

Beyond Cost Benefit Analysis: Promoting Ecological Sustainability in  
Natural Resource and Environmental Agencies in the United States  
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Gary Bryner<sup>1</sup>

Cost benefit analysis is widely used in policy making at all levels of government in the United States, for several reasons. It is rooted in common sense calculations, consistent with an economy that values economic efficiency and market-based decision making. At the federal level, Congress and the Executive Branch have emphasized CBA in agency decisionmaking, particularly in formulating and assessing alternatives in issuing rules and regulations. Despite years of effort by the Office of Management and Budget officials and others, CBA is still a very problematic and contested framework to guide agency analysis of policy options. In this paper, we argue that CBA has largely failed to serve as an effective guide to shape agency discretion and the selection of policy options. Part I examines the case for and against using CBA in assessing policy options. Part II explores the implementation of CBA in federal natural resource agencies. Part III sketches some elements of an alternative framework for natural resources policy making, based on concepts from ecological science. Our argument is not that CBA has no place in policy analysis; to the contrary, it can play a valuable role in helping to assess policy options. We urge policy makers to move from viewing CBA as the primary criterion for guiding natural resource policy making to a broader framework rooted in ecological science to provide overall criteria for guiding policy making.

### **I. The Benefits and Costs of Cost Benefit Analysis**

Every president during the past 25 years has sought ways to influence the decisions of regulatory agencies and to require they take greater account of the economic impacts of their actions through some form of cost-benefit analysis. Both Republican and Democratic presidents have issued a series of executive orders aimed at specifying when and how agencies are to take into account and balance the costs and benefits of the actions they propose.<sup>2</sup> These efforts have been motivated by a variety of goals, such as reducing the cost of compliance with regulations in order to foster economic growth, increasing the cost-effectiveness of regulation so that benefits are maximized, and ensuring that agency actions are consistent with administration policy objectives.

President Reagan's 1982 Executive Order 12291 required agencies to assess the costs and benefits of all major regulations unless their authorizing statute prohibited such a calculation. In 1993, President Clinton reaffirmed the review process in issuing Executive Order 12866, which required all federal agencies to "assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating" in making decisions on whether and how to regulate." The order established that the analysis must include both quantifiable and qualitative measures of

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<sup>1</sup> Gary Bryner is a professor of public policy and political science at Brigham Young University and a research associate at the Natural Resources Law Center, University of Colorado School of Law.

<sup>2</sup> See Exec. Order 12,291, 3 C.F.R. 127 (1982); Exec. Order 12,498, 3 C.F.R. 323 (1986); and Exec. Order 12,866, 3 C.F.R. 638 (1994).

costs and benefits even if they are difficult to quantify. It provides that, "Each agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs." "In choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits... ." The order only applies to a "significant regulatory action," defined by four types of impacts; the impact that has most commonly triggered compliance by federal agencies is that requiring a cost-benefit analysis any time the agency action would have economic impacts "of \$100 million or more."<sup>3</sup>

Cost benefit analysis is defined here as an approach to evaluation that compares the costs of regulations with their benefits, requires the quantification and monetization of those values, and presumes that only policy options whose benefits exceed its costs should be pursued. The regulatory review process for implementing the Executive Order takes place in the Office of Management and Budget's Office of Information and Regulatory Analysis (OIRA). When an agency transmits a draft rule to OIRA, it reviews the draft rule for consistency with the regulatory principles stated in the Order, with the President's policies and priorities, and with the following statutory provisions:

- Under the Congressional Review Act, 5 U.S.C. chapter 8, OIRA must determine if an agency final rule meets the standards for a "major" rule (in general, having an annual economic effect of over \$100,000,000), and thus subject to special provisions of that Act.<sup>4</sup>
- Under the Consolidated Appropriations Act of 2001, H.R. 5658, section 624, P.L. 106-554. the OMB Director must submit an annual report to Congress on the costs and benefits of Federal regulation; OIRA prepares that report, based largely on the regulatory impact analyses that agencies prepare in compliance with E.O. 12866.
- Under the Unfunded Mandates Reform Act, each agency must prepare a benefit-cost analysis for any proposed and final rule "that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100,000,000 or more (adjusted annually for inflation) in any one year." In its analysis, the agency must also "identify and consider a reasonable number of regulatory alternatives and from those alternatives select the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule ..."<sup>5</sup>
- Under Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, the OMB is required to issue "government-wide guidelines that provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies."<sup>6</sup>

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<sup>3</sup> Exec. Or. 12866 (1993).

<sup>4</sup> See, OMB Memorandum M-99-13, Guidance for Implementing the Congressional Review Act (March 30, 1999).

<sup>5</sup> P.L. 104-4, section 202 (March 22, 1995).

<sup>6</sup> P.L. 106-554.

- Under the Paperwork Reduction Act, OIRA reviews and approves or disapproves “each collection of information by a Federal agency, including information required to be provided under federal agency regulations.”<sup>7</sup>

### **CBA in the Office of Management and Budget**

The Office of Management and Budget (OMB) plays a key role in shaping how federal agencies perform cost benefit analyses as it issues guidance to agency and reviews the analyses agencies submit to OMB as part of the process of issuing federal regulations. In evaluating the benefits and costs, OMB requires federal agencies to provide the following:

- An explanation of how the actions required by the rule are linked to the benefits; agencies are to explain the mechanisms through which the rule produces the promised benefits
- A baseline for comparison purposes: the benefits and cost of an action are usually compared to a no action baseline; a comparison to alternative rules may also be helpful for policy makers.
- A discussion of undesirable side-effects and ancillary benefits.<sup>8</sup>

OMB guidelines also emphasize the transparency of the analysis and the ease with which a policy maker can evaluate the different arguments presented. This is particularly important in the case of “intangible” or qualitative factors. In cases where qualitative factors tip the analysis in favor of regulation, the relevant arguments for these factors should be clearly explained in the analysis and carefully evaluated. The following elements should be included in any CBA:

- Private sector compliance costs and savings
- Government administrative costs and savings
- Gains or losses in consumers’ product surpluses
- Discomfort or inconvenience in costs and benefits
- Gains or losses of time in work, leisure and/or commuting/travel settings.<sup>9</sup>

According to the OMB, cost-benefit analysis should take into account a wide range of factors, such as cost savings innovations that result from regulatory performance standards and incentive based policies, costs associated with slower rates of innovation or adoption of technology due to delays in approval or more stringent standards for new facilities than old ones, and should explain why market forces would not achieve the same goals as the regulation. Analyses should also include the difference between costs (or benefits) and transfer payments. The net reduction in total surplus should be viewed as a real cost to society, and benefit and cost estimates should reflect real resource use.

Agencies often conduct cost benefit analyses in the face of considerable uncertainty. OMB uses uncertainty to refer to both a lack of knowledge and to statistical variability. CBAs should discuss the quality of data used in the analysis, identify inferences and assumptions, and delineate strengths and uncertainties. When scientific uncertainty is high, it may be necessary to

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<sup>7</sup> 44 U.S.C. chapter 35.

<sup>8</sup> OMB, Circular A-4, 4.

<sup>9</sup> Circular A-4, 4.

present different alternative scenarios without evaluating the likelihood of each. When scientific studies have widely divergent results, presenting a range of possibilities with other available information may help determine which is qualitatively more likely to occur. Analyses should include (1) a quantitative analysis characterizing probabilities of relevant outcomes and (2) an assignment of economic values to the predicted outcomes. Agencies should conduct numerical sensitivity analysis to examine how the results of the analysis vary with plausible changes in assumptions, choices of input data, and alternative analytical approaches. This is especially useful when there isn't enough information to do a formal probabilistic simulation. Numerical sensitivity finds the "switch points" – values at which estimated net benefits change sign or the low cost alternative switches. However, this analysis is not sufficiently formal for rules above a \$1 million threshold. In those cases, agencies should use Delphi (or other comparable) methods to apply formal probabilistic analysis of pertinent uncertainties.<sup>10</sup>

In treating non-monetized benefits and costs, sound quantitative estimates are preferable to qualitative ones, since they help decision makers understand the magnitude of a given effect; for those effects which are too difficult to quantify or monetize a careful evaluation should be done, these non-quantified and non-monetized benefits are sometimes called "intangibles." For example, if benefits and costs cannot be monetized, they can be quantified, such as stream miles of improved water quality or increase in fish population. Particular care must be taken to double counting, especially if an effect that cannot itself be quantified is estimated in another part of the analysis (such as an increase in property value).<sup>11</sup> If effects cannot be quantified all relative quantitative should be presented along with a description of unquantified effects (and an explanation of why they cannot be quantified) such as ecological gains, improvements in quality of life, and aesthetic beauty. If the magnitude of risk is known but the number of individuals exposed is not, the total effect would be unquantifiable, all of these factors should be explained and the magnitude of risk included in the analysis. When unquantified benefits (or costs) affect a policy choice, a clear explanation of the rationale behind the choice should be provided<sup>12</sup>

Calculating the discount rates is particularly important. The beginning point for estimates should be the year in which the final rule will begin to produce effects; the ending point should be far enough in the future to encompass all the significant benefits resulting from the rule. Benefits and costs should be measured in constant dollars; hence the need for discount rates to take into account inflation and the positive time preference (the general preference to consume today rather than tomorrow). The further the benefit is in the future the more it should be discounted. Agencies should adjust all benefits and costs to reflect value in equivalent units and discount them at the rate consumers and savers would normally use in discounting future benefits. Generally, a seven percent real discount is used for federal regulatory analysis: seven percent is an estimate of the average before-tax return rate for private capital in the U.S. economy and is to be used whenever a regulation displaces or alters use of capital in the private sector.<sup>13</sup> When a regulation primarily effects private consumption (through higher prices), a three percent discount rate is to be used.<sup>14</sup> Future health effects (benefits and costs) should be

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<sup>10</sup> Circular A-4, 41.

<sup>11</sup> Circular A-4, 27.

<sup>12</sup> Circular A-4, 27.

<sup>13</sup> Circular A-4, 33.

<sup>14</sup> Circular A-4, 33.

discounted at the same rate. OMB suggest a lower, but positive, discount rate for intergenerational analysis. Differences in timing should be taken into account even for non-monetized costs and benefits; if the non-monetized benefits begin as soon as the cost is incurred, then the benefits may be annualized.

Direct uses of market data are to be preferred, since they are the most accurate measure of the marginal value of a good or service. Market imperfections and government intervention can cause the market price to deviate from the true marginal value (shadow price); market prices may not reflect true value if the production or consumption results in positive or negative external effects or transfer payments.<sup>15</sup> The value of goods not traded in markets, such as cultural or environmental amenities, is calculated in terms of both use and non-use.<sup>16</sup> Use-values are those where an individual derives satisfaction from using the resource, now or in the future; non-use values are where an individual places value on a resource, good, or service even though the individual will not use the resource now or in the future.

Willingness to pay (WTP) is to be used as a measure of opportunity cost; WTP is useful because it measures values from the perspective of people. The guidelines recognize that WTP values are most useful if they come from well functioning markets, but that is not always possible.<sup>17</sup> Revealed preference methods use actual market decision by customers to develop estimates for the value of goods or services. When market participants are well informed and confronted with real choices those choices can then be used to determine accurate monetary values for the relevant goods or services. Again, markets must be well functioning, with no externalities, that would skew the analysis.<sup>18</sup> Stated preference methods, such as contingent valuation, conjoint analysis, and risk-tradeoff analysis, are based on hypothetical questions that ask respondents to create willingness-to-pay estimates in valuing both use and non-use values. Willingness-to-pay questions, for example, “should be designed to focus the respondent on the reality of budgetary limitations and alerted to the availability of substitute goods and alternative expenditure options” and should “probe beyond general attitudes (e.g., a ‘warm glow’ effect for a particular use or non-use value) and focus on the magnitude of the respondent's economic valuation.”<sup>19</sup> Other OMB guidelines include the following issues:

- Distributional effects should be noted and disproportionate impacts of a regulation on different population segments should be explained.
- Development of a no-action baseline against which benefits and costs can be assessed should be included.<sup>20</sup>
- Three alternatives should be considered, the preferred option, a more stringent option and a less stringent one; if the preferred option is at the limits of technology a more stringent option does not need to be considered.

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<sup>15</sup> For example, gasoline market price may not reflect the true value due to taxes, other government interventions, and negative externalities. Circular A-4, 21-22.

<sup>16</sup> Circular A-4, 22.

<sup>17</sup> Circular A-4, 20.

<sup>18</sup> Circular A-4, 20.

<sup>19</sup> Circular A-4, 23.

<sup>20</sup> This provision raises questions about how the degradation of ecological systems should be calculated in the no-action baseline? If the degradation is included in the baseline and then counted again as a cost that would be double counting. Any ecological valuation needs to address this issue.

