



2014 Road Weather Management Stakeholder Meeting

Session 5 - Data Collection and Analysis
10:15 – 10:30



Benefit Cost Analysis



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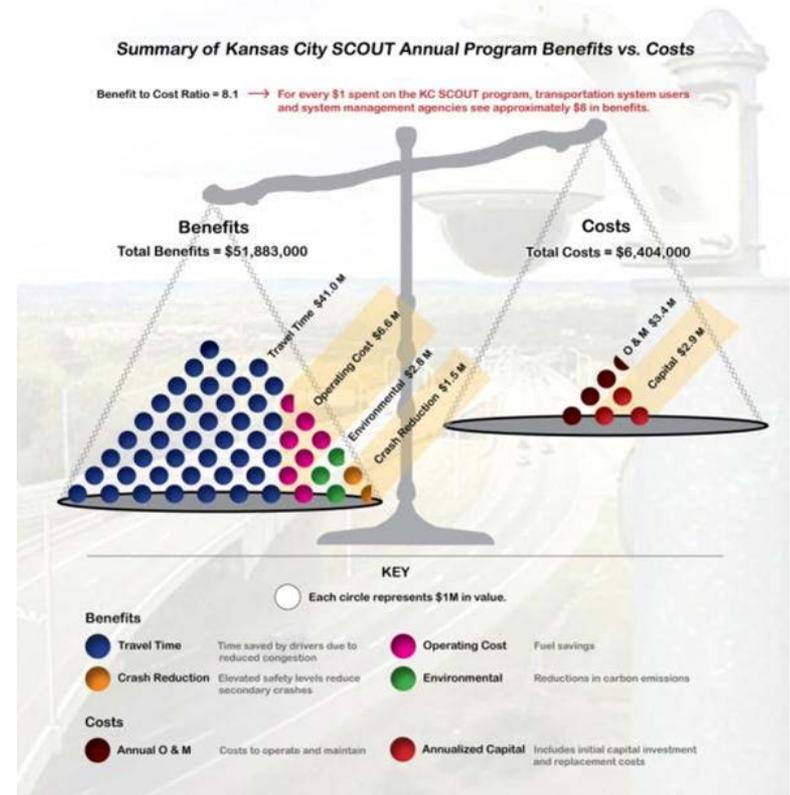
August 12 – 14, 2014
Salt Lake City, Utah

What I Will Cover in this Presentation

- Why is BCA Important for Transportation Operations/WRTM and What are the Challenges?
- Introduction to BCA
- Steps for Conducting BCA
- Measuring Costs and Quantifying WRTM Benefits
- Tools and Resources for Conducting WRTM BCA

BCA for Transportation Operations Strategies

- It is often difficult for decisionmakers to weigh the benefits of investing in operations strategies vs. more traditional capacity projects
- Benefit/Cost Analysis helps decision makers consider the value of operations projects including WRTM



Challenges for Transportation Operations BCA

- Estimating and quantifying the effects of strategies
 - e.g. traveler response to information?
- Including “non-typical” days in the analysis
- Measuring & Valuing travel time reliability
- Operations is often a collection of integrated elements (e.g. field, center, vehicle)
 - Not all physical (procedures)
 - Data sharing
 - Synergies
 - Cost attribution
- Operation and Maintenance Costs

Specific Challenges for WRTM BCA

- Frequency, intensity and specific location of weather events are unknown/unpredictable
- Impacts of weather on traffic mobility and safety not well established
- Limited knowledge on the effectiveness of WRTM strategies in mitigating weather impacts

Types of Economic Analysis



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- **Benefit Cost Analysis**
 - Life-Cycle Cost Analysis
- **Equity Analysis**
- **Financial Analysis**
- **Activity Forecasting**
- **Risk Analysis**
- **Economic Impact Analysis**

Steps for Conducting BCA

1. Establish objectives
2. Identify constraints and specify assumptions
3. Define base case and identify alternatives
4. Set analysis period
5. Define level of effort for screening alternatives
6. Analyze traffic effects
7. Estimate benefits and costs relative to base case
8. Evaluate risk
9. Compare net benefits and rank alternatives
10. Make recommendations

Benefits & Costs – A List

- **Benefits**

- ✓ Reduced Congestion
- ✓ Travel Time
- ✓ Reliability
- ✓ Safety
- ✓ Energy
- ✓ Others

- **Costs**

- ✓ Equipment
- ✓ O&M
- ✓ Software
- ✓ Communications
- ✓ Installation
- ✓ Others

What's Missing?

