SANDAG

Transportation Modeling Forum

June 12, 2019
Forum Agenda

Regional Count Database

TDM Toolbox / CAP Analysis

ABM2+ Model Development
Regional Count Database

Mike Calandra
Mike.Calandra@sandag.org
Overview

- Contract
- Modules
- Features and Goals
- Application Customization
- Account Setup
- Upcoming Training
- Application Demonstration
Contract

- Full RFP process
- Three modules
- 10 years of maintenance
Modules

- Transportation Data Management System (TDMS)
  - Traffic Count Database System (TCDS)
    - Average Daily Traffic
      - Short (hose) Counts
      - Continuous Counts
  - Turning Movement Counts (TMC)
    - Lefts, throughs and rights at intersections
- Non-Motorized Database System (NMDS)
  - Pedestrian and bicycle counts
Features

- Stable cloud-based environment
- User permission levels
- Interactive mapping
- Local arterial counts only
- Custom report generation
- Bulk download
- Bulk upload from field devices
Goals

- New approach of data management
  - Replace existing annual solicitation to update observed traffic counts via static PDFs with continuous updates to a robust database
  - Travel demand model calibration
Application Customizations

- Migration of existing legacy ADTs
- Convert PDF data to interactive points

City of La Mesa

<table>
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<tr>
<th>Primary Street</th>
<th>1st Cross Street</th>
<th>2nd Cross Street</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<th>2015</th>
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<tr>
<td>JACKSON DR</td>
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<td>7600 N</td>
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<td>7600 N</td>
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</tbody>
</table>
Application Customizations

- Migration of existing pedestrian and bicycle counts
  - Coming soon
- No existing turning movement data to migrate
- Incorporation of local GIS data
- Linked to the ABM for model calibration
Account Setup

- Permission levels
  - Site Manager: Read/Write & add users
  - Admin: Read/Write
  - User: Read only

- Desire multiple logins for each jurisdiction
  - Request a login by sending an email to:
    - mike.calandra@sandag.org
    - joaquin.ortega@sandag.org
Account Setup

- Login instructions document
  - User Name: first.last
  - Password: (found in the document)

- Please change your generic password the first time you login!
Application Demonstration

- High level overview of the system
- Basic editing of points
  - The conversion of PDF data to interactive GIS points can require some review
    - Moving count points
    - Updating point metadata
    - Updating count data

https://sandag.ms2soft.com/tcds/tsearch.asp?loc=Sandag&mod=TCDS
TDM Toolbox / CAP Analysis

Krystal Ayala
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Allison Wood
allison.wood@sandag.org
ReCAP Overview

1. Develop and maintain CAP
2. Implement CAP
3. Monitor and report progress

sandag.org/climate
Custom CAP Services

- CAP Development, Implementation Plans, Benefit-Cost Analysis
- Currently working with seven cities

ReCAP Snapshots

- GHG Emissions Inventory, Performance Indicators
- Planned updates for Roadmap cities every 2 years

Climate Action Data Portal

- Forthcoming web-based tool for CAP-related data
Transportation Emissions

VMT * Emissions Factor

- Annual O-D VMT
- I-I + 1/2*(E-I+I-E)
- EMFAC
- CO₂e/mile

Sample GHG emissions inventory

SANDAG 2018
CAP Analysis
Emissions Projections and Targets

Sample CAP wedge chart

GHG EMISSIONS (MT CO₂E)

TIME (YEARS)

BAU GHG EMISSIONS PROJECTIONS

LEGISLATIVELY-ADJUSTED BAU

TARGET EMISSIONS

REDUCTION AFTER LOCAL CAP MEASURES

SANDAG 2018
CAP Analysis

GHG Reduction Measure Quantification

• Closing the Gap
  Gap between BAU projection and GHG targets

• Quantify GHG reductions from measures
  State Measures
    E.g., Zero Emission Vehicles
  Local CAP measures
    E.g., Bike infrastructure
CAP Monitoring Framework

Assess progress toward GHG reduction targets and CAP measure implementation

1. Community-wide GHG Inventory
   Updated every 2 years (ABM VMT data)

2. Activity Data for CAP Measures
   Best available, regionally consistent observed data

3. Recent Accomplishments
   Jurisdiction-specific actions undertaken
Ongoing CAP Activities

• Iterative nature of CAP planning
  Plan – Implement – Monitor – Update

• Opportunities to improve analysis
  Data, research, information sharing

• Regional Plan

Questions?

