Origin-Destination Pattern Comparison by County and Sub-County Area Streetlight vs SCAG Model Output

May MTF Meeting

Ellen Jisu Lee and Yang Wang
Modeling & Forecasting
5/25/2022

Who are we planning for?

Projected Regional Growth

- HOUSEHOLD:
  - 2016: 6M
  - 2045: 7.6M

- POPULATION:
  - 2016: 18.9M
  - 2045: 22.5M

- EMPLOYMENT:
  - 2016: 8.4M
  - 2045: 10M

Changing Age Demographics in the Region

- UNDER 14:
  - 2016: 3.7M
  - 2045: 3.9M

- 15-64:
  - 2016: 12.6M
  - 2045: 14M

- 65 & OVER:
  - 2016: 2.4M
  - 2045: 4.6M

HOW WE TRAVEL TODAY (2016)

<table>
<thead>
<tr>
<th>TRIP TYPE</th>
<th>ALL TRIPS</th>
<th>SCHOOL WORK</th>
<th>WORK</th>
<th>SCHOOL</th>
<th>OTHER</th>
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<td>1.1%</td>
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</table>

Source: SCAG Master Plan

1 IN 5 PEOPLE WILL BE AGE 65+

5/25/2022
## Overview

- Sub-County Area Development
- Streetlight Variable and Analysis Description
- Origin-Destination Comparison
- Trip Length Distribution Comparison
- Correlation between Streetlight and SCAG Model Output

## SCAG Sub-County Area Development

- SCAG Zonal Levels
  - 15 Sub Air Basin
  - 56 RSA (Regional Statistical Area)
  - 369 CSA (Community Statistical Area)
- Administrative Boundary within the SCAG Region
  - County
  - City / Unincorporated Area
  - 15 Sub Region
- Goal: to better detect O-D patterns, construct a zonal level that is
  - For SCAG travel demand modeling internal usage
  - Finer than and respect county boundary
  - Respect Tier2 TAZ boundary
SCAG Sub-County Area Development

- Imperial County
  - A single sub-region county
  - Use the county boundary

- San Bernardino County
  - A single sub-region county
  - Use the county boundary

- Ventura County
  - A single sub-region county
  - Remove off-shore islands
  - Use the county boundary (mainland portion)

SCAG Sub-County Area Development (Riverside County)

- Riverside County
  - Two sub-regions:
    - Coachella Valley Association of Governments (CVAG)
    - Western Riverside Council of Governments (WRCOG)
  - Three polygons in shapefile
    - Additional: Riverside Non-COG area
      - Relatively stable SED across years
  - Merge Riverside Non-COG with WRCOG
  - Keep CVAG boundary as is
SCAG Sub-County Area Development (Orange County)

- Orange County
  - A single sub region county
  - Job centers in 2016
    (def. by SCAG, significantly higher emp density)
    - Brea
    - Anaheim-Fullerton
    - Santa Ana
    - SNA–Irvine
    - Irvine–Spectrum
    - Newport–Mesa
    - San Clemente

- Create two sub region areas
  - North
    Group by RSAs near Brea, Anaheim–Fullerton
  - South
    Group by the rest of RSAs in the county

SCAG Sub-County Area Development (Orange County)

- Orange County North
  - Anaheim
  - Brea
  - Buena Park
  - Fullerton
  - Garden Grove
  - Huntington Beach
  - Placentia
  - Westminster
  - Yorba Linda

- Orange County South
  - Costa Mesa
  - Irvine
  - Mission Viejo
  - Newport Beach
  - Santa Ana
  - San Clemente
  - San Juan Capistrano
  - Tustin
SCAG Sub-County Area Development (Los Angeles County)

- Los Angeles County
  - Nine sub-regions
    - San Gabriel Valley Council of Governments (SGVCOG)
    - Las Virgenes – Malibu Council of Governments
    - Westside Cities Council of Governments (WCCOG)
    - North Los Angeles County Transportation Coalition
    - San Fernando Valley Council of Governments (SFVCOG)
    - Arroyo Verdugo Communities Joint Powers Authority (AVCJPA)
    - Gateway Cities Council of Governments (GCCOG)
    - South Bay Cities Council of Governments (SBCCOG)
    - City of Los Angeles

SCAG Sub-County Area Development (San Gabriel Valley)

