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Some Realism about Environmental Skepticism: The Implications of Bjorn Lomborg's The Skeptical Environmentalist for Environmental Law and Policy

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Some Realism About Environmental Skepticism: The Implications of Bjørn Lomborg's *The Skeptical Environmentalist* for Environmental Law and Policy

*Douglas A. Kysar*

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INTRODUCTION

Stanford University biologist Paul Ehrlich is an expert in the fields of ecology and biology, the author of more than 700 scientific papers and several books, a member of the National Academy of Sciences, and a past president of the American Institute of Biological Sciences. To many, however, Ehrlich is better known as the man who lost $1,000 to growth economist Julian Simon after betting that the price of a basket of five metals would rise between 1980 and 1990. Ehrlich became well known through his 1968 book The Population Bomb, a work that attempted to revive Malthusian concerns about exponential population growth. Along with the authors of The Limits to Growth, Ehrlich was seen as a figurehead among ecological doomsayers and, thus, a natural foil for Simon in his deliberately public gamble.

Though hardly an academic exercise, the gamble—along with the prodigious growth of world economic output during the 1980s and 1990s—cast a demoralizing cloud over the efforts of scholars like Ehrlich who insist that human material appropriation necessarily faces constraints imposed by nature. For whatever reason, growth in economic production has not been limited by obvious natural limits in recent human history, providing support for the intoxicating notion that humans can both enhance their numbers and improve their quality of life ad infinitum. After all, gross world product expanded seventeen-fold between 1900 and 1998, allowing increasing percentages of a dramatically increasing population to enjoy levels of consumption previously reserved only for royalty. By ignoring such palpable triumphs of capitalist development, Ehrlich and his followers seemed rather like party-crashers, prematurely announcing that the keg is almost empty when, to most observers, it looks primed to flow all night.

Indeed, according to a prominent recent survey of scientific research by heretofore little-known Danish statistician Bjørn Lomborg, the party may continue unabated for the next century and beyond. Originally motivated by a concern for the environment and a desire to prove wrong the blissful predictions of Simon, Lomborg assembled a team of his “sharpest students” to help him review the entire body of scientific

6. Id. at xix.
research on both the current and the predicted condition of humanity and its environment. Much to his surprise, Lomborg found that the seemingly preposterous claims of Simon were often borne out by the data, while the alarms raised by leading environmental organizations proved extremist, misguided, and, sometimes, simply fallacious. In contrast to the dire warnings of environmental advocates, Lomborg found that the "real state of the world" was stunningly positive:

We are not running out of energy or natural resources. There will be more and more food per head of the world's population. Fewer and fewer people are starving. In 1900 we lived for an average of 30 years; today we live for 67. According to the United Nations we have reduced poverty more in the last 50 years than we did in the preceding 500, and it has been reduced in practically every country.

Global warming, though its size and future projections are rather unrealistically pessimistic, is almost certainly taking place, but the typical cure of early and radical fossil fuel cutbacks is way worse than the original affliction, and moreover its total impact will not pose a devastating problem for our future. Nor will we lose 25-50 percent of all species in our lifetime—in fact we are losing probably 0.7 percent. Acid rain does not kill the forests, and the air and water around us are becoming less and less polluted.

Mankind's lot has actually improved in terms of practically every measurable indicator.

Such euphoric observations may have been dismissed out of hand were they not backed up by voluminous citations and a jacket spine bearing the name of one of the world's leading academic presses (more on that in a moment). Instead, the American popular press began to lionize Lomborg and his study even before its U.S. release. An early review in the New York Times hailed The Skeptical Environmentalist as "a substantial work of analysis" that exposes the "urban myths" of the environmental agenda.

A reviewer in the Washington Post agreed, calling the work a "massive, meticulously presented argument," "a factual encyclopedia," "a magnificent achievement," and "the most significant work on the environment since... Rachel Carson's Silent Spring, in 1962." This is not to say that Lomborg's book was universally heralded. The scientific community, in particular, took pains to identify and

7. Id.
8. Id. at 4-5.
9. See Denis Dutton, Greener Than You Think, WASH. POST, October 21, 2001, at BW01.
10. LOMBORG, supra note 5, at 4 (citations omitted).
12. See Dutton, supra note 9.
publicize perceived academic shortcomings of the work. Other reviewers, however, seemed to view Lomborg as something of a prescient iconoclast who had finally put to rest concerns about the environment. Judge Alex Kozinski, for instance, described *The Skeptical Environmentalist* as "an indispensable resource" that provides "a devastating critique of the environmental scare-mongering of the last three decades." And in a particularly dramatic flourish, the World Economic Forum named Lomborg a "Global Leader of Tomorrow."

