Benefit-Cost Analysis: An FHWA Perspective

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Benefit-cost analysis in Highway Programs

- Method to assess, and to monetize as far as possible, the benefits of projects and programs in comparison to their costs
- Differs from economic impact analyses which estimate impacts of investments on market economic indicators
- Core approach focuses on travel time and vehicle operating costs, and sometimes crash and pollution costs.

BCA Approaches

- How it is used depends on the policy question
- Examples include use in
  - Evaluating programs
  - Evaluating projects
  - Pavement and Bridge Program Management
  - Safety program development
  - Relating systemic strategies with investment levels , eg. C & P Report
- Link to Performance Management

BCA Tools for Highway Projects

Descriptions of various tools:

- FHWA web site

  http://www.fhwa.dot.gov/planning/toolbox/costbenefit_forecasting.htm

- Caltrans web site

  http://www.dot.ca.gov/hq/tpp/offices/ote/benefit_cost/index.html

- Forthcoming AASHTO Report on User Benefits Analysis for Highways

HERS

- Uses b-c to evaluate investment levels and their impact on the highway system
- Used to prepare the biennial Condition & Performance Report to Congress
- HER-ST for state use that performs similar functions
- HERS-ST has been used by a number of states to evaluate impacts of investment levels on the systems, to determine needs, to establish performance objectives, and to comply with GASB 34, to perform scenario analyses, diversion analysis of truck traffic

Postprocessors for network models

- Perform benefit-cost calculations using outputs from regional travel demand models
- Example: One of the TIGER 1applicants used travel model estimates such as speed to input into a B/c model to determine benefits for a highway project

Network models with benefit estimation capabilities

- Network models used by states and MPOs generally lack such capabilities
  - Focus on travel time as measure of performance.
- Starting to see more models with benefit estimation along BCA lines. Examples:
  - California Statewide Interregional Integrated Model (under development)
  - Evaluations of toll roads in Austin, TX and Oslo

Sketch modeling tools

- Some post-processors (e.g. STEAM) give users choice of sketch modeling or drawing on outputs from travel demand models.
- Sketch models useful where network effects less important (rural projects).

Challenges: Changes in Policy Issues

- Pricing
  - HOT lanes
- GHG
- PPPs
- Mainlining ITS
- New rail starts and other transit
- Interaction of land use and transportation
- Commercial vehicles & freight movement

Challenges: Road Pricing

- Traditional travel demand models are awkward for modeling tolls, especially time-variant tolls.
- New-generation models will better represent time-of-day shifts, traveler heterogeneity, traffic dynamics, & land use impacts
- Consider pricing as component of base case and project alternatives; see 2008 C&P Report

Challenges: GHG Emissions

- How do emissions vary with vehicle speed and roadway conditions/geometry?
- Lack of recent evidence even for conventional vehicle technologies, while new technologies (e.g., electric) will become more common.
- NCHRP Project 01-45 will recommend models consistent with current vehicle technology for fuel consumption and other vehicle operating costs.
- Economic value of GHG emissions reductions somewhat controversial
- Uncertainties about timing and long-term impacts of projects to better coordinate transportation and land use

Challenges: PPPs & ITS Investments

- PPPs significantly alter the nature and allocation of project risks
- Costing of risk has been an ongoing challenge in BCA
- ITS positively impacts reliability – how to differentiate reliability from travel time

Challenge: Multi-modalism

- Service quality differences between modes remain a challenge for BCAs, especially of modes new to a region (e.g. light rail)
- HOT lanes – demand for express bus service an important factor in benefit-cost analysis.

Challenges: Data

- Assumes you can measure all relevant benefits
  - "Soft" factors are difficult to quantify
- Difficulty in estimating costs
  - Planning level estimates are developed prior to project design and years before construction
- Data availability
  - Extent
  - The more infrastructure-oriented, the more the data exist

Other Approaches in Use – especially for "Soft" Factors

- Cost-Effectiveness Models
- Least-Cost Planning Approaches
- Multicriteria Goal Achievement
- Anlytical Hierarchical Analysis

Relationship to Performance Management

- Setting Targets
  - Used to determine relationship between investment levels and performance measures (C & P)
- Tradeoff Analysis
  - Explore the performance implications of various allocation scenarios (SEMCOG)
- Resource allocation
  - Link between planning and programming
    - Are there better ways to achieve the objectives?
- Monitoring and reporting
  - Feedback loop

Utility of B-C & other methods to provide objective information

- Provides evaluation information which leads to better informed investment decisions
- Identifies relationships between investment levels and performance outcomes
- Assists in identifying target levels or performance that could be achieved at particular funding levels
- Enables tradeoffs between investments which achieve various levels of performance