BENEFIT COST ANALYSIS

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INTRODUCTION

Evaluation of the benefits and costs of a proposed action or series of actions (strategy) is an important step in the policy process. This appendix describes how to do so in the context of SED. It explains the concept, challenges, and basic steps for benefit cost analysis, and provides a framework for triple bottom line or sustainability BCA.

THE CONCEPT OF BENEFIT COST ANALYSIS

One action is not a strategy. A strategy looks beyond immediate concerns to describe a vision for the future and a *package of actions* that make the desired future more likely. Getting the best package (or, more realistically, one of the best packages) is not likely without some evaluation of the actions that comprise it. Three principles should and usually do guide that evaluation:

- Society evaluates its choices for action by looking at their impacts.
- Those impacts are of many types and can be positive or negative (benefits or costs).
- Identifying, measuring, and consolidating those benefits and costs across alternatives for action is the essence of policy evaluation.

That last point is, broadly, the definition of *benefit-cost analysis* (BCA), the techniques of which are described in dozens of books, guidebooks, journal articles, and administrative rules. One does not have to implement all of the analytical details suggested by BCA, but the basic principles are not far from common sense and common practice in policy evaluation.

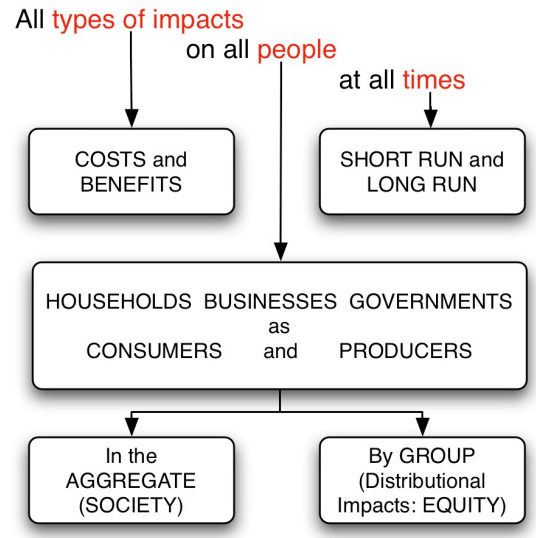
In concept, BCA attempts to measure—or at least consider—all types of relevant impacts, on all people, at all times. Figure 1 shows the general framework for BCA.

BCA CHALLENGES

Although the concept of BCA is relatively simple, implementation can more difficult. There are many challenges:

- *Complexity.* In most instances there are many potential impacts, with dozens of sub-categories, each with dozens of possible measurements. The list of possible measurements (of benefits and costs by group) is huge. Interaction among impacts adds an additional layer of complexity.
- *Uncertainty and prediction.* Policy evaluation is less often about measurement than it is about prediction, which increases the uncertainty and compounds the number of potential impacts that must be described. In the context of concerns about sustainability, there is more concern about the long run. That means not only more uncertainty, but the need for a local government to make assumptions about and take into consideration the needs of people that do not even live within its boundaries yet.
- *Distribution of impacts.* It is hard enough to predict and report some idea of the average impacts for a city, county, or state. Predicting them for distinct sub-areas or interest groups makes the effort much greater.

FIGURE 1: GENERAL BCA FRAMEWORK



- *Relative value of impacts.* Even if one could predict with a high degree of accuracy and certainty what the impacts of public actions would be on all groups now and into the future, there is still the messy issues of *valuing the impacts*. Policy evaluation refers to this challenge as the problem of multiple objective decisionmaking.
- *Misleading Precision.* The numerous variables and complexity of models involved in BCA may create a false impression of accuracy. It is important to be very clear about assumptions and data limitations, and to conduct sensitivity analyses to determine the robustness of results under various scenarios.

BASIC STEPS FOR BCA

The basic steps to benefit cost analysis—setting the framework, measuring, and evaluating—are described briefly below.

FRAMEWORK

- **Establish a framework for the evaluation.** Among other things, the framework establishes the categories of impacts one might want measurements. For SED, the framework will include triple-bottom-line dimensions of economy, environment, and society.