As someone who has written previously about humanity's dependency on the environment, I began to shift uneasily in my chair while reading these glowing accounts. Could it really be the case that widespread "exaggeration, prevarications, white lies and even convenient typographical errors had been absorbed unchallenged into the folklore of environmental disaster scenarios"? Could it really be that, when confronted with "a clear, scientifically based picture of the true state of the Earth," the policy concerns of environmentalists would evaporate into triviality? My apprehension scarcely dissipated when the English language edition of Lomborg's tome landed on my desk, for his manuscript, with over 500 pages, nearly 3000 footnotes, and 182 tables and diagrams, is instantly impressive. Indeed, much has been written about the sheer volume of citations in *The Skeptical Environmentalist,* as if their numerosity alone demonstrated their veracity.

13. See Douglas A. Kysar & James Salzman, *Environmental Tribalism,* 87 MINN. L. REV. 1092, 1115-17 (2003). In fact, the Danish Research Agency—Denmark's preeminent scientific association—responded to numerous professional complaints brought against Lomborg by conducting an official investigation into the matter, which ultimately concluded that *The Skeptical Environmentalist* constituted a form of "scientific dishonesty" that was "clearly contrary to the standards of good scientific practice." See Danish Committees Against Scientific Dishonesty, *Decision Regarding Complaints Against Bjorn Lomborg,* available at http://www.forsk.dk/uvvu/nyt/udtaldebat/bl_decision.htm. It is hard to know what to make of such a condemnation, however, given that Lomborg continues to hold an official government post as head of the Danish Institute for Environmental Assessment. See Andrew C. Revkin, *Danes Rebuke A “Skeptic,”* N.Y. TIMES, Jan. 8, 2003, at A7.


18. Id.

19. See, e.g., *Defending Science,* ECONOMIST, Feb. 2, 2002 ("Mr Lomborg diligently piles on the footnotes (2,930 of them) so there is no dispute about where his numbers have come from."); Charles T. Rubin, *Green No More: The Education of an Environmentalist,* WKLY. STANDARD, Dec. 24, 2001 ("*The Skeptical Environmentalist* has so many virtues (to say nothing
I have now spent considerable time wading through *The Skeptical Environmentalist* and its prolific footnotes and I am prepared to offer an assessment. In brief, Lomborg's study is neither as riotously good as his champions claim it to be, nor as scathingly bad as his critics portray it. Rather, it is simply the latest salvo in a debate that will continue to rage until the keg unequivocally runs dry or, alternatively, until humanity finally eases into a giddy, self-congratulatory stupor. To be sure, Lomborg provides a valuable service by reminding us that we are not entirely the nest-fouling ne'er-do-wells that we appear to be in the screeds of the most ardent environmentalists. Rather, over the last century in particular, we have made enormous gains in life expectancy, literacy rates, poverty reduction, access to food and water, and other undeniably significant areas of social welfare. As Lomborg rightly points out, these are extraordinary achievements that should not be denigrated as part of an effort to chastise humanity into compliance with environmental goals.

Nevertheless, Lomborg's more fundamental claim concerns our prospects for continuing such successes in the future and here, despite appearances, *The Skeptical Environmentalist* turns out to be much less about knowledge than it is about uncertainty. Ultimately, what Lomborg and other environmental optimists fail to acknowledge is that Ehrlich and Simon both may be correct in their observations: given imperfect market information, natural resources may become available to more people at less cost even as they are running out. Put differently, with its tap at the bottom, a keg simultaneously can be flowing steadily and nearing empty. Lomborg's approach to environmental policy, which focuses upon measuring flows of material inputs to drive production, may not perceive an end to the total stock of such inputs nor, consequently, an end to the economic party. The environmentalist pessimist's contention in contrast is that nature, like a keg, has a finite capacity that constrains human development in ways both far more varied and more subtle than revealed by Lomborg's study.

This debate, of course, is an empirical one and *The Skeptical Environmentalist* does little to resolve it, despite the promise to deliver a comprehensive scientific assessment of the human condition. Rather, what Lomborg offers is simply a particular view as to how humanity should govern itself in the face of uncertainty: namely, do nothing, for

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20. See infra text accompanying notes 29–35.
regulatory cures are generally worse than environmental disease. He does not, however, offer a true description of the "real state of the world," any more than environmentalists have offered a false one. Put differently, Lomborg provides his reader with heavily footnoted, yet eminently familiar political argument, not scientific description, which might help to explain why Cambridge University Press published the book through its social science department, not its natural science division.

