Sacramento Area Council of Governments

Travel Model Comparison: Trip-Based vs. Tour/Activity-Based

& Integrated Land Use/Economic Modeling

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For Caltrans Planning Horizons

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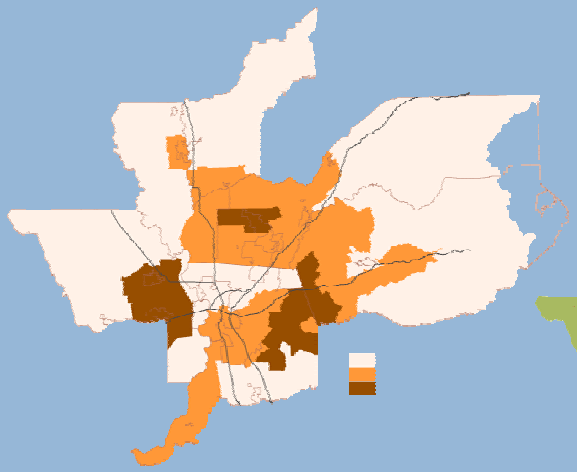
SACOG's 4Ds Applications

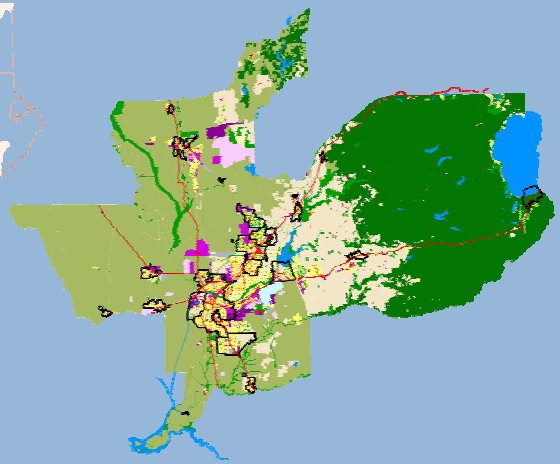
(Cont. from Jerry Walters' presentation)

- 4Ds Post-processor to trip based travel model
- Also in I-PLACE^{3}S land use planning model
- Both were significant to bringing better information to the Sacramento regional Blueprint effort
- (However, post-processing the 4Ds limits the full examination of land use effects:

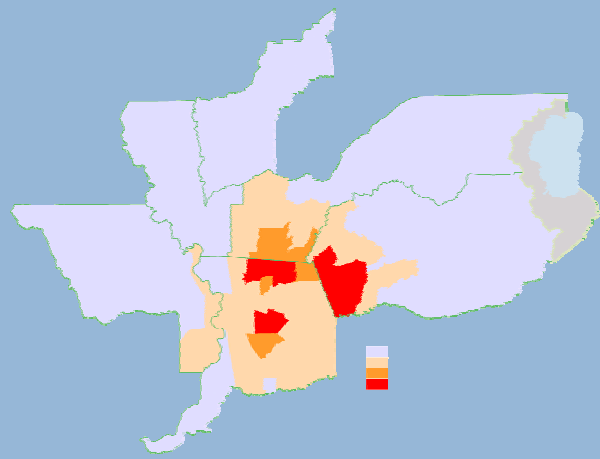
Goal: Develop Better Information and Tools for Decision-Making



MEPLAN - Land Economics



PLACE³S - Land Use/Transportation Impacts



SACMET & 4Ds - Transportation

SACOG's Model Development History

- **Household Travel Survey** (1991)
- **SACMET travel demand model** (1994-2005)
- **MEPLAN land use model** (1995-2001)
  - Bob Johnston, Caroline Rodier, John Abraham, Doug Hunt
- **Household Travel/Activity Survey** (2000)
- **Integrated Land Use/Travel Model Design** (2001)
  - **PECAS economic land use model**
  - **Activity/tour-based travel demand model**

