California VMT Model Spatial Variables

Center for Neighborhood Technology
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VMT Model for an Infill Index

- The Center for Neighborhood Technology (CNT) previously developed a vehicle miles traveled (VMT) model for CA based on the statewide travel survey.
- This presentation details the methods and factors we are using to update the model as the basis of a VMT performance-based infill index for CA.
- While the data used to calibrate the model were based on the location of the home of each survey respondent, for developing the infill index the census block centroids will be used as the location.
- Using the new AllTransit update and the 2017 5-year ACS, and the most recent LEHD (2015) the spatial variables are updated and then put into the part of the model that depends on location.
- Then that output is normalized between 0-100 (0 being the most VMT and 100 the least) that will form the basis for the index.
The spatial variables for the VMT model are:

- **Location Efficiency**
  - Employment Density – Density of jobs recorded in LEHD within a half mile of the household. (Expressed as jobs / acre)
  - Transit Availability – The number of transit vehicle runs (in each direction) stopping within a half mile of the household in a typical week
  - (Neighborhood Commute Distance – Weighted average of median commute block group distances within a half mile of the household – was included in the previous version of the model, but is excluded from this version as explained below).

- (Regional Context – was included in the previous version of the model, but is excluded from this version as explained below.
  - Rural Area Areas – eligible for housing assistance from the USDA
  - Metro Region – Non-Rural Areas composed of U.S. Census Urban Areas with a municipality of at least 150,000 residents who, on average, can reach at least 90,000 jobs in a half-hour on transit.
  - Small City – All non-Rural Areas that do not qualify as Metro Regions)
Employment Density

• Density of jobs recorded in LEHD within a half mile of the household. (Expressed as jobs / acre)
Employment Density
Employment Density

Redding

- Counties

Job Density (Jobs/Acre)
- 0 - 2
- 2 - 6
- 6 - 12
- 12 - 22
- 22 - 39
- 39 - 69
- 69 - 126
- 126 - 218
- 218 - 356
- 356 - 524
Employment Density
Employment Density
Transit Availability

• The number of transit vehicle runs (in each direction) stopping within a half mile of the household in a typical week.
Transit Availability

[Map of California showing transit availability]

- Counties
- Transit Routes
- Trips per Week
  - None
  - 0 - 1200
  - 1200 - 4500
  - 4500 - 11000
  - 11000 - 30000
  - 30000 or more

[Map legend and scale]
Transit Availability
Transit Availability
Neighborhood Commute Distance and Regional Context

• Neighborhood Commute Distance was considered, but excluded from VMT performance in this model for the following reasons:
  • Often the variable cannot be calculated because of low number of commuters.
  • While this variables is partly a locational variable, it also has a large component of household choice.

• A Regional Context dummy variable used in the VMT model was also excluded from the VMT index
VMT Spatial Index without Commute Distance and Regional Context Dummy Variable

• Run the part of the model that includes these variables (see highlighted elements for model table on next slide – note the variables and interactions that are dropped in this index are highlighted in grey)

• Then set up a scoring system that gives each block a score.

• Since there are some variables that interact with the demographics of the household and the day of the week sampled – the model will assume two adults, 52 Saturdays and Sundays with the rest of the 261 days as weekdays.

• In the following maps and graphs this is referred to as VMT Index
<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Type</th>
<th>Parameter</th>
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<tbody>
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<tr>
<td>Moderate Income (MI)</td>
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Regional Context

• As explained earlier, the Regional Context Dummy Variable was excluded from the VMT Index, but following is more context about the variable

• Rural Area Areas – eligible for housing assistance from the USDA

• Metro Region – Non-Rural Areas composed of U.S. Census Urban Areas with a municipality of at least 150,000 residents who, on average, can reach at least 90,000 jobs in a half-hour on transit.

• Small City – All non-Rural Areas that do not qualify as Metro Regions

• In running these criteria on current data, the scope changes some, the biggest change is the addition of the Fresno urbanized area to the metro region from small city. Other changes do not result in adding new urbanized areas. The next slide has a list of the cities that meet the criteria.
## Cities Meeting the Metro Criteria