MEASUREMENT

- **Look at multiple sources to get ideas about specific measurements**. For SED, this web content report is a start, and it provides links to other resources.
- **Consider the quantity and quality of the data required for specific measurements.** Considerations include:
  - **Data availability.** Do you have access to the data? Can you get them at a reasonable cost?
  - **Data quality.** How confident are you in the quality of the data and models? Can assumptions and predictions reasonably be made for the time period in question?
  - **Data interpretation.** Even if you can measure something accurately, are you clear about how to interpret the results? For example, is a drop in unemployment attributable to an increase in jobs or to potential workers dropping out of the labor force either by leaving the area or giving up on the search for employment.
- **Consider predictability.** Even with relatively solid information about the direction of the desired outcome (e.g. lower employment), you must consider if it is possible to predict, quantify, and isolate the effects of policies and projects. For example, a decline in unemployment may or may not be due to the success of a specific economic development action. Do you have the appropriate data for your population to answer this question conclusively?
- **For each measure describe its salient characteristics.** Those salient characteristics should be the same as *criteria for evaluating the usefulness of the measure.*
- **Reduce the long list of measures to a manageable subset.** Each broad *category of measurement* (e.g., environmental quality) will have many *possible measures.* Analysts and policymakers must use some type of evaluation criteria to choose some subset of all possible measures as the *best measures*.

Categories, measures, and evaluation criteria are easy to expand; trimming is the hard part. When trimming analysts should consider how they will eventually combine multiple measures in each category to get a score for that category for a particular policy, program, or project. Even if scores are not used, the advantages of a nested hierarchy are considerable: in other words, one should be able to roll-up multiple measurements into some kind of rating at the next, more general level, and keep doing that until one is at the top level with a rating of one choice relative to another evaluated with the same measures.

EVALUATION

Hard as it may be to list and measure potential benefits and costs, it is harder yet to aggregate multiple measures and agree on their relative importance. Without that agreement, the measures are just an arsenal of data that parties to the debate can select from to press their cases.

There are many techniques for aggregating measures suggested in the professional literature and applied in the field.[1] Most of them accept, more or less, the broad principles described in this Toolkit; they accept that there are multiple objectives, that potential actions regarding those objectives should be evaluated on what they deliver (benefits) and what they cost, and that all important benefits and costs should be considered (whether monetizable, quantifiable, or qualitative).

Where the techniques differ is in the degree of rigor with which effects are quantified, and how they deal with consolidating many individual measurements or descriptions of impacts into a decision that optimally balances the typical tradeoffs among objectives (the problem of scoring and weighting).

The idealized and frequently criticized version of BCA attempts to convert all relevant and significant effects to dollar values, and then sum them to a net present value for each alternative, which decisionmakers can use to directly compare alternatives. If everything is in dollars, the problem of consolidating multiple impacts is solved. However, evidence supports the position taken on this web content report that not everything can be measured in dollars, including many important things. Thus, good BCA must take a broader perspective.

[1] Not covered here all the sophisticated analytical and math-based techniques that come out of the literature of decisions analysis and operations research.

OTHER EVALUATION TECHNIQUES

BCA is not the only evaluation technique available. Others, some of which may be used in conjunction with BCA, include:

Least-cost planning (LCP). LCP is similar **to BCA, but it focuses on t**he cost side of the BCA equation. Conceptually, LCP is incompatible with SED objectives as "least-cost" is the wrong idea. What society wants is "best value," and one way to measure that is excess of benefits over cost (net benefits).

Multiattribute utility analysis (MUA). Conceptually, MUA is similar to BCA, but it uses scoring and weighting to measure impacts. It is more rigorous than a simple matrix display of goals versus actions. The purpose is to get decisionmakers to reveal their assessments of the importance of different proposed action "attributes" (impacts, outcomes, criteria). This assessment results in a "utility" measure for each attribute, which equals a weight (relatively importance) multiplied by the probability that it will be achieved. Utility scores for each attribute can then be added. BCA can incorporate the techniques of MUA or analytical hierarchy systems (next) to deal with the problem of weighting and consolidation.

