Only the text in the *green italics* represents the consensus views of the SAB Committee on Valuing the Protection of Ecological Systems and Services and has been approved by the chartered SAB, All other text was provided by individual committee members and is offered to extend and elaborate the very brief descriptions provided in chapter 4 of the SAB Report, *Valuing the Protection of Ecological Systems and Service* and to encourage further deliberation within EPA and the broader scientific community about how to meet the need for an integrated and expanded approach for valuing the protection of ecological systems and services.

Economic methods

Excerpt from draft SAB Committee report, *Valuing the Protection of Ecological Systems and Services*: *Economic valuation methods seek to measure the tradeoffs individuals are willing to make for ecological improvements or to avoid ecological degradation, given the constraints they face. An ecological change improving a resource that an individual values will increase that person's utility. The marginal value or economic benefit of that change is defined to be the amount of another good that the individual is willing to give up to enjoy that change (willingness-to-pay) or the amount of compensation that a person would accept in lieu of receiving that change (willingness to accept). Although these tradeoffs are typically expressed in monetary terms, economic methods that express tradeoffs in non-monetary terms (such as conjoint analysis or other choice-based methods) are increasingly being used.*

Economic methods can estimate values not only for goods and services for which there are markets but also for non-market goods and services. Economic methods can also value both use and non-use (e.g., existence) values. Thus, economic valuation captures values that extend well beyond commercial or market values. However, economic valuation does not capture non-anthropocentric values (e.g., biocentric values) and values inconsistent with the principle of trade-offs (such as values based on the concept of intrinsic rights).

There are multiple economic valuation methods that can be used to estimate economic values. These include methods based on observed behavior (market-based and revealed-preference methods) and methods based on information elicited from responses to survey questions about hypothetical tradeoffs (e.g., stated-preference methods). Some of these methods are more applicable to some contexts than to others.

Brief Description of Methods. The economic concept of value is based on two fundamental premises of neoclassical welfare economics: that the purpose of economic activity is to increase the well-being of the individuals in the society, and that individuals are the best judges of how well off they are in any given situation and of what changes would enhance that well-being.

The concept of value underlying economic valuation methods is based on substitutability, or, more specifically, on the trade-offs individuals are willing to make for ecological

improvements or to avoid ecological degradation. These trade-offs provide an indication of changes in well-being that result from increases and decreases in goods and services people value. By itself, an ecological change that an individual values will increase that person's utility. The value or benefit of that change can be defined in two ways. The first is the amount of another good that the individual is willing to give up to enjoy that change (his "willingness to pay" or WTP). The second is the amount of compensation that a person would accept in lieu of receiving that change (his "willingness to accept" or WTA). These trade-offs are typically defined in terms of the amount of money an individual is willing to pay or willing to accept and hence benefits are measured in monetary terms. In this case, WTP is the amount of money that would make the individual indifferent between paying for and having the improvement and foregoing the improvement, while keeping the money to spend on other things. Likewise, WTA is the amount of money that would generate an increase in utility equivalent to that realized from the improvement in the environmental amenity.

However, it is important to note that the concept of benefit does not hinge on the use of monetary units. In principle, benefits could be defined in terms of changes in any other good or service that the individual would willingly agree to in exchange for the environmental change (e.g., food). The use of money as the basis for exchange is simply a convenience. In particular, use of a common money metric allows all benefit measures to be easily aggregated and compared with monetary measures of cost.

The benefits captured by the concepts of WTP or WTA can be derived not only from goods and services for which there are markets (e.g., forest products) but also from goods and services for which markets might not exist (such as clean air and clean water). In addition, they include values derived from use of the environment (e.g., hiking in the woods) as well as those derived from the "existence" of a valued species or condition. Thus, economic valuation captures values that extend well beyond commercial or market values. However, it does not capture non-anthropocentric values (e.g., biocentric values) and values based on the deontological concept of intrinsic rights.

All economic measures of value based on willingness to pay are limited by the fact that the maximum amount a person could pay for anything is constrained by that person's ability to pay, which is indicated by the individual's wealth. Thus the value estimates derived from economic valuation methods are conditional on the existing distribution of income and prices.

As a result, acceptance of these benefit estimates implies acceptance of the underlying distribution of wealth. One way to incorporate concern for equity in the distribution of well-being, with roots going back to Bergson (1938), is to weight the measures of economic value or welfare change for each individual by that person's relative degree of "deservingness"; that is, to attach a higher weight to benefits going to those judged to be more deserving because of some attribute such as their lower level of income. However, there is no clear way to determine the appropriate weights. In practice, analysts typically use the value measures derived from the mean individual in the sample that is providing data for the valuation model in use. If value or willingness to pay is an increasing function of income, the analyst is implicitly underestimating the values of the highest income individuals and overestimating the values of the lowest income individuals. The result, in a crude qualitative sense at least, is equivalent to assigning more weight to the values of low income than high income individuals.

The key input for all of the economic methods is data on the choices that people have made or indicate they would make about the things that contribute to their economic well-being. These choices are made in several contexts. The first is choices about quantities demanded and supplied in markets at alternative prices, e.g., the amount of commercial fish that are harvested and sold at various prices. These choices generate demand and supply functions that can be estimated with the information on the amounts purchased at different prices using statistical (i.e., econometric) methods. Changes in these demand and supply functions in response to changes in the levels of ecosystem services (e.g., a change in water quality) can be analyzed to obtain market-based estimates of the values of the changes in these services. Second, choices can involve the selection of quantities of goods and services (or responses to changes in the availability of goods and services) that are not sold in markets, such as many ecosystem services. Non-market revealed preference methods can be used to obtain estimates of the values of changes in these goods and services. Third, hypothetical choices made in response to survey questions can be analyzed with one of the several stated preference methods for valuation to provide information on trade-offs people would be willing to make. The specific methods that employ these three different types of choice data to value ecological changes are discussed in more detail in the following sections.

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