Lesson 11

Analytical Tools

Methods
Learning Outcomes

- Identify analytical tools and methods that are available to support the coordination of transportation and land use
- Compare the strengths and limitations of the various tools and methods
- Critique the assumptions underlying the methods
- Match planning activities with appropriate analytical tools
Lesson 11:
Analytical Tools & Methods

11.1 Travel Demand Forecasting Models
11.2 Land Use Allocation Models and Methods
11.3 Scenario Planning Tools
11.4 Other Tools and Methods
Travel Demand Forecasting Models

- Traffic Analysis Zone (TAZ)
- Transportation Network

1,250 households
1,575 jobs
Basic Modeling Steps

Urban Activity → Trip Generation

Highway and Transit Networks

Trip Generation → Trip Distribution

Trip Distribution → Mode Usage

Mode Usage

Highway Assignment

Transit Assignment
Models in Common Practice

- CUBE Voyager (Citilabs) – also TP+/VIPER, TRANPLAN
- EMME/2 (INRO)
- TransCAD (Caliper)
- VISUM (PTV America)
Micro-Scale Modeling

- More detailed model structure (subarea modeling)
- Walk and bike modes in mode choice model
- “Pedestrian Environment Factor” (Portland)
  - Extent of sidewalks
  - Ease of street crossings
  - Connectivity of street/sidewalk system
  - Terrain
Lesson 11: Analytical Tools & Methods

11.1 Travel Demand Forecasting Models
11.2 Land Use Allocation Models and Methods
11.3 Scenario Planning Tools
11.4 Other Tools and Methods
Range of Land Use Allocation Methods

- Qualitative methods
  - Delphi/expert panel approach
- Simplified and rules-based quantitative models
  - Accessibility-based
  - Proximity-based
- Complex land use models and integrated models
Expert Panel and “Delphi” Techniques

- Qualitative approach based on expert judgment
  - Local planners and economic development officials
  - Local developers and real estate analysts
  - Academics

- Multi-step feedback
  - Start with independent assessments
  - Allow panel to comment on forecasts and revise their own based on others’ input
Rules-Based Models

- Allocate land uses based on factors such as transportation accessibility or proximity, available land, and other measures of development suitability and attractiveness

- Examples
  - UPLAN
  - What-If
  - Treasure Valley
Rules-Based Method

Population & Employment Growth

Land Consumption Conversion Factors

Land Consumption

GIS Allocation to Preferred Growth Areas

Map of Future Development Pattern
Complex Land Use Models

- Operate at regional level
- Designed to interface with travel demand model
- Commonly used for baseline projections
  - Example – DRAM-EMPAL & successors
  - Generally incorporate transportation accessibility
- More sophisticated models
  - Examples – UrbanSim, MEPLAN, PECAS
  - May incorporate additional land use policy variables, economic underpinning, disaggregate behavior
11.1 Travel Demand Forecasting Models

11.2 Land Use Allocation Models and Methods

11.3 Scenario Planning Tools

11.4 Other Tools and Methods
Scenario Planning Tools – Uses

- Develop indicators of the impact of development patterns
  - Community
  - Environment
  - Transportation
- Facilitate land use scenario development
- Visualize development patterns
Scenario Development
Sacramento, CA (PLACE3S model)

Source: Sacramento Area Council of Governments
# Commonly-Used Scenario Planning Tools

<table>
<thead>
<tr>
<th>Model</th>
<th>Community Impact Indicators</th>
<th>Land Use Scenario Development</th>
<th>Visualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>INEX</td>
<td>◆</td>
<td></td>
<td>Mapping</td>
</tr>
<tr>
<td>Smart Growth INEX</td>
<td>◆</td>
<td></td>
<td>Mapping</td>
</tr>
<tr>
<td>Paint the Town/ Paint the Region</td>
<td>◆</td>
<td>◆</td>
<td>Photos/ simulations</td>
</tr>
<tr>
<td>PLACE3S</td>
<td>◆</td>
<td></td>
<td>Photos/ simulations</td>
</tr>
<tr>
<td>CommunityViz</td>
<td>◆</td>
<td>◆</td>
<td>3-D/Dynamic</td>
</tr>
<tr>
<td>CorPlan</td>
<td>◆</td>
<td>◆</td>
<td>Photos/ simulations</td>
</tr>
<tr>
<td>MetroQuest</td>
<td>◆</td>
<td></td>
<td>Photos/ simulations</td>
</tr>
<tr>
<td>What-If?</td>
<td>◆</td>
<td></td>
<td>Mapping</td>
</tr>
</tbody>
</table>
Lesson 11: Analytical Tools & Methods

- 11.1 Travel Demand Forecasting Models
- 11.2 Land Use Allocation Models and Methods
- 11.3 Scenario Planning Tools
- 11.4 Other Tools and Methods
Other Tools and Methods

- Traffic simulation models
- Visualization techniques
- Economic analysis
- Fiscal impact analysis
- Infrastructure cost models
- Environmental models
Traffic Simulation Models - Uses

- Measure localized impacts of development on traffic congestion
- Test alternative intersection, corridor, and subarea network designs
Traffic Simulation Models - Uses

- Can test movements that cannot be analyzed using regional 4-step models
- 3D animation of movements and queue lengths
Visualization Tools

Methods
- Photo-simulation
- 3-D visualization (static and dynamic)
- Visual preference surveys

Software
- Photoshop
- Sketch-Up
- VRML/X3D
- Quick Time
- ArcView 3D Analyst
- Site Builder 3D
- Scenario 360
Traditonal Artist Rendering

Source: Glatting Jackson
Digital Rendering

Source: McCormick Taylor
Data-Driven Rendering

Source: McCormick Taylor
3-D Visualization and Animation

- 3-D models driven by 2-D maps

Source: Orton Family Foundation
NHI-137022
CORSIM Traffic Simulation Model Training
Which are conventional travel demand models better suited for – analyzing the distribution of regional growth, or analyzing the effects of micro-scale design policies such as the 3Ds?

List two ways of better incorporating land use factors into conventional travel demand models

List two factors that might make an expert panel an appropriate land use forecasting method

What is the primary weakness of most scenario planning tools for forecasting transportation impacts?