- The analysis should be transparent and reproducible.
- If there is fundamental disagreement in the scientific community about the probability distribution, benefits and costs should be described under various scenarios (with the supporting evidence and assumptions) rather than expressed as a range of values.<sup>21</sup>
- When there are health gains for both children and adults, and benefits for children are monetized, those benefits for children should be at least as large as the values for adults.
- The benefit transfer method is a method of last resort and should not be used unless expressly justified. It should not be used if resources are unique or have unique attributes. For example, snowmobile use in parks in one state may have different impacts than snowmobile use in another, and a study from one state cannot simply be transferred to another.<sup>22</sup>

Benefits and costs should be expressed in quantitative terms, then physical terms; if the first two are not possible, then it is to be expressed in qualitative terms. According to the guidelines, CBA is less useful when either benefits or costs cannot be expressed in monetary terms, and can be misleading due to the failure to “fully evaluate” all of the relevant benefits and costs.<sup>23</sup> Non-quantifiable factors, if important are to be discussed at length and analytical explanations given to justify their consideration or their outweighing other monetized factors. Outcomes should be measured in terms of final outcomes (lives saved or extended) as opposed to intermediate outcomes (tons of pollution reduced, crashes avoided, and so on). This is consistent with the goal of quantifying results as much as possible since final outcomes are more likely to have generally accepted monetary values than do intermediate outcomes.<sup>24</sup> OMB guidelines also provide that in measuring the effectiveness of a proposed regulation, the varying quality of a final outcome (such as acres of wetland saved, if quality varies across the entire wetland) be taken into consideration.<sup>25</sup>

Cost-benefit analysis is not mandated in every situation. Congress can specify whether CBA or some other criteria should guide agency decision making. In a 2001 case, the Supreme Court rejected an industry objection to the U.S. Environmental Protection Agency’s 1997 national air quality standards. A number of briefs submitted to the Court urged it to require the EPA to use cost-benefit analysis as a guide in formulating regulations under the Clean Air Act, but the Court found that Congress had not intended that kind of balancing when it specified in the 1970 act that national air quality standards should be set at levels that protect public health “with an adequate margin of safety.”<sup>26</sup> Nevertheless, there is strong support in Congress, the Executive Branch, and among policy analysts for expanding the role of CBA in policy making. The benefits of CBA are compelling.

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<sup>21</sup> Circular A-4, 18.

<sup>22</sup> Circular A-4, 25.

<sup>23</sup> circular A-4, 10.

<sup>24</sup> Circular A-4, 12. A number of criticisms of OMB’s guidelines have been offered. See, for example:

“A review of the Office of Management and Budget’s Draft Guidelines for Conducting Regulatory Analyses,” by Robert W Hahn and Robert E. Litan, Regulatory Analysis 03-6, March 2003, Joint Center AEI-Brookings Joint Center for Regulatory Studies and “Public Interest Comment on The Office of Management and Budget’s 2004 Draft Report to Congress on the Costs and Benefits of Regulation,” Mercatus Center, George Mason University Regulatory Studies Program.

<sup>25</sup> Circular A-4, 12.

<sup>26</sup> *Whitman v American Trucking Associations*, 531 U.S. 457 (2001).

## The Benefits of Cost Benefit Analysis

Cost benefit analysis' popularity as a tool for assessing policy choices is rooted in several factors. CBA appears to be a common-sense decision making rule that only policies whose likely benefits are greater than their costs should be pursued. CBA "sets out to do for government what the market does for business: add up the benefits of a public policy and compare them to the costs" and helps ensure government regulations and other policies do "not go astray for lack of an objective standard by which to judge whether they are meeting citizens' needs."<sup>27</sup> It is also promoted as a solution to the problem of lack of sensible priorities. Critics of government regulation such as Justice Stephen Breyer, for example, argue that agencies often fail to address the most serious risks, and that identifying the costs and benefits of alternative actions will help ensure policies that promise to accomplish the most good with available resources and give priority to reducing the most serious risks.<sup>28</sup>

CBA is championed as a way to avoid policies such as overly stringent regulations that impose major compliance costs but produce limited value. CBA seeks to ensure that only worthwhile projects are undertaken and that imposing costs does not waste resources that could be put to more productive use. Since the costs and benefits of different policy choices are believed to vary significantly, CBA can help ensure that comparable factors are examined in comparable ways and options are selected that produce the greatest benefits.<sup>29</sup> One variation of CBA, cost-effectiveness analysis, seeks to ensure that the option with the greatest benefit to cost ratio is identified. CBA is aimed at identifying the kinds of decisions markets would produce if they were able to function. Efficient allocation of resources is a widely held value, and CBA is a key tool in ensuring that policies promote efficiency.

Since tradeoffs are inevitable in a world of scarce resources and limited policy agendas, CBA seems to be an essential tool in ensuring that those tradeoffs are based on rational calculations. CBA advocates suggest that many of the decisions people make about the costs and benefits associated with daily decisions are based on irrational, uniformed calculations. Perceptions about risks and the benefits and costs of reducing or avoiding them are often based on inaccurate information. People are much more likely to die driving to the airport than they are in a plane crash, for example, but many nevertheless may believe that airplane accidents pose a much greater risk. CBA can help correct those irrational beliefs and help people assess alternatives based on statistical projections of actual risks, costs, and benefits.

Cost-benefit analysis' utilitarian roots make it attractive in a democracy. It calls for a distribution of benefits, opportunities, and burdens that generates the greatest welfare for the greatest number. It is consistent with economic efficiency; a failure to maximize benefits would be unjust, because of the unrealized potential for generating wealth and the consequential well-

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<sup>27</sup> Frank Ackerman and Lisa Heinzerling, *PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING* (2004): 37.

<sup>28</sup> Stephen Breyer, *BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION* (1993).

<sup>29</sup> Robert W. Hahn and Cass R. Sunstein, *A New Executive Order for Improving Federal Regulation? Deeper and Wider Cost-Benefit Analysis*. Working Paper 02-4, AEI-Brookings Joint Center for Regulatory Studies (March 2002), 3.

being. It seeks to maximize the economic value of goods and services or economic utility. It is also egalitarian: every person's utility or interests are given equal weight and reinforces democratic expectations of individual equality and majority rule.<sup>30</sup> Robert W. Hahn and Cass R. Sunstein suggest that "cost-benefit balancing is now the official creed of the executive branch."<sup>31</sup>

### **The Shortcomings of Cost Benefit Analysis**

The dominant role CBA plays in policy analysis at all levels of policy making, but at the federal level in particular, has fostered a wide range of criticisms of the theory on which it rests. One strand of criticism of cost-benefit analysis rooted in political philosophy focuses on the clash between the aggregation of utility and the moral commitment to protect individual rights. CBA may produce unfair outcomes as benefits largely accrue to one group while burdens are primarily imposed on others. "If enough cheering Romans pack the Coliseum to watch the lion devour the Christian," writes Michael Sandel in vivid imagery, "the collective pleasure of the Romans will surely outweigh the pain of the Christian, intense though it be." Following Kant, Sandel argues that utilitarianism fails because it "fails to respect the inherent dignity of persons" and "treats people as a means to the happiness of others, not as ends in themselves, worthy of respect."<sup>32</sup>

A second criticism is that cost-benefit analysis is based on an *aggregate* of relevant costs and benefits, but these consequences may not be distributed equally. An industrial facility that generates benefits reaching an entire community, for example, may also pose greater risks to some residents than others, such as those who live near enough to inhale toxic emissions. Even if the aggregate benefits clearly and strongly overwhelm the costs to local residents, it is hard to defend as fair such a mismatch between those who bear the burdens and enjoy the benefits of a particular activity. Since wealthy communities are willing and able to pay more to not have a hazardous or otherwise undesirable facility within their borders, the net benefits to society would be greatest if such facilities were located in low-income areas, a pattern that is not only expected in theory but typically realized in practice.<sup>33</sup>

Third, because CBA emphasizes the quantification and monetization of relevant variables, it typically carries with it an aura of objectivity that can be quite misleading. CBA is built on subjective judgments about what to include as relevant costs and benefits. For example, the costs of a regulation might include the direct compliance costs to be expended by regulated industries and the expenditures of the responsible regulatory agency. But they might also include the loss of tax revenue if production decreases, the cost to workers who might lose their job if part of the operations close as a result of the regulation, the cost to social service agencies as laid off workers require increased assistance, the cost to families of having their source of income disrupted, and on and on. While it is clearly the case that some costs and benefits are more plausibly associated with regulatory options than others, it may be difficult to replicate CBAs and ensure their consistency and comparability, since they require subjective judgments about what to include in costs and benefits and where to break off the causal chain.

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<sup>30</sup> See Henry S. Richardson, DEMOCRATIC AUTONOMY (2003).

<sup>31</sup> Robert W. Hahn and Cass R. Sunstein, 1.

<sup>32</sup> Michael Sandel, DEMOCRACY'S DISCONTENT (1996), 9.

<sup>33</sup> Ackerman and Heinzerling, 150-51.

Fourth, CBA is a much different framework for evaluating risks than most people regularly employ in evaluating risks, and estimates of costs and benefits often differ between experts and average citizens. Rather than relying on numerical probabilities, they generally consider both quality and quantity, and are particularly concerned about “unfamiliar, uncontrollable, involuntary, inequitable, danger to future generations, irreversible, man-made, and/or catastrophic” risks. In areas of great uncertainty, skeptics of CBA argue that it is at least as rational to admit that “some kinds of events are surrounded by such uncertainty that they outstrip our analytical power” and we should take precautionary action, as it is to “pretend that unknowable future events can be assigned precise numerical probabilities.”<sup>34</sup>

Fifth, the nature of the risks that are often the subject of CBA is a complicating but important factor here. CBA is championed as reflecting the idea that each person is the best judge of his or her own well-being. Risks that are voluntarily assumed and represent an informed choice pose less of a problem than risks involuntarily imposed on others. For example, the choice of individuals to live on the oceanfront and voluntarily accept the increased risk of damage or death from hurricanes and other storms does not pose a challenge to this notion of distributive justice. On the other hand, a decision to live next to a toxic emitting factory or incinerator is problematic, because it may be in only a very narrow sense “voluntary;” low-income persons may have few options besides choosing to live in economically depressed areas where prices are low and environmental risks are high.<sup>35</sup> Similarly, as tragically demonstrated by Hurricane Katrina’s impact on New Orleans in 2005, low income persons often lack meaningful choices about where to live, they are more susceptible to adverse consequences, and they often lack the resources to mitigate adverse effects. But CBA does not reflect differences in the acceptance of risk.

One might acknowledge the difficulties in achieving the expectations held for CBA, and the problems of quantifying and monetizing some values and even agree that it can be manipulated to provide “objective” cover for decisions reached on questionable grounds. But from this perspective, these are largely problems in implementation rather than a reflection of fundamental shortcomings with the methodology. One might argue that cost-benefit’s bias against values that are not easily quantified need not be fatal, since CBA can also lay out in qualitative terms the values to be compared. This systematic identification of the costs and benefits of alternatives can be a very useful decision making tool and help illuminate the consequences of policy choices. However, the inability of such qualitative CBAs to generate an unambiguous bottom line—whether the benefits are greater than the costs—renders it of only limited value, and fails to provide the kind of analysis that makes CBA so attractive to advocates.

The debate over cost benefit analysis between economists, philosophers, policy analysts and others suggests that CBA will always have defenders and detractors. Our purpose here is not to suggest that CBA has no place in policy analysis; it clearly does. We applaud efforts to improve and refine CBA so that it can be a more useful tool in illuminating policy options. What we do suggest is that, at least in the area of natural resource policy, CBA cannot and should not

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<sup>34</sup> Ackerman and Heinzerling, 130, 138.

<sup>35</sup> See generally, Robert D. Bullard, *DUMPING IN DIXIE: RACE, CLASS, AND ENVIRONMENTAL QUALITY* (1990).

play the role its most ardent advocates argue it can. CBA should not be the official creed of the federal government. It should not be seen as a kind of mega-decision rule to guide policy makers in assessing policy options. It should be an intermediate level analytic tool in service to a broader set of principles rooted in the idea of ecological sustainability. The discussion below first explores in more detail the reason why CBA cannot serve as a fundamental criterion for natural resource policy making and then turns to a discussion of how sustainability is a better candidate for playing that role.

## II. CBA in Natural Resource Agencies

CBA has deep roots in natural resource policy making. One of the earliest uses of CBA was to evaluate water projects.<sup>36</sup> How well has CBA served as a guide for decision making in this policy arena? Our discussion focuses on CBA in the context of natural resource policy making in federal agencies, although some of the issues raised may parallel concerns in other policy arenas.

### Army Corp of Engineers

The Army Corp of Engineers is the principal federal agency for water-related development projects, including both fresh and salt-water projects. In 1980 a federal advisory body, the Water Resources Council, proposed a set of principles and standards to be used by federal agencies that were involved in developing water resources. These guidelines were used to evaluate the national economic development (NED) costs and benefits of federal water and related land resource projects.<sup>37</sup> In 1983, the Reagan administration issued a new set of principles that superseded the earlier guidelines.<sup>38</sup> These principles only applied to the Army Corp of Engineers, the Bureau of Reclamation, and the Tennessee Valley Authority. The principles contained in this directive were more general in nature than the earlier principles and guidelines; the directive required "water and related land resources project planning... to contribute to national economic development consistent with protecting the Nation's environment,"<sup>39</sup> and provided that policy options producing the greatest net economic benefit consistent with protecting the nation's environment be the selected alternative.<sup>40</sup>

Cost-benefit analysis occurs throughout the Corp's multi-tiered planning process, involving six steps:<sup>41</sup> (1) identify problems and opportunities; (2) inventory and forecast the critical resources relevant to these problems and opportunities; (3) formulate alternative plans (in formulating these plans, the Corp is required by law to consider; enhancing national economic development, protecting and restoring the quality of the total environment, the well-being of the people of the U.S., the prevention of loss of life, and the preservation of

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<sup>36</sup> Edward Gramlich. A GUIDE TO BENEFIT-COST ANALYSIS (1998), 2.

