trip Length (miles per trip)

Step 8: Obtain displaced private automobile trip CO2 emission rates from the current version of EMFAC.

Step 9: Calculate total CO2 emission reductions by multiplying VMT reductions calculated in Step 7 by EMFAC exhaust emission rates from Step 8.

*CO2=VMT * EMFAC * 12.4%*

VMT = Calculated displaced VMT (miles)
12.4% of Bike Rides displace VMT for commutes or errands
EMFAC = EMFAC CO2 emission rate (grams per mile)

5) Challenges, Constraints, and Strategy Implementation Tracking

A bike-friendly ecosystem is important to effectively implement this strategy. The ecosystem will require sufficient bike-related Infrastructures, such as bike lane, bike rack, and etc. However, these infrastructures are usually beyond the scope of bike-sharing program. Therefore, the effectiveness of bike sharing programs could be constrained by the readiness and availability of bike-related Infrastructures. Other challenges come from transportation network companies (TNCs) such as Lyft and Uber. Additionally bike share is constrained by the terrain. In order to track this strategy SCAG will continue to monitor growth of the bike share service territories.

Bike commuters frequently use additional transportation modes for their trip, which can significantly increasing the total time required to travel. In addition, many bike share programs only provide service in a limited area (e.g., cities) either near home location or work place. As a result, potential bike commuters will need to plan longer travel time and pay premium for using bikes from multiple companies which may increase total commute cost.

In addition, bike sharing program users may worry about the protection of their privacy. Many shared bikes are installed with route tracking devices (e.g., GPS) to help company tracking the bike flow.

However, it can be a big challenge to properly store and use these activity data. Currently, there is no specific regulations in this area and improper usage of activity data which harms people's privacy is very likely to adversely affect their willingness to participate in bike sharing programs.

Another potential challenge of bike sharing programs is the rider safety. Most bike sharing programs do not provide complimentary protective gear (e.g., helmet, knee pads, etc), and only takes only minimum responsibility if users get injured. These issues need to be addressed in the long run to successfully implement bike sharing programs.

Monitoring/Tracking

- Specific bike share, e-scooter sharing or other related projects
- Number of bikes in bike sharing program
- Number of miles logged through bike sharing programs

2. <u>Car Sharing</u>

1) Strategy Description

Carshare service is available in three varieties in the SCAG region, traditional roundtrip, one way, and peer to peer carshare. Traditional roundtrip service provides vehicles at designated parking spaces, called pods or stations depending on the provider. Cars must be returned to their pods at the end of the trip. One way vehicles can be picked up then dropped off at another station within the specified service territory. Peer to peer carshare is similar to roundtrip service except the vehicles are owned/leased by private individuals and the transaction is managed by a third-party operator, usually via a smart phone app. Potential GHG-reducing benefits associated with car sharing include reduced vehicle ownership rates, single occupancy vehicle trips, and VMT, as trips shift to walking, bicycle, and public transit due to reduced driving associated with reduced ownership rates. In addition, vehicles used for car sharing are often newer and less polluting than older privately-owned vehicles whose trips are replaced by car sharing.

Currently there are five carshare providers called in the SoCal region. Zipcar provides roundtrip service, and primarily serves university and college campuses in the region except with the central Los Angeles area where they have numerous locations. There is also a one-way provider called Blue LA that specifically serves low-income disadvantaged communities. Finally there are three peer to peer carshare providers: Getaround, Turo, and Maven.

2) Objectives

Carsharing systems reduce GHG emissions in a number of different ways:

- Reducing congestion by lowering the number of vehicles
- Lowering the overall VMT, ultimately cVMT (combustion VMT)
- Changes in fleet mix, such as reducing vehicle ownership and more zero emission vehicles (ZEV)
- Replacing private vehicles with car share vehicles
- Diverse impacts on other modes

3) Trip and Emissions Data Needs

Data needs include:

- Service Areas for round-trip and one-way car share systems
- Ridership data from publicly subsidized partners
- Service areas for peer-to-peer car share systems
- Ridership data where possible.

Average vehicle trip length

- VMT reduced.

4) Quantification Methodology

SCAG has two options for quantifying GHG reductions from car share. The first option is to use an off-model excel-based calculator developed by SANDAG as part of a project under the 4 MPO Future Mobility Research Program.   The second option is to use the methodology laid out in the ARB Final Draft SCS Evaluation Guidelines Appendices (pages 69-74). Both work on the same premise of identifying different geographies where carshare vehicles will be operating, identifying a number of carshare vehicles within those geographic areas, and assigning a participation rate within those respective areas. Based on the participation rate, staff will derive a GHG emissions reduction based on changes in travel behavior related to changes in vehicle ownership supported research.

ARB Methodology

Step 1: Identify regions/County/City/TAZs that have sufficient residential densities to support car sharing. Research indicates the minimum residential density required for a neighborhood to support car sharing is five (5) residential units per acre.

   a) Preferred Approach: Use data from regional and/or local TNC operators, region-specific study, or other local empirical data sources for local residential density support rate.

   b) Alternate Approach: Use conservative local residential density support rate five (5) residential units per acre.

Step 2: Estimate Total Population of regions/County/City/TAZs identified in Step 1 as having sufficient residential densities to support car sharing.

Step 3: Identify regional car share adoption rate. Research from the Transportation Research Board's Transit Cooperative Research Program indicates that car share members are most likely to be between the ages of 25 to 4598, while 10% of individuals aged 21+ in metropolitan areas of North America would become members if it were more convenient.

   a) Preferred Approach: Use data from regional and/or local TNC operators, region-specific study, or other local empirical data sources for regional adoption rate.

   b) Alternate Approach: Use conservative adoption rate of 10% of individuals aged 21 to 45. This number was derived from two car-sharing studies in major metropolitan/urban areas described above.

Step 4: Estimate car share membership population of region/ County/City/TAZs identified as having sufficient residential densities to support car sharing (Step 2) using the car sharing adoption rate (Step 3).

   *Membership Population$_{CS}$ = (Total Population$_{CS}$ * Adoption Rate$_{CS}$)*

Membership Population$_{CS}$ = Number of car sharing members in region/County/City/TAZs
Total Population$_{CS}$ = Total population of region/County/City/TAZs identified as having sufficient residential densities to support car sharing
Adoption Rate$_{CS}$ = Car sharing adoption rate for region/TAZ

Step 5: Estimate VMT reductions from vehicles discarded or shed by car sharing members. Research by the University of California at Berkeley (TSRC) indicates that car sharing leads to a net VMT reduction, which are associated with car sharing members sell their existing vehicles and reducing purchases of new vehicles. Research from the San José State University's Norman Y. Mineta International Institute for Surface Transportation Policy Studies (MTI) indicates that vehicles discarded or shed by car sharing members would otherwise have been driven 8,200 miles per year101. While VMT may slightly increase for specific car share members that did not previously own a car, the overall VMT tends to drop substantially for the car sharing membership fleet.

   a) Preferred Approach: Use data from regional and/or local TNC operators, region-specific study, or other local empirical data sources to estimate the number of trips or miles per year that are associated with shed vehicles per car sharing member.

   b) Alternate Approach: Use conservative estimate that shed VMT is 8,200 miles per year.

   *Total VMT$_{Shed}$ = (Membership Population$_{CS}$ * - VMT$_{Memb\ Shed}$)*

   Total VMT$_{Shed}$ = Total VMT from shed vehicles in region/TAZs (miles/year)
   Membership Population$_{CS}$ = Number of car sharing members in region/TAZs
   VMT$_{Memb\ Shed}$ = VMT shed per car share member per year (miles/member/year)

Step 6: Obtain CO2 emission rates for shed private automobiles from the current version of EMFAC.

