Using Contingent Valuation in the Design of Payments for Environmental Services Mechanisms: A Review and Assessment

Dale Whittington and Stefano Pagiola

February 2011

Latin America and Caribbean Sustainable Development Department
World Bank
Washington DC, USA
Abstract
As the use of payments for environmental services (PES) programs for conservation has grown in developing countries, the use of stated preference methods, particularly contingent valuation (CV) surveys, to estimate the maximum amount that users of environmental services (“buyers”) would be willing to pay has also increased. This paper reviews 25 CV studies conducted in the context of PES programs (CV-PES) and assesses their quality and usefulness for designing PES programs. Almost all these studies attempt to estimate the demand of downstream water users for up-stream watershed protection and, more generally, for improved water services. Most studies were methodologically uninspired and generally low-quality applications of stated preference methods, with limited policy relevance. The quality and usefulness of CV-PES studies could be substantially improved at only a modest increase in costs.

Authors
Dale Whitington is Professor of Environmental Sciences & Engineering and City & Regional Planning, University of North Carolina at Chapel Hill, and Professor, Manchester Business School.
Stefano Pagiola is Senior Environmental Economist in the Latin America and Caribbean Sustainable Development Department, World Bank.

Keywords
Payments for environmental services (PES), Contingent valuation (CV)

Cover photo
Enumerators conducting a household survey in Palawan, Philippines (Stefano Pagiola).

PES Learning Papers
PES Learning Papers draw on the World Bank’s extensive experience in supporting programs of Payments for Environmental Services (PES). They are part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world.
The PES Learning Paper series disseminates the findings of work in progress to encourage the exchange of ideas about PES. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.
Using Contingent Valuation in the Design of Payments for Environmental Services Mechanisms: A Review and Assessment

Dale Whittington and Stefano Pagiola

1. Introduction

Payments for environmental services (PES) programs are an increasingly popular policy instrument in developing countries, especially for promoting watershed protection. Most PES programs involve downstream water users—such as domestic water supply utilities or hydroelectric power producers—paying upstream landholders to undertake activities to protect a watershed. Upstream landholders may be paid to stop deforestation, undertake afforestation, reduce soil erosion on agricultural lands, or cease slash-and-burn agriculture. The potential benefits to downstream water users include improvements in the quality, quantity, and reliability of water supplies, reduced risk of severe floods, and perhaps the bequest value of preserving natural areas for future generations.

The price to be paid for environmental services is a critical aspect of any PES program. The viability of any PES program requires that the maximum amount that users of environmental services (“buyers”) would be willing to pay for improvements in those services exceed the minimum amount that providers of those services (“sellers”) would be willing to accept. PES designers have often turned to stated preference methods, and particularly to contingent valuation surveys (CV), to estimate either or both of these values.1 As use of CV in this context grows, it becomes important to assess how well this stated preference method is being applied, and how its results can best be used.

In this paper we review CV studies that have been conducted in the context of PES schemes (CV-PES), almost all of which have tried to estimate the demand of downstream water users for upstream watershed protection and, more generally, for improved water services. Our objective is to assess the quality of these CV-PES studies, and their usefulness for designing and planning PES programs to compensate landholders for activities to protect upstream watersheds. We begin by reviewing the use of PES in developing countries (section 2). We then discuss the possible uses of CV in the design of PES schemes (section 3). Section 4 discusses nine indicators of good practice that we use to assess the quality of our sample of CV-PES. Although many of the issues that a well-designed CV must consider are not unique to CV-PES, the PES context introduces several special considerations, which we discuss section 5.

---

1 Contingent valuation (CV) is just one type of stated preference method that could be used to estimate the willingness to pay of downstream users and the willingness to accept payment of upstream landowners. As the vast majority of stated preference applications in the PES field, in fact, use CV, in this paper we focus on CV rather than stated preference methods more generally. Many of our observations and conclusions are equally applicable to other stated preference methods.
section 6 we review the existing CV-PES and assess their overall quality. We then discuss the limitations of the results from this literature (section 7) and conclude by summarizing the implications of our findings (section 8).

2. Payments for Environmental Services

PES is a market-based approach to conservation financing based on the twin principles that those who benefit from environmental services (such as users of clean water) should pay for them, and that those who contribute to generating these services (such as upstream land users) should be compensated for providing them (Wunder, 2005; Pagiola and Platais, 2007; Engel and others, 2008). The approach thus seeks to create mechanisms to arrange for financial transactions between service users and service providers that are in both parties’ interests, internalizing what would otherwise be an externality. PES can thus be conceptualized as an attempt to strike a Coasian bargain between service users and providers. The PES approach is attractive in that it (i) generates new financing which would not otherwise be available for conservation; (ii) is likely to be sustainable as it depends on the mutual self-interest of service users and providers and not on the vagaries of government or donor financing; and (iii) is likely to be efficient in that it conserves services whose benefits exceed the cost of providing them, and does not conserve services when the opposite is true.

There are two basic kinds of PES programs (Pagiola and Platais, 2007; Engel and others, 2008): user-financed PES programs in which service providers are paid by service users, and government-financed PES programs in which providers are paid by a third party, typically a government. User-financed PES programs are preferred in most situations because they are most likely to be efficient as service users provide not only financing but also information on what services are most valuable, can readily observe whether they are receiving the desired service, and have a strong incentive to ensure that payments are used effectively. Conversely, government-financed PES programs typically cover much larger areas, but are less likely to be efficient because governments have no direct information on service value or on whether services are being provided, and need to respond to numerous pressures that are often unrelated to the program’s objectives.

In developing countries, user-financed PES programs have most commonly been for water services, where users are easy to identify and receive well-defined benefits (Pagiola and Platais, 2007).\(^2\) The dominance of payments for water services within PES schemes more generally is likely to continue. The very nature of the services involved means that water programs are much easier to implement than, for example, payments for biodiversity services (Pagiola and Platais, 2007).\(^3\)

\(^2\) Our discussion in this paper focuses on the use of PES in developing countries. See Salzman (2005) for a discussion of some applications in industrialized countries.

\(^3\) Programs aimed at sequestering carbon are a distant second, in terms of number of mechanisms and area covered, after water services. This may change in the future, however, if markets develop for Reduced Emissions from Deforestation and forest Degradation (REDD).
There are now numerous PES programs in existence that involve direct payments by various types of water users at a variety of geographic scales. In Ecuador, Quito’s water utility and electric power company pay to conserve the upstream watersheds from which they draw their water (Echavarría, 2002a; Southgate and Wunder, 2009). In Costa Rica, Heredia’s public service utility pays for watershed conservation with funds from a special fee on consumers (Barrantes and Gámez, 2007). Many small towns have similar programs, including Pimampiro, Ecuador (Wunder and Albán, 2008); San Francisco de Menéndez, El Salvador (Herrador and others, 2002); Jesús de Otoro, Honduras (Mejía and Barrantes, 2003); and San Pedro del Norte, Nicaragua (Obando Espinoza, 2007).