Analytical hierarchy systems / conjoint analysis. Conjoint analysis is a special way of determining weights, based on math and statistics. In essence, decisionmakers answer a battery of questions that ask them about which of two benefits (type and level) they prefer. Researchers statistically analyze these answers to determine the relative weights of different attributes.

Choosing by advantages. Like BCA (like all techniques really), this technique starts with the idea that decisionmakers care about net benefits in a multiattribute world. It creates a typical matrix of alternatives (actions) and outcomes (impacts, effects, evaluation criteria). Then, for each impact type, it finds the alternative that has the most benefits (the most "advantages"). Then, it looks across impact types to make a subjective decision about "the most important advantage" and arbitrarily scores that as 100. Finally, it ranks all other cells in the matrix relative the primary advantage. The result is a matrix with each alternative listed as a unique observation (row) and columns for the evaluation criteria. Each cell includes a score for that particular alternative and criterion.

Numerical compilation of opinions. Several possibilities: public-opinion surveys (statistical or anecdotal), expert judgment (formal or informal), or voting (e.g., by a referendum). This technique has the advantage of some quantification, but the disadvantage that what is being quantified are the opinions of a small subset of the population, and those opinions may be largely uninformed by evidence about the likely magnitudes of key impacts

Matrix display, discussion, and consensus or voted agreement. The most common method. It is like Choosing By Advantages, but usually with a crude system of scoring (e.g., 1, 2, or 3) that would not pass muster in graduate school. A method that had currency in the planning literature was "Goals Achievement Matrix," essentially a weight-times-score method. Simpler methods do not use scoring: they show some data about expected performance of alternatives on a few criteria, let decisionmakers talk about it, and accept as optimal whatever alternative the decisionmakers can agree on pursuing.

Good BCA must try to consider the broad range of important effects, both those that can be monetized and those that are otherwise described quantitatively or qualitatively. This type of BCA must still deal with the problem of weighting (e.g., what is the value of the non-monetizable impacts relative to the monetizable ones?), but it provides an important improvement by bringing into consideration non-monetizable benefits and costs.

A TBL FRAMEWORK

This Toolkit recommends a Triple Bottom Line (TBL) framework for the evaluation of SED actions. Conceptually the same as BCA, a TBL framework measures all the relevant and potentially significant economic, environmental, and social impacts (benefits and costs), over time, and across groups. Doing so supports more complete and accurate analysis and alignment with multiple community objectives.

This section of the appendix discusses the TBL *framework*, which this Toolkit recommends using to evaluate SED policies and actions. The TBL framework is different from the TBL Tool described in Appendix 3. The TBL framework is a guide to the types of impacts a TBL evaluation considers. The TBL Tool goes further: it describes *specific* impacts and criteria to consider. It is one way (and a good one) to try to apply a TBL framework to an evaluation of economic development projects. You can read more about the TBL Tool in Appendix 3: The Triple-Bottom-Line Tool.

Recalling that the triple bottom line refers to the three dimensions of sustainability—economy, environment, equity—some key points regarding TBL as an evaluation framework include the following:

- The basic concept of evaluating multiple objectives is not new. While the concept of the TBL is relatively new to the private sector, which had typically focused on a single bottom line of profit, the public sector has always acknowledged its obligation to look at the full range of effects its decisions have. Well before TBL, the public policy processes implicitly acknowledged that public bodies have multiple objectives, people value them differently, public debate about those differences is essential, and good information should be central to the debate. Although policymakers have used different tools to facilitate decisionmaking—BCA, LCP, TBL—these tools fundamentally agree about broad categories of impacts (the three Es or Ps); they differ in how they quantify or monetize impacts.
- A TBL framework is helpful because it focuses attention on key factors for decisionmaking. TBL may be a better way of explaining to the public and its elected and appointed decisionmakers the importance of a full evaluation of public actions, and what such an evaluation entails (technically and politically).
- The new emphasis on TBL decisionmaking derives from several factors. Data on environmental and social issues has improved, which: (1) makes some long-standing problems more real, and (2) allows a more rigorous evaluation of potential consequences. As a result, there is growing recognition among decisionmakers and the general public of the connection between environmental and social issues and economic outcomes. This recognition drives TBL decisionmaking, made possible by improvements in both data and analytical techniques.
- Some of the technical difficulties with TBL analysis have been discussed for over 50 years; TBL is not going to resolve these limitations. TBL faces the fundamental difficulty that plagues any effort at multi-criterion decisionmaking. Namely, it must also answer the question: What is the relative importance of the many desirable and undesirable consequences of alternative courses of action? Some TBL analyses attempt to resolve this challenge by using scores and weights; others by voting or public discussion; and others do not really address the point in any detail.
- The framework does, however, provide a structure for data and evaluation. A TBL framework makes it clear that there are more impacts of interest than just the ones that affect short-term profits and the economy. It is consistent with the idea of identifying and measuring those impacts, and with comparing impacts across alternatives.

Implied in TBL is the idea of "best value." In business, a single bottom line has and continues to be a predominant metric for evaluating business investment decisions: what is our **return on investment** (value returned compared to resources invested; bang for the buck)? In TBL, the "return" is what the public gets of value from the investment: the benefits. The "investment" is what the public pays or gives up: the costs. Both the benefits and the costs can be non-monetary. Thus, if the public sector is to define return on investment to include economic, social, and environmental benefits and costs, it has to consider a triple bottom line. Note that having the most benefits is not necessarily the objective: the costs may be even higher. The objective is net benefits (the excess of benefits over costs; i.e., return on investment).

These considerations lead to the following suggestions for a TBL evaluation of SED policies or actions:

- **Reflect values, goals and objectives.** Start with the community's values, goals, and objectives, as articulated in relevant plans and policies. These goals would be arranged as sub-goals of the triple bottom line.
- **Quantify direct costs and benefits.** At a minimum, quantify the direct public costs and primary benefits for a proposed action. For example, if the stated purpose of a proposed action is to reduce traffic congestion or improve traffic safety, quantify (and ideally monetize) the expected benefits to get a sense of the return on investment (i.e., a return on the direct monetary outlay of the public sector).
- **Identify other major costs and benefits.** Identify and, when possible, quantify other major direct and indirect costs and benefits. Although there could be dozens or even hundreds of potential costs and benefits to measure, focus attention on just a handful of the ones that the professional literature or local opinion deems most significant, with at least one addressing each of the three elements of the triple bottom line.
- **Identify who benefits and who pays.** For TBL and all good evaluation of public policy, showing that an investment has a positive TBL in the aggregate is not enough: policymakers want and have a right to want to know how those benefits and costs are distributed among different interest groups. Make explicit who benefits and who pays.

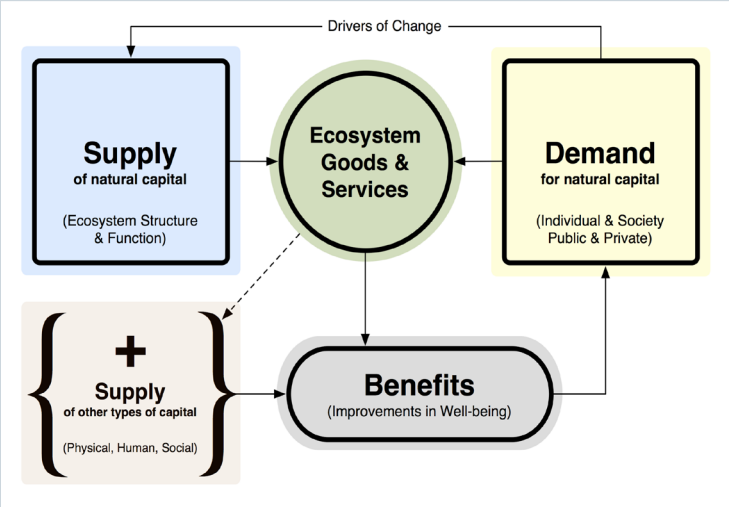
QUANTIFYING ENVIRONMENTAL IMPACTS

Some impacts are relatively easy to quantify, such as the cost and revenues associated with implementing an action. Other impacts, including environmental ones, are more difficult to quantify and monetize. Ecosystem services is a concept to describe how natural resources interface with and benefit human society. Economists have used this framework to identify, value, and monetize ecosystem services (environmental impacts).

