Travel Demand Modeling

Lubna Shoaib

East West Gateway Council of Governments

May 29th, 2012

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Discussion Flow

- What is Travel Demand Modeling

- Scenario evaluation

- 4-Step Models

- Inputs & results

- Current model recalibration effort

- MOVES methodology update

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Introduction
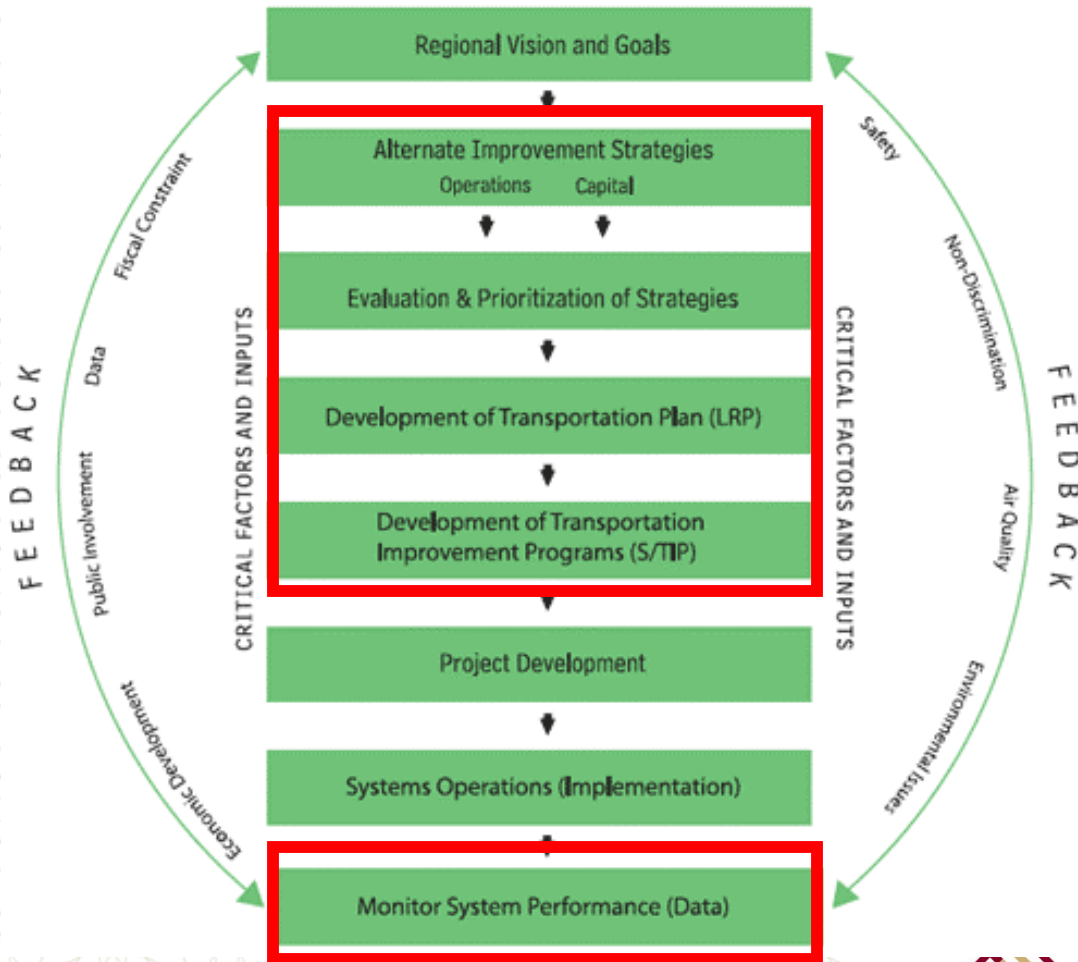
Introduction

- *Who*

- *What*

- *When*

- *Why*

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Introduction—Where do we fit?

- *When*

- *Where*

- *Why*

What is Modeling?

Mathematical representation of a system or concept

What Is a Travel Demand Model?