Hydroelectric power (HEP) producers are also well-represented in current PES programs. In Costa Rica, for example, many public-sector and private-sector HEP producers are paying for conservation of the watersheds from which they obtain water from upstream sources, generating payments of about US$0.5 million and conserving about 18,000 ha annually (Pagiola, 2008, Blackman, and Woodward, 2010). In Venezuela, power company CVG-Edelca will pay 0.6 percent of its revenue (about US$2 million annually) to conserve the watershed of the Río Caroní, where 70 percent of the country’s HEP is generated (World Bank, 2007). Some irrigation systems, such as those in Colombia’s Cauca Valley, have also participated in PES programs, paying upstream landowners for watershed protection (Echavarría, 2002b).

Government-financed PES programs depend either on annual appropriations from the national budget (as in Mexico) or on revenues from earmarked taxes (as in Costa Rica). Government-financed programs can, in principle, target any environmental service deemed to be of social importance. In practice, they have also focused primarily on water services. The main window of Mexico’s Payments for Forest Environmental Services (PSAB) program deals largely with water services (Muñoz and others, 2008). China’s Sloping Lands Development Program (SLCP) focuses exclusively on areas at risk of erosion (Bennett, 2008). Costa Rica’s Program of Payments for Environmental Services (PPSA) currently defines its eligible areas primarily on biodiversity criteria, due to early financial support from the Global Environment Facility (GEF) to the program, but is evolving towards a greater focus on water services (Pagiola, 2008). Some governments use public resources for PES programs aimed at biodiversity conservation, but such funding is very limited. At the end of 2007, the area enrolled under the biodiversity window of Mexico’s PSAB program was less than one tenth that enrolled under the water services window. The dearth of spending on protected areas is another indication of the inability or unwillingness of most developing countries to devote significant resources to biodiversity conservation.
3. Uses of CV surveys in PES design

Payments to service providers in a PES program must be less than the value of the service to users (or it would not make economic sense to provide it), but more than the cost of providing it (or suppliers would not provide it). The objective of a CV-PES could be to determine the maximum amount that a user would be willing to pay suppliers, the minimum compensation that sellers would accept to change their behavior and/or undertake a new set of land use activities, or both. To date, the vast majority of CV-PES has focused on estimating the buyers’ willingness to pay (WTP) for improved environmental services; only a few examine service providers’ willingness to accept (WTA) payments to modify their behavior or undertake specific activities. In this paper, we focus on the WTP studies.

One reason that most stated preference surveys focus on the WTP of the buyer of environmental services is that estimates of the cost of service provision by upstream landholders are often relatively easy to obtain by other means. This is because they consist primarily of the opportunity costs of displaced land uses, plus any out-of-pocket costs involved (for example, for planting trees). The rental value of land in an upstream watershed can also serve as a useful proxy for the costs of service provision. The value of improved service provision to users, on the other hand, is typically harder to observe because prices for such services are administratively determined and often heavily subsidized, and thus do not reflect the real value of the services to users.

CV can play several possible roles in PES design. The most obvious is to help assess whether a PES mechanism would be feasible. By providing estimates of either WTP for services or WTA to provide them, CV-PES can help determine whether there is ‘room for a deal.’ A related objective is to assess whether PES would be welfare-improving. In this case, the WTP estimates are used in a cost-benefit analysis to estimate potential welfare increases resulting from improved service provision. This role would be particularly important in the case of government-financed PES programs. CV-PES can also provide guidance on specific aspects of PES, such as the price to be charged to service users. Finally, CV-PES can provide reassurance to policymakers that implementation of PES is politically feasible, by indicating that users would indeed be willing to pay for the benefits they would receive.

CV-PES can also be administered at different stages of PES design. A survey intended to determine whether a program is feasible would best be administered early in the process, while one aimed at establishing an appropriate price would be most useful late in the process. This has implications for the information that would be available for construction of the stated preference scenario, as discussed below.

---

4 We found only two CV studies that examined upstream landholders’ WTA payments to participate in a PES mechanism (Southgate and others, undated; Lundine, 2005). In addition, Porras and Hope (2005) use conjoint analysis to examine farmer WTA payments in the Arenal watershed (Costa Rica).

5 In fact, in San Pedro del Norte, Nicaragua, payments to participating farmers were explicitly based on land rental values (Obando Espinoza, 2007).
4. Indicators of good practice in CV applications in the PES field

Carrying out CV-PES requires adherence to good practices that are needed in applications of CV in all sectors. There are now numerous excellent manuals and books to which CV consultants can refer for guidelines and examples of good practice (Mitchell and Carson, 1989; Arrow and others, 1993; Louviere and others, 2000; Bateman and others, 2002; Champ and others, 2003; Alberini and Kahn, 2006). Best practice in the design and implementation of CV is constantly evolving. What needs to be done to ensure high-quality results in any particular context is a matter of judgment and subject to budgetary constraints. In this section we briefly describe the nine indicators of good practice that we subsequently use to assess the sample of CV-PES.

The nine indicators we use here are not meant to be comprehensive. Moreover, we recognize that not all CV researchers working on CV-PES have the time or budget to implement all of these best practices. The NOAA Panel Guidelines (Arrow and others, 1993) form the basis for some, but not all, of our indicators. We have selected these nine because they are relatively easy and straightforward to assess from reading the CV-PES, and because they cover a range of design and implementation issues.

Using methods to reduce hypothetical bias

The main criticism that economists have leveled at CV has been that WTP estimates are inflated because respondents do not face an actual budget constraint (hypothetical bias), and because they are prone to say yes too easily, perhaps just to please the interviewer (enumerator bias). In our opinion, these are serious threats to the results of CV-PES (Whittington, 2010). However, CV researchers have developed a number of ways to reduce this yea-saying tendency, including (i) cheap-talk scripts (Cummings and Taylor, 1999; List, 2001; Carlsson and others, 2005), (ii) ballot boxes to simulate voting behavior (Carson and others, 1994; Krosnick and others, 2002; Harrison, 2006), (iii) recalibration of results with data from real experiments (Blackburn and others, 1994), (iv) time-to-think (TTT) experiments (Whittington and others, 1992), and (v) drop-off protocols (Subade, 2007). The use of one or more of these methods to reduce the risk of hypothetical bias is an important indicator of the quality of a CV-PES.

