ISSUES IN THE VALUATION OF ENVIRONMENTAL RESOURCES: A PERSPECTIVE FROM THE PSYCHOLOGY OF DECISION MAKING

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EXECUTIVE SUMMARY

In contrast to previous historical periods in which the U.S. Army Corps of Engineers was able to operate with considerable autonomy in selecting, developing and managing water projects, it now faces an environment in which decisions must be made in consultation with state and local officials, and even with various interest groups. This marked change has arisen through many developments, but principally because of the increased requirement for cost sharing with state and local governments for Corps project and the increased legal status of various effects of Corps projects under recent statutes and associated regulations such as the Clean Water Act of 1991. In this new environment, the preferences and beliefs of the public concerning environmental resources have been transformed from essentially public relations matters to potentially dramatic influences on the policies and actions available to the Corps. Thus, an important objective for the Corps would seem to be to devise a mechanism for incorporating these influences in a way that makes them as predictable and as manageable as possible.

Unfortunately, the results of over three decades of research on how people form and express their preferences suggests that measuring them may be a challenging undertaking. Most people apparently do not have well-formed values for each of the vast array of environmental resources that could potentially confront them. Rather, people seldom think about the value of an environmental commodity until they are asked about it. Based on the results of hundreds of empirical studies from the resource economics and decision making disciplines, it does seem extremely likely that the average citizen’s value for restoring or maintaining a given environmental resource is more than zero. However, because these preferences are usually quite vague and are given specific form only in response to a question, little more can be said with any confidence about the precise magnitude of the monetary values that attach to them. Efforts to attach precise numbers to these preferences have been plagued by unwanted methodological influences that lead mostly to the conclusion that the answer depends heavily on how the question is asked. It is yet possible that people may be able to reliably rank in order a set of environmental resources that are presented to them. This is an empirical question that deserves further study. But in the end, the overwhelming verdict of the evidence is that a “true” parameter value that represents the public’s monetary value for restoring or maintaining a given environmental resource probably does not exist in any practical sense.

The most useful position that the Corps can take is to assume that the value of a resource is constructed through some social interaction or negotiation, and is therefore inherently influenced by the particulars of the process of construction. Indeed, many stakeholders may even judge the value of a proposed action based in part on their perceptions of the decision-making process. Therefore, the Corps should place a high priority on learning how to design and conduct the process of value construction in ways that produce acceptable and implementable value representations. The Gregory, Lichtenstein and Slovic (1993) multiattribute utility approach is a significant step in this direction, where relevant constituencies are explicitly and intentionally involved in the process of value construction, rather than being passive participants for whom only a single isolated feature such as willingness-to-pay is to be measured. Regardless of the specific approach taken, it behooves the Corps to take control of its destiny by developing expertise in such procedures, lest these stakeholder interactions become an unpredictable and uncontrollable tail wagging the water project dog.

INTRODUCTION

In contrast to previous historical periods in which the U.S. Army Corps of Engineers was able to operate with considerable autonomy in selecting, developing and managing water projects, it now faces an environment in which decisions must be made in consultation with state and local officials, and even with various interest groups. This marked change has arisen through many developments, but principally because of the increased requirement for cost sharing with state and local governments for Corps project and the increased legal status of various effects of Corps projects under recent statutes and associated regulations such as the Clean Water Act of 1991. In this new environment, the preferences and beliefs of the public concerning environmental resources have been transformed from essentially public relations matters to potentially dramatic influences on the policies and actions available to the Corps. Thus, an important objective for the Corps would seem to be to devise a mechanism for incorporating these influences in a way that makes them as predictable and as manageable as possible.

If the preferences and beliefs of these other groups were similar to those within the Corps, then incorporating them into the decision making process would not be a huge challenge. However, there is much evidence that the public often views things quite differently than scientists or technical experts (e.g., Slovic, Fischhoff & Lichtenstein, 1982). For example, even if
both groups are presented with the same technical data, citizens may interpret it differently (expert - "the probability of this risk is effectively 0"; citizen - "Oh my god, I didn't even know that could happen - it sounds horrible"), or even reject the validity or relevance of the data ("I don't understand where these numbers came from" or "those engineers don't speak for me"). More significantly, even if a common fact base can be achieved, the public often has legitimately different preferences for alternative states of the environment than technical experts (e.g., NIMBY). Thus, without further investigation it seems unlikely that the Corps can anticipate the beliefs and preferences of stakeholder groups by extrapolating from its own.

The goal of this paper is to characterize, from a psychological perspective, what is currently known about how people arrive at their valuations for environmental resources. First, the findings of over four decades of research on the psychology of preferences will be briefly reviewed to place the analysis of preferences for environmental resources in context. Second, conceptual issues surrounding how people think about environmental resources are reviewed and discussed. Finally, the state of the art in measurement techniques for the value of environmental resources is assessed from a psychological perspective.

The Psychology of Preferences

It surprises many who are not economists or psychologists to learn that the two disciplines have had relatively little interaction despite shared interests in the prediction and interpretation of choices. While interaction on these issues may seem potentially profitable in situations where markets are present, the need is even greater where markets are absent, for example, when public goods such as environmental resources are under study. Interactions between psychology and economics have been increasing in recent years (see for example, Hogarth and Reder, 1986), although the seeds of their development were planted over four decades ago. In many ways, the challenges posed by the valuation of environmental resources brings into joint focus several different streams of thought, each of which has been decades in the making. The following brief stroll through history is not a casual one, however, as many of the issues surrounding the psychology of environmental resource valuation are not new, and can be placed squarely within long-term and inexorable trends in the study of preferences.

