Environmental Justice Analysis of Goods Movement in Southern California

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Research & Analysis
Southern California Association of Governments

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Southern California Association of Governments (SCAG)
SCAG Quick Facts

- Nation’s largest Metropolitan Planning Organization (MPO)
- 6 counties and 191 cities
- 18 million people within 38,000+ square miles
- GDP in 2012: $890 Billion, 16th largest economy in the world
Overview

• Background
• Objectives
• Methodology
• Results
• Conclusions
SCAG’s 2012-2035 RTP/SCS

• Regional Transportation Plan (RTP)
• SB 375 - Nation’s first law to control greenhouse gas (GHG)
• Sustainable Communities Strategy (SCS)
• 2012-2035 RTP/SCS adopted on April 4, 2012
SCAG and Environmental Justice

• Title VI of the Civil Right Act of 1964

“No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.”
SCAG and Environmental Justice

- Title VI of the Civil Right Act of 1964
- Executive Order 12898
- DOT and FHWA Orders on EJ
- Other nondiscrimination requirements and guidance in support of Title VI
• Integration of the principles of Title VI into RTPs to address EJ

• EJ analysis to assess the impacts of RTP programs and projects on minority and low-income populations
Goods Movement in the SCAG Region

- Goods movement system development ➔ one of the key RTP strategies
- Largest international trade gateway in U.S.
- Domestic, regional and local goods movement activity
- Economic growth and expansion of international trade ➔ GM to serve market demand and to facilitate economic growth
Environmental Concerns and Strategies

• Continuing increases in truck volumes
  ➔ Increasing environmental concerns in the region

• Strategies to reduce the impacts of the regional goods movement system on the environment and public health

• Strategies to improve or mitigate any disproportionate impacts to minority and low-income populations
Research Objectives

• Spatial distributions of the minority and low-income populations (“EJ population groups”) adjacent to major truck corridors
• Estimate of truck emission intensity for areas near major truck corridors
• EJ concerns and issues from the goods movement system in the SCAG Region
Methodology
Methodology

- Identifying EJ Population Group
- Determining Buffer Distance Criteria
- Spatial Distribution of EJ Population Groups & Emission Intensity Estimates
Identifying EJ Population Groups

Minority:

• A person who is Black, Hispanic or Latino, Asian American, American Indian, Alaskan Native, Native Hawaiian and Other Pacific Islander

Low-Income:

• A person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines
Socioeconomic Indicators of EJ Population Groups

**Ethnic/Racial/Other Indicators:**
- White (NH), Hispanic (Latino), African-American, American Indian, Asian/Pacific Islander, Others
- Disabled, Age 65 and Above, Age 5 and Below

**Income Indicators:**
- Below Poverty Level
- Income Quintile
Concentration of EJ Population Groups

• Minority and low-income population is *concentrated* if the percentage of minority and low-income population of the affected area is "*meaningfully greater*" than the percentage of minority and low-income population in the general population. (EPA EJ Guidance)

• Comparative analysis between the share of EJ population groups near major truck corridors and the share in the regional level.
Determining Distance Criteria

- Buffer distance criteria
- Guidance and recommendations from various organizations
- 500 ft vs. 1,000 ft
- No significant difference between the two buffers
Residential Area-Weighted Interpolation

- Population estimates based on ratio of res. area in 500ft buffer to res. area in entire TAZ

\[ P_{buffer}^{t_{2008}} = P_{TAZ}^{t_{2008}} \times \left( \frac{RA_{buffer}^{t_{2008}}}{RA_{TAZ}^{t_{2008}}} \right) \]

where:

- \( P_{buffer}^{t_{2008}} \) = total population in buffer (2008)
- \( P_{TAZ}^{t_{2008}} \) = total population in TAZ (2008)
- \( RA_{buffer}^{t_{2008}} \) = total residential area in buffer (2008)
- \( RA_{TAZ}^{t_{2008}} \) = total residential area in TAZ (2008)
Emission Intensity Estimates

- SCAG Emission Impact Study

  - SCAG Model (4 veh. types / 5 time periods)
  - Emfac 2007 (13 veh. types / 24 time periods)
  - Results to Network Link
  - Assigned to TAZ level

- Running emission estimates for air pollutants (ROG, CO, CO₂, NOₓ, SO₂, PM₂.₅) for the year 2008 at TAZ level
• Total emissions of TAZ located within 500 feet from major truck corridors, normalized by total acreage of TAZ

• The emission data includes emissions from heavy-duty vehicles (LHDT1, LHDT2, MHDT, HHDT).

