SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

SCAG's Transportation Modeling Program

"Modeling 101"

August 25, 2011

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Presentation Overview

- General Modeling Concepts
- SCAG's Modeling Role
- Overview of SCAG's Models
- New Modeling Tools
- Subregional Modeling

WHAT IS A TRANSPORTATION MODEL?

Black Box, Crystal Ball, Mystery

Or …

- Mathematical Abstraction of the Transportation System
- A Tool to Forecast Future Travel

Typical Uses of Transportation Models

- **Supports Transportation Planning**
  - Transportation System Design
  - Transportation Facility Design
  - Evaluate Policy/Operational Decisions
- **Supports Environmental Planning**
  - Environmental Impact Analysis
  - Supports Air Quality Analysis
- **Supports Land Use Planning**
  - Traffic Impacts of Landuse Proposals

Why Use Models?

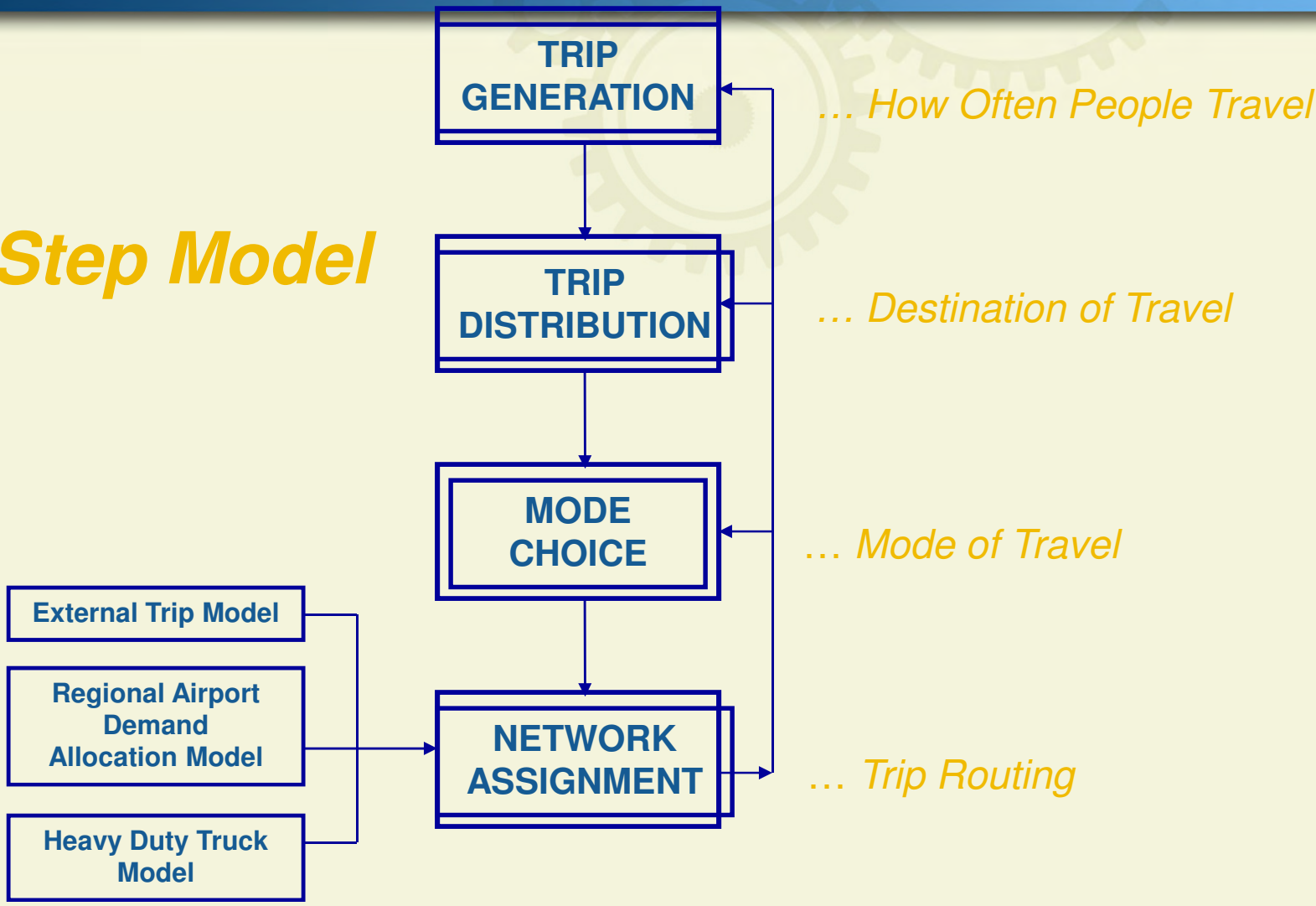
- Analytical Basis, Unbiased, Common Foundation for Planning Decisions
- Promotes Integration Landuse/Transportation
- Test Policy and Planning Decisions/Proposals
- Good Estimator of Incremental Changes and Relative Changes between Alternatives
- Quickly Examine Impacts and Consequences
- Interfaces With Environmental Analysis Tools
- Fulfills State/Federal Requirements

