Modeling Guidelines and Procedures for Medium-Sized Urban Areas in North Carolina

North Carolina Model Users Group Meeting
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Background

North Carolina Profile

- 17 MPOs, 10 with population < 250,000
- 20 Rural Planning Organizations
- 1959 GS 136-66.2
- 2001 revisions were made to GS 136-66.2
Current Challenges

- Changing workforce
- Changes in scope and responsibility
- Loss of experienced, knowledgeable staff leading to an erosion of modeling skills and loss of institutional knowledge in modeling practice
NCDOT’s Efforts

- Broad scale effort to improve travel forecasting tools in NC
- Sponsored research to develop best practice guidelines for planning analysis tools (Tier 1 and 2 communities)
- Contracted with PB to develop standard modeling guidelines and procedures (Tier 3 communities)
Outline

- North Carolina Combined Survey Database
- Model Structure
- Traditional Approach vs. Key Features of New Approach
- Graphical User Interface
- Benefits
Combined Survey Database

- Household travel survey data from 3 MPOs across North Carolina
- Used to develop default rates and parameters
  - Household disaggregate curves
  - Production and attraction rates
  - Initial gamma coefficients
  - Mode split factors
  - Vehicle occupancy factors
  - Time of day distribution
- Starting point for communities with no observed travel survey data
Model Structure

- Highway Networks
- Level-of-Service Matrices (skims)
- Zonal Demographics & Land Use Data
- Trip Generation
- Trip Distribution
- Mode Choice
- Time of Day
- Trip Assignment
- Commercial Vehicles and External Station Analysis
## Traditional Approach vs. New Approach

<table>
<thead>
<tr>
<th>Component</th>
<th>Traditional Approach</th>
<th>New Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Collection</td>
<td>100% field inventory</td>
<td>Census data, Private vendor data</td>
</tr>
<tr>
<td>Highway Network</td>
<td>No standard approach</td>
<td>Minimum required attributes</td>
</tr>
<tr>
<td>Rates and Parameters</td>
<td>Borrowed from other areas</td>
<td>Default rates derived from combined survey database</td>
</tr>
<tr>
<td>Trip generation</td>
<td>3 trip purposes, Productions by 5 dwelling unit classes, Attractions by 5 employment types, Vehicle trips</td>
<td>5 trip purposes, Productions by household size and auto ownership (20 classes), Attractions by 5 employment types, Person trips</td>
</tr>
</tbody>
</table>
# Traditional Approach vs. New Approach

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| Trip distribution  | ▪ Friction factor table
▪ Impedance = initial travel time                                                      | ▪ Gamma function
▪ Impedance = generalized cost                                                        |
| Mode Split         | ▪ No mode split step                                                                  | ▪ Mode factors applied to person trip tables                                   |
| Commercial vehicles| ▪ Trip rate applied to total commercial vehicles per zone
▪ CV trips combined with NHB trips for distribution                                      | ▪ Separate production and attraction equations for 3 classes of CV
▪ 3 classes maintained through time of day                                              |
## Traditional Approach vs. New Approach

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<tr>
<td>Time of day</td>
<td>▪ Daily model</td>
<td>▪ AM, Midday, PM, and Off Peak time periods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Vehicle occupancy factors</td>
</tr>
<tr>
<td>Highway assignment</td>
<td>▪ Primarily all-or-nothing</td>
<td>▪ Time period equilibrium assignment using a conical delay function</td>
</tr>
<tr>
<td>Validation and Reasonableness</td>
<td>▪ Primarily performed at highway assignment using screenline and coverage counts</td>
<td>▪ Reasonableness checks at each step in the process using secondary sources of data</td>
</tr>
</tbody>
</table>
Graphical User Interface
Overall benefits

- Streamlines and standardizes model development
- Moves NCDOT towards current best practice
- Provides basis for training
- Adaptable to future enhancements
- Rates and parameters based on North Carolina data