A Brief History

The two principle cornerstones of future interaction between economists and psychologists were laid in the midst of an explosion of work on mathematical models of choice that followed the seminal work on utility theory of von Neumann and Morgenstern (1947). In 1954, Ward Edwards first introduced psychologists to these formal models of rational choice, arguing that they could be used as normative benchmarks against which to evaluate judgment and decision making behavior. This insight led to the development of the paradigm that was to form the core of later work on the psychology of decision making, in which the manner and conditions under which actual decision behavior deviates from a normative benchmark is the principle window into underlying cognitive mechanisms. Concurrently, Herbert Simon (1955) was challenging economists to question the basic behavioral assumptions of their mathematical models of rational behavior. He argued that humans lacked the information processing and computational capacity required to achieve utility maximization, and, therefore, that models of rational choice could not, even in principle, describe actual choice behavior ("what a man cannot do he will not do"). Consequently, humans are bounded in their rationality, using simplified and approximate methods ("heuristics") to achieve satisfactory solutions to their problems, rather than aspiring to the optimality assumed by economic models. These two distinct, though related, lines of reasoning were to be principle factors in the development of a new and important sub-discipline within psychology, behavioral decision research, and ultimately to a recognition by economists of the serious questions posed by Simon’s challenge to the descriptive validity of economic models of rational behavior.

Early behavioral decision research in the 1960s and 1970s focused on identifying tasks and circumstances where systematically irrational behavior occurred, as measured against the definitio...
TABLE 1
SOME CONCLUSIONS FROM BEHAVIORAL DECISION RESEARCH

- People usually do not solve complex problems in their original form -- they either adopt a simplified version of the problem and then solve it or use heuristic strategies that ignore parts of the problem.

- People often change their preference ordering for the same options when the description of the options or the procedure for responding are changed.

- People tend to overestimate how much they know about a problem (e.g., excessive confidence in point estimates of unknown parameters).

- People tend to accept information in the form it is presented (e.g., to assume information in a questionnaire is correct).

- People are equally confident in their answer to a partial version of a decision problem and their answer to a complete version.

- People are relatively insensitive to the reliability of information (e.g., a small sample often has the same effect on beliefs as a larger sample)

- People base their perceptions of decision risk on many factors besides the expectation and variance of possible decision outcomes.

- People adapt their decision approach to the situation (i.e., no one uses the same decision strategy in every situation)

Yet, by the end of the 1970s, economists had paid relatively little attention to the challenge to their models that the results of behavioral decision research represented. Three events occurring in 1979 signaled a coming change in this view (although many other factors also contributed). First, two respected economists, David Grether and Charles Plott, published a paper in which they replicated Lichtenstein and Slovic’s preference reversal results under severe conditions imposed by some thirteen different economics-based criticisms. This article by economists, which was published in the premier journal of the discipline, the American Economic Review, was widely discussed in the field. Second was the publication in another premier economics journal, Econometrica, of an important theoretical paper by two behavioral decision researchers, Daniel Kahneman and Amos Tversky, that presented a formal descriptive model of choice behavior as an alternative to the traditional rational choice model. A decade of efforts by economists and decision researchers alike to generalize the traditional model to accommodate behavioral biases followed. Finally, and perhaps most symbolically, Herbert Simon was awarded the 1979 Nobel prize in economics, which in part represented a recognition by economists of the serious questions posed by his challenge to the descriptive validity of rational choice models. Subsequently, efforts by economists to give greater attention to issues of empirical validity as well as to build bridges to psychological research have become more frequent, as exemplified by the 1986 economics-psychology conference at the University of Chicago, whose participants included six then and eventual Nobel prize winners, as well as numerous other luminaries from both the psychology and economics fields (Hogarth & Reder, 1986). While it is hardly the case that economists are abandoning the traditional models in droves, the foundations of rational choice models have become legitimate topics for critical debate.

Constructive Preferences

If an implication of behavioral decision research is that people are not always rational (at least in the way economists define rationality), then two obvious questions are: “Why aren’t they?” and “What do they do instead?” The simplest answer to the first question is Simon’s, that these difficulties are the inevitable consequence of fundamental limits on human cognitive abilities to encode, process, and recall information. That is, the barrage of problems, decisions, information, and other stimuli that the complexity of the real world compels upon us overwhelms our processing capacity. As James March (1978) states in his discussion of human preferences, “Human beings have unstable, inconsistent, incompletely evoked, and imprecise goals at least in part because human abilities limit preference orderliness” (p. 598). What someone cannot do they will not do.

Does this mean that people are fundamentally random and unpredictable? Does this pessimistic assessment of human decision making abilities preclude hope of discovering useful regularities in preferences? Clearly not. Indeed, all of the psychological research referred to above relies on the assumption that people are quite purposeful in their activities, and are even “rational” in the more familiar sense that they attempt to choose means that are likely to achieve their desired ends. What is most interesting about the various errors and biases revealed in the literature is precisely the fact that they are systematic, and therefore explainable, and in some fortunate cases, even predictable. Further, many of these biases are modest in size or occur within a limited range of situations. For example, virtually all studies of preference reversal have used decision alternatives that are quite close in value, so that the reversals demonstrated usually do not mean that people are oscillating between wild extremes. Common sense usually rescues people from such outcomes. People probably do
intuitively attempt to do something like utility maximization, but achieve it to only a fairly gross and common-sensical degree.

