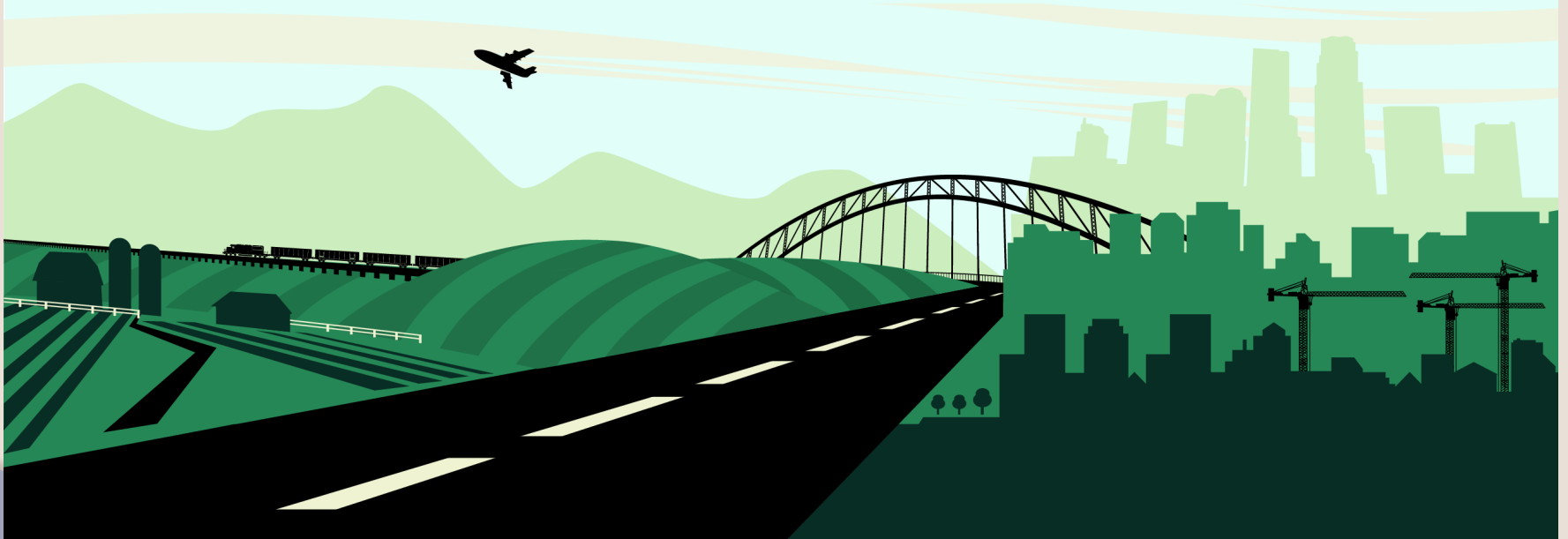




U.S. Department of Transportation
Office of the Under Secretary

INFRA **INFRASTRUCTURE FOR
REBUILDING AMERICA**





U.S. Department of Transportation
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Preparing a Benefit-Cost Analysis for INFRA Grants

**Office of the Assistant Secretary for
Transportation Policy**

Office of the Chief Economist

BCA and INFRA

- ◎ All project sponsors should submit a benefit-cost analysis (BCA) as part of their INFRA grant application
- ◎ Use of the BCA in INFRA
 - Assessment of project cost-effectiveness
 - Evaluation of the Economic Vitality selection criterion

USDOT BCA Review

- ◎ USDOT economists will review the applicant's BCA
 - Examine key assumptions
 - Correct for any technical errors
 - Perform sensitivity analysis on key inputs
 - Consider any unquantified benefits

Economic Vitality

- ◎ USDOT considers the relative magnitude of estimated project benefits and costs
- ◎ Assign projects to one of four benefit-cost ratio ranges
 - $BCR > 3.0$
 - $BCR 1.5 - 3.0$
 - $BCR 1.0 - 1.5$
 - $BCR < 1.0$
- ◎ Also assign a confidence rating to the assessment (high, medium, low)