Modeling Requirements

- Capable of Forecasting 20 Year Demand
  - Title 23 CFR Part 450.322
- Modeling Specifications per Conformity Regs.
  - Title 40 CFR Part 93
- Modeling Specification per Greenhouse Gas Reductions
  - Calif. Gov. Code Section 65080(b)(2)(G)
- Modeling Best Practices
  - Title 40 CFR Part 93.122(b)
- Regional Transportation Plan Guidelines
  - California Transportation Commission

Typical Travel Model Structure

Four-Step Model



Model Inputs & Outputs

Model Inputs:

- Socio-Economic Data
- Transportation Networks
- External Data
- Special Generators
- Model Parameters

Model Outputs:

- Trips by Mode
- Traffic Volumes
- Congested Speed
- Transit Volumes
- Bike/Ped Info.
- Transportation Summaries
- Emission Data

Model Products

- **Examples of useful model outputs:**
  - Vehicle Miles Traveled (VMT)
  - Traffic volumes
  - Hours of delay
  - Average speed
  - Mode shares
- **Examples of useful indicators derived from model output:**
  - Mobility (speed & delay)
  - Accessibility (access to opportunities)
  - Reliability (day-to-day trip time variation)
  - Productivity (system performance during pk. periods)

OVERVIEW OF MODELING PROCESS

- Conduct Travel Survey & Gather Data
- Develop Model Inputs:
  - Define Study Area
  - Define Traffic Analysis Zones (TAZs)
  - Develop Networks
  - SED/Landuse Data
- Model Calibration
- Model Validation
- Model Peer Review
- Model Applications

SCAG's Modeling Role

- Develop/Maintain the Regional Model
- Review/Utilize Adopted Growth Forecast
- Coordinate Regional Modeling Activities
- Apply the Model to RTP/FTIP/Projects
- Transportation Conformity Determination
- Promote/Support Subregional Models

SCAG's Modeling Challenges

- Large Region … 190+ Cities … Huge Model
- Diverse Region … Farms - High Rises
- Multiple Travel Modes … Walk – Rail
- Complex Emerging Modeling Issues …
  - Modeling 4-Ds … SB-375
  - Toll Modeling
  - Pricing
  - High-Speed Rail Modeling

