Pueblo Colorado MPO Travel Model

CHICAGO AREA MODEL USERS GROUP
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Outline of the Presentation

- A look at Pueblo
- Four-step model framework.
- TAZ and highway network
- Forecasting the socioeconomic data.
- Straightforward “dashboard” type model with quick learning curve.
- Model work completed in one year including model development, future year scenario, methodology and user guide.
- Framework for the integration of emerging Colorado statewide model components to the PACOG model.
Altitude: 4,692 feet

Arkansas River (W to E) runs through Pueblo
Overview of PACOG Region

- Population of 165,000 persons in 2016.
- The MPO is Pueblo Area Council of Governments (PACOG)
- The MPO extent is 2,400 square miles – all of Pueblo County
Pueblo Colorado PACOG Model

- 214 TAZ
- Used the Front Range Household Survey 2010
- Trip Generation – cross classified Household size (5 categories by income (4 categories).
- Mode Choice – auto-driven, no transit network or skims. Uses auto occupancy from the HHTS.
- Assignment – standard equilibrium assignment with BPR function based on time - 100 global iteration maximum and a global convergence criteria of .001 on link segment time.
Four-step model framework.
Map of Pueblo Colorado (TAZ)
Highway Network

- Six functional classifications + centroid connectors
- Attributes include FC, area type, # of lanes, posted speed, congested speed, capacity, AADT
Front Range household survey

- Collected in 2010
- 989 households collected
- Used to prepare cross classification trip generation rates for by size and income
- Used to calibrate trip distribution
Forecasting the SE data

PACOG provided significant assistance

- Prepared the ACS (U.S. Census) conversion to PACOG TAZ system for 2010
- Obtained and cleaned the employment data - Colorado 2010 Quarterly Census of Employment & Wages (QCEW) and used this point data to establish 2010 employment at the zonal level in the study area.
- Conducted all the forecast work including getting buy-in from regional leadership and citizen base.

<table>
<thead>
<tr>
<th>Employment Category</th>
<th>NAICS Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC</td>
<td>&lt;= 425120</td>
</tr>
<tr>
<td>RETAIL</td>
<td>441110 - 454390</td>
</tr>
<tr>
<td>SERVICE</td>
<td>481111 - 814110</td>
</tr>
<tr>
<td>GOVERNMENT</td>
<td>&gt; 814110</td>
</tr>
</tbody>
</table>
Approach to transit, trucks and time of day periods

- Transit – used bus stops per TAZ as a surrogate for transit use; applied a .997 to .999 factor to person trips for TAZs with at least one bus stop.
- Trucks – included in the trip generation and distribution step, unvalidated.
- Three time periods: 1 hour AM, one hour PM, 22 hour off peak
Approach to externals
Software

- Historically (1970s) the PACOG model was UTPS
- By the 1980s it migrated to MinUTP
- Converted to TransCAD by 2002 – with Fortran call for trip generation
- Latest update inserted TransCAD module for trip generation.

TransCAD Version 6.0 used
Validation used AADT
Screenline with validation
All highway links with validation

<table>
<thead>
<tr>
<th>Volume Range (Two-Way)</th>
<th>Volume Range ID</th>
<th>Number of Observations</th>
<th>Observed VMT</th>
<th>Model VMT</th>
<th>Difference</th>
<th>% Difference</th>
<th>% Root Mean Square Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5,000</td>
<td>1</td>
<td>173</td>
<td>195,486</td>
<td>220,050</td>
<td>24,564</td>
<td>12.6%</td>
<td>127</td>
</tr>
<tr>
<td>5,000-10,000</td>
<td>2</td>
<td>118</td>
<td>262,499</td>
<td>266,895</td>
<td>4,396</td>
<td>1.7%</td>
<td>125</td>
</tr>
<tr>
<td>10,000-20,000</td>
<td>3</td>
<td>94</td>
<td>508,338</td>
<td>490,152</td>
<td>(18,186)</td>
<td>-3.6%</td>
<td>29</td>
</tr>
<tr>
<td>20,000-30,000</td>
<td>4</td>
<td>35</td>
<td>202,893</td>
<td>180,735</td>
<td>(22,158)</td>
<td>-10.9%</td>
<td>16</td>
</tr>
<tr>
<td>30,000-40,000</td>
<td>5</td>
<td>11</td>
<td>76,959</td>
<td>58,453</td>
<td>(18,506)</td>
<td>-24.0%</td>
<td>27</td>
</tr>
<tr>
<td>40,000-50,000</td>
<td>6</td>
<td>4</td>
<td>32,015</td>
<td>28,774</td>
<td>(3,241)</td>
<td>-10.1%</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td>435</td>
<td>1,278,190</td>
<td>1,245,059</td>
<td>(33,131)</td>
<td>-2.6%</td>
<td>64</td>
</tr>
</tbody>
</table>
Straightforward “dashboard” type model with quick learning curve

GUI with 4 tabs, scenario builder, model step breakout, ability to look at SE data, & parameter settings

Maps and reports feature – generate and save
Model needed for Long Range Planning
# Timeline of model development

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kickoff</strong></td>
<td>April 2014</td>
<td>HH survey ready, previous model at hand, work plan in place for team</td>
</tr>
<tr>
<td><strong>Problem Solving</strong></td>
<td>August 2014</td>
<td>network capacity calculation, employment data cleaning, traffic count collection &amp; prep</td>
</tr>
<tr>
<td><strong>2010 validation and 2040 NB complete</strong></td>
<td>April 2015</td>
<td></td>
</tr>
<tr>
<td><strong>LRP drafted</strong></td>
<td>Summer 2015</td>
<td>LRP drafted, completed December 2015</td>
</tr>
</tbody>
</table>
Summary

- “Right-sized” models are of high value to small and medium sized MPOs.
- Add detail where the MPO needs it: TAZ resolution, excellent SAF and employment data cleaning, good network assignment visuals.
- Budget and schedule are manageable.
- Staying with a standard four-step model structure provides ease in set-up and completion
  - Well-studied components.
  - National targets for guidance