Allison Wood
allison.wood@sandag.org
SANDAG Mobility Management Toolbox

Transportation Modeling Forum
June 12, 2019
Mobility Management at the Regional Level

• SANDAG incorporates a variety of mobility management strategies in the Regional Plan:
  – Transportation Demand Management (TDM)
  – Transportation System Management (TSM)

• SANDAG is designated the area-wide clearinghouse for the review of environmental documents and or projects
Regional Resources

- Regional Mobility Hub Strategy
- Regional Parking Management Toolbox
- Integrating TDM into the Planning and Development Process
- Mobility Management Toolbox (under development)
Mobility Management Toolbox

• Caltrans Strategic Partnerships Planning Grant
• Quantify vehicle miles traveled (VMT) reductions resulting from TDM and TSM implementation
• Key resource during the development review process and for transportation analyses required under CEQA
• Help jurisdictions implement SB743
• Support CAP implementation and monitoring
Regional Stakeholder Outreach

- Survey of local jurisdictions & interviews in Summer 2018
- Focus groups with industry experts, development community, public agency staff
- Regional stakeholder workshop in November 2018
- Webinar in December 2019
Literature Review & Case Study Research

• Review available research
  – Compilations and meta-analyses
  – Strategy-specific studies
  – Existing calculator tools

• Review current practices for implementation of TDM and TSM as mitigation strategies and SB 743 implementation
# Mobility Management Strategies with Defensible VMT Reduction Estimates

<table>
<thead>
<tr>
<th>Land Use Strategies</th>
<th>Employer Commute Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Transit oriented development (TOD)</td>
<td>- Employer commute program</td>
</tr>
<tr>
<td>- Mixed use development</td>
<td>- Employer carpool program</td>
</tr>
<tr>
<td></td>
<td>- Employer vanpool program</td>
</tr>
<tr>
<td></td>
<td>- Employer transit subsidy</td>
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<td></td>
<td>- Employer telework program</td>
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<table>
<thead>
<tr>
<th>Neighborhood Enhancements</th>
<th>Parking Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Street connectivity improvements</td>
<td>- Parking pricing</td>
</tr>
<tr>
<td>- Pedestrian facility improvements</td>
<td>- Parking cash-out</td>
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<tr>
<td>- Bikeway network expansion</td>
<td></td>
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<tr>
<td>- Bike facility improvement</td>
<td></td>
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<table>
<thead>
<tr>
<th>Transit Strategies</th>
<th>Neighborhood Enhancements</th>
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<tr>
<td>- Transit service expansion</td>
<td>- Carshare</td>
</tr>
<tr>
<td>- Transit frequency improvements</td>
<td>- Bikeshare</td>
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<tr>
<td>- Transit supportive treatments</td>
<td>- Community-based travel planning</td>
</tr>
<tr>
<td>- Transit fare reduction</td>
<td></td>
</tr>
<tr>
<td>- Microtransit (NEV Shuttle)</td>
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</table>
VMT Reduction Calculator

**Overview**

The Mobility Management VMT Reduction Calculator Tool estimates the percent reduction in vehicle miles traveled (VMT). This Excel tool is intended to act as a resource for evaluating and quantifying the impacts of mobility management strategies as part of the development review and transportation analysis process. The toolbox supports the goals of SB 713 (Steinberg, 2013) by providing jurisdictions and developers with a resource to quantify VMT reductions resulting from implementation of a variety of mitigation strategies at various scales.

The tool operates at two geographic scales: project/site level and community/city level. Depending on the project location and project type, users can select appropriate strategies of interest for mitigating transportation impacts.

Some strategies reduce VMT only from employee commute trips. Other strategies reduce VMT from all project-related trips or all community/city trips. The type of VMT affected is shown on the Results pages and on the individual strategy pages.

Each strategy requires that the user input values that are used to calculate the percent reduction in VMT for each selected strategy. For many strategies, the tool offers default parameters that can be replaced with user-provided values if available.

This project was funded by a Caltrans Strategic Partnerships Planning Grant. This project is available as a resource for local jurisdictions. Local jurisdictions are under no obligation to use this tool in their development.