<sup>37</sup> 44 FR 72892, Dec. 14, 1979.

<sup>38</sup> Planning Guidance, Army Corp of Engineers ER 1105- 2-100, 1-2,3, Apr. 22, 2000.

<sup>39</sup> Id., at 2.

<sup>40</sup> Id., at 1-3. This criterion can, however, be overridden if other concerns called for a different outcome. Id. These guiding principles gave rise to the current Army Corp of Engineer regulations found in guidance document ER 1105-2-100 entitled Planning Guidance which outlines the current procedures the Corp must follow before a project can begin.

<sup>41</sup> Planning Guidance, Army Corp of Engineers ER 1105-2-100, 2-2, Apr. 22, 2000.

cultural and historic values);<sup>42</sup> (4) evaluate alternative plans; (5) compare alternative plans; and (6) select a plan.<sup>43</sup> Specific guidelines are aimed at shaping the analysis. Benefits, for example, can be both monetary and non-monetary.<sup>44</sup> Analysts are to perform trade-off analyses, which requires identify the potential gains and loses associated with producing a larger or smaller amount of a given output or outputs.<sup>45</sup> To capture the true opportunity costs of a proposed plan (the value of that which is foregone when a particular plan or measure is pursued), national economic development costs include implementation costs, other direct costs, and associated costs.<sup>46</sup> Implementation costs are the explicit costs of implementing a project; other direct costs are the costs of resources directly required for a project or a plan but for which no implementation outlays are made; and associated costs are those costs necessary for production of project outputs for which no project expenditure is made.<sup>47</sup> Additional guidelines focus on how to deal with uncertainty. Officials are to “characterize, to the extent possible the different degrees of risk and uncertainty and to describe them clearly so that decisions can be based on the best available information.”<sup>48</sup>

The *Washington Post* has published a series of articles in recent years on the Army Corps of Engineers’ use of cost-benefit analysis. The articles describe a number of projects in which the Corps use of cost-benefit analysis has been questioned. In one case, an environmental group claimed although the Corp found a slight benefit for a project; in reality, the project actually had losses that were up to 50 times greater than the benefits.<sup>49</sup> The articles argue that the Corp is really just a political pawn that is used by Senators and others to get projects into their home voting districts.<sup>50</sup> The Office of Special Counsel of the Department of Defense, according to the *Post* report, concluded that Corps officials appeared to engage in a deliberate pattern of manipulating economic cost analyses in order to justify expansion of Corps projects.<sup>51</sup>

The ill-fated efforts of the agency in preparing New Orleans for Hurricane Katrina raises similar concerns about agency analysis. The Corps spends more money in Louisiana than any other state. It had just begun a construction project on one of the levees along the New Orleans Industrial Canal that was breached by Katrina; the project was not aimed at flood control but to build a new lock for the canal as part of an effort to accommodate increasing barge traffic, despite the fact that canal traffic had been steadily falling. That project was one of the Corps’ most controversial projects, challenged legally and politically by taxpayer, environmental, and low-income advocacy groups, but nevertheless pursued by the agency after it left out from its analysis data on declining barge traffic. Critics have renewed the charge that Corp officials manipulate analyses in order to justify projects, and there is no mechanism for setting priorities.

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<sup>42</sup> *Id.* at 2-4

<sup>43</sup> *Id.* at 2-7.

<sup>44</sup> *Id.* 2- 10.

<sup>45</sup> *Id.*

<sup>46</sup> *Id.* at 2-11,12.

<sup>47</sup> *Id.* at 2-12.

<sup>48</sup> Planning Guidance, Army Corp of Engineers ER 1105-2-100,1 App. D E- I 1, Apr. 22, 2000; quote at E-12.

<sup>49</sup> Michael Grunwald, *A Race to the Bottom', with flawed analyses, corps dredge ports nationwide*, A1, WASHINGTON POST, September 12, 2000.

<sup>50</sup> Michael Grunwald, *Working to Please Hill Commanders; In miss. and elsewhere, lawmakers call shots*, A1, WASHINGTON POST, September 11, 2000.

<sup>51</sup> Michael Grunwald, “*An Agency Unchecked Clout; water projects roll past economic, environmental concerns,*” WASHINGTON POST, September 10, 2000, A1.

This is not simply a problem of inadequate agency analysis, however. The Corps' \$4.7 billion annual budget is almost completely determined by earmarks inserted by individual members. Even after a port deepening project had failed the cost-benefit analysis, one of the state's senators had included in an emergency funding bill a provision ordering the agency to redo its analysis of the project.<sup>52</sup> CBA has failed here to play the kind of role its advocates argue that it or should be able to play in federal agency decision making.

## U.S. Forest Service

The U.S. Forest Service (USFS) uses cost benefit analysis in making a number of planning and management decisions that impact public lands. However, it does not use CBA as its primary determinant; instead it considers costs and benefits as one set of criteria in a long chain of factors that feed into its decision process. Cost-benefit analysis is reserved for use in assessing traditional economic impacts and not for the analysis of noncommodity values, where the agency has as developed other criteria. In its forestry planning process, for example, under the Forest and Rangeland Renewable Resources Planning Act, the USFS is to implement a renewable resource program that is based on "a comprehensive assessment of present and anticipated uses, demand for, and supply of renewable resources from the Nation's public and private forests and rangelands, through analysis of environmental and economic impacts."<sup>53</sup> In carrying out this assessment, the agency is to evaluate "opportunities for improving yield of tangible and intangible goods and services, together with estimates of investment costs and direct and indirect returns to the federal government."<sup>54</sup>

In response to this act, the Forest Service created a series of procedures for assessing national forest land policy options that involve a number of interdisciplinary groups.<sup>55</sup> One group in this process is the Forest Resources Economics Research and Resource Program and Assessment group, which conducts research in land capability, resource analysis (including recreation, wilderness, wildlife, range, timber, water, and minerals), multi-resource use, and in projections of long-term supply and demand.<sup>56</sup> When all of the groups have completed their analysis, agency staff prepare a assessment, which includes:

- The "economic, social, and environmental implications of the relationship between long-run demand and supply projections," Id. at 1912.4(1).
- The "net social and economic contributions to the Nation's well being with consideration given to the regional and local benefits," Id. at 1913.03(4).
- The "costs, outputs and effects in terms of the Forest Service role and national goals" of alternatives,
- The "economic impacts of each decision," and
- "implementation requirements, cost effectiveness, economic efficiency, equity considerations, and budgetary constraints." Id. at 1913.13(2).

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<sup>52</sup> See Michael Grundwald, *Money Flowed to Questionable Projects*, WASHINGTON POST, September 8, 2005, A1.

<sup>53</sup> 16 U.S.C.A §1600 (3); see also 16 U.S.C.A §1604(g).

<sup>54</sup> 16 U.S.C.A §1601 (a)(2); see also 16 U.S.C.A. §1602 (2).

<sup>55</sup> Forest Service Manual, Title 1900, 1910.3(2).

<sup>56</sup>

Cost-benefit analysis is part of the process, but it is only used to assess the values of traditional commodity goods and to account for traditional costs. In other words, it is used to assess the value of trees and the costs of getting the trees out of the forest, but is not used to value the preservation of wilderness or the value of a scenic overlook or other noncommodity values.<sup>57</sup>

Another area in which the USFS often uses cost-benefit analysis is in environmental impact statements (EIS) required by the National Environmental Policy Act (NEPA). NEPA guidelines require that CBA should be incorporated into NEPA documents if that is relevant to the choice among alternatives.<sup>58</sup> In response, the USFS created its own guidelines for including cost-benefit analysis in NEPA documents.<sup>59</sup> The USFS guidelines provide that CBAs must “discuss the relationship between that analysis and any analyses of unquantified environmental impacts, values, and amenities.”<sup>60</sup> USFS officials do not try to quantify other environmental impacts; instead, they compare the environmental and economic impacts of each type of data. An example of the agency’s assessment of timber sales helps illustrate this approach. In preparing a draft EIS for timber sales in the Gifford Pinchot National Forest, officials looked at a number of variables, including soils, climate, vegetation and biological diversity, water, fish, wildlife, roads, trails, social and economic impacts, and cultural resources. They used a separate method of analysis for each of these variables. In the economic impacts section, they used CBA. The benefits were defined as the price paid by the purchaser for the timber and increased employment rates and wages that would benefit the local economy. The costs associated with the project included planning, harvesting, road building, watershed protection, replanting, and wildlife protection projects. The CBA then became part of a broader analysis that had been conducted that did not quantify any of the other variables in monetary terms.

The Forest Service is not insulated from CBA performed by other agencies. In one of the most far-reaching decisions ever made by the Forest Service, it proposed in 2000 to protect 60 million acres of roadless areas from logging. The policy was challenged by the timber industry when the Bush administration took office, and the OMB issued an analysis in 2002 concluding that the annual costs of the policy were \$184 million and the benefits were \$219,000. Not included in the benefits were the ecological services forests provide, such as purifying air and water, trapping carbon dioxide and reducing the threat of global warming, providing habitat for species, and ecotourism; the benefits were limited to the savings from not building roads.<sup>61</sup> As a result of the analysis, the roadless rule was put on the OMB’s hit list of regulatory policies to be reviewed by agencies. The Bush administration withdrew the rule in July, 2004, arguing that the policy faced “endless lawsuits” and needed to be replaced by a policy emphasizing cooperation between state and federal governments. The CBA itself did not produce the demise of the roadless policy, but is useful here as an example of how the analysis sometimes takes place in natural resource policy.<sup>62</sup>

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<sup>57</sup> See Visual Management System, USDA Agriculture Handbook 462, Vol.2.

<sup>58</sup> 40 C.F.R. § 1502.23.

<sup>59</sup> Forest Service Environmental Policy and Procedures Handbook, FSH 1909.15.

<sup>60</sup> Forest Service Environmental Policy and Procedures Handbook, FSH 1909.15, Chap. 20, 22.35.

<sup>61</sup> Ackerman and Heinzerling, 5-7.

<sup>62</sup> Juliet Elperin, *Roadless Rules for Forests Set Aside*, WASHINGTON POST, July 11, 2004, A1. The rule was also invalidated by a Wyoming federal district court and that case was awaiting appeal when the administration replaced the rule allowing governors to petition the USFS if they wanted roadless areas protected from development.

## Bureau of Land Management

The Bureau of Land Management (BLM) uses cost-benefit analysis in land-use planning and NEPA compliance. In these types of situations the BLM appears to use the cost-benefit analysis in much the same manner as the Forest Service.<sup>63</sup> For traditionally noncommodity items such as the benefit of increasing water or air quality, the BLM simply qualitatively defines the benefit and appears to make a judgment regarding the value of the benefits and whether it outweighs the costs, and does not try and quantify all variables so a formal cost-benefit analysis can occur.

An example of how CBA takes place in the BLM can be found in the agency's recent revision of its surface management regulations.<sup>64</sup> Because the impacts of this policy change were expected to exceed \$100 million annually the BLM conducted a programmatic cost-benefit analysis for the new regulations.<sup>65</sup> In conducting this analysis the BLM admitted that the costs were fairly easy to quantify and constructed ten computer models for estimating the potential costs associated with each type of mine. In assessing the costs of the new mining regulations the BLM considered the following as costs: foregone production, capital values, employment loss, mining costs (labor, equipment, fuel, electricity, etc.), variable reclamation costs, costs with meeting water quality requirements, permitting and environmental compliance costs, and BLM administrative costs. Each of these costs was then analyzed independently and a discussion on the impacts to individual miners was carried out. All of these variables were also plugged into the various computer models that were created and an output was created that showed the impacts of these costs on various mining operations over a ten year span. In the end the BLM produced an estimated yearly cost range for each alternative.

The BLM had a much harder time defining and quantifying the benefits of the new regulation and reported them in qualitative form. Agency analysts defined the economic benefits of the proposed regulations "as the avoided costs of potential future environmental damages or benefits associated with higher levels of environmental quality." The benefits that were considered were: gaining of additional information (on mining activities, environmental conditions, and means of addressing potential hazards), water quality, air quality, fish and wildlife, wetland and riparian, enhanced enforcement mechanisms, recreation, cultural, and non-use values.<sup>66</sup> The analysis argued that the benefits can only truly be defined when examining individual projects. BLM examined the possibility of trying to quantify benefits through

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<sup>63</sup> See Department of the Interior, BLM, Land Use Planning Handbook, Handbook No. H-1601-1 (available at <[http://www.blm.gov/nhp/200/w210/landuse\\_hb.pdf](http://www.blm.gov/nhp/200/w210/landuse_hb.pdf)>); Department of the Interior, BLM, National Environmental Policy Act Handbook, Handbook No. H-1790-1 (available at <<http://www.blm.gov/nhp/efoia/wo/handbook/h1790-1.htm>>).

<sup>64</sup> 43 C.F.R. 3809.

<sup>65</sup> Department of the Interior, BLM, Surface Management Regulation (3809) Benefit-Cost Analysis (October 21, 2000) (available at <[http://www.blm.gov/nhp/news/regulatory/3809-final/benefit\\_cost/benefit\\_cost\\_analy.htm](http://www.blm.gov/nhp/news/regulatory/3809-final/benefit_cost/benefit_cost_analy.htm)>).