Where does this leave us as a practical matter in our quest to understand preferences? Students of preferences differ considerably in the core assumptions they make about the nature of the values that are available for elicitation. At one extreme is what Fischhoff (1991) calls the "philosophy of articulated values," which assumes that people have well-formed preferences about any relevant topic, and can directly retrieve an appropriate response to an elicitation question. Adopting this view leads to a focus on finding the correct methodology for eliciting values, as has been the emphasis in the CV literature (e.g., Mitchell & Carson, 1989). At the other extreme is the "philosophy of basic values," which assumes that people have well-defined values only for very familiar topics. Under this presumption, people must derive specific valuations for less familiar topics through some inferential process. This view leads to the conclusion that in many if not most cases, people must construct their responses at the time they are asked an elicitation question, rather than retrieve a previously formed value (Slovic, Griffin & Tversky, 1990). A key implication of a more constructive view of preferences is that elicited values are heavily influenced by the particular features of the elicitation process.

Thus, the constructive perspective provides a cognitive mechanism that explains the sensitivity of expressed values to methodological factors that has been the hallmark of much decision research. Different combinations of these factors can emphasize different aspects of the problem and thereby evoke different processes for arriving at a decision. In this way, characteristics of the decision problem at least partially determine the preferences and beliefs we observe. Fischhoff, Slovic, and Lichtenstein (1980) argue that "expressed values seem to be highly labile" (p. 137). That is, "subtle aspects of how problems are posed, questions are phrased, and responses are elicited can have substantial impact on judgments that supposedly express people's true values" (p. 118). Further, the idea of constructive preferences goes beyond a mere denial that observed preferences result from retrieving the appropriate value from a mental master list in memory. It also means that preferences are not necessarily generated by some consistent and invariant algorithm, such as an expected utility calculation (Tversky, Sattath & Slovic, 1988). It appears that decision makers have a repertoire of methods for identifying their preferences and developing their beliefs. These multiple methods or strategies result from both experience and training (see Payne, Bettman & Johnson, 1992).

The Psychology of Environmental Resource Valuation

Most people do not spend a lot of time thinking about the environment, although they do so occasionally. Even fewer spend their leisure time pondering the monetary value of a potential change in the environment. It is probable that, like most things, people think about the environment mostly in response to a news account, tales of a picturesque vacation in an unspoiled location, or some other unsolicited stimulus. Those environmental resources heard about through the media are most often far away and not in a person's direct experience (e.g., Persian Gulf, Brazilian rain forest, in another state). Also, since no action is required by these occasional episodes, people spend little time considering commitment to a course of action. The infrequent times that people are engaged more intensely usually occur when some resource very near their residence is damaged in some way or threatened by proposed development. In this case, they may gain a rich set of details about a specific site or type of problem.

If this haphazard type of experience constitutes a good portion of a person's exposure to environmental resources, what type of preferences will be developed? The brief and shallow brushes with the subject matter are not a promising basis for the development of deep and detailed beliefs and preferences about the environment. An intense experience with a given resource may engender strong feelings, but not be very representative of other types of resources or locations. In addition to this information, people no doubt draw also on basic values derived from their childhood, personal experiences, or religious and philosophical beliefs. These sources may paradoxically give:

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**TABLE 2**

**CONDITIONS FAVORABLE TO WELL-ARTICULATED VALUES**

(adapted from Fischhoff, 1991)

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiar topic</td>
</tr>
<tr>
<td>Personally important topic</td>
</tr>
<tr>
<td>Information about topic is available and well-understood</td>
</tr>
<tr>
<td>Uncontroversial topic</td>
</tr>
<tr>
<td>Outcomes are few in number</td>
</tr>
<tr>
<td>Outcomes are easy to compare or combine</td>
</tr>
<tr>
<td>Outcomes will be directly experienced</td>
</tr>
<tr>
<td>Little uncertainty about outcomes of actions</td>
</tr>
<tr>
<td>Respondent's role in topic is well defined and straightforward</td>
</tr>
<tr>
<td>Topic considered in isolation from others</td>
</tr>
<tr>
<td>Information presented in a familiar format</td>
</tr>
</tbody>
</table>

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(35)
rise to deeply held but vague preferences. These individual shallow experiences may simply add to the person’s overall perceptions about the environment, rather than contributing to the development of a more differentiated view. Thus, many people may develop vague, non-specific, but paradoxically deeply held preferences. Such preferences may be many things, but are probably not well-articulated.

When people are asked to state their value for an environmental resource, how do they go about responding? Answering such a question is a daunting task, characterized by a lack of well formed preferences, feelings of uncertainty about the future outcomes of proposed policies, simplistic mental models of environmental functioning that extrapolate poorly to a real situation, and doubts about the credibility of information from scientific, business, or government sources. But if someone is asked a number, they will generally oblige with one, finding inventive and sometimes surprising mechanisms for answering. Schkade & Payne (1994) asked respondents to a contingent valuation survey to think aloud as they formulated their WTP. A series of verbatim excerpts are reproduced in Appendix 1. The dominant theme that characterized the considerable variety in considerations that various respondents used was a struggle to redefine the problem as a more familiar one that they knew how to answer. If we measure a task with these conditions against the list of criteria in Table 2, it is a situation almost certain to engender constructive preferences. Alternatively, since people have, at best, a vague understanding of both the scientific functioning of environment and their preferences for it, they may even judge proposed policies based on their perception of the process by which it is generated (e.g., “was my group represented?”), rather than based on the substance. The outcomes of such policies are off in the murky future, whereas the process is current and more easily observed.

