How GIS based Visualizations Support Land Use and Transportation Modeling

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Introduction

This presentation will explain the following

- Why we use GIS in modeling
- How we use GIS to generate model inputs, and outputs
- Performance measures and visualizations
- Challenges and lessons learned

Summarize the benefits of using GIS in transportation modeling and planning.

The goal is to demonstrate how GIS plays an increasing role in Land Use and Transportation modeling.
Federal Requirements (450.316)

“Employing visualization techniques to describe metropolitan transportation plans and TIPs;”

“Visualization techniques means methods used ... in the development of transportation plans and programs with the public... in a clear and easily accessible format such as maps, pictures, and/or displays, to promote improved understanding of existing or proposed transportation plans and programs.”

FHWA Federal Certification Review panel commends KCOG
SB 375 is a new law requiring Land Use and Transportation planning that will reduce GHG emissions—mainly from passenger vehicles.

SB 375 requires a long-term Sustainable Communities Strategy or SCS for Regional Transportation Plans.

Public and stakeholder participation requires presenting information that is easy to understand.

SB 375 encourages use of integrated land use and travel models.
What is UPlan?

UPlan is a GIS based land use model that is used to illustrate future growth patterns.

Shape files representing general plans, specific plans, existing urban areas, infrastructure, urban cores, highway ramps, environmental, and others areas are converted to grid based rasters.
Model Inputs - Shapefiles
Travel Analysis Zones - TAZ
Model Output - Final Allocation Raster

Scenario maps are generated using the final allocation rasters that are created by the model.
What is Cube?

- Cube is a suite of transportation related modeling software developed by Citilabs.
- The latest versions of Cube includes the ESRI ArcMap engine.
- Transportation model run outputs are stored in a geodatabase.
- Cube Land is an economic based land use model that runs interactively with the Cube Voyager travel model.
Land Use and Travel Modeling Flowchart

Current vs Future Methodologies

- Uplan Land Use
- Cube Land
- Cube Travel
- EMFAC
- Emission Measures
- SB 375 Requirements

- Planners
- Stakeholders
- Public Outreach
- Alternative Growth Strategies

- Transportation Measures by Scenario
- SB 375 Requirements
Travel Model Output - Level of Service

1st Generation GIS map from the model
Cube GIS Interface

True Shape Road Network in a Geodatabase
Cube Land Output

Households by Income (red-green) and Jobs (blue)
Cube Land Output
Housing Affordability Index

Model output uploaded to ArcGIS Online
Combined Land Use and Travel Output

Land Use
- Existing - 2010
- Households
- Employment

Travel
- Road Network
- Level of Service

2035 Projection – Bakersfield, CA
Performance Measures
Access to Transit
Performance Measures

Land Use Scenario Development

Regional Transportation Plan-RTP/SCS
GIS input used for 3D Visualizations

Downtown Bakersfield General Plan
GIS based 3D Visualization

Proposed Bakersfield HSR Station Area
Challenges and Lessons Learned

**Challenges**
- Obtaining local and regional data by geometry
- Data conversion from various agencies/sources
- Educating decision makers the value of using GIS – difficult to identify immediate savings

**Lessons Learned**
- Maintain consistency of data and assumptions between users and model runs
- Develop systematic methods to update datasets
- Add graphics and visualizations along with GIS maps to reports and presentations.
Benefits of GIS

1. Improved participation by decision-makers, stakeholders, and the public.

2. Significant improvements in projecting future land use patterns and travel.
   a. Allows for more sophisticated models
   b. Improves scenario development effort
   b. Ability to create performance measures

3. Meet requirements of federal/state laws and local planning polices or strategies
Kern COG is interested in working with others to realize the goal of integrating Land Use and Transportation modeling in the near future.