Cost Quantification

- Price lists
- Data such as FHWA ITS Cost Database
www.itscosts.its.dot.gov
 - Provides historic ITS deployment costs
 - Unit Costs, System costs
 - ITS Capital and O&M Cost
- Previous Projects

Benefit Quantification

- Often the heart of the matter!
- Identify Measures of Effectiveness (MOE)
 - Traditional – Travel Time Savings, Vehicle Operating Cost, Safety, Emissions
 - Emerging MOEs – Travel Time Reliability, Induced Travel/Consumer Surplus, Climate Change
 - Other MOEs – Quality of Life, Customer Satisfaction, Feelings of Safety & Security

Benefit Monetization

- Where we need to get to for BCA
- Pair MOEs with value estimates & prices
 - Value of time
 - Value of reliability
 - Value of life
 - Cost of injury and property damage
 - Fuel price
 - Value of emissions reductions
 - Others

Data Requirements for WRTM BCA

- Traffic Data (Volume, Speed, Travel Time)
- Safety Data (Crash rates, Crash costs)
- Mobility Costs (Value of time/delay)
- Agency Costs (labor rate, material, equipment costs)
- Vehicle Operating Costs (fuel cost etc.)
- Discounting Rates (interest, inflation)

Hierarchy of BCA Tools

- **General Tools**
 - **Various Spreadsheets**
- **Transportation Tools**
 - **bca.net On Line**
- **Transportation Program Areas**
 - **IDAS, TOPS-BC Spreadsheets**
- **Technology-Specific Tools**
 - **Clear Roads BCA Toolkit On Line**

WRTM BCA Resources - ITS Benefits Database



U.S. Department of Transportation
Federal Highway Administration
Federal Transit Administration

- www.itsbenefits.its.dot.gov/

The screenshot shows the website interface for the ITS Benefits Database. At the top, it features the RITA logo and the text "U.S. Department of Transportation Research and Innovative Technology Administration". Below this is a navigation bar with "Intelligent Transportation Systems Joint Program Office" and icons for various transportation modes. A "Knowledge Resources" section contains a menu with "Home", "Benefits Database", "Costs Database", "Lessons Learned", "Applications Overview", "Deployment Statistics", and "Contact Information". The main content area is titled "Road Weather Management (61 unique benefit summaries found)" and includes a search box, a "Benefits Database" sidebar with links like "Overview", "About Benefits", and "Browse Benefits", and a list of related webinars and articles. The articles list various studies and reports, such as "Indiana reduced their total winter maintenance budget by 27 percent for an estimated \$11 million savings by implementing a Maintenance Decision Support System (MDSS). (June 2012)".

WRTM BCA Resources - ITS Costs Database



U.S. Department of Transportation
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Federal Transit Administration

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RITA U.S. Department of Transportation
Research and Innovative Technology Administration

Intelligent Transportation Systems
Joint Program Office

Knowledge Resources

Home Benefits Database **Costs Database** Lessons Learned Applications Overview Deployment Statistics Contact Information

Knowledge Resources Home > Costs Database > Road Weather Management

Search

Enter Keyword

in Costs

Costs Database

Overview

About Costs

Browse Costs

Map Costs

Latest Updates

Frequently Asked Questions

Available Documents

Links

Unit Costs

Unadjusted Costs

Adjusted Costs

Road Weather Management (51 unique system cost summaries found)

▶ **Related T3 Webinars**

Surveillance, Monitoring, & Prediction Traffic Control Response & Treatment Information Dissemination [View Related Cost Data](#)

- ▶ Study finds that costs of procuring private sector data to support WRTM can range from \$28,000 to \$200,000 per year. (October 18, 2012)
- ▶ Weather Information Integration into Transportation Management Center estimated at \$314,500, with \$49,500 in annual maintenance costs. (January 2011)
- ▶ In Nisqually Valley, Washington, an Ice Warning System consisting of a road weather information system (RWIS) station and closed-circuit television (CCTV) camera cost \$165,000. (June 2009)
- ▶ In Wenatchee, Washington, the construction of a Transportation Management Center (TMC) and the installation of the associated ITS field equipment cost \$460,000. (June 2009)
- ▶ In Yakima, Washington, the deployment of a Traveler Information System cost \$333,000. (June 2009)
- ▶ Statewide Implementation of a Maintenance Decision Support System (MDSS) in Indiana for FY09 cost \$529,000 (2009)

Atmospheric Conditions

- ▶ Study finds that bridge wind speed alerting system can cost as little as \$10,000 per site. (June 2012)
- ▶ Weather Information integration into TMC Operations estimated at \$6,270,000, with \$833,000 in annual Operations and Maintenance Cost. (December 15, 2010)

Road Weather Management BCA Compendium



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- Several case studies being developed that describe BCAs for road weather management technologies or strategies
- Hypothetical examples demonstrate how TOPS-BC, Clear Roads & Other BCA tools can be used
- Shows how analysts have conducted or in the future could conduct a BCA for road weather management

ROAD WEATHER MANAGEMENT STRATEGIES

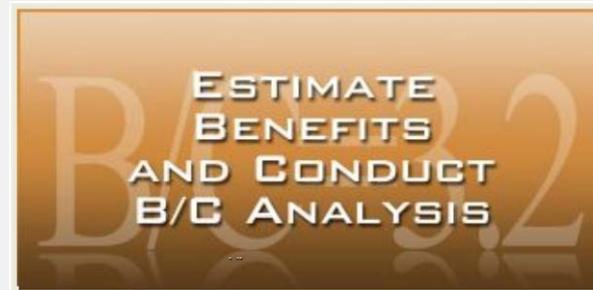
Surveillance, Monitoring and Prediction	Traffic Control
Response and Treatment	Information Dissemination

TOPS-BC: An Introduction

- TOPS-BC is a sketch planning Excel spreadsheet model designed to assist planners evaluate TSMO projects
- Designed for Visioning & Screening
- Also useful for some Long-Range Planning
- Not designed for more detailed BCA required in project development

What Can You do With TOPS?