In many ways, asking someone about their value for an environmental resource has much in common with the preference tasks that behavioral decision researchers have studied for years. Questions are initiated by a researcher or consultant, rather than by the respondent, key information about the problem is provided by the researcher, the respondent is limited in their response by the format of the task, etc. Several authors have suggested that the construction of preferences may be common in CV studies (Fischhoff & Furby, 1988; Gregory, Lichtenstein & Slovic, 1993). Mitchell and Carson (1989) do acknowledge that “people tend not to have previously well-defined values for many of the goods valued in CV studies” (p. 249). However, they go on to argue that improvements in method can overcome the potential biases resulting from this lack of well-defined values.

A constructive view of decision making suggests at least three sources of such task and context effects. First, decisions are often complex. CV tasks, in particular, can involve environmental resources, payment vehicles, etc., that have many diverse dimensions. In addition, as noted by Gregory et al. (1993), environmental resources are not normally thought of in quantitative (dollar) terms. Because decision makers typically simplify a complex problem such as this in many different ways, failures of invariance may be related to task complexity. Examples of the ways decision makers have been found to simplify problems include adopting a strategy of screening out decidedly inferior options from a large set of possibilities or emphasizing those elements that are most compatible with the response mode (see Payne, Bettman & Johnson, 1992).

Second, decisions often involve conflicting values, where a decision must be made on how much to value one attribute of a problem, relative to another. This is the task presented to respondents in a CV study. In trying to deal with such conflicts, people often adopt different strategies in different situations. This strategy switching can cause variance across situations (e.g., across response modes).

Third, even if we know what we will get upon choosing a particular option, we may not know how we will feel about it (Kahneman & Snell, 1990). For example, we may know that a prestigious Ivy League school offers a competitive and high-pressure graduate program, but we might be quite unsure about how well we would like such an environment. Hence, invariance may fail because of uncertainty in our underlying values, even when we know what we will receive. We suspect that the typical CV task is characterized by much uncertainty in values.

An obvious hypothesis, for which there is some support, is that the more ambiguity in one’s preferences, perhaps due to a lack of familiarity with the objects in question, the more one’s expressed preferences will be subject to procedural and descriptive influences. For example, Hoch and Ha (1986) and Levin and Gaeth (1988) found that in the context of product evaluations, the more ambiguous a consumer’s experience with a product, the more their evaluations are susceptible to how the product is described. Recently, Cox and Grether (1992) have shown that repeated experience and proper incentives can reduce the frequency of preference reversals. Unfortunately, CV is often of greatest interest when valuing novel or unfamiliar resources (especially for non-use values). In such a case, the respondent is likely to be influenced by whatever cues are available, whether from their own limited experience or from the questionnaire itself (Harris, Driver & McLaughlin, 1989). McClelland et al. (1992) also emphasize that non-use values must be constructed by respondents, rather than be retrieved from a list of existing values.

Thus, it seems particularly likely that CV will evoke constructed rather than well-articulated preferences. If responses to CV questions are indeed constructed, we would expect them to be highly sensitive to features of the task and context that could influence the process of construction. That is, it may be inevitable that CV values for unfamiliar goods will be greatly affected by the context of elicitation. To summarize, the literature on the psychology of preferences suggests that the susceptibility of CV results to various influences is just one example among many of how expressed preferences are sensitive to task and context factors, and often in ways not easily
reconciled with the assumptions of the economic model that underlies contingent valuation.

The State of the Art in Measurement: A Psychological Perspective on Contingent Valuation

Researchers have worked for many years to develop methods to measure the values of environmental resources for which there are no relevant markets. In particular, researchers have been concerned with the development of methods that could measure "nonuse" values such as an existence value—the value placed on simply knowing that a resource exists independent of any current or possible future use value (Krutilla, 1967). Some experts believe that CV is the only method that can measure both use value and nonuse or "passive-use" value. The CV method uses surveys to create hypothetical markets for an environmental resource. A typical WTP question in a CV survey aims to elicit from the respondent the "change in his income, coupled with the change in the level of the public good, leaves his utility level unchanged" (Mitchell and Carson, 1989). As an example of such a question, consider the following scenario: Suppose respondents are told that 200,000 ducks, geese, and other migratory waterfowl were dying each year from contact with oil, gas, and other by-products of production and drilling operations in a distant region of the country. A CV question might be "What is the most your household would agree to pay in higher prices for oil and gas to prevent these 200,000 birds from dying each year from this issue?" Thus, respondents are asked to determine the reduction in their annual disposable income (the stated WTP amount) that would leave them indifferent between the current level of an environmental good (the annual loss of a specified number of waterfowl) and the hypothetical improvement in the supply of an environmental good (protection of a specified number of waterfowl). If respondents answer as assumed, the resulting values correspond to the economic value of the resource as measured by the Hicksian compensating surplus (Mitchell and Carson, 1989).