<sup>66</sup> The BLM said at the beginning of the benefit section: "[t]he material below identifies and discusses the expected benefits in conceptual and qualitative terms but does not attempt to derive quantitative estimates of the benefits of the regulation. Developing such estimates is neither feasible or practical given the programmatic nature of the regulation. . . ."

considering avoided costs. It looked at a series of past environmental impacts from mining and at the costs associated with those projects; costs that could be avoided at those sites under the new regulation were considered to be benefits. However, the agency found this method of calculating benefits was troublesome for a number of reasons and decided not to rely on it. Instead, the BLM took each benefit category and discussed the potential benefits of each alternative in a qualitative way. The BLM included quantitative analysis, but, in the end, it did not monetize benefits: “the benefits of the alternatives cannot be quantified because information on site specific factors is not available.” The agency concluded that “[t]he potential environmental benefits of protecting even a small number of unique resources over time could easily offset the costs of the regulation” and the new regulation was adopted.<sup>67</sup>

### **National Park Service**

Although the use of cost-benefit analysis is never specifically mentioned in National Park Service (NPS) Management Policies there are discussions in the Management Policies relating to the need to weigh environmental impacts against opportunities for public use.<sup>68</sup> The NPS has produced a number of handbooks that give guidance on how to carry out specific planning actions in light of these two values. One of these handbooks, the Directors Order 12 Handbook, provides guidance on NPS compliance with the National Environmental Policy Act (NEPA).<sup>69</sup> Although NEPA does not require a cost-benefit analysis, it does require an interdisciplinary study, and a cost-benefit analysis is often one aspect of that kind of study.<sup>70</sup>

The NPS, for example, recently completed a cost-benefit analysis in conjunction with updating its winter use policies for Yellowstone and Grand Teton National Parks.<sup>71</sup> The first part of the analysis looked at the costs associated with each alternative that had been identified in the environmental impact statement. These cost were separated into four types: (1) Initial costs are those required to get the parks into position to allow the implementation of the selected alternative; (2) Replacement costs are the costs associated with replacing equipment as it wears out under a given alternative; (3) Annual costs are those that are derived from carrying out activities defined under a given alternative on an annual basis. (4) The life-cycle costs, which include the management and administrative costs associated with the selected alternative.<sup>72</sup> In addition to the above costs the NPS looked at impacts on income, employment, and tourism under each alternative.<sup>73</sup> These variables were considered either a cost or a benefit depending on the alternative being considered. Based on these numbers the NPS determined the economic impacts, positive or negative, of each alternative. Following the release of the draft EIS the NPS

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<sup>67</sup> 43 C.F.R 3809. See Also 65 Fed. Reg. 69998, 70099 (Nov. 21, 2000) (Notice of rule change and discussion of the cost-benefit analysis); 66 Fed. Reg. 54834, 54844 (Oct. 30, 2001) (Notice of rule change and discussion on compliance with EO 12866).

<sup>68</sup> U.S. Department of the Interior, National Park Service, Management Policies 2001, [www.nps.gov/policy/mp/policies.pdf](http://www.nps.gov/policy/mp/policies.pdf), at 24.

<sup>69</sup> U.S. Department of the Interior, National Park Service, Directors Order 12 Handbook-NEPA Compliance, <[www.nps.gov/policy/dorders/rm12.pdf](http://www.nps.gov/policy/dorders/rm12.pdf)>.

<sup>70</sup> Id. at 7.

<sup>71</sup> U.S. Department of the Interior and National Park Service, Winter Use Plans Final Environmental Impact Statement for the Yellowstone and Grand Teton National Parks and John D. Rockefeller, Jr., Memorial Parkway vol. I, 104-118.

<sup>72</sup> Id. at vol.1 105-118.

<sup>73</sup> Id. at vol.1 105-118.

received public comments that raised the concern that “the economic analysis must include an assessment of the environmental costs associated with snowmobiling.”<sup>74</sup> In explaining the role of noneconomic factors in the economic analysis, the NPS analysis stated:

The modeling of resource values (for example the value of an elk or of clean water) is possible within identified limits and assumptions, and it is a valuable tool in answering some questions. Often it is difficult to find much agreement on what the assumptions should be, because they are literally value judgment. This is the primary limitation on such models: value lies in the eye of the beholder and there is no agreement within the body politic on inherent value of resources in dollars.<sup>75</sup>

Based on these comments the agency decided to not try and quantify the value of clean air or the value of biodiversity. Instead, analysts considered each of these factors separately in the EIS and discussed the impacts of each alternative on these resources in a qualitative instead of quantitative way. Although the NEPA compliance process is not the only way in which the NPS uses cost-benefit analysis, it does illustrate the way in which cost-benefit analysis is used generally. The NPS, like other federal agencies, does not generally try to quantify the value of traditionally noneconomic factors like biodiversity or a scenic view. Instead, the NPS qualitatively assesses these variables and then compares the quantitative noneconomic data with the qualitative economic data.

### **The Environmental Protection Agency**

The Environmental Protection Agency is a strong advocate of cost benefit analysis and most EPA regulations have undergone some form of cost benefit analysis. EPA use of CBA is governed by the agency’s *Guidelines for Preparing Economic Analyses*.<sup>76</sup> In terms of benefits, the Guidelines suggest that all value stems from an individual’s willingness to pay for a benefit or to avoid a harm or the amount required to compensate an individual for a loss.<sup>77</sup> WTP is commonly used to value benefits because it is relatively easy to measure and estimate. In practice, the difficulty of obtaining enough WTPs for an entire set of policy options leads analysts to use an effect-by-effect approach.<sup>78</sup> Contingent valuation may also be used to develop estimates of WTP for the combined effects of a policy, and this can then be used to serve as an upper bound for the cumulative WTP.<sup>79</sup> The effect-by-effect approach requires the analyst to identify potential benefit categories, determine the physical effects of the pollutants as they move through the environment, consider possible change in the effects as a result of the policy, quantify significant physical effects in terms of the changes resulting from each policy option in comparison to the baseline, describe qualitatively the effects that cannot be quantified, estimate

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<sup>74</sup> *Id.* at 119.

<sup>75</sup> *Id.*

<sup>76</sup> It is interesting to note that none of the sources of authority for performing economic or cost benefit analysis detail the manner in which such an analysis should be carried out nor do they establish the types of factors (economic, health, ecological, etc) that should be considered. The only direction from without the individual agencies comes from the Office of Management and Budget and will be discussed later.

<sup>77</sup> Guidelines, p60.

<sup>78</sup> Guidelines, p62.

<sup>79</sup> Guidelines, p62.

the values of the effects using studies that address the expected impacts or by transferring estimates from studies of similar impacts, and describe the sources of estimates and the confidence or reliability of those sources.

The Guidelines include the following suggestions to guide analyses:

- Focus on key issues; resources should be focused on benefits categories that are likely to influence policy decisions (however, there is no guidance as to what types of benefits categories are the most influential),
- Balance usefulness of further information against the cost of doing the research,
- Additional research may not be warranted if the new information is unlikely to lead to a different conclusion,
- Consider changes in behavior as a result of improvements in environmental quality
- Guard against double counting benefits
- Explicitly address uncertainty and non-monetized effects; benefits should not be monetized only when there is significant uncertainty that cannot be reduced; the relative significance of unquantified benefits should be described.

The Draft 2005 Report to Congress, “Benefits and Costs of Federal Regulations,” provides several examples of EPA regulations along with their accompanying benefits and costs. It also serves as an illustration of EPA CBA practices. When a regulation results in reduced emission EPA will frequently only quantify but not monetize the benefits of a rule. For example, for the 1995 Rule on Standard of Performance for Municipal Waste Combustors, the EPA calculated the costs at \$320 million/yr (in constant 1990 dollars) but the benefits were listed as quantified reductions in PM<sub>10</sub>, SO<sub>2</sub>, MO<sub>x</sub>, Mg, and dioxin emissions (Mg. and Kg.).<sup>80</sup> Sometimes the EPA will quantify and monetize some of the benefits and mention other possible benefits that were not monetized. The EPA’s National Primary Drinking Water Regulations for Disinfectants and Disinfection Byproducts (1998) identified costs at \$700 million and benefits as 0 to 9,300 avoided bladder cancer cases per year, monetized at \$0-4 billion/yr (all in 1998 dollars); possible reduction in rectal and colon cancer and reproductive and developmental effects were not quantified.<sup>81</sup> EPA’s National Primary Drinking Water Regulations for Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring (2001) identified costs at \$206 million (1999 dollars) and benefits at from \$140-198 million, but agency officials were unable to monetize or even quantify other benefits such as reduction in skin and kidney cancers.<sup>82</sup> In its Effluent Guidelines and Standards for the Meat and Poultry Products Point Source Category, the EPA calculated the benefits for increased recreational use but not for reduced levels of pathogens or increased health of the environment or reduction of eutrophication. In the regulation Establishing Location, Design, Construction, and Cooling Water Intake Structures at Large Existing Power Plants, the agency calculates the increased fish catch (recreational and commercial) and mentions but does not specify other “ecological and non-use benefits.”<sup>83</sup>

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<sup>80</sup> Draft 2005 report to Congress, p26

<sup>81</sup> Draft 2005 Report to Congress, p26.

<sup>82</sup> Draft 2005 Report to Congress, p27.

<sup>83</sup> Circular A-4 says that if non-quantifiable factors are important that they should be mentioned and discussed. It isn’t clear from the Draft Report whether the ecological and non-use benefits were discussed at much length but

## Assessing CBA in federal natural resource agencies

The examples cited here do not reflect a systematically selected sample of federal agency analysis of natural resource policies, but they do reflect some of the most politically visible policies agencies have pursued. It may be that CBA works better for routine, small scale policy making than when agencies confront major policy choices. The examples suggest that when economic and environmental values are combined, quantified economic variables are given more attention than environmental ones that are often unquantified. Describing and assessing the costs and benefits can be a useful way to collect and display information, but CBA hasn't served as a clear guide to agency decision making. The analysis is easily biased in favor of easily quantified values, such as industry compliance costs, and against more intangible and hard to quantify ethical values of biodiversity, environmental health, social equity and empowerment of politically disadvantaged groups, and public well being. Cost-benefit analysis' bias against values that are not easily quantified can be overcome by resisting quantification and laying out in qualitative terms the values to be compared. This systematic identification of the costs and benefits of alternatives can be a very useful decision making tool and help illuminate the consequences of policy choices, but the pressure to produce an unambiguous bottom line—whether the benefits are greater than the costs—creates strong incentives to eventually minimize the importance of those nonmonetized variables such as environmental quality.

CBA is inevitably biased in favor of easily quantified values, such as industry compliance costs, and against more intangible and hard to quantify ethical values of biodiversity, environmental health, social equity and empowerment of politically disadvantaged groups, and public well being. The costs of compliance with regulations, for example, are much easier to estimate than the benefits of actions that save lives, reduce cancer cases, and protect nature, because these benefits are literally priceless. Cost-benefit analysis' bias against values that are not easily quantified can be overcome by resisting quantification and laying out in qualitative terms the values to be compared. This systematic identification of the costs and benefits of alternatives can be a very useful decision making tool and help illuminate the consequences of policy choices, but the pressure to produce an unambiguous bottom line—whether the benefits are greater than the costs—creates strong incentives to eventually minimize the importance of those nonmonetized variables such as environmental quality.

To overcome the problem of pricelessness, analysts have tried to devise surrogate measures of prices for these values, such as how much people value their own life. The EPA and other federal agencies often uses the figure of about \$6 million to represent the value of a statistical life. If a regulation is expected to cost more than \$6 million and its benefit is only one life saved, then it should not be pursued. This figure is based on the value of life reflecting the premium paid to workers to accept jobs with a greater risk of injury or death. But not all workers are free to choose among more or less risky jobs. Latino workers die on the job at a higher rate than whites or blacks, perhaps a result of limited English skills that means they are less likely to understand warnings and safety information, especially when given in an emergency, and may not be in a position to demand an unsafe job premium. Using wage-risk calculations, for

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mentioning them on one line amidst the hard numbers of monetized costs and benefits doesn't seem like an effective way of taking them into consideration.

example, one study found the value of a statistical life for male blue collar workers is \$2.6 million and \$13 million for women; for white collar workers, the value is \$6.1 million for men and \$42.3 million for women.<sup>84</sup> Which figure should represent the value of life used in cost benefit analysis?

