BENEFIT-COST ANALYSIS TO SUPPORT TIGER II GRANT APPLICATIONS

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Introduction

- This presentation is intended to help you prepare the Benefit-Cost Analysis (BCA) to support your TIGER II grant application
- The advice and suggestions offered here are based on the Notice of Funding Availability (NOFA) published on June 1, 2010 and prior experience with the first TIGER program
- Please note that the controlling guidance for TIGER II BCA procedures is the NOFA; not this presentation

Background

- An application for a TIGER II grant must include an analysis of the project's lifecycle benefits and costs
  - This analysis is referred to as a Benefit-Cost Analysis (BCA)
  - The benefits must pertain to the five Long-Term Outcomes listed in the NOFA
- If the application does not provide a BCA, or if the BCA clearly indicates the project's costs will exceed its benefits, USDOT will not award a grant

Ratings of BCA

- USDOT will rate the BCA as follows:
  - Very Useful – comprehensive, provides high degree of confidence that benefits exceed costs, includes indirect effects on land use and timing of benefits
  - Useful – thorough but with some gaps in benefits and costs; provides reasonable confidence of net benefits
  - Marginally Useful – reasonable effort but with significant gaps in quantified benefits and costs, uncertain net benefits
  - Not Useful – inadequate effort that provides little or no basis to gauge if benefits exceed costs

Ratings of BCA (continued)

- The key to a good rating on your BCA is to establish that you have thoroughly considered the long-term benefits and costs of your project, and that the project represents a good use of public resources
- We do not rate the BCAs based on the size of the Benefit-Cost Ratio (it is enough that the ratio exceeds 1)
- In most cases, you can do a good BCA in-house

BCA Should Be Manageable if a Project Has Been Planned Carefully

- Much of the information needed for BCA should be available from the planning, design, and engineering work to develop the project
  - Who will the project serve?
  - What volumes of cargo or passengers should the project be able to accommodate?
  - How much time and operating costs will the project save?
  - How much will it cost to build, maintain, and operate the project?

BCA Should Be Manageable (Continued)

- You should access the project records to obtain the data, attach economic values to the data, and then calculate the monetary value
- In some cases, you will have to supplement the original project planning data to address benefits you did not originally consider, such as livability and sustainability benefits, or congestion benefits that accrue to non-users of the project

Economic Impact Analysis (EIA) Is Not BCA

- BCA measures the direct benefits of a project to society; it does not measure how such benefits will ripple through the economy
- Typical benefits measured in BCA include reduced vehicle or freight costs, reduced travel time, reduced fatalities or injuries, reduced air emissions and CO_2, and improved access
- Typical benefits measured in EIA include employment changes, business sales, and land valuations

EIA Is Not BCA (continued)

- Jobs are very important, but are not necessarily a measure of a project's benefits to society
  - Job increases in one location may be offset by losses in another location
  - Even new jobs represent both a benefit (to the worker) and a cost (to the employer); are a transfer payment
  - Value of job to worker depends on circumstances
- Sales of goods represent gross revenues, not net revenues; tourist spending is also a transfer

EIA Is Not BCA (continued)

- Changes in land value attributed to transportation projects are often associated with spending by developers (transfers) or "capitalization" of transportation benefits
  - Carefully used, however, changes in land value can capture the value of some benefits of transportation investments that are difficult to measure directly
  - E.g., Productivity, livability, and noise benefits
- There is a real danger of "double-counting" benefits in EIA assessments

Baselines and Alternatives

- BCA measures the value of what would happen if you make an improvement to a facility versus if you don't make the improvement
  - "Baseline" (or "base case") is the "no build" alternative
  - "Alternatives" are the various improvements that could be made to a facility
- In most cases, BCA does not measure the overall value of an existing port or road to society, but rather the incremental value of an improvement relative to the baseline

Be Realistic

- The "no build" baseline case should be realistic, represent a well-managed and maintained operation, and assume intelligent user responses to building congestion
- Exponential growth in delay or costs is unlikely to occur in the baseline if a project is not undertaken
- Users generally won't tolerate extreme congestion or costs and will logically change their behavior if baseline conditions become too severe

Consider a Range of Actions

- Consideration of only one "build" alternative in your BCA may lead to over- or under-investment, particularly if compared to an unreasonable "no build" case where any alternative would compare favorably
- For instance, you might evaluate rehabilitating a pier or bridge, rebuilding it in kind, or replacing it with a larger structure

Independent Utility

- Project should have independent utility
- A berth expansion that also requires channel deepening must include the channel deepening as part of its costs and benefits
- Some projects are components of larger projects
  - Emphasize independent utility of component
  - Alternatively, demonstrate that overall project is fully funded (with grant) and allocate overall project benefits to component proportionately based on its share of costs

Affected Population

- BCA must identify the population to be affected by the project
  - Amount of freight (in tons or ton-miles) for a freight project
  - Amount of passengers (in passenger miles traveled or passenger vehicle miles) for a passenger project
  - Some projects will affect more than one population
- Emphasize impacts on disadvantaged communities, multistate areas, and modal shifts
- Affected population will usually change (grow) over time