Figure 3 illustrates an approach to defining ecosystem services that embodies several economic principles few other frameworks recognize:

- It places ecosystem services at the nexus of supply and demand. Benefits, i.e., improvements in human well-being, flow only when the ecosystem's structures and functions produce things that humans require at a given time and place.
- It recognizes that the benefits provided by ecosystem services are rarely (if ever) realized without other inputs of capital. Even the most basic of benefits, well-being derived from knowing that habitat exists for a salmon to spawn, for example, also requires inputs of human knowledge (human capital) and social or cultural context and meaning (social capital).
- It indicates that demand can influence the ecosystem (supply) and the benefits available from a given ecosystem can shape demand.

FIGURE 3: ECOSYSTEM SERVICES-BENEFITS FRAMEWORK



Analysts can provide information about the distribution of impacts (across TBL categories and sub-categories, and by location or group). They cannot (and should not) make the final normative judgment about the value of different distributions; that is a task for policymakers.

- **Develop rough estimates.** The future is uncertain—it may be difficult, expensive, and inefficient to try to develop precise estimates of costs and benefits. Rough "back of the envelope" estimates may be sufficient for making decisions. Focus on identifying the big benefits and costs and getting their estimates approximately right.

  In making such estimates there are advantages to using a standardized procedure: it saves time, is often more explainable and better documented, and it can head off later accusations of "cooking the books." A strong form of standardization is a computer model that accepts standard inputs and runs them through a standard evaluation process.

- Integrate TBL methods into design and decisionmaking. Applying a TBL analysis should not be some kind of optional effort, applied separately at the end of a regular process. TBL concepts and methods should be incorporated into all phases of design and decisionmaking: identifying values, determining goals and objectives, selecting evaluation measures, making plans, setting policies, allocating funding to projects, and developing projects. The consistent application of a TBL approach throughout the development of alternatives helps ensure the development of strong alternatives that generally meet SED objectives.

- Help policymakers to balance priorities. Once policymakers have developed alternatives and measured their impacts, they must communicate that information in a way that facilitates public debate and decisionmaking. Each alternative may have dozens of impact measurements, in different units, valued differently by members of the public. Often, no one alternative will be clearly superior to all others; rather, one option will be better in one respect and a different option will be better in another. A TBL framework should provide policymakers with solid information for making choices, but not dictate the "right" answer.

- Monitor outcomes. After a decision is made, the outcomes of an action should be monitored to ensure they align with expectations.

MODELING TBL IMPACTS

Developing computer models for BCA or TBL is a challenge: there three bottom lines, each with several to a dozen sub-categories of objectives, each with potentially scores of measurements. Not only will measurement be complex and incomplete, but the relative importance (value) of those measurements is not something that should be hard-wired into a model: those values vary locally and should be derived via public discussion.

In that context, a good computer-based tool would be one that helps a jurisdiction assemble data in a way that allows it to be easily and understandably displayed in TBL categories. The display would allow all parties to a debate about a particular SED action to see a rough assessment of how that action would perform on various measurements deemed relevant to one or more of the bottom lines.

This web content report references a tool that decisionmakers can use to evaluate specific projects or investments: the Triple Bottom Line Tool, developed by Dr. Janet Hammer of Portland State University for the US Economic Development Administration. The tool "is designed to help optimize and communicate the impact of economic development investment on economic vitality, natural resource stewardship, and community well-being."[2] Appendix 3 explains the tool.

[2] http://tbltool.org/about.html