Mathematical representation of how, where, when and why people travel

7

Transportation Modeling

Micro Level

Macro Level

Intersection

Link Connection

Area or Corridor

Regional

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Transportation Modeling

Micro Level

Macro Level

Model Uses

3-D Analysis
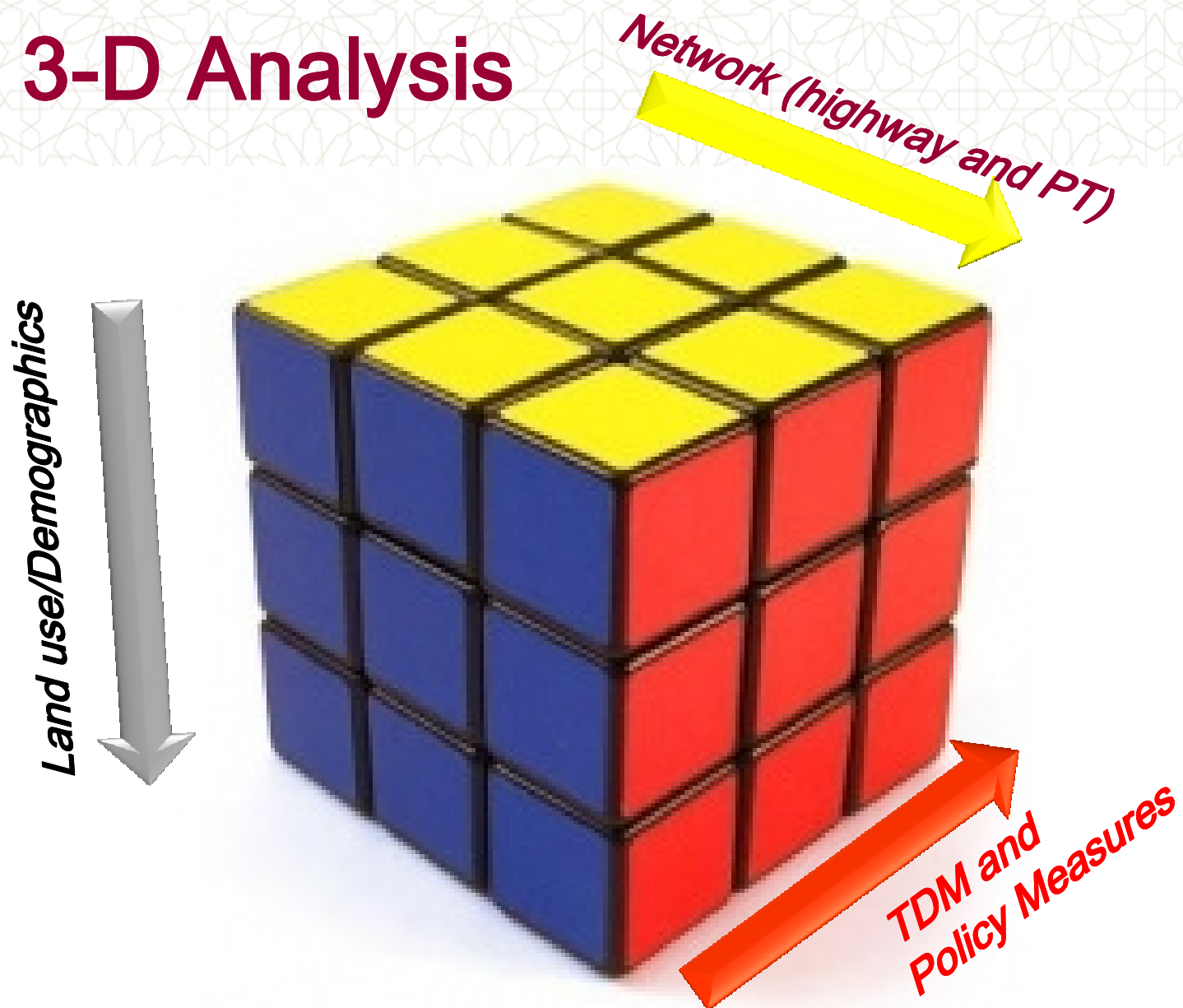

Network (highway and PT)

