Tools for Staying Ahead of the Curve

Today’s Presenters

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Tools for Staying Ahead of the Curve
LCCA and RealCost in Map-21/TPM

TPM Exchange
Office of Transportation Performance Management
March 25, 2013

Eric Ross
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Transportation Performance Management Engineer
LCCA and RealCost in Map-21/TPM

• LCCA
  – Economic Analysis
  – Compares Different Alternatives
  – Discount Rates

• What Do you need?
  – Agency costs
    Design, Activity timing,
    Structural Life, Functional Life,
    Analysis Period, ...
  – User Costs
    Activity Duration, Capacities,
    Speeds, ADT, Operating Costs, ...

FHWA Transportation Performance Management
When will the future maintenance and rehabilitation costs be incurred?
Computing Life-Cycle Costs

Present Value = \[ \sum_{k=0}^{N} (\text{Cost}_k) \times \left( \frac{1}{(1 + d)^{n_k}} \right) \]

Cost = Cost of the activity
N = length of analysis period
d = discount rate
n_k = year of expenditure

Present Value Factor
Probabilistic Approach

![Probabilistic Approach Diagram]

- Alternative A
- Alternative B

Frequency, %

Net Present Value (NPV), $Millions

FHWA Transportation Performance Management
**Difference Distribution Curve**

Alt A – Alt B

60% of the Time Alternative A will be Less than Alternative B.
LCCA Software - RealCost™
<table>
<thead>
<tr>
<th>Total Cost (Present Value)</th>
<th>Alternative 1: HMA PAVEMENT (Night Work)</th>
<th>Alternative 2: PCC PAVEMENT (Night Work)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agency Cost ($1000)</td>
<td>User Cost ($1000)</td>
</tr>
<tr>
<td>Mean</td>
<td>$6,428.98</td>
<td>$48.50</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>$565.53</td>
<td>$11.59</td>
</tr>
<tr>
<td>Minimum</td>
<td>$4,550.47</td>
<td>$23.26</td>
</tr>
<tr>
<td>Maximum</td>
<td>$8,147.40</td>
<td>$97.03</td>
</tr>
</tbody>
</table>

**User Cost - Difference (Alt 1- Alt 2)**

- Annual Average Daily Traffic: 0.71
- Discount Rate: 0.37
- Alternative 2: Activity 1: Service...
- Alternative 2: Activity 2: Service...
- Alternative 1: Activity 3: Service...
- Alternative 1: Activity 1: Service...
- Alternative 1: Activity 2: Service...
- Alternative 1: Activity 5: Service...
- Alternative 1: Activity 4: Service...
- Alternative 1: Activity 6: Service...

**User Cost**

- Present Value ($1000) vs Correlation Coefficient
- Blue line: Alternative 1: User Cost
- Red line: Alternative 2: User Cost
Tools for Staying Ahead of the Curve

Benefit-Cost Analysis
An Investment/Economic Analysis Tool

TPM Exchange
Office of Transportation Performance Management
March 25, 2013

Nathaniel D. Coley, MBA
Structural Engineer/Economist
Office of Transportation Performance Management
Why Investment/Economic Analysis?

• System demands far outweigh available & expected resources
• Links accountability to decision making
• Proven process for evaluating alternatives
• MAP-21 Requirements
  “link investments to outcomes”
  – Investment Plans
  – Performance-Based Plans
  – Financial Plans
Analyzing Transportation Decisions

• We typically evaluate objectives individually but program projects as a package of objectives
Analyzing Transportation Decisions

• We need to evaluate investment decisions on a project by project bases considering all factors
## Analyzing Transportation Decisions
### Building a Program or Plan

<table>
<thead>
<tr>
<th>Benefit – Cost Ratio</th>
<th>Safety ROI</th>
<th>Life-Cycle Costs</th>
<th>Environmental ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3</td>
<td>$2.3m</td>
<td>5.1mil</td>
<td>$3.1m Or NOx</td>
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<tr>
<td></td>
<td>-234 crashes Avoided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>$2.3m</td>
<td>7.1mil</td>
<td>$7m Or CO</td>
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<td></td>
</tr>
<tr>
<td>-2</td>
<td>$2.3m</td>
<td>22.1mil</td>
<td>$5.3m Or NOx</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Economic/Investment Analysis

For public agencies benefit-cost analysis results describe ROI. Traditional benefit cost analysis and ROI analysis for transportation includes user benefits (time, cost, safety) for travelers and select environmental effects (air, quality, noise) along with capital, operations, and maintenance (O&M) costs.
Economic/Investment Analysis

Example Benefits
• Reduced Accident Costs
• Reductions in Delay Costs
• Reduced noise or emissions

We monetize benefits & account for the changing value of a dollar over time.
Economic/Investment Analysis: Tools

- **BCA.NET**: web-based project-level benefit-cost analysis tool
Economic/Investment Analysis: Tools

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- **Surface Transportation Efficiency Analysis Model**: corridor-level benefit cost analysis tool for large transportation projects
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- **BLCCA2**: Bridge Life-Cycle Cost Analysis
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- **BLCCA2**: Bridge Life-Cycle Cost Analysis
Nathaniel D. Coley Jr.
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http://www.fhwa.dot.gov/infrastructure/asstmgmt/economic.cfm
What is the HSM?

