Transportation Broadband Strategies to Reduce VMT and GHG Emissions

Southern California Association of Governments

Magellan Advisors, LLC
DKS Associates

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.
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>3.043</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>

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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</tbody>
</table>

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>
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<tr>
<td>B: 2045 NBEI-SIPB</td>
<td>454,523,915</td>
<td>-1.00%</td>
<td>163,009</td>
<td>-0.89%</td>
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<td>C: 2045 NBEI-UBB</td>
<td>451,795,887</td>
<td>-1.61%</td>
<td>162,185</td>
<td>-1.43%</td>
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<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 Increase
- Daily VMT reductions between 4.6 million to 7.3 million (1 - 2%) CO₂
- 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)
- CO₂ 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