INFRA Cost Effectiveness Requirements

◎ Large Projects

- USDOT must determine that the project will be cost effective in order for it to be selected

◎ Small Projects

- USDOT must consider project cost-effectiveness in making selections

◎ Cost-effectiveness determinations based on results of the BCA

- Projects must be found to have estimated benefits that are reasonably likely to exceed costs in order to be considered cost effective

USDOT BCA Guidance

- ◎ Covers all USDOT discretionary grant programs
- ◎ Updated January 2020
- ◎ Available at
<https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance>

What's New?

- ◎ Updated monetization values
- ◎ Additional guidance and recommended values for vehicle occupancy and crash reduction
- ◎ Additional clarifications on analysis period assumptions and the use of crash modification factors (CMFs)

Transparent & Reproducible Analysis

- ◎ BCAs should provide enough information for a reviewer to follow the logic and reproduce the results
 - Spreadsheet or database files showing the calculations
 - Technical memos describing the analysis and documenting sources of information used (assumptions and inputs)
 - Present annual benefit & cost streams by type (not just summary output)

Baselines

- ◎ Should measure costs and benefits of a proposed project against a baseline alternative (“base” or “no build”)
- ◎ “Do’s”
 - Factor in any projected changes (e.g., increased traffic volumes) that would occur even in the absence of the requested project
 - Factor in ongoing routine maintenance
 - Consider full long-term impacts of no build (e.g. bridge closure/posting)
 - Explain and provide support for the chosen baseline
- ◎ “Don’t’s”
 - Assume that the same (or similar) improvement will be implemented later
 - Use unrealistic assumptions about alternative traffic flows



Demand Forecasts

- ◎ Most benefit estimates depend on ridership or usage estimates
- ◎ Provide supporting info on forecasts
 - Geographic scope, assumptions, data sources, methodology
- ◎ Provide forecasts for intermediate years
 - Or at least interpolate—don't apply forecast year impacts to interim years
- ◎ Exercise caution about long-term growth assumptions
 - Consider underlying capacity limits of the facility

Analysis Period

- ◎ Should cover both initial development and construction and a subsequent operational period
- ◎ Generally tied to the expected service life of the improvement or asset
 - I.e., the number of years until you would anticipate having to take the same action again
 - Lesser improvements should have shorter service lives
- ◎ Avoid excessively long analysis periods (over 30 years of operations)
 - Use residual value to cover out-years of remaining service life for long-lived assets
 - Recommend 20 years maximum for capacity expansion



Inflation and Discounting

◎ Inflation Adjustments

- Recommend using a 2018 base year for all cost and benefit data
- Index values for the GDP Deflator included in the BCA guidance

◎ Discounting

- Use a 7% discount rate

Scope of the Analysis

- ◎ Project scope included in estimated costs and benefits must match
 - Don't claim benefits from an entire project, but only count costs from the grant-funded portion
- ◎ Scope should cover a project that has independent utility
 - May need to incorporate costs for related investments necessary to achieve the projected benefits
- ◎ Project elements with independent utility should be individually evaluated in the BCA
 - BCA evaluation will cover both independent elements and the submitted project as a whole

Benefits

- ◎ Should be presented on an annual basis
 - Don't assume constant annual benefits without a good reason to do so
- ◎ Negative outcomes should be counted as “disbenefits”
 - E.g., work zone impacts
- ◎ Avoid double-counting benefits

Travel Time Savings

- ◎ Recommended values found in BCA Guidance
 - See footnotes for discussion of non-vehicle time, long-distance travel, business travel
- ◎ Consider vehicle occupancy where appropriate
 - Local/facility-specific values preferred
 - National-level values provided in BCA Guidance
- ◎ If valuing travel time reliability:
 - Carefully document methodology and tools used
 - Show how valuation parameters are distinct from general travel time savings

