Introduction to the Four-Step Modeling Process
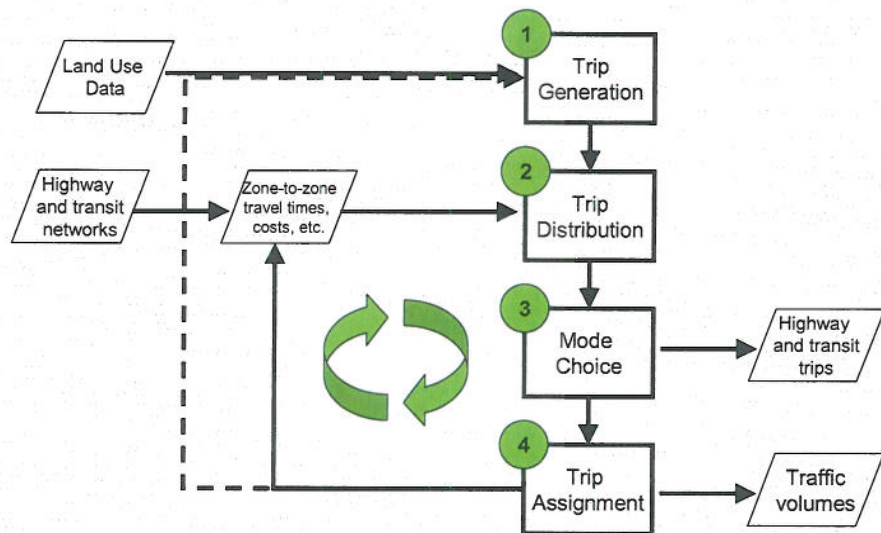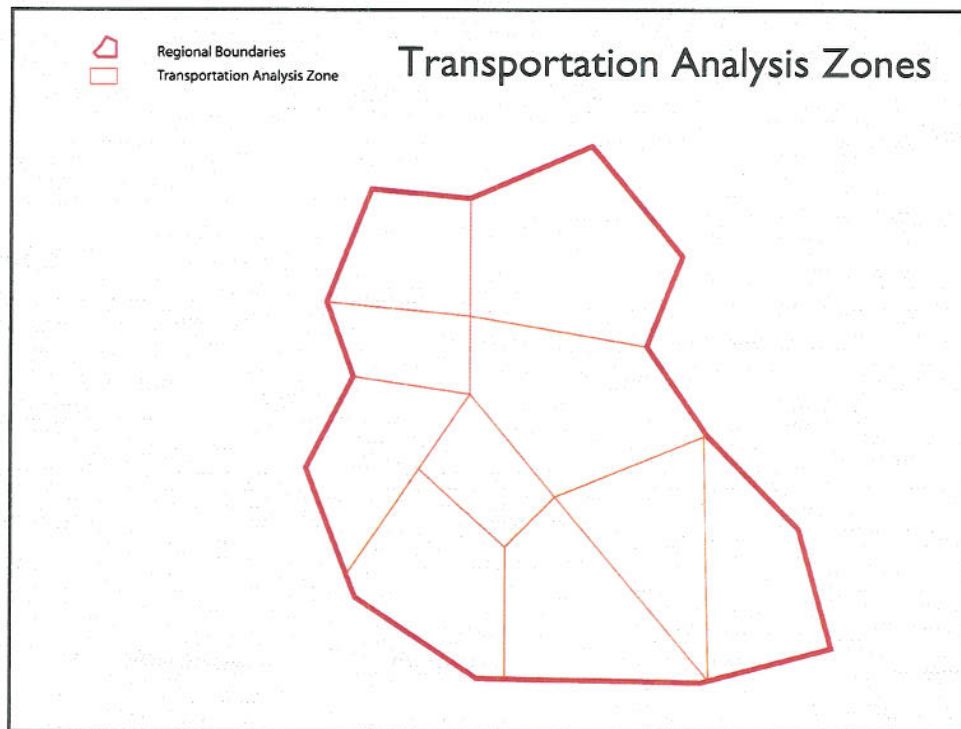