Part IA describes Lomborg's argument that available scientific research does not support what he terms the "Litany..." or the view of the environment that is shaped by the images and messages that confront us each day on television, in the newspapers, in political statements and in conversations at work and at the kitchen table." As will be shown, Lomborg rightly derides the extreme conclusions occasionally drawn by environmentalists from basic scientific research. However, in his haste to expose the overzealous fringe, Lomborg repeatedly overlooks the actual import of the environmental research that he is analyzing. In addition, although he purports to show that humanity's future appears incontrovertibly bright based upon the best available scientific evidence, Lomborg instead resorts to his own set of unwarranted conclusions, overbroad generalizations, and shaky assumptions—a menagerie of missteps that Part IB collectively (and cheekily) terms Lomborg's "Counterlitany." Ultimately, then, the only lesson clearly demonstrated by The Skeptical Environmentalist is the unintentional one that scientific information is both malleable and easily deployed by those with an axe to grind, whichever side they happen to be grinding.

Part II argues that such an uncertain, politicized scientific arena complicates significantly the current drive to erect a "cost-benefit state."

21. See, e.g., LOMBORG, supra note 5, at 5 ("What I will show throughout the book is that our problems are often getting smaller and not bigger, and that frequently the offered solutions are grossly inefficient.").
22. See Stephen H. Schneider, Hostile Climate: On Bjorn Lomborg and Climate Change, GRIST MAG., Dec. 12, 2001, available at http://www.gristmagazine.com/books/schneider121201.asp. To be sure, Lomborg states that he is not interested in advancing a political argument, see, e.g., LOMBORG, supra note 5, at 359 n. 249, but numerous rhetoric-laden statements from The Skeptical Environmentalist cast doubt on this claim. See, e.g., id. at 329 ("This kind of supercilious attitude is a challenge to our democratic freedom and contests our basic right to decide for ourselves how we lead our lives, so long as doing so does not bring us into collision with others."). 333 ("In all liberal democracies, voters have displayed ever increasing and broadening expectations for public services, which has put the squeeze on public funding throughout most of the Western world."). 351 ("We have become richer and richer primarily because of our fundamental organization in a market economy.").
23. LOMBORG, supra note 5, at 3.
24. Cass R. Sunstein, Congress, Constitutional Moments, and the Cost-Benefit State, 48 STAN. L. REV. 247, 249 (1996) ("The election of the 104th Congress signalled the transformation of America into a genuinely post-New Deal regulatory state. This emerging nation remains in a process of development; but it may be described as a cost-benefit state, one whose performance
Like many other commentators, Lomborg emphasizes cost-benefit analysis as the linchpin of a more rational regulatory agenda. However, using Lomborg's analysis of global climate change as an example, Part II demonstrates that the practice of cost-benefit analysis in environmental, health, and safety regulation must overcome a variety of actual and potential problems before achieving its full theoretical promise. For instance, comparative risk assessment and risk-risk analysis—two regulatory decisionmaking processes frequently associated with cost-benefit analysis and advocated in *The Skeptical Environmentalist*—aim to highlight easily overlooked health and safety tradeoffs, but may in practice handicap effective risk management if not treated with sufficient caution by policymakers. When used in health and safety contexts, cost-benefit analysis also unavoidably involves the comparison of interests that many might consider incommensurable. Moreover, such comparisons often are not made in a manner that is readily transparent to public observers given that cost-benefit analysis typically monetizes the value of life, discounts the interests of future generations, excludes distributional consequences of risks, and ignores those variables that have not been or cannot be quantified. Finally, as Lomborg's own study amply illustrates, the scientific basis for a particular comparison of regulatory costs and benefits often is far less stable and well understood than one can discern from the seemingly exact quantitative results of a cost-benefit exercise.

Any version of cost-benefit analysis that remains insensitive to these political and philosophical complications will tend to obscure what it promises to clarify. For that reason, Part II concludes with a few cautionary observations about the technocratic ideal of cost-benefit analysis that seems to have captivated Bjørn Lomborg, arguing that his

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27. A powerful argument building upon these and other critiques can be found in Frank Ackerman & Lisa Heinzerling, Priceless: Human Health, the Environment, and the Limits of the Market (2003).
approach threatens to inadvertently realize the caustic observation of Jorge Luis Borges that “[d]emocracy is an abuse of statistics.”

I

WHERE THE BODIES ARE BURIED

An old saw advises readers to scrutinize the footnotes of any extended argument, for that is “where the bodies are buried.” On that theory, Lomborg’s study, with its 2,930 footnotes, promises a veritable necropolis of misinterpretations, factual errors, and eyebrow-raising omissions. Nevertheless, before taking spade to turf, it is important to acknowledge the many areas in which The Skeptical Environmentalist has brought a refreshing perspective to the environment-development debate. As Lomborg persuasively argues, on any number of measures humanity has made astounding advancements in welfare over the past century. For instance, “more than 85 percent of the world’s inhabitants can expect to live for at least 60 years—more than twice as long as people were expected to live on average just a hundred years ago.” Lomborg is right to call this increase in longevity “[i]ncredible progress.”