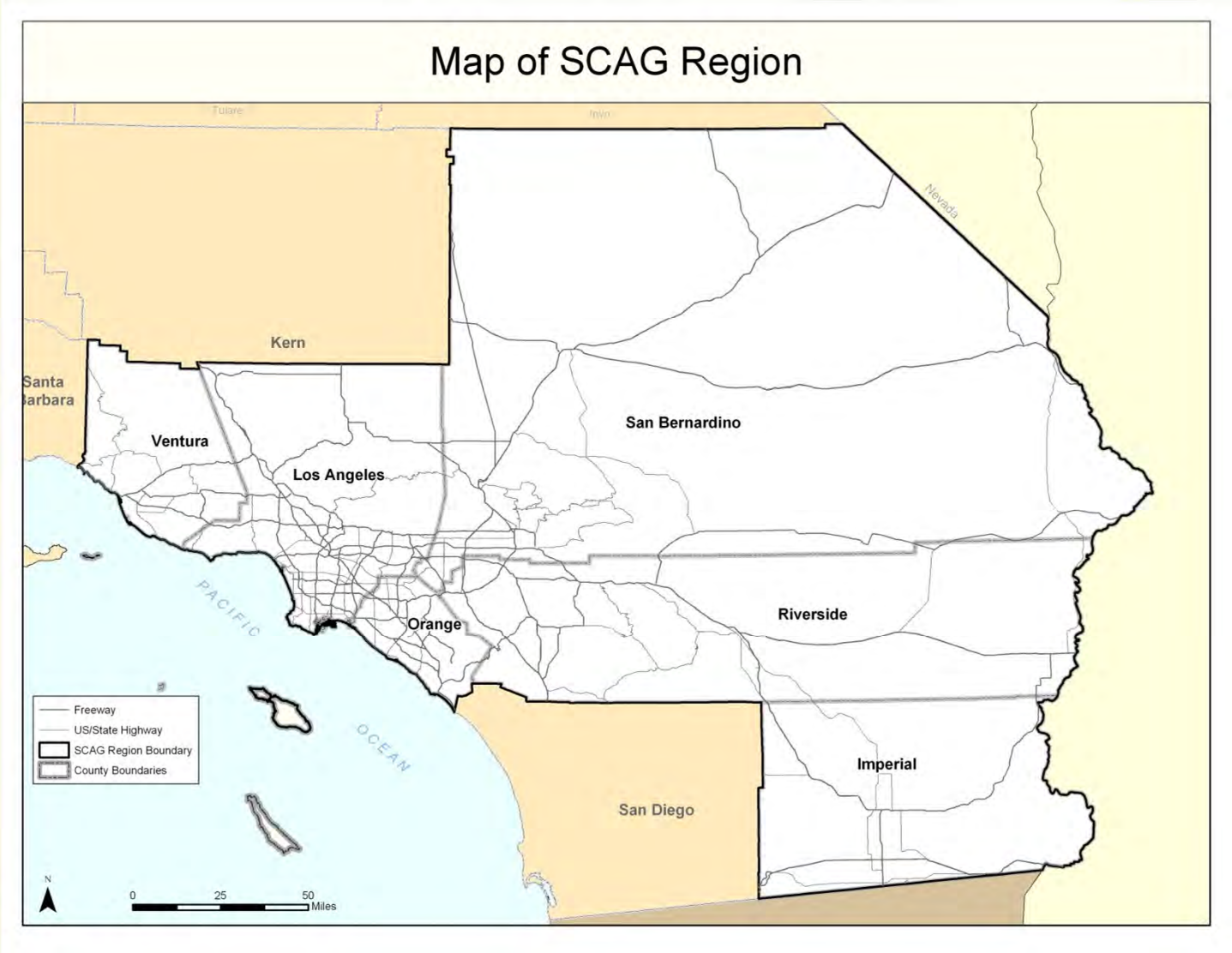
SCAG's Regional Model Components

- **Transportation Model**
  - Passenger Car and Carpool
  - Transit Modes
  - Non-Motorized
- **Heavy-Duty Truck Model**
- **Pricing Model Component**
- **Air Passenger/Cargo Model**
- **Ports Model**
- **Air Quality Model**

2012 RTP Model Enhancements

- Improved Sensitivities to …
  - micro-level land use ("smart growth")
  - pricing policies
  - transit forecasting
  - traffic assignment
  - time of day
  - high-speed rail forecasting
  - heavy-duty trucks
  - representation of travel markets
- TransCAD 6.0 Software Platform