SACOG Model Development History *(continued)*

- **Blueprint plan** (2002-2004)
  - **SACMET** Travel Model with 4Ds
    - 4Ds adds land use sensitivities
  - **MEPLAN** upgrades (2002) for Base Case scenario
  - **MEPLAN** (2003-04) - 6 county
    - Improved land use and price data/estimates
- **Tour-based travel model** (2005-07)
  - Met. Trans. Plan (2008) and air quality plan (2008)
- **PECAS integrated land use/economic/transp. model development** (2002-2003, 2008-2009)

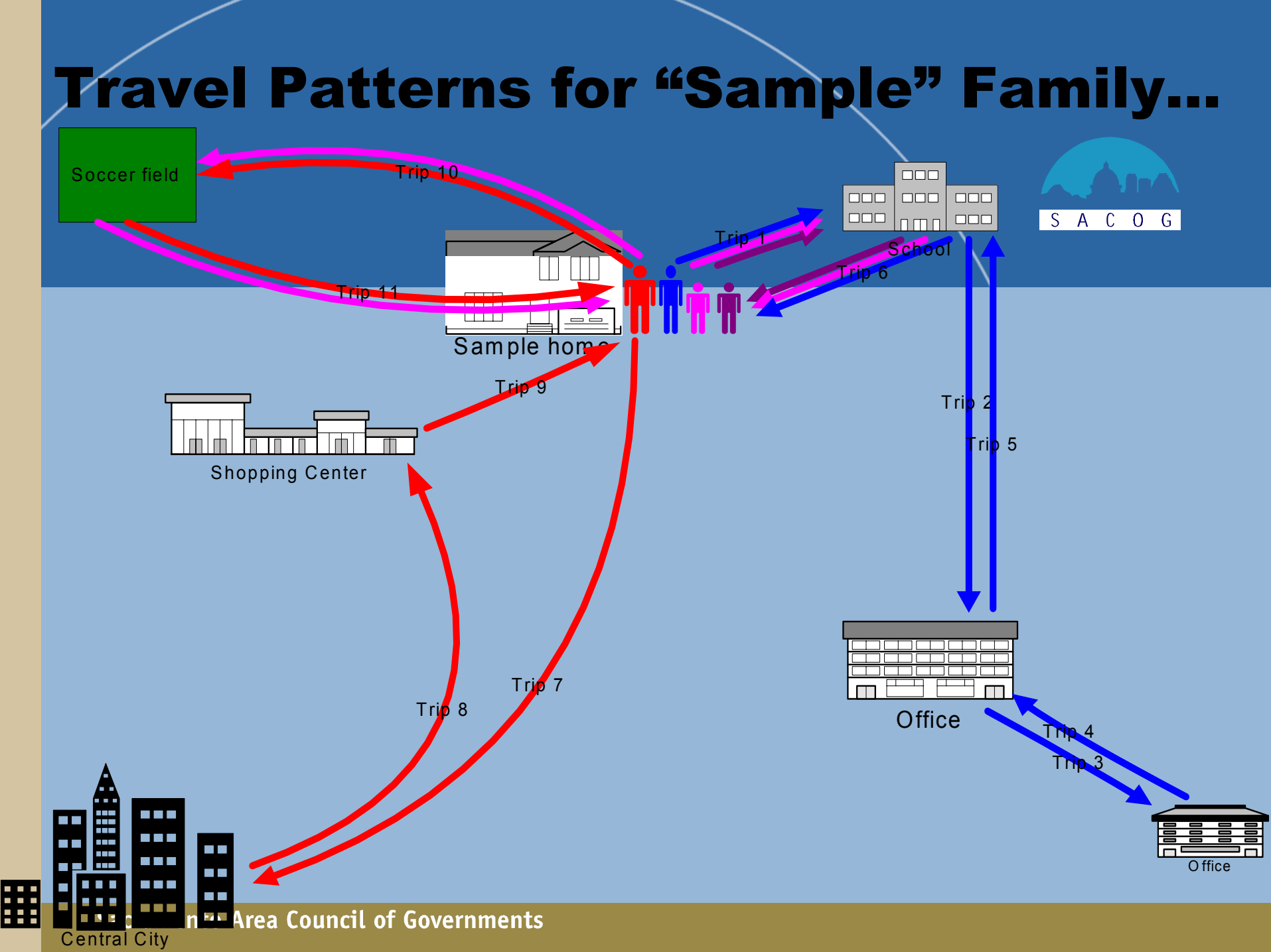
Trip-Based *vs.* Tour/Activity-Based Travel Models