Likewise, it should be taken as welcome news that “illiteracy in the developing world has fallen from about 75 percent for the people born in the early part of the 1900s to below 20 percent among the young of today.” So too should declining birth rates, infant mortality rates, and percentages of people starving worldwide be taken as signs of significant improvement in the collective lot of humanity. Although I would not go so far as to join Lomborg in concluding that “[w]e have experienced fantastic progress in all important areas of human activity,” I concur that there is much to celebrate. Moreover, I agree with Lomborg’s intuition that paying exclusive attention to negative aspects of the human condition might foster a sense of hopelessness that ultimately undermines any prospect of eradicating those problems.

Still, Lomborg is hardly the first to point out the existence of such promising indicators of development, nor is he even the first to point them out as part of an argument against the prevailing pessimistic ethos
Indeed, in many respects, the first several chapters of *The Skeptical Environmentalist* that develop these points read simply like an updated edition of Julian Simon's *The Ultimate Resource*. For that reason, in order to evaluate what, if any, original contribution the Danish statistician has made to our understanding of the "real state of the world," one must turn to his chapters on resource use and environmental degradation. In these sections, Lomborg sets out to demonstrate that the Litany constructed by environmental organizations not only overlooks progress in important areas of human development, but also misrepresents the various areas of ecological trouble to which it does attend.

### A. Lomborg’s Critique of the Litany

To his credit, Lomborg candidly discloses in the preface to *The Skeptical Environmentalist*, "I am not myself an expert as regards environmental problems." The author later proves as much when he argues that plant photosynthesis is not instrumentally significant to humans, apparently forgetting that the very evolution of animal life was made possible by plants increasing the oxygen content of the atmosphere over a period of millions of years. Admittedly, the eradication of all plant life from the face of the Earth, discussed as a rather blasé hypothetical by Lomborg, would not have an immediate impact on humans due to the immense amount of oxygen presently stored in the atmosphere. However, elimination of all photosynthesizing life forms from the Earth eventually would result in a decline of atmospheric oxygen content, a fact that perhaps reveals more about Lomborg's level of concern for future generations than it does his scientific expertise.

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38. LOMBORG, supra note 5, at xx.

39. Id. at 115.


41. See LOMBORG, supra note 5, at 115 ("Even if all plants, on land as well as at sea, were killed off and then decomposed, the process would consume less than 1 percent of the atmosphere's oxygen.").

42. See Wim Vermaas, *An Introduction to Photosynthesis and Its Applications*, WORLD & I, March, 1998 ("Without photosynthesis, the oxygen in the atmosphere would be depleted within several thousand years."). *available at* http://photoscience.la.asu.edu/photosyn/education/photointro.html.
Unfortunately, such confusions plague The Skeptical Environmentalist.\footnote{43} A typical example is Lomborg's treatment of acid rain. In four short pages, Lomborg argues that acid rain has no effect on forests, dismissing the well-known claim to the contrary as a "myth."\footnote{44} Yet Lomborg's analysis of the issue borders on inept. He begins by opining that "big-city pollution has nothing to do with acid rain,"\footnote{45} despite the fact that traffic emissions have been shown to be a major contributor of nitrogen compounds that cause acid rain.\footnote{46} He then reproduces a single graph from an early and much-criticized\footnote{47} National Acid Precipitation Assessment Program (NAPAP) report showing inconsequential differences in growth rates among seedlings from three species of trees that were exposed to varying concentrations of acid rain over a short period of time.\footnote{48} From this and a sprinkling of other data, Lomborg concludes that the widely held perception that acid rain contributes to forest death is "not borne out by the evidence."\footnote{49}

As with many other claims in the book, Lomborg's conclusion appears to be driven by his exclusion of evidence that contradicts his chipper assessment. Numerous peer-reviewed scientific studies demonstrate that acidic deposition adversely impacts forest ecosystems, whether by causing observable mortality and decline in tree species, as in the case of the sugar maple\footnote{50} and the red spruce,\footnote{51} or by causing more long-term and widespread declines in forest quality due to the gradual erosion of base cation nutrient levels in soil.\footnote{52} One may be tempted to excuse Lomborg for his oversight because, after all, he is not himself "an expert as regards environmental problems." But Lomborg did not need to delve deeply into the primary scientific literature to discern these facts. Indeed, he simply could have examined NAPAP's more recent 1998