Asking debriefing questions

CV researchers typically follow-up a respondent’s answer to the valuation question with a series of “debriefing questions.” The NOAA Panel Guidelines (Arrow and others, 1993) called for debriefing questions, referring to them as “Yes/No Follow-ups.” If respondents say “Yes,” and agree to pay the offered amount (bid) in the CV scenario, the interviewer follows up with a question about the reasons why the respondents agreed to pay. If the respondents say “No,” that they will not pay, then the interviewer follows up with a question about the reasons why they are not willing to pay. The purpose of debriefing questions is to try to determine whether respondents have interpreted and answered the valuation question in the way that the researcher intended. Respondents can offer legitimate and illegitimate to both
“Yes” and “No” answers to the valuation question(s). A well-designed CV-PES will include debriefing questions in order to separate legitimate from illegitimate answers to the valuation question(s).

**Asking uncertainty questions**

In the early applications of CV, uncertainty questions were rarely included in survey instruments. CV researchers now routinely try to gauge the level of confidence—or certainty—that respondents have in their answers to the valuation question (Alberini and others, 2003; Li and Mattson, 1995; Loomis and Ekstrand, 1998; Whitehead and others, 1998; Samnaliev and others, 2006; Akter and others, 2008). If respondents express a high level of certainty in their answer, this may be an indicator that in fact they will pay the offered bid amount. Respondents’ answers to uncertainty questions can be used during the analysis of the survey data to decide how many of the respondents who agreed to pay (i.e., said “yes” to the dichotomous choice valuation question) should actually be treated as definite “Yes” votes. The NOAA Panel Guidelines called for including a simple “don’t know” or “not sure” response. Other approaches have been used to assess the magnitude of a respondent’s uncertainty (for example, Wang, 1997). Some CV researchers now prefer to embed the uncertainty questions directly into the available responses to the dichotomous choice valuation question (Ready and others, 1995). We consider any approach to obtain information about the uncertainty respondents feel toward their answer to the valuation question to be an indicator of a high-quality CV-PES.

**Determining whether respondents are “in the market”**

When a dichotomous choice, referendum question is used to elicit respondents’ WTP, the CV researcher will typically want to carefully distinguish respondents who do not value the good or service at all from those who will not pay the offered price but may be willing to pay something. Policy makers are often interested in the raw data on the number of respondents who are not willing to pay anything. Also, if there are many such “zero WTP” respondents, spike models may be the most appropriate econometric framework for analyzing the co-variates of respondents’ answers to the valuation question (Hanemann and Kristrom, 1995; Kristrom, 1997). Several approaches are used in the literature to identify “zero WTP” respondents. The approach we prefer is to begin the valuation questions with the discrete price offer. If the respondents say “Yes,” it is clear that they are willing to pay something and are “in the market.” If the respondents say “No,” then it is natural to follow-up with the question, “Would you pay anything?” If the respondents again say “No,” sometimes a second follow-up question is posed: “Would you take it (i.e., the good or service) for free?” However, in our assessment we consider the inclusion of any sequence of questions to determine who is in the market to be an indicator of a high-quality CV-PES.

**Using visual aids to explain the CV scenario**

In a well-crafted CV survey instrument, respondents are presented with a hypothetical management plan (policy intervention) and a choice as to whether they
would be willing to pay a specified amount of money for it to be implemented. The NOAA Panel Guidelines called for an “Accurate Description of the Program or Policy,” and said: “adequate information” must be provided to respondents about the environmental program that is offered (Arrow and others, 1993: p.10). One way to accurately convey the details of the hypothetical management plan and the results of its implementation is to use pictures, maps, diagrams, figures, and tables (Labao and others, 2008). These visual aids are not always required, but their presence as part of a survey protocol suggests that the CV researcher is seriously concerned that respondents understand the CV scenario. In a CV-PES, there are many possible uses of visual aids to convey relevant information. For example, if the management plan requires upstream landowners to change their land use practices, photographs could be used to show the current state of erosion in the upstream watershed and what the land would look like after afforestation. Diagrams could be used to show how downstream water quality would improve. In contrast, it could be very difficult to convey such information in the absence of visual aids. We consider the use of visual aids during the presentation of the CV scenario to be an indicator of a high-quality CV-PES.

**Using split-samples to test for the robustness of results**

The NOAA Panel noted that “common notions of rationality” impose requirements on the results of CV (Arrow and others, 1993: p.11). For example, one usually assumes that respondents should be willing to pay more for a large amount of a good or service than for less of it. CV researchers may ask different split-samples of respondents their WTP for different levels or “scope” of the good or service to be provided in order to demonstrate that respondents are answering the valuation questions in ways that are consistent with common notions of rationality. Such scope tests are not always straightforward, as there is often little a priori guidance as to how much such estimates should differ. But we consider the use scope tests and other split-sample experiments to test for the reliability and accuracy of the WTP results to be an indicator of a high quality CV-PES.

**Testing if income is positively correlated with WTP**

Demand theory suggests that WTP for normal goods increases as income increases. Other things equal, we expect high-income respondents to have higher willingness to pay than low-income respondents. If this is not true, it suggests that respondents may not be answering the valuation questions as the CV researcher intended. We thus expect a high-quality CV-PES to report whether income is positively correlated with respondents’ WTP.
**Addressing intrahousehold allocation**

Intrahousehold allocation issues pose a number of complex research design decisions for CV researchers (Adamowicz and others 2005; Whittington and others 2008; Prabhu, 2010). The first decision a CV researcher needs to make is whether or not the respondent is supposed to answer the valuation question(s) for himself (herself) or for the entire household. The second decision is who to interview - the husband? The wife? Or both? The simplest approach in a CV is to use the household as the sampling unit and interview whoever is identified as a household decision maker, usually either the husband or the wife. However, when households’ decision-making is best characterized as cooperative bargaining, this simple approach is likely to be inadequate. We consider an explicit effort to address such intrahousehold allocation issues in the determination of whom to interview and in the construction of the CV scenario to be an indicator of a high-quality CV-PES.

**Obtaining informed consent**

Obtaining informed consent from respondents is necessary to ensure that they can choose whether or not to participate in the CVS (Whittington, 2004). An informed consent form is presented to a potential respondent before an interview. It tells the respondent about the objectives of the research, the sponsoring agency, and any potential risks to his household or others. It promises the respondent and his household anonymity and provides the respondent with someone to contact if problems occur (this person cannot be directly affiliated with the research project). If compensation is offered to the respondent, it should be clear in the informed consent form that this compensation will be paid even if the respondent declines to participate. Offering a respondent an informed consent form certainly does not solve all of the potentially problematic ethical issues involved in conducting a CVS, but it is a step in the right direction. We consider an effort to obtain respondents’ informed consent to be an indicator of a high-quality CV-PES.

**5. Special challenges in the design of CV-PES**

The nine indicators of good practice described in the previous section are broadly applicable to CV in all sectors. In addition, there are specific challenges in the design of CV-PES that need to be recognized. In a PES program, payments from downstream water users are collected and used to pay upstream landholders to undertake one or more land uses that are expected to improve water services. There are several sources of uncertainty in this context.

