Phase 1 Milestones:
PACOG Travel Demand Model Evaluation, Update and 2040 RTP Support
Project No. 14-009

Presentation Overview

1. Background and Overview
2. Blended Team Approach
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1. Background and Overview

Purpose and Need

- Moving Ahead for Progress in the 21st Century (MAP-21) and National Environmental Policy Act (NEPA) legislation require transportation planning processes to use the most current available data.
- An update to PACOG’s Travel Demand Model (TDM) is needed to support development of the 2040 Regional Transportation Plan.
  - The TDM update will incorporate Front Range Travel Survey (2010) travel data.
  - The TDM update will use the current traffic analysis zone (TAZ) structure that was required for the 2010 Census.

PACOG’s Travel Demand Model is a tool to support investment decision-making.
### 4-Step Travel Demand Model (TDM)

**Structure and Operation**

- **Trip Generation**
  - Uses survey trip rates and zonal socioeconomic characteristics as input
  - Calculates zonal trips produced and attracted by/to each TAZ by trip purpose

- **Distribution**
  - Uses zone to zone travel times and zonal trip productions and attractions as input
  - Calculates trip origin to/from destination trip tables by purpose
  - A “Gravity Model” formulation is used to “distribute” zonal trip productions/attractions to the zone-to-zone interchanges

- **Mode Choice**
  - Calculates mode shares for total travel by purpose; focus is typically on the Home-Based Work trip purpose travel segment
  - A “Nested Logit Model” formulation is used to calculate shares/split trip tables by mode of travel

- **Assignment**
  - Assigns zone to zone auto, truck and transit trips to the highway and transit networks
  - Can use a variety of assignment formulations, all of which account for the effects of capacity utilization (network congestion) on route choice
  - Truck assignment may use an all-or-nothing, minimum path, although the “Equilibrium Assignment” approach is typically used for general applications

Four simulation steps comprise traditional 4-step travel demand models

### TDM Building Blocks – Network Data

Highway, transit and connector network data feeds the TDM
Zonal data (travel times, socioeconomic data, and trip matrices) are also needed.

**TELUM Basics**

- PACOG uses TELUM to make long term forecasts of the MPO region’s spatial patterns.
- TELUM uses current and prior residential, employment data to forecast future locations of each by employment sector (TELUM-EMP), household income group (TELUM-RES).
- TELUM uses a *gravity model formulation* for spatial allocation.
TELUM Basics

- Required TELUM-EMP input data for each time (t):
  - Employment of type (k) in all TAZ’s
  - Population of all types in all TAZ’s
  - Total area per zone for all zones
  - TAZ to TAZ travel cost (time) between TAZ (j) and all other TAZ’s for all TAZ’s

- Required TELUM-RES input data for each time (t):
  - Residents of all h types in TAZ (i) at previous time (t-1)
  - Land used for residential use in TAZ i at time (t)
  - Vacant developable land in TAZ (i) at time (t)
  - TAZ to TAZ travel cost (time) between TAZ (j) and all other TAZ’s for all TAZ’s at time (t+1)
  - Employment of all (k) in all TAZ’s at time (t+1)

PACOG uses TELUM software to forecast TAZ socioeconomic data inputs

Scope of Work Overview

- Phase 1:
  - Work Plan and Team Identification ✓
  - Data Collection ✓
  - Legacy Travel Demand Model Evaluation ✓

- Phases 2A and 2B:
  - Allocate 2010 Socioeconomic Data to TAZ’s
  - Develop/Validate 2010 Base Year Model
  - Prepare 2040 Socioeconomic Forecasts
  - Model Alternatives for Regional Transportation Plan (RTP) 2040 Update
  - Develop Model Upgrade Goals and Objectives
  - Develop TDM Applications/Procedures
  - Prepare Documentation/Provide User Training
2. Blended Team
Team Approach

Consultant Team
3. Data Collection Status
Phase 1 Data Collection Approach

- Assemble complete inventory of PACOG archived travel model files
- Complete an inventory of PACOG’s project-oriented travel model versions
- Engage PACOG staff collaboration as a key resource for data collection
- Utilize a “Quick-Start” approach to advance data collection and processing to support advancing Phase 2 travel demand modeling!

Data Initially Provided by PACOG

- Available economic and socioeconomic reports
- Available planning and land use reports
- Available travel demand model documentation
- GIS shape files and data (Census 2000, 2010)
- Official PACOG TAZ layer
  - To be named “ZONE2014”
  - Includes 206 internal zones
  - Identical to PACOG-specified 2010 Census TAZ
- Available TransCAD model files for three travel model application “versions”
TransCAD plot shows new and old TAZ’s for TDM coverage area

TransCAD plot shows new and old TAZ’s for central model area
Phase 1 Data Collection Status

- Obtain employment data ✔
- Obtain household (Census) data ✔
- Collect special generator data ✔
- Collect school data ✔
- Obtain Department of Local Affairs (DLA) data and forecasts ✔
- Obtain “current” travel model computer code and documentation ✔
- Assemble available planning, land use, economic and socioeconomic data ✔
- This work is complete!