- Trip-based (traditional) travel models based on Aggregate travel (zone-to-zone) – ***vs.*** –
- Tour/Activity-based micro-simulation models of the need to travel (re: households)
  - Provide improved representation of demographic, spatial, and time variations in the population
  - Get rid of "Non-Home Based Trips"
  - Much improved accountability of causes and impacts of travel and transportation investments

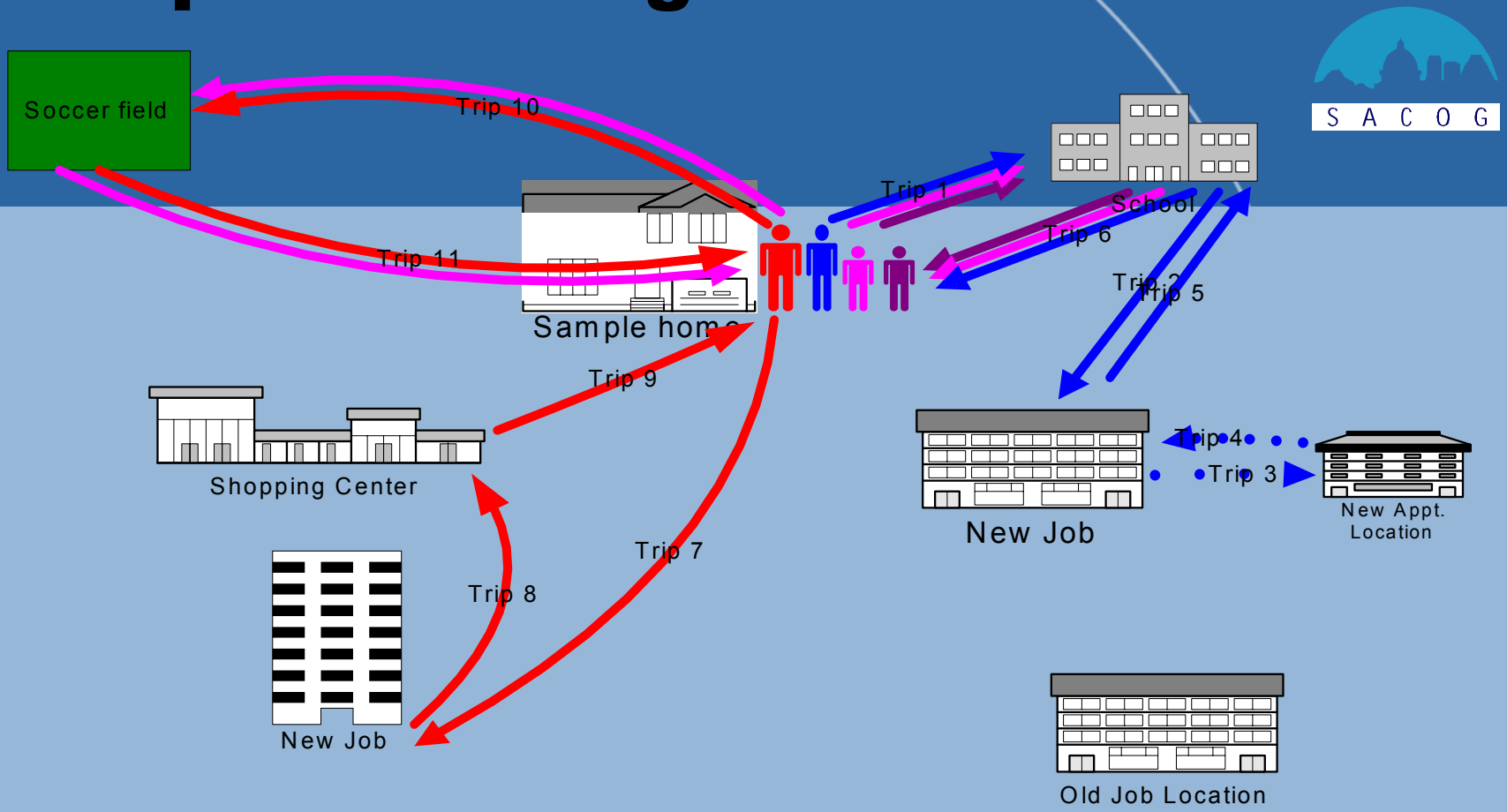
Tours *vs.* Activities

- **"Tour-based"** assumes list of activities leads to travel
- **"Activity-based"** assumes list of activities mostly leads to travel
  - More person's time & activity is simulated
  - Telecommuting and internet shopping applications
  - Requires more data on intra-household interactions, time schedules