The first challenge arises from the fact that it is difficult to predict how specific upstream land uses will affect downstream water quality and quantity in a

---

6 We are aware of only one case in which payments are for actual service provision: the payments made by the La Esperanza hydroelectric power plant in Costa Rica to the Monteverde Conservation League, which owns the watershed where the plant is located, are based on the plant’s ability to generate electricity (Rojas and Aylward, 2002). This is an unusual case, however, with a single user and a single provider in a small watershed.
particular watershed, as the scientific evidence to establish this relationship is often weak. Downstream users thus bear a risk that the benefits will not be as great as anticipated (Pagiola and Platais, 2007). This risk is lower when detailed *ex ante* hydrological studies have been undertaken, but cannot be completely eliminated. The impact of this risk can also be mitigated somewhat in well-designed PES programs by including monitoring and evaluation systems that enable adjustments to be made to contracts with landholders to ensure that downstream users receive the benefits for which they are paying. In user-financed PES programs, users also have the option of ending payments if they are not satisfied with the services they receive, thus putting a limit on possible losses.

The challenge this scientific uncertainty poses for a designer of a CV-PES is to decide how much of this scientific uncertainty to try to explain to respondents during the interview. Broadly speaking, there are two ways to proceed. One is to attempt to convey to respondents the true degree of scientific uncertainty about the consequences of upstream actions, and try to ensure that respondents incorporate an understanding of these risks in their responses to the valuation questions. In this case the estimates of the willingness to pay (WTP) of the downstream users will incorporate the information that the policy outcomes are uncertain. The survey designer could also describe the features of the PES mechanism that can help mitigate the risk. The other approach is for the survey designer to try to estimate downstream users’ WTP for specific policy outcomes contingent on the success of the upstream watershed protection activities. In other words, the survey designer tries to estimate what downstream users would be willing to pay for improved environmental services *contingent* on their successful delivery. In this case the downstream users’ WTP estimates are policy relevant only if the planner is confident that the upstream watershed protection activities being contemplated will result in outcomes at least as good as the respondents were told to assume in the CV-PES.

A second challenge concerns the description of institutional uncertainty. A PES mechanism requires that money be collected from service users, be administered, and then used for the purpose intended. In many developing country situations, respondents may be highly skeptical that any monies they provide will actually be paid to upstream landholders, or that landholders would respond as expected. Respondents may refuse to participate in a PES program not because of scientific uncertainty or because they place low values for service improvements, but because they lack confidence in the institutions. One approach to handling this institutional uncertainty is to acknowledge in the questionnaire that the researcher knows that many people feel this way, and to specifically instruct respondents to suspend their lack of trust in institutions and assume that the money would be handled honestly and provided to the upstream landowners as promised. This challenge is especially severe in the case of CV-PES administered early in the program design process. Here, too,

---

7 Such studies were rarely undertaken during the design of most existing PES programs, but are becoming more common in the design of new PES programs.
the option of estimating the value of the service is contingent on its successful delivery.

A third challenge survey designers face is that respondents may have preferences for more than just improved service delivery. Downstream users may care about upstream watershed protection for other reasons than simply the attributes of downstream water services. Upstream watersheds may provide wildlife refuges, forests for recreation, and nonuse environmental benefits. Upstream landholders may be poor, and downstream respondents may place a premium on helping them. If people care about upstream land uses for reasons other than the downstream service improvements, and if these other reasons are omitted from the information set provided to respondents, the WTP estimates obtained from the survey will be too low. An important question thus concerns how much detail respondents should be provided about how the PES program would work in upstream areas—who would be paid, and to do what. One extreme is not to tell respondents anything about the management plan (or even the PES scheme itself), and to simply measure their demand for improvements in the quality, quantity, and reliability of the downstream water services without telling them how these improvements will come about. The other extreme is to tell respondents a good deal about the management plan and what landholders would actually have to do to receive the proposed payments from downstream users. If respondents are given more details about the management plan, they may be more willing to believe that upstream landholders would actually participate in the PES scheme.

The different studies can thus be classified according to the degree to which they recognize and address these challenges (that is, explaining scientific and institutional uncertainty, and describing the elements of PES management plans that can affect respondent preferences). At one extreme, studies could provide information on all three of these aspects. In a simpler approach, the survey could provide information on some, but not all of these aspects. Finally, respondents could be simply presented with a scenario that asks them to value specific improvements in downstream water services, without being told about either the management plan or the uncertainty in the outcome.\(^8\)

---

\(^8\) In fact, there are a large number of CV studies in the literature that attempt to measure households’ WTP for improved water services (including, among others, Whittington and others, 1990, 1992, 1998, 2002; Briscoe and others, 1990; Hoehn and Krieger, 2000; Bohn and others, 1993; Reddy, 1999). Even though none of these studies were conducted in a PES context, their results are potentially useful for PES program design—as long as respondents were not told that the improvements in service quality would occur by some other means.
6. An assessment of the quality of existing CV-PES

To assess the quality of existing CV-PES, we sought studies that had been undertaken specifically in the context of an actual or hypothetical PES program for watershed protection. We were able to collect 25 such studies. Table 1 summarizes the characteristics of the studies included in our review.

Many of the applications we review are in the grey literature; only a few have been published in refereed journals. Two of the 25 studies were theses conducted by students as part of their Masters program. Almost half of the papers are only available in Spanish.

Several researchers recur frequently among the contributors. All of the studies have been carried out over the past decade—not surprisingly, since PES has been in use only since the late 1990s. Almost all are from Latin America—again, not surprisingly, as most existing PES programs have been implemented there (Southgate and Wunder, 2009; Camhi and Pagiola, 2010). In fact, 10 studies are from Mexico and 5 are from Costa Rica. Only one is from Africa, and two from Southeast Asia (both from the Philippines); none are from the Middle East or South Asia. In practically all of the studies, the downstream parties were urban water users. There are only a few studies of irrigators’ WTP to preserve their water supplies (Lopez and others, 2006; Shultz and Solis, 2007), and only one of electricity users’ WTP to protect watersheds where hydroelectric power is generated (Alpizar and Otarola, 2004).

Many of CV-PES were undertaken as part of the design of proposed or actual PES programs, or examine working PES programs. It is noteworthy, however, that many published applications are for purely hypothetical PES programs. Among the policy studies, almost all were undertaken during the design phase of the PES program concerned, but one (Moreno-Sánchez, 2009) examines the possible expansion of a working program.

---

9 The only studies we found that used other stated preference techniques were by Alpizar and others who used choice experiments in numerous studies.

10 Note that some studies have been the subject of more than one publication, and that some publications cover several studies. We count studies rather than publications.

11 Whittington (2010) notes that most stated preference applications now carried out in less-developed countries never make it to refereed journals, for two reasons. First, most are done to support ongoing policy work and were never intended for distribution to a wide, academic audience. Second, most journals have increasingly stringent publication standards for stated preference articles. Straightforward, professional applications of the methods may be fine for policy work, but a simple reporting of empirical findings is of little interest to most editors. Many well-executed studies thus never reach a wide audience.