Step 7: Estimate CO2 emission reductions from private automobiles shed by car sharing members.

   *- CO2 $_{Shed}$ = - Total VMT$_{Shed}$ * EMFAC$_{Shed}$*

   CO2 $_{Shed}$ = CO2 emission reductions from shed vehicles in region/County/City/TAZs (grams/year)
   Total VMT$_{Shed}$ = Total VMT from shed vehicles in region/County/City/TAZs (miles/year)
   EMFAC$_{Shed}$ = Average EMFAC CO2 emission rate for shed vehicles in region/County/City/TAZs (grams per mile)

Step 8: Estimate VMT from car share members driving car share vehicles CARB analysis of research conducted by MTI indicates that car share members drive on average 1,200 miles per year in a car share vehicle.

   a) Preferred Approach: Use data from regional and/or local TNC operators, region-specific study, or other local empirical data sources to estimate the average number of trips or miles per year driven per car sharing member.

   b) Alternate Approach: Use conservative estimate that each car share member drives 1,200 miles per year in a car share vehicle.

   *Total VMT$_{CS}$ = (Membership Population$_{CS}$ * VMTMemb $_{CS}$)*

Total VMT$_{CS}$ = Total VMT from car share members driving car share vehicles in region/TAZs (miles/member/year)
Membership Population$_{CS}$ = Number of car sharing members in region/TAZs
VMTMemb $_{CS}$ = Car share VMT per member per year in region/TAZs (miles/member/year)

Car share vehicles are expected to be more fuel efficient than the average fleet. Vehicles used for car sharing are often newer and less polluting than older privately-owned vehicles whose trips are replaced by car sharing. California's car sharing services offer a variety of vehicles to members however, compared to the average light duty fleet, the vast majority of the car sharing fleet are low and zero emission vehicles (ZEV) such as hybrids, PHEVs or a Battery Electric Vehicles (BEV). Until the average light duty fleet in CA will reach the same ratio of conventional/combustion vs. low/zero emission vehicles (cVMT vs eVMT), the car sharing fleet is on average more fuel-efficient. This difference in fuel usage represents, when converted, a direct GHG emission reduction. CARB analysis of research conducted by MTI indicates that car sharing vehicle fleets are typically 29% more efficient than the overall population of vehicles shed by car sharing members.

a) Preferred Approach: Use average local car sharing mix fleet based on data from regional and/or local TNC operators, region-specific study, or other local empirical data sources to identify average fleet-specific mix and age distribution to estimate car share fleet emission rates from the current version of EMFAC.

b) Alternate Approach: Obtain CO2 emission rates for shed private automobiles from the current version of EMFAC and reduce by 29%.

Step 9: Estimate CO2 emissions from car sharing vehicle operation.

*CO2 $_{CS}$ = Total VMT$_{CS}$ * EMFAC$_{CS}$*

CO2 $_{CS}$ = CO2 emissions from car share vehicles in region/TAZs (grams)
Total VMT$_{CS}$ = VMT from car share vehicles in region/TAZs (miles)
EMFAC$_{CS}$ = EMFAC CO2 emission rate for car share vehicles in region/TAZs (grams per mile)

Step 10: Estimate total CO2 emissions associated with car sharing in the region/TAZs.

Total CO2 $_{CS}$ = CO2 $_{Shed}$ + CO2 $_{CS}$

Total CO2 $_{CS}$ = Total CO2 emissions from car share strategy (grams/year)
CO2 $_{Shed}$ = CO2 emission reductions from shed vehicles in region/County/City/TAZs (grams/year)
CO2 $_{CS}$ = CO2 emissions from car share vehicles in region/County/City/TAZs (grams/year)

5) Challenges, Constraints, and Strategy Implementation Tracking

One of the main challenges with carshare is the limited utility of round-trip services, and the limited penetration of one-way services. While the growth of peer to peer carshare is encouraging, as they are private companies, data sharing has been limited. In the SCAG region Blue LA is a promising service with a long-term vision for expansion in the region.

Other challenges include the following:

- Is there sufficient local empirical data sets available to identify:
  o Residential densities that support car sharing
  o Car share adoption rate

- o VMT reductions from shed vehicles
- o VMT associated with car share vehicles driven by car share members
- o Shed vehicles and car share fleet characteristics
- Do the types of car sharing programs (i.e., traditional roundtrip, one-way, peer-to-peer, and fractional) have different adoption rates?

6) Monitoring and Tracking
- Regions/TAZs that support car sharing
- Car share member population before and after strategy implementation
- VMT reductions from shed vehicles or trips
- VMT associated with car share vehicles driven by car share members

3. <u>Changing Workplace: Automation, Co-working</u>

1) Strategy Description

In general, this strategy aims to increase telecommuting, working from home, and other alternatives to single-occupant vehicle (SOV) employee commuting to a fixed work site. The specific focus is on co-working spaces, which are an increasingly prevalent feature of the region's employment landscape over the last several years. While the travel behavior of co-workers likely varies, it is reasonable to believe that the ability to use a co-working site in lieu of a farther away work space is a primary driver of their increasing popularity, which would result in lower VMT. While

2) Objectives

Objectives of the Connect SoCal are to increase the options available to workers across the region, allowing them to choose alternatives to fixed places of work which are major drivers of VMT. Telecommuting and flexible working hours are key factors in achieving this. However, not all work is suitable for a home location, and co-working spaces or teleworking centers can offer conveniently-located, affordable spaces for work to take place outside the home but without the need to commute a longer distance to a fixed work location. While there has been a consistent increase in telecommuting and working from home, co-working spaces (in particular WeWork sites and Regus shared offices) are fairly new and have not yet been considered as part of a VMT reduction strategy. SCAG hopes to increase investments and policies in this area through the 2020 Connect SoCal RTP/SCS.

3) Trip and Emissions Data Needs

The primary data challenge is understanding the travel behavior of the users of co-working sites to ensure that they are indeed traveling less than they would to a fixed worksite. A SCAG-led consultant project is currently underway and as of this writing has surveyed roughly 150 co-working site users across the region, collecting data on their home locations, their industry/occupation, their commute mode, and where they would go if they didn't have a co-working site available. In addition, data is being collected about the extent and spatial distribution of co-working sites in the region in order to forecast their likely number and penetration during the RTP/SCS forecast horizon. Finally, the surveying effort has resulted in a robust network of contacts of co-working space site managers which will allow SCAG and its partners to help promote the advancement of trip-reducing uses of co-working throughout the region.

4) Quantification Methodology

Once survey results are complete by mid-2019, data can be used to estimate the current trip reduction potential based on the location of the region's co-working sites today and in the future. In addition, longitudinal telework and work-at-home data from the National Household Travel Survey (NHTS) and American Communities Survey (ACS) provide trend projections of these activities, which are similar to co-working spaces. It will then be possible to apply a past telecommute/work-at-home growth rate to our co-working site data to project future co-working travel behavior.

5) Challenges, Constraints, and Strategy Implementation Tracking

Implementation tracking may be a challenge; however, SCAG's experience with collecting survey data has resulted in a robust list of contacts at co-working sites. A follow-up plan and additional surveying may need to be developed. A challenge is that, until survey results are available in mid-2019, it will not be possible to quantify the trip reduction potential of co-working sites.