- SGVCOG
  - Completely covered by North LA County
  - Keep SGVCOG sub-region boundary as is
  - Clip SGVCOG sub-region boundary out of North LA County sub-region

- San Gabriel Valley
  - Alhambra
  - City of Industry
  - Covina
  - El Monte
  - Pomona
  - San Gabriel
  - Baldwin Park
  - Claremont
  - Diamond Bar
  - Pasadena
  - Rosemead
  - West Covina
### SCAG Sub-County Area Development (Las Virgenes)

- Las Virgenes – Malibu Council of Governments
  - Keep its sub-region boundary as is
  - Las Virgenes
    - Calabasas
    - Malibu

### SCAG Sub-County Area Development (Westside Cities)

- WCCOG
  - A multi-polygon (enclave) sub-region
  - Create a spatially contiguous boundary
    - Merge WCCOG sub-region boundary (green hatched fill)
    - Merge RSA #16 (red hatched fill)
    - Merge TAZs near LAX Airport (red polygon)
      - Part of City of Los Angeles sub-region

- Westside Cities
  - Beverly Hills
  - Culver City
  - Santa Monica
  - West Hollywood
SCAG Sub-County Area Development (North Los Angeles County)

- North Los Angeles County Transportation Coalition
  - Covers
    - SGVC(OG) (completely)
    - San Fernando Valley COG (partially)
  - Include Santa Clarita w/ Palmdale & Lancaster
    - Clip out SGVC(OG) sub-region boundary
    - Clip out the overlapping SFVC(OG) sub-region

- North Los Angeles County
  - Lancaster
  - Palmdale
  - Santa Clarita
San Fernando Valley Council of Governments (SFVCOG)
Arroyo Verdugo Communities Joint Powers Authority (AVCJPA)

- SFVCOG sub-region boundary covers
  - Part of City of Los Angeles sub-region boundary
  - Most of AVCJPA sub-region boundary
- Merge AVCJP
- Keep the City of Los Angeles sub-region portion within
- San Fernando Valley
  - Burbank
  - Glendale
  - La Canada Flintridge
  - San Fernando

SCAG Sub-County Area Development (San Fernando Valley)

SCAG Sub-County Area Development (San Fernando Valley)
SCAG Sub-County Area Development (Gateway Cities)

- Gateway Cities Council of Governments (GCCOG)
  - Remove off-shore islands
  - Use the sub-region boundary (mainland portion)
- Gateway Cities
  - Artesia
  - Cerritos
  - Compton
  - Downey
  - Lakewood
  - Long Beach
  - Montebello
  - Norwalk
  - Whittier

SCAG Sub-County Area Development (South Bay Cities)

- South Bay Cities Council of Governments (SBCCOG)
  - A multi-polygon (enclave) sub-region
  - Create a spatially contiguous boundary
    - Merge SBCCOG sub-region boundary (red hatched fill)
    - Merge TAZs in between and near two ports (green hatched fill)
- South Bay Cities
  - Carson
  - Hawthorne
  - Inglewood
  - Rancho Palos Verdes
  - Torrance
  - Gardena
  - Hermosa Beach
  - Manhattan Beach
  - Redondo Beach
SCAG Sub-County Area Development (City of Los Angeles)

- City of Los Angeles sub-region
  - Overlaps with
    - SFVCOG
    - Las Virgenes – Malibu COG
    - WCCOG
    - GCCOG
    - SBCCOG
  - Keep the non-overlapping portion of City of Los Angeles sub-region boundary
### SCAG Sub-County Area Development (Los Angeles County)

![Map of Los Angeles County showing different sub-county areas.]

### SCAG Sub-County Area: 2016 SED

<table>
<thead>
<tr>
<th>Sub County Area</th>
<th>Residential Population %</th>
<th>Household %</th>
<th>Employment %</th>
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<tbody>
<tr>
<td>Imperial</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
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<tr>
<td>Westside Cities</td>
<td>5.3%</td>
<td>7.7%</td>
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<td>South Bay Cities</td>
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<td>11.1%</td>
<td>11.0%</td>
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<tr>
<td>City of Los Angeles</td>
<td>19.5%</td>
<td>20.8%</td>
<td>21.0%</td>
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<td>0.9%</td>
<td>1.5%</td>
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<tr>
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<td>100.0%</td>
</tr>
<tr>
<td>Ventura</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Focused on Weekday StreetLight Volume
- Weekday from 1/1/2019 to 12/31/2019 (Tuesday to Thursday)
- StreetLight Volume = an output type that represents an estimated number of vehicle trips that interact with zones of analysis