12 Nine of the studies conducted in Mexico were contracted by national forest commission (CONAFOR) as part of an effort to help jumpstart local PES mechanisms to complement the national PES program, while the other two were academic studies.

13 Bennagen and others (undated) also conducted CV studies for a hypothetical PES program in the Philippines, including separate surveys of domestic water users, irrigated rice farmers, and tourists. However, we omitted this paper from this review as it provides no description whatsoever of its methodology.
<table>
<thead>
<tr>
<th>Location (country, site)</th>
<th>PES context/Estimated Mean WTP</th>
<th>Policy or hypotheticala</th>
<th>Date of study</th>
<th>Size of sampleb</th>
<th>Sourcesc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bolivia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comarapa (town)</td>
<td>US$1.95 per month per HH</td>
<td>P</td>
<td>221</td>
<td>Shultz and Soliz, 2007 [PR]</td>
<td></td>
</tr>
<tr>
<td>Comarapa (lower watershed)</td>
<td>US$27 per hectare per year</td>
<td>P</td>
<td></td>
<td>Shultz and Soliz, 2007 [PR]</td>
<td></td>
</tr>
<tr>
<td><strong>Colombia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chaina</td>
<td>Expansion of existing mechanism serving 5 rural water supply systems WTP = US$1.48 per month per household (in addition to existing payment of US$0.50/m)</td>
<td>P</td>
<td>2006</td>
<td>300</td>
<td>Moreno-Sánchez and others, 2009 [WP]</td>
</tr>
<tr>
<td><strong>Costa Rica</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cartago</td>
<td>0.0206-0.0227 per kwh per electricity user</td>
<td>???</td>
<td>2003</td>
<td>413</td>
<td>Alpizar and Otarola, 2007 [BC]</td>
</tr>
<tr>
<td>Dos Novillos watershed</td>
<td>US$4.66 per month per HH</td>
<td>H</td>
<td>2005</td>
<td>398</td>
<td>Kaplowitz and Lupi, 2008 [UN]</td>
</tr>
<tr>
<td>Esparza</td>
<td>US$1 per month per HH</td>
<td>??</td>
<td>2005</td>
<td>365</td>
<td>Alpizar and Madrigal, 2007 [UN]</td>
</tr>
<tr>
<td>Reventazón watershed</td>
<td>Protecting watersheds serving two rural community aqueducts US$4.34 per month per HH</td>
<td>H</td>
<td>2006</td>
<td>300</td>
<td>Ortega-Pacheco and others, 2009 [PR]</td>
</tr>
<tr>
<td><strong>Turrialba</strong></td>
<td>US$6.90 per month per HH</td>
<td></td>
<td>2002</td>
<td>200</td>
<td>Berggren and Stahl, 2003 [ST]</td>
</tr>
<tr>
<td><strong>Ecuador</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotacachi</td>
<td>[WTP not reported]</td>
<td></td>
<td>2002; 2004</td>
<td>274</td>
<td>Rodriguez and others, 2009 [PR]</td>
</tr>
<tr>
<td><strong>Ghana</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weija</td>
<td>US$5.4</td>
<td>H</td>
<td>2008</td>
<td>89</td>
<td>Peprah, 2009 [ST]</td>
</tr>
<tr>
<td><strong>Honduras</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copan Ruinas</td>
<td>US$1.0-1.1 per month per HH</td>
<td>P</td>
<td>??</td>
<td>285</td>
<td>Cisneros and others, 2007 [UN]; Madrigal and Alpizar, 2007 [UN]</td>
</tr>
<tr>
<td><strong>Siguatepeque</strong></td>
<td>US$0.6-.9 per month per HH</td>
<td></td>
<td>2002 (?</td>
<td>337</td>
<td>Cruz and Rivera, 2002 [UN]</td>
</tr>
<tr>
<td><strong>Mexico</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bahías de Huatulco, Oaxaca</td>
<td>US$0.06-.08 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>376</td>
<td>González-Ortiz, 2007 [CR]</td>
</tr>
</tbody>
</table>
Table 1: Characteristics of CV surveys used for analyzing Payments for Environmental Services Programs and estimates of Willingness to Pay

<table>
<thead>
<tr>
<th>Location (country, site)</th>
<th>PES context/Estimated Mean WTP</th>
<th>Policy or hypothetical⁴</th>
<th>Date of study</th>
<th>Size of sample⁵</th>
<th>Sources⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coatepec and nearby towns, Vera Cruz</td>
<td>US$1.1-1.2 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>197</td>
<td>Puente-González, 2007 [CR]</td>
</tr>
<tr>
<td>Colima-Villa de Alvarez, Colima</td>
<td>US$3 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>422d</td>
<td>Pizano-Portillo, 2007 [CR]</td>
</tr>
<tr>
<td>El Cielo-Ciudad Victoria area, Tamaulipas</td>
<td>US$0.6 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>432</td>
<td>Campos-Benhumea, 2007 [CR]</td>
</tr>
<tr>
<td>Monterrey, Monterrey</td>
<td>US$0.6 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>384</td>
<td>Saldivar-Valdés, 2007 [CR]</td>
</tr>
<tr>
<td>Saltillo, Coahuila</td>
<td>US$0.6 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>180</td>
<td>Arias-Rojo, 2007 [CR]</td>
</tr>
<tr>
<td>Santa María de Huatulco, Oaxaca</td>
<td>US$2.0-2.8 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>381</td>
<td>González-Ortiz, 2007 [CR]</td>
</tr>
<tr>
<td>Six small towns, Quintana Roo</td>
<td>US$3.4 per month per HH</td>
<td>P</td>
<td>2007</td>
<td>377</td>
<td>Contreras-Benítez, 2007 [CR]</td>
</tr>
<tr>
<td>Tapalpa watershed, Jalisco</td>
<td>Domest. user - US$10 per mo</td>
<td></td>
<td>2005</td>
<td>243</td>
<td>López et al., 2007 [PR]</td>
</tr>
<tr>
<td></td>
<td>Agric. users - US$12 per mo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ranchers - US$10 per mo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Firms (services) - US$7 per mo.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial users - US$16 per</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper watershed of Rio Balsa, Mexico</td>
<td></td>
<td>P</td>
<td>2007</td>
<td>837e</td>
<td>Vargas-Pérez, 2007 [CR]</td>
</tr>
<tr>
<td>Nicaragua</td>
<td></td>
<td>H</td>
<td>1998</td>
<td>153</td>
<td>Johnson and Baltodano, 2004 [PR]</td>
</tr>
<tr>
<td>San Dionisio</td>
<td>US$0.42 per month per HH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td>H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro Manila</td>
<td>US$0.52 per month per HH</td>
<td></td>
<td></td>
<td>2232</td>
<td>Calderon and others, 2006 [PR]</td>
</tr>
<tr>
<td>Tuguegarao City</td>
<td>US$0.84-1.50 per month per HH</td>
<td></td>
<td>2006</td>
<td>401</td>
<td>Ampoon and others, 2007 [WP]</td>
</tr>
</tbody>
</table>