\begin{itemize}
\item \footnote{43} For instance, in his chapter on the environmental and health risks of synthetic chemicals, Lomborg erroneously claims that benzene and aflatoxin are pesticides, see LOMBORG, supra note 5, at 231, 233, and that maize apparently is not a type of grain, see id.
\item \footnote{44} id. at 178–81. Lomborg wisely chooses not to dispute the impact of acid rain on lakes and other aquatic environments. See id. at 179.
\item \footnote{45} Id. at 178.
\item \footnote{46} See NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM BIENNIAL REPORT TO CONGRESS: AN INTEGRATED ASSESSMENT 29 (1998).
\item \footnote{47} See Lisa Heinzerling, Selling Pollution, Forcing Democracy, 14 STAN. ENVTL. L.J. 300, 326 (1995).
\item \footnote{48} See LOMBORG, supra note 5, at 178–79.
\item \footnote{49} Id. at 181.
\item \footnote{50} See C. T. Driscoll et al., Acidic Deposition in the Northeastern United States: Sources and Inputs, Ecosystem Effects, and Management Strategies, 51 BIOSCIENCE 180 (2001).
\item \footnote{51} See A. H. Johnson et al., Synthesis and Conclusions from Epidemiological and Mechanistic Studies of Red Spruce Decline, in ECOLOGY AND DECLINE OF RED SPRUCE IN THE EASTERN UNITED STATES 385 (Eagar, C., and M.B. Adams eds. 1992).
\item \footnote{52} See DAN BINKLEY ET AL., ACIDIC DEPOSITION AND FOREST SOILS: CONTEXT AND CASE STUDIES OF THE SOUTHWESTERN UNITED STATES 129 (1989).
\end{itemize}
report to Congress, the executive summary of which states unequivocally, “Sulfur and nitrogen deposition have caused adverse impacts on certain highly sensitive forest ecosystems in the United States... [If] deposition levels are not reduced in areas where they are presently high, adverse effects may develop in more forests due to chronic, multiple decade exposure.”\(^5\)

Such cursory and lopsided analysis occurs throughout *The Skeptical Environmentalist*, as numerous respondents to Lomborg have taken pains to demonstrate.\(^6\) Rather than rehearse such point-by-point rebuttals, this Section instead will review briefly the statistician’s treatment of three key indicators of environmental sustainability: biodiversity, renewable resources, and nonrenewable resources. As will be seen, Lomborg’s analysis of each of these subjects fits into a pattern of oversimplification.

1. **Biodiversity**

As with the rest of his study, Lomborg’s section on the value of biodiversity adopts a purely instrumentalist and anthropocentric perspective: “[T]he needs and desires of humankind represent the crux of our assessment of the state of the world. This does not mean that plants and animals do not also have rights but that the focus will always be on the human evaluation.”\(^5\) Such a perspective is consistent with the dominant mode of environmental policy analysis today\(^6\) and I will not take issue with it. I will, however, criticize Lomborg for ignoring the major instrumental reason for valuing diversity in ecosystem life: its link to water purification, flood control, nutrient cycling, atmospheric stabilization, crop pollinization, and other so-called “ecosystem services.”\(^5\) For at least the past decade, a major international research

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53. NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, supra note 46, at 3.


55. LOMBORG, supra note 5, at 11.

56. William F. Baxter’s classic work articulating such a view, *People or Penguins: The Case for Optimal Pollution* (1974), may have been viewed as iconoclastic when released, but its intellectual success in the years following has been tremendous. See Barton H. Thompson, Jr., *People or Prairie Chickens: The Uncertain Search for Optimal Biodiversity*, 51 STAN. L. REV. 1127, 1127–28 (1999).

effort has been underway to identify and evaluate the many ways in which healthy ecosystems provide services of benefit to humans and other life forms. It is no overstatement to conclude that all branches of environmental science, law, and policy now must confront the issue of ecosystem services as a central aspect of their inquiry. Nevertheless, in reflecting upon the significance of biodiversity, Lomborg somehow manages to overlook entirely the teachings of this literature.

Lomborg’s basic message with regard to species loss is that it “is not a catastrophe but a problem.” Such a conclusion is made possible—indeed it is preordained—by incorporating only the narrowest understanding of biodiversity’s instrumental significance. Lomborg introduces the subject with what he terms the “irreverent” question, “Is biodiversity important?” and he responds tepidly in the affirmative by recognizing only the derivation of food and medicines from plants. Lomborg addresses the issue of ecosystem services, but dismisses it as a nonstarter. He argues that biotic communities as a whole produce ecosystem services, and therefore the worth of any individual species within a community is negligible.