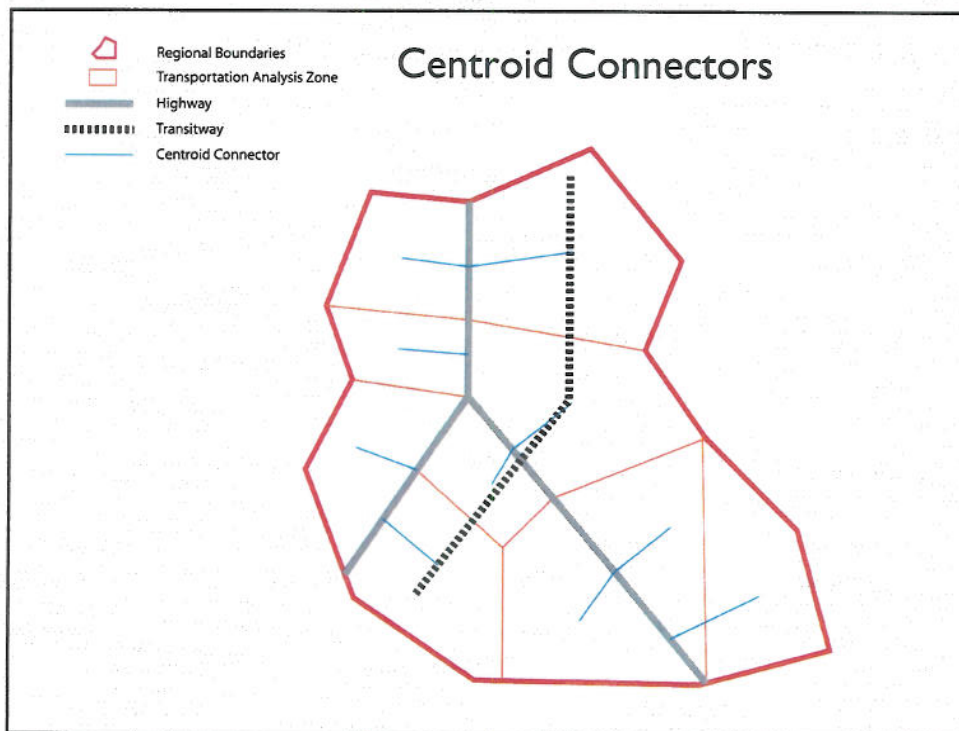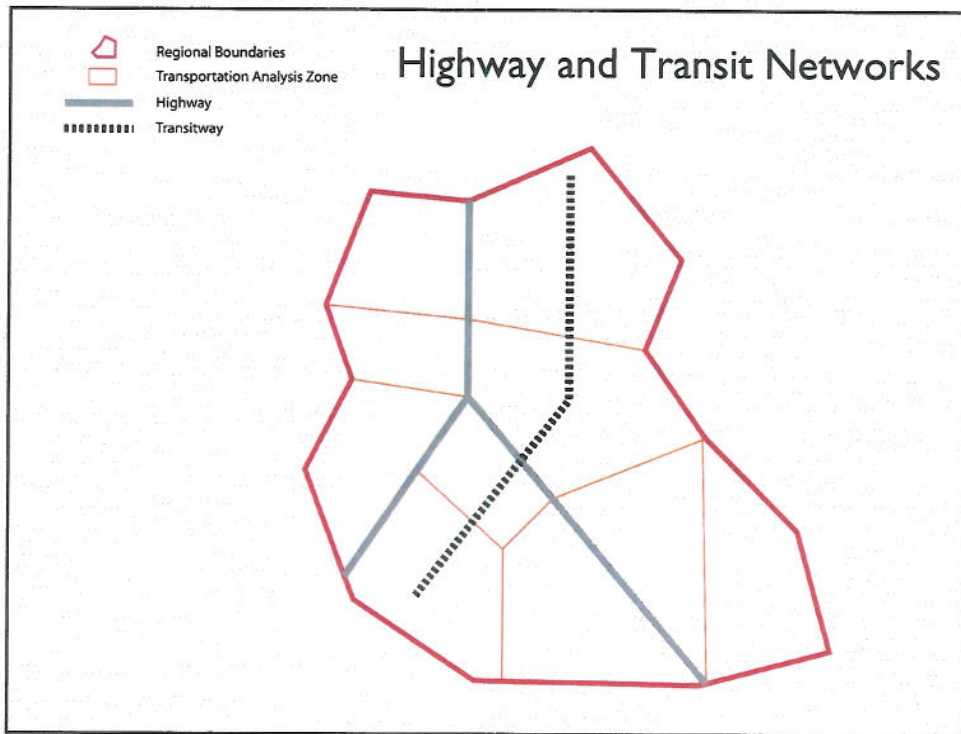## TPB CAC Scenario Working Group