The SCAG Region

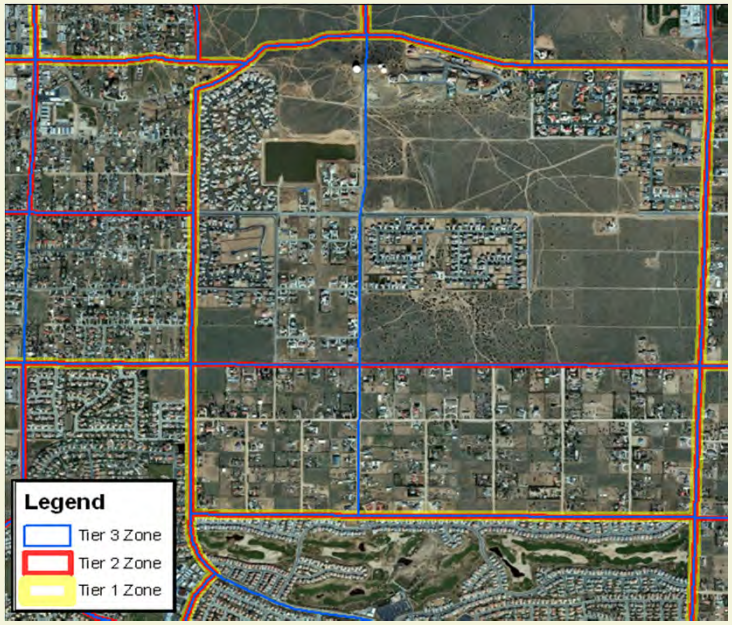


2012 RTP Modeling Area

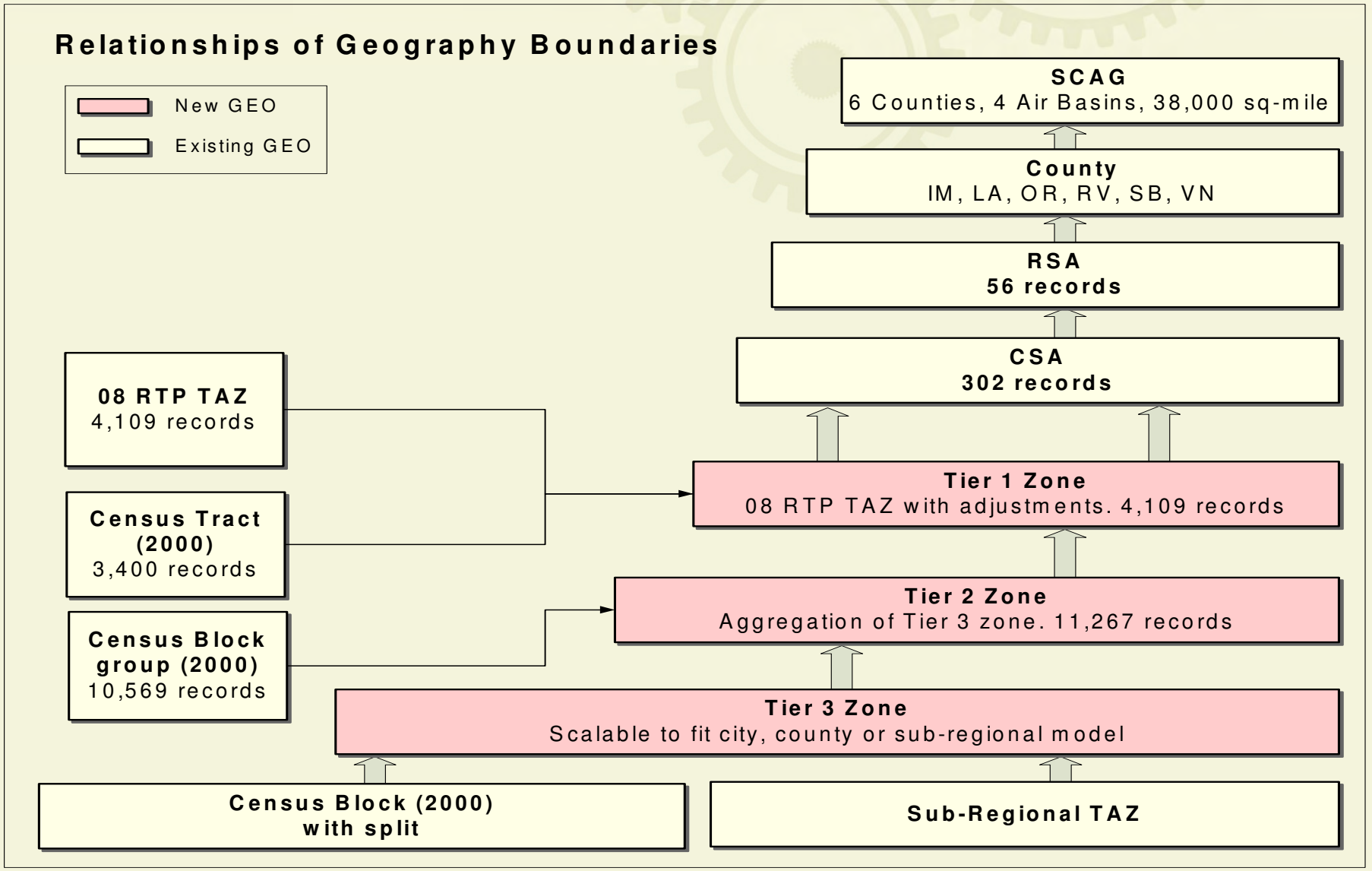
- **SCAG's Modeling Area**
  - 38,000 square miles
  - 4 air basins
  - 6 counties (IM, OR, RV, SB, VN, LA)
  - 56 Regional Statistical Area (RSA)
  - 302 Community Statistical Area (CSA)
  - 11,000+ Traffic Analysis Zones (TAZ)

SCAG's Traffic Analysis Zones -TAZs

- TAZ – Model's basic geographic unit
- Tier 1 - TAZs consistent with 08RTP zones (4109 TAZS)
- Tier 2 - To enhance the precision of micro-level land use and smart growth analysis for the SCS (11,267 TAZs)
- Tier 2 Development Process:
  - Collaboration with local jurisdictions
  - TAZs from cities/counties/subregions
  - Extensive local review and revisions
  - Minor Tier 1 boundary adjustment based on local requests