4. <u>Electric Vehicle Charging Infrastructure</u>

1) Strategy Description

The goal of the electric vehicle (EV) Charging Infrastructure strategy is to increase the number of workplace EV chargers in the region to facilitate workplace plug-in hybrid vehicles (PHEVs) charging by employees where the infrastructure is installed at workplaces. Currently, the average all-electric range (AER) of the PHEV fleet in California is approximately 33 miles per day per vehicle (mi/d/veh), while the average in situ PHEV electric-drive range for this fleet is usage is only 20 e-miles/d/veh110. This difference between AER and average PHEV electric-drive range suggests that PHEV drivers operate their PHEVs in gasoline operating mode rather than electric operating mode for part of their work commutes.

As PHEVs can operate in gasoline and electric operating modes, the strategy would serve to maximize PHEV operation in electric operating mode and minimize their operation in gasoline mode, thereby reducing tailpipe CO_2 emissions. Providing EV chargers at employee workplaces would help to extend the electric operation range of PHEVs used by employees who use EVs for commuting. Specifically, the strategy assumes PHEV batteries are fully charged prior to an employee beginning a commute trip to their workplace from home, as most PHEVs charge at home, where the owner can qualify for low-cost night time charging which makes the electricity cheaper than gasoline. To facilitate PHEVs operating in electric mode on the employee's return commute trip to their home from workplace, the PHEV batteries are "topped off" during work hours through the EV charging infrastructure installed under this strategy. In addition, as the strategy would be limited to employees where EV vehicle charging infrastructure is installed due to the strategy and would not be available to the general public, it is anticipated the strategy would not affect PHEVs driven by the general public and would not lead to induced VMT nor trips.

As part of this strategy, the following financial incentives would be provided:

a. A one-time financial subsidy offered to employers for the purchase and installation of workplace EV charging infrastructure.
b. When gasoline is cheaper than electricity on a per-mile basis, on-going incentives offered to employers to subsidize PHEV-driving employees to charge their cars with EV vehicle infrastructure to help disincentivize the operation of PHEVs in gasoline operating mode.

In addition, to facilitate use of workplace EV chargers by employees, providing subsidized power to employees through the employer (subsidized power would help to make electric charging cheaper than gasoline to disincentivize gasoline operation) would facilitate implementation of this off-model strategy would allow PHEV drivers to charge at home and recharge at work to increase electrical usage.

2) Objectives

Electric Vehicle Charging Infrastructure strategies can reduce GHG emissions as follows:

- The number of new workplace EV charging stations
- The number of PHEVs participating in the program

3) Trip and Emissions Data Needs

- Number of vehicles that can be charged per EV charging station
- Number of PHEVs in the region (this data is available from the DMV)
- Number of EV charging facilities implemented as part of the program
- Electric range of PHEVs in the region (this data might be available from the DMV or from the National Renewable Energy Laboratory)
- Driving length frequency distribution of drivers (i.e., how far does the average PHEV drive each day above its all-electric range)?

4) Quantification Methodology

The overall approach is to determine the increase PHEV mileage shifted from gasoline to electricity (e-miles) due to PHEV workplace charging at EV charging connectors installed by the strategy.

The estimate of GHG emission reductions from increased PHEV e-miles due to the strategy can be based upon two different initial approaches of the strategy:

a) Set up of the strategy based on the number of EV charging connectors installed:
Estimate the number of population of PHEVs in region >> Estimate the number of PHEVs per charging connector >> Estimate the number of PHEVs in the region that could use workplace EV Charging Connectors >> Estimate average VMT shift per PHEV from gas to electricity (e-miles) >> Estimate total regional VMT shift from gas to electricity (e-miles) >> Estimate CO2 emission reductions from PHEV e-miles.

b) Set up of the strategy based on the number of PHEVs in the region that could use installed EV charging connectors:
Estimate population of PHEVs in region >> Estimate number of PHEVs per charging connector >> Estimate number of EV Charging Connectors to install >> Estimate VMT shift from gas to electricity (e-miles) >> Estimate CO2 emission reductions from PHEV e-miles.

These approaches are described in more detail in ARB's Final Draft SCS Program and Evaluation Guidelines Appendices (pages 78-83).

SCAG's implementation of the strategy will create more charging stations across the region than would be created by state efforts alone. A greater number of charging stations in the region will enable PHEV drivers to charge more frequently and operate their vehicles in electric mode for a higher proportion of travel.

SCAG intends to use the quantification methodology outlined in ARB's Final Draft SCS Program and Evaluation Guidelines Appendices.

5) Challenges, Constraints, and Strategy Implementation Tracking

- This strategy can be tracked by analyzing longitudinal data of registered PHEVs and installed EV stations in the region.
- The effectiveness of this strategy may fluctuate depending on adoption of EVs, availability of funding sources for incentives, and electric range of PHEVs.
- Local data on charging and electric use of PHEVs may be limited.

    Other:
- The goal of the strategy is to increase PHEV e-miles per day; not to increase purchases of PHEV nor BEVs. That is covered by other strategies.
- PHEV electric range would not increase as a result of the strategy. Rather, the strategy will allow workplace charging to facilitate the operation of the PHEV in electric mode and limit operation in gasoline mode.
- The choice of electricity over gasoline in a PHEV depends upon the relative price (cost/mile). It is critical to the success of this strategy to have a low competitive price for electricity, whether from the power company rate structure or from direct employer subsidy

5. First/Last Mile Improvements

1) Strategy Description

This strategy uses a Complete Streets approach to maximize the number of people walking or biking to transit by improving active transportation conditions within a radius of up to three miles from a transit station or stop. Improving conditions includes increasing safety, improving infrastructure, and reducing the time it takes to access the transit station.

Infrastructure investments may include dedicated bike routes, sidewalk enhancements, mid-block crossings (short-cuts), reduced waiting periods at traffic signals, bicycle parking, signage and wayfinding, bike share, micro mobility, landscaping, streetscape furniture, and others.

The strategy of developing first/last mile solutions will increase transit ridership and increase the number of people using active transportation to reach a transit stop. This strategy works by attracting transit riders by decreasing the "cost" or total trip time of a transit trip (creating the conditions that allow people to travel a longer distance in the same amount of time) as well as improving safety.

2) Objectives

- Reduce vehicle miles traveled (VMT)
- Increase transit ridership
- Reduction air pollution
- Increase physical activity and improve health outcomes (Not sure if this is of interest here)

3) Trip and Emissions Data Needs

TBD

4) Quantification Methodology

TBD

5) Challenges, Constraints, and Strategy Implementation Tracking

Potential challenges and constraints include:

- Collecting consistent data from a variety of jurisdictions and transit service providers
- Making accurate estimates of sidewalk coverage due to lack of complete data sets
- Decreases in transit ridership from other factors including TNCs and increased auto ownership
- Funding availability

Implementation success will be tracked by evaluating the following metrics:

- Increases in transit ridership
- Reduction in VMT
- Miles of new bicycle or pedestrian infrastructure improvements (e.g., protected bicycle lanes, new sidewalk, etc.)
- Installation of transit station amenities to encourage bicycling and walking (e.g., bike parking)
- Reduction in rate of collisions involving people walking and biking near transit stations

6. <u>Improved Pedestrian Infrastructure</u>

1) Strategy Description

Installation of sidewalks, paths, ADA requirements, and other pedestrian facilities to support safe conditions for walking trips and to encourage additional trips to be taken by walking. This strategy is closely aligned with the First/Last Mile Strategy and the Safe Routes to School Strategy, but focuses primarily on the development of wholesale pedestrian networks across land use scenarios.

Investments will include the installation of new sidewalks, repair of existing sidewalks, improvement of intersection designs, installation of ADA compliant infrastructure, and traffic calming projects that reduce vehicle speeds. Investments will include state and federal grants, complete streets investment strategies, and county and local funding sources.

