PREDICTING REACTIONS TO ENVIRONMENTAL CHANGE

George Loewenstein and Shane Frederick

All decisions require us to evaluate counterfactuals—situations other than the one we are in. Decision makers routinely ask themselves questions such as, How would I feel eating that dish, driving around in that car, married to that person, attending that school, or vacationing in that country? Questions of this type require predictions of what Daniel Kahneman calls “experience utility” (Kahneman and Snell, 1990, 1992). The accuracy of such predictions is critical for effective decision making. If we underestimate how good it will feel driving around in a nice car, we may fail to purchase that car when we should. If we overestimate how good it will feel, we may later regret purchasing it.

The accuracy of predicted experience utility (PEU) is also relevant for environmental decisions, such as whether to support environmental legislation that would raise taxes or prices, to participate in recycling programs, or to donate time or money to environmental causes. Like all other decisions, these require predictions of experience utility—for example, assessments of how bad it would be if the rain forests disappeared or if lakes became too acidified to support fish or how good it would be if air quality improved or if the California condor recovered. If such predictions

We thank Jon Baron, Baruch Fischhoff, Jack Knetsch, and the editors for helpful comments. This research was funded by the Center for the Integrated Study of the Human Dimensions of Global Change at Carnegie Mellon University.
systematically overestimate or underestimate the impact of environmental
problems on experience utility, people may invest too much or too little in
the environment. Furthermore, if people underestimate the effects of some
problems while exaggerating the effects of others, they may misallocate
scarce resources.

Appropriate public policy decisions also depend on the accuracy of
PEU. In recent decades, there has been a trend toward basing public pol-
icy on private citizens’ values. The best known of these efforts is Oregon’s
attempts to use public perceptions of the severity of different health out-
comes to make rationing decisions for scarce health care dollars. In the
environmental arena, new techniques such as contingent valuation have
been developed to measure the public value of different environmental
amenities. These values are used for allocating government spending, for
making various types of siting and development decisions, and for guid-
ance in litigation involving environmental degradation, such as oil or
chemical spills.

Such survey-based measures of public values inevitably require predic-
tions of experience utility; people have to imagine what it would be like to
be in a different health condition or to experience an environmental state
different from that currently prevailing. So the meaningfulness of mea-
sured values and the optimality of the policies based on them are con-
strained by the accuracy of PEU. This problem has not escaped the notice
of practitioners in these areas. Consider, for example, the controversy
over the siting of the federal government’s high-level nuclear waste re-
pository. Because the process of constructing and filling the repository would
not be completed for another forty to sixty years, the main impacts of the
repository will be delayed by almost half a century. Paul Slovic and other
social scientists who have been commissioned to measure public attitudes
and preferences toward the proposed repository have lamented the diffi-
culty of eliciting preferences for such delayed outcomes. As Slovic notes,
asking people to predict, for example, how the repository might affect
vacation decisions to be made in the distant future might be “asking them
to tell more than they can know” (Slovic and others, 1991, p. 684).

To gain insight into the accuracy of PEU for environment-related issues,
one would ideally want to ask people to predict how they will feel about
environmental changes that are likely to occur in the ensuing years, and
then compare these predictions to actual ratings made after the projected
states were experienced. For example, one might ask people to predict
how much they would be disturbed by the smells emanating from a paper
mill, the sounds of an airport runway, or the visual obstruction of power
lines that are scheduled for construction, and then compare these
predictions with their reported disturbance at different times after those facilities have been operating. Unfortunately, such a study would be infeasible for many important gradual environmental changes, such as global climate warming. In fact, even if researchers possessed the resources and patience to conduct a panel study on prediction accuracy, it is unlikely that its findings would be very revealing. With so much time passing between initial predictions and subsequent ratings, standard threats to internal validity, such as history, maturation, and instrumentation (in this case, changes in the way that respondents use the response scales), would pose formidable obstacles.

Is there any hope, then, of assessing the accuracy of PEU in environmental domains? Perhaps. Several existing studies have examined the accuracy of PEU in nonenvironmental contexts—mostly for health-related decisions—where people’s future quality of life may depend critically on the accuracy of their PEU. Patients facing major medical procedures are often required to make extremely important life decisions and to provide “informed” consent, with little understanding of how the potential outcomes of alternative treatments would be experienced. Recognizing this problem, new decision aids (such as taped interviews of people who have experienced each outcome) have been developed to help inform patients about the possible outcomes of different treatments (Agre, Kurtz, and Krauss, 1994; Hopper and others, 1994).

Other researchers have begun to examine the accuracy of patients’ PEU for health conditions by comparing prospective overall health or quality of life ratings with similar ratings taken after the medical treatment or procedure. Such studies attempt to determine whether patients can accurately predict the effects of medical procedures on their well-being without direct prior experience of the possible consequences. These studies and others conducted in different contexts are beginning to produce some insights into the factors that mediate experience utilities and the influences that cause people to overestimate or underestimate these utilities. The next section, “Theory and Evidence,” reviews some of the findings from this emergent field of research, both in the medical and nonmedical domain, and attempts to draw out their implications for the accuracy of PEU in the environmental domain.

It is also possible to crudely test the accuracy of PEU in the environmental domain by employing a cross-sectional design rather than a prospective panel study. The research summary later in this chapter presents results from such a study, in which we asked one group of people to rate the impact on their lives of environmental changes that have occurred
over the last decade and a second group to predict the impact of comparable changes that may occur in the next decade.

We close by discussing the dilemma created when accurate PEU conflicts with current preferences or values. For example, suppose evidence suggests that degradations in health or environmental conditions confer little long-term disutility. Should this information override people's current preferences that strongly oppose such deterioration? Should current opposition to increased air pollution be discounted if it partly reflects an ignorance of how rapidly or completely people adapt to reductions in air quality? We do not resolve this dilemma but do question the appropriateness of basing policy decisions solely on estimates of experienced utility (even when those estimates are accurate).

Theory and Evidence

Evidence on the accuracy of PEU is mixed. To try to make sense of the disparate findings, we have classified them into several categories, based on whether the experience being predicted is desirable or undesirable and on whether EU is accurately estimated, underestimated, or overestimated. Our intention is not to cover all cases of PEU, but only those most relevant to environmental change.\(^1\)

Adapting to Negative Changes

The case of adapting to negative changes is most relevant to environmental decision making. Although some government programs (such as Superfund) and some individual decisions (such as removing garbage from a trout stream) are intended to produce positive changes, most environmental policies are intended to prevent further degradation. The question is whether people can accurately anticipate the effect of such degradation on their own future experience utility.

**ACCURATELY PREDICTING ABILITY (OR INABILITY) TO ADAPT TO NEGATIVE CHANGES.** Most studies of adaptation to negative change have been conducted in the domain of health care. Many of these studies have documented relatively accurate predictions of PEU. For example, Llewellyn-Thomas, Sutherland, and Thiel (1993) informed sixty-six laryngeal cancer patients of common outcomes of radiation therapy and asked them to predict how they would feel after four weeks of radiation therapy using direct utility rating scales and time trade-off measures of utility. Following
completion of the therapy, patients described their actual end-of-therapy state and assigned a utility to it. The researchers found that the utility ratings were remarkably close to the values predicted prior to therapy. Rachman and Eyril (1989) found that people suffering from chronic headaches were relatively accurate in predicting the intensity of future headaches. Hunter, Philips, and Rachman (1979) found that neurosurgical patients’ recall of acute pain was “surprisingly accurate” up to five days after an experience of acute pain. Kent (1985) reported reasonably accurate predictions of dental pain.

Furthermore, it seems likely that the number of published studies finding no prediction bias underestimates the prevalence of this finding. Here, as elsewhere, biases are more interesting than accurate predictions and therefore more likely to be published. For example, a graduate student in our department collected data in small claims court to determine whether people in the heart of a dispute could predict the likely fact that they would cool off with time. She asked disputants to predict how they would feel six weeks after they won or lost the case and then followed them up six weeks later. She dropped the project when the results began to show that disputants’ predictions of their own feelings were relatively accurate.

UNDERESTIMATING ABILITY TO ADAPT TO NEGATIVE CHANGES. There is very little direct evidence showing underestimation of adaptation to negative changes. However, many findings strongly suggest that people are remarkably good at adapting to or coping with deficiencies or inconveniences in the circumstances of their life. This is true generally, as when people adapt to the gradual loss of vigor as they age, and specifically, as when people get used to the noise of their computer’s hard drive. In a famous study, Brickman, Coates, and Janoff-Bulman (1978) asked lottery winners, accident victims, and a control group a series of questions about past and present happiness. The lottery group consisted of twenty-two people who had recently (within the last year) won between $50,000 and $1,000,000 in the Illinois state lottery. The victim group consisted of twenty-nine people who had suffered a debilitating accident within the last year that had left them paraplegic or quadriplegic. Though accident victims did rate their current happiness as significantly lower than the control group or the lottery winners (2.96, 3.82 and 4.00, respectively, on a 5-point scale) the differences still seem small given the extremity of these outcomes. (Note that the victim group still rated their happiness as 2.96, which is above average on a 5-point scale). Although the researchers did not ask people to predict their own experience utilities beforehand (because lottery winners and accident victims cannot be identified before-
hand), most people are so surprised by the results of the study that it seems likely that the respondents themselves would have underpredicted their own adaptation had they been asked.

Another set of studies has looked at how people react to good or bad news about disease states. Intuitively, one might think that having a less than 100 percent ($p < 1$) chance of a negative outcome (such as being infected with an incurable disease) would not be as bad as knowing for sure that one has the disease. Indeed, this belief seems to prevent people from getting (or performing on themselves) various medical tests, as was shown in the context of testing for Huntington's disease (for example, Mastromauro, Myers, and Berkman, 1987) and breast self-examination (Kash, Holland, Halper, and Miller, 1992). However, Brandt and others (1989) found no major disruptions in the lives of people one year after they had received an unfavorable test result for Huntington's disease (using a test for which a positive test result means a 95 percent probability of developing the disease). Wiggins and others (1992) found that people showed less psychopathology one year after receiving a positive HIV result than they did at the time of testing.

Thus, despite the widespread fear of adverse medical results, many studies have found that people are not only surprisingly quick to adapt to bad news but sometimes feel better after receiving it. However, none of these studies directly addressed the accuracy of PEU because none elicited such predictions. To address this gap in the literature, Sieff, Dawes, and Loewenstein (1994) conducted a study in which people who were tested for HIV predicted how they would feel about five weeks after obtaining the test results. The survey consisted of two twenty-one-item mood inventories. Subjects completed one survey based on how they would expect to feel in five weeks if they obtained a negative (favorable) result and another survey based on how they would expect to feel if they obtained a positive (unfavorable) result. The study was intended to be within-subject, but the very low rate of positive results precluded any meaningful comparisons of predicted versus actual mood among those with positive results. As a highly imperfect remedy to this problem, the researchers advertised in local newspapers for people who had received HIV test results in the last four to ten weeks, and selected a sample of positives from this group. Though the results are confounded by the noncomparability of the groups, they indicate underprediction of adaptation. As is evident from the figures in Table 4.1, respondents predicted greater misery than the people in the group that tested positive for HIV reported feeling. (They also predicted greater elation than they themselves later felt following a negative [favorable] test result.)
Table 4.1. Anticipated Versus Actual Distress Following HIV Testing.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t(df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated</td>
<td>50</td>
<td>94.7</td>
<td>22.6</td>
<td>2.9(69)</td>
<td>.005</td>
</tr>
<tr>
<td>Actual</td>
<td>21</td>
<td>77.6</td>
<td>21.8</td>
<td></td>
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<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t(df)</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td>Anticipated</td>
<td>49</td>
<td>47.4</td>
<td>16.1</td>
<td>-3.9(92)</td>
<td>.002</td>
</tr>
<tr>
<td>Actual</td>
<td>54</td>
<td>59.1</td>
<td>19.4</td>
<td></td>
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<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t(df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated</td>
<td>25</td>
<td>49.8</td>
<td>17.8</td>
<td>1.5(24)</td>
<td>.15</td>
</tr>
<tr>
<td>Actual</td>
<td>25</td>
<td>54.7</td>
<td>20.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Larger numbers signify greater distress.

OVERESTIMATING ABILITY TO ADAPT TO NEGATIVE CHANGES. People may also overpredict their ability to adapt to, adjust to, or accommodate the persistence or development of an irritation, inconvenience, imperfection, limitation, or deficiency. For example, we are often mistaken when we believe that we will get used to someone's nasal voice or eccentric habit, or cease to notice a cosmetic blemish, or become accustomed to a new inconvenience like having to separate the garbage or put the toilet seat down. However, though there seems to be abundant anecdotal evidence suggesting that we sometimes adapt less than we hope or expect, we know of little research documenting a systematic overestimation error of this type.
Tuning

For adverse outcomes, adaptation is likely to be reinforced by another process that could be called "tuning." Instead of simply passively adapting to bads, in the sense of getting used to them, people may take active steps to mold their preferences or their material circumstances to deal with such changes. For example, when people move to a new city, the initial transition is often difficult because they arrive with tastes and habits tailored to their previous location. Over time, however, tastes change, and people learn how to take advantage of the amenities offered by the new location. If the new city has great restaurants, the migrant develops an appreciation for fine food; if it offers opportunities for outdoor recreation, she takes up bicycling. Note that for undesirable changes, adaptation and tuning both have the same effect—they reduce the aversiveness of the change over time. For desirable changes, however, the two processes oppose one another; adaptation leads to a decline in utility, but tuning leads to a progressive improvement over time as people adjust their preferences or change their behavior to benefit maximally from the change.

