A New Approach for Trip Generation Estimation for TIA

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Transport Impact Assessment (TIA)

- Generally a short range transport planning activity
- Assess transport impacts of new developments or expansions
- Present solutions to mitigate impacts
Problems with TIA Process

- Inaccuracies and variability in trip estimation due to data availability and quality:
  - Private vehicles focus (i.e. Veh Trip Ends)
  - Proxy variables (e.g. 100sqm GFA)
  - Trip generation rates (e.g. VTE/proxy)
  - Little info/guidance on trip chaining effects
  - Little info/guidance on non-PV modes

- Requires significant professional judgment

Long Range Transport Planning: treatment of Trip Generation

- Meaningful land use and trip generation relationships developed
- Methods include:
  - Land-area trip rate
  - Regression analysis
  - Cross classification
- Explanatory variables reflect:
  - Household attributes
  - Built environment characteristics
  - Land use patterns
Long Range Transport Planning: treatment of Modal Split

- Person trips assigned to available modes
- Modelling predominantly uses Utility Maximisation Approach e.g.
  - Logit
  - Probit
  - Multiple Regression Analysis
- Explanatory variables reflect:
  - Trip characteristics
  - Socioeconomic/demographic characteristics
  - Urban form

Literature: treatment of Trip Chaining

- Multiple Regression Analysis model structure
- Explanatory variables reflect:
  - Socioeconomic/demographic characteristics
  - Urban form
Literature: Trip Chaining influences

Trip Generation ↓

Trip Chaining ↑

Mode Choice

Private Vehicles ↑
Public Transport ↓

Methodology to Improve TIA
Trip Generation Estimation

• Recognise importance of Development’s surrounding urban form

• Adopt similar TG approach to long range studies with enhanced explanatory variables:
  ➢ Trip characteristics
  ➢ Socioeconomic/demographic characteristics
  ➢ Urban form
Methodology to Improve TIA Trip Generation Estimation

- Adopt Multiple Regression Analysis model structure

\[ TG = \sum_{i=1}^{n} c_i IV_i + \varepsilon \]

- Where we have \( n \) explanatory variables \( IV \)

Improved TIA Trip Generation Estimation: Child Care Centres

- A suitable development type (land use) selected for proof-of-concept pilot study

- Long Day Care Child Care Centre (CCC)
  - Located in many different suburb forms
  - Increasingly relevant land use
  - Complex trip generation characteristics
Improved TIA Trip Generation Estimation: Child Care Centres

- Explanatory variables chosen from those cited mostly in literature for long range studies
  - Sourced from Census data and cartographic sources
- Dependent variables chosen for pilot model calibration
  - Captured from survey of CCCs

Improved TIA TG Estimation: CCC Demographic Variables

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted average household size</td>
<td>Number of HH heads affects trip chains Presence of children increases tour complexity</td>
</tr>
<tr>
<td>Weighted average age</td>
<td>Trip chaining peaks between 45 and 54 Younger, older people tend to make less complex tours</td>
</tr>
<tr>
<td>Gender ratio</td>
<td>Women tend to make more complex tours</td>
</tr>
</tbody>
</table>
### Improved TIA TG Estimation: CCC Socioeconomic Variables

<table>
<thead>
<tr>
<th>Socioeconomic Variable</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average household income</td>
<td>Higher income HHs have more complex tours</td>
</tr>
<tr>
<td>Employment rate (employed/unemployed)</td>
<td>Employment positively associated with numbers of stops (chaining)</td>
</tr>
<tr>
<td>Average car ownership</td>
<td>Associated with more complex tours</td>
</tr>
</tbody>
</table>

### Improved TIA TG Estimation: CCC Urban Form Variables

<table>
<thead>
<tr>
<th>Urban Form Variable</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use density ratio (residential/non-residential density)</td>
<td>Metropolitan area residents more likely to make more complex tours</td>
</tr>
<tr>
<td>Average distance to transit</td>
<td>Neighbourhood accessibility tends to decrease tour compexity</td>
</tr>
</tbody>
</table>
Improved TIA TG Estimation: CCC Dependent Variables Capture

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Acquisition Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip generation</td>
<td>Driveway-style traffic count</td>
</tr>
<tr>
<td>Mode split</td>
<td>Questionnaire (staff and customers)</td>
</tr>
<tr>
<td>Trip chaining</td>
<td>Questionnaire (staff and customers)</td>
</tr>
<tr>
<td>General information e.g. families, GFA</td>
<td>Centre Director</td>
</tr>
</tbody>
</table>

Improved TIA TG Estimation: CCC Pilot Survey

- 2 pilot surveys in Brisbane
  - Indooroopilly (Zone 2; medium density urban)
  - Pullenvale (Zone 4; low density semi-rural)
Improved TIA TG Estimation: CCC Pilot Survey

- Morning peak period surveyed
- Low response rates
  - 20 responses
  - 8% to 15%
  - Not atypical for a time-poor target market
- Results:
  - Morning peak period – 7:30 to 9:00 am
  - 64% chained trips
  - 83% private vehicle

Conclusion

- Questionnaire found able to capture trip chaining and modal split data to acceptable level
- More centres within a suburb should be surveyed:
  - to capture more comprehensive trip chaining and mode choice data
  - to achieve statistical significance
With Thanks

- Goodstart Early Learning Centre, Indooroopilly
- Goodstart Early Learning Centre, Pullenvale