Providing complete sidewalk networks allows safe travel for walking trips and encourages walking for a variety of short trip purposes. Investments will improve safety outcomes for pedestrians and reduce VMT by shifting short trips to walking modes.

2) Objectives

- Reduction in VMT
- Increase in walking mode share
- Reduction in rate of collisions involving pedestrians
- Reduction in air pollution
- Increase in physical activity and health outcomes (Not sure if this if of interest here)

3) Trip and Emissions Data Needs

Much of the built environment currently includes sidewalks, however, there are often gaps in the network, sidewalks in need of repair due to tree roots and other impacts, and in some cases sidewalks

were installed that do not meet current ADA requirements. Several jurisdictions have completed sidewalk inventories which can be used to develop estimates across place types for identifying regional investment strategies and expected changes in mode choice.

4) Quantification Methodology

Estimates for sidewalk coverage will be developed for place types as was done in the 2016 RTP/SCS but with improved accuracy based off the existing sidewalk inventories of several of our counties. Investment and completion levels will be based on the percent completed for different land use strategies (NMA's, TPAs, HQTAs, etc.) which will be modeled using an off model strategy.

Changes in transit infrastructure, land use, and pedestrian infrastructure will all impact mode shift and safety outcomes. Other strategies that impact those factors should be considered during modeling.

5) Challenges, Constraints, and Strategy Implementation Tracking

- Collecting consistent data from a variety of jurisdictions
- Funding availability
- Making accurate estimates of sidewalk coverage due to lack of complete data sets
- Decreases in transit ridership from other factors including TNCs and increased auto ownership

Metrics of success may include:

- Reduction in VMT
- Reduction in rate of collisions involving pedestrians
- Miles of new and/or repaired sidewalk or other pedestrian facilities (e.g., mid-block crossings, ADA compliant infrastructure, signage/wayfinding)
- Traffic calming project implementation

7. Parking Management

1) Strategy Description

Parking management techniques include real-time identification of open parking spaces, active wayfinding, adaptive pricing and consumer facing apps for information and payment of parking. These pertain to on-street as well as public off-street parking. Private parking is not precluded, but likely is not incentivized to participate. In the SCAG region the City of Los Angeles Department of Transportation (LADOT) has deployed smart parking systems throughout downtown, Hollywood, and have plans for deployment in Westwood Village near UCLA.

Parking management strategies aim to reduce GHG emissions by reducing vehicle trips and promoting alternative modes of transportation through methods such as pricing mechanisms, allowable hours of parking, or parking permits. These strategies can potentially improve and increase turnover rates for parking availability in impacted areas, and reduce parking search time and the associated VMT and GHG emissions. The existing parking management strategies that SCAG will quantify include the following:

- Long/short-term fee differentials
- On-street fees and resident parking permits
- Reduced reliance on minimum parking standards
- Adaptive parking pricing

In the SCAG region the parking management strategy that will be analyzed will be discouraging vehicle trips through installing parking meters and assigning limited hours for parking areas that are currently offered for free.

2) Objectives

The intended goal is increased customer satisfaction, better utilization, and increased parking revenues and citations. The GHG reduction goal is a decrease in VMT by reducing cruising for empty spaces due to the improved wayfinding. Additionally where parking has not been priced before some mode switching to transit, biking and walking may occur as driving is disincentivized.

Parking management strategies can reduce GHG emissions as follows:

- Reduced VMT
- Reduced vehicle trips
- Reduced vehicle hours traveled (VHT) (i.e., searching time for parking)
- Changes in mode share.

3) Trip and Emissions Data Needs

Data needs includeExtent of smart parking deploymentsReduction in circling due to implementation

- Number of vehicle trips reduced
- Average vehicle trip length in the implemented area
- Parking turnover rates before and after the implementation of strategy

4) Quantification Methodology

SCAG will follow the off-model methodology laid out in the ARB Draft SCS Evaluation Guidelines for calculating VMT due to shorter searching time for parking based on Smart Parking deployment. The GHG emission reductions SCAG will analyze are generally attributable to reductions in VMT (due to shorter search times for parking and less vehicle trips).

The following are the basic analytical steps that MPOs can consider when estimating VMT and/or GHG emission reductions associated with parking management strategies.

Quantifying VMT reduced due to shorter searching time for parking:

$-VMT_{parking} = v_{avg} * t_{saved}$
-VMT: VMT reduced due to shorter search time for parking (mile
v_{avg} *: Average travel speed on local streets (mph)*
t_{saved} *: Time saved from parking (hour).*

5) Challenges, Constraints, and Strategy Implementation Tracking

Smart Parking systems face one unanticipated challenge, and that is the proliferation, and abuse of parking disabled parking placards. Since placards allow drivers to park for free there is a large incentive for non-eligible drivers to use relatives' placards, or seek out disreputable doctors to provide them. Additionally with an aging population there will be an increase in placards being given out to elderly residents whether they truly need them or not. According to a source at one city agency up to 40% of the most sought after spaces in their service area may be occupied by placard holders at any given time.

Another challenge to parking management policy planning is that MPOs and/or local jurisdictions need to partner with communities to identify the rates and hours of parking that would be effective in reducing GHG emissions. Especially in developing areas, proposal parking management policy needs to consider the unforeseen demand as well. Another possible challenge would be to isolate parking management strategy's impact on reducing VMT and/or GHG emissions from other strategies that potential have similar impact on the affected population and implemented areas. For example, high cost of parking can promote travelers to consider transit as an alternative means of transportation. However, direct transit strategy (e.g., more frequent transit service) can also motivate traveler in the same planning area to switch from auto mode to transit mode.

8. Multimodal Dedicated Lanes

1) Strategy Description – Multimodal Dedicated Lanes.

Conversion of traffic lanes to multimodal dedicated lanes in portions of the City of Los Angeles. These lane conversions would serve both transit and active transportation modes. They have been developed to be consistent with the City of Los Angeles's Transit Enhanced Network, a key strategy of the Mobility Plan 2035: An Element of the General Plan.

There are three levels of intervention, comprehensive, moderate plus, and moderate. The comprehensive corridors feature round the clock dedicated multimodal lanes. The moderate plus lanes will feature peak hour multimodal lanes. The moderate lanes feature bicycle lanes and rapid bus service, and are only being included for the San Fernando Valley portions of the City of Los Angeles.

The strategy is expected to reduce greenhouse gas emissions by encouraging modal shift from auto travel to active modes and transit.

2) Objectives

Multimodal dedicated lanes would be used to: 1) Increase transit vehicle speeds 2) Increase transit system reliability by reducing traffic congestion imposed variably in travel time 3) Enhance safety for cyclists and new mobility users. These objectives would lead to increased use of these modes in the specified corridors and would provide residents of these areas with additional mobility options. Additionally, reduced mixed vehicle capacity may result in less vehicle miles travelled.

The strategy is expected to increase bicycle lanes and transit boardings, while decreasing vehicle miles travelled. Reduced vehicle miles travelled and greenhouse gas emission would be the result of reduced vehicle trips due to modal shift.

3) Trip and Emissions Data Needs

Cost estimates for the strategy will be based on average of programmed totals from programmed investments for dedicated bus lanes.

Currently, there are dedicated lanes or road facilities for transit buses in at least five SCAG subregions – Westside COG, San Fernando Valley COG, San Bernardino COG, City of Los Angeles, and San Gabriel Valley COG.

Responsible parties for the implementation of this strategy could be either local cities or transit providers. SCAG will partner with both agencies to track strategy implementation and success metrics.