Special Generator Data Collection

- Provides important detail to the travel model not captured by household trip generation
- Includes data and handling for:
  - 20 Largest Employers
  - Major Tourist Destinations
  - Colleges/Universities
  - Hospitals
  - Large Government Employers
  - Motels/Hotels
- This work is complete!
School Enrollment and Employment Data Collection

- Focused on two school districts – City and County
- Allocated to the correct school facility
- Tabulation of employees all a district headquarters was an issue
- This work is complete!

Quick-Start Phase 2 Data Tasks Status

- Complete Census GIS: Allocate 2010 household data to TAZ’s ✓
- Complete processing of 2010 employment data
- Complete employment GIS: Allocate 2010 employment data to TAZ’s
- This work is ongoing!
2010 Census Data has already been allocated to TAZ's

Phase 2 Quick-Start 2010 Employment Data Processing

- PACOG requested and received the Quarterly Census of Employment and Wages (QCEW), formerly ES-202 for 2005 and 2010
- Staff reviewed and began to process data
- May need up to 100 hours staff time to clean and reconcile data
- Issues – missing addresses, zip codes or number of employees
- Work is ongoing - No tasks are more critical in May-June 2014!
Travel Model Version Evaluation

• Additional files and supplemental documentation were obtained from multiple sources.
• Four travel model versions were researched and evaluated for use in the PACOG TDM Update:
  – Legacy 1993 MINUTP Model (Barton Ashman)
  – I-25 EIS model application (CH2M Hill)
  – Pueblo Ranch model application (LSA)
  – US 50 PEL Study model application (JF Sato)
• Each version data set was a valuable resource for a different reason.
• Sum total – enough to make a good start on official PACOG travel model.
Phase 1 Model Evaluation Status

- Model Computer Code Audit and Integration ✔
- Hardware and Software Acquisition (PACOG) ✔
- Trip Generation Audit ✔
- Phase 2 “Quick-Start” approach was implemented and expanded model data needs were identified ✔
- This work is complete!

Quick-Start Phase 2 Model Tasks Status

- Build TransCAD Library ✔
- Prepare TELUM input zone-to-zone travel time matrices (for ZONE2014; 2005, 2010, 2035)
- Initiate setup for TELUS runs to forecast/allocate 2040 socioeconomic data
- This work is ongoing!
Quick-Start Phase 2 Socioeconomic Forecasting Tasks

- PACOG uses the Transportation Economic and Land Use Model (TELUM) to prepare socioeconomic forecasts for the Travel Demand Model
- TELUM will be used to forecast household and employment allocations to TAZ’s for 2040
- TELUM freeware was sponsored by the Federal Highway Administration (FHWA) and is supported by New Jersey Institute of Technology (NJIT)
- PACOG has in-house TELUM expertise
- Building blocks for 2040 TELUM application are in progress – specifically assembly of 2005 and 2010 employment seed data is still underway
Critical Path Activities

• 2010 Employment data processing
  – In progress
  – PACOG - HDR Blended Team supported
  – Highest priority
• TELUM Model Runs
• Selected model activities
  – Stand-up of US 50 PEL model version in ZONE2014 TAZ structure
  – Trip generation update for new 2010 base year
  – Travel time matrices for TELUS (206 x 206)

6. Next Steps
Short Term Next Steps

- Continue critical path activities under Phase 1 NTP
- Prepare for initiation of work under Phase 2 NTP
  - Contractual
  - Work plan
  - Budget
- Begin strategy sessions to advance completion of PACOG 2040 Regional Transportation Plan Update
Combined Project Schedule

Phase 1: Data Collection & Model Evaluation
- Task 1.1 Data Collection
- Task 1.2 Model Evaluation

Phase 2A: Travel Demand Model Update
- Task 2A.1 Model Update

Phase 2B: 2040 RTP Support & User Training
- Task 2B.1 RTP Support
- Task 2B.2 User Training

Key Dates

- Major Deliverable Completion Dates
  - Validated 2010 Base Year Model – July 28th
  - TELUM 2040 Forecasts – August 4th
  - RTP Alternatives Analysis – August 5th to September 1st

- Milestone Presentations to TAC (2 Meetings)
  - TDM Framework and Model Validation – August 8th
  - RTP Alternatives Analysis – September 4th
  - Project-Level TDM Applications – November 6th

- TDM Documentation and Training Schedule
  - TDM Methodology Report – September 1st
  - TDM User Guide/Standards – November 24th
  - TDM Training Module/Training – early December