Transportation Broadband Strategies to Reduce VMT and GHG Emissions

Southern California Association of Governments

Magellan Advisors, LLC
DKS Associates
Agenda

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Demographics
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Transportation System Performance
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Broadband in Transportation Projects
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Introductions

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Introductions
Project Objectives

Determine how broadband availability impacts VMT and GHG emissions.
  • Estimate how VMT and GHG emissions may be reduced as broadband is used as a substitute for travel.

Determine how integrated broadband and transportation planning can increase broadband availability.
  • Identify cost and funding strategies for including broadband in transportation projects.
Age

- Up to 25 years
- 25 up to 60
- 60 and older

US
SCAG average
Imperial
Los Angeles
Orange
Riverside
San Bernardino
Ventura
Education

High School or less

Some college or associate's degree

Bachelor's degree

Graduate or professional degree

- US
- SCAG average
- Imperial
- Los Angeles
- Orange
- Riverside
- San Bernardino
- Ventura
## Income by Education

<table>
<thead>
<tr>
<th>Educational Attainment</th>
<th>Median Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
</tr>
<tr>
<td>All levels</td>
<td>$41,801</td>
</tr>
<tr>
<td>Less than high school graduate</td>
<td>$25,876</td>
</tr>
<tr>
<td>High school graduate (includes equivalency)</td>
<td>$31,956</td>
</tr>
<tr>
<td>Some college or associate's degree</td>
<td>$38,125</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>$56,344</td>
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<tr>
<td>Graduate or professional degree</td>
<td>$75,495</td>
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</tbody>
</table>
Commuting

- Drove alone
- Carpooleed
- Public transit
- Walked
- Other means
- Worked at home

U.S.
SCAD
Imperial
Los Angeles
Orange
Riverside
San Bernardino
Ventura
Demographics

Highlights for the SCAG Region Compared to the Nation

• Includes both the U.S.’s largest and most populous counties
• Highly economically and socially diverse
• Generally younger and less educated
• Comparable incomes but more likely to be in sales and service occupations
• More likely to commute by car and for longer durations
Environmental Impacts of Broadband

42 Professional and Academic Publications, 1990’s – Present

Confirm VMT and Air Quality Benefits

Scale a Key Differentiator for Applicability

- Majority of empirically-based publications were Facility-Based (Single/Small sample of Employers and not representative of the wider workforce)
- No Differentiation of Essential vs. Non-Essential Workers
- Majority were survey-based – again typically Facility-Based

Eleven of “most-relevant” sources cited in Report

- Regional Benefits of Telecommuting
- Regional Emission Reduction Benefit Range: 1 - 15% Reduction
Transportation System Performance

Baseline Performance Assessment

Level of Congestion (VMT; VHT; VHD)
- Volume/Capacity Plots
- Speed Plots

Identified Non-Broadband Areas (TAZs)

Origin-Destination of Trips from Non-Broadband TAZs
- Streetlight Data from SCAG
- Home-Based Work Trips (19% of total trips)
- Average Trip Length – Approximately 6 miles

Safety
- Federal PMs

<table>
<thead>
<tr>
<th>PERFORMANCE MEASURE</th>
<th>2016 BASELINE 5-YEAR ROLLING AVERAGE</th>
<th>2017 SINGLE YEAR</th>
<th>2021 SCAG REGIONAL TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF FATALITIES</td>
<td>1,403</td>
<td>1,505</td>
<td>1,622</td>
</tr>
<tr>
<td>FATALITY RATE (PER 100 MILLION VMT)</td>
<td>0.88</td>
<td>0.906</td>
<td>1.32</td>
</tr>
<tr>
<td>NUMBER OF SERIOUS INJURIES</td>
<td>5,044</td>
<td>6,386</td>
<td>6,672</td>
</tr>
<tr>
<td>SERIOUS INJURY RATE (PER 100 MILLION VMT)</td>
<td>3.162</td>
<td>3.843</td>
<td>5.45</td>
</tr>
<tr>
<td>TOTAL NUMBER OF NON-MOTORIZED FATALITIES + SERIOUS INJURIES</td>
<td>2,046</td>
<td>2,118</td>
<td>2,212</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>VMT</th>
<th>VHT</th>
<th>VHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASSENGER VEHICLES</td>
<td>427,205,797</td>
<td>12,170,601</td>
<td>2,484,014</td>
</tr>
<tr>
<td>LIGHT TRUCKS</td>
<td>5,877,749</td>
<td>134,496</td>
<td>25,694</td>
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<tr>
<td>MEDIUM TRUCKS</td>
<td>4,345,778</td>
<td>100,475</td>
<td>18,443</td>
</tr>
<tr>
<td>HEAVY TRUCKS</td>
<td>20,960,500</td>
<td>409,955</td>
<td>68,076</td>
</tr>
<tr>
<td>TOTAL</td>
<td>458,389,824</td>
<td>12,815,527</td>
<td>2,596,227</td>
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</table>
Broadband Expansion
Market Assessment