Notes: HH = household; mo = month
a. P = Policy; H = Hypothetical
b. The numbers in this column refer to completed interviews. Response rates are rarely reported, so it is generally not possible to determine the original sample size.
c. BC = Book chapter; CP = Conference paper; CR = Consultant report; PR = Published in a peer-reviewed journal; ST = Student thesis; WP = Formal working paper series; UN = Unknown
d. In addition to 422 households, the researchers also surveyed 356 commercial water users.
e. 168 households in watershed; 353 in city; 316 in suburbs.
f. The range of WTP estimates for different model specifications.
Many characteristics of the studies are not reported in the papers, but most of the studies appear to have involved in-person interviews in respondents’ homes. All studies used a monetary numeraire to measure willingness-to-pay. With a few exceptions, sample sizes are generally modest. Table 2 summarizes the elicitation procedure used by the research team in the CV-PES. As shown, most used dichotomous choice questions, mostly single-bounded.

<table>
<thead>
<tr>
<th>Table 2 - Elicitation Procedure - CV Valuation Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elicitation procedure</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Dichotomous choice: single bounded or double bounded</td>
</tr>
<tr>
<td>Open-ended maximum WTP</td>
</tr>
<tr>
<td>Payment Card</td>
</tr>
<tr>
<td>NR</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Assessing the quality of the CV-PES

In assessing the studies, we were limited by the information provided by the papers and reports. Many CV-PES did not include the survey instrument or report the CV scenario. Nor was the approach described in sufficient detail for us to fully assess the quality of the fieldwork and the results—even the grey literature reports, which do not face the length restrictions of journal articles, often failed to provide sufficient detail on their methodology.

The most common payment vehicle was the household water bill, but a surprisingly large number of studies did not have a payment vehicle. Respondents were simply asked if they would pay a specified amount (for example, in a single or double bounded dichotomous choice elicitation procedure), without telling them how this amount would be collected. In some cases neither the elicitation procedure nor the payment vehicle were reported in the study.

Tables 3 and 4 examine how the CV-PES we reviewed fared in terms of our nine indicators of good practice. Table 3 presents a simple count of the number of studies in our sample that used different numbers of quality indicators (from 0 to 9). For example, 7 of the 25 CV-PES did not have (or did not report) using any of the nine quality indicators. Eight studies had only one of the nine attributes. Only 2 of the 25 studies had 6 or more indicators of quality (neither was from Latin America). The mode was one indicator; the mean was 1.6 indicators.

14 This is reasonable in that the vast majority of PES mechanisms take monetary payments from service users and make monetary payments to service providers. There are a few schemes in which non-monetary payments are used. Asquith and others (2008), for example, describe a case in Bolivia in which providers receive bee hives and training in honey production as compensation for conservation activities.
Table 3: Number of quality indicators included in CV-PES study

<table>
<thead>
<tr>
<th>Number of quality indicators included</th>
<th>Number of studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

*Notes: Mode = 1; Mean = 1.6*

Table 4 - Percent of CV-PES that included each indicator of study quality

<table>
<thead>
<tr>
<th>Quality indicator</th>
<th>No. of studies</th>
<th>% of all studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use methods to reduce hypothetical bias</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Ask debriefing questions</td>
<td>13</td>
<td>52</td>
</tr>
<tr>
<td>Ask uncertainty questions</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Determine whether respondents are “in the market”</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Use visual aids to explain the CV scenario</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>Use split-samples to test for the robustness of results</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Test if income is positively correlated with WTP</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Address intrahousehold allocation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Obtain informed consent</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4 presents more evidence that state-of-the-art CV craftsmanship is missing from the majority of the CV-PES in the sample. Table 4 shows the number (and percentage) of studies in the sample that used each of the nine indicators of good quality. The three indicators found most often in the CV-PES were debriefing questions (52 percent); tests of whether income was positively correlated with income (32 percent); and the use of visual aids in the presentation of the CV scenario (28 percent). Only two of the studies (8 percent) used any of the currently available techniques to minimize hypothetical bias: Calderon and others (2006) and Amponin and others (2007) used a ‘cheap talk’ script. Very few studies asked questions to

---

15 Most of these only asked a single debriefing question. If the respondent refused to pay, the enumerator asked, “Why?”
assess a respondent’s uncertainty (8 percent); or used split sample experiments to test for the robustness of respondents’ answers to the valuation question (4 percent). None of the 25 CV-PES explored intrahousehold allocation issues or obtained informed consent.

With the notable exception of the Calderon and others’ (2006) study from Manila, Philippines (n = 2232), the sample sizes of the CV-PES are relatively small. Not all authors report the mean or median household willingness to pay (WTP) of water users for improved service quality and reliability (Table 1). For those that do, there is a wide range of estimates, from US$0.42 per month for households living in five small communities in Nicaragua (Johnson and Baltodano 2004), to US$6.90 for households in Turrialba, Costa Rica (Berggren and Stahl, 2003) and about US$10 in Jalisco, Mexico (Lopez et al, 2007). Of the majority of the WTP estimates are less than US$2 per household per month. In one of the most carefully executed studies in the literature, Calderon and others (2006) reported a mean WTP for households in Manila of US$0.50 per month.

In the best studies figures, tables, and photographs were provided to respondents to help them understand the management plan under consideration and the choice task. However, in many studies respondents not only were given little or no information on how service improvements would be achieved, but were often given almost no information on what kind of service improvement they would receive. Many studies simply asked respondents their maximum for WTP for “water service improvements.” None of the CV-PES attempt to convey to respondents the uncertain outcomes associated with upstream watershed protection activities. Nor did any of the studies ask respondents to suspend their possible skepticism about institutional uncertainty. In the majority of studies, respondents were not told about either the management plan or the scientific and institutional uncertainty associated with the management plan and downstream outcomes. Calderon and others’ 2006 study provides a good example of an information set in which respondents were told about watershed protection activities upstream and the downstream consequences but not about the risk that some of these outcomes might not materialize.

There are two especially revealing indications of the wide variation in the quality of the CV-PES in our sample. First, many studies fail to find a statistically significant relationship between respondents’ answers to the valuation questions and household income (or wealth). This is quite unusual in well-executed stated preference studies.

The second indication of the low quality of many CV-PES can be seen by a direct examination of information sets and valuation questions provided to respondents. The choice tasks presented to respondents vary widely in their clarity and policy-relevance. Some of the valuation questions are not incentive-compatible,

---

16 However, some of these studies were conducted in small communities and the sample frames are small, so small samples sizes do not necessarily indicate an inadequate sample size.