The affected population for this strategy are the residents living near the corridors, as well as travelers who use the corridors.

There are three types of data needed: infrastructure assumptions; baseline travel data; and travel demand model test run elasticity factors.

Data needs include total baseline travel via personal vehicle, transit, and active modes, as well as corridor length for the entire network, split comprehensive and moderate plus networks. The total mileage for each network needs to be identified:

Infrastructure Assumptions
- Comprehensive Bus Corridors
- Moderate Plus Bus Corridors
- Moderate Bus Corridors
- Bike Lanes

Baseline Travel Data
- Plan year baseline and plan transit travel
- Plan year baseline and plan active modes travel
- Plan year baseline and plan VMT

Elasticity Factors
- Model test run elasticity factor for auto travel
- Model test run elasticity factor for transit travel
- Model test run elasticity factor for active modes travel
- Model test run elasticity factor for VMT

4) Quantification Methodology

Use of the converted multimodal dedicated lanes will be estimated using elasticity factors derived from a test run of the regional travel demand model. These estimates will be expressed in VMT. The methodology will attempt to estimate the benefits of comprehensive, moderate plus, and moderate lanes.

The elasticity factors will be applied to the output of the travel demand model for the three modes (vehicle travel, transit, and active transportation) along the specified corridors. These numbers will be aggregated to the comprehensive, moderate plus, and moderate levels. The difference between aggregated baseline and aggregated new travel across the three modes will be multiplied by Carbon Dioxide emissions rates obtained from EMFAC and used to produce estimated greenhouse gas reductions.

5) Challenges, Constraints, and Strategy Implementation Tracking

The off model analysis of this strategy will require the production of elasticity factors from the travel demand model. A test run has been conducted and this seems achievable. These factors will then have to be multiplied against plan year forecast data from the travel demand model, which will be produced as part of SCAG's normal metropolitan planning activities.

Implementation tracking may be a challenge; however, Federal Transit Administration Small Starts grants require before and after studies; if any Small Starts grants are used to pay for lane conversions these reports would be required. These reports will facilitate implementation tracking.

Metrics of success would include direct measures include: 1) increased average transit vehicle speeds in the corridor 2) increased on-time performance in the corridor 3) decreased pedestrian involved traffic collisions in the corridor 4) decreased bicyclist involved traffic collisions in the corridor.

Indirect measures would include: 1) increased transit trips in the specified corridors 2) increased active mode travel in the specified corridors 3) decreased auto travel in the specified corridors.

IX. Other Data Collection Efforts

1. <u>Local Input Survey</u>

To assist in the development of Connect SoCal, SCAG initiated the Local Input Process in 2017. The Local Input Process is designed to engage local jurisdictions in establishing base geographic and socioeconomic data sets for Connect SoCal. As part of the Local Input Process, SCAG developed a 2020 Local Input Survey to collect information from local jurisdictions related to the implementation of the 2012 and 2016 RTP/SCS as well as to assist in the development of Connect SoCal. The 2020 survey builds and expands upon the 2016 survey by adding substantive questions. Whereas the 2016 Local Input Survey focused primarily on land use, transportation and natural lands issues, the 2020 Local Input Survey expands the questions to include questions related to housing, goods movement, public safety, environmental compliance and justice and data. During the 2016 Local Input process, SCAG staff received multiple requests from local jurisdictions to provide clarifications on certain technical terms. As such, SCAG staff has developed a glossary to assist local jurisdictions in completing the Local Input Survey in a timely matter. Distribution of the 2020 Local Input Survey began on October 1, 2017 and concluded on October 1, 2018. The survey was distributed via email, hardcopy and online (Survey Monkey). The Local Input Survey consists of the following topics:

1) Land Use
2) Transportation
3) Environmental
4) Public Health and Safety
5) Data

Approximately 60 percent of local jurisdictions responded to the survey. Survey responses will assist in developing SCAG's scenario planning model for the SCS.

Please email written comments to Rongsheng Luo, Program Manager of Air Quality and Conformity, at luo@scag.ca.gov by April 25, 2019.

Technical Working Group

Agenda Item 5

Summary of Issues and Potential Risks of

Anticipated Final Federal Action on Safer Affordable Fuel-Efficient (SAFE) Vehicle Rule

April 15, 2019

Issues

- On August 24, 2018, U.S. Environmental Protection Agency (EPA) proposed to withdraw the Clean Air Act Preemption Waiver granted to California in 2013 for its "Advanced Clean Car" regulations as part of the Proposed SAFE Rule.

- If EPA finalizes the rule including the Waiver withdrawal as anticipated, the "Advanced Clean Car" regulations would be invalided.

- Because the "Advanced Clean Car" regulations were integrated into EMFAC2014, the official emission factors model approved and required by EPA for transportation conformity analysis in California, the action could invalid EMFAC2014.

- If EMFAC2014 would be invalided,
  1) MPOs in California would not be able to make any new transportation conformity determination for their RTPs, FTIPs, and their amendments.
  2) EPA could disapprove California's State Implementation Plans (SIPs) currently under its review.
  3) EPA could also ask FHWA/FTA to invalid the current transportation conformity determinations because those determinations were based on EMFAC2014.

Potential Risks

- Due to many uncertainties that would shape the course upon EPA's final action, it is very difficult, if not impossible, to figure out what will actually happen and when. Nonetheless, there are four potential consequences.
  1) If an applicable conformity deadline would be missed because of the anticipated EPA action, a 12-month transportation conformity grace period would be triggered after the missed deadline.
  2) If a SIP would be disapproved without a protective finding by EPA because of the anticipated EPA action, a transportation conformity freeze would be triggered upon effective date of the SIP disapproval.
  3) If a SIP disapproval would not be resolved after two years because of the anticipated EPA action, highway sanctions would be triggered.
  4) If an RTP/FTIP conformity determination would expire or not be made for more than one year or a SIP would be disapproved for more than two years because of the anticipated EPA action, a transportation conformity lapse would be triggered.

- Under a conformity grace period or a conformity freeze, no new RTP/FTIP or RTP/FTIP amendment.

- Under highway sanctions, federal funding would be restricted on many highway projects.

- Under a conformity lapse, non-exempt and TCM projects could not receive federal funding, federal approval, or be amended into RTP/FTIP.