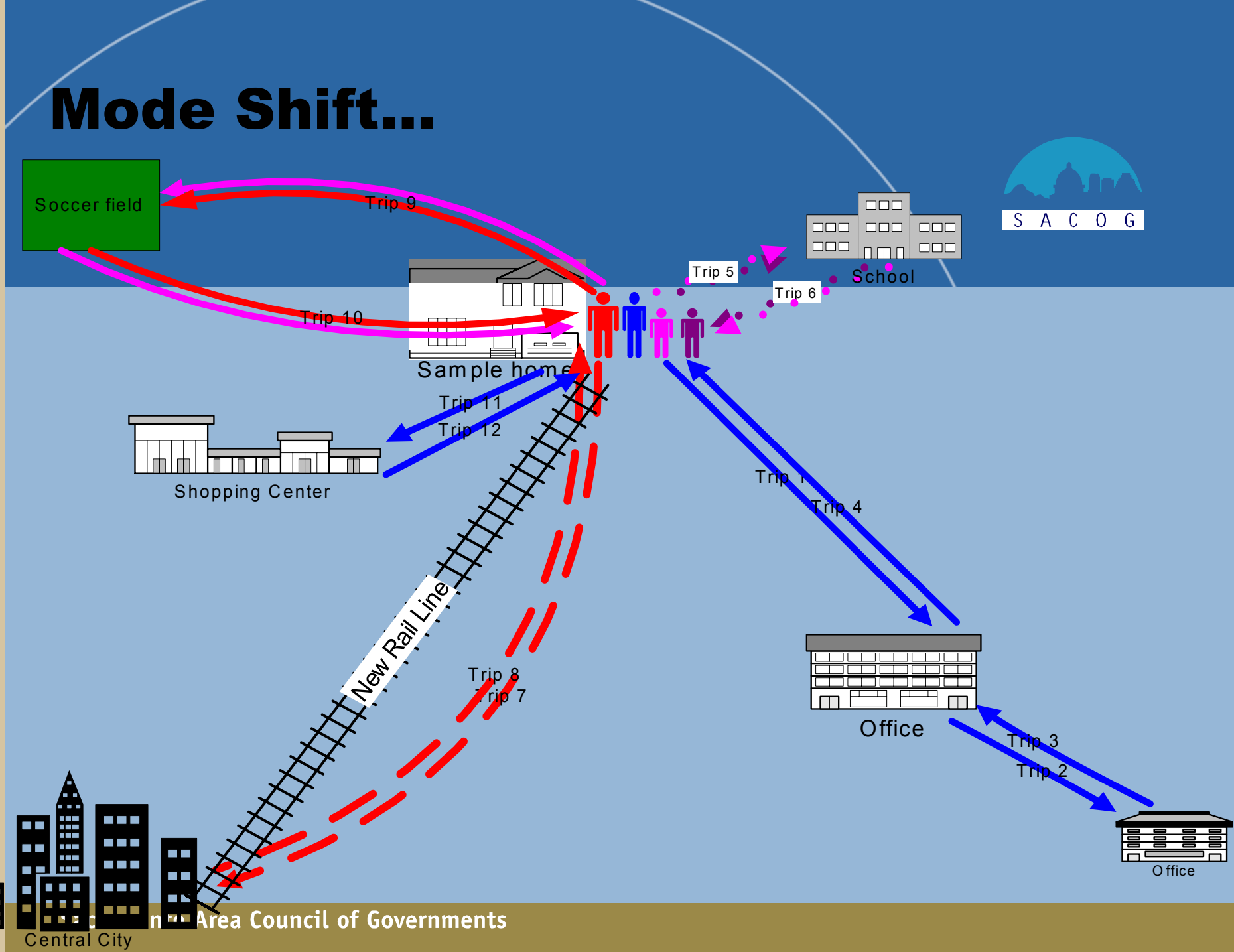
Travel Patterns for “Sample” Family…



Trip Shortening...



Mode Shift...


Soccer field
Trip 9
Trip 10
Sample home
Trip 5
Trip 6
School
S A C O G
Trip 11
Trip 12
Shopping Center
Trip 1
Trip 4
New Rail Line
Trip 8
Trip 7
Office
Trip 3
Trip 2
Office
Central City
Area Council of Governments

Model Development Agencies: Tour/Activity-Based Travel Models

- **In use:**
  - County of San Francisco; New York; Columbus, Ohio; SACOG, Ohio Dept. of Transportation (DOT), Oregon DOT
- **In development:**
  - Portland, Atlanta, Denver, Seattle, Metropolitan Transportation Commission (SF Bay Area)
- **Starting development:**
  - SCAG, Phoenix

Data Requirements
(beyond trip-based models)

- **Household travel AND activity data**
  - Caltrans and MPOs working on joint survey effort to improve consistency and reduce cost of collecting data.
- **Spatial data**
  - Land use
  - Population and household demographics
  - Employment