2012 RTP Model Geography

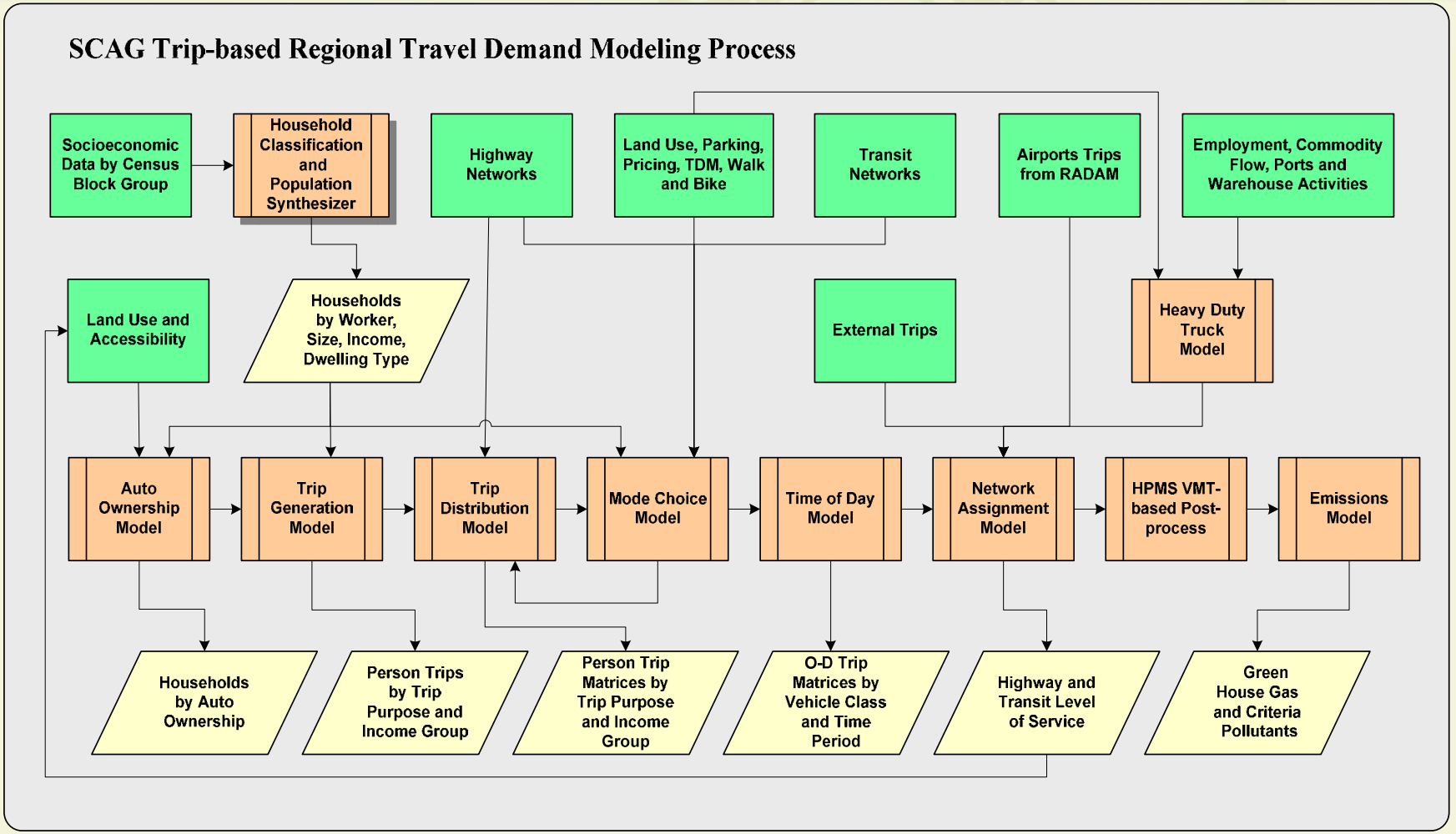


Traffic Analysis Zones - TAZs

SUMMARY OF TAZ STATISTICS

Modeling Area	2000 Census Tract	2000 Census Block Group	RSA	CSA	08 RTP TAZ (Internal)	Tier 1 Zone (Internal)	Tier 2 Zone (Internal)
Imperial County	29	105	1	15	110	110	239
Los Angeles County	2,052	6,345	21	155	2,243	2,243	5,697
Orange County	577	1,826	10	43	666	666	1,741
Riverside County	343	804	11	38	478	478	1,532
San Bernardino County	244	1,099	7	34	402	402	1,395
Ventura County	155	390	6	17	210	210	663
Total	**3,400**	**10,569**	**56**	**302**	**4,109**	**4,109**	**11,267**

SCAG's Model – Complex 4-Step Model



Legend

Input | Module | Output

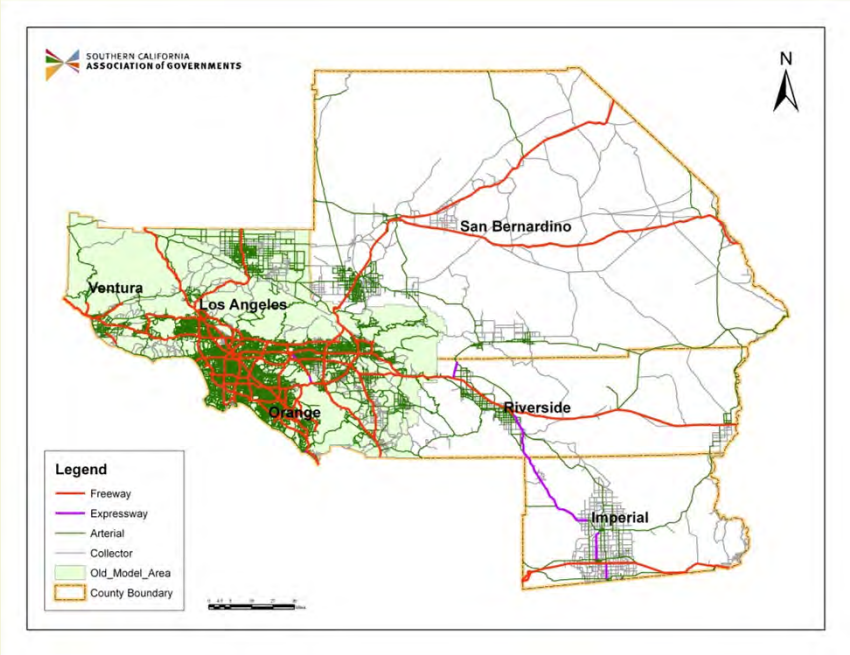
Note:
Population Synthesizer (shadowed) is a new component.
All the model modules and input data are updated for 2008 model validation and 2012 RTP analysis.

