

Economic Valuation of Environmental Conditions and Impacts

Approach developed for Caltrans
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Valuation in Transportation Decision-Making

Many decisions related to transportation infrastructure are based upon economic variables. SAFETEA-LU Section 6001 placed an emphasis on including environmental information early in transportation decision-making. In order to use both environmental and economic benefits and costs information at the same decision point, it is important to put them on the same scale so as to ease comparisons. One way to do this is to convert changes in environmental conditions or impacts to fiscal equivalents (\$).

Economic valuation of environmental conditions and impacts can be conducted using a variety of methods and at a variety of scales. The primary methods in the economics and scientific literature are the focus of our recommended approach. Two transportation planning scales are focused on as both examples and important scales in their own right: Corridor System Management Planning and Regional Transportation Planning. Valuation information obtained at these scales would be useful for project ranking and prioritization, scenario planning, corridor/project impact analysis, and project alternative selection.

This project develops an approach and framework that can lead to a more complete accounting of environmental impacts in transportation planning and decision-making by describing an approach to measure the economic equivalents of these impacts.

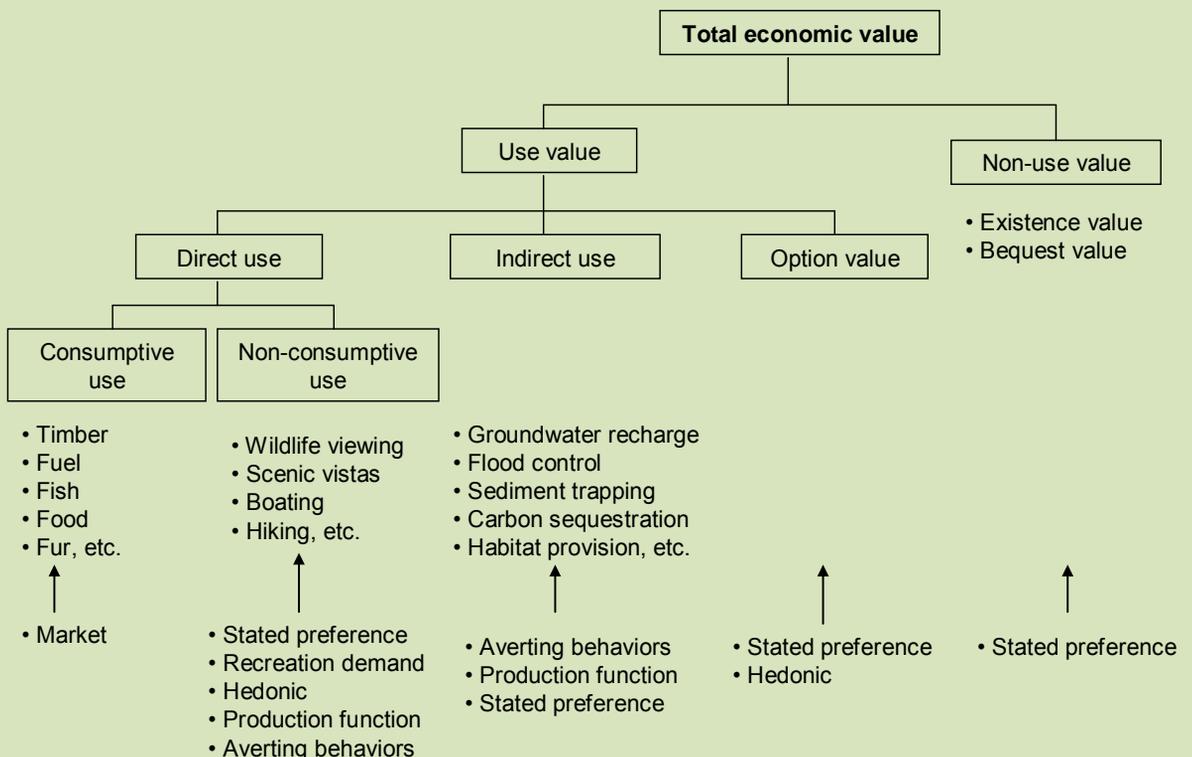
This approach has 4 steps:

- 1) Identification of potential impacts of proposed transportation projects and activities,
- 2) Screening and categorizing impacts for type and severity,
- 3) Quantification of the impacts,
- 4) Economic valuation of the impacts

Valuation is a useful way to inform transportation decision-making for multiple needs:

- 1) For informing decisions related to regional planning networks (spatially connected elements) and sequences (temporally connected) of projects that are efficient relative to goals (e.g., high total benefits)
- 2) For comparing among scenario/project/route alternatives for greatest total benefits
- 3) For developing mitigation alternatives (avoid, minimize, compensate/offset) and estimates based on valuation information
- 4) To integrate this information into Regional Transportation Plan and Corridor System Management Plan development/analysis to inform decisions and consider environmental resources early.

Total economic value (TEV) is a framework to account for the multiple values of ecosystems. TEV is composed of use values and non-use values, which can be estimated using various valuation methods.



Valuation Methods

Revealed preference methods take advantage of observed choices that individuals make in relation to natural assets and of the prices of related traded goods to assess the value of changes in the environment. **Hedonic methods** attempt to explain price variations using information on the different characteristics of a marketed good, including environmental quality or amenities. For example, the willingness to pay more for a house adjacent to water or open space provides a partial estimate of the value the buyer places on that amenity. **Recreation demand methods**, including the standard travel cost model and the travel cost random utility model (RUM), are used to value recreational uses provided by the environment. **Averting behavior methods** attempt to infer values of non-marketed environmental characteristics based on individuals' willingness to pay to either reduce the likelihood or the impact of a loss of health or wellbeing from environmental degradation. The **market price method** uses the information about productivity and price changes in marketed goods to infer the value of the changes in an environmental resource that contributes to the production of the marketed good.