Alternatively, estimates of the value of life employed in CBA may be based on the compensation given to victims of accidents and crimes, but such calculations run counter to most people's intuition. In the case of the 1989 Exxon Valdez spill in Alaska's Prince Williams Sound, a jury found fishermen and local residents suffered economic losses of \$300 million as a result of damages to sea life from the leaked oil. Prosecutors, in deciding what level of punitive charges to seek, hired consultants to surveyed a sample of Americans and asked them how much they would be willing to spend to clean up the spill; the average was \$100, for a national total of \$9 billion. When respondents were asked how much they would pay to allow another spill to occur, many said they would refuse to allow that, at any price. Congress unanimously passed the 1990 Oil Pollution Act to require double hulled tankers, without conducting an assessment of costs and benefits. Other estimates of willingness to pay also appear incoherent. A family may be awarded \$3 million for the wrongful death of a family member, but that does not mean that they would accept the idea that people can kill others as long as they are willing to pay \$3 million for the privilege of doing so: "Society may demand compensation after the damage has been done, but that does not establish a price at which future damages should be allowed with impunity."<sup>85</sup> These estimates clash with how people think about typical risks, such as driving a car or flying in an airplane, and are likely to be willing to allocate resources to reduce risk, because the nature of these risks are quite different.<sup>86</sup> For many people, a major tenet of their religious or personal morality is that they value others' lives more than their own, such as parents who are devoted to their children or soldiers who are devoted to their country. How much is it worth to a person to prevent the death of another person or even to not be complicit in the death of others? People's common, intuitive reasoning is rooted in a social context rather than in an abstract calculation of statistical life.<sup>87</sup>

Finally, when CBA is used, it appears in many cases to provide little policy guidance. The OMB estimated that the total annual costs associated with all major federal environmental regulations was between \$120 billion and \$203 billion; the total annual benefits were between \$120 billion and \$1.78 trillion. This wide range in estimates suggests that CBA is a very limited guide to policy making.<sup>88</sup> Even though cost-benefit analysis has been institutionalized since the early 1980s, it has apparently not prevented federal agencies from issuing rules where the costs and benefits seem, from a common-sense point of view, out of balance. Justice Breyer, for example, found a 1990 EPA regulation for the hazardous waste listing for wood-preserving

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<sup>84</sup> Risk-wage calculations are made by taking the risk of death in a job, say 1 in 10,000, the typical rate in a blue collar job, whose pay is 30 cents an hour or \$600/year more than a safe, risk free job, the typical white collar job. Workers taking the risky job accept \$600 for a 1 in 10,000 chance of death, suggesting that they value a life at \$600 x 10,000 or \$6 million. See Ackerman and Heinzerling, 76-79.

<sup>85</sup> Ackerman and Heinzerling, 153-57, quote at 157.

<sup>86</sup> Breyer, 13-14.

<sup>87</sup> Ackerman and Heinzerling, 69-71.

<sup>88</sup> Office of Management and Budget, *Draft Report To Congress On The Costs And Benefits Of Federal Regulations*, 67 FED. REG. 15014 (March 28, 2002), at 15037.

chemicals whose cost per premature death averted was estimated at \$5, 700,000,000.<sup>89</sup> Hahn and Sunstein, in their analysis of cost benefit analysis in federal agencies, examined a number of regulations whose costs exceeded their benefits, and found that the executive orders mandating CBA apparently “have not had a large effect and may have had “little impact on what agencies actually do” despite their initial argument that CBA is the reigning orthodoxy for federal policy making.<sup>90</sup> Environmental regulation and natural resource policy is highly ideological and aggressively debated. CBA is a weapon used in these battles, rather than an objective standard that those of different political faiths can jointly embrace. The champions of CBA in the Federal government and Washington think tanks are predominately those who believe that there is too much regulation and that society would be better off with fewer public policies and less government intervention in the economy. CBA seems to be well suited to help them marshal arguments against such policies.

### III. Beyond CBA

The shortcomings of CBA in natural resource policy making are not simply the result of problems with calculating benefits, but are rooted in the neoclassical economic theory that underlies the calculation of costs and benefits that is not well suited to assess environmental and natural resource-related issues. The core tenets of ecological science clash with the assumptions underlying CBA and market economics. At one level, the problem is rooted in differences between private and social costs and benefits. Markets work well when private and social costs are equivalent, when prices include all the costs that matter to society and to the environment. But prices often fail to reflect the true, environmental costs of production, and companies have powerful incentives to externalize rather than internalize costs in the pursuit of maximum profits. There are often differences between the private and social benefits: the use of some resources may produce economic gains for some individuals, while other activities could bring much greater gains. Planting a forest creates some level of benefits for a landowner who eventually sells the timber, for example, but it also produces additional benefits of sequestering carbon, filtering air and water, and providing habitat that are not likely to be reflected in markets. Geoffrey Heal nicely summarizes this fundamental limitation of markets: “Just as we will tend to do too much of the activities whose social costs exceed the private costs, so will we also do too little of those for which social benefits exceed private benefits.”<sup>91</sup>

Market theory demands that costs and benefits that extend very far into the future are discounted and devalued. As a result, as William Ophuls and A. Stephan. Boyan, Jr. argue, “critical ecological resources that will be essential for our well-being even 30 years from now not only have no value to rational economic decision makers, but scarcely enter their calculations at all.”<sup>92</sup> Markets typically handle incremental change with relative ease but tend to break down when confronted with absolute scarcity or even marked discrepancies between supply and demand. In such situations (for example, in famines), market collapses or degenerates into

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<sup>89</sup> Breyer, 27.

<sup>90</sup> Hahn and Sunstein, 3.

<sup>91</sup> Geoffrey Heal, *NATURE AND THE MARKETPLACE: CAPTURING THE VALUE OF ECOSYSTEM SERVICES* (2000).

<sup>92</sup> William Ophuls and A. Stephan. Boyan Jr., *EQUALITY AND THE POLITICS OF SCARCITY REVISED* (1992), 219.

uncontrolled inflation, because the increased price is incapable of producing an equivalent increase in supply. Markets also fail to respond to problems of ecological scarcity because scarcity "tends to induce competitive bidding and preemptive buying, which lead to price fluctuations, market disruption, and the inequitable or inappropriate distribution of resources."<sup>93</sup> Even if prices are carefully regulated to ensure they reflect true costs, the assumptions on which neoclassical economics rests are largely at odds with ecological science.<sup>94</sup>

The inherent dynamic of markets has produced, as F. Herbert Borman and Stephen R. Kellert put it, a global environmental deficit, the "collective and mostly unanticipated impact of humankind's alteration of the earth's atmosphere, water, soil, biota, ecological systems, and landscapes." This deficit has occurred because "the longer-term ecological, social, and economic costs to human welfare are greater than the shorter-term benefits flowing from these alterations."<sup>95</sup> Ecosystems are dominated by shared resources, such as air and water, that create a "common pool over both space and time" that ensures a mismatch between costs and benefits. Those who receive benefits from economic activity "will often not be required to absorb the related costs."<sup>96</sup> Environmental deficits rob future generations as they permit profligate consumption by the current generation who pursue their interests rather than ensuring that the needs of current and future generations are preserved. More broadly, market ideology fails to reflect the larger community of land, resources, biomes, languages and cultures, and institutions in which economic activity is embedded and on which it depends.<sup>97</sup>

Ecological science emphasizes the complexity and interconnectedness of nature that operates much differently than the kind of simple, linear balancing of markets. Nature is characterized as multi-causal, non-linear, multi-scalar, unpredictable, and dynamic. Equilibria may be reached, then a new balance struck as ecological conditions change. Elements of ecosystems are not fungible and interchangeable but are inextricably intertwined; if key elements are lost, the system as a whole ceases to function as it has in the past, and ecologists argue that the natural systems on which life depends are faltering.<sup>98</sup> Societies have collapsed in history as population pressures lead to unsustainable and environmentally damaging practices that lead to societal decline and collapse.<sup>99</sup> Economic life is dependent on the health of the natural world, but natural resources are exhaustible and natural systems as a whole are irreplaceable. Spatial and temporal scales, affected by one location, may be quite different in another. Protecting the health of ecosystems on which all life depends requires adaptive management that acknowledges uncertainty and complexity and seeks to protect the long term structure, function, and integrity of ecosystems. Public land managers need to think in multiple scales and take multiple approaches that are integrative and holistic rather than reductionist and incremental.<sup>100</sup>

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<sup>93</sup> Ophuls and Boyan, 220.

<sup>94</sup> Nadeau, 9.

<sup>95</sup> F. Herbert Borman and Stephen R. Kellert. *ECOLOGY, ECONOMICS, ETHICS: THE BROKEN CIRCLE*. (1991), xii.

<sup>96</sup> *Id.*

<sup>97</sup> See, generally, Herman E. Daly and John B. Cobb, Jr., *FOR THE COMMON GOOD* (1994).

<sup>98</sup> Yvonne Baskin, *THE WORK OF NATURE: HOW THE DIVERSITY OF LIFE SUSTAINS US* (1997), 4;

<sup>99</sup> Jared Diamond, *COLLAPSE: HOW SOCIETIES CHOOSE TO FAIL OR SURVIVE* (2005), 5-6.

<sup>100</sup> Presentation by John Shultis, University of British Columbia, 8<sup>th</sup> World Wilderness Congress, Anchorage, October 6, 2005.

Challenging or even rejecting CBA is far from the same as suggesting that compliance costs cannot or should not be assessed. David Driesen, for example, argues that those who suggest that proponents of CBA favor cost-sensitive decision making and those who reject CBA favor cost-blind decisionmaking are mistaken.<sup>101</sup> One can reject CBA as a flawed framework for assessing policies in place or evaluating proposed policy options but still allow for cost-sensitive decisions. The feasibility principle, for example, allows Congress to make decisions about the distribution of costs in ways that preclude requiring that plants shutdown. The feasibility principle calls for stringent regulation to protect human health or ecological values, but recognizes that businesses must carry out their productive activities while meeting environmental standards. It is illogical for regulation to require facilities to shut down, but it can require reductions that are achievable.<sup>102</sup>

The feasibility principle is widely found in environmental statutes and underlies technology-based regulatory schemes. It seeks to force companies to invest in technologies that reduce emissions as much as possible without resulting in plant shutdowns. The Clean Air Act, for example, includes provisions calling for the “best available control technology” and the “lowest achievable emission rates;” the Clean Water Act mandates standards such as the “best available technology and the “best available demonstrated control technology.”<sup>103</sup> In a 2004 case, the Supreme Court held that the EPA can overrule a state regulatory agency decision about what industry investments satisfy the requirement of the “best available control technology” in the Clean Air Act. Both the majority and the dissenting opinions agreed that this provision authorizes the EPA to require “the technology that can best reduce pollution within practical constraints.”<sup>104</sup> Driesen argues that this is essentially the “maximum feasible reduction principle” and that this standard is much more consistent with congressional intent in giving priority to public health and environmental protection in relevant statutes and a much more useful standard for agency decisionmaking than CBA.<sup>105</sup>

Cost benefit analysis fails to provide the kind of decision making framework and meta-criteria for natural resource policy making required to secure the level of environmental quality essential for human life to flourish. It fails to give priority to ecological values, and protecting environmental values are a prerequisite for economic growth and material progress; if ecological values are severely compromised, economic activity will decline. This is not to argue that CBA is not useful; it should continue to serve as an analytic tool for illuminating policy options. But it should, in our view, be seen as an analytic tool rather than a decision criterion. Rather than assuming that environmental and economic values can be balanced through CBA, ecological science recognizes that the economy is best understood as a subsidiary of the environment. A broader decision making framework that gives priority to ecological values is needed. One candidate for such an integrative approach is ecological sustainability.

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<sup>101</sup> David M. Driesen, *Distributing the Costs of Environmental, Health, and Safety Protection: The Feasibility Principle, Cost-Benefit Analysis, and Regulatory Reform*, 32 BOSTON COLLEGE ENVIRONMENTAL AFFAIRS L.REV. 1 (2005).

<sup>102</sup> Driesen, 21.

<sup>103</sup> Driesen, 20-21.

<sup>104</sup> *Alaska Department of Environment v. EPA*, 540 U.S. 461 (2004), at 489-90, n. 13.

<sup>105</sup> Driesen, 9.

## The Idea of Ecological Sustainability

Ecological sustainability emphasizes the interaction of ecological, economic, social, cultural, and other values, so that no one set of values, such as environmental or economic factors, can alone determine policy. Sustainability assessments can be used to organize factors and show their interrelationships and interactions. Once ecological sustainability becomes a framework for analysis, there is room for assessments of costs and benefits of policy alternatives, comparisons of the cost-effectiveness of policy options, and other related calculations. But they all take place within the framework of the primary, prerequisite value of ecological sustainability.

The concept of sustainability has well-developed roots in modern environmental and natural resource policy. Sustainability has been a standard for decades for assessing the yield of natural resources such as forests, as land managers have sought to ensure that renewable resources are used no faster than they are replenished and can be used indefinitely.<sup>106</sup> In the 1970s, scholars broadened the notion to examine the extent to which economic activity, resource use, and pollution was consistent with the planet's carrying capacity.<sup>107</sup> The World Conservation Strategy proposed the concept of sustainable development in 1980.<sup>108</sup> But the idea of sustainable development gained real international prominence and attention with the publication in 1987 of the World Commission on Environment and Development's *Our Common Future* report, which urged all nations to commit to the idea of sustainable development, defined as "development that meets the need of the present without compromising the ability of future generations to meet their own needs."<sup>109</sup> The idea of sustainable development was an essential underpinning of the 1992 United Nations Conference on Environment and Development (UNCED). The term was included in nearly half of the 27 articles that made up the Rio Declaration, a statement of broad principles to guide economic development, and was the basis for Agenda 21, a detailed plan of action aimed at implementing the idea of sustainable development, that were both signed by participants of the conference.<sup>110</sup> The idea of sustainability has been built upon principles of intergenerational equity, defined by Edith Brown Weiss as including three principles: (1) each generation should be required to conserve the diversity of the resource base so that it does not unduly restrict the options available to future generations, (2) each generation should maintain the planet's overall quality so that it is bequeathed in no worse condition than it was received; and (3) members of every generation should have comparable rights of access to the legacy of

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<sup>106</sup>.G. Tyler Miller, Jr., *LIVING IN THE ENVIRONMENT* (Belmont, CA: Wadsworth Publishing, 1996): 13, 618-19.