Origin–Destination Analysis was used in this study
- O–D analysis lets you analyze trips that start and stop your origin and destination zones
- SCAG County and SCA Zones are used

SCAG Model Output
- 2016BY LM Origin–Destination matrix was used

### County Origin-Destination

<table>
<thead>
<tr>
<th>SCAG 2016</th>
<th>IMP</th>
<th>LA</th>
<th>OR</th>
<th>RIV</th>
<th>SB</th>
<th>VN</th>
<th>Sum of Origin</th>
<th>% Origin</th>
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<tr>
<td>County Name</td>
<td>County No.</td>
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<td>59</td>
<td>65</td>
<td>71</td>
<td>111</td>
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<tr>
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<td>341,661</td>
<td>25</td>
<td>157</td>
<td>2,481</td>
<td>44</td>
<td>217,066</td>
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<td>4%</td>
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<tr>
<td>Sum Intra-County</td>
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<th>RIV</th>
<th>SB</th>
<th>VN</th>
<th>Sum of Origin</th>
<th>% Origin</th>
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<td>County Name</td>
<td>County No.</td>
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<td>65</td>
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<td>1,643</td>
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<td>2,598,894</td>
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<td>Sum</td>
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<tr>
<td>% Destination</td>
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<td>53%</td>
<td>18%</td>
<td>14%</td>
<td>12%</td>
<td>4%</td>
<td>100%</td>
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<tr>
<td>Sum Intra-County</td>
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<td>36,274,767</td>
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County Origin-Destination

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<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>VN</td>
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<td>4%</td>
</tr>
</tbody>
</table>

% Origin Trips

% Destination Trips

Trip Length Distribution

- SL has higher % for shorter-distance trips (< 2 miles)
- SL Average Trip Length ~ 8.62 mi
- SCAG Average Trip Length ~ 9.62 mi

StreetLight SCA 2019 (%) vs. SCAG 2016 (%)
### Sub-County Area Origin-Destination