Stated preference methods assess valuations based on intentions stated by individuals in hypothetical situations. Stated preference methods use surveys for eliciting values people place on changes in goods, services, and amenities. The two main groups of stated preference methods are **contingent valuation** approaches and **conjoint analysis** (also referred to as choice modeling). The **contingent valuation** method typically focuses on estimating the value of one particular environmental change scenario. **Conjoint analysis** is typically used to estimate values over changes to a set of attributes of an environmental amenity.

Benefit transfer is the transfer of existing estimates of non-market values to a new study which is different from the study for which the values were originally estimated. Though usually cheaper to conduct, the National Research Council suggests benefit transfer is generally considered a "second best" valuation method because benefit transfers involve reusing existing data, and a benefit transfer does not provide an error bound for the value in the new application after the transfer.

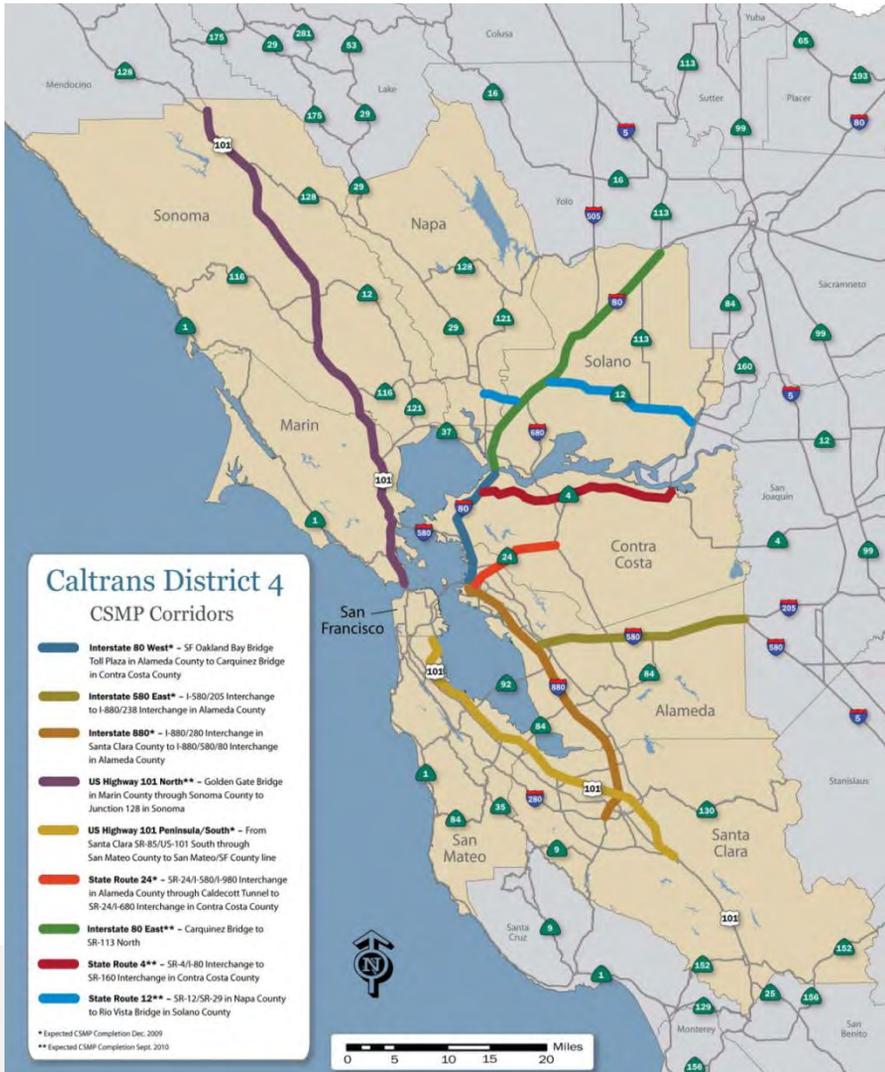
Cost-based methods measure levels of avoided cost, replacement cost or cost of treatment to approximate the benefits of a service by the cost of artificially providing it. These methods should be used with caution since they are not necessarily strict measures of impacts to human welfare as are the other primary methods. However since the required information may be easier to collect they can provide a useful proxy for values when only a coarse measure of value is necessary.



Corridor System Management Plan

Corridor and region-scale planning are both appropriate scales for valuation of environmental conditions and impacts. Projects nest within corridors, which in turn nest within regions. Each scale may have unique environmental attributes to measure and consider, but the nested scales provide greater efficiencies in valuation analysis.

For example, primary valuation studies on corridors in a region may serve as information sources for a benefits transfer approach used for other corridors in the same region.



District or Regional Transportation Plan

Next Steps in Valuation

The approach developed by the UC Davis team can be applied at the corridor scale to inform planning and project delivery, as well as providing useful information for elsewhere in the region.

Case studies at the nested project, corridor, and region/district scales would provide critical models for developing economic valuation as an inexpensive tool to aid in efficient and sustainable planning. Application of a pilot area to implement the methodology outlined is recommended.

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