• The HSM is a tool for estimating safety performance of design and traffic control elements being evaluated in the project development process.

• The HSM introduces a science-based approach that allows safety to be quantitatively evaluated alongside traffic operations, environmental impacts and construction costs.

• Provides analytical tools and techniques for quantifying the potential effects on crashes as a result of decisions made in planning, design, operations, and maintenance.
# HSM Related Analysis Tools

<table>
<thead>
<tr>
<th>HSM Section</th>
<th>Related Tools</th>
<th>Web links</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td>Part C: Predictive Methods</td>
<td>IHSDM</td>
<td><a href="http://www.ihsdm.org">www.ihsdm.org</a></td>
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<tr>
<td></td>
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<tr>
<td>Part D: Crash Modification Factors (CMFs)</td>
<td>CMF Clearinghouse</td>
<td><a href="http://cmfclearinghouse.org">cmfclearinghouse.org</a></td>
</tr>
</tbody>
</table>
How do the tools relate to HSM?

- **Safety Analyst** provides a set of software tools used by state and local highway agencies for the highway safety management process documented in Part B of the HSM.

- **Safety Analyst** can be used by highway agencies to improve their programming of site-specific highway safety improvements.

- The *IHSDM* Crash Prediction Module (CPM) provides a faithful software implementation of the crash prediction methods documented in Part C of the HSM.

- **IHSDM** is a suite of software analysis tools for evaluating safety and operational effects of geometric design decisions on highways.
CMF Clearinghouse
QUESTIONS

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Karen Scurry – CMF Clearing House
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Tools for Staying Ahead of the Curve

MAP-21 Website

TPM Exchange
Office of Transportation Performance Management
March 25, 2013

Michael Nesbitt
Stakeholder Engagement Liaison

U.S. Department of Transportation
Federal Highway Administration
MAP-21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), was signed into law by President Obama on July 6, 2012. Funding surface transportation programs at over $105 billion for fiscal years (FY) 2013 and 2014, MAP-21 is the first long-term highway authorization enacted since 2005.

MAP-21 is a milestone for the U.S. economy and the Nation's surface transportation program. By transforming the policy and programmatic framework for investments to guide the system's growth and development, MAP-21 creates a streamlined and performance-based surface transportation program and builds on many of the highway, transit, bike, and pedestrian programs and policies established in 1991.

To view PDF files, you can use the Adobe® Reader®.

Recently Added
- 2/22 - Railway-Highway Crossings Program Reporting Guidance
- 2/22 - Highway Safety Improvement Program Reporting Q and A
- 2/13 - Highway Safety Improvement Program Reporting Guidance
- 2/13 - Older Drivers and Pedestrians Special Rule Interim Guidance and Q and A
www.fhwa.dot.gov/map21

MAP-21
Moving Ahead for Progress in the 21st Century

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U.S. DOT Home | USA.gov | WhiteHouse.gov

Federal Highway Administration | 1200 New Jersey Avenue, SE | Washington, DC 20590 | 202-366-4000
MAP-21 - Moving Ahead for Progress in the 21st Century

Performance Management Questions & Answers

Posted 3/25/2012

**Question 1:** Please describe the process that USDOT will utilize to solicit input in the establishment of performance measures?

**Answer 1:** USDOT is planning to provide opportunities for stakeholders to contribute their input regarding the measures required under 23 U.S.C. 150(c) (newly-established by section 1203 of MAP-21). Information will be provided on the USDOT and FHWA websites soon with more information on these opportunities. In addition, stakeholders can provide their input regarding the required measures by contacting Francine Shew Whitson by phone at (202) 366-6023, by email at FSWhitson@dot.gov, or mail at Federal Highway Administration, 1200 New Jersey Ave, SE, Washington, D.C. 20590.

Also, for the notice of proposed rulemaking (NPRM), 23 U.S.C. 150(c)(2) requires the Secretary to provide no less than 90 days for the public to comment on the NPRM. The Secretary is also required to take into consideration any comments relating to a proposed regulation received during that comment period.

**Question 2:** Are States required to set performance targets? If so, when are they due?

**Answer 2:** States are required to establish targets that reflect the measures established by the USDOT under 23 U.S.C. 150(c) where applicable. A State may, as appropriate, provide for different targets for urbanized and rural areas. To ensure consistency, States must, to the maximum extent practicable, coordinate with the relevant MPO and with providers of public transportation in an urbanized area not represented by an MPO. The State must establish these targets within 1 year after the USDOT final rule on performance measures. (23 U.S.C. 135 & 150)

**Question 3:** Are MPOs required to set performance targets? If so, when are they due?

**Answer 3:** Metropolitan Planning Organizations (MPOs) are required to establish targets for each measure established in 23 U.S.C. 150(c), where applicable. MPOs are required to establish targets in coordination with the relevant State(s) and, to the maximum extent practicable, with providers of public transportation no later than 180 days after the date on which the relevant State(s) or the provider of public transportation establishes their performance targets. (23 U.S.C. 134)

**Question 4:** MAP-21 sets forth a limited set of areas in which USDOT can establish performance measures. Does USDOT have authority to establish measures for other areas?

