VALUING ENVIRONMENTAL SERVICES

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Why valuation?

Payments for environmental services usually signal the value that service users attach to them or the opportunity cost for land users to provide the same. The absence of markets for most environmental services makes it difficult to estimate a payment structure acceptable to both parties. For instance, an ecosystem may provide several kinds of environmental services, with only a few being valuable to service users. Similarly, opportunity costs for service providers will depend on the specific land uses they are asked to adopt. Therefore, an *ad hoc* payment structure will rarely work in the long run. Instead, PES programs must conduct careful analysis to estimate values of the environmental services they are going to secure. In some cases, like carbon sequestration, it is becoming to use actual market values as those markets come into being. Where there are no markets, methods to estimate value include: 1) imputing the value of the environmental service from observable phenomena; 2) using the survey-based approach known as contingent valuation to estimate buyers' willingness to pay (WTP) for a service and sellers' willingness to accept (WTA) compensation in return for providing a service, and 3) using auctions to identify actual WTP and WTA. Several techniques can be used to conduct these experiments, which are part of a growing field in economics called non-market valuation.

Examples and issues for further consideration

Imputing values. Imputing the value of an environmental service can be done in a variety of ways, depending on the situation. For example, a study in Manggarai, Indonesia, carried out an implicit economic valuation of a change in water flow levels from an increase in forest cover in the upstream areas. Using hydrological modeling, the study projected that an increase in forest area will increase the baseflow in only four out of nine counties in the region. Economic benefits for local residents in these four counties were estimated in the form of annual savings in water collection costs. Multiplying the number of labor hours saved by the prevailing wage rate gives a ballpark estimate of the value of the environmental service. The savings ranged from 1,773 Indonesian rupiah (about $2) per household in one county to 2,669 rupiah per household in another. However, an increase in upstream forest cover could reduce baseflow in the other five counties, with annual losses (in the form of increase in water collection cost) per household ranging from 2 rupiah in one county to 5,052 rupiah in another. Interestingly, although the change in land use is the same across all counties, it reduces water collection costs in only four of the nine counties. Residents in these four counties may thus be willing to pay a small amount for a forest protection program while the residents across the other five counties would prefer to avoid this land use change.

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The travel cost method is another approach for imputing value, particularly for scenic beauty that attracts tourists to visit a particular site. The amount that tourists spend to travel to the site indicates the minimum economic value that these users place on the site. A recent study in Michigan used this approach to suggest that the total annual recreational value of the Saginaw Bay coastal marsh area in Michigan was $15.9 million; or a lifetime recreational value of $239 million for all residents in Michigan.

Estimating values from survey data. Often, instead of carrying out an implicit valuation of an environmental service, researchers may directly question service users about their WTP for a hypothetical improvement in an environmental service. Such questionnaire-based studies constitute contingent valuation (CV) surveys whereby researchers estimate a demand curve for a particular environmental service. For instance, the study of Saginaw Bay used the Contingent Value Method to suggest that state residents are willing to pay a total of $207,000 per annum to protect an additional 1,125 acres of this coastal area.

Researchers may ask service providers about their WTA for providing a certain environmental service. Ideally, payments should lie above providers' WTA and below buyers' WTP. This method has been used in improving the water quality in Heredia, Costa Rica. The public utility of Heredia (ESPH) charges local residents an additional $\$0.05/m^3$ in their monthly water bills for protection of upstream watersheds. The payment is less than the replacement cost for downstream water users and more than the estimated opportunity cost for upstream land users.

A study under the RUPES project in Indonesia used conjoint analysis to identify specific preferences of services providers. Under this method, service providers are asked to choose among contracts that vary by their attributes. Survey respondents can choose among a set of hypothetical contract characteristics, for example, the duration of the contract, the type of the reward, the types of restrictions, etc. Using a regression equation, researchers can construct standard contracts from the attributes most preferred by service providers (in addition to the service buyers, of course).

A major limitation of those methods is that they are based on stated preferences of the respondents, which may or may not be their true preferences. Thus, a WTP estimate may not necessarily translate into actual payments when the conservation program is introduced. The same is true for WTA.

Auctions. Environmental service providers and buyers may have asymmetric information, meaning that the two parties do not have the same information and thus one may take advantage of the other in negotiating a payment system. In particular, it is difficult for service users to know under what conditions land users would be willing to provide an environmental service. This may lead to poorly structured payment systems that cost more than they need to or that end up paying those who would have provided the service anyway without influencing the land use of those who do not provide the service.

Some economists suggest that an effective way to deal with the asymmetry is to conduct auctions among service providers. Auctions are based on the premise that, when service providers compete for a contract, they are bound to reveal their true preferences. Under auctions, buyers invite bids or tenders from potential suppliers of a particular environmental service, then select the lowest bids. This method is supposed to be cost-effective, providing the biggest conservation bang for the buck. Auctions are commonplace in cap-and-trade systems (such as the acid-rain program in the United States) where various companies bid on emission permits.

The best-known example among PES-type programs is the Conservation Reserve Program in the United States, where landowners make offers to receive payments in return for retiring their land from crop production. The U.S. Department of Agriculture ranks these offers by the environmental sensitivity of the land and selects bids that provide the best combinations. However, a major constraint with auctions is that their political and social feasibility in the context of developing countries is still to be tested, and paying two neighbors differently for the same environmental service may lead to resentment. RUPES is conducting some experimental auctions in Indonesia, which may suggest the way forward.

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