Kahneman (1986) notes that the basic presumption underlying contingent valuation, whatever the question format, is that "there exists a set of coherent preferences for goods, including non-market goods such as clean air and nice views, that these preferences will be revealed by a proper market; and that these preferences can be recovered by CV" (p.192). Studies have shown that CV results can be reliable in a test-retest sense and, in the case of use values for familiar goods, generally correspond to the values obtained by other methods (see Loomis, 1990, for an example of a reliability study and Cummings & Harrison, 1992, for a general review of literature on CV). A growing body of research, however, suggests that the presumption of a coherent set of preferences is questionable, particularly in the case of non-use values for unfamiliar natural resources. More specifically, an increasing body of research shows that contingent valuation responses are sensitive to methodological factors that some argue are theoretically irrelevant to the underlying value of the resource (e.g., Cummings & Harrison, 1992; Irwin et al., 1993; McClelland et al., 1992; Peterson, Driver & Gregory, 1988), as well as sometimes relatively insensitive to certain factors that might reasonably be expected to influence WTP responses (e.g., Boyle, et al., 1994; Kahneman & Knetsch, 1992).

Of course, there are likely to be disagreements about exactly which effects of task (e.g., response mode) and context (e.g., embedding) are theoretically irrelevant or relevant and which levels of sensitivity to such variables are reasonable to expect in various situations (e.g., see Milgrom, 1993; Peterson, Driver & Gregory, 1988). Nonetheless, the findings of task and context effects have led many researchers concerned with the application of contingent valuation methods to speculate about what may be going through respondents' minds when answering WTP questions. Respondents may indeed be trading off an increase in the level of an environmental resource against a decrease in wealth, as is generally assumed (Mitchell & Carson, 1989). However, researchers have suggested that other considerations may be operating as well in determining a CV response. These other considerations affect the interpretation given to the CV response. For instance, in addition to (or in place of) the value of the resource, respondents might be thinking of a contribution to a charity (Diamond & Hausman, 1993), the "warm glow of giving" or a feeling of moral satisfaction (Andreoni, 1990; Kahneman & Knetsch, 1992), or of some aspect of the payment vehicle (Mitchell & Carson, 1989) when coming up with their WTP response. Other possibilities include a symbolic response to a larger set of environmental issues (Mitchell & Carson, 1989), "doing your fair share" (Diamond & Hausman, 1993), and other strategic behaviors (Cummings & Harrison, 1992; Diamond & Hausman, 1993). More generally, it has been suggested that the respondent in a CV study may be responding to something quite different from the specific good for which the researcher hopes to obtain a willingness-to-pay. The next section discusses these and other concerns that have been raised about the validity of CV responses.

Issues Concerning the Validity of the CV Method

Question Format. Researchers increasingly are advocating framing the CV question like a vote on a referendum (such as a school bond issue) in which respondents are told how much each would have to pay if a measure dealing with a specified environmental resource were passed and then are asked for a simple "yes" or "no" vote. For example, a CV referendum question might take the form, "Would you be willing to be taxed Y dollars to cover the cost of avoiding or repairing environmental damage X?" Note that this form of CV question is essentially a choice response in which the respondents simply decide whether they prefer the option defined by the current levels of the environmental resource and wealth or the option defined by the proposed improvement in the environmental resource (+X) and decrease in wealth by the amount Y.

Both theoretical and practical advantages are cited for the referendum question format. One potential advantage of this
form of CV question over the open-ended format is that choice is generally a cognitively easier task than the value-matching task required by the open-ended format (Tversky, Sattath, and Slovic, 1988, Schkade and Johnson, 1989; Payne, Bettman, and Johnson, 1992). Additionally, people are believed to have more experience with real referenda regarding the provision of public goods than with open-ended WTP questions. Also, since the results of actual referenda are taken seriously as valid preference measures, the results of hypothetical referenda in CV studies gain credibility. Recently, the NOAA panel on using CV to determine nonuse values strongly recommended the referendum form of CV question (U.S. Department of Commerce, 1993).

The referendum format is not without disadvantages, however. Recent research has shown that respondents have a tendency to answer favorably even at very high bids (Kanninen, 1993, Boyle et al., forthcoming). Boyle et al. cite an example of this so-called “yee-saying” bias where more than 30 percent of respondents stated they would agree to pay $1,000 a year to prevent environmental damages from oil spills. This bias produces a thick tail in the empirical distribution of responses, which substantially increases the location and variability of the mean WTP estimates. Other difficulties with this question format include sensitivity to the list of bid amounts that are offered to respondents (see Loomis, 1989; Boyle et al., 1994; and McFadden & Leonard, 1993). Much remains to be seen concerning the reliability and validity of responses to CV referendum questions.

Willingness-to-pay versus willingness-to-accept. When an environmental resource has or will be altered, the theoretically appropriate measure concerns compensation, that is, the minimum payment people would be willing-to-accept (WTA) in return for the damage. Unfortunately, this type of question often results in absurdly large answers (“Since I’m not paying, I’ll ask for all I can get”). As a result, CV researchers have turned to WTP, because it produces a theoretical lower bound on WTA, and people are less likely to offer to pay huge amounts (that may be large proportions of their income, or even exceed it).