59. To be sure, at times in The Skeptical Environmentalist Lomborg reveals an awareness of the concept of ecosystem services. For instance, in trying to debunk the view that global warming has led to catastrophic weather events, Lomborg argues that a particularly severe flood in China “was in large measure caused by clear-cutting forests on the upstream slopes, causing more rapid runoff.” LOMBORG, supra note 5, at 296. Thus, flood control provides a salient example of ecosystem services when it serves Lomborg's purpose, but when the topics of biodiversity and ecosystem vitality are directly at issue, such services disappear from view. To make matters worse, when Lomborg does recognize the existence of ecosystem services, he refuses to credit natural scientists with this discovery: “Of course, [acknowledging the flood protection services provided by standing forest] is just plain and simple . . . social cost-benefit analysis—good economics, and not ecology.” Id. at 15. With this statement, Lomborg slides from merely negligent to reckless disregard of intellectual history. As I have detailed in other work, (see supra note 16), the incorporation of ecosystem services into economic theory requires extensive modification of background assumptions regarding the availability and substitutability of natural capital. Although these modifications are beginning to take place, they are doing so largely at the behest of biologists, physicists, and other natural scientists who have collaborated with a few sympathetic economists to bring multidisciplinary rigor to the study of nature's role within human economic production. Lomborg's ignorance of this history not only undermines his discussion of biodiversity, it also reflects a deeper problem of asymmetric skepticism that plagued The Skeptical Environmentalist throughout. See infra Section II.B.1.
This reasoning is fatuous. To begin with, there is some reason to believe that the loss of even a single species may have significant consequences for the integrity of an ecosystem. Just as the introduction of a single non-native species often leads to sweeping changes in the composition of an ecosystem,\textsuperscript{65} the elimination of just one native component of an ecological community also appears capable of rendering the remaining system dramatically unstable.\textsuperscript{66} Even apart from such evidence, however, Lomborg's argument is flawed because it misconstrues its target. Scholars who advocate orienting environmental law and policy around the notion of ecosystem services do not base their case on the notion that such services depend upon the health of any individual species. Rather they contend that overall species diversity acts as an important factor in determining the resiliency and vitality of an ecosystem.\textsuperscript{67}

As one influential group of scientists and legal scholars recently noted while introducing a symposium devoted to the topic, "[u]nderstanding the role of ecosystem services powerfully justifies why habitat preservation and biodiversity conservation are vital, though often overlooked, policy objectives."\textsuperscript{68} Unfortunately, Lomborg's chapter on biodiversity attempts to set this understanding back considerably.

Turning to the actual measurement of biodiversity and species extinction, Lomborg introduces the issue by noting that the fact of "species getting blotted out has been part and parcel of evolution."\textsuperscript{69} This phrasing is not only inelegant, it is misleading: the pertinent question is whether the current rate of "species getting blotted out" exceeds the background rate, not whether such a phenomenon is historically unique. With respect to the former question, environmental organizations have

\begin{itemize}
  \item \textsuperscript{65} See generally \textsc{Charles S. Elton}, \textit{The Ecology of Invasions by Animals and Plants} (1958).
  \item \textsuperscript{66} See, e.g., J. A. Estes et al., \textit{Killer Whale Predation on Sea Otters Linking Oceanic and Nearshore Ecosystems}, 282 \textit{Science} 473 (1998) (reporting evidence that a decline in the availability of forage fish near Alaska's Aleutian archipelago caused a decrease in the population of seals and sea lions which caused killer whales to shift their diet to sea otters which caused an increase in the population of sea urchins, a dietary staple of sea otters, which finally in turn caused a sharp decrease in kelp forests, a dietary staple of sea urchins). I am indebted to J.B. Ruhl for the insightful analogy between introduction of a non-native and removal of a native species.
  \item \textsuperscript{67} See J.B. Ruhl, \textit{Working Both (Positivist) Ends Toward a New (Pragmatist) Middle in Environmental Law}, 68 Geo. Wash. L. Rev. 522, 542-43 (2000) ("Although the relationship between biodiversity and ecosystem processes is complex, researchers are repeatedly finding that diversity of species assemblages is tied directly to ecosystem productivity, resilience, and sustainability."); S. Naeem et al., \textit{Biodiversity and Ecosystem Functioning: Maintaining Natural Life Support Processes}, 4 Issues in Ecology 1 (1999), available at http://www.esa.org/sbi/issue4.pdf (surveying research regarding the significance of number of species to ecosystem functioning and concluding that "[m]any ecosystem processes are sensitive to declines in biodiversity").
  \item \textsuperscript{68} Salzman, Thompson, Jr., & Daily, \textsuperscript{supra} note 57, at 312.
  \item \textsuperscript{69} \textsc{Lomborg}, \textit{supra} note 5, at 249.
\end{itemize}
gotten much mileage out of biologist and popular author Norman Myers’s 1979 statement that as many as 40,000 species may be lost per year, an amount several thousand times the estimated background rate. Lomborg rightly points out that Myers’s estimate was simply a hypothetical discussion point, not a matter of scientific research or analysis. Nevertheless, much like the traditional health advice to consume eight glasses of water per day, the extinction figure appears to have achieved great salience and authority merely through its pervasive repetition. Thus, with regard to this well-known statistic, Lomborg’s critique of the Litany has hit its mark.