• Estimation of truck VMT share to better assess the impacts of truck movement.
Results
## Distribution of EJ Population Groups (Major Truck Corridors vs. SCAG Region)

<table>
<thead>
<tr>
<th>Ethnic/Racial /Other Indicators</th>
<th>500 ft from Major Truck Corridors</th>
<th>SCAG Region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2035</td>
</tr>
<tr>
<td>Hispanic</td>
<td>56.2%</td>
<td>64.8%</td>
</tr>
<tr>
<td>NH White</td>
<td>23.2%</td>
<td>15.5%</td>
</tr>
<tr>
<td>NH Black</td>
<td>7.3%</td>
<td>6.3%</td>
</tr>
<tr>
<td>NH NA</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>NH Asian</td>
<td>11.2%</td>
<td>11.1%</td>
</tr>
<tr>
<td>NH Others</td>
<td>1.7%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Age 65 &amp; Above</td>
<td>9.2%</td>
<td>15.1%</td>
</tr>
<tr>
<td>Age 5 &amp; Below</td>
<td>9.4%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Disabled</td>
<td>9.2%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>
Distribution of EJ Population Groups (Major Truck Corridors vs. SCAG Region)

<table>
<thead>
<tr>
<th>Income Indicators</th>
<th>500 ft from Major Truck Corridors</th>
<th>SCAG Region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2035</td>
</tr>
<tr>
<td>Poverty 1*</td>
<td>15.7%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Poverty 2*</td>
<td>9.9%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Poverty 3*</td>
<td>9.4%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Quintile 1</td>
<td>21.5%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>22.5%</td>
<td>22.0%</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>21.8%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>19.6%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>14.7%</td>
<td>15.3%</td>
</tr>
</tbody>
</table>
Distribution of EJ Population Groups (Major Truck Corridors vs. SCAG Region)

- Higher share of most EJ population groups within 500 feet from major truck corridors than regional average
- High concentration of EJ population groups living nearby major truck corridors
## Truck Emission Intensity (2008)

<table>
<thead>
<tr>
<th>Emission Factors</th>
<th>Truck Emission Intensity (gram/year/acre)</th>
<th>Truck Emission Intensity Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Major Truck Corridors</td>
<td>Other Freeways</td>
</tr>
<tr>
<td>ROG</td>
<td>1.70 (34%)</td>
<td>0.66 (24%)</td>
</tr>
<tr>
<td>CO</td>
<td>11.29 (12%)</td>
<td>5.17 (9%)</td>
</tr>
<tr>
<td>CO₂</td>
<td>2,808.29 (24%)</td>
<td>1,187.55 (16%)</td>
</tr>
<tr>
<td>NOₓ</td>
<td>22.49 (75%)</td>
<td>8.52 (64%)</td>
</tr>
<tr>
<td>SO₂</td>
<td>0.03 (23%)</td>
<td>0.01 (16%)</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>0.84 (75%)</td>
<td>0.29 (61%)</td>
</tr>
</tbody>
</table>

*(Numbers in parenthesis indicate percentage out of total emission intensity.)*
## Share of Truck VMT (2008)

<table>
<thead>
<tr>
<th>Major Truck Corridors</th>
<th>Length (mi.)</th>
<th>Total VMT (thousands)</th>
<th>Truck VMT (thousands)</th>
<th>Share of Truck VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,810</td>
<td>124,940</td>
<td>15,693</td>
<td>12.6%</td>
</tr>
<tr>
<td></td>
<td>(26%)</td>
<td>(49%)</td>
<td>(63%)</td>
<td></td>
</tr>
<tr>
<td>Other Freeways</td>
<td>5,210</td>
<td>131,240</td>
<td>9,207</td>
<td>7.0%</td>
</tr>
<tr>
<td></td>
<td>(74%)</td>
<td>(51%)</td>
<td>(37%)</td>
<td></td>
</tr>
<tr>
<td>Entire Freeways</td>
<td>7,020</td>
<td>256,180</td>
<td>24,901</td>
<td>9.7%</td>
</tr>
</tbody>
</table>
Truck Emission Intensity
(Major Truck Corridors vs. Region)

- Higher emission intensity within 500ft buffer from major truck corridors than regional level
- High truck movements on major truck corridors than regional level
- More adverse truck-related environmental impacts on areas adjacent to truck corridors
Conclusions
Conclusions

• High concentration of the EJ pop. groups living near major truck corridors
• High truck emission intensity within areas adjacent to major truck corridors
• EJ population groups highly exposed to high and adverse human health/environmental effects from goods movement system
• Potential disproportionately high and adverse human health or environmental effects on the EJ population groups from the goods movement system
• Further analysis is needed.
Areas for Future Research

- Racial/ethnic majority in the SCAG Region
- Additional data and analysis is needed to understand the future environmental justice impacts of other goods movement system such as rail and ports
- EJ impacts on policy, e.g. shifting portions of truck traffic to rail
Thank you!

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