Unfortunately, WTP brings to mind all sorts of irrelevant issues, such as a person’s income (which is not necessarily a relevant bound on value), the appropriateness of the payment vehicle, the effectiveness of the proposed remedy, who should pay, and many others. The choice of WTP rather than WTA, implicitly acknowledges that people employ other considerations than those required by the economic model when answering such questions. Further, justifications for this choice also cite the “conservative” estimates that it provides. However, since we cannot validate either of these types of question, there is no way to tell whether the adjustment achieved by using WTP rather than WTA is too large or too small. At best, making this adjustment is an (barely) educated guess, and at worst it is a mere shot in the dark. For example, using the best available practice, the WTP for damage to Prince William sound estimated by the team of government experts (which included Mitchell, Carson, and Hanemann) was $2.9 billion. This is a remarkable number for a site that less than 1% of the population had ever heard of before the Exxon Valdez incident. It was meaningful only because one of the world’s ten largest corporations was involved, as it would completely bankrupt the vast majority of potential polluters. How conservative should these estimates be considered if they are even still too large to be practically actionable?

Inadequate responsiveness to the scope of the environmental insult. According to the recent NOAA panel report, perhaps the most important specific evidence on the reliability of the CV method relates to the “embedding phenomenon” (U.S. Department of Commerce, 1993). For instance, in one study, Kahneman (1986) found that the WTP for the cleanup of all lakes in Ontario was only slightly more than the WTP for cleaning up the lakes in just one region of Ontario. In a more recent study of this phenomenon, Boyle et al. (1994) found that the average WTP to take measures to prevent 2,000 migratory birds (not endangered species) from dying in oil-filled ponds was as great as that for preventing 20,000 or 200,000 birds from dying. As noted in the recent NOAA panel report, “Diminishing marginal WTP for additional protection could be expected to result in some drop. But a drop to zero, especially when the WTP for the first 2,000 birds is certainly not trivial, is hard to explain as the expression of a consistent, rational set of choices” (U.S. Department of Commerce, 1993). Thus, independent samples of respondents may not provide WTP amounts that vary as predicted by utility theory.

Why might WTP responses show an inadequate responsiveness to the scope of the environmental insult? Some have argued that the studies showing such an effect do not employ “best” CV practices. For example, the Boyle et al. (forthcoming) study has been criticized as using an open-ended WTP form of question rather than the referendum format. It has also been criticized because the respondents were told that 2,000 birds was much less than one percent of the total migratory bird population and that 200,000 birds was about two percent of the total. The argument is that respondents may have been led to evaluate the programs as being essentially the same. Although, as noted by the NOAA panel, if the percentage of the total were such a salient issue, it makes one wonder why the stated WTP amounts for the less than one percent scenario was so substantial (i.e., about $80 per household per year).

Another possible explanation for the embedding effect is that the relative insensitivity of expressed WTP amounts reflects “a warm glow of giving” (Andreoni, 1990) or the purchase of moral satisfaction (Kahneman and Knetsch, 1992) rather than a purchase of a specified improvement in a particular environmental resource at a stated price. A related idea is that there is a symbolic bias in the CV responses in which “respondents react to an amenity’s general symbolic meaning instead of to the specific levels of provision described... a propensity to respond to the symbol rather than to the substance” (Mitchell and Carson, 1989). These arguments are consistent with the basic values philosophy in which people can reliably determine that this is a good cause, but not a more
specific numerical value. Other possible motives that have been mentioned include "doing your fair share" (Diamond and Hausman, 1993) and the CV response as a symbolic response signaling a concern for a larger set of environmental issues (Mitchell and Carson, 1989). When Schkade and Payne (1994) asked respondents to "think aloud" while answering a CV question, they found that these and several other motivations were mentioned, few of which would be anticipated by economic theory (see Appendix 1). The recent NOAA panel report (U.S. Department of Commerce, 1993) concluded that respondents' answers to follow-ups to the CV referendum question should refer to the cost and/or value of the program. If they do not, this would be sufficient to judge the CV responses as "unreliable." Thus, it appears that in judging the responses to a CV survey one must be concerned not only with the values of the CV responses that are generated, but also with the reasoning behind those numbers.

Inadequate consideration of alternative expenditure possibilities. Generally, a concern has existed among researchers about the magnitude of CV responses, and especially whether one could simply add the individual estimates for various changes in quality and get a reliable total estimate. One possibility is that respondents did not adequately consider the number and range of possible environmental causes that they might value. Recently, Hoehn and Loomis (1993) have shown that substitution among resources can affect the magnitude of CV responses. More generally, people may not adequately consider the number and range of other possible uses of the amounts they are willing to pay for the particular environmental good in the CV scenario (Kemp and Maxwell, 1993; Smith, 1992). Some evidence in support of this concern was obtained in Schkade and Payne (1994). In that study, respondents were asked, after generating a CV response to a particular scenario, if they would be willing to support other important issues with a similar dollar amount. When confronted with this question about other causes, several respondents suddenly realized the far-reaching implications for their household budget of the their previous WTP response, and indicated that the amount they stated was really too large or that it should go for all similar issues.

This reaction is consistent with the idea that people often adopt a "minimal mental account" (i.e., a narrow definition of the problem) when making a decision, "often isolating the current problem from other choices that may be pending, as well as from future opportunities to make similar decisions" (Kahneman and Lovallo, 1993). Similarly, Randall and Hoehn (1992) have recently suggested that respondents have "tunnel vision" and conduct an incomplete search of the opportunity set, possibly leading to embedding effects. As a way of dealing with the narrow-definition problem, the NOAA panel has recommended that respondents be reminded "forcefully" of substitute commodities and other things on which respondents could spend their money directly prior to the main valuation question (U.S. Department of Commerce, 1993).