- It is important to note: 1) The SAFE Vehicle Rule including the Waiver Withdrawal is intended to roll back vehicle GHG emission standards, not to create transportation conformity failure or highway sanctions; and 2) All SIP and conformity actions by EPA, FHWA/FTA, or ARB require a public process.
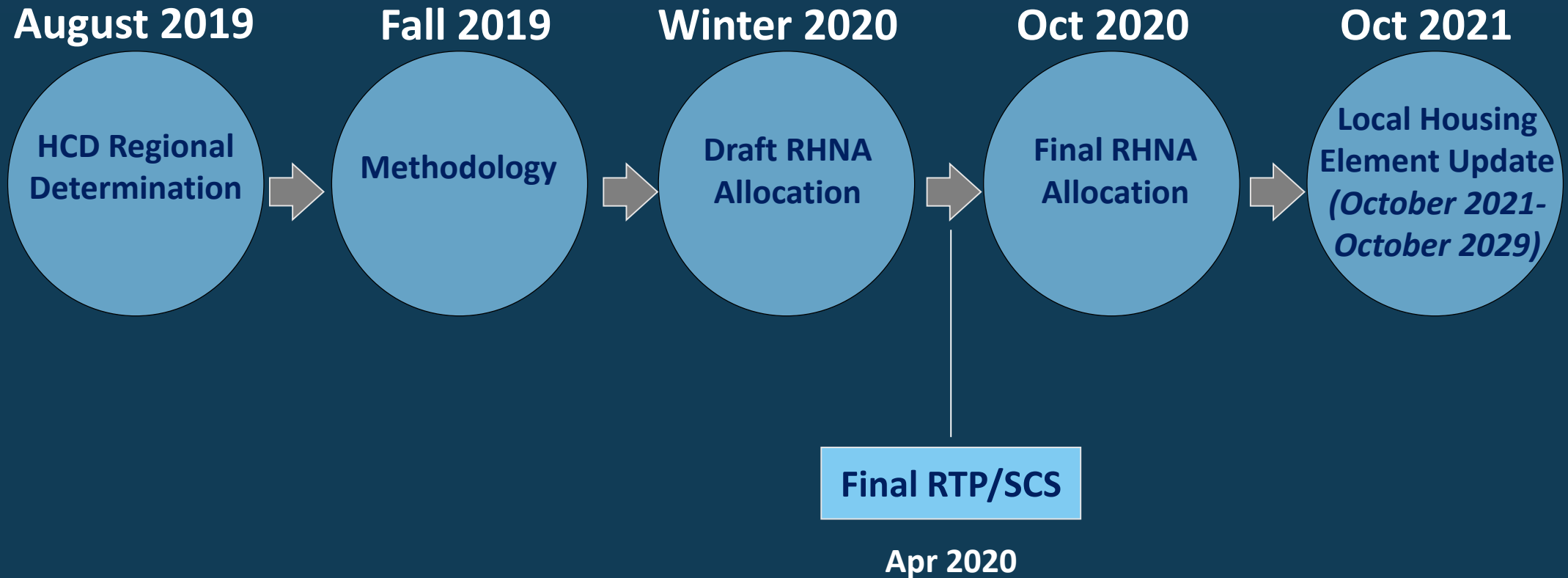
Technical Working Group

Agenda Item 6

RHNA Methodology Update: Existing Needs

Ma'Ayn Johnson, AICP

Compliance and Performance Monitoring

The RHNA Process

August 2019

HCD Regional Determination

Fall 2019

Methodology

Winter 2020

Draft RHNA Allocation

Oct 2020

Final RHNA Allocation

Oct 2021

Local Housing Element Update (October 2021- October 2029)

Final RTP/SCS

Apr 2020

Objectives of RHNA

1) To increase the housing supply and mix of housing types, tenure and affordability within each region in an equitable manner

2) Promoting infill development and socioeconomic equity, the protection of environmental and agricultural resources, and the encouragement of efficient development patterns

3) Promoting an improved intraregional relationship between jobs and housing

4) Allocating a lower proportion of housing need in income categories in jurisdictions that have a disproportionately high share in comparison to the county distribution

5) Affirmatively furthering fair housing

Methodology
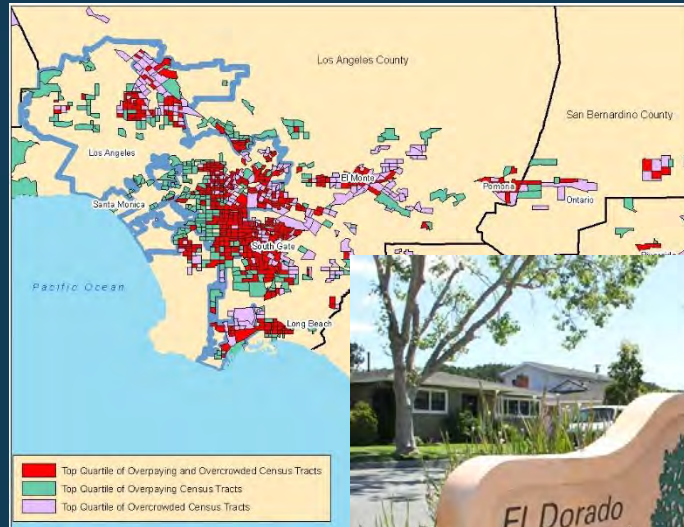
- Applied to the regional determination to determine a draft RHNA allocation

- Developed by SCAG

- Survey of jurisdictions on local planning factors and fair housing policies

Methodology: Survey Packet

- Three surveys were sent to planning directors
  - *Planning factor survey*
  - *AFFH survey*
  - *Replacement need survey*

- Due to SCAG by April 30, 2019

- Results will be reviewed by RHNA Subcommittee

RHNA: Projected and Existing Need

Region	Projected need	Existing need
Jurisdiction	Projected need	Existing need
Jurisdiction with social equity adjustment	Projected need	Existing need

Regional Projected and Existing Need

Regional Projected Housing Need	Regional Existing Housing Need
+Household growth	+Overcrowding
+Vacancy need	+Vacancy need
+Replacement need	+Cost−burdened
=Projected housing need	=Existing housing need

- Each jurisdiction will receive a share of the region's existing housing need

- Existing need has accumulated over several decades and is a regionwide responsibility

- Different ways to distribute existing housing need
  - Current share of regional population or households
  - Specific local jurisdictional factors as a modification

Modifying Existing Housing Need

- Factors for consideration:

  - Access to transit

  - Jobs Housing fit

  - Opportunity Indices

SB 535 Disadvantaged Communities
in the SCAG Region

SB 535 Disadvantaged Areas
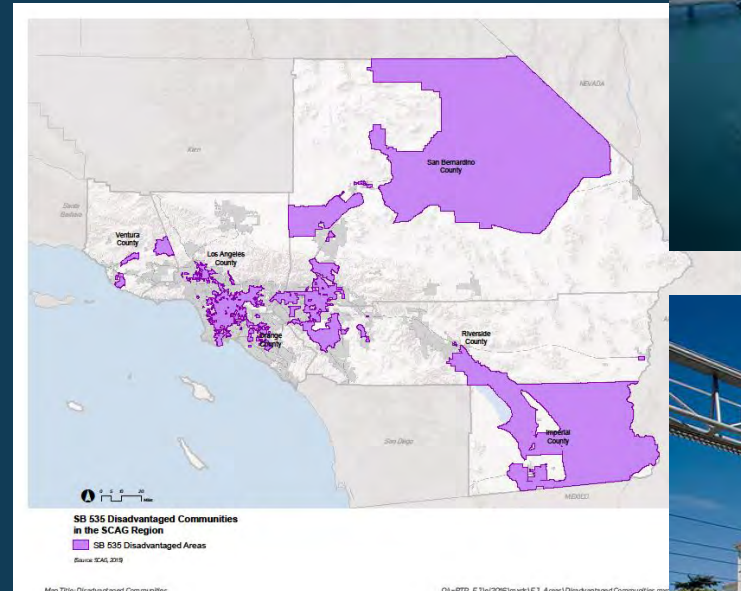
Adjusted Distribution (110%)

Household income level	City A adjusted distribution	Final RHNA allocation (units) = 1,000
Very low income	23.9%	239
Low income	15.7%	157
Moderate income	15.2%	152
Above moderate	45.2%	452