Demand Forecasts

- Future demand is critical to the economic justification of a project
  - Excessively high traffic growth forecasts will bias results in favor of the "build" alternatives
  - Do not rely on simple linear extrapolations of past growth trends unless you have sound reasons for expecting prior conditions will continue
- <u>You must clearly explain how you arrived at your forecasts of future demand for the project</u>
- Discuss risks to your forecast

Discounting

- Provide year-by-year stream of benefits and costs over the lifecycle of the project – at least 20 years for a long-lived project
- Future dollar values must be "discounted", which means they must be presented in their value to us in the present day
  - A dollar in 20 years is not worth as much to us now as a dollar in hand, even if there is no inflation
  - Discounting adjusts the value of future dollars into their "present value" so all dollars can be summed and compared regardless of when they accrue

Discounting

- Future benefits and costs should be projected in "real" dollars (e.g., dollars with purchasing power of a dollar in year 2010)
- Future real dollars should be converted to present value using 7% real discount rate (OMB) and 3% rate using following formula:

$$PV = \sum_{t=0}^{N} \left(\frac{1}{(1+r)^t} \right) A_t$$

- The farther into the future, the less a dollar will be worth in present value terms

Discounting

Assume 4% real discount rate, units are $1000
Alternative 1 compared to base case (no build)

Life-Cycle	Costs	Benefits	Net Benefits	Discount Factor	NPV (PV of Net Benefits)
Year 0	$6,500		-$6,500	1.000	-$6,500
Year 1	$400	$1,000	$600	0.962	$577
Year 2	$400	$1,200	$800	0.925	$740
Year 3	$400	$1,400	$1,000	0.889	$889
Year 4	$400	$1,600	$1,200	0.855	$1,026
Year 5	$400	$1,800	$1,400	0.822	$1,151
Year 6	$400	$2,000	$1,600	0.790	$1,265
Total		Undis. =	$100	NPV =	-$853

Costs

- Costs must pertain to same independent project for which benefits are claimed and over the same analysis period (e.g., 25 years)
  - Includes planning, design, land, construction, operations, maintenance, and user and external costs
- Do not limit costs to the grant amount or costs borne solely by your agency
  - Include all lifecycle costs of the independent project
  - If the project's success is contingent on a related project not yet built, include the costs of this contingent project in the overall BCA

Types of Benefits

- The June 1 NOFA describes five categories of benefits under "long-term outcomes"
  - State of Good Repair
  - Economic Competitiveness
  - Livability
  - Environmental Sustainability
  - Safety
- You must assign the benefits you calculate to one of these categories, but if you the chose wrong category you will not be penalized

State of Good Repair

- Projects that improve the state of good repair of transportation infrastructure can reduce facility operations, maintenance, and repair costs
- This "benefit" stream typically is measured by the lower lifecycle O&M costs of the improvement alternative relative to the baseline facility–Asset Management
- Project can also reduce future costs of other maintenance activities or preclude temporary facility closures
- Document the facility's condition by metrics

Economic Competitiveness

- Economic competitiveness benefits include reduced operating costs for new or existing users of the facility, reduced delay or travel time, and improved reliability
- Can measure the benefits per freight ton-mile, or containers handled, or reduced truck miles, or other metrics
- User fees can indicate benefits but will not capture full benefit – fee is a transfer payment
- Be careful not to double-count benefits; carrier savings are passed on to shippers – count only once

Livability

- Livability benefits reflect the positive impact of a project on qualitative measures of community life
  - Increased transportation choices and access to transportation services for people in communities across the United States
  - Could include noise reductions or other localized improvements that make community more pleasant
  - Can be hard to monetize
- Proxy measure is increase in land values not caused by other investments or transportation time savings

Environmental Sustainability

- Transportation projects that reduce congestion or lead to changes in transportation modes can reduce emissions of criteria pollutants and CO_2
- Estimate tons of criteria pollutants avoided by project and assign values, then discount
- Guidance on economic values for pollutants is provided in:

  "Corporate Average Fuel Economy for MY 2012-MY 2016 Passenger Cars and Light Trucks"

Safety

- A project can reduce transportation fatalities and injuries, either by improved geometrics or by shifting to safer modes
- Benefit claims must be clearly documented
- Safety valuations are controversial but valid; society must decide where to put its resources
- Safety benefits can be quite large due to the high value attached to a statistical human life

Transparency of Methods

- Explain the methodology that you used to:
  - Quantify capital, operating, and maintenance costs, including user and external costs
  - Calculate benefit performance units and specify monetary values assigned to them
- Explain all calculations; where possible, show your calculations on an electronic spreadsheet
- Emphasize public benefits but do not forget benefits and costs to private sector

Conclusion

- Much more thorough guidance is available in the Federal Register NOFA
- However, if you keep the above recommendations in mind, you are very likely to produce a useful analysis to support your grant application