The reader is still left wondering, however, why the author would devote several pages of his skeptical opus to such easy prey. The answer, one soon discovers, is that Lomborg has far less success criticizing the more recent and rigorous attempts that scientists (including Norman Myers) have made to quantify the extinction rate. The dominant method of determining rates of extinction today depends upon associations believed to exist between habitat destruction and species loss. Lomborg argues that such associations are tenuous based upon two pieces of evidence, both of which turn out to be problematic for the Danish statistician. First, he argues that the eastern forests of the United States were “reduced over two centuries to fragments totaling just 1-2 percent of their original area, but nonetheless this resulted in the extinction of only one forest bird.” However, as biologist Thomas Lovejoy points out, Lomborg’s figure regarding original forest cover is a highly misleading measure of habitat loss since it ignores simultaneous reforestation: in fact, “total forest cover never fell below roughly 50 percent—allowing much biodiversity to survive as forest returned to an even greater area.”
Second, Lomborg cites a study of bird life in Puerto Rico finding that seven out of sixty species of birds became extinct during a period of heavy deforestation on the island. Lomborg argues that "[t]he most significant finding is that only seven species of birds became extinct," apparently viewing the keg as half full when others justifiably might have deemed it half empty. More importantly, as the editor of Scientific American has pointed out, Lomborg neglects to note that "many species of bird did not go extinct because they were not unique to Puerto Rico and could recolonize it from other islands; that the seven species that did become extinct were all from a group of only 20 bird species unique to the island; and that at least four of the surviving species have only a few members and may yet perish." In short, despite admittedly dramatic flourishes, Lomborg fails in his somewhat hubristic attempt to cast doubt on the extinction rate estimation technique favored by the world's biologists.

To counter the figures derived from species-habitat area formulae, Lomborg makes much of the fact that official World Conservation Union (IUCN) "recorded extinction figures for mammals and birds are very small." This emphasis is surprising given that, in the notations to one of his own tables, Lomborg acknowledges that "because of the severe requirements for documenting extinctions [imposed by IUCN] these figures almost certainly underestimate their true numbers." Among other requirements, IUCN guidelines mandate that prior to the listing of a species as extinct, no individual member of that species can have been observed for a length of time at least equal to its life cycle, a period generally taken to be a minimum of fifty years without observation.

In light of the conservative bias of officially reported extinction rates, a useful exercise might have been to examine IUCN's information on "threatened" species, in addition to those that have been classified as officially "extinct." Had Lomborg undertaken that task, he would have

77. See LOMBORG, supra note 5, at 254.
78. Id. at 409 n. 2048 (emphasis added).
80. For instance, Lomborg accuses Edward O. Wilson and Paul Ehrlich of supporting a plan "to move the entire population of the [United States] so as to re-create a natural wilderness in most of the North American continent." See LOMBORG, supra note 5, at 257. In reality, these scientists simply have offered public endorsement of the Wildlands Project, a nonprofit organization that seeks to interconnect large wilderness reserves with undeveloped pathways that will allow species migration between preservation zones. See http://www.twp.org/inside_wp/index.html (last visited March 10, 2003).
81. LOMBORG, supra note 5, at 254 (internal quotations and citations omitted); see also id. at 255 (discussing lack of recorded extinctions in Brazilian Atlantic rainforest).
82. Id. at 250.
discovered that 24 percent of mammals and 12 percent of bird species worldwide currently are regarded as threatened.\textsuperscript{84} He also might have discovered that a recent global survey identified habitat loss as the principal factor affecting 83 percent of threatened mammals and 85 percent of threatened birds,\textsuperscript{85} findings that lend further support to the species-habitat area formulae that Lomborg dismisses without adequate justification. In short, he might have discovered relevant, credible information that reveals much more about the "real state of the world" than a straw-man critique of Norman Myers's twenty-year old extinction rate figure.

2. Renewable Resources

Although 1970s debates about the future of the environment tended to focus on the projected availability of nonrenewable resources,\textsuperscript{86} renewable resources appear to have emerged as the area in which environmental constraints are most apparent.\textsuperscript{87} The United Nations Environment Programme (UNEP), in its most recent \textit{Global Environmental Outlook}, identified a variety of such areas of concern: a "net loss in forest area during the 1990s [of] 94 million [hectares];"\textsuperscript{88} 

\[\text{"[o]verexploitation of many of the surface water resources and great aquifers upon which irrigated agriculture and domestic supplies depend;"}\textsuperscript{89} and "a sharp global trend towards increasingly intense exploitation and depletion of wild fish stocks [such that n]umerous fisheries have collapsed and others are threatened with overexploitation."\textsuperscript{90}