Tuning may be important in adapting to adverse health conditions. Perhaps the paraplegics studied by Brickman, Coates, and Janoff-Bulman had already developed new interests and new friends by the time they completed the survey, and one can imagine that people in highly polluted environments develop tastes and hobbies that minimize their contact with the pollution. When people think about change, we conjecture that they imagine the new situation holding their current lifestyle constant and thereby overestimate the long-term severity of negative changes. It seems likely, therefore, that people not only underestimate how their psychological experience of a given situation will change over time but also underestimate their ability to alter which things they experience.

Adapting to Positive Changes (Satiation)

Social scientists have little understanding of why people rapidly adapt to some negative changes but become increasingly sensitized to others over time. Equally unknown are people's predictions and responses to positive changes—why people sometimes experience rapid satiation and other times not, and why they fail or succeed in predicting the extent of satiation.

For positive changes, rapid adaptation is a liability, rather than an ability. It would clearly be preferable if newly discovered pleasures could not be satiated—if hobbies, television shows, or music albums never lost their
novelty, if our romantic or sexual attraction never waned, if our elation over being promoted or receiving a favorable medical test lasted for years, rather than days or hours. Unfortunately, we rapidly adapt to many of the positive changes in our life so that they cease to bring us much pleasure. We often fail to appreciate the expanding consumption our increasing income makes possible (Scitovsky, 1976), and we may gradually take for granted the wonderful qualities of our friends or spouses. Nevertheless, not everything is subject to this phenomenon. Our new apartment’s impressive view may remain impressive after millions of viewings, and there may be some people you “just can’t get enough of.”

How accurately can people predict their liability to adapt to positive changes? How well can they discriminate between those goods, activities, or consequences whose pleasure is fleeting and those that endure as lifelong sources of pleasure? If people could accurately predict their rapid accommodation to increased influence or income, would they work as diligently for a promotion? Conversely, if people could accurately predict that the pleasure of some activities (such as musical or artistic activities) is relatively resistant to the eroding forces of adaptation, would they work harder developing the skills necessary for their enjoyment?

Only a few studies, to our knowledge, have looked at predictions of experience utility under conditions of potential satiation. Kahneman and Snell (1990) had subjects predict their future liking of either ice cream or plain yogurt, which was to be consumed every day for eight consecutive days. The subjects who ate the ice cream correctly predicted satiation—that they would enjoy the ice cream less over time. The subjects who ate the plain yogurt also expected to like it less over time but, in fact, liked it more (or disliked it less—for those subjects who considered eating plain yogurt an aversive experience).

In another pertinent study, Itamar Simonson (1990) compared the desire for variety when people choose consumption items sequentially versus simultaneously. He uncovered a phenomenon he refers to as the “diversification bias.” In one condition (simultaneous choice), students chose from among six snack types the three snacks they would eat during that class and the following two classes. In the other condition (sequential choice), students chose their snacks on the same day they were to be consumed. Students chose substantially more variety when all the choices were bracketed together (the simultaneous choice condition) than when they were bracketed individually (in the sequential choice condition). In a follow-up to Simonson’s paper, Read and Loewenstein (1995) replicated his effect and also showed that subjects in the simultaneous choice condition regretted opting for variety. When the second and third class meet-
ings arose, subjects generally wished they had chosen to consume the same snack for all three days.

Surprisingly, overestimating satiation to a positive stimulus (saltiness, sweetness, nuttiness, and so on) and underpredicting adaptation to a negative stimulus (receiving an unfavorable test result) may both reflect what Read and Loewenstein (1995) call “time dilation”—the tendency to ignore or underweight time intervals occurring between consumption. If subjects imagine the three consumption episodes as occurring during a single instant (or over a very short period of time), they will overestimate the degree of satiation (for example, the extent to which eating a Snickers bar on the first day interferes with the pleasure of eating a Snickers bar on the second day). Similarly, if people prospectively ignore or underweight the time interval following the receipt of bad news, they may underpredict their extent of adaptation at future times.

**Research Summary**

The research just discussed presents a mixed picture concerning the ability to predict future experience utility. If a systematic bias predominates, it seems to be a tendency to underestimate the strength of adaptation. One would expect this particular bias to be especially prevalent for environmental changes, due to the long periods involved and the apparent tendency to time dilate, that is, to underappreciate the length of time intervals.

**Testing the Accuracy of Environmental and Nonenvironmental PEU**

As noted earlier, conducting a prospective study of the accuracy of PEU is often infeasible. As a substitute, we conducted a cross-sectional study in which we asked some respondents to rate how different events that had occurred in the past decade had affected their quality of life, and we asked other respondents to predict how matched events that might occur in the next decade would affect their quality of life. Where appropriate, we also asked subjects to rate how the past or predicted change had or would “change the quality of life in this country as a whole.” We chose twelve different changes, four environmental, four social, and four personal, as follows:

**ENVIRONMENTAL**

- Change in local air pollution
- Rain forest destruction
• Restriction of sport fishing due to pollution
• Recovery of certain endangered species

**SOCIAL**
• Increase in number of coffee shops and cafes
• Increase in number of television channels and selection of videotapes
• Reduced risk of nuclear war
• Increased risk of AIDS

**PERSONAL**
• Change in free time
• Development of pain-causing chronic health condition
• Change in household income
• Increase in body weight

In some cases, such as the increase in television channels, we knew that the event had happened for virtually everyone during the last decade and that it was almost certain to continue during the next decade. In other cases, such as weight gain, we did not know whether the individual had experienced the event during the past decade and therefore included a question to determine whether he or she had. Subjects in the prediction condition were asked to assume that they would experience such a change over the next decade (for example, that they would gain fifteen pounds). In still other cases, such as a change in free time, we asked the retrospective group whether the change had occurred and the members of the prospective group whether they expected the change to occur. We then compared the two groups, looking at subjects with matched recollections and predictions of change (for example, those who believed they had less free time than ten years ago and those who expected to have less free time ten years from now).

**Method**

Eighty-four adults waiting for flights at the Pittsburgh International Airport in November of 1995 were randomly assigned to complete one of the two surveys. Forty-one completed the retrospective survey and forty-three completed the prospective survey. Subjects received a chocolate bar for completing the self-administered survey. The survey began by eliciting demographic information—gender, age, household income, city of resi-
dence, and whether the respondent had lived in that city for at least ten years. Subjects then saw a quality of life “ladder” with rungs labeled from 0 (“worst life imaginable”) to 100 (“best life imaginable”), and they were asked to position themselves on the scale. Subjects in the retrospective condition were asked whether the air quality in their city had improved significantly, deteriorated significantly, or remained about the same over the past ten years. Subjects in the prospective condition were asked to predict how (or if) the future air quality in their city would change, using the same three response options. Both groups were then asked to rate (or predict) how changes in air quality would affect the quality of their life. The response scale shown here is for the retrospective condition. (The scale for the prospective group was identical except for tense—for example, “has decreased” was replaced by “will decrease.”)

How much has [described scenario] changed the quality of your life?
(Circle one of the following, using the key shown below.)

L  M  S  0  S+  M+  L+

L = has decreased the quality of my life by a large amount (over 10 points on the ladder)
M = has decreased the quality of my life by a moderate amount (between 5 and 10 points on the ladder)
S = has decreased the quality of my life by a small amount (between 0 and 5 points on the ladder)
0 = has not affected the quality of my life at all, or does not apply to me.
S+ = has increased the quality of my life by a small amount (between 0 and 5 points on the ladder)
M+ = has increased the quality of my life by a moderate amount (between 5 and 10 points on the ladder)
L+ = has increased the quality of my life by a large amount (over 10 points on the ladder)

Results

Fifty-three percent of the respondents were male; the mean age was forty-six (SD = 15). Of the sixty-two subjects who responded to the income question, 65 percent had an income less than $20,000, and the remainder had incomes between $20,000 and $40,000. Given the surprisingly low
income range, we can only speculate that people with higher incomes were less likely to answer this question. Sixty percent of the sample had lived in the same city for the last ten years. The mean quality of life was 76 on the 100-point scale (range from 12 to 100; SD = 17). The prospective and retrospective groups were similar on every dimension except income, for which the prospective group was marginally higher \((p < .10)\).