<sup>107</sup>.Dennis Pirages, *THE SUSTAINABLE SOCIETY* (New York: Praeger, 1977).

<sup>108</sup>.International Union for the Conservation of Nature, "World Conservation Strategy: Living Resource Conservation for Sustainable Development (Gland, Switz.: IUCN, United Nations Development Programme, and World Wildlife Fund, 1980), cited in John Kirby, Phil O'Keefe, and Lloyd Timberlake, ed., *THE EARTHSCAN READER IN SUSTAINABLE DEVELOPMENT* (London: Earthscan, 1995): 1.

<sup>109</sup> World Commission on Environment and Development, *OUR COMMON FUTURE* (New York: Oxford University Press, 1997): 43.

<sup>110</sup> For discussions of the Rio Summit, see Adam Rogers, *THE EARTH SUMMIT* (Los Angeles: Global View Press, 1993); Daniel Sitarz, ed., *Agenda 21: THE EARTH SUMMIT STRATEGY TO SAVE OUR PLANET* (Boulder, CO: EarthPress, 1993).

past generations and should conserve this access for future generations” (combining intra- and inter-generational equity).<sup>111</sup>

According to one count, there are at least 70 competing definitions of sustainability.<sup>112</sup> The idea of sustainable development has evolved from its early, and rather precise formulation as sustainable yield, to its current widely embraced but vaguely defined status as a core principle. Sustainability means for some, for example, that we continue with business as usual, pursuing economic growth while trying, whenever it is not too expensive or disruptive of economic goals, to minimize environmental damage and resource use. It might mean that industry needs to reinvent itself in ways that promote pollution prevention, energy efficiency, and technological innovation. It might mean that ecological and environmental goals are given roughly equivalent status, that they must be pursued in tandem and in innovative ways that promote a much wider range of values than are incorporated in market prices. Or sustainable development might be understood as preserving the biosphere as the most important collective objective. As a prerequisite for every other human endeavor, it must be given priority over any economic goal.

The idea of sustainability has been viewed as compelling for several reasons. Its breadth gives it the potential to be able to aggregate a wide range of interests under its umbrella, but proponents also find enough specificity to give some direction. Some argue that the idea of sustainability is most useful in narrow settings, where parties may be able to agree that certain practices are not sustainable and should be changed, but is too vague to illuminate broader issues.<sup>113</sup> Others argue that sustainability, like other transformative ideas, “promises to remake the world through reflection and choice, but its potential to engage people’s hopes, imagination, and sense of responsibility may depend more on strategic uses of ambiguity than on conceptual precision and clarity.” Sustainability is a powerful concept because it is “sufficiently ambiguous to be embraced by diverse interests, yet coherent enough to inspire movement in a particular direction.”<sup>114</sup> Sustainability has the potential to become one of the ideas, like justice, equality, and freedom, that create fundamental expectations for public and private behavior, as well as take shape in different contexts in providing specific guidance for action.

The most widespread view of sustainability appears to suggest that its attractiveness lies in the broad direction it gives, rather than in prescribing specific policies, and that poses a clear challenge for the idea that ecological sustainability can provide a decision making criteria for public policy making. Kai Lee, for example, argues that sustainable development “is not a goal, not a condition likely to be attained on earth as we know it. Rather, it is more like freedom or

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<sup>111</sup> See Norman J. Vig, “Introduction,” in Regina S. Axelrod, David Leonard Downie, and Norman J. Vig, *THE GLOBAL ENVIRONMENT: INSTITUTIONS, LAWS, AND POLICIES* (Washington, DC: CQ Press, 2005): 6.

<sup>112</sup> Kirby, O’Keefe, and Timberlake, *EARTHSCAN READER IN SUSTAINABLE DEVELOPMENT*, p. 1.

<sup>113</sup> Dale Jamieson, “Sustainability and Beyond,” *Natural Resources Law Center Discussion Paper Series PL 02* (Boulder, Co: University of Colorado School of Law, 1996).

<sup>114</sup> Lamont C. Hempel, “Conceptual and Analytic Challenges in Building Sustainable Communities,” in Daniel A. Mazmanian and Michael E. Kraft, eds., *TOWARD SUSTAINABLE COMMUNITIES: TRANSITION AND TRANSFORMATIONS IN ENVIRONMENTAL POLICY* (Cambridge, MA: MIT Press, 1999): 43-74, at 44.

justice, a direction in which we strive, along which we search for a life good enough to warrant our comforts.” The appropriate metaphor, he argues, is the garden: “a place that is bounded and organic, designed yet open to seasons and elements, natural but cultivated, sustainable and humane.”<sup>115</sup> Thomas Prugh, Robert Costanza, and Herman Daly argue that it is not appropriate to “prescribe a particular vision of a sustainable society. There are simply too many possibilities, and because they evolve over time and must be continuously selected among, prescription is pointless.”<sup>116</sup> Similarly, Neil Harrison describes sustainability as a journey, a process, rather than a policy agenda.<sup>117</sup> Daniel Mazmanian and Michael Kraft describe it as a third epoch of the environmental movement, the latest stage in the evolution of environmental movement from an emphasis on reducing pollution to addressing the economic, environmental, psychological, and cultural well-being of communities.<sup>118</sup>

Dennis Pirages argues that much as human survival and success is a result of “evolutionary mechanisms that have adapted the human body and human behavior to changing environmental constraints,” sociocultural evolution is a similar process by which “survival-relevant information is passed from one generation to the next.”<sup>119</sup> The challenge is to identify and inculcate values and behaviors that will allow human society to learn to function in ways that are consistent with ecological constraints. Just as natural selection shapes the survival of humans, sociocultural evolution can produce norms, values, and practices that allow human society to flourish. Pirages argues that sustainability should be viewed not as a constraint on humans and a diminution of our quality of life, but an enterprise that can engage our best energy and creativity in trying to increase human satisfaction and happiness without increasing material consumption. Pirages and colleagues identify a host of actions that are part of the process of sustainability: devising new measures of welfare and progress and indicators of sustainability, lengthening the time that products are used, redistributing resources to meet pressing human needs and thereby increasing satisfaction, improving efficiency, using more renewable resources, and expanding recycling. Sustainability requires a combination of changes in how material resources are used and in the values and institutions that determine behavior. Creating a more sustainable world is a “dynamic, complex, and continuous process that will require decades of concerted effort.”<sup>120</sup> Given the great diversity in human societies and ecological conditions, there is no single plan for sustainability, but, rather, is an effort to strengthen the evolutionary capacity of societies.

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<sup>115</sup> Kai N. Lee, *COMPASS AND GYROSCOPE: INTEGRATING SCIENCE AND POLITICS FOR THE ENVIRONMENT* (Washington, DC: Island Press, 1993): 200-01.

<sup>116</sup> Thomas Prugh, Robert Costanza, and Herman Daly, *The Local Politics of Global Sustainability* (Washington, DC: Island Press, 2000): xiii.

<sup>117</sup> Neil E. Harrison, *CONSTRUCTING SUSTAINABLE DEVELOPMENT* (Albany, NY: SUNY Press, 2000).

<sup>118</sup> Daniel A. Mazmanian and Michael E. Kraft, eds., *TOWARD SUSTAINABLE COMMUNITIES: TRANSITION AND TRANSFORMATIONS IN ENVIRONMENTAL POLICY* (Cambridge, MA: MIT Press, 1999).

<sup>119</sup> Dennis C. Pirages, *BUILDING SUSTAINABLE SOCIETIES: A BLUEPRINT FOR A POST-INDUSTRIAL WORLD* (Armonk, NY: M.E. Sharpe, 1996): 4-5.

<sup>120</sup> Pirages, *BUILDING SUSTAINABLE SOCIETIES*, 12.

## **Thick and Thin Notions of Sustainability.**

One helpful distinction is that sustainability can be viewed as either a modest, weak, or thin agenda for change, or a thicker, deeper, more radical prescription. A weak or thin form of sustainable development holds that economic and environmental concerns can and must be balanced. In the past, economic growth has been given priority and seen as paramount; now it must be refined and balanced by environmental sensitivity. But fundamental changes are not required: current technologies and patterns of production and consumption are acceptable as long as they are tempered by environmental/resource considerations and we can largely continue to do what we have done in the past as long as we are more “sensitive” to environmental conditions. Similarly, the overall value of the natural and economic capital for future generations be undiminished by the current generation. The goal is to ensure the same level of resources, while permitting some substitution of natural resources for an equivalent amount of capital.

This view of sustainability was reflected in the President’s Council on Sustainable Development (PCSD), created by the Clinton administration in 1993 to bring together representatives from environmental groups, industry, and government to advise the president “on matters involving sustainable development.” The term was defined as “economic growth that will benefit present and future generations without detrimentally affecting the resources or biological systems of the planet.”<sup>121</sup> The Council’s “vision statement” argues that a “sustainable United States will have a growing economy that provides equitable opportunities for satisfying livelihoods and a safe, healthy, high quality of life for current and future generations.”<sup>122</sup> Sustainability means that business can continue as usual, that we can pursue economic goals of growth and consumption, but we need to find ways of minimizing environmental damage and resource use so that the economic activity is sustainable or can continue. The key words here are balance and restraint—economic growth can continue as long as it is smart growth, sensitive to environmental constraints, and balanced with ecological concerns. This idea of sustainable development has been so attractive so many people because they have in mind the first definition, and realize that it does not require fundamental changes in lifestyles, consumption, transportation, and production

In contrast, a strong or thick form of sustainable development, what might be called ecological sustainability, holds that environmental preservation is the paramount value. It places a major constraint on economics; only economic activity that is consistent with the fundamental criterion of ecological sustainability is acceptable. The current distribution of critical natural capital must be maintained in some form, so that the ecosystem services it provides are maintained. It cannot simply be harvested to generate economic wealth that is to be passed down to subsequent generations. Industrial activities, energy production, transportation, and consumption must be fundamentally transformed to avoid ecological disruptions and protect regenerative processes.. Ecological survival simply outweighs economic growth as the primary

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<sup>121</sup> Executive Order 12852, June 29, 1993, amended on July 19, 1993, 42 U.S.C. 4321.

<sup>122</sup> The President’s Council on Sustainable Development, *Sustainable Development: A New Consensus* (Washington, DC: U.S. Government Printing Office, 1996): iv.

public priority.<sup>123</sup> Since ecological conditions make all life, including economic activities, possible, preserving those conditions should be given priority. Balancing is not enough; ecological values must come first, and must define and limit what kinds and levels of economic activity are acceptable. Policy goals such as free trade and economic efficiency are subordinated to preservation of biodiversity, protection of wild lands, and reclamation of damaged areas.

Another important feature of this thick notion of development is its integration of ecological protection and economic activity with social equity and political empowerment. Sustainable development here gives priority to reducing poverty and helping the poor gain some measure of self-sufficiency through a more equitable distribution of resources. Political participation is a key ingredient in ensuring that decisions affecting economic and environmental conditions be made more inclusive.<sup>124</sup> Sustainability is not an ecological concept alone, but also one of social justice, inclusion, fairness, community well being, and political engagement. These social and political values are important and valued in their own right as well as because they contribute to ecological protection.

These two versions of sustainability differ along key dimensions. A weak form of sustainability is that the overall value of the natural and economic capital for future generations is undiminished by the current generation. In contrast, a strong form, or ecological sustainability, holds that the distribution of critical natural capital must be maintained. The thin version holds that economic and environmental concerns must be balanced; in the past, economic growth has been given priority or seen as paramount; now they must be balanced. The thick form holds that environmental preservation is the overriding goal, and places a major constraint on economics; only economic activity that is consistent with the fundamental criterion of sustainability is acceptable. The weak form is that the status quo is acceptable as long as it is tempered by environmental/resource considerations; we can pretty much continue to do what we have done in the past as long as we are sensitive to the environment; the strong form emphasizes that industrial activities, energy production, transportation, and consumption must be fundamentally transformed. Sustainable development can be a radical goal, a new way of defining problems and devising responses to them, or it can be a call to continue with current practices and priorities as long as we are careful to give more attention to ecological protection and conservation of resources.

A central goal of sustainability is the preservation of natural capital--the natural resources that are used to satisfy human needs and wants and make life on the planet possible. But sustainability can mean one of several things here. A weak form holds that the current generation is obligated to pass on to future ones at least the same level of wealth and resources, but the actual mix of natural, economic, human, social, and even cultural capital is not important. What is important is that the functions performed by these different forms of capital can be maintained. For example, some proponents of technology may believe that virtual or digital

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<sup>123</sup> For an exploration of these views from an economics' perspective, see Todd Sandler, *GLOBAL CHALLENGES* (Cambridge: Cambridge University Press, 1997); for a broader ecological and political debate over sustainability, see Dennis Pirages, ed., *BUILDING SUSTAINABLE SOCIETIES* (Armonk, NY: M.E. Sharpe, 1996).

<sup>124</sup> See William Lafferty, "The politics of sustainable development: global norms for national implementation," *ENVIRONMENTAL POLITICS* vol. 5 (1996): 185-208.

forms of information expression can replace direct, human, sensory experience, or interaction with nature in controlled contexts like zoos are equivalent in function to encounters in nature. An intermediate position allows for some substituting across different forms of capital, but also recognizes that some functions cannot be substituted. Engineers may not be able to design artificial replacements for some services provided by ecosystems, such as filtering clean air or water, without the cost of doing so being much greater than preserving the natural resources in the first place. Such a position may also recognize that there are no adequate substitutes for direct, sensory, aesthetic interaction with natural systems.