Operating Cost Savings

- ◎ Avoid double counting operating savings and other impacts
 - E.g., truck travel time savings, fuel consumption reductions
- ◎ Localized, specific data preferred
 - Standard per-mile values for light duty vehicles and commercial trucks provided in BCA Guidance

Safety Benefits

- ◉ Typically associated with reducing fatalities, injuries, and property damage
- ◉ Projected improvements in safety outcomes should be explained and documented
 - Justify assumptions about expected reductions in crashes, injuries, and/or fatalities (and document any CMF used)
 - Show clear linkage between project and improved outcomes
 - Use facility-specific data history for baseline where possible
- ◉ Crash-related injury and fatality data may be available in different forms
 - MAIS/KABCO injury scales
 - Fatal/Injury crashes vs. fatalities/injuries
 - BCA Guidance provides values covering all of these



Emissions Reduction Benefits

- ◎ For infrastructure improvements, emissions reductions will typically be a function of reduced fuel consumption
- ◎ Recommended unit values for CO₂, SO₂, VOCs, NO_x, and PM_{2.5} found in BCA guidance
 - Be careful about the measurement units being applied

Benefits to Existing and Additional Users

- ◎ Primary benefits typically experienced directly by users of the improved facility
- ◎ Includes both “existing” users (under baseline) and “additional” users attracted to the facility as a result of the improvement
 - Standard practice in BCA would value benefits to additional users less than those for existing users (see BCA guidance)

Modal Diversion

- ◎ **Projected magnitude**
 - Should be based on careful analysis of the market and potential for diversion from other modes that might be attributable to the project
- ◎ **Benefits estimates should not be based on comparing user costs of “old” and “new” mode**
 - Would be reflected in benefits to additional users
- ◎ **Reductions in external costs would be relevant**
 - E.g., emissions costs, pavement damage
- ◎ **If using 1997 HCAS values...**
 - Don't apply urban values to rural truck travel
 - Should net out highway user fees paid by trucks from marginal pavement damage costs

Other Benefits

◎ Resilience

- Consider expected frequency of events and their consequences

◎ Noise Reduction

◎ Emergency Response

- FEMA methodology for fire and ambulance services

◎ Quality of Life

◎ Property Value Increases

- Is a measure rather than a benefit—avoid double-counting

Unquantified Benefits

- ◎ Should quantify magnitudes/timing of the impacts wherever possible
- ◎ Should clearly link specific project outcomes to any claimed unquantified benefits

Capital Costs

- ◎ Include all costs of implementing the project
 - E.g., design, ROW acquisition, construction
 - Regardless of funding source
 - Include previously incurred costs
- ◎ Three forms of capital costs
 - Nominal dollars (project budget)
 - Real dollars (base year)
 - Discounted Real dollars (use in BCA)

Maintenance Costs

- ◎ Net maintenance costs may be positive or negative
 - New facilities would incur ongoing maintenance costs over the life of the project
 - Rehabilitated/reconstructed facilities may result in net savings in maintenance costs between the build/no-build

Residual Value

- ◎ For assets with remaining service life at the end of the analysis period, may calculate a “residual value” for the project
- ◎ Simple approach: assume linear depreciation
- ◎ Be sure to properly apply discounting

Comparing Benefits to Costs

◎ **Net Present Value (Benefits – Costs)**

◎ **Benefit-Cost Ratio (Benefits / Costs)**

- Denominator should only include capital costs (i.e., net maintenance costs and residual value should be in the numerator)

Other Issues

◎ Economic Impact Analysis (EIA)

- BCA measures the value of a project's benefits and costs to society
- EIA measures the impact of increased economic activity within a region attributable to a project
- EIA represents the translation of “first order” benefits into other economic outcomes—not added benefits to be counted in BCA

◎ Transfers



- ◎ For additional INFRA information and how to apply:
www.transportation.gov/buildamerica/INFRAgrants
- ◎ For technical questions, please email:
INFRAgrants@dot.gov.

Questions?