The general pattern of results shown in Table 4.2 can be summarized as follows: people generally expect changes in their environments to have a greater impact on their quality of life than they actually seem to experience (or report experiencing). Seven of the eight significant or marginally significant differences in the table reflect this pattern (the increase in television channels shows the opposite pattern.) This pattern is most consistent with respect to the environmental problems; three out of three display the pattern of greater anticipated than experienced change. (Air quality was not included because the small numbers of respondents either reporting or

<table>
<thead>
<tr>
<th>Description</th>
<th>Experienced</th>
<th>Predicted</th>
<th>Significance ((p &lt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rain forest destruction</td>
<td>-.4</td>
<td>-1.2</td>
<td>.01</td>
</tr>
<tr>
<td>Restricted sport fishing due to pollution</td>
<td>-1.2</td>
<td>-1.8</td>
<td>.10</td>
</tr>
<tr>
<td>Recovery of certain endangered species</td>
<td>+.3</td>
<td>+.7</td>
<td>.11</td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in coffee shops and cafes</td>
<td>+.2</td>
<td>+.0</td>
<td>n.s.</td>
</tr>
<tr>
<td>Increase in number of television channels and selection of videotapes</td>
<td>+.6</td>
<td>+0.0</td>
<td>.02</td>
</tr>
<tr>
<td>Reduced risk of nuclear war</td>
<td>+.9</td>
<td>+.9</td>
<td>n.s.</td>
</tr>
<tr>
<td>Increased risk of AIDS</td>
<td>-.4</td>
<td>-1.0</td>
<td>.02</td>
</tr>
<tr>
<td>Personal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in free time</td>
<td>+.8</td>
<td>+1.8</td>
<td>.05</td>
</tr>
<tr>
<td>Decrease in free time</td>
<td>-.6</td>
<td>-.1</td>
<td>n.s.</td>
</tr>
<tr>
<td>Development of pain-causing chronic health condition</td>
<td>-1.7</td>
<td>-1.6</td>
<td>n.s. ((n = 8)) ((n = 37))</td>
</tr>
<tr>
<td>Increase in body weight</td>
<td>-.6</td>
<td>-1.2</td>
<td>.10 ((n = 18)) ((n = 37))</td>
</tr>
</tbody>
</table>
predicting positive or negative changes in air quality precluded any comparison between the two groups.)

Change in income is excluded from Table 4.2 because a t test was not the appropriate analysis. Because we asked subjects how much their income had increased (or was expected to increase), we regressed change in quality of life against change in income. To test whether changes in income had a differential impact on quality of life when viewed retrospectively or prospectively, we modeled the interaction between condition and change in income as an independent variable. If people conform to the general pattern of exaggerating the impact of changes prospectively, we would expect to observe a positive interaction term. The actual estimated equation was

\[
\text{CHANGE IN LIFE QUALITY} = 0.76 + 0.000015 \times CI + 0.000028 \times CI \times PROSP
\]

\[
p < .01 \quad \quad p < .10 \quad \quad R^2 = .27
\]

where \( CI \) stands for change in income, and \( PROSP \) is a dummy variable designating the prospective condition. Notice that although the interaction term is only marginally significant, the combined magnitude of the \( CI \) effect is roughly three times as high in the prospective condition (0.000043 = 0.000015 + 0.000028) as in the retrospective condition (0.000015). Stated simply, people expected income to influence their quality of life about three times as much as it actually seems to.

Table 4.3 presents comparisons between the impact on personal quality of life and the impact on the quality of life in the country for the five changes for which we included both kinds of impact. For all five changes, both negative or positive, people expected the impact on quality of life to be greater on the country than on themselves.

<table>
<thead>
<tr>
<th>Description</th>
<th>Impact on Self</th>
<th>Impact on Country</th>
<th>Significance (p &lt;)</th>
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<tbody>
<tr>
<td>Rain forest destruction</td>
<td>-0.8</td>
<td>-1.1</td>
<td>0.05</td>
</tr>
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<td>Restricted sport fishing due to pollution</td>
<td>-0.8</td>
<td>-1.4</td>
<td>0.0001</td>
</tr>
<tr>
<td>Recovery of certain endangered species</td>
<td>+0.6</td>
<td>+1.1</td>
<td>0.0002</td>
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<tr>
<td>Reduced risk of nuclear war</td>
<td>+0.9</td>
<td>+1.5</td>
<td>0.0001</td>
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<tr>
<td>Increased risk of AIDS</td>
<td>-0.7</td>
<td>-2.2</td>
<td>0.0001</td>
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</table>
Discussion

Our results point to two major patterns. First, people seem to expect changes in their circumstances to affect their quality of life in the future more than equivalent things have affected their quality of life in the past. We can think of two possible reasons for this effect. First, and consistent with much of the evidence reviewed in the previous section, people may underestimate their own tendency to adapt to change. Second, they may overestimate the impact of any one factor on their quality of life. Clearly, quality of life depends on a wide variety of things, any one of which is likely to have only a small impact. However, perhaps when a respondent’s attention is focused on a particular type of change (such as opportunities for fishing), he or she exaggerates its overall importance. Either of these mechanisms could explain the discrepancy between prospective and retrospective evaluations, and both predict that people exaggerate the overall impact of adverse and favorable changes in a particular area of their life.