#### Streetlight 2019

| Sub-County Area | SCA_ID | Imperial | San Bernardino | Ventura | Westside Cities | South Bay Cities | City of Los Angeles | Las Vegas | Gateway Cities | San Bernardino | Sub-County Area | Orange County North | Orange County South | WRCOG and Riverside Non-COG | Coachella Valley |
|-----------------|--------|----------|----------------|---------|----------------|-----------------|--------------------|-----------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|-----------------|
| Imperial        | 25     | 71       | 111            | 371     | 372            | 373             | 375                | 376       | 377            | 378            | 379            | 380            | 381            | 382              | 383              | 384              | 385              |
| San Bernardino  | 71     | 143      | 146            | 147     | 148            | 149             | 150                | 151       | 152            | 153            | 154            | 155            | 156            | 157              | 158              | 159              | 160              |
| Ventura         | 111    | 20       | 2,493          | 896     | 2,724          | 14,208          | 82,997             | 3,113     | 92,714         | 6,339          | 14,704         | 1,868          | 3,128          | 5,328             | 1,106            | 323              | 1,460            |
| Westside Cities | 371    | 5        | 4,787          | 9,987   | 10,015         | 912             | 1,362              | 1,094     | 75,028         | 1,406          | 2,355          | 893            | 483            | 203              | 67               | 361              | 5,490            |
| South Bay Cities| 372    | 42       | 10,413         | 2,783   | 137,021        | 2,216,845       | 239,297            | 1,721     | 256,584        | 23,311         | 24,187         | 3,020          | 41,946         | 18,982            | 7,510            | 709              | 2,469,224        |
| City of Los Angeles | 373 | 33       | 29,664         | 54,811  | 475,771        | 217,209         | 9,006,290          | 9,788     | 390,015        | 410,810        | 277,849        | 28,659         | 39,594         | 20,021           | 12,109           | 1,110            | 5,740,391        |
| Las Vegas       | 374    | 2        | 304            | 64,947  | 14,422         | 1,621           | 9,028              | 172,190  | 1,094          | 75,028         | 1,406          | 2,355          | 893            | 483              | 203              | 67               | 361              | 5,490,290        |
| Gateway Cities  | 375    | 113      | 39,235         | 5,165   | 44,292         | 248,579         | 385,171            | 1,185     | 6,043,390      | 37,412         | 210,697        | 5,655          | 37,368         | 85,638            | 22,759           | 1,460            | 5,496,290        |
| San Bernardino  | 376    | 35       | 12,467         | 95,966  | 110,965        | 23,506          | 416,996            | 79,063    | 37,466         | 4,918,622      | 128,287        | 127,745        | 11,614         | 7,576            | 4,655            | 968              | 6,016,129        |
| Ventura         | 377    | 89       | 334,856        | 6,472   | 24,867         | 23,435          | 260,094            | 1,528     | 208,656        | 128,291        | 6,081,043      | 10,659         | 85,928         | 32,346           | 42,917           | 1,657            | 5,321,866        |
| Westside Cities | 378    | 34       | 9,727          | 54,552  | 9,214          | 4,699           | 26,788             | 2,170     | 5,334          | 123,755        | 10,182         | 2,652,000      | 2,433           | 5,519            | 2,083            | 408              | 2,372,832        |
| Orange County North | 581 | 84       | 54,675         | 2,003   | 35,293         | 40,438          | 38,637             | 526       | 376,184        | 11,761         | 87,491         | 3,794,459      | 639,314        | 30,793           | 1,690            | 5,049,320        |
| Orange County South | 582 | 68       | 32,389         | 1,363   | 11,259         | 18,214          | 19,495             | 520       | 80,725         | 7,299          | 32,169         | 1,667          | 627,502        | 1,477,850         | 1,831            | 5,430,665        |
| WRCOG and Riverside Non-COG | 651 | 496      | 187,700        | 1,129   | 4,294          | 7,477           | 12,312             | 236       | 22,506         | 5,112          | 42,901         | 2,224          | 58,352         | 4,982,632         | 14,164           | 5,501,705        |
| Coachella Valley | 652    | 1,548    | 17,024         | 254     | 531            | 536             | 1,090              | 70        | 1,019          | 818            | 1,539          | 398            | 1,599          | 1,665            | 18,957           | 1,406,272        | 1,454,535        |
| Sum             |        | 4,577,654| 7,205,534      | 2,053,834| 1,879,420      | 2,954,315       | 5,721,376          | 366,849   | 5,506,008      | 6,007,420      | 5,235,104      | 5,049,979      | 5,429,484      | 5,505,506         | 1,439,690        | 57,721,296       | 81%              |

### Sub-County Area Origin-Destination

#### % Origin

- **Imperial**: 1% 3%
- **San Bernardino**: 13% 10%
- **Ventura**: 5% 4%
- **Westside Cities**: 3% 4%
- **South Bay Cities**: 5% 6%
- **City of Los Angeles**: 10% 11%
- **Las Vegas**: 1% 1%
- **Gateway Cities**: 10% 11%
- **San Fernando Valley**: 10% 11%
- **San Gabriel Valley**: 9% 10%
- **North Los Angeles County**: 4% 3%
- **Orange County North**: 9% 8%
- **Orange County South**: 9% 10%
- **WRCOG and Riverside Non-COG**: 10% 8%
- **Coachella Valley**: 3% 2%

#### % Origin SL

- **Imperial**: 1% 1%
- **San Bernardino**: 13% 10%
- **Ventura**: 5% 4%
- **Westside Cities**: 3% 4%
- **South Bay Cities**: 5% 6%
- **City of Los Angeles**: 10% 11%
- **Las Vegas**: 1% 1%
- **Gateway Cities**: 10% 11%
- **San Fernando Valley**: 10% 11%
- **San Gabriel Valley**: 9% 10%
- **North Los Angeles County**: 4% 3%
- **Orange County North**: 9% 8%
- **Orange County South**: 9% 10%
- **WRCOG and Riverside Non-COG**: 10% 8%
- **Coachella Valley**: 3% 2%
### Sub-County Area Origin-Destination

#### % Destination

<table>
<thead>
<tr>
<th>Sub-County Area</th>
<th>% Destination SL</th>
<th>% Destination Model</th>
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<tbody>
<tr>
<td>Imperial</td>
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<tr>
<td>San Bernardino</td>
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<td>Las Virgenes</td>
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</tr>
<tr>
<td>Coachella Valley</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

### SCA Correlation

#### OD Correlation (All OD Pair)

- Correlation = 0.991

#### OD Correlation (excluding Intra Zonal)

- Correlation = 0.986
Thank you