17 The WTP estimates reported here and in the Table 1 are in US$ for the year the study was conducted. They have not been normalized to a base year.
meaning that respondents have an incentive to misrepresent their preferences, and are inappropriate in the PES context of collective action (Carson and Groves, 2007; Whittington, 2002).

The state-of-the-art in conducting stated preference studies is constantly evolving, and some of these CV-PES are now a decade old. It would be of course unfair to impose today's standards on the older studies. On the other hand, the NOAA Blue Ribbon panel’s recommendations for CVS (Arrow and others, 1993) are now almost two decades old, and the vast majority of the CV-PES included in our review do not meet these standards. We thus believe it is accurate to characterize a large number of these CV-PES as uninspired from a methodological perspective, and generally low quality applications of stated preference methods. One possible indicator is that only a handful of these studies have been published in international refereed journals.

7. How useful are the results of stated preference studies for policy purposes?

The potential usefulness of a CV-PES depends in part on how accurate and reliable the results are, and, as discussed in the previous section of the paper, the quality of many of these studies raises questions in this regard. However, even if one assumes that the WTP estimates from such CV-PES are accurate and reliable, they are just one input into a negotiation process between upstream landholders and downstream water users. Almost all of the papers are silent on the question of how their results can be used in the design of PES programs. The authors of some studies seem to argue that a PES deal is feasible if the summation of the WTP of downstream users is greater than the upstream landholders’ minimum WTA to implement the watershed protection plan. In fact, for a PES negotiation to be feasible, three conditions must hold.

First, the potential revenue collected from downstream users for the PES program must be greater than the minimum payments required by upstream landholders to participate. Water service providers are not perfectly discriminating monopolists, so it is not possible to collect revenues equal to the summation of the maximum WTP of each of the downstream users. Only one of the CV-PES that we reviewed attempted to use the WTP estimates to calculate the revenue that might be collected from downstream users (Calderon and others, 2006). The CV-PES in the literature thus provide some of the raw data needed to support the design of PES programs, but there is little evidence that these raw data are actually being used correctly to estimate potential revenues.

---

18 An exception is Barrantes and Gámez (2007). Their results were used in Heredia, Costa Rica. The CV found WTP of CRC15.5/m³ and demonstrated to town officials that PES was viable. Actual charges were CRC1.9/m³, which is equivalent to about CRC40/hh/month, or 2 percent of average monthly fees). Unfortunately, this survey was never written up, and so it is not in our sample.
Second, the payments from downstream water users to participating upstream landholders must be less than the costs of alternative means that downstream users could adopt to achieve the same service improvements. In other words, not only must the possible payments from downstream water users be sufficient to compensate landholders, but they must also be less than other ways that the water service provider could utilize. In the language of negotiations, the PES deal for the downstream users must be better than their “Best Alternative to a Negotiated Agreement (BATNA).” Third, the transaction costs of collecting payments from service users and making payments to service providers must be less than the difference between the WTP and the WTA.

These three conditions together imply that there is potential for a PES negotiation to be successful if the potential revenues from downstream users are greater than the payments necessary to compensate potential landholders and cover the transaction costs of the program, and they are less than the costs of alternative means of delivering service improvements:

\[
\text{Payments to landholders} + \text{Transaction costs} < \text{Revenue from downstream users} < \text{Costs of alternatives to downstream users}
\]

The results from CV of downstream users alone are not a sufficient basis to demonstrate this condition. None of the authors of the papers included in our sample supplement their CV-PES results with additional information on the costs of alternative means of achieving equivalent service improvements, or on the compensation needed by participating upstream landholders, in order to examine the feasibility of a potential PES negotiation, and none provide information on transaction costs (indeed, most do not even mention them).

There is a strong inclination for authors to simply claim that their results are policy relevant without demonstrating how these estimates of demand for improved services and/or upstream watershed protection can be used to make better decisions. For some of the CV-PES, this may be because they were undertaken for academic purposes. Although many of these authors intended for their research to support the design of PES programs, the authors’ search for policy relevance occurred after the research was finished, and they sought to market their findings to policy makers. But some of these CV-PES were in fact undertaken for clients. For example, CONAFOR commissioned most of the Mexico studies, and several of the Costa Rica studies were undertaken under the FOCUENCAS project that implemented a pilot PES.

The CV-PES are largely silent on how the estimated WTP amounts can be used to revise water tariffs in order to collect the revenues needed to make payments to upstream landholders. In some of the CV-PES, respondents were asked an open-ended maximum WTP question; in others respondents were presented with a fixed increase in their monthly water bill. None of the CV-PES offered respondents a higher volumetric charge for their water, and asked them how much water they would want...
to purchase at this higher price. In rural communities in Latin America volumetric tariffs are relatively rare, but in medium-size and large municipalities, volumetric charges (often in the form of increasing block tariffs) are typically used in the tariff structure. If a volumetric charge is used, the only reasonable way that the results of these CV-PES can be utilized in terms of tariff design is to estimate the amount that can be added to a fixed charge component in the tariff structure. This is how the extra fee for PES is often described to respondents in the CV-PES, but it may not be the most appropriate way to modify the tariff (Boland and Whittington, 2000).

Some authors use the estimated WTP to calculate the consumer surplus, and simply give this as a maximum total payment that should be collected from water users (Cisneros and others, 2007; Alpizar and Madrigal, 2007). While this is technically correct, it does not provide program developers much concrete guidance. Alpizar and Madrigal (2007) suggest charging 50 percent of the estimated WTP, so as to “divide the consumer surplus equally between service users and service providers” (p.17). Alpizar and Madrigal simply divide the estimated WTP by the average water use to estimate WTP in volumetric terms (Alpizar and Madrigal, 2007). How can the WTP estimates be used to estimate the amount of this increase in the fixed charge? One approach would be to use the CV-PES results to estimate the monthly charge that would pass a public referendum (for example, 50 percent approval). Alternatively, the water utility might choose to select a fixed fee that would be approved by a higher percentage of the public (for example, 66 percent or 75 percent). From both an economic and political perspective, water service providers may not want to implement tariff reforms that would result in dramatically reduced household water use - or in substantial numbers of households disconnecting from their network. None of the CV-PES asked respondents what their household would do if the proposed monthly fee were implemented even if they personally voted no (or said they would not pay). A household that voted “no” to a proposed increase in their monthly water bill might disconnect from the water system. Alternatively they might pay the proposed increase in the fixed charge and suffer a welfare loss (Whittington and others, 2002). This uncertainty about how households would behave in response to a tariff increase may be one explanation for what occurred in Heredia, Costa Rica, where CV was used to estimate households’ WTP, and the actual fees were set far below the estimated WTP (Barrantes and Gámez, 2007).