The second major pattern we observe is a tendency to view the changes as having a greater effect on the country as a whole than for oneself. This effect could have a trivial cause; perhaps people simply increase their assessment to account for the numbers of people affected. But this seems unlikely to us because any such adjustment would be difficult to even represent on the 7-point scale in the questionnaire. An alternative, and we believe more plausible, explanation for this effect is that people answer the question about other people much as they answer questions about their own future selves—tending to underestimate the power of adaptation.

Clearly, the findings of this study should be interpreted cautiously. The cross-sectional methodology is a poor approximation of the within-subject panel study that one would ideally want to run. The cross-sectional methodology has two major pitfalls. First, it is difficult to equate the magnitude of changes that have occurred in the past with changes that will occur in the future. Subjects either may not view a given change as equally severe (for example, any further reduction in rain forests may seem more severe given that so many have already been depleted) or may simply not believe the assumptions posited in the survey (for example, that the risk of nuclear war has dramatically declined in the last ten years). However, it seems unlikely that the failure to equate past and future changes could account for the highly systematic discrepancies that we observed, unless future changes are typically expected to be more dramatic than past changes. The second major limitation is the failure to account for age effects. Given that the mean age of subjects in our two experimental conditions is equivalent, when we ask them to either look
back on the last ten years or look forward to the next ten years, we are implicitly comparing two different decades of their lives. For example, in the retrospective condition, a thirty-year-old is being asked about the decade between ages twenty and thirty, whereas in the prospective condition, he or she is being asked about the decade between ages thirty and forty. To partly investigate the severity of this problem, we looked at the correlation between age and judgments of change in quality of life and found no significant relationship. We also ran regressions for each type of change in which the dependent variable was impact on quality of life and the independent variables were condition and age. In no case was the age coefficient significant. We also ran similar regression in which we added ten years to the ages of people in the prospective condition to take account of the fact that their questions dealt with a period one decade later. Again, controlling for age did not change the basic pattern of results.

**Conclusion**

In a seminal paper, James March noted that “rational choice involves two kinds of guesses: guesses about the future consequences of current actions and guesses about future preferences for those consequences” (1978, p. 589). Making decisions on the basis of biased assessments of how one will feel about outcomes is no less problematic than making decisions based on inaccurate assessments of the outcomes themselves. In the environmental domain, as in others, both types of predictions are important, but the lion’s share of research has focused on the latter—on predicting the objective consequences of current actions, such as global warming, ozone depletion, and so on. There has been very little research looking at the accuracy of PEU in any domain and, to our knowledge, virtually none that focuses on the environment. This chapter is a first attempt to address this gap in the literature.

Predicting future preferences and values is difficult. Kahneman and Snell (1990) have shown that people have different intuitions regarding the dynamics of hedonic experience and that they often cannot predict their own future experience (much less the experience of individuals in future generations). This evidence has important implications. If people do not know what is good for them, we cannot assume that their choices maximize their utility (utility here means some measure of the hedonic quality of experiencing an event or its outcome; Kahneman and Varey, 1991).

However, although accurate PEU may be necessary for rational choice, it is far from clear that decisions should be based solely on PEU, even if accurate measures were available. Consider the following examples:
• There is some evidence that the inhabitants of poorer cities (Schneider, 1975), regions (Liu, 1970), or countries (Easterlin, 1973) are no less happy than the inhabitants of wealthier places. Suppose these studies are correct. Should we therefore conclude that economic development is a misguided goal? Similarly, if we discover that individuals with Down’s syndrome are actually happier than average, should society discontinue research aimed at preventing it, or even find ways of inducing it in utero?

• If consequences are evaluated solely by the experienced utility of humans, should we conclude that environmental degradation is acceptable if it goes unnoticed by current and future generations? Should the government conceal or misrepresent the degree of environmental damage to minimize the detrimental effect of negative emotions on experienced utility? Conversely, should we conclude that the increased awareness of knowledge about some area (or some animal species) resulting from media coverage of some environmental calamity represents an increase in people’s existence value and that the degradation is therefore beneficial? (How many people had even heard of Prince William Sound prior to the Exxon Valdez spill?)