**Answer 4:** USDOT is limited under MAP-21 to establishing national measures on which the States must report to only those listed in the new 23 U.S.C. 150(c).
Fact Sheets

- Appalachian Development Highway System (PDF, 13 KB)
- Apportionment (PDF, 97 KB)
- Bridge and Tunnel Inspection (PDF, 27 KB)
- Congestion Mitigation and Air Quality Improvement Program (CMAQ) (PDF, 36 KB)
- Construction of Ferry Boats and Ferry Terminal Facilities (PDF, 20 KB)
- Emergency Relief (PDF, 23 KB)
- Metropolitan Planning (PDF, 27 KB)
- National Highway Performance Program (NHPP) (PDF, 45 KB)
- Performance Management (PDF, 37 KB)
- Railway-Highway Crossings (PDF, 22 KB)
- Significant Freight Provisions (PDF, 33 KB)
- State Planning and Research (SP&R) (PDF, 21 KB)
- Statewide and Nonmetropolitan Transportation Planning (PDF, 25 KB)
- Surface Transportation Program (STP) (PDF, 37 KB)
- Technology and Innovation Deployment Program (PDF, 21 KB)
- Territorial and Puerto Rico Highway Program (PDF, 20 KB)
- Training and Education (PDF, 24 KB)
- Transportation Alternatives Program (TAP) (PDF, 35 KB)
- Transportation Infrastructure Finance and Innovation Act (TIFIA) (PDF, 35 KB)
- Tribal High Priority Projects Program (PDF, 26 KB)
- Tribal Transportation Program (PDF, 60 KB)
- Workforce Development & Disadvantaged Business Enterprises (PDF, 22 KB)

To view PDF files, you can use the Acrobat® Reader®.
Performance Management

Program purpose

A key feature of MAP-21 is the establishment of a performance- and outcome-based program. The objective of this performance- and outcome-based program is for States to invest resources in projects that collectively will make progress toward the achievement of the national goals.

Statutory citation(s): MAP-21 §§1106, 1112-1113, 1201-1203, 23 USC 119, 134-135, 148-150

National policy in support of performance management

“Performance management will transform the Federal-aid highway program and provide a means to the most efficient investment of Federal transportation funds by refocusing on national transportation goals, increasing the accountability and transparency of the Federal-aid highway program, and improving project decision-making through” [§1203; 23 USC 150(a)]

National performance goals

Establishes national performance goals for the Federal-aid highway program in seven areas:

[S§1203; 23 USC 150(b)]

<table>
<thead>
<tr>
<th>Goal area</th>
<th>National goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>To achieve a significant reduction in traffic fatalities and serious injuries on all public roads</td>
</tr>
<tr>
<td>Infrastructure condition</td>
<td>To maintain the highway infrastructure asset system in a state of good repair</td>
</tr>
<tr>
<td>Congestion reduction</td>
<td>To achieve a significant reduction in congestion on the National Highway System</td>
</tr>
<tr>
<td>System reliability</td>
<td>To improve the efficiency of the surface transportation system</td>
</tr>
<tr>
<td>Freight movement and economic vitality</td>
<td>To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development</td>
</tr>
<tr>
<td>Environmental sustainability</td>
<td>To enhance the performance of the transportation system while protecting and enhancing the natural environment</td>
</tr>
</tbody>
</table>
Noteworthy Practices

Many state and local agencies are successfully implementing innovative approaches to Transportation Performance planning, implementation, and evaluation. The individual case studies provide summaries of each practice, key accomplishments, results, and contact information for those interested in learning more.

- North Carolina Refining a Performance Management System (.pdf, 0.6 mb)
- Pennsylvania Evaluating Performance Measures (.pdf, 0.4 mb)
- Performance-based Planning Case Studies
- Rhode Island Collaborating for Performance (.pdf, 0.5 mb)
- Virginia’s Dashboard: Driving VDOT Success (.pdf, 0.5 mb)
- Washington State’s Effective Communication of Performance Drives Results (.pdf, 0.5 mb)
- West Virginia Planning for Performance Management (.pdf, 0.5 mb)
Do you want to learn more about collaborating on performance management with regional partners?

Contact

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Michael.Nesbitt@dot.gov
Do you have a Noteworthy Practice or Upcoming Event to share?

Contact

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Tashia.Clemons@dot.gov
Questions?

Thank You!

www.fhwa.dot.gov/tpm