SUMMARY AND CONCLUSION

The results of over three decades of research on how people form and express their preferences suggests that measuring them may be a very challenging undertaking. Most people apparently do not have well-formed values for each of the vast array of environmental resources that could potentially confront them. Rather, people do not usually think about the value of an environmental commodity until they are asked about it. Based on the results of hundreds of empirical studies from the resource economics and decision making disciplines, it does seem extremely likely that the average citizen's value for restoring or maintaining a given environmental resource is more than zero. However, because these preferences are usually quite vague and are given specific form only in response to a question, little more can be said with any confidence about the precise magnitude of the monetary values that attach to them. Efforts to attach precise numbers to these preferences have been plagued by unwanted methodological influences that lead mostly to the conclusion that the answer depends heavily on how the question is asked. It is yet possible that people may be able to reliably rank in order a set of environmental resources that are presented to them. This is an empirical question that deserves further study. But in the end, the overwhelming verdict of the evidence is that a "true" parameter value that represents the public's monetary value for restoring or maintaining a given environmental resource probably does not exist in any practical sense. The quest for the "holy grail" of better measurement techniques is probably in vain.

The most useful position that the Corps can take is to assume that the value of a resource is constructed through some social interaction or negotiation, and is therefore inherently influenced by the particulars of the process of construction. Indeed, many stakeholders may even judge the value of a proposed action based in part on their perceptions of the decision making process. Therefore, the Corps should place a high priority on learning how to design and conduct the process of value construction in ways that produce acceptable and implementable value representations. The Gregori, Lichtenstein and Slovic (1993) multiattribute utility approach is a significant step in this direction, where relevant constituencies are explicitly and intentionally involved in the process of value construction, rather than being passive participants for whom only a single isolated feature such as willingness-to-pay is to be measured. Regardless of the specific approach taken, it behooves the Corps to take control of its destiny by developing expertise in such procedures, lest these stakeholder interactions become an unpredictable and uncontrollable tail wagging the water project dog.

1 As an indication of the vitality of this new subdiscipline, during the decade of the 1980's two leading behavioral decision researchers, Daniel Kahneman and Amos Tversky, were the second and fourth most cited authors in any area of psychology.
Many financial planners and accountants make their living just trying to get people to think about immediate and already realized budgetary issues.

In an actual CV study, extensive details about the situation, proposed remedy, payment vehicle, etc., would be provided.

REFERENCES


APPENDIX 1
EXCERPTS FROM THINK-ALOUD PROTOCOLS FOR A CV QUESTION
(from Schkade & Payne, 1994)

The number of migratory waterfowl killed was set at one of three levels: 2,000, 20,000, or 200,000 birds per year. After first answering several questions about their experiences with migratory waterfowl (e.g., hunting, bird watching), waste oil holding ponds and their effects on migratory waterfowl in the Central Flyway were described in considerable detail. Respondents were then asked the following WTP:

If the proposed regulations are approved, oil companies would pass on the costs of the wire net covers to consumers in the form of higher prices. Higher petroleum product prices would, in turn, increase the prices of most other things that you buy.

It is important to know how much protecting these migratory waterfowl is worth to you. Please think about:

* Your current household income
* Your current household expenses
* Other possible uses for your household income

Keeping these factors in mind, what is the most that your household would agree to pay each year in higher prices for wire-net covers to prevent about 2,000(20,000)(200,000) migratory waterfowl from dying each year in waste-oil holding ponds in the Central Flyway?

$________ per year

The most common consideration in our sample involves first acknowledging that something should be done and then trying to figure out how much an appropriate amount would be. For instance, 41% of the sample mentioned the idea that if everyone did their part, each household would not have to give all that much. Indeed, respondents who used this reasoning did give significantly lower WTPs. This result is consistent with a recent finding by Kahneman that respondents give lower WTP responses when told that the size of the relevant population is large. Some respondents also wanted to be sure that their small payment would be effective in solving the problem, which would depend on many other people doing the same. These quotes illustrate this line of reasoning:

"Um, this is very difficult to determine. You'd have to consider how many millions of people in the country would also be contributing to this. . . . as far as how much per family this would break down to and what is the cost of putting this netting over all the different ponds, and how many ponds there are, so that would be the cost. I mean, if it . . . comes out to be a couple of dollars per household, then it seems reasonable. If it comes out to something more than that, um, it seems a little high. . . . So I'm going to say . . . $5." [respondent #24]

"I'd probably be willing to donate about $10 per year and I guess if the majority of the U.S. did that, you'd uh . . . go a long way towards deferring the cost of the wire net covers." [respondent #65]

"Well, if everybody was required to pay this, I can't see why everybody couldn't put up at least 25 bucks in a year. That would more than cover it." [respondent #78]

A related strategy, which accounted for 23% of the sample, involved first accepting as inevitable that the consumer would pay higher prices, followed by an attempt to estimate how much this would amount to for them. Consider these responses:

"Um, I figured like just about, uh well, 40 or 50% of the things that uh every individual uses in their everyday life is oil or petroleum-based. . . . If say, if they even added like a nickel to the price of a gallon of gas over the long run that's roughly about $80 to $100 there over a year's length of time and then, in my case, it would probably be a little bit more because I'm traveling about 15, 20 miles a day one way to work, so we're talking 40 miles a day, and uh, I mean I have a pretty efficient automobile, but we're talking gobs and gobs of gallons of gas each month and each year, so I think $100 is a pretty conservative estimate." [respondent #28]

". . . Right now I pay $1 a gallon. Say they tacked on, uh, 10 cents. Uh I would be willing to pay, uh, I'm doing this on an average of what I spend a day on gas. I spend on an average of about $5 a day and it's about $1 a gallon and
averaging that, which I figured if I paid an extra 10 cents a gallon, which would come out to be $100 a year.” [respondent #80]

These excerpts are fairly typical of respondents who attempted to estimate what their increased cost would be in that: (1) the main focus is on gasoline (despite the passing reference to other products in the first excerpt); and (2) the calculations or estimates are sometimes questionable. There was no relationship between this consideration and WTP.