Land use/Demographics

TDM and Policy Measures

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

3-D Analysis
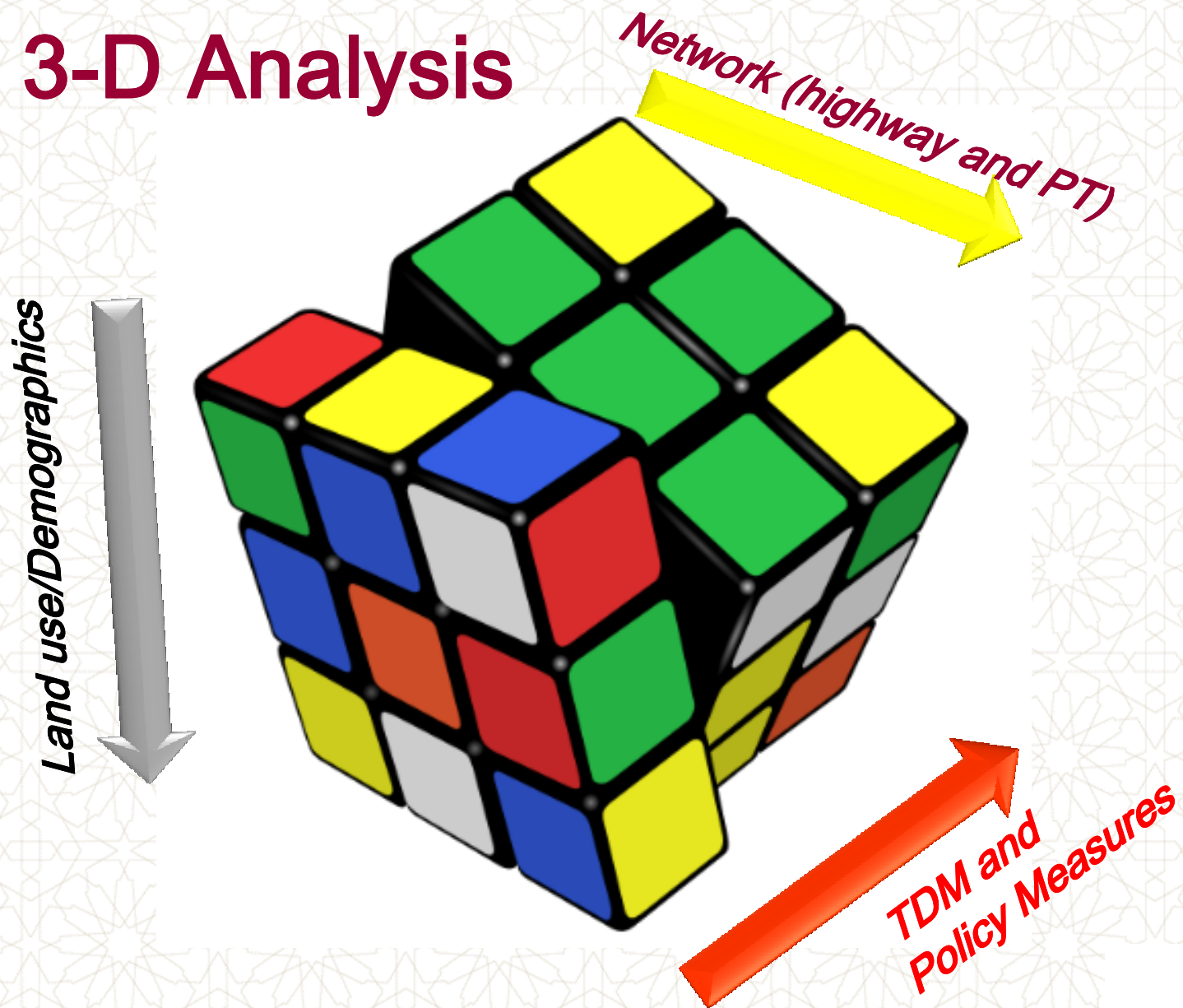
Network (highway and PT)

Land use/Demographics

TDM and Policy Measures

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Scenarios Evaluated

Analysis Variables

- **Land use/ SED**

- **Network Supply (highway and Public Transport network changes)**

- **Travel Demand Measures/Policy— leading to targeted goals**

- Analysis Years—2015, 2030, 2040….

Final Scenarios......

- *Study the effect of various combinations*

- *Final 'best' solution*

EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

Four Step Travel Demand Modeling

Trip Making Behavior

You decide to make a shopping trip

You then decide where to go for shopping

Then you decide how you will travel; car, bus, rail or walk

Last, you decide which route you want to take based on time and distance

Translated Into Modeling

You decide to make a shopping trip

Trip Generation

You then decide where to go for shopping

Trip Distribution

Then you decide how you will travel; car, bus, rail or walk

Mode Choice

Last, you decide which route you want to take based on time and distance
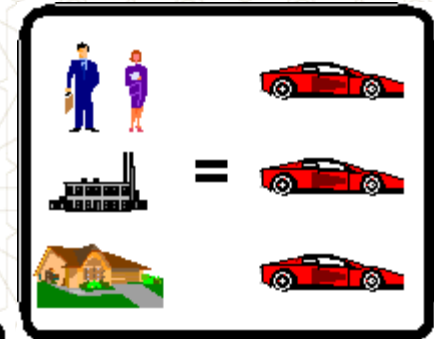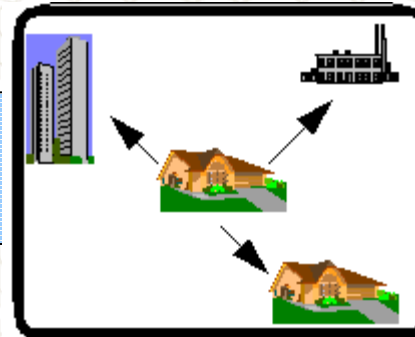
Assignment of Traffic
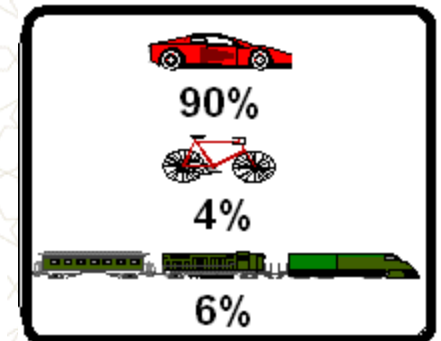
Traditional 4 Step Model
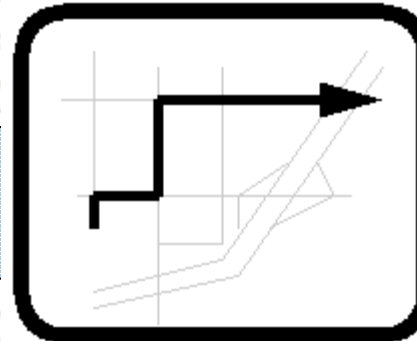
Trip Generation