**Instructions**

Follow the steps below:

1. Under the “Project Information” section below, select the scale of analysis.
2. Select the location of analysis, using the drop-down menus below. If San Diego City or Unincorporated San Diego County is selected, the user has the ability to select the Community Plan Area location.
3. Depending on the scale of analysis, different mobility management strategies are available for consideration. Click on a strategy of interest by selecting the strategy name. The hyperlink will take the user to that strategy page. Each strategy page requires the user to update input cells to estimate the percent VMT reduction. See Legend to the right for a display of the different cell styles present in the strategy formularia.
4. Using hyperlinks, the user can navigate to the appropriate Results pages to see the individual strategy and cumulative results.
5. Additional strategies can be selected, and the Results page will reflect the combined impact of multiple strategies. If the user does not want to include the impact of a strategy with the cumulative results, they may click “Exclude from Results” on the strategy page (see Legend).
6. Once the user has reviewed the individual strategy and cumulative results on the appropriate Results page, they can click the “Print Results” hyperlink to take them to a printable page with a summary of project information, percent VMT reduction, and citations for the strategies.

**Legend**

Below are the different cell styles the user will see in the formularia of the strategy pages. Not all strategies use each cell style.

- **constant, coefficient, or default**
  - user input
  - user input, optional
  - overridden default
  - user input, linked
  - calculation
  - % change in VMT
  - % change in VMT, max
  - exclude from results
# VMT Reduction Calculator Demo

## Mobility Management Strategies

### Project/Site-Level Strategies

<table>
<thead>
<tr>
<th>Project-Level Results</th>
<th>Community/City-Level Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employer Commute Trip Reduction Programs</td>
<td>Community-Level Results</td>
</tr>
<tr>
<td>Strategies implemented by employers that encourage workers to commute by modes other than single-occupant vehicle (SOV)</td>
<td>Neighborhood Enhancements</td>
</tr>
<tr>
<td>1A Voluntary Employer Commute Program</td>
<td>4A Street Connectivity Improvement</td>
</tr>
<tr>
<td>1B Mandatory Employer Commute Program</td>
<td>4B Pedestrian Facility Improvement</td>
</tr>
<tr>
<td>1C Employer Carpool Program</td>
<td>4C Bikeway Network Expansion</td>
</tr>
<tr>
<td>1D Employer Transit Pass Subsidy</td>
<td>4D Bike Facility Improvement</td>
</tr>
<tr>
<td>1F Employer Vanpool Program</td>
<td>4E Bikeshare</td>
</tr>
<tr>
<td>1F Employer Telework Program</td>
<td>4F Carshare</td>
</tr>
</tbody>
</table>

### Land Use Strategies

<table>
<thead>
<tr>
<th>Strategies that modify the location or characteristics of development projects to encourage non-SOV travel modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A Transit Oriented Development</td>
</tr>
<tr>
<td>2B Mixed Use Development</td>
</tr>
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</table>

### Parking Management

<table>
<thead>
<tr>
<th>Strategies that discourage SOV travel by modifying the price or supply of vehicle parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A Parking Pricing</td>
</tr>
<tr>
<td>3B Parking Cash Out</td>
</tr>
</tbody>
</table>
EMPLOYER VANPOOL PROGRAM

Vanpools typically carry 10 passengers and operate anywhere, serving either one of two common trip origin locations (physically or partially) or at a distinct station and the place of work. Vanpool programs can provide vehicle ownership by an organization to encourage and drive in-commuting options and also share an employer’s distribution. The van pool may be operated by the driver or by the company themselves. Some vanpool programs provide shuttle services to attend potential events.

SCALE OF APPLICATION: Project Size

IMPACT ON VMT

Reduction of up to 20% of vehicle miles traveled

VMT reduction estimated by:

- The number of vanpools established through the program
- The number of miles driven by each vanpool
- The number of miles driven in a vanpool
- The number of employees in a vanpool
- The number of employees in a vanpool

IMPLEMENTATION CONSIDERATIONS

- Most appropriate for larger employers with worksites
- Available in one location and serving regular routes
- Service can be shared or separate from regular commute
- Vanpool can provide an incentive for employees

IMPLEMENTATION RESOURCES

- SANDAG Vanpool Program provides a subsidy of up to $300 per month or $600 per year for the vanpool
- Employees may be eligible for additional incentives from their workplace
- www.sandag.org/vanpool

REFERENCE


www.technology-handbook.com/ch/04/040805

COMPLEMENTARY STRATEGIES

- Often implemented as part of a broader employer commute trip reduction program

CASE STUDY

TerraCon, a global engineering company headquartered in San Diego, helped cut fees for those who vanpool by providing each vanpool with $175 per month for expenses. The program grew to 15 vanpools in 2016.
ICF Toolbox Design Document

Mobility Management
VMT Reduction
Calculator Tool – Design Document

May 2010

1E. Employer Vanpool Program

Description: Vanpooling is a collective form of public transportation that provides groups of 5-20 people with a cost-effective and convenient rideshare service for commuting. An employer can encourage employees to use vanpooling by establishing a vanpooling program for employees that have a similar origin and destination and by providing parking spots for employees that vanpool.

The Sandag Vanpool program provides a subsidy of up to 50% per employee to offset the vehicle lease charges.

Formula: Change in VMT (With vanpool) - Change (Without vanpool) = Z

where:
VMT with vanpool = 2 * P * Q * V1 * [0.6 * (1 - 0.0)] + Q
VMT without vanpool = 2 * P * Q * V1 * [0.6 * (1 - 0.0)] + Q

\[ Z = \text{vanpool subsidy} \]
\[ G = \text{vanpool program} \]
\[ V = \text{vanpool coupon} \]
\[ E = \text{employee} \]
\[ O = \text{commute trip length} \]

Data inputs:
- Number of employees
- Number of vanpools

Common assumptions:
- Average one-way commute trip length is 15.72 miles.

Vanpool facts:
- Average one-way vanpool trip length is 18 miles.
- Average vanpool occupancy including driver is 6.8 percent.

Sources:
- "Sandag, 2018 Employer Vanpool Program
Next Steps

• All project deliverables finalized by June 30
  – Mobility Management Toolbox Guidebook
  – VMT Reduction Calculator
  – Design Document
  – Recommendations for Application
  – User Training Videos
Questions?

Mobility Management Toolbox resources available:
www.icommutesd.com/localgov

Krystal Ayala, Regional Planner
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Preamble to the ABM2+ Model Development

Rick Curry
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RTP/RP/SCS Acronym Soup

**RTP = Regional Transportation Plan**
- 1975 to 2007
- 2020 Federal Plan

**RPs & SCSs**
- 2011, 2015, 2021
- RP = Regional Plan
  - Merge of RTP & Regional Comprehensive Plan (RCP)
- SCS = Sustainable Communities Strategy
  - SB375 requires regional metropolitan planning organizations in California to develop a SCS, or long-range plan, which aligns transportation, housing, and land use decisions toward achieving GHG emissions reduction targets set by the California Air Resources Board (CARB)
## RP / RTP / SCS Model Linkage

<table>
<thead>
<tr>
<th>RP / RTP / SCS</th>
<th>Model Version</th>
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<tr>
<td>2011 RP (1st SCS)</td>
<td>4-Step v12.1</td>
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<tr>
<td>2015 RP (2nd SCS)</td>
<td>ABM1 v13.2.3</td>
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<tr>
<td><strong>Current Model</strong></td>
<td><strong>ABM1 v13.3.2</strong></td>
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<tr>
<td>2019 RP (3rd SCS)</td>
<td>ABM2 v14.0.1</td>
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<tr>
<td>2020 RTP</td>
<td>ABM2 v14.1.0</td>
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<tr>
<td>2021 RP (3rd SCS)</td>
<td>ABM2+</td>
</tr>
<tr>
<td>2025 RP</td>
<td>ABM3</td>
</tr>
</tbody>
</table>
ABM2+ Model Development

Wu Sun

wu.sun@sandag.org
Modeling Challenges

Emerging technologies & modes
- Limited observed data
- Limited opportunity for analogy
- Potential transformative changes in travel behavior

Traditional single-point forecasts ineffective

Scenario testing preferred
- Multiple runs with systematically varied parameters
Emerging Technologies & Modes

Transportation network company (TNC)
Connected & Autonomous Vehicles (CAV)
High-speed transit services
Micro mobility
Roadmap & ABM2+

Active Transportation Model
Database & Reporting
Base year 2012

ABM1 Development
01/09-01/13

2006 HHTS
2009 On-Board Survey
Base year 2010

ABM1
2015 RP
01/15-10/15

2016/17 HHTS
2015 On-Board Survey
Tour-based CVM
Travel Time Reliability
Base year 2016

ABM2
07/17-06/18

ABM2+ Development
03/19-12/19

We are here

CAV/TNC
High Speed Transit
MicroMobility

ABM2+
2021 RP
03/20-11/21

QA/QC
Sensitivity Tests

03/2020:
A Magic Date

Tour
- based CVM
Base year 2010
Why modeling emerging technologies?

- COMPLETE CORRIDORS
- TRANSIT LEAP
- MOBILITY HUBS
- NEXT OS
- FLEXIBLE FLEETS
Modeling TNCs

Effects of TNC availability on auto ownership
- Via addition of TNC nest to transit accessibilities

Extension of mode choice
- Mobility-as-a-service nest
  - Taxi, TNC-single, & TNC-shared
  - User-configurable wait time and cost functions
- TNC-transit access mode similar to KNR-transit
- Alternative-specific constants to reflect non-included attributes
  - Calibrated to TNC survey
Modeling CAVs (1)

Auto ownership model-extended
- Human-driven vs. autonomous vehicles

Vehicle type availability
- Households with both HV and AV – is an AV available for the tour?

Mode choice model-extended
- Minimum age for drive-alone
- In-vehicle time sensitivity
- Auto operating cost modifier; parking cost modifier; terminal time modifier
Modeling CAVs (2)

Extended Auto Ownership Model

- **Choice**
  - **0 Autos**
  - **1 Auto**
  - **2 Autos**
  - **3 Autos**
  - **4+ Autos**

  - **0 Autos**
    - **Human-Driven**
    - **Autonomous**
  - **1 Auto**
    - **3 HVs**
    - **3 AVs**
  - **2 Autos**
    - **1 HV 2 AVs**
    - **2 HVs 1 AV**
  - **3 Autos**
    - **4+ HVs**
  - **4+ Autos**
    - **2 HVs**
    - **2 AVs**
    - **1 HV 1 AV**
Modeling CAVs (3)

Highway Assignment
- Add AVs to non-AVs using AV factors
  - Represent assumed AV efficiencies on PCEs
- Assign AVs separately
  - Track AV demand on AV-only lanes facilities
  - Challenge(s): already 30 vehicle classes; would increase model runtime significantly

Capacity improvements
- Limited improvements in mixed-fleet situations
- Larger improvements in 100% AV situations
Modeling Shared Autonomous Vehicles (SAVs)

SAV routing algorithm
- Approximation of SAV routing based on Lyft Line algorithm
- Inputs from ABM
  - Trip list
  - Travel time and distance

Preliminary Results
- Approximately 420k vehicles to serve 11.5M trips
- 0.35 veh/household vs. current 1.8 veh/household
Modeling High Speed Transit Mode

Add new mode to EMME transit network

Code station-station times and headways
- Actual wait times may require iterating with demand depending on assumed vehicle capacities

Compete in ‘premium’ and ‘premium + local with transfer’ mode alternatives

High Speed Transit time & distance skimmed separately

High speed transit-specific constants in mode/transit path choice
Modeling MicroMobility

Modeled via walk-transit-walk mode

- Max "walk" distance increase based on availability assumptions
- Number of zones accessible to transit increase
- Walk times reflect generalized cost of walk and MicroMobility
- Either all-or-nothing or apply choice model to estimate micro-mobility demand from walk-transit trips

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
<th>Units</th>
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<tbody>
<tr>
<td>Walk speed</td>
<td>3</td>
<td>MPH</td>
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<tr>
<td>Micro speed</td>
<td>15</td>
<td>MPH</td>
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<tr>
<td>Micro cost</td>
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<td>per mile</td>
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<tr>
<td>Micro wait time</td>
<td>3</td>
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<tr>
<td>Micro constant</td>
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<td>minutes</td>
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<tr>
<td>Time Value of Money</td>
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<td>MPD</td>
</tr>
</tbody>
</table>

Walk Time Versus Equivalent Micro-Mobility Time

![Graph showing walk time versus equivalent micro-mobility time](image-url)
What Have We Done Beyond Just Plumbing Work?

Technical Advisory Committee (TAC)
- National leaders in travel demand modeling
- TAC members from FHWA, CARB, MPOs, academia, & an independent consultant

Goals
- Evaluate exiting ABM2
- Review proposed ABM2+ methodologies
- Engage in multi-year guidance
  - 05/2019 meeting
  - 11/2019 meeting
  - Once a year after
Forum Agenda

Regional Count Database

TDM Toolbox / CAP Analysis

ABM2+ Model Development

Next Transportation Model Forum:
December 11, 2019
SANDAG

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