

Appendix E. Cost-Benefit Analysis Methodology

Cost-benefit analysis

Cost benefit or life cycle analysis measures the relative cost effectiveness of alternative investments. These investments can have different:

1. Initial cost
2. Operating and maintenance costs
3. Project life spans

This analysis accounts for the time value of money based on an assumed discount rate. The discount rate is the investor's desired rate of return and can vary from investor to investor. A three percent discount rate was selected for this document's purpose as it is the US Department of Commerce's recommended rate for 2007.¹

Essentially cost-benefit analysis poses the following question:

How much money would an investor need to be paid today to equal some stream of payments over time at a specified interest rate and be equally well off with the lump sum payment and the stream of payments?

Cost-benefit analysis (CBA) was developed by the US Army Corps of Engineers to economically evaluate dam projects in the 1930s. CBA's advantage stems from its ability to put projects with different initial costs, annual benefits or costs, and/or longevity on equal footing. A rich CBA literature exists and it is beyond the scope of this document to explain the somewhat arcane theory, mathematics, and the frankly black magic associated with selecting an appropriate "discount". The reader is referred to *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis—April 2007*² for a good introduction and explanation of CBA theory and mechanics.

CBA for this document's purpose supplies the discounted present value (PV) of each BMP's cost over a 20 year period. For some BMPs, the prime example, cover crops, must be reinstalled each year and therefore incurs an "initial cost" throughout the 20-year analysis period. Other projects like tree plantings require one initial installation fee and then a minimal cost for maintenance over the 20-year analysis period. To compare these significantly different benefit streams, we need cost benefit analysis.

¹ Rushing and Lippiatt, *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis—April 2007*, US Department of Commerce, Technology Administration, National Institute of Standards and Technology, NISTIR 85-3273-22, May 2007.

² Ibid.

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Performing a CBA for a menu of different BMPs enables the decision maker to economically rank each BMP relative to the other potential BMPs. Noting that each BMP may have its own:

- Initial or capital cost,
- Periodic maintenance expense (for some BMPs this is zero),
- Pollution reduction efficiency, and
- Lifetime

cost benefit analysis provides the tool for measuring the relative economic value each BMP, regardless of their disparate cost/benefit streams and timing.

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