Trip Distribution

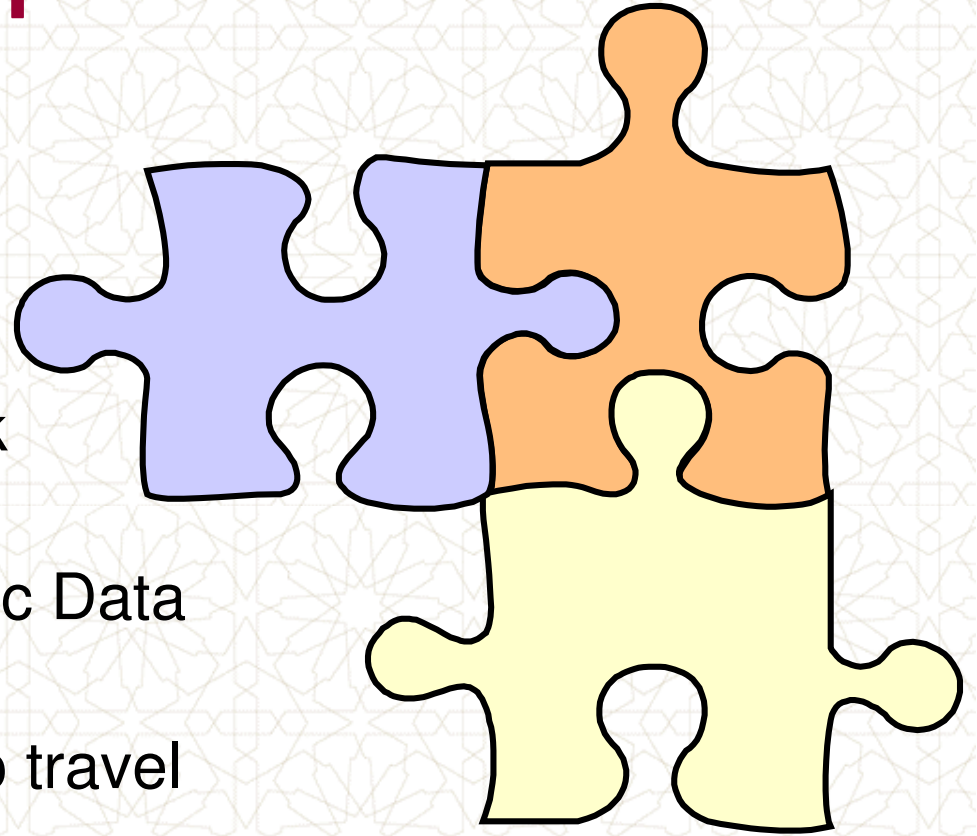**Mode Choice**

90%

4%

6%

Trip Assignment

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries
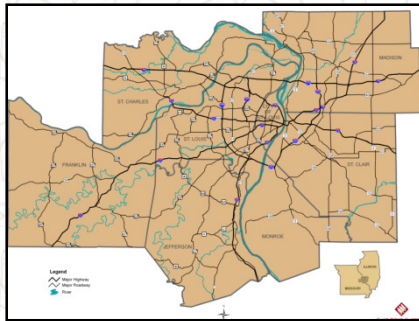
Inputs