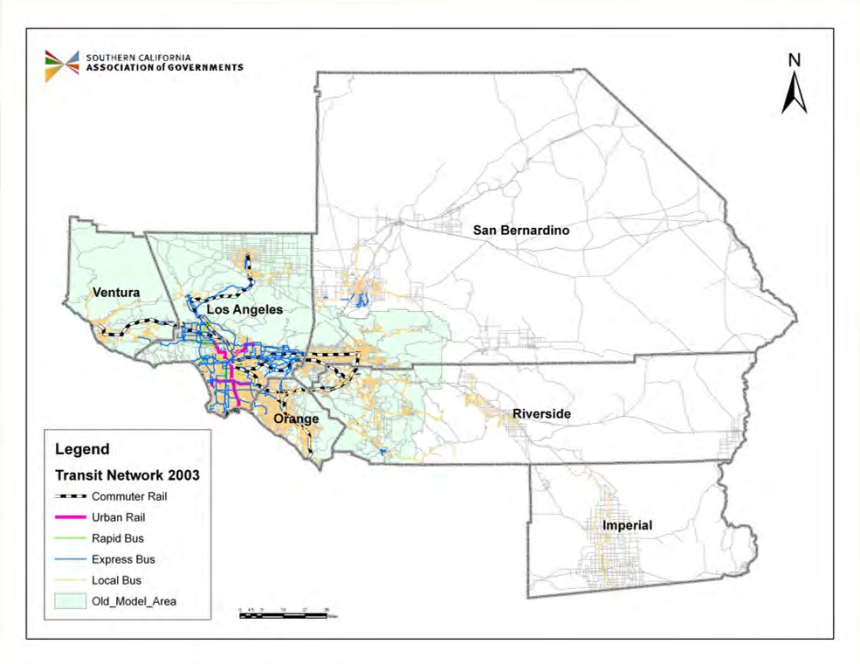
Socio-Economic Data Variables

- Total Population
- Workers
- Households - Single and Multiple
- Household Income
- School Enrollment - K-9 and College
- Employment - Retail, Service, Basic

Transportation Networks

Highway Network





Transit Network

SCAG's Trip Generation Model

- 14 Trip Types.
- Vehicle Availability Model
- Census Household Classification Model
- Cross-classification Trip Production Models
- Multiple Regression Trip Attraction Models

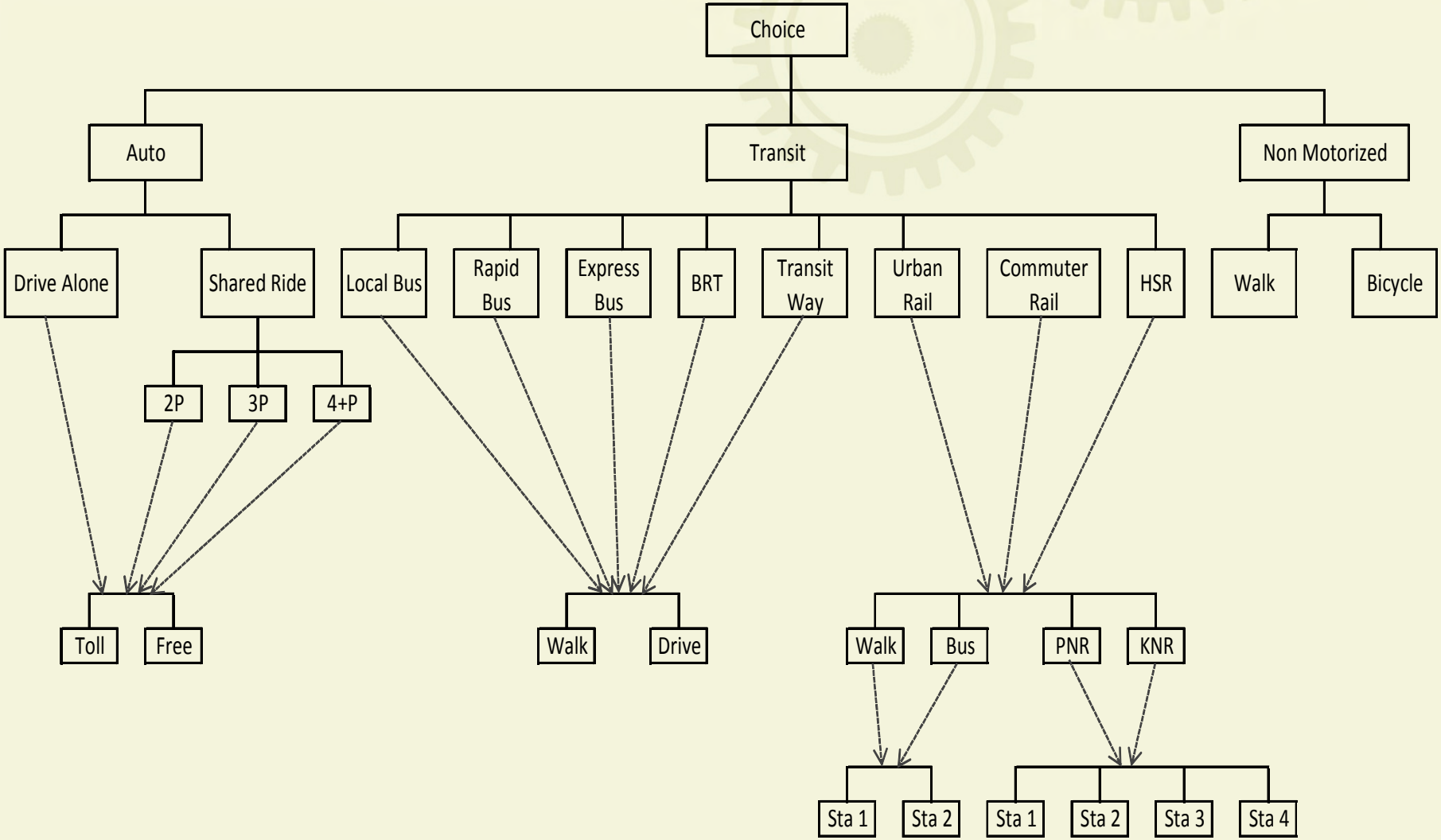
SCAG's Trip Distribution Model

- Calibrated friction factors by trip purpose, income group (for work trips), and time period (peak, off-peak), 28 curves in total.
- Logsum from mode choice used in trip distribution for home-based work direct trips
- Intermediate stop choice models allocate home-based work strategic trips to intermediate stops after mode choice

SCAG's Mode Choice Model

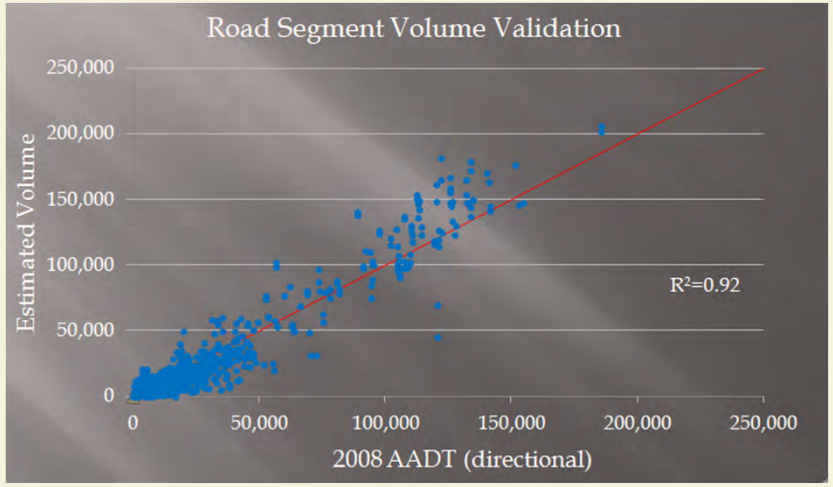
- Nested Logit models
- Separate models for each trip purpose, stratified by peak and off-peak periods
- Include non-motorized trips
- Model transit trips by mode and access/egress types

2012 RTP Model – Mode Example



SCAG's Network Assignment

- 5 time period equilibrium assignments
- 3 auto classes (SOV, HOV2, HOV3+)
- 3 classes of heavy-duty trucks
- External trips
- Ports trips
- Airport trips
- Simultaneous assignment
- Transit assignments



SCAG's New Modeling Tools

SCAG's Next Generation Models:

- Activity-based Models
- Land-Use Models
- Sustainability Tool
- California Household Travel Survey

Activity-Based Model

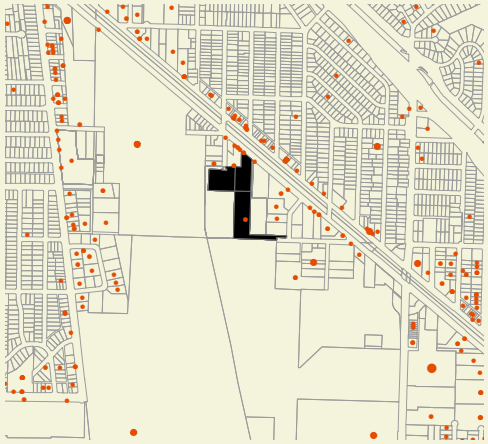
- Simulation that recreates activities and travel for the entire resident population in a region
- Human interactions explicitly modeled
- Replaces first three steps of "four-step" model
- Implementation:
  - Phase 1 Adapt DFW Model
  - Phase 2 Develop SCAG Model
  - Phase 3 Complete ABM w/Dynamic Traffic Assignment

Study Team:

- Kostas Goulias, University of California, Santa Barbara
- Ram Pendyala, Arizona State University, Tempe
- Chandra Bhat, The University of Texas, Austin

Land Use Model

- Support analysis of land use and transportation system scenarios, a tool for land use scenario development
- PECAS Modeling System
- Integrated into SCAG's Modeling System
- Consultants:
  - ULTRANS, UC Davis
  - HBA Specto



Sustainability Tool

- Developed an ArcGIS-based sketch planning tool for local jurisdictions to analyze the impact of different land use scenarios on vehicle ownership, VMT, mode use, and associated effects on GHG emissions