The policy relevance of the WTP estimates from these CV-PES for the redesign of water tariffs is limited by another factor. In many instances, the existing water tariffs appear to generate revenues below the costs of system operation and maintenance, and far below the cost of capital replacement. In such a situation, if a household is asked whether they would pay an increase in their water bill for upstream watershed protection, their total water bill may still be quite modest. Their answer to a CV valuation question about their WTP for a PES program might have been

---

19 In our opinion this was the correct decision, but it is important to recognize that the information collected cannot be used to predict how downstream, water users would respond to a change in the volumetric component of a water tariff.
quite different if the water utility had already implemented a higher water tariff structure that attempted to recover more of the capital costs. In this case, the results of the CV-PES in terms of incremental WTP for watershed protection may be highly contingent on the low status quo water tariff. The water service provider may have some room to increase water tariffs and still maintain public support, but this slack could be quickly used up by any increase in the monthly water bills, for whatever reason. In other words, the water services provider could not increase the water tariffs in an attempt to recover more capital costs, and then still rely on the results of the CV-PES to justify raising the tariff again to pay for upstream watershed protection.

That several CV-PES studies have been carried out in a policy context could, in principle, provide a test of the accuracy and reliability of their results. This is not always the case. In Copán Ruinas, Honduras, initial payments under the local PES programs were made using funds provided by a donor rather than from charges to water users, with the intention of demonstrating the viability of the program before water users are actually asked to pay (Madrigal and Alpizar, 2007). Water user charges for PES have actually been implemented in several cases where prior CV-PES studies had been undertaken, including Heredia, Costa Rica (Barrantes and Gámez, 2007), Pimampiro, Ecuador (Wunder and Albán, 2008), and Saltillo, Mexico (Pagiola, 2010). Unfortunately, we have been unable to obtain copies of any of these studies. In each of these cases, the introduction of water charges has been problem-free. The test of predicted vs. actual behavior is not very stringent, however, because the payments assessed to water users have usually been far below the estimated WTP. In the case of Heredia, for example, the actual charge was only about 10 percent of the estimated WTP (Barrantes and Gámez, 2007). Perhaps the most interesting case here is that of Saltillo, Mexico, where a study (not in our sample) showed positive WTP. A purely voluntary payment mechanism was created, in which water users can, at their discretion, add an amount to their water bill. In 2009, 31,000 households (about 10 percent of water users) made voluntary contributions to the program, totaling M$1.2 million (Pagiola, 2010).

8. Discussion and Recommendations

Our objective in this review of CV-PES is quite modest. We have read many of existing CV-PES, and have reported on their quality. We do not know the actual impact of the CV-PES on the design of the PES programs. Nor do we know how useful decision makers found the results of these CV-PES. It is possible that they were satisfied with the work despite our assessment that the quality of many of these studies was quite low judged against the state of the art. Indeed, the fact that so many CV-PES are being conducted would seem to suggest that there is a demand for this work and that someone finds them useful.

---

20 Similarly, Griffin and others (1995) found that the actual behavior of households in Kerala, India, where piped water distribution systems were installed, was predicted accurately by their responses to an ex ante CV survey.
However, from our perspective there is little reason that the quality of CV-PES cannot be substantially improved at little or only a modest increase in costs. The primary impetus will probably come from the purchasers of CV-PES - the clients of the CV-PES consultants - who should demand higher quality products for their money. A necessary first step will be improved terms of reference that funding agencies can use to contract for higher quality CV-PES.

We do not recommend that terms of reference require CV-PES consultants to rigidly adhere to the National Atmospheric and Oceanic Administration (NOAA) guidelines (Arrow et al, 1993) or other such protocols. Agencies commissioning CV-PES have various information needs and different budget constraints. However, we believe that it is reasonable that terms of reference should include at least the following four elements.

First, clients should be involved in the selection of the information set(s) to be presented to respondents in CV scenarios. CV-PES consultants should provide clients with alternative information sets and discuss the pros and cons of each before the CV-PES is launched. Clients should expect that the CV-PES consultant will use photographs, figures, tables, and perhaps video clips to communicate information to respondents, and should ask to review such information before the CVS is launched.

Second, the terms of reference for CV-PES should require researchers to demonstrate that they have considered:

- alternative means to reduce hypothetical bias;
- alternative payment vehicles for collecting monies from service users; and
- the choice of respondent within a household (i.e., who to interview).

The terms of reference should request CV-PES consultants to discuss the pros and cons of different options for these three design issues, and to justify their recommendations. Admittedly it will be difficult for many clients with little experience with the stated preference techniques to effectively review such decisions, but advisory panels or outside consultants may be engaged to provide suggestions for improvements or an alternative perspective.

Third, the terms of reference should specify that CV-PES consultants provide estimates of the potential revenues that could be obtained from downstream water service users if different prices, charges were implemented. The terms of reference should also require CV-PES consultants to be specific about the options they propose for adjusting tariff structures. Decision makers typically want to understand their options, and CV consultants should be asked to tie their studies and recommendations more closely to the actual decisions that need to be made in the design of pricing and tariff structures.

In addition to improved terms of reference, it would also be helpful for agencies involved in PES programs and that commission CV-PES to have easy access to information on what others are doing through a Web-based clearinghouse. It would be relatively simple and inexpensive for an international organization, NGO, or one of the environmental economics networks (for example LACEEP, EEPSEA, SANDEE), to
post both studies and survey instruments so that both clients and researchers could easily see how what others have done and how they have tackled some of the challenges discussed in this paper. An old joke in economics concerns a drunk who searches for his lost house keys under a light post, not because that is where he lost them, but because that is where the light is. The use of stated preference techniques in the design of PES programs often has a strong hint of this. Our impression is that the use of the CVS is often driven by the perceived ease with which it can be applied in the PES context, rather than by its being the best tool for the job.

This is best illustrated by one of the CV-PES contracted by CONAFOR in Mexico. The consultant presents data that show that urban residential water users account for only about 1 percent of total water use in the study area. Yet the only valuation exercise the consultant carried out was a CV-PES of these consumers. Properly designed, carefully conducted CV-PES can in many cases provide useful insights for the design of PES programs, but they are certainly not required in all instances.
References


23


CV-PES Studies Included in our Review


Cisneros, J, F. Alpízar, and R. Madrigal. 2007. “Valoración económica de los beneficios de la protección del recurso hídrico bajo un esquema de pago por servicios ecosistémicos en Copán Ruinas, Honduras.” SEBSA-CATIE

Contreras-Benítez, H.A. 2007. “Estudio de valoración y demanda de servicios ambientales hidrológicos en el área promisoria de servicios ambientales ‘Sian Ka’an-Cancún’.” Guadalajara: CONAFOR.


González-Ortiz, M.A. 2007. “Estudio de valoración y demanda de servicios ambientales en el área promisoria de servicios ambientales ‘Copalita-Huatulco’.” Guadalajara: CONAFOR.