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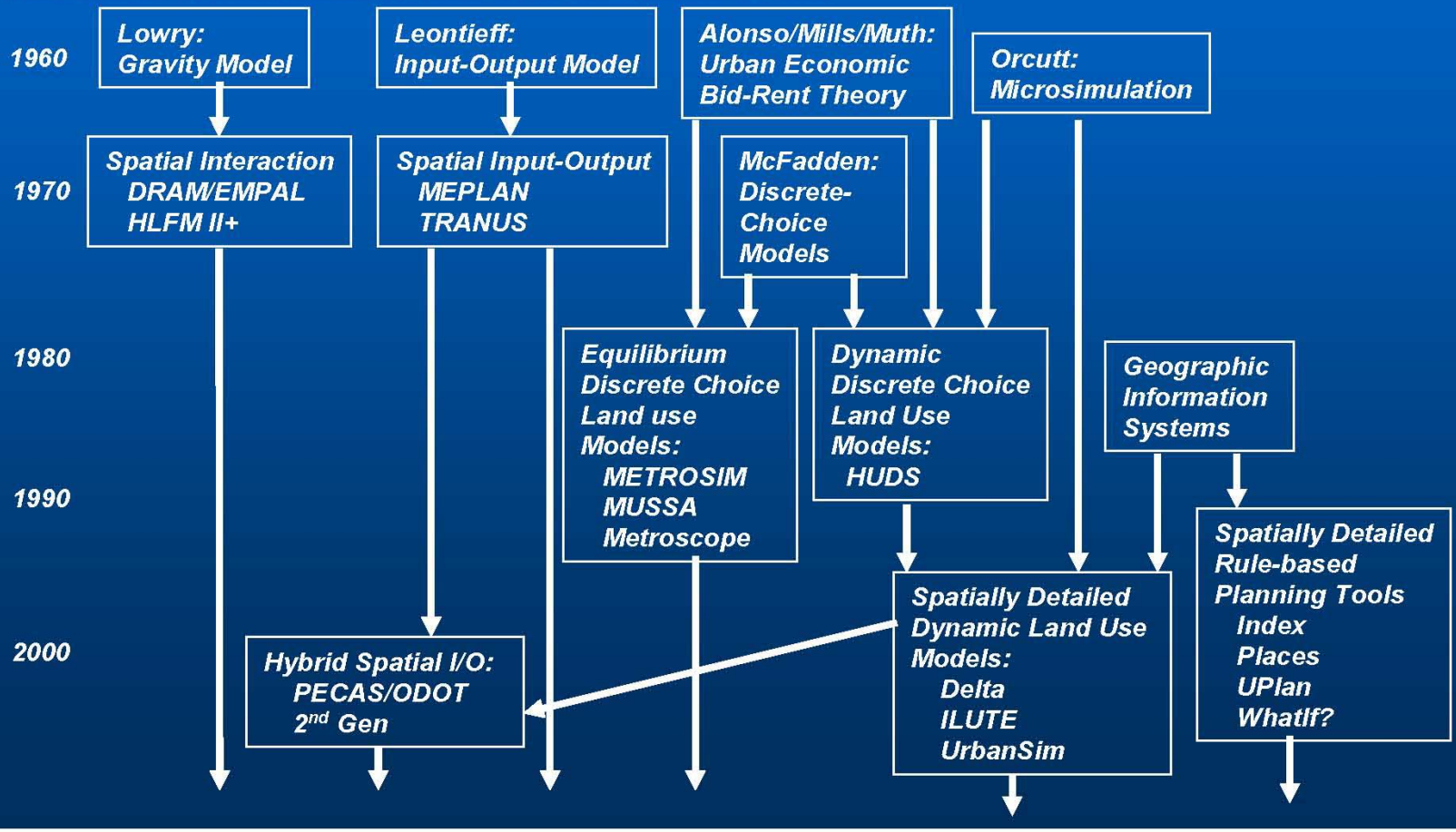
Integrated Economic, Land Use & Travel Modeling