There are (at least) two ways to reconcile apparent discrepancies between utilities inferred from actual choice or stated preference and the utilities reported in subjective measures of well-being. First, it is possible that the discrepancy is illusory because analyses of experience utility neglect the utility of transitions. In the long run, lottery winners may be no happier (nor paraplegics any sadder), but the brief period of ecstasy (or agony) immediately after winning the lottery (or becoming paralyzed) may justify the intense attraction of (or aversion to) those outcomes. Consider, for example, the aversiveness of getting a tooth drilled without anesthesia, or the horror of the final moments preceding an airplane crash, when the passengers realize that all is lost; it may not be unreasonable to place a large value on a relatively brief period of misery.

Second, the discrepancy might be caused by a type of responsibility effect. As Shefrin and Statman postulate (1984, p. 269), people may feel worse about an outcome when they have chosen it than when it just occurs (or just “is”). For example, an alternative world which has always lacked desert pupfish would be indistinguishable from the world we currently live in, where such species exist in small numbers in isolated places and are rarely seen or even known about by anyone (thereby lacking characteristics that affect people’s choiceless experience utility). (See Loomes and Sugden, 1982, and Sugden, 1985, for a discussion of choice utility
versus choiceless utility.) However, once a person is made aware of such a species and his or her attention is temporarily focused on its plight, that person may be willing to sacrifice considerable amounts of money to prevent the feeling that he or she stood by and chose not to help while the species went extinct.

The preceding discussion highlights the difficulty of reconciling experience and choice utility. Sometimes the discrepancy simply reflects errors in judgment that we should strive to eliminate. Do we really want to base public policy on the uninformed judgments of people who have never experienced the relevant outcomes? Do we want to base health rationing decisions on people’s inaccurate assessments of the utility of different health states or base environmental policy on people’s stereotypical, misguided images of the effects of different types of environmental degradation? At other times, however, the discrepant experience- and choice-based evaluations may reveal distinct aspects of human values. Thus, although most decision makers would surely want to consider how people experience outcomes, few would feel comfortable bequeathing a world so polluted that natural trees are replaced with plastic ones, even if the plastic trees are acceptable to (or even preferred by) future generations. We find ourselves persuaded by Tribe (1974, pp. 1325–1326), who argues that it is a mistake to value the environment solely in terms of how well it satisfies human preferences: “Policy analysts typically operate within a social, political, and intellectual tradition that regards the satisfaction of individual human wants as the only defensible measure of the good, a tradition that perceives the only legitimate task of reason to be that of consistently identifying and then serving individual appetite, preference, and desire. . . . To insist on the superiority of natural trees in the teeth of a convincing demonstration that plastic ones would equally well serve human purposes may seem irrational—yet the tendency to balk at the result of [such an] analysis remains.”

We believe that the best resolution to this dilemma lies in informing people about the consequences of their decisions in the fullest, deepest manner possible. As we note, this is already a major trend in medical decision making, where new methods have been developed to make sure that informed consent really is informed. Acquiring and communicating understanding about changes in experience utilities will likely prove difficult for many environmental decisions because many of the consequences are uncertain, unfamiliar, delayed, or protracted. For now, perhaps the best that can be done is to educate private individuals and policymakers about what has been learned about general principles that mediate temporal changes in experience utility.
NOTES

1. One important topic relating to PEU is the ability to predict future emotions, drives, and somatic sensations such as hunger and pain. Loewenstein (1996) refers to these influences as “visceral factors” and discusses in detail two types of pervasive prediction errors: First, people seem to underestimate the impact of visceral factors when they are not experiencing them in the present. For example, when one is not hungry after lunch, it is difficult to appreciate the motivational force of the temptation one experiences if peanuts are available just before dinner. Second, when currently experiencing a visceral factor, people often have difficulty imagining themselves not experiencing it. When angry, it is difficult to imagine that one will cool off quickly; when hungry, it is difficult to imagine oneself satiated—hence the danger of grocery shopping “on an empty stomach.”

2. Notably, when Read and Loewenstein emphasized the time intervals between class meetings, the discrepancy between sequential and simultaneous choice was significantly reduced.

REFERENCES


Schneider, M. “The Quality of Life in Large American Cities: Objective and Subjective Social Indicators.” *Social Indicators Research*, 1975, 1, 495–509.