Input Requirements

1. Highway and Transit Network

2. Land use and Socio-economic Data

3. Equations translating this into travel demand – Model Algorithm

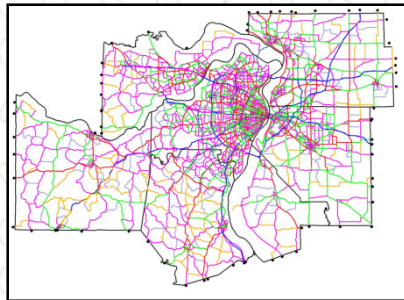# How Travel Demand Models Work

Model Inputs

Land Use

+

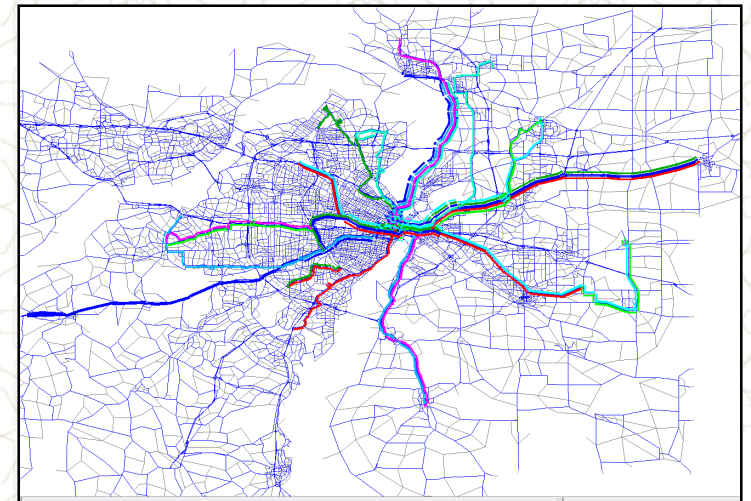**Road and PT Network**

Travel Demand Model

Model Outputs

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Analysis Year Network

Highway Network 2010

2010 Highway Network

Freeway and Expressway
Arterials

GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

Highway Network 2014

Highway Network 2025

2025 Highway Network

Freeway and Expressway
Arterials

GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Highway Network 2040

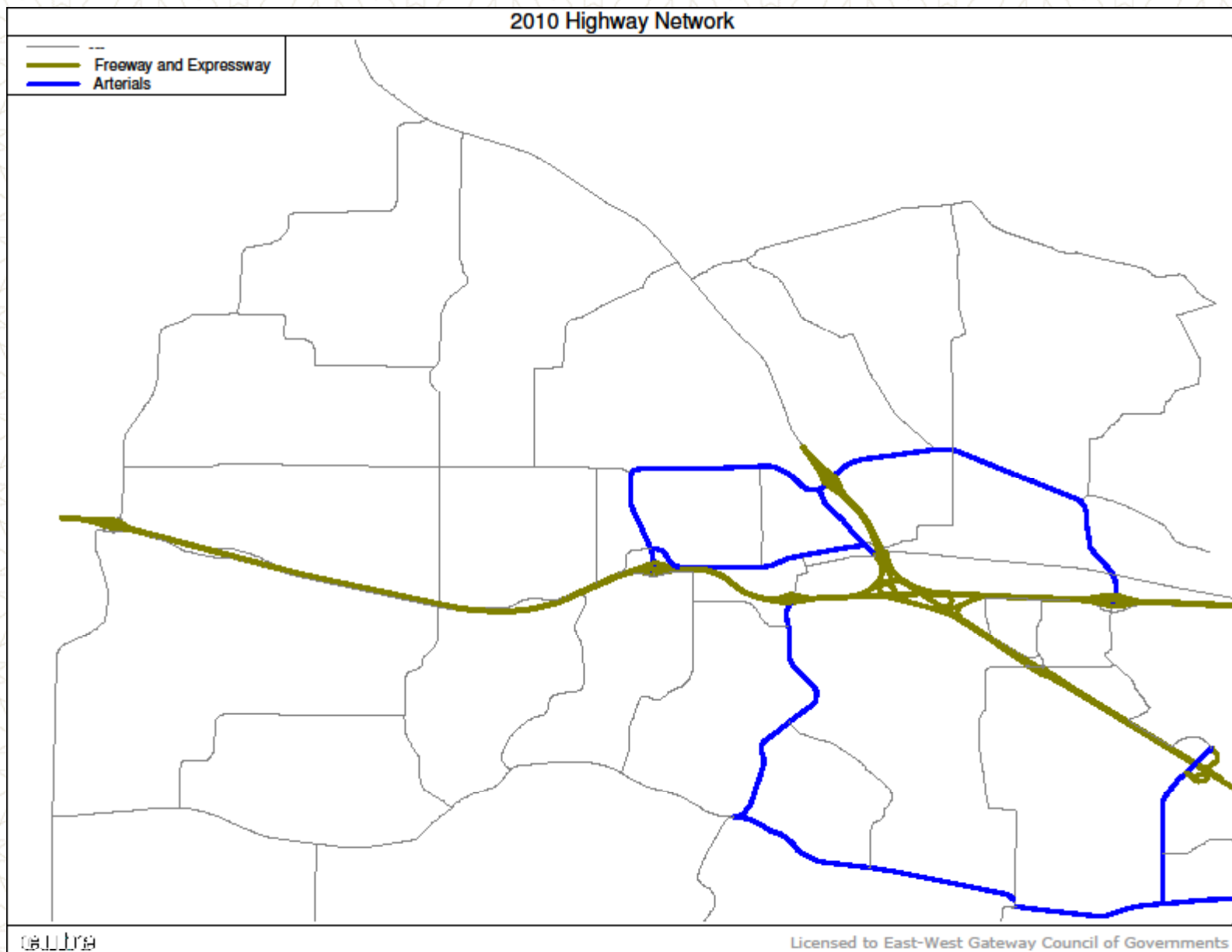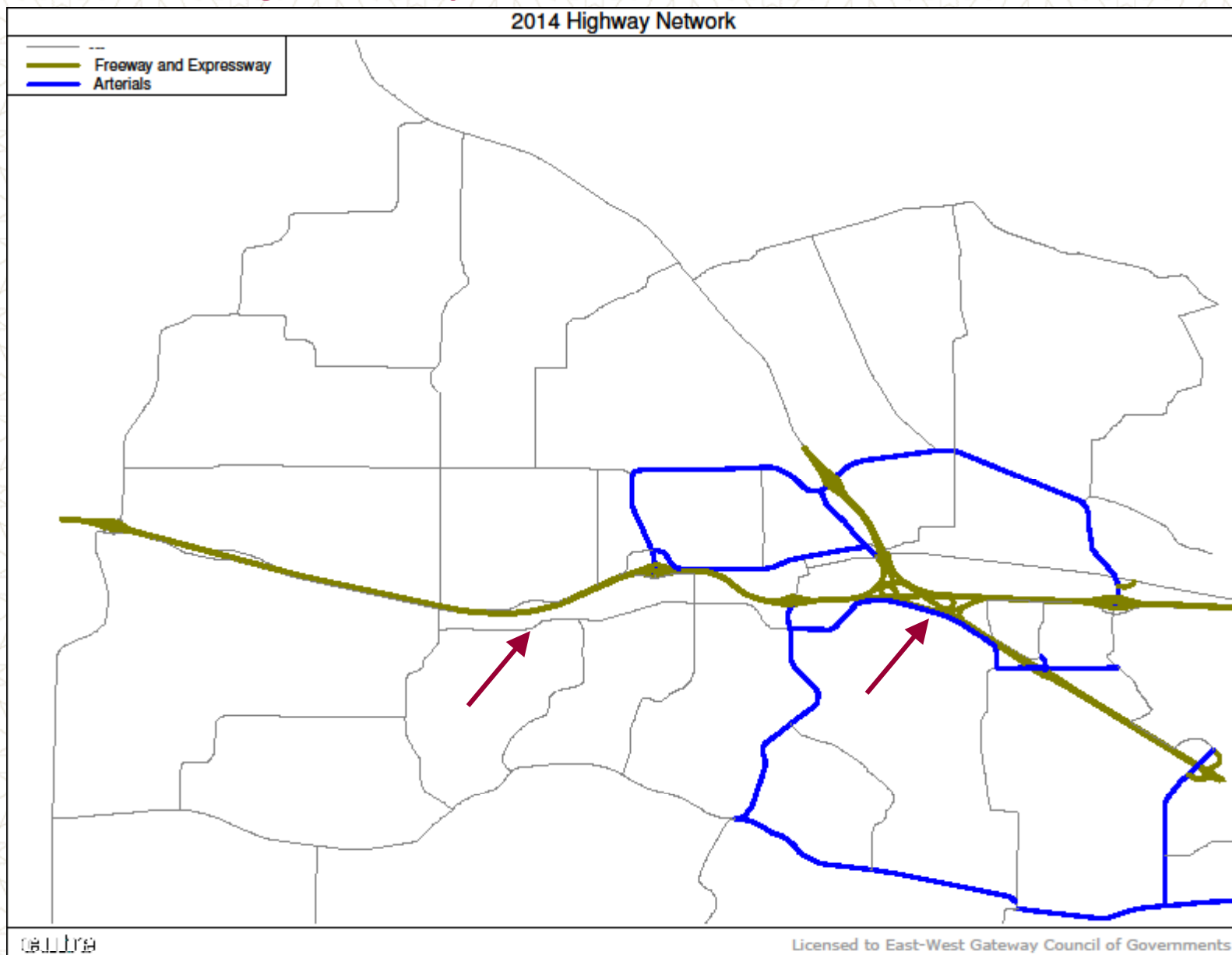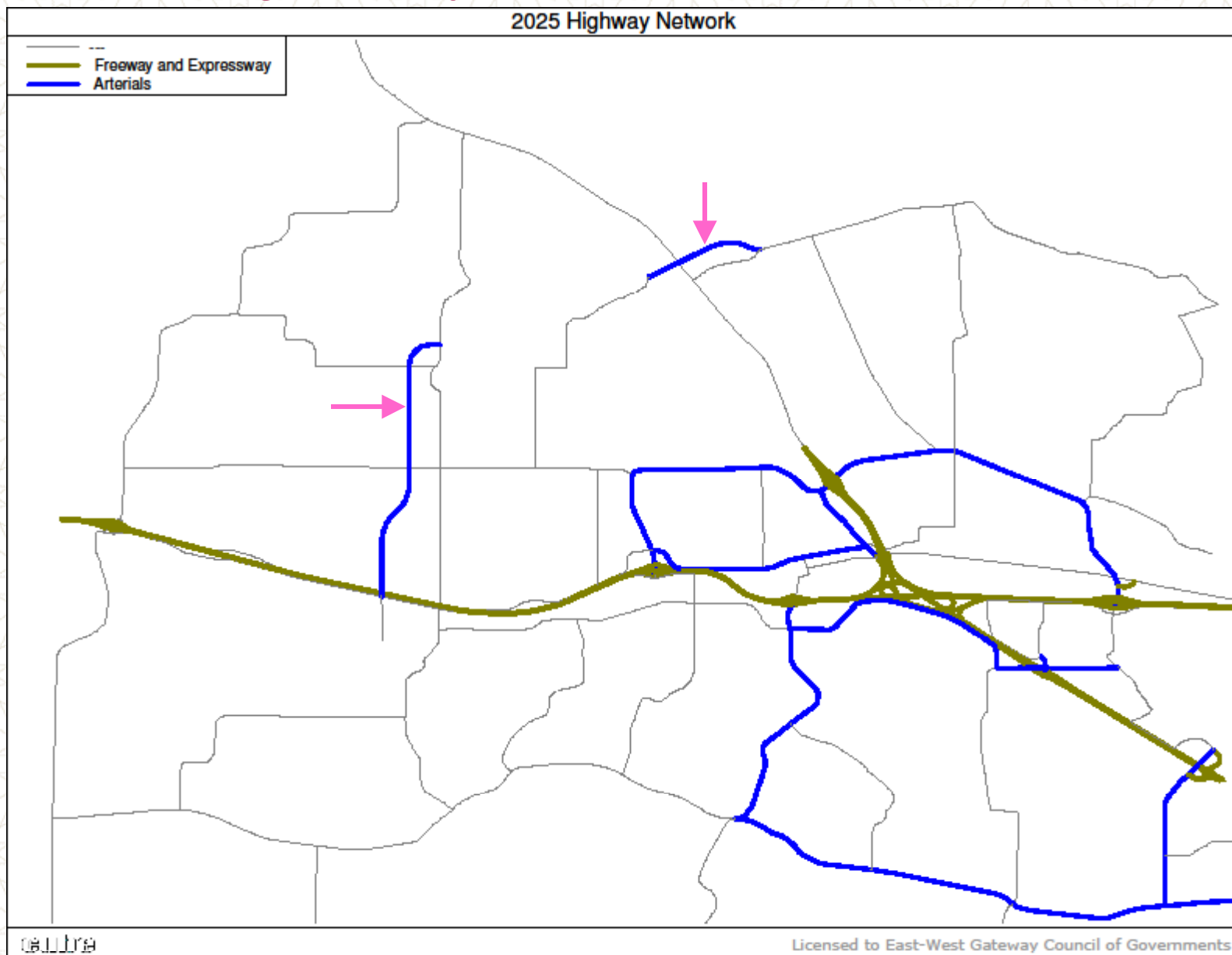2040 Highway Network