Land Use Modeling Frameworks



PECAS Integrated Model

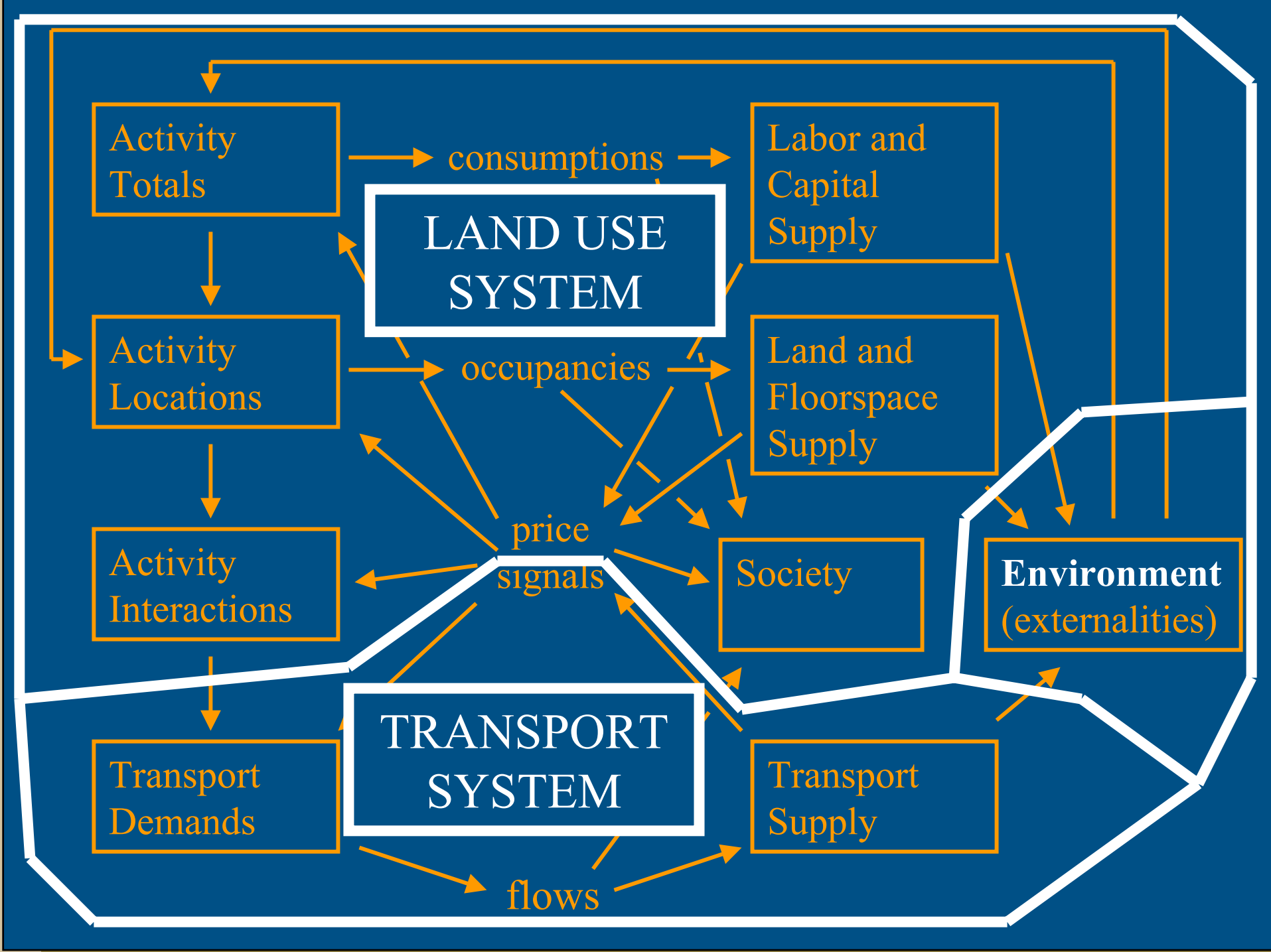
P roduction

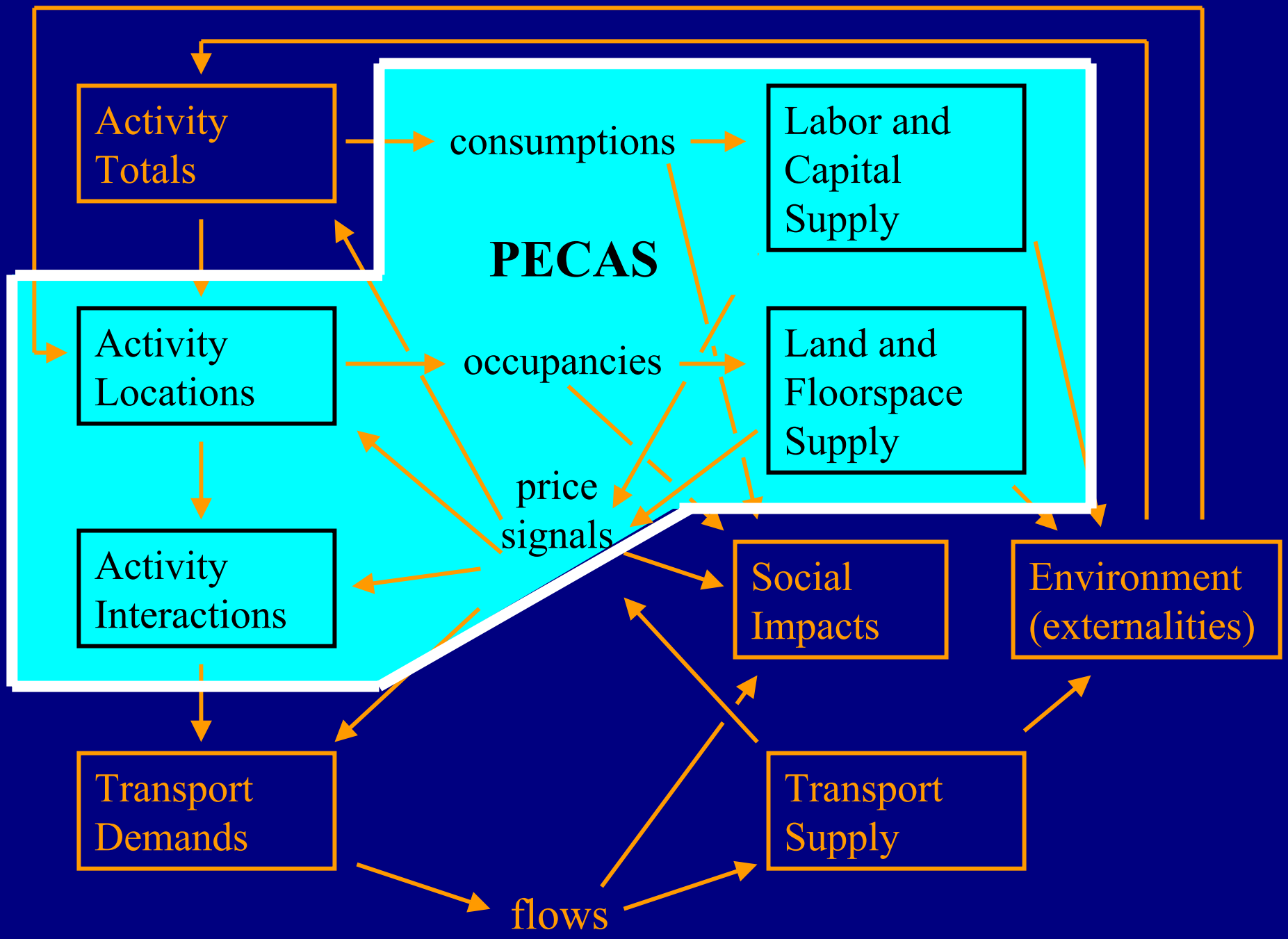
E xchange

C onsumption

A llocation

S ystem


Activity Totals
consumptions
Labor and Capital Supply
LAND USE SYSTEM
Activity Locations
occupancies
Land and Floorspace Supply
price signals
Activity Interactions
Society
Environment (externalities)
TRANSPORT SYSTEM
Transport Demands
Transport Supply
flows


Activity Totals
consumptions
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PECAS
Activity Locations
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Social Impacts
Environment (externalities)
Transport Demands
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flows

PECAS Framework Components

- **Economic Interactions (Activity Allocation):**
  - Production to exchange to consumption location chains determined for all goods, services and labor
  - Equilibrium markets for all commodities, with prices & clearing
  - Consumer surplus and producer surplus considered
- **Space Development (Land Use):**
  - Changes in space year-to-year based on allowable zoning and prices from Activity Allocation
- ***Links to:***
  - Travel model (either trip-based or tour-based)
  - Non-spatial economic model

Benefits of Integrated Models:

- Apply economic analysis to spatial/land use issues
- Simulate developer decisions in addition to government policies
- Assess land use impacts for travel and emissions
- Peak spreading of congestion
- Pricing policy analysis
- Improved impact assessment