The Four-Step Model

Model Inputs

- Regional system of transportation analysis zones.
- Land use data and transportation networks.
  - Where jobs and households are in the future.
  - Highway and transit networks.
- Centroid connectors link networks to zones.

Regional Boundaries
Transportation Analysis Zone

Transportation Analysis Zones

Highway and Transit Networks

Legend:
- Regional Boundaries
- Transportation Analysis Zone
- Highway
- Transitway

Centroid Connectors

Legend:
- Regional Boundaries
- Transportation Analysis Zone
- Highway
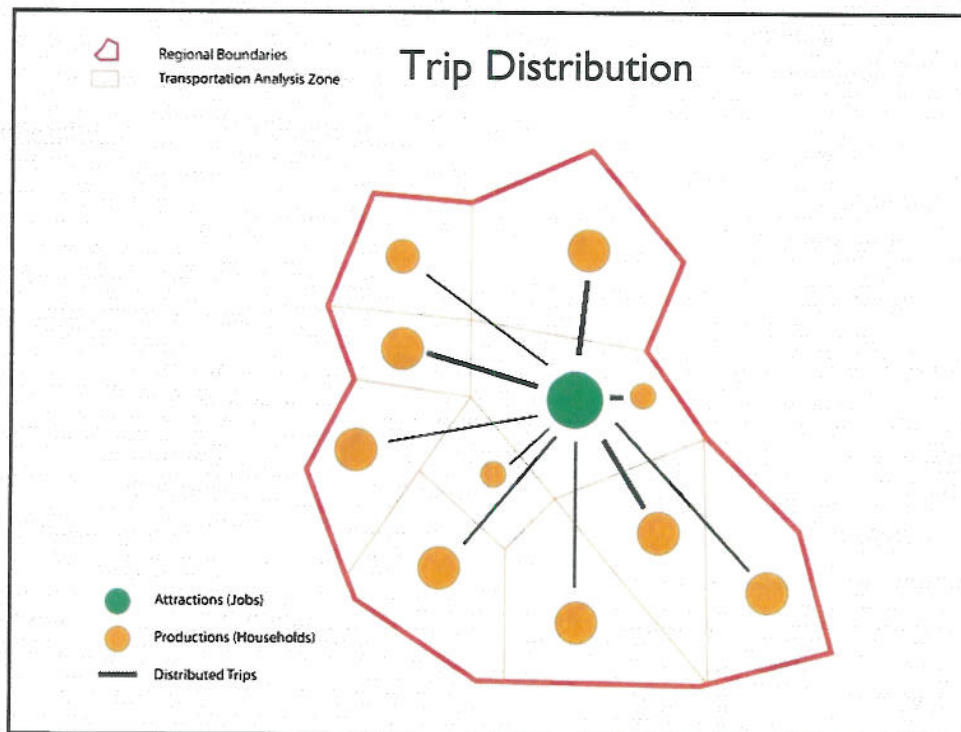- Transitway
- Centroid Connector

Step 1: Trip generation - How many trips are generated?

- Based on trip productions and trip attractions
  - Trip productions are origins, often households
  - Trip attractions are jobs, shopping and "other"
- Productions and attractions for each zone are based on land use (residential and employment) characteristics.