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<td>Los Angeles</td>
<td>4,367,693</td>
<td>489,586</td>
<td>Irvine</td>
<td>283,205</td>
<td>196,477</td>
<td>Santa Clara</td>
<td>178,620</td>
<td>353,870</td>
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<td>San Diego</td>
<td>1,464,495</td>
<td>144,863</td>
<td>Glendale</td>
<td>238,572</td>
<td>499,014</td>
<td>South Gate</td>
<td>172,775</td>
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<td>San Jose</td>
<td>1,153,823</td>
<td>220,251</td>
<td>Huntington Beach</td>
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<td>139,035</td>
<td>Daly City</td>
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<td>San Francisco</td>
<td>890,402</td>
<td>653,730</td>
<td>Hayward</td>
<td>222,391</td>
<td>118,211</td>
<td>East Los Angeles</td>
<td>166,951</td>
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<td>Sacramento</td>
<td>575,871</td>
<td>161,582</td>
<td>Torrance</td>
<td>217,652</td>
<td>224,996</td>
<td>Downey</td>
<td>165,948</td>
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<td>198,165</td>
<td>Fullerton</td>
<td>206,764</td>
<td>183,104</td>
<td>Inglewood</td>
<td>164,978</td>
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<td>Fresno</td>
<td>498,885</td>
<td>90,539</td>
<td>Pasadena</td>
<td>202,032</td>
<td>248,166</td>
<td>Concord</td>
<td>164,032</td>
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<td>Oakland</td>
<td>484,329</td>
<td>389,249</td>
<td>Orange</td>
<td>197,817</td>
<td>241,752</td>
<td>Westminster</td>
<td>163,601</td>
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<td>Anaheim</td>
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<td>241,786</td>
<td>Sunnyvale</td>
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<td>349,866</td>
<td>Costa Mesa</td>
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<td>Santa Ana</td>
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<td>403,380</td>
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<td>El Monte</td>
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<td>Garden Grove</td>
<td>292,886</td>
<td>277,667</td>
<td>Richmond</td>
<td>183,603</td>
<td>128,165</td>
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</tbody>
</table>
Regional Context
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Socioeconomic Factor Indicators
Similar to CalEnviroScreen 3.0
Using 2017 5-year ACS Data
At the Block Group Geography

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CalEnviroScreen uses the following Socioeconomic Factor Indicators:

• Five Indicators:
  • Educational Attainment – percent of the population over age 25 with less than a high school education. (ACS 2017)
  • Housing Burden – percent of households in a census tract that are both low income (making less than 80% of their county's median family income) and severely burdened by housing costs (paying greater than 50% of their income for housing costs). (CHAS 2016)
  • Linguistic Isolation – percent of limited speaking households, which are households where no one over age 14 speaks English well. (ACS 2017)
  • Poverty and – percent of the population with incomes less than two times the federal poverty level. (ACS 2017)
  • Unemployment – percent of the population over the age of 16 that is unemployed and eligible for the labor force. (ACS 2017)

• A percentile is assigned for each of these indicators—essentially indexing the values
• All five indicators are then averaged
• CNT has repeated this for all the block groups in California (except for the Housing Burden which is only at the tract level, but then we assign the tract value to its constituent block groups)
Example: Percentages and Percentiles in the Los Angeles Area
Example: Average of Five Socioeconomic Factors in Los Angeles Area—Educational Attainment, Housing Burden, Linguistic Isolation, Poverty and Unemployment
Average of Five Socioeconomic Factors Statewide and Focus Cities — Educational Attainment, Housing Burden, Linguistic Isolation, Poverty and Unemployment
CalEnviroScreen does not use Race and/or Ethnicity

Because race and ethnicity are important equity factors, CNT has looked at three more indicators. We have not averaged these the with the other socioeconomic factors above:

- **Hispanic** – percent of the population self identified as Hispanic/Latino. (ACS 2017)
- **Black** – percent of the population self identified as Black or African American but not as Hispanic/Latino. (ACS 2017)
- **Minority** – percent of the population self identified as Hispanic/Latino, or not as White alone. (ACS 2017)

We also assigned a percentile for each of these indicators.
Example: Race and Ethnicity in the Los Angeles Area—Three Indicators
Hispanic/Latino – Percentile

Los Angeles
% Hispanic
By Census Block Group
0% - 2.5%
2.5% - 5%
5% - 10%
10% - 15%
15% - 20%
20% - 26%
20% - 36%
30% - 35%
35% - 50%
50% - 75%
75% - 100%

Los Angeles
Percentile Hispanic
By Census Block Group
0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100

Hispanic/Latino – Percentage
Minority – Percentage

Minority – Percentile
Percentile of Minority Residents Statewide and Focus Cities—Percent of the population self identified as Hispanic/Latino, or not as white alone.
Modeled VMT for Two “Control” Households

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Case Studies of Four Municipalities

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