- What should the RHNA distribution be based on?
  - *Household income distribution?*
  - *Transit accessibility?*
  - *Jobs housing fit?*
  - *Opportunity Indices?*
  - *Something else?*
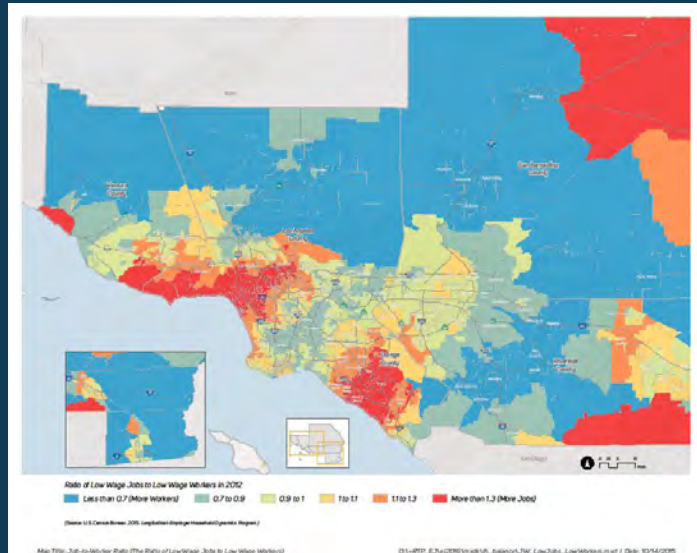
Percent of Low Income Households Around 2012 High Quality Transit Area*

Low Income Households (%)

0% - 10%	51% - 60%
11% - 20%	61% - 70%
21% - 30%	71% - 80%
31% - 40%	81% - 90%
41% - 50%	91% - 100%
No Data	

Freeway

County Boundaries

2012 HQTA*

Ventura County

Los Angeles County

San Bernardino County

Orange County

Riverside County

Riverside County

Imperial County

Miles
0 4 8 12 16 20

Note: The 2012 High Quality Transit Areas (HQTA) are extracted from 2012 base year data of the 2016-2040 RTP/SCS Amendment 2 and modified by inputs from transit operators and local jurisdictions. SCAG's HQTA is within one-half mile from Major Transit Stops and HQTCs and developed based on the language in SB375. Please note that this map may undergo changes as SCAG continues to update its transportation network as part of the 2020 RTP/SCS development process and SCAG shall not be responsible for local jurisdiction's use of this map. Updates to this information will be forthcoming as information becomes available.

Source: SCAG, ACS 2013-2017 5-Year Estimates

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Modifying Existing Need: Jobs Housing Fit
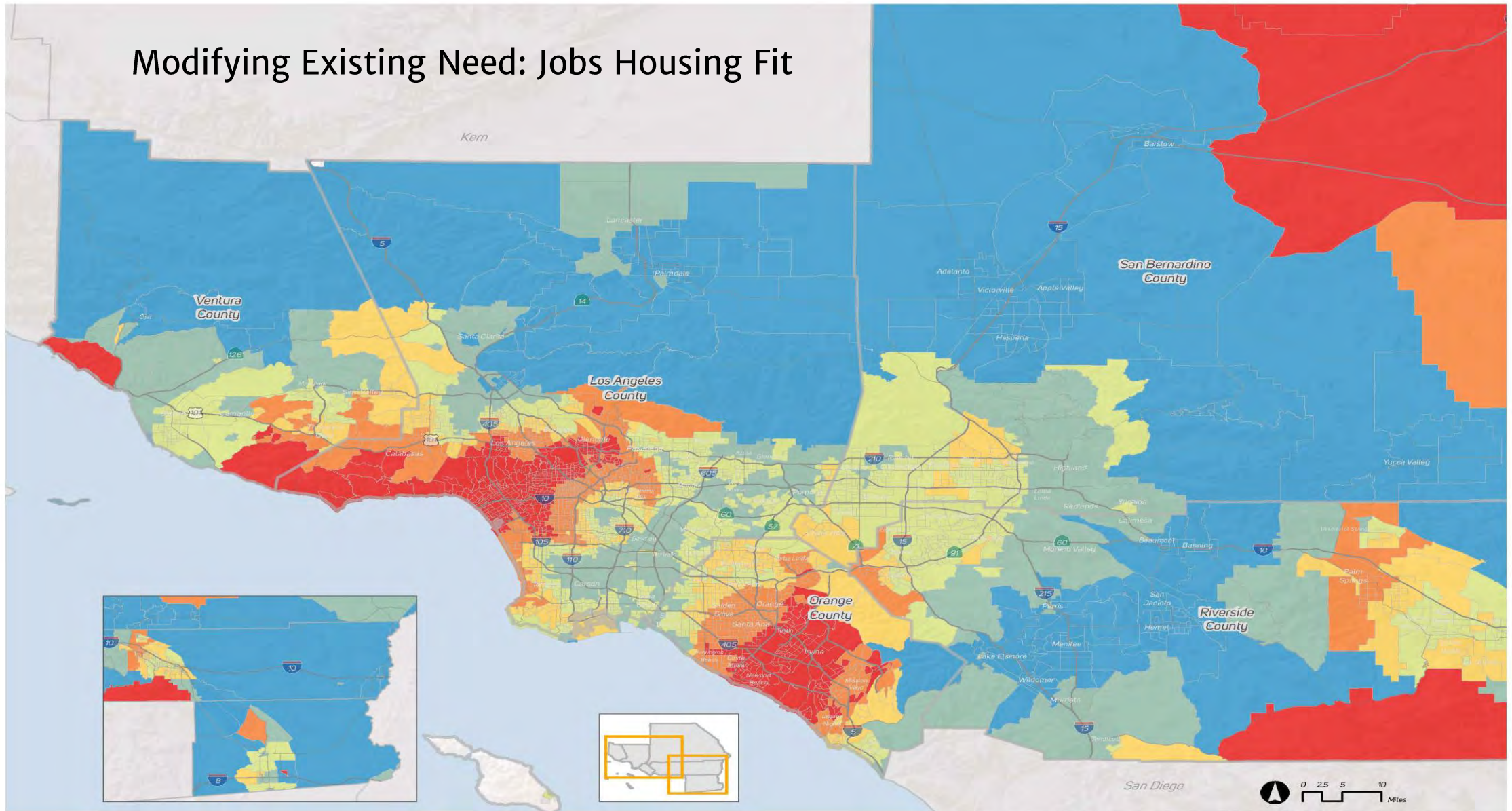
Ratio of Low Wage Jobs to Low Wage Workers in 2012

- Less than 0.7 (More Workers)
- 0.7 to 0.9
- 0.9 to 1
- 1 to 1.1
- 1.1 to 1.3
- More than 1.3 (More Jobs)

(Source: U.S. Census Bureau. 2015. Longitudinal-Employer Household Dynamics Program.)

Map Title: Job-to-Worker Ratio (The Ratio of Low Wage Jobs to Low Wage Workers)

O:\=RTP_EJ\ej2016\mxds\jh_balance\JW_LowJobs_LowWorkers.mxd | Date: 10/14/2015

- Seven indices developed by U.S. Department of Housing and Urban Development (HUD)

- Measures various factors relating to access to opportunity, such as poverty rates, environmental health, and jobs proximity

- Directly addresses social equity and AFFH

Social Equity Adjustment

- Total draft RHNA divided into 4 income categories

- Social equity adjustment can be applied to avoid overconcentration of lower income households

Social Equity Adjustments

Income Category	City A Existing Distribution	County Existing Distribution/ 100% Adjustment	110% Adjustment	175% Adjustment
Very low income	36%	25%	23.9%	16.75%
Low income	19%	16%	15.7%	13.75%
Moderate	13%	15%	15.2%	16.5%
Above moderate	32%	44%	45.2%	53%

- ABAG (109 jurisdictions)
  - Applied a 70% total housing need to priority development areas (PDA)
    - PDA: Highly urbanized areas with high access to transit
    - Caps on maximum percentage of growth