Freeway and Expressway
Arterials

Model Updates

Federal Mandate

§ 93.122 (b)(1)(i)   Procedures for determining regional transportation related emissions

*(i) Network-based travel models must be validated against observed counts (peak and off-peak, if possible) for a base year that is **not more than 10 years prior to the date of the conformity determination**. Model forecasts must be analyzed for reasonableness and compared to historical trends and other factors, and the results must be documented;*

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Why Update Travel Demand Models

1. Current **Behavioral** Attributes

2. Travel Pattern and Travel Mode Choices

3. Impact of other externalities on travel—fuel price, transit fares, attitudes etc

4. Revised demographics, land use data, Census and ACS data

Recalibration

Unified Planni...

- UPWP FY 2013

ON-BOARD TRANSIT SURVEY
1.02

Activities*:

1. Prepare a regional database of existing transit users travel patterns in the bi-state St. Louis area by conducting travel surveys on all the transit modes, including light rail and buses, available in the region.

2. Analyze the travel pattern of transit users in the bi-state St. Louis area.

3. Analyze relationship between transit user demographics, socioeconomic characteristics and travel patterns, and better understand the travel characteristics of many specialized populations.

4. Develop relationships and techniques for estimating the mode choice behavior in the bi-state St. Louis region.

5. Recalibrate the regional travel demand model TransEval, by integrating these updated relationships and techniques in the mode choice model to better reflect the current mode choice behavior.

6. Validate and transition to the recalibrated model.

7. Prepare technical documentation of the survey methodology, instrument and transit travel pattern database development, including a final report.

8. Prepare technical documentation for TransEval recalibration.

(Note: All activities will be performed by a consultant)

Products/Outcomes:

A. Executed contract for consulting services to conduct the on-board survey and recalibrate the travel demand model based on the survey results (October 2012)