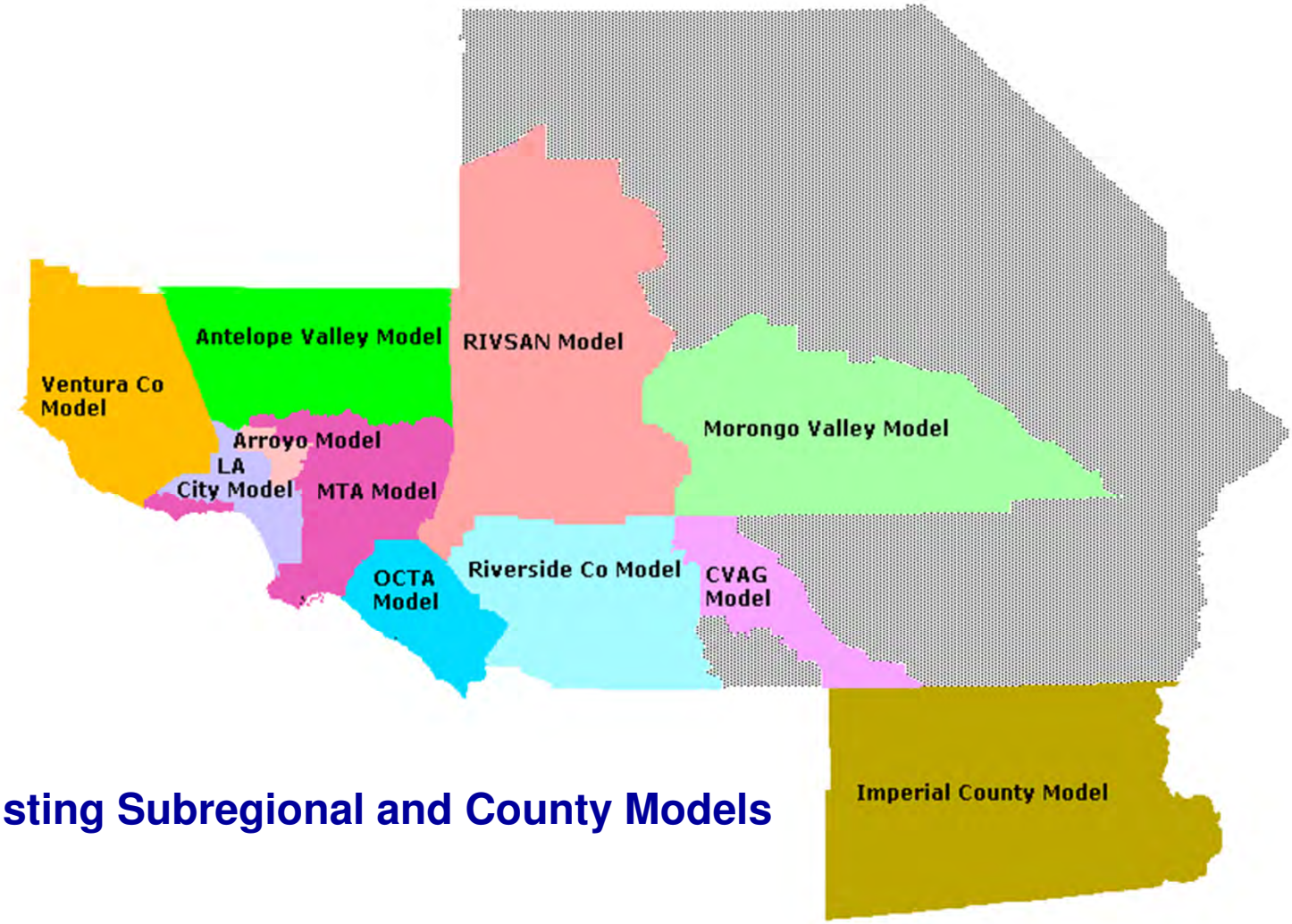
- In response to SB 375
  - Primary emphasis on reducing vehicle travel through compact, transit-oriented land use
  - MPOs must develop Sustainable Communities Strategy (SCS)
  - Regional GHG reduction targets for 2020 and 2035 to be set by CARB in 2010

- Consultants:
  - Rich Kuzmyak
  - Fregonese Associates
  - Fehr & Peers

Year 2011 Travel Survey

- Collaboration between Caltrans & MPOs to address both statewide and regional needs
- Support development of RTP, statewide travel model, next-generation models
- Status:
  - Pre-Survey Design (Goulias) Completed
  - NuStats – Contract Executed, 7/15/2010
  - CHTS Project Kick-off Pre-Test 8/15/2011
- Funding:
  - Prop 84 - $2,028,000, FY 2009/10
  - Caltrans - $4,302,000, FY 2009/10
  - MPOs - $4,000,000
  - Total - $10,330,000
- Samples: 60,000 Households (5,000 GPS Samples)
- Schedule:
  - 10/10 - 06/11 … Finalize Survey Design
  - 08/11 - 11/11 … Conduct Pre-Test Survey
  - 10/11 - 11/11 … Evaluate/Refine Survey
  - 11/11 - 12/12 … Conduct Main Survey
  - 12/11 - 2/13 … Analysis & Final Report

Subregional Models



Existing Subregional and County Models

Role of Subregional Models

- Better captures local trip making
- Finer level of modeling detail
- Simplified user-friendly methodology
- Provides local access to modeling tools
- Consistent with the Regional Model

SCAG's Subregional Modeling Tool

- Streamlines model development
- Reduces development costs
- Promotes model consistency
- Simplified user-friendly interface
- Tied closely to SCAG's Regional Model
- Three current applications of the Tool

For more information please contact

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Questions - http://tmip.fhwa.dot.gov/

THANK YOU

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