While the first two considerations involve some form of calculation, based on either the proposed solution or the payment vehicle, another common strategy involved viewing the WTP amount as a contribution to a charity. Because the commodities that are judged in CV research are often unfamiliar, it seems natural for respondents to look for something they are familiar with (e.g., a charity) to serve as a point of reference for establishing their response. Respondents who used this strategy, which accounted for 17% of the sample, often referred to specific other causes or amounts given to these causes, and on average gave significantly lower WTPs. These excerpts illustrate this type of response:

"I uh was just thinking about how I make a donation to like maybe the Fraternal Order of Police or to uh MADD or different types of, of things that are for the good of our society... [$15].” [respondent #83]

"Now for that I'm going to put maybe $10 per year because... that's what we normally contribute, my husband and I, to the uh, presidential thing... when they fill out your income tax.” [respondent #15]

"Well, I usually give a small percentage of my income to charities, and uh the church and the biggest of my income goes to the church. To charities I usually give no more than $20; so that's how I arrived at my $20 figure.” [respondent #38]

A substantial group, 23% of the sample, suggested a desire to signal their concern for larger or more inclusive issues, such as preserving the environment or leaving the planet in good condition for their progeny. This type of reasoning is consistent with the symbolic bias arguments of Mitchell and Carson (1989), who state, "Symbolic bias occurs when respondents react to an amenity's general symbolic meaning instead of to the specific levels of provision described... a propensity to respond to the symbol rather than to the substance” (p. 249). Similarly, the moral satisfaction arguments of Kahneman and Knetsch (1992) would suggest that respondents might be thinking of a larger or more inclusive resource than just migratory waterfowl in the Central Flyway. Respondents mentioning this consideration gave significantly higher WTP responses. Here are two examples:

"... somebody has to watch out for the things like that, and along with economical problems and everything, waste and all that, I think $500 is not very much to spend each year in taking care of our world...” [respondent #79]

"... I'm thinking like, um, I would pay $50, maybe even $100, $50-100 a year would sound about right to me. I think it's a little bit high, but I kind of think it's important because, um I feel it's important for us to preserve the wildlife, and not, not only ducks and geese, but other animals too. I feel like if we just continue to let things go, we're going to be paying money for other things that may not be quite as important, and when you're killing off all of these animals, and I don't think that's good. I'd like my children to see these animals one day... when I have them.” [respondent #2]

A surprisingly large segment, 20% of the sample, said that they just made up a number or guessed at an answer. This result may reflect the unusual and challenging task faced by respondents in a contingent valuation question. There was no significant relationship between this consideration and WTP. Here are some examples:

"Um, I have no idea. I guess $500 sounds like a nice round number.” [respondent #104]

"I don't really know... this is confusing to me... I would be willing to pay higher [prices], but I really don't know how much... OK. I just put down something -- I guessed. [$50]” [respondent #99]

"Um, let's see what would I, I would probably, it's hard to say how much I would pay. I don't see how much it would really... I don't know how much it would really cost... I'd probably say about $100 a year... um, just out of the blue. There was no thought really put into it, I think the $100 figure just popped into my head and that's why I put it down, really.” [respondent #53]

"Well... it was more or less, you know, an off the top of my head answer, I guess. But it sounded like a fairly significant amount for, you know, one person out of the millions of people living in this country... so I would say that would be a safe answer [$100].” [respondent #82]
Notable by their scarcity were statements in the protocols indicating that respondents considered how much they valued the birds or how much the birds were worth. Similarly, there were few instances of reasoning about the economic tradeoffs necessary to make a dollar payment. However, while few respondents directly verbalized the idea that they were trading off birds against money, 31% did mention their household income and expenses. There was no significant relationship between the use of this consideration and WTP. Here are three protocols that seemed to reflect a considered tradeoff between a limited budget and a general concern for the environment:

"I'm not real happy about an increase in . . . . outlay of money since things are pretty tight. But this is important, . . . . and we do need to protect the environment as well as . . . . keeping things . . . . clean and possibly protecting those birds. Um I would say maybe about, um, I would not like . . . . spend more than an additional, say $1,000 per year. I know that's not a lot but that's about as much as I think I can afford" [respondent #11]

"Uh, well . . . . both my wife and I are retired, which means that the ability of us to support certain things financially is limited. And this would be, would have to be one of the lower . . . . priorities in our budget, even though I would like it to be . . . . higher, if I had the ability to pay . . . . [$25]" [respondent #6]

"Well, gee, I wish I could say a lot. However, I'm just come off a 6-month unemployment spree, still trying to make it back on my feet and every time I want to commit to some type of wildlife help program, I never find myself able to give very much. So current household income is not . . . . very much, household expenses are extreme, because I'm still trying to catch up. Let's see . . . . what, $5 per month, 5 X 12, $60 per year." [respondent #91]