

## Environmental Economics for Watershed Restoration: Valuation for Non-Economists

### Background

Researchers can measure the value of goods that are not traded in a market. Knowing the value of nonmarket goods helps with handling tradeoffs with market goods, with analyzing regulatory impacts, and with prioritizing, refining or justifying environmental restoration projects.

EPA economists completed research projects and summarized related valuation methods and case studies, mostly dealing with acid mine drainage. Their recent book (edited by Thurston, et al.) is intended to make stakeholders more comfortable talking about economic jargon and to inform non-economists whose valuation needs may not require expensive economic consultation.

### Revealed Preferences Methods

These methods infer the value of nonmarket goods or attributes based on prices of related market goods.

#### *Travel Cost Method*

The travel cost method can estimate how much people spend to travel to a recreation spot and can use the data to estimate what the spot is worth. The method requires a large amount of data.

#### *Hedonic Modeling*

Hedonic modeling uses data on market transactions to value nonmarket goods. For example, the prices of two houses that are similar except for an environmental factor

such as the odor from a pig farm can be used to estimate the (likely negative) value of that smell.

Hedonic modeling generates estimated values that policy makers are likely to understand. However, economists should probably help collect, analyze and model the data.

### Stated Preferences Methods

These methods use surveys to ask people to state directly how much they value or prefer something.

#### *Contingent Valuation Method*

The contingent valuation method uses surveys to ask people to place a value on a change in a nonmarket good or service. The method needs careful study design to help respondents that are not familiar with the relevant issues and to tackle validity and reliability issues.

#### *Stated Choice Method*

The stated choice method gives the survey respondent a choice between several options. The data from many such choices can be used to estimate the value of different tradeoffs. Sophisticated statistical techniques are needed to analyze the data.

### Combining Studies: Benefit Transfer Method

The benefit transfer method can save money and time by using values estimated from the four methods already summarized. With benefits

and costs estimated for one project or area, the benefit transfer method estimates costs and benefits for another project or area. The method accommodates a wide range of ecological and human health benefits (e.g., soil retention, scenic vistas or reduced risk of asthma).

The benefit transfer method needs the careful treatment of uncertainty to incorporate values generated by various methods, and is open to variability in transferring estimates from one study to another or from a study site to a policy site. Due to the inherent complexities, best practices are still being debated and expertise in meta-analysis is critical.

### Applications: Decision Tools

*Environmental Economics for Watershed Restoration* relates the impacts of the application of five valuation methods, mostly in acid mine drainage case studies. However, the valuation methods can be applied to diverse ecological (e.g., ecosystem services) or human health benefits.

Four decision tools summarized below can use values from the five valuation methods to inform decision-making. Since political, location or cultural concerns may make the monetizing of benefits unnecessary in some cases, one decision tool presents benefits in non-monetary terms. In addition, conceptual models can clearly communicate tradeoffs to stakeholder groups and function as analytical

road maps if further transdisciplinary analyses are needed.

*Benefit-cost analysis* includes market and monetized nonmarket values. Ratios of the benefits to the costs enable comparisons of the efficiency of resource use.

*Economic impact analysis* examines economic inputs and outputs across different business sectors. The input/output analysis reflects the impact of changes to the local economy from an increase in demand for outdoor recreation or tourism (e.g., from fishing or bird watching).

*Equity assessment* determines the winners and losers of a particular project, focusing on subpopulations.

*Cost-effectiveness analysis* presents costs in dollars and benefits in non-monetary terms (e.g., ratio of dollars to unit of pollution reduced). It is typically used when quantifying the benefits is too difficult.

**REFERENCE**

Thurston, H.; M. Heberling; A. Schrecongost (eds). 2009. *Environmental Economics for Watershed Restoration*. CRC Press, Boca Raton, FL.

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The table below summarizes five valuation methods.

	<b>How Value is Measured</b>	<b>Strengths</b>	<b>Limitations</b>
<b>Travel Cost Method</b>	Revealed by people completing a trip	Good for well-defined sites of interest	Assumes people respond to travel cost and admission price in the same way  Assumes trip has a single purpose  Assumes people can substitute recreational time for wages
<b>Hedonic Modeling</b>	Revealed by people completing a transaction	Useful when values of related goods are known	Market must exist  Must include relevant variables  Limited by the data
<b>Contingent Valuation Method</b>	Stated by people in a survey	Useful when evaluating proposed policy alternatives	Hypothetical bias  Strategic bias  Design bias/information bias  Payment vehicle bias
<b>Stated Choice Method</b>	Stated by people in a survey	Good for mimicking tradeoffs	Difficult to make tradeoffs not familiar with  As number of attributes and levels increase, so must number of choice sets and sample size (survey cost)  Sophisticated statistical techniques needed for analysis
<b>Benefit Transfer Method</b>	Approximated using other studies	Useful when many related studies are available	Requires good quality economic studies and similar populations  Not as accurate as other methods  Expertise in meta-analysis is critical