Pre-screening at the block group level
- Census table B28011 “Internet Subscriptions in Household”
- If Block Group < 50 percent of households: Non-Broadband-0
- If Block Group > 50 percent of households: Broadband-1
- Aggregate Block Groups to the TAZ level
  - If TAZ < 50 percent of households: Non-Broadband-0
  - If TAZ > 50 percent of households: Broadband-1

Total households: 441,712 (5.8% of Total HH in 2045)

Non-broadband TAZs have significantly higher proportion of low-income households.
Broadband Expansion Market Assessment

Essential verses Non-essential Workers

- NAICS Code
- 387 Sub-Sectors

<table>
<thead>
<tr>
<th>Major Sector</th>
<th>Percent Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>100%</td>
</tr>
<tr>
<td>Construction</td>
<td>100%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>92%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>70%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>70%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>100%</td>
</tr>
<tr>
<td>Information</td>
<td>88%</td>
</tr>
<tr>
<td>Finance Insurance Real Estate</td>
<td>66%</td>
</tr>
<tr>
<td>Professional Scientific and Technical</td>
<td>52%</td>
</tr>
<tr>
<td>Education</td>
<td>83%</td>
</tr>
<tr>
<td>Arts Entertainment Recreation</td>
<td>59%</td>
</tr>
<tr>
<td>Other Service</td>
<td>57%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>60%</td>
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Broadband Scenarios

Shelter in Place Behavior

- StreetLight Data & PeMS Data.
- Shelter-In-Place Orders (closing and reopening periods) during the COVID-19 pandemic. AM / PM Peak Period.
- HBW origin-destination volumes between the Non-Broadband TAZs and all other zones.
- Passenger Vehicles Only

Upper Bound Behavior

- Non-Essential Workers (NAICS Analysis)
- Non-Broadband TAZs and Broadband TAZs
- Passenger Vehicles Only
Broadband Scenarios: 2045

A. Future Baseline - Pre-Pandemic Travel Behavior – SCAG Connect SoCal (RTP/SCS) Preferred Scenario

B. Non-Broadband Expansion Increment – Shelter in Place Behavior: Modified SCAG O-D Trip Matrix

C. Non-Broadband Expansion Increment - Upper Bound Behavior: Modified SCAG O-D Trip Matrix

D. Total Broadband - Upper Bound Behavior (Regionwide): Modified SCAG O-D Trip Matrix
   - Vehicle Miles of Travel (Regionwide)
   - Vehicle Hours of Travel (Regionwide)
   - Volume Difference Plots of SCAG Network
Analysis of Broadband Impacts on VMT and GHG

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>TOTAL VMT LDA/LDT</th>
<th>PERCENT CHANGE OF TOTAL VMT</th>
<th>CO2 (TONS PER DAY)</th>
<th>PERCENT CHANGE OF TOTAL CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: 2045 BASELINE</td>
<td>459,090,327</td>
<td>-</td>
<td>164,369</td>
<td>-</td>
</tr>
<tr>
<td>B: 2045 NBEI-SIPB</td>
<td>454,523,915</td>
<td>-1.00%</td>
<td>163,009</td>
<td>-0.89%</td>
</tr>
<tr>
<td>C: 2045 NBEI-UBB</td>
<td>451,795,887</td>
<td>-1.61%</td>
<td>162,185</td>
<td>-1.43%</td>
</tr>
<tr>
<td>D: 2045 TB-UBB</td>
<td>400,444,110</td>
<td>-14.65%</td>
<td>148,397</td>
<td>-11.48%</td>
</tr>
</tbody>
</table>