Lomborg tries unsuccessfully to dispute these trends in chapters devoted to food and forests.\textsuperscript{91} He attempts, for instance, to discount the collapse of world fisheries by reporting a figure for global fish production that includes farm-raised fish.\textsuperscript{92} However, he never mentions the feed grain inputs, biological and chemical pollutants, genetic contaminants,
and other environmental factors that make aquaculture an imperfect substitute for wild catch.\textsuperscript{93} Similarly, Lomborg reports global forest data without distinguishing between old growth forest, regrowth forest, and managed timber plantations, even going so far as to include clear-cut zones that are merely scheduled to be replanted as currently forested areas.\textsuperscript{94} As UNEP has noted, however, "[f]orest plantations typically contain only one, or a few, species, which makes them less biologically diverse and more susceptible to diseases and other disturbances than natural forests."\textsuperscript{95} They also often fail to provide the same quality and degree of ecosystem services as do natural growth forests.\textsuperscript{96}

Lomborg demonstrates his lack of appreciation for these distinctions by noting rather unremarkably that "the total forest loss in the Amazon since the arrival of man has only amounted to 14 percent."\textsuperscript{97} Coupled with UNEP's recent observation that current tropical deforestation rates are about 1 percent per year,\textsuperscript{98} the conclusion reasonably follows that a

\textsuperscript{93} See generally Mary Liz Brenninkmeyer, \textit{The Ones That Got Away: Regulating Escaped Fish And Other Pollutants From Salmon Fish Farms}, 27 B.C. ENVT. AFF. L. REV. 75 (1999); D. Douglas Hopkins et al., \textit{An Environmental Critique of Government Regulations and Policies for Open Ocean Aquaculture}, 2 OCEAN & COASTAL L. J. 235 (1997); Ronald J. Rychlak & Ellen M. Peel, \textit{Swimming Past the Hook: Navigating Legal Obstacles in the Aquaculture Industry}, 23 ENVTL. L. 837 (1993). Of course, to engage in a comprehensive comparison of aquaculture to wild catch, one also would need to consider fuel consumption and other impacts of open seas fishing that are not shared by aquaculture. \textit{See infra} text accompanying notes 201-215. However, even apart from the ecological distinctions between farm-raised and wild catch, recent analysis suggests that the Chinese government systematically overstated national catch rates during the 1990s in a manner that fundamentally taints the FAO data relied upon by Lomborg. \textit{See Reg Watson & Daniel Pauly, \textit{Systematic Distortions in World Fisheries Catch Trends}, 414 NATURE 534, Nov. 29, 2001. Revised data now suggest that the global catch fell by some 360,000 tons per year, rather than rising by approximately that amount as previously believed. \textit{See id.}}

\textsuperscript{94} \textit{See LOMBORG, supra} note 5, at 110 (noting that "the overall area covered by forest has not changed much since 1950..." without distinguishing among types of forest cover). Lomborg's data on forest loss suffer from a variety of such problems that have been explored by Emily Matthews, a senior associate with the World Resources Institute. \textit{See Emily Matthews, Not Seeing the Forest for the Trees: On Bjorn Lomborg and Deforestation, GRIST MAG., December 12, 2001, available at http://gristmagazine.com/grist/books/matthews121201.asp}. For instance, he relies upon a data series from the United Nations Food and Agriculture Organization (FAO) that was expressly discontinued by FAO because it considered the data unreliable for assessing forest cover. He also confusingly juxtaposes net forest cover figures with estimates of reductions in original forest cover, \textit{see LOMBORG, supra} note 5, at 355 n. 73, and chooses without explanation to express changes in forest cover as percentages of the total land area of the world, \textit{see id.} at 111. Finally, he criticizes the World Wildlife Fund (WWF) for overestimating the massive Indonesian forest fires of the late 1990s, when in fact "the most authoritative consensus estimate of the extent of forests burned during the Indonesian fires of 1997-1998 is more than twice the WWF estimate that is derided by Lomborg." \textit{Id.}

\textsuperscript{95} \textit{UNITED NATIONS ENVIRONMENT PROGRAMME, supra} note 84, at 93.

\textsuperscript{96} \textit{See supra} text accompanying note 67 (noting that many ecosystem services are positively correlated with ecosystem diversity).

\textsuperscript{97} \textit{See LOMBORG, supra} note 5, at 10.

\textsuperscript{98} \textit{See UNITED NATIONS ENVIRONMENT PROGRAMME, supra} note 84, at 92. Lomborg states that the tropical deforestation rates is only 0.46 percent per annum, \textit{see LOMBORG, supra
majority of the Amazonian rainforest will disappear in just one century. Amazingly, Lomborg still claims that “[b]asically . . . our forests are not under threat.”99 As with his chapter on biodiversity, Lomborg’s positive assessment appears to stem from a lack of understanding, or possibly even awareness, of the lessons of environmental science.100 The statistician sees a pound of fish as a pound of fish, a board foot of lumber as a board foot of lumber,101 while environmental scientists see intricate webs of life whose functioning depends upon qualitative factