Rethinking the urban freeway

Options for rebuilding, replacing, altering or otherwise addressing aging freeways
State Smart Transportation Initiative

Practical Solutions to Move America Forward

A network of reform-oriented state DOTs, founded in 2010 and housed at the University of Wisconsin.

- Executive-level Community of Practice
- Technical assistance
- Resource for the transportation community
Today’s Speaker

David Vautin
Senior Transportation Planner
Metropolitan Transportation Commission
MAKING A COMPELLING CASE

Performance-Driven Investments in the MAP-21 Era

Dave Vautin
Metropolitan Transportation Commission
SSTI Webinar - May 30, 2014
Overview of MTC’s Role: Planning for the San Francisco Bay Area

Impetus for Project-Level Assessment: Limitations of Scenario-Level Analysis

Modeling, Analysis, and Communications: Framework for Evaluating Hundreds of Projects

Policy Implications: High-Performers and Low-Performers

Potential Areas for Future Improvement: Taking Project-Level Analysis to the Next Level
Overview of MTC’s Role:
Planning for the San Francisco Bay Area

Image Source: https://www.flickr.com/photos/clintsharp/11079639516
THE SAN FRANCISCO BAY AREA IN NUMBERS

- 7,000 mi²
- 9 counties
- 101 cities
- 7 million people today
- 9 million people in 2040
- 3 major cities: San Jose, San Francisco, and Oakland

Image Source: https://www.flickr.com/photos/clintsharp/11061059935
MTC’s Roles and Responsibilities

- Metropolitan planning organization for nine-county San Francisco Bay Area
  - Planning
  - Funding
  - Coordination

- Responsible for development of long-range regional plan (RTP/SCS) and short-range programming (TIP)
Typical MPO Performance Responsibilities

Performance Monitoring

Performance-Based Planning

Performance-Based Programming
LONG-RANGE PLANNING PROCESS

A. Establish Performance Targets
B. Assess Project Performance
C. Assess Scenario Performance
D. Assess Plan/EIR Performance
E. Monitor Performance of Adopted Plan
2

Impetus for Project-Level Assessment: Limitations of Scenario-Level Analysis
<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2005</th>
<th>2009</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2001 Regional Transportation Plan</strong></td>
<td>None</td>
<td>Goals-based</td>
<td>Goals-based</td>
<td>Integrated targets</td>
</tr>
<tr>
<td><strong>Transportation investment packages</strong></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Limited benefit-cost analysis</td>
</tr>
<tr>
<td><strong>Transportation targets</strong></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Rigorous benefit-cost analysis</td>
</tr>
<tr>
<td><strong>Integratd transportation &amp; land use scenarios</strong></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Number of Projects Analyzed</strong></td>
<td>0</td>
<td>400</td>
<td>700</td>
<td>900</td>
</tr>
</tbody>
</table>
• First regional plan to integrate transportation, land use, and housing

• Sustainable Communities Strategy initiated by California Senate Bill 375
A COLLABORATIVE TARGET-SETTING PROCESS

- Engaged stakeholders from the region’s 9 counties, 101 cities, 26 transit operators, and numerous advocacy organizations
- 6-month process to define performance measures & targets
- 8-month process to establish project evaluation framework
- Result: broad support for rigorous performance assessment from key stakeholders, executive leadership, and policymakers
Increase gross regional product

Reduce per-capita greenhouse gas emissions from cars and light-duty trucks

Direct all non-agricultural development within the urban footprint

Reduce premature deaths from exposure to particulate emissions

Reduce injuries and fatalities from collisions

Increase average daily time spent walking or biking

House all of the region’s projected housing growth

Decrease housing and transportation costs as a share of low-income household budgets
Scenario Target Results

• Despite examining numerous scenarios with varying land use and transportation combinations, relatively similar results emerged on many of the Plan’s performance targets.

• Analyzing packages of similar projects (e.g. rail efficiency) obscures key differences between projects within the packages.
Modeling, Analysis, and Communications: Framework for Evaluating Hundreds of Projects
1. Which projects should be subjected to performance assessment?

2. Should projects be assessed qualitatively or quantitatively?

3. What analysis year(s) should be selected?

4. What models or tools can assist in identify merits of projects?

5. Is it possible to quantify “non-traditional” benefits?

6. What inputs are necessary for project sponsors to provide?
Which projects should be subjected to performance assessment?

• Critical decision: where do you draw the line?

• Careful balance between:
  – second-guessing projects under construction
  – giving a pass to potentially poor-performing projects
Which projects should be subjected to performance assessment?

Number of Projects

- Assess by project type
- Committed: 200
- Assess individually: 500

Cost of Projects (in billions of $)

- Assess by project type
- Committed: 30
- Assess individually: 170

Number and cost of projects are approximated for simplicity.
Should projects be assessed qualitatively or quantitatively?

<table>
<thead>
<tr>
<th></th>
<th>QUALITATIVE ASSESSMENT</th>
<th>QUANTITATIVE ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRENGTHS</td>
<td>• Can capture benefits or impacts unable to be quantified in travel model</td>
<td>• Can rely on advanced travel model to quantify benefits</td>
</tr>
<tr>
<td></td>
<td>• Requires less time and computing power</td>
<td>• Quantitative results can challenge qualitative assertions of project sponsor</td>
</tr>
<tr>
<td>WEAKNESSES</td>
<td>• Certain degree of subjectivity in results</td>
<td>• May require significant modeling resources</td>
</tr>
<tr>
<td></td>
<td>• Difficult to weight various qualitative goals</td>
<td></td>
</tr>
</tbody>
</table>
Should projects be assessed qualitatively or quantitatively?

Number of Projects

- Qualitative only (by project type): 700
- Quantitative & qualitative: 100
- Quantitative only: 200
- Committed: 500

Cost of Projects (in billions of $)

- Qualitative only (by project type):
  - Qualitative only: 10
  - Quantitative & qualitative: 20
  - Committed: 30
- Committed: 150

Number and cost of projects are approximated for simplicity.
What analysis year(s) should be selected?

- Single year or multiple years?
- Horizon- or stream-based approach?
- Analysis complexities & modeling requirements
What models or tools can assist in identifying merits of projects?

- Activity-based model?
- Prior analyses (EIR, etc.)?
- Sketch-level planning tool?
- Planning intuition?
What models or tools can assist in identifying merits of projects?

- For Plan Bay Area - leveraged existing investment into ABM (Travel Model One)
- Runtime reduced from 24 hours to 8 hours via modeling efficiencies
- 100+ model runs to calculate individual benefits of each project
- Captured project benefits across all 9 counties (esp. important for project with regional impacts)
Is it possible to quantify “non-traditional” benefits?

- Public health
- Land use
- Public realm
- Auto ownership & parking
- etc.
Is it possible to quantify “non-traditional” benefits?

<table>
<thead>
<tr>
<th>Benefit Distribution for a Typical ROADWAY Project</th>
<th>Benefit Distribution for a Typical TRANSIT Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>95% travel time</td>
<td>73% travel time</td>
</tr>
<tr>
<td>Travel Time</td>
<td>Travel Time</td>
</tr>
<tr>
<td>Travel Cost</td>
<td>Travel Cost</td>
</tr>
<tr>
<td>Air Pollutants</td>
<td>Air Pollutants</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
</tr>
</tbody>
</table>

Note that negative benefits (disbenefits) are not shown.

“Other” benefits include: collision reduction, noise reduction, and health benefits from active transportation.
What inputs are necessary for project sponsors to provide?

- Capital and operating costs
- Project extents
- Operational patterns
- etc.
TARGETS ASSESSMENT

Determine impact on targets adopted by MTC and ABAG

Analyzed all 1000 uncommitted projects

BENEFIT-COST ASSESSMENT

Compare benefits & costs

Analyzed most significant projects (approximately 100 in total)
**Targets Assessment**

Assessed qualitatively using target scores (max score of +10).

1. Climate Protection  
2. Adequate Housing  
3. Particulate Matter  
4. Collisions  
5. Active Transportation  
6. Open Space  
7. Equitable Access  
8. Economic Vitality  
9. Non-Auto Mode Share/VMT  
10. State of Good Repair

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**Benefit-Cost Assessment**

Assessed quantitatively using MTC Travel Model One.

**BENEFITS**
- Travel time (including recurring & non-recurring delay)
- Travel cost (auto operating/ownership, parking)
- Emissions ($CO_2$, $PM_{2.5}$, ROG, $NO_x$)
- Collisions (fatalities, injuries, property damage)
- Health impacts due to active transport
- Noise

**COSTS**
- Capital costs
- Net operating and maintenance (O&M) costs
Project Performance Assessment: All Road Projects

Bubble size represents the project benefits.

- Road Project
- Silicon Valley Express Lanes Network
- Fremont/Union City East-West Connector
- MTC Express Lanes Network
- SR-239 Expressway (Brentwood to Tracy)
- SR-84/I-680 Interchange Improvements and Widening
- New SR-152 Alignment
- SR-4 Bypass Completion
- I-680/SR-4 Interchange Improvements and Widening
- Marin-Sonoma Narrows (Phase 2)
- Freeway Performance Initiative
- ITS Improvements in Santa Clara and San Mateo Counties
- SR-85 Auxiliary Lanes
- US-101 HOV Lanes (Whipple to Cesar Chavez)
- I-80 Auxiliary Lanes (Airbase Parkway to I-680)
- SR-29 HOV Lanes and BRT
- Bay Bridge Contraflow Lane
- Treasure Island Congestion Pricing
- Congestion Pricing Pilot
Project Performance Assessment: Selected Transit Projects

Bubbles labeled for projects with greater than $15 million in annual benefits. Bubble size represents the project benefits.

- Transit Project

Adverse Impact on Targets

Supports Targets
Project Performance Assessment: Results by Project Type

Bubble size represents the total annual benefits for all projects of that type.

- **Road Project**
- **Transit Project**
- **Regional Program**
Plan Bay Area Performance Assessment

Benefit-Cost Limitations

• New/induced trips
• Simple methodologies for active transport, parking, and vehicle ownership
• Utility framework vs. BCA framework
• Interregional travel
• Dynamic tolling
• etc.
Policy Implications:
High-Performers and Low-Performers
Sample High-Performing Projects

Prioritized for Regional Funding

BART Metro

Urban BRT Systems

Caltrain Electrification

BART Extension to San Jose

SF Congestion Pricing

Freeway Performance Initiative

Sample Low-Performing Projects

Required Compelling Case for Inclusion in Plan

SMART Expansion

Dumbarton Rail

Freeway Widening (US-101 & SR-239)
**COMPELLING CASE CRITERIA**

**Category 1: Modeling Limitations**

*must prove limitations directly resulted in a B/C ratio less than 1*

1. Interregional or recreational corridor
2. Access to international airports
3. Benefit accrual from non-modelable effects such as weaving reduction, transit crowding reduction, etc.
4. Synergies with other fully funded investments

**Category 2: Federal Requirements**

1. Cost-effective in reducing CO\(_2\), PM, or ozone precursors
2. Improves mobility or air quality in communities of concern

[Image Source: http://www.flickr.com/photos/jasonholmberg/8416363059/sizes/o/]
IMPLICATIONS OF COMPPELLING CASE REQUIREMENT FOR LOW-PERFORMING PROJECTS

Projects re-scoped:
(7) Environmental phase only
(5) Sponsor agreed to fully fund project locally
(1) Down-scoped to achieve B/C ratio greater than 1

Projects withdrawn by sponsors:

Compelling cases approved:
(6) Communities of Concern
(1) Air quality
(1) Recreational trips

Case slated for rejection; “settled out of court”
Federal, state, and regional expectations for performance assessment have grown significantly in the past decade. Analyses on the project level can help us to move beyond scenarios and develop more refined investment packages.
Lessons Learned from Plan Bay Area Performance Assessment

- Given the limited budget for expansion projects, performance data is at a premium.
- Performance results helped to advance good projects and weed out bad ones.
- Modeling capabilities were stretched thin for operational and state of good repair projects.
- Tread carefully when picking:
  a. performance objectives
  b. which projects to evaluate
5 Potential Areas for Future Improvement:
Taking Project-Level Analysis to the Next Level
PREVIOUS RTP (ADOPTED IN 2009)

TRANSPORTATION 2035
CHANGE IN MOTION

30% O&M - Roads & Bridges
5% Expansion - Roads & Bridges
14% Expansion - Transit

$218 BILLION

CURRENT RTP (ADOPTED IN 2013)

Bay Area Plan

56% O&M - Transit
5% Expansion - Roads & Bridges
7% Expansion - Transit

$292 BILLION

Image Source: http://www.flickr.com/photos/9702212@N03/3794015390/sizes/o/
Potential Future Enhancements

• State of good repair and operational investments
  – Incorporating into travel models
  – Calculating consistent benefits

• Stream-based BCA

• Improved project cost estimation

• Potential integration of state and federal metrics
VITAL SIGNS:

- New performance monitoring initiative
  - Consider a broad range of regional goals
  - Track on-the-ground performance on an annual basis
  - Communicate performance results to general public
  - Leverage online capabilities for dynamic maps & charts

- Full integration of existing regional & state performance measures

- Future integration of MAP-21 performance targets
MTC Goals

- Climate Protection
- Adequate Housing
- Healthy & Safe Communities
- Open Space & Agricultural Preservation
- Equitable Access
- Economic Vitality
- Transportation System Effectiveness

MAP-21 Goals

- Safety
- Environmental Sustainability
- Congestion Reduction
- System Reliability
- Freight Movement
- Infrastructure Condition
Questions?

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THANK YOU!

A recording of this webinar will be on the SSTI website later today.

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