Trip Generation
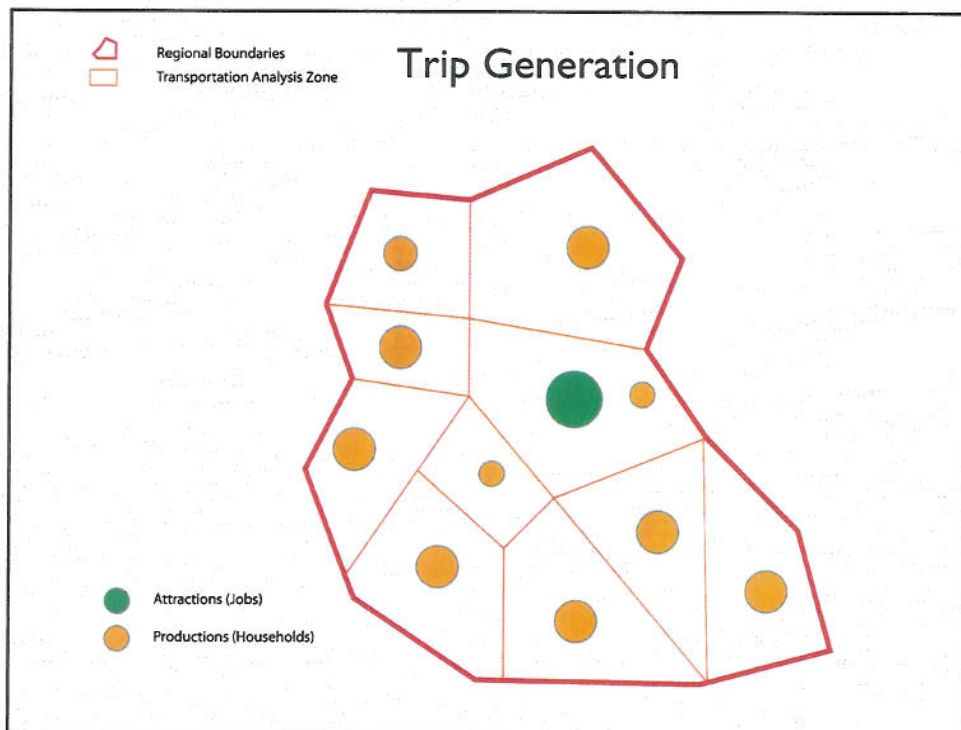
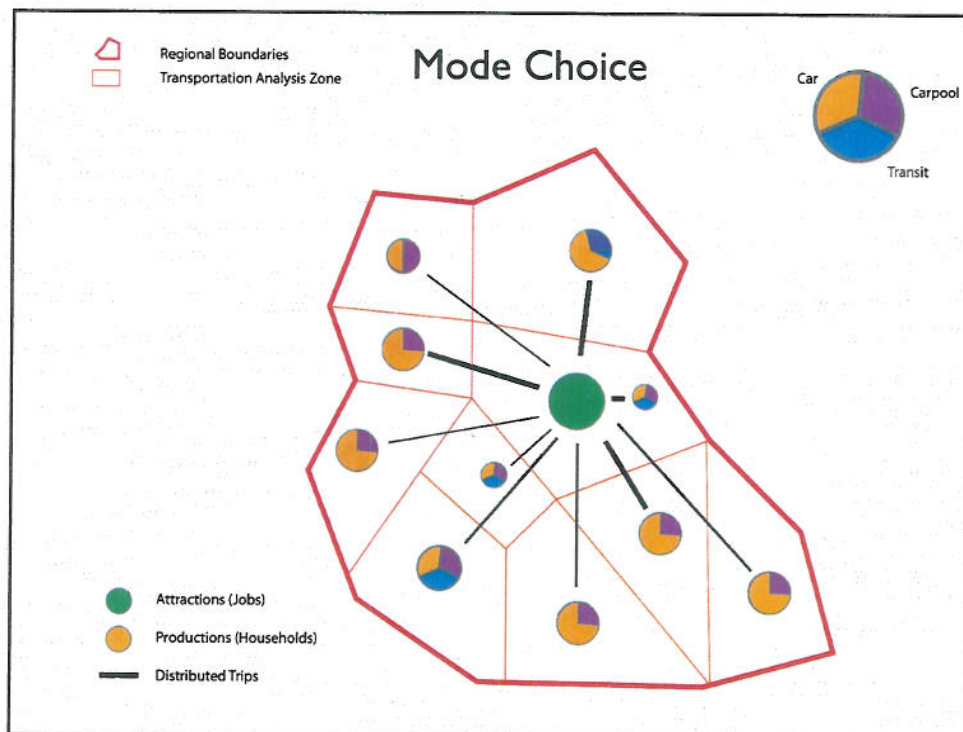## Step 2: Trip distribution - Where do the trips go?

- Trip productions are matched with trip attractions.
- Uses "gravity model" in which productions are more likely to be matched to attractions that are closer.
- "Friction factors" are applied to account for travel time penalty.
- Results in "trip tables" describing the number of trips of each type between each pair of zones.

Trip Distribution

Regional Boundaries
Transportation Analysis Zone

Attractions (Jobs)
Productions (Households)
Distributed Trips

## Step 3: Mode choice - What travel mode is used for each trip?

- Available Modes:
  1. Mass transit
     - Walk access versus drive access
  2. Drive alone
  3. Carpooling
- Choice made based on relative availability and attractiveness of each mode :
  - Accessibility of mass transit
  - Automobile ownership
  - Proximity to carpool lanes
  - Costs* required to use the mode
  - Time required to use the mode

*"out of pocket" costs, including mass transit fares, the price of gasoline, parking, and a mileage rate for driving

Mode Choice

Regional Boundaries
Transportation Analysis Zone

Car   Carpool
Transit

Attractions (Jobs)
Productions (Households)
Distributed Trips

Step 4: Trip assignment - What is the route of each trip?

- Determines the number of vehicles that will travel on each of the network segments.

- Best path is determined: the shortest way in terms of "time" to get from zone to zone

- Accounts for link capacity, to prevent overloading individual links.

- Determines congestion levels and updates travel times which are fed back into Step 2.

Trip Assignment
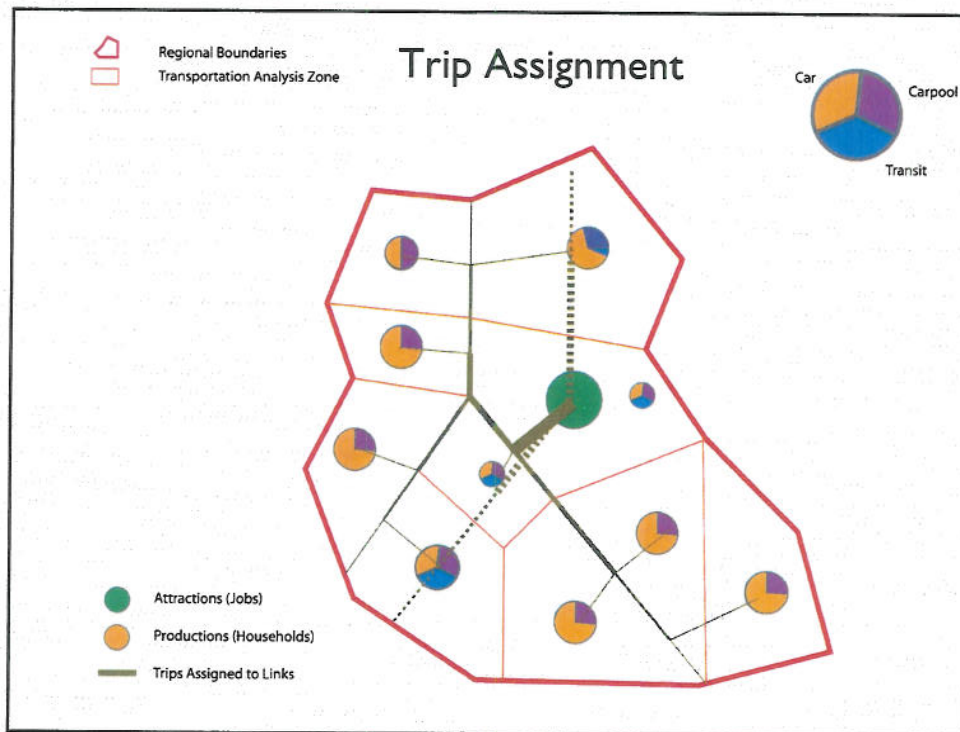
Model Outputs

- Highway and transit trips
- Traffic volumes
- Zone-to-zone travel times
- Regional travel statistics (VMT, Lane Miles of Congestion, etc.)