The strong version of sustainability requires that, for precautionary reasons and because we do not know what the desires or utility functions of future generations will be, we should ensure that each kind of capital is maintained. For example, we can deplete some nonrenewable sources of energy, such as oil, as long as we invest in new technologies such as solar power, so that future generations have at least the same reserve of energy resources that we have. Finally, the absolutist form of sustainability requires that we not use any nonrenewable resource, but that we limit ourselves to consuming only renewables. We have, of course, long since violated such a proscription, but there is some value here in assessing how far we diverge from this absolute standard. Proponents of preserving biodiversity argue, for example, that since we do not now know how to create or restore extinct species, the genetic pool that is currently encapsulated within the existing species represents the entire library of genetic material available to us, and we should strive to preserve as much as possible. Others may argue, in the context of energy, that we should move much more aggressively to renewable energy forms in order to reserve fossil fuels for future use.

### **Economics, Markets, and Prices**

Ecosystems can be understood and valued in terms of the services they provide to humankind. Sustaining those ecosystem services is of fundamental importance to our survival. A primary function of ecosystems is to produce food; the primary concern here is the degradation of soil that, in the past, has been offset by increased use of pesticides and fertilizers, but it is not clear how long that can continue. Water quantity is threatened by growing diversion of water for human use that leaves less for environmental values. Water quality has improved in some wealthy countries but not in developing nations, and pollution threatens water systems throughout the world. Increased food production has reduced the capacity for carbon storage, as forests have been converted to agricultural lands. Biodiversity is threatened by pollution, invasive species, and loss of habitat. Demand for ecosystem goods and services continues to grow; sustainability requires a major commitment to ecosystem management in order to secure these services for current and future generations.

Securing ecosystem services poses a number of major challenges. Knowledge of how ecosystems function, their productive capacity, required tradeoffs, and long term consequences is essential. Baseline data and inventories are required to assess changing conditions. An ecosystem approach must engage the public in a discussion of the benefits of ecosystem services, the costs and benefits of ecosystem use, and the tradeoffs to be made. Local communities must be involved in decisions to ensure fairness in the distribution of benefits and costs and to engage local stakeholders in preserving ecosystem health. Accurate prices are critical: since prices of

food, water, and other goods typically do not reflect the real costs to the environment of producing them, those costs are ignored or undervalued. Prices need to accurately reflect costs so we can make efficient tradeoffs between competing values and set priorities for limited resources. Urban planning and ecosystem management needs to be coordinated to minimize the impact of housing, transportation, and energy development on natural systems.<sup>125</sup>

At the heart of the commitment to maintaining ecological services and preserving natural capital is the precautionary principle. Given the uncertainty surrounding the consequences of resource use and pollution, we should err on the side of caution and preserve ecosystems and minimize pollution and resource use, since the stakes are so high and some consequences are irreversible. Sustainability is rooted in the need to protect against unintended consequences, against possible synergistic effects when ecological conditions interact, against cascading effects and feedback loops that exacerbate ecological threats, against cascading events that run out of control and cliffs and turning points that belie the belief that ecological change is incremental and predictable, and the sheer power of exponential growth.<sup>126</sup>

Ecosystem services are priceless. Without them, life is not possible. But finding some rough measures of the value of natural resources and ecosystem services is essential in moving towards the goal of true costs. Only crude estimates are currently available for some ecosystem services.<sup>127</sup> One approach to estimating ecosystem services is to calculate the cost of restoring damaged systems to a more pristine, undisturbed state. Another is to estimate the cost of constructing a particular ecosystem. Less useful methods rely on surveys of people's willingness to pay for ecosystem services such as aesthetics, although more concrete inquiries about how much people value recreational opportunities can help shed light on values that could be incorporated in to prices. Comparing property values of land near natural amenities and protected areas with those near developed sites can provide rough estimates of ecosystem worth.

Estimating the cost of ecosystem services is not only difficult, but it is also controversial. Attempting to put a price tag on services that are, in reality, priceless diminishes their value. Critics of cost-benefit analysis, for example, argue that the analysis is inevitably biased in favor of values that can be unambiguously quantified, such as the cost of complying with environmental regulations by installing new control equipment. The benefits of such installations, such as protecting ecosystem services, is much more difficult to estimate precisely and is hence discounted when costs and benefits are estimated. There are a number of challenges to using cost benefit analysis, such as how nonmarket values are quantified, how costs and benefits are identified, what impacts are to be included in assessing costs and benefits (how long should the chain of possible impacts arising from agency actions included in the analysis be), how to address distributional issues (where the costs are borne by one set of people and the benefits largely accrue to another set, for example), and how to determine the present value of future costs and benefits. Variations such as cost-effective analysis can be used to identify

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<sup>125</sup> WORLD RESOURCES 2000-2001, 21-22.

<sup>126</sup> Lester Brown, et al., eds., STATE OF THE WORLD 2000 (New York: W.W.Norton, 2000), especially chapter 2.

<sup>127</sup> One pioneering study concluded that some global ecosystems should be valued at from \$16 to 54 trillion.<sup>127</sup> Robert Costanza, et al., "The value of the world's ecosystem services and natural capital," NATURE (387 (May 15, 1997): 253-60.

options that produce the greatest benefits per unit of costs or greatest total benefits, given the resources available, or some other measure. But some kind of assessment of the costs and benefits of damaging (or restoring) ecosystems versus converting the resources into manufactured goods or other forms is unavoidable. If ecosystem services are not estimated, the debate, by default, will be dominated by narrow, economic-based assessments.

Tax policy provides a clear means of integrating and improving economic and environmental policy. Shifting taxes away from desirable actions such as earning profits and paying salaries, and directing them toward undesirable actions of producing pollution and harvesting scarce resources can strengthen economies and make them more ecologically sustainable at the same time. Taxing pollution ensures that producers of pollution take some responsibility for the harms they create. It ensures that those who benefit economically from industrial production also pay the costs and do not impose them on others who do not enjoy the benefits. It creates clear incentives for people to reduce harmful activities without the heavy hand of government regulators and the inherent loss of flexibility and freedom that comes from command and control regulation. It encourages pollution reduction to be efficient.<sup>128</sup> While energy and other taxes are typically very unpopular as they increase costs to consumers, those increases are essential in ensuring that prices reflect the true costs of production. Some argue that green taxes should be revenue neutral; other taxes could be decreased to match the green tax increases. The main goal of green taxes should be to ensure that prices communicate accurate information about the costs of production. Current green taxes, because they are so low, raise resources for environmental programs, rather than being used as an alternative to regulation.<sup>129</sup>

Poorly functioning markets allow polluters to externalize some of the costs of production and distribution of their products in order to reduce costs, rather than ensuring prices accurately reflect true costs, so that efficient decisions can be made about the allocation of scarce resources and consumers and producers have information about the real consequences of their decisions. The environmental costs of production and marketing can be internalized a number of ways. One of the most effective ways is to prevent pollution from occurring. Another innovative approach is for manufacturers to retain ownership and responsibility for their products, lease them to consumers rather than sell them, and then take back the used product for recycling and

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<sup>128</sup> Taxes, for example, can be used to help workers. Pollution taxes are often regressive since they raise the price of energy, transportation, manufactured goods, and other essentials, and take a larger bite out of the total income of poor households than of more wealthy ones. They must be combined with wage and income tax cuts aimed at low income families, rebates for energy taxes, and other adjustments. It is difficult to calculate the appropriate level of these taxes, since pollution levels differ significantly across similar sources (motor vehicles vary tremendously in their emissions, for instance, as a result of kinds of fuel, meteorological conditions, driving patterns, and other factors). Placing economic values on environmental quality or scarce resources is similarly difficult. Taxes must be integrated with other laws and policies. The benefits of increased gasoline taxes, for example, are countered by land use decisions that encourage urban sprawl and more driving. Increasing taxes may not solve problems of how pollution sources are distributed and their tendency to be concentrated in low-income communities. Some species will require absolute protection and a ban on their killing. See David Malin Roodman, "Public Money and Human Purpose: The Future of Taxes" *WorldWatch* 8 (September-October 1995): 10-19.

<sup>129</sup> These taxes could be adopted incrementally, over a period of 20 years or so, in order to provide time to make adjustments. They would create incentives to improve the efficiency of production and distribution and permit consumers to reassess their decisions and to adapt their behavior to environmental constraints. Paul Hawken, *THE ECOLOGY OF COMMERCE* (New York: Harper Business, 1973): 172-75.

reuse of parts. Sustainability can also be pursued through regulations such as emission standards that go beyond the separate media (water, air, and land) to involve a much more integrated and effective program of reducing emissions. Property rights in resources can be allocated in ways that ensure that if depletion of a resource occurs, that is reflected in higher prices, and that the most efficient reductions in pollution are made through trading emission rights. Taxes can send strong signals to reduce pollution and conserve resources; taxes on virgin materials can create strong incentives for recycling. Subsidies for water and energy projects that do damage to the environment and divert resources from more ecologically sound practices are another part of sustainability. Liability rules and the cost of insurance can contribute to conservation.

Another critical step in generating true cost prices is ending public policies that subsidize environmentally destructive activities. Logging, mining, pesticide and fertilizer use, and energy development are subsidized rather than taxed, encouraging inefficient production and consumption. If taxes were imposed on excess profits from natural resources, for example, producers would still earn profits and have an incentive to produce, but society would gain the windfall as resources become increasingly scarce and scarcity forces up prices. According to one estimate, countries provide some \$800 billion a year in subsidies for environmentally damaging activities.<sup>130</sup>

Making markets work through true cost pricing is critical, but is not sufficient to produce ecological sustainability. Markets may understate or discount the value of things in the future. Costs and benefits that extend very far into the future are discounted and devalued. As a result, "critical ecological resources that will be essential for our well-being even 30 years from now not only have no value to rational economic decision makers, but scarcely enter their calculations at all."<sup>131</sup> Although the market price mechanism handles incremental change with relative ease, it tends to break down when confronted with absolute scarcity or even marked discrepancies between supply and demand. In such situations (for example, in famines), markets sometimes collapse or degenerate into uncontrolled inflation, because the increased price is incapable of calling forth an equivalent increase in supply.<sup>132</sup> Markets also sometimes fail to respond to the problems of ecological scarcity because scarcity "tends to induce competitive bidding and preemptive buying, which lead to price fluctuations, market disruption, and the inequitable or inappropriate distribution of resources."<sup>133</sup>

Economic indicators such as the gross national product need to be revised to include measures of sustainability, such as the depletion of natural resources, the cost of cleaning up

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<sup>130</sup>Roodman, "Public Money and Human Purpose," at 13.

<sup>131</sup>William Ophuls and A. Stephan Boyan Jr., *EQUALITY AND THE POLITICS OF SCARCITY REVISED* (New York: W.H. Freeman, 1992): 219.

<sup>132</sup>Ophuls and Boyan, *ECOLOGY AND THE POLITICS OF SCARCITY*, 219.

<sup>133</sup>Consumers may not respond to rising prices in ways predicted by economic theory. Some consumer decisions are rather independent of price increases; increasing the price of gasoline is likely to have little impact, in the long run, on driving, unless the price increases are so dramatic that they discourage people from driving their own vehicles. If such price increases occurred, the resultant concerns about social equity and resource allocation would be daunting. Other consumer decisions, such as the kind of energy used to heat a home, are essentially locked in because of the high capital costs involved in converting to another energy system. High prices may not be enough to deter ecologically unsustainable activities. Ophuls and Boyan, *ECOLOGY AND THE POLITICS OF SCARCITY*, 220.

pollution and treatment of environmentally induced illness, and broader measures of human well-being. One preliminary but promising such effort is the World Bank's proposal to measure a country's wealth by estimating not only how much it produces, but also its investments in natural and human resources. The new system breaks down national wealth into three major attributes: natural capital, or the economic value of timber, mineral deposits, land, water and other environmental assets; produced capital, or the value of a nation's machinery, factories, roads; and human resources, such as the educational level of a population. National wealth is ultimately viewed as the value of produced goods minus consumption, depreciation of produced assets, and use of natural resources. There are several advantages that arise from this kind of broad balancing of national economic books. First, it focuses attention on the value of investments that increase human capital. Education, health, and other social services are critical in development human resources. Second, as data are developed over time, relative changes in a country's development can be identified and adjustments made. Third, the development of information on natural resource wealth can help identify the long-term consequences of selling off natural resources in the short-term; while rapid harvesting of resources might appear as gains in immediate economic figures such as gross national product, they will be reflected in reductions in indicators of natural resource wealth.<sup>134</sup>

### **Sustainability as Ecology, Economy and Equity**

One way to sort out the debate over what constitutes ecological sustainability is to recognize the intersection of its ecological, economic, and equity elements. A primary feature of sustainability is the commitment to give priority to ecological preservation rather than economic growth, and the recognition that the economy is part of the global ecosystem and completely dependent on it. Economic production is fundamentally “the process of converting the natural world (renewable and nonrenewable resources and the ecosystems they constitute) to the manufactured world (houses, cars, computers, roads, books, plastic toys, etc., and non-natural ecosystems such as parks and fields).”<sup>135</sup> As a result, the economy grows at the expense of the environment, but cannot outgrow its host; economic growth is finite. As the value of manufactured goods increases and the amount of natural resources dwindles, eventually, more is lost by reducing natural capital than is gained by expanding manufactured capital, and economic growth actually makes people worse off.<sup>136</sup> Underlying ecological and economic considerations is the importance of equity and fairness. Any effort to protect and conserve resources must recognize the great inequality in the distribution of resources and the importance of alleviating poverty and suffering in the current generation.

The elements of sustainability include four broad categories:

1. Ecological integrity, ecosystem services, and natural capital  
Ensure economic activity is within ecological limits

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<sup>134</sup>See The World Bank, *MONITORING ENVIRONMENTAL PROGRESS: A REPORT ON WORK IN PROGRESS* (Washington DC: The World Bank, 1995); Ismail Serageldin, "Third Annual World Bank Conference on Environmentally Sustainable Development," paper prepared for the Third Annual World Bank Conference on Environmentally Sustainable Development, Washington, DC, October 1995.

<sup>135</sup> Prugh, Costanza, and Daly, *THE LOCAL POLITICS OF GLOBAL SUSTAINABILITY*, 19.

<sup>136</sup> Prugh, Costanza, and Daly, *THE LOCAL POLITICS OF GLOBAL SUSTAINABILITY*, 21.

Maintain ecological integrity, protect key ecosystem services  
Meet needs of present without compromising those of future  
Ensure sustainable yield of renewable resources  
Preserve and regenerate of natural capital base  
Protect the ecosystem in light of uncertainty—the precautionary principle  
Use adaptive management to respond to the dynamic nature of the environment

2. True-cost prices and ecologically-sensitive economic indicators

Internalize environmental costs in market exchanges  
Prevent pollution to reduce wastes and externalities most efficiently  
Regulate emissions to reduce externalities  
Use emissions trading, pollution taxes, and other market-based regulatory approaches  
Reduce subsidies that have harmful environmental consequences—water, energy  
Create incentives for reduced pollution through legal liability and liability insurance  
Require economic valuation of ecosystem functions  
Develop economic indicators and measures that reflect depletion of natural resources, count pollution cleanup and illness treatment as costs  
Devise broader measures of social and economic factors

3. Wealth, population, technology, and consumption

Ensure intergenerational equity--non-declining per capital wealth  
Ensure intragenerational equity—current social, political, and economic equality  
Address interaction of poverty and environmental degradation  
Develop appropriate, efficient, conserving technologies  
Transfer and disseminate widely cleaner technologies

4. Democratic politics, community, and natural resource governance

Foster strong democracy and participation  
Strengthen community, civil society, and social capital

Ecosystems are defined as “communities of interacting organisms and the physical environment in which they live.” Several dimensions of ecosystems are critical. Their members are intricately intertwined. Size ranges from a small bog or patch of forest to a major river system. The areas of transition between ecosystems are particularly important, as the different systems are knit together in a dynamic, interactive relationship. Some ecosystems are managed, while others are more natural.<sup>137</sup> Sustainability requires that we understand the functions of the major types of ecosystems, evaluate their health, restore damaged systems, and protect healthy ones. An ecosystem management approach to ecological sustainability has at least six major elements:

- It integrates management efforts across a wide range of services, so that tradeoffs are transparent and the optimal mix of benefits is ensured.
- It is built on natural, rather than political boundaries, so that ecosystems are managed as whole entities and not fragmented.

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<sup>137</sup> United Nations Development Programme, United Nations Environment Programme, World Bank, and World Resources Institute, *WORLD RESOURCES 2000-2001* (2000): viii.

- It takes a long, broad view, that integrates the protection of ecosystem processes with larger landscapes that evolve over time.
- It links human needs and biological capacity and brings together social, economic, and ecological information.
- It ensures the production of current ecosystem services as well as their preservation, so that future needs will also be met.<sup>138</sup>
- It requires adaptive management that learns from experience, recognizes the pervasiveness of uncertainty, and views ecosystem management as an experiment.<sup>139</sup>

Securing ecosystem services poses a number of major challenges. Knowledge of how ecosystems function, their productive capacity, required tradeoffs, and long term consequences is essential. Baseline data and inventories are required to assess changing conditions. An ecosystem approach must engage the public in a discussion of the benefits of ecosystem services, the costs and benefits of ecosystem use, and the tradeoffs to be made. Local communities must be involved in decisions to ensure fairness in the distribution of benefits and costs and to engage local stakeholders in preserving ecosystem health. Accurate prices are critical: since prices of food, water, and other goods typically do not reflect the real costs to the environment of producing them, those costs are ignored or undervalued. Prices need to accurately reflect costs so we can make efficient tradeoffs between competing values and set priorities for limited resources. The preservation of parks, wild lands, and other protected areas need to be integrated with other efforts to preserve ecosystem services.<sup>140</sup>

The methodology of sustainability builds on the idea of ecosystem services, but goes beyond to include several other additional criteria for assessing policy choices, including pollution prevention rather than treating emissions, sustainable yield of renewable resources, the precautionary principle and preservation of ecological values in the face of uncertainty, true-cost prices-that internalize environmental costs in market exchanges, the development of economic indicators and measures that reflect depletion of natural resources, considerations of equity and distribution, and preservation of ecological conditions and options for future generations. Ecological sustainability holds that environmental preservation is a precondition for life itself. It places a major constraint on economics; only economic activity that is consistent with ecological sustainability is acceptable. Critical natural capital must be maintained so that the ecosystem services it provides are maintained; it cannot simply be harvested to generate economic wealth. Industrial activities, energy production, transportation, and consumption must be fundamentally transformed to avoid ecological disruptions and protect regenerative processes.

Most importantly, ecological survival simply outweighs economic growth as the primary public priority. Balancing environmental protection and economic growth is not enough; ecological values must come first, and must define and limit what kinds and levels of economic activity are acceptable. Policy goals such as free trade and economic efficiency are subordinated to preservation of biodiversity, protection of wild lands, and reclamation of damaged areas. Sustainability requires that, for precautionary reasons and because we do not know what the

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<sup>138</sup> World Resources Institute, WORLD RESOURCES 2000-2001, 21-22.

<sup>139</sup> See Kai Lee, COMPASS AND GYROSCOPE: INTEGRATING SCIENCE AND POLITICS FOR THE ENVIRONMENT (1993): 9.

<sup>140</sup> World Resources Institute, 21-22.

desires or utility functions of future generations will be, we should ensure the preservation of as much of the natural world as possible as we balance meeting the needs of current generation with preserving resources for future ones. Sustainability requires strong commitments to monitoring, feedback loops, and other means of ensuring that decision makers learn from experience and be able to make adjustments as learning occurs.

### **Ecological Sustainability, Intergenerational Equity, and Succeeding Generations**

Ultimately, however, what makes ecological sustainability most attractive is the way in which it reflects the idea of intergenerational equity, the obligation each generation has to ensure that it leaves a hospitable environment for succeeding generations. The profound commitment to the equal value and worth of every person that underlies American society extends to future generations as well. We not only seek to realize our own life plans also to perpetuate the free life for those that follow us. We are self-determining agents, responsible for designing and implementing our own life plans and ensuring future generations have the opportunity to flourish as well, to enjoy the environmental and natural resource preconditions required for them to make and carry out their own life plans. The free life carries with it a very powerful threat of degeneration, that the current generation may be so preoccupied with its own interests that it neglects the perpetuation of life. The opportunities for material consumption, the advertising that fuels it, the tremendous interest generated by new technologies and new products generate strong pressures to emphasize the realization of life and to set aside consideration of future needs. Consumption of essential nonrenewable natural resources by the current generation may place severe limits on the options of future generations, just as the destruction of key ecosystem services and the creation of long-lasting environmental hazards with limit the freedom of future generations. Activities that concentrate benefits in the current generation and burdens in future ones are inconsistent with the integration of realizing and perpetuating life.<sup>141</sup>

A primary task of public policy is to find ways to ensure that free beings are able to make and realize life plans and at the same time perpetuate the free life. The free life inextricably intertwines the realization and perpetuation of life so that all persons, in this and in future generations, have the opportunity to choose and follow a plan of life and to be accountable for those choices. The hope of sustainability is that a strong commitment to future generations and to the well-being of the global community seems most likely to arise from a people and a political culture who see their future, and the future of their grandchildren and those beyond them, are inextricably intertwined with those of their neighbors throughout the world. At a minimum, sustainability could be viewed as the obligation of the oldest generation in its last years to ensure, through their personal practices as well as the public policies they support, that the generation just being born enjoys the same level of natural resource wealth and environmental quality that the old generation is enjoying as its life comes to a close. But practices and policies would also have to ensure that natural resource and environmental harms that may take more than a few generations to manifest themselves, such as long term climate change, be understood, addressed, and mitigated.

A commitment to future generations that is understood as an integral part of our realization of life requires a powerful individual and collective commitment that overrides the

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<sup>141</sup> See unpublished manuscript by Don Sorensen, 2005.

tendency to consume without regard to the future. An example of such a commitment is the growing interest in linking efforts of conservationists and people of faith. Advocates of environmental protection and sustainable development have much in common with religious believers as they examine trends in sustainability.<sup>142</sup> Both groups look at the world from the perspective of moral values; both are motivated by values that go beyond economic considerations, both warn of the hazards of excessive materialism and over-consumption, and both are forward looking, seeking to balance the needs of current generations with those of generations to come. Environmentalists' analyses are strongly rooted in science as are their remedies for improving sustainability. They benefit from working with religions in broadening support for the changes they believe are required. Religious traditions hold great moral authority and are deeply influential in shaping the worldviews of their adherents, motivating them to live their lives in ways consistent with those worldviews, and effective in generating social capital and community. They have a long history of criticizing materialism and the excessive consumption, promoting social justice, and building community. Religion shapes one's cosmology or worldview and provides meaning to life.<sup>143</sup> Environmentalists argue that excessive consumption depletes raw materials and degrades ecosystems. Believers argue that humankind has a sacred stewardship to protect and preserve creation for themselves and for succeeding generations. Excessive consumption corrodes the development of character; living simply and modestly "frees up resources for those in need, and frees the human spirit to cultivate relationships with neighbors, with the natural world, and with the world of spirit."<sup>144</sup>

Debates over the depth of sustainability permeate efforts to determine guidelines for public policy and private behavior. Assessments of how to understand and operationalize the idea of sustainability are highly contested. Sustainability challenges capitalism and its emphasis on private property rights, corporate structures that are accountable to short-term rate of return calculations, competitiveness and the inexorable pressure to externalize and reduce costs, creative destruction and the continual need to generate new demand for consumption, and the incentives that come from unequal distribution of wealth. Sustainability requires new ways of thinking that integrate ideas of individual rights, community responsibility and accountability, material and spiritual well being, and ecological health. It requires, from this view, a radical set of changes in order to ensure fairness in the distribution of benefits and burdens, a perpetual resource base and ecological services, and a social system that secures the interests of all persons. Sustainability focuses on comprehensive solutions that reflect the interconnections of ecology. It respects the maxim, "everything is connected to everything else," that is at the heart of ecology. It requires that we address a broad range of problems that people are concerned about—sprawl, traffic, air pollution, open spaces, access to recreation, overcrowding, and other ills that threaten our quality of life.

Questions over the scope of sustainability, and what behaviors should come within its reach are just as contested. If sustainability requires that the stock of nonrenewable natural resources be preserved for future generations, does that mean we have long since violated its basic premise? Does sustainability suggest a static goal of ensuring that future generations have

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<sup>142</sup> Gary Gardner, *Invoking the Spirit: Religion and Spirituality in the Quest for a Sustainable World*, Washington, DC: Worldwatch Institute, Worldwatch paper 164, 2002.

<sup>143</sup> Gardner, 5-21.

<sup>144</sup> Gardner, p. 38.

the same level of resources and ecosystem services to rely on? How does sustainability make sense in light of the dynamic nature of biological evolution? The value of natural resources, in part, lies in their use, but human use has varied greatly. Uses of forests have changed dramatically, for example, from sources of strategic defense materials (wood for battleships) to watershed functions of cleansing water. What kinds of changes can and should be limited in the pursuit of sustainability? Perhaps most difficult is the question of whether sustainability is in the interest of the current generation. Is it more morally compelling for them to improve the quality of life of existing members of that generation and reduce the enormous disparities in wealth, or is it better to set aside resources for those not yet born? Sustainability seems promising as an idea for governing a community. The problem is how to extend the idea beyond our community. We may find that our own community is sustainable if we export our wastes or import unsustainable levels of resources. How does sustainability guide us in these circumstances?

Developing good answers to these and other questions is central to the viability of ecological sustainability. The idea of sustainable development has firmly taken root in global, national, and local political discourse in a remarkably short length of time. Government agencies at all levels, transnational corporations, multilateral institutions, community-based collaborative groups, and many others have embraced the idea of sustainability. The impreciseness of sustainability makes it an attractive idea around which diverse expectations can congregate. But that impreciseness makes its use as a guide for decision making problematic. The contested nature of the idea of sustainable development is rooted in two primary dimensions: the depth of sustainability and the level of change required, and the breadth of sustainability and the range of practices and behaviors it reaches. As these provisions are debated and refined, we can develop a clearer picture of what an ecologically sustainable technological society might look like. The development of sustainability-related methods and tools can also serve to replace assessments of discrete policy choices, now dominated by cost-benefit analysis, with a form of analysis that is better suited to protecting the health of ecosystems on which all life on earth depends.