Broadband Expansion (Scenario B and C): Isolates Increment
- Daily VMT reductions between 4.6 million to 7.3 million (1 - 2%) CO\(_2\)
- Reduction between 1,360 – 2,184 tons/day (1 – 1.5%)

Total Region (Scenario D): All Non-Essential Workers Telecommute
- Daily VMT reductions up to 59 million (15% reduction)
- CO\(_2\) Reduction of up to 15,972 tons/day (11.5% reduction)
Volume Difference Plots

AM/PM Peak Hour Roadway Volumes (Scenario B or C) relative to Connect SoCal RTP/SCS (Scenario A).

Most heavily utilized roadways (shown as green) that serve non-broadband areas (i.e., TAZs)
Analysis of Broadband Impacts on VMT and GHG

Most Benefiting Roadways from Broadband Expansion to Non-Broadband Areas:

- I-10
- I-110
- I-605
- I-710
- SR 215
- SR 91
- SR 72
- SR 42
- North Waterman
- South Atlantic Blvd
- Riverside Dr
- East 7th St
- Figueroa St
- West 120th St
For Further Study

Refine Definition of Non-Broadband Areas
- Access / Adoption / Speed
- Apply Continuous Scale vs. Binary
- Finer spatial granularity

Include Additional Trip Purposes and Other Time Periods (Non-Peak Periods)
- Tele-Shopping
- Tele-Health

Reflect Current Academic Research
- UC Davis Research
- USC Research

Analyze Additional Scenario (E) Total Broadband – Shelter-In-Place Behavior
- Anticipated Benefit: Between 2 – 15% VMT and GHG Emission Reduction
- Connect SoCal (2024 RTP/SCS Update) - contribute to SCAG Region’s GHG Emission Targets
Broadband in Transportation Projects

Conduit Installation in Road RoW, per mile

- Full cost: $317,522
- Open trench cost: $54,380
- *Open trench represents approximately 80% savings over full installation*
- Value engineering and other cost reduction tactics notwithstanding

Funding Options

- **Capital improvements and other infrastructure**
  - Conduit as a protected, standard line item in all projects
  - Means to manage and capitalize on assets
- **Development conditioning, joint build, and partnerships**
  - Close coordination and customer relations with service providers
- **Grants and low-cost loans**
- **Revenue Generation**
Conclusions 1

• Broadband use can substitute for travel to significantly impact GHG emissions.

• Including network infrastructure in transportation projects substantially decreases capital expenses and facilitates market entry by broadband providers.

• Non-Broadband Areas (as defined in this study) within the SCAG region have a higher proportion of disadvantage households and a higher percentage of essential workers. Household market of Non-Broadband Areas represent 6% of total households in the SCAG Region in 2045.

• Targeting Non-Broadband Areas (as defined in this study) will reduce VMT and GHG emissions associate with commuting by 1 - 2%. Upper bound benefit for entire region assuming employer telecommuting policies emulate policies during COVID-19 for non-essential workers is 15%. 
Conclusions 2

• Close coordination and collaborative planning is necessary to ensure transportation broadband strategies are successful at increasing availability and reducing broadband service costs.

• Increased telecommuting and other uses of broadband to reduce transportation demand depend on public and private policies and programs.

• More complete and detailed data on assets and demand—particularly geo-data—are needed to effectively focus public investment for the greatest impact on VMT and GHG reductions.
Next Steps

Conduct additional research, per “Further Study”

Build on recent state policy changes to promote broadband in transportation planning
  • Define the practice of including network infrastructure in planning
  • Identify means to promulgate the practice

Establish forums for collaboration between network companies and public officials
  • Focus on Development, Planning, and Public Works

Develop programs to increase telecommuting and transformation of essential jobs
  • Engage major employers and real estate developers
Questions and Input

Thank you for your input!