B. On-board transit survey proposed methodology report, survey instrument, pilot survey (February 2013)

C. Conducted on-board transit survey (April 2013)

D. Data sets of transit users travel and socioeconomic characteristics (June 2013)

E. Validated base highway and transit travel demand model, and updated mode choice model parameters (June 2013)

7

GATEWAY
ernments

Creating Solutions Across Jurisdictional Boundaries

MOVES Update

Running MOVES

Inventory Mode

Emission Rate Mode

EAST-WEST GATEWAY
Council of Governments
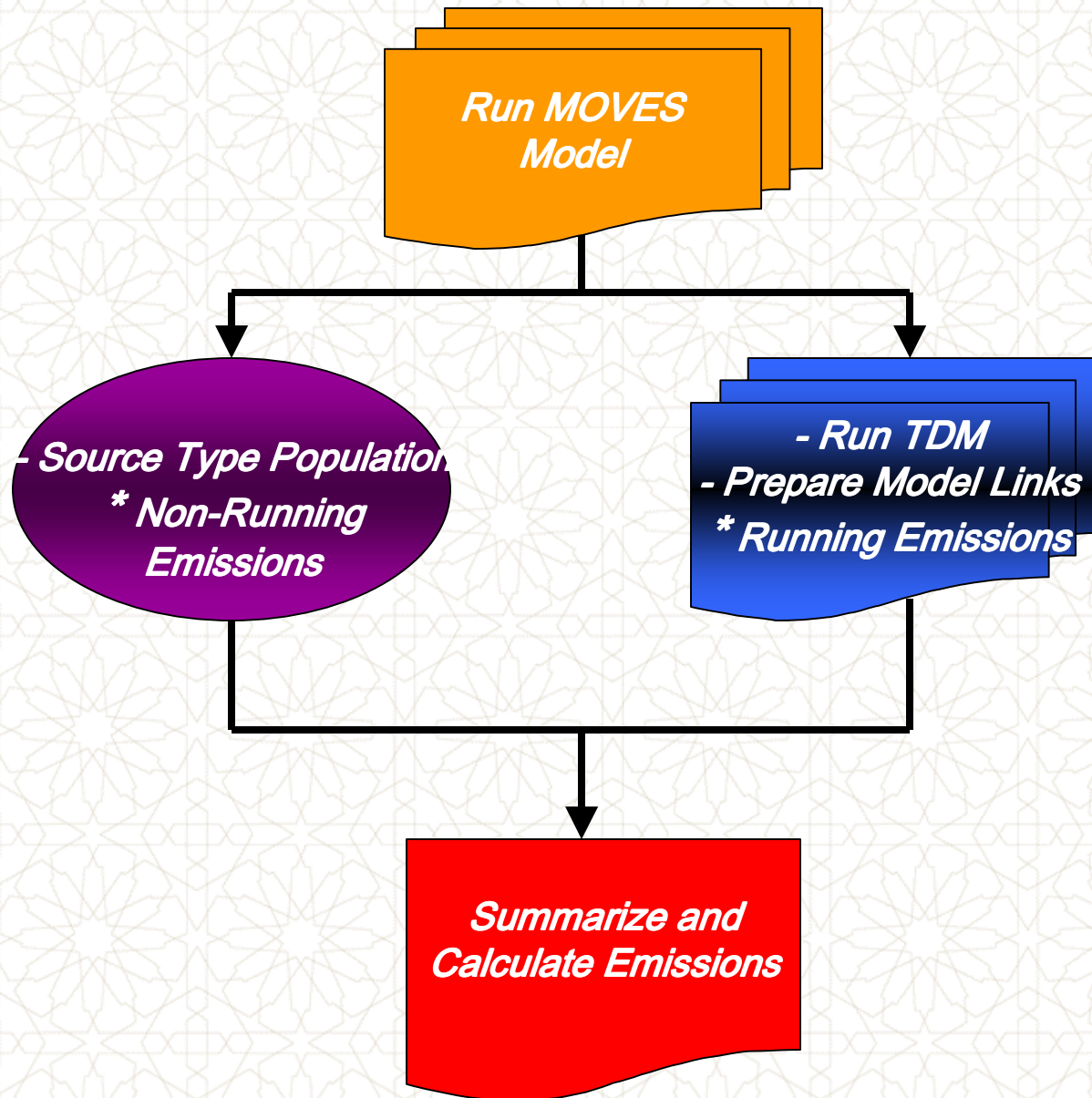Creating Solutions Across Jurisdictional Boundaries
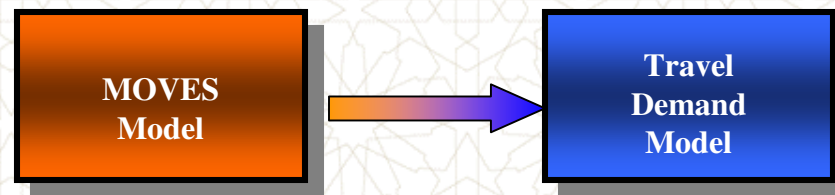
Why Emission Rate Mode

1. Creates emission rates lookup table

2. Use same rates across multiple counties

3. MOVES run only when an input changes

4. Network change warrants only travel model run

   i. VMT

   ii. Speed distribution

   iii. Road Type

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

MOVES—Emission Rate Mode

Run MOVES Model

- Source Type Population
* Non-Running Emissions

- Run TDM
- Prepare Model Links
* Running Emissions

Summarize and Calculate Emissions

EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

Questions?