Data Needs for DTA as Applied to a Managed Lane Procedure

presented to Model Task Force

presented by Michael W Doherty

Date: Wednesday, June 19th, 2013

Data Needs for DTA

• All managers ask this series of questions when addressing a spending plan or budget for a needed project.
  – Who?
  – What?
  – Where?
  – When?
  – Why?
  – How much?
Data Needs for DTA

The Who and Why

The Where

Figure 1-1. Decision-making framework for tolling and pricing projects.

Figure 1. Forecasting tools by stage of project development.
Dynamic Traffic Assignment models

- Explicit model traffic flow dynamics to ensure direct linkage between travel-time and congestion
- Is best-suited to analyze either
  - Traffic congestion effects at a fine-grained temporal level
  - The many measures that can be taken to address congestion
    - HOV, HOT
    - Peak Spreading
    - Congestion pricing

Data Needs for DTA

Generic DTA Structure
Data Needs for DTA

The What

DTA Data needs

- O-D demand data
- Network data
- Traffic Control data
- Scenario data
- Model Validation and Calibration data
- Survey data

• Demand Data
  – Origin-Destination Trip Tables from a existing model
    • Tables should be broken into different periods of the day
      – AM peak, PM peak and Off-peak (Midday, Night)
    • Tables need to maintain the directionality of O-D trips
    • For each period, the Tables need to contain sub-tables by Vehicle class (SOV, HOV, Light Truck, Heavy Truck) by Choice (Toll, Free)
Data Needs for DTA

• Network Data
  – Existing network can be used as a starting point
  – Additional detail needed
    • Number of lanes on each link
    • Acceleration/Deceleration lanes
    • Turn Bays
    • Aux Lanes
    • Defining Allowed and Prohibited Lane movements
    • More Accurate Geography
      – Distances
      – Zone connectors at real physical roadways

Data Needs for DTA

• Traffic Control data
  – Signal timing
    • Fixed
    • Actuated
  – Ramp Meter control
  – Standard Uncontrolled Intersections
    • All-way Stop
    • Two-way Stop
    • Roundabouts
    • Freeway merges, Yield signs
Data Needs for DTA

• Scenario data
  – Parameters used for application of interest
  – Link/segment traffic flow parameters
  – Capacities / Performance functions
  – O-D adjustments
  – Route choice model parameters
  – Historical network travel times

Data Needs for DTA

• Model Validation and Calibration data
  – Vehicle counts by lane (detector location)
  – Average vehicle speeds (detector location)
  – Average link/segment density
  – Queue lengths
  – Link or sub-route travel times
  – Intersection turning movement counts
  – Data collection interval must be compatible with the desired modeling time interval in the above data

Example: hourly variations in demand & network performance, then hourly data should be collected.
**Data Needs for DTA**

Count Collection Locations based on a 10 mile Project Corridor

13 ITS locations, (Red Star)
24 Intersection locations, (Blue Star)

---

**Data Needs for DTA**

Survey and Data Collection Needs

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Household Interview</th>
<th>Origin-Destination</th>
<th>Stated Preference</th>
<th>Opinion</th>
<th>Highway Speed</th>
<th>Traffic Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory Screening</td>
<td>⭐️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Erforderungen</td>
</tr>
<tr>
<td>Preliminary Feasibility</td>
<td>⭐️ ⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>Erforderungen</td>
</tr>
<tr>
<td>Feasibility Evaluation</td>
<td>⭐️ ⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>Erforderungen</td>
</tr>
<tr>
<td>Investment Grade</td>
<td>⭐️ ⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>⭕️</td>
<td>Erforderungen</td>
</tr>
</tbody>
</table>
## Data Needs for DTA

### When, How Much?

<table>
<thead>
<tr>
<th>Traffic Count Collection (Duration: 1 Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
</tr>
<tr>
<td>ITS Locations</td>
</tr>
<tr>
<td>Intersection Locations</td>
</tr>
<tr>
<td>Traffic Count Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surveys (Duration: 9 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
</tr>
<tr>
<td>• Travel Pattern Surveys (&quot;Revealed Preferences&quot;) :</td>
</tr>
<tr>
<td>— Household-Based Travel/Activity Surveys</td>
</tr>
<tr>
<td>— Origin-Destination Surveys on specific facilities and existing toll roads</td>
</tr>
<tr>
<td>• Stated Preference Surveys that vary significantly across the following dimensions:</td>
</tr>
<tr>
<td>— Choice Dimensions and Scenario Design</td>
</tr>
<tr>
<td>— Trip Attributes Relevant for Pricing Studies (VOT, VOR)</td>
</tr>
<tr>
<td>— Choice Context</td>
</tr>
<tr>
<td>— Instrument Design</td>
</tr>
<tr>
<td>— Sampling</td>
</tr>
<tr>
<td>• Special Survey Types including:</td>
</tr>
<tr>
<td>— Surveys of Commercial Vehicles</td>
</tr>
<tr>
<td>— Surveys of Visitor Vehicles</td>
</tr>
<tr>
<td>— Bluetooth Surveys (O-D Patterns, Speeds)</td>
</tr>
<tr>
<td>Survey Total</td>
</tr>
</tbody>
</table>

### Questions?

![Question Mark Image]