  - Remaining 30% of areas received additional allocation based on:
    - Residential permits issued
    - High job growth
    - Transit access
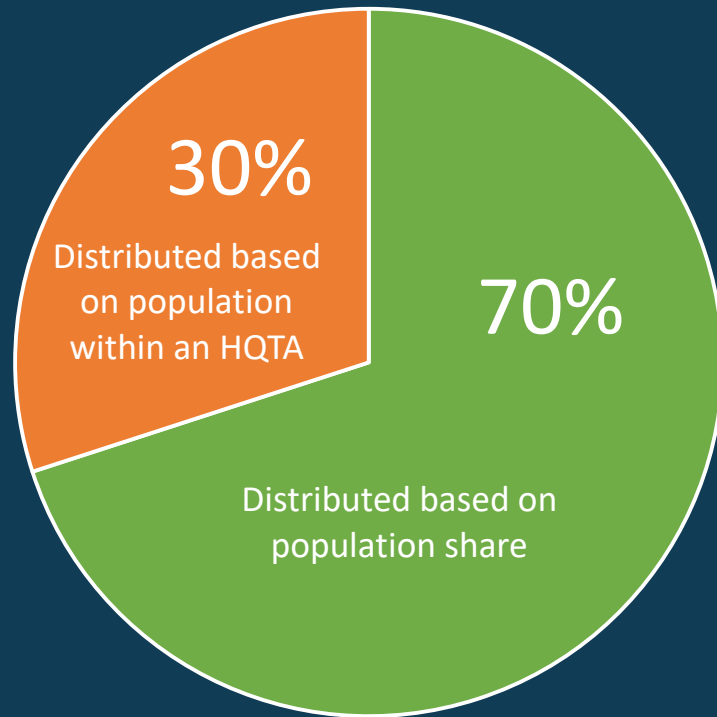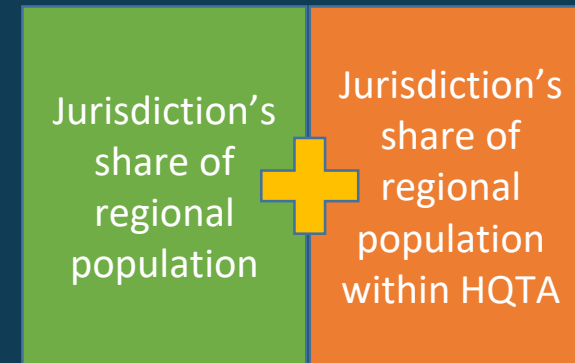
  - 175% social equity adjustment

- SANDAG (19 jurisdictions)
  - Review of housing element capacity
    - No more than 20 dwelling units per acre based on "default density" calculation
    - After cap reached, 112% distribution for the 14/19 jurisdictions

- SACOG (28 jurisdictions)
  - 100% social equity
  - Trendline to achieve regional income parity by 2050

Possible Recommendation: Step 1 Determining Existing Need

Regional Existing Need

- 30% Distributed based on population within an HQTA
- 70% Distributed based on population share

Jurisdiction Existing Need

Jurisdiction's share of regional population + Jurisdiction's share of regional population within HQTA

Possible Recommendation: Step 2 Determining Total RHNA Allocation

Jurisdiction Existing Need

Jurisdiction's share of regional population **+** Jurisdiction's share of regional population within HQTA

+

Jurisdiction Projected Need

TBD

=

Jurisdiction Total RHNA Allocation
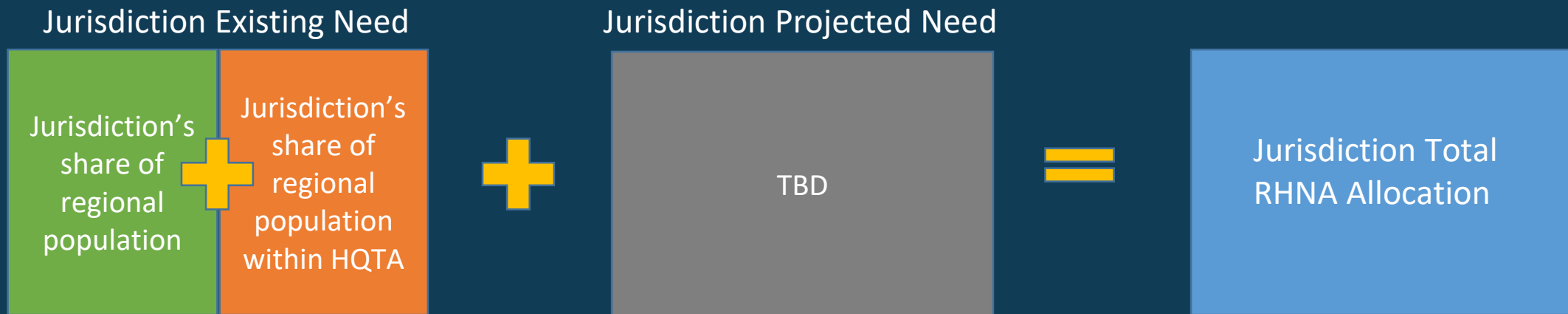
Possible Recommendation: Step 3 Determining Income Categories

| Jurisdiction Total RHNA Allocation | ✖ | 150% social equity adjustment | = | Jurisdiction Total RHNA Allocation |

Jurisdiction Total RHNA Allocation

| Very low |
| Low |
| Moderate |
| Above moderate |

City A and City B: A Methodology Example

- City A
  - Urbanized
  - Within County X
  - Most of population is within an HQTA
  - Population: Appx. 60,000
  - Higher concentration of lower income households than other parts of the county

- City B
  - Suburban community
  - Within County Y
  - No HQTAs within jurisdiction
  - Population: Appx 105,000
  - Higher concentration of wealthier households than other parts of the county

City A and City B: Step 1

- Example assumption: Regional existing need of 400,000
  - 280,000 (70%) will be assigned based on population share
  - 120,000 (30%) will be assigned based on population share within HQTA

City A	Existing need
+Share of regional population (0.34%)	947
+Share of regional population within HQTA (0.82%)	980
=Total existing need	1,927

City B	Existing need
+Share of regional population (0.59%)	1,642
+Share of regional population within HQTA (0%)	0
=Total existing need	1,642

City A and City B: Step 2

- The mechanism to determine projected need will be recommended separately
- For illustrative purposes, projected need is based on local input on household growth and a vacancy rate adjustment

City A	
+Existing need	1,927
+Projected need	662
=Total draft RHNA allocation	2,588

City B	
+Existing need	1,642
+Projected need	2,411
=Total draft RHNA allocation	4,053

City A: Step 3

Income category	City A existing income distribution	County X income distribution	City A income distribution after 150% social equity adjustment	RHNA allocation by income category (total = 2,588)
Very low	30.1%	25.3%	22.9%	593
Low	18.6%	15.6%	14.1%	365
Moderate	18.6%	16.8%	15.9%	412
Above moderate	32.7%	42.3%	47.1%	1,219

City B: Step 3

Income category	City B existing income distribution	County Y income distribution	City B income distribution after 150% social equity adjustment	RHNA allocation by income category (total = 4,053)
Very low	15.8%	23.7%	27.7%	1,121
Low	12.2%	16.5%	18.6%	755
Moderate	16.8%	18.3%	19.1%	773
Above moderate	55.2%	41.5%	34.6%	1,404

Next Steps

- Next RHNA Subcommittee meeting
  - May 6, 10 a.m.
  - Webcasting available

- Proposed RHNA Methodology Public Hearings
  - August/September 2019

- Proposed RHNA Methodology Review by HCD
  - Fall 2019

- Comments can be sent to housing@scag.ca.gov

For more information

www.scag.ca.gov

Email: housing@scag.ca.gov