What would you like to do today?



TOPS-BC Application

- Conduct simple sketch planning level B/C analysis for selected TSM&O strategies
 - Develop a set of input data for project type, facility type, number of lanes, analysis period
 - Use TOPS defaults for facility performance or use your own data (freeway link capacity, etc.)
 - Select MOE impact levels or use TOPS national level defaults (travel time savings, etc.)
 - Select values for key variables including; travel time, reliability, crash costs, etc.

Multiple Strategies

- You can select multiple strategies
- You can select supporting strategies
- You select the timeframe for analysis
- You select the discount rate
- You can vary inputs to run sensitivities
- You see your results instantly

See the Results Instantly

Choose the active strategies:

- Generic Link Analysis
- Signal Coordination: Central Control
- Ramp Metering: Preset Timing
- Traffic Incident Management
- Dynamic Message Sign
- Highway Advisory Radio
- Pre Trip Traveler Information
- HOT Lanes
- Hard Shoulder Running
- Speed Harmonization
- Road Weather Management
- Work Zone Systems
- Traffic Management Center
- Loop Detection
- CCTV

Benefit/Cost Summary

Annual Benefits

		Generic Link Analysis	Signal Coordination: Central Control
Travel Time	\$	0	0
Travel Time Reliability	\$	0	0
Energy	\$	0	0
Safety	\$	0	0
Other	\$	0	0
User Entered	\$	0	0
Total Annual Benefits	\$	0	0

Annual Costs

	\$	0	0
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Benefit/Cost Comparison

Net Benefit	\$	0	0
Benefit Cost Ratio		0.00	0.00

Stream of Net Benefits

Clear Roads BCA

Road Weather Strategies

- Anti-icing
- Deicing
- Carbide blades
- Front plows
- Underbody plows
- Zero velocity spreader
- Maintenance Decision Support Systems (MDSS)
- Automatic Vehicle Location and Geographic Positioning Systems (AVL/GPS)
- Road Weather Information Systems (RWIS)
- Mobile pavement or air/pavement temperature sensors

Clear Roads BCA

5-Step Process

- Step 1: **Define Project Parameters** –the user will provides specific parameters related to the application they plan to analyze.
- Step 2: **Enter Costs** –the user enters initial and annual costs specific to the agency. Such costs include the purchase price of the item of interest, installation, maintenance, communications, and so forth
- Step 3: **Benefits** – This page presents the user with a list of quantified and nonquantified benefits that may be achieved by the agency, user and society through the use of the item being examined.
- Step 4: **Benefit Quantification** –the user enters values related to the determination of benefits that use an item will produce for the agency, user and society.
- Step 5: **Results** - the user will see the results of their analysis.

Summary

- Tools are available for general Operations BCA as well as specific WRTM BCA
- Not a single analytical tool that can do everything or solve every problem
- Method or tool should be consistent with planning objectives and matched with budget and resource requirements
 - Using a tool that is too sophisticated results in poor use of resources
 - Using a tool that is too basic results in inaccurate or unreliable results

Latest FHWA Materials to Support Planning for Operations

Designing for Transportation Management and Operations

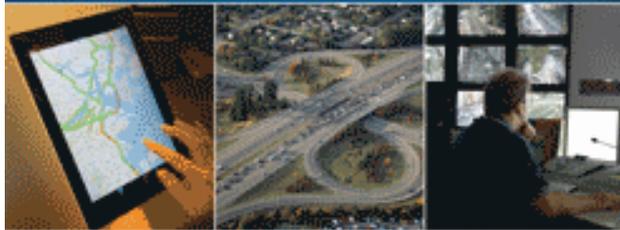
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OPERATIONS BENEFIT/COST ANALYSIS DESK REFERENCE

Providing Guidance to Practitioners in the Analysis of Benefits and Costs of Management and Operations Projects



OPERATIONS BENEFIT/COST ANALYSIS TOPS-BC USER'S MANUAL

Providing Guidance to Practitioners in the Analysis of Benefits and Costs of Management and Operations Projects



2012-2013

FHWA BCA of TSMO Support

- BCA Desk Reference & Other Pubs
- BCA Data & Tool Development
- BCA Workshops for SDOT, MPO, Others
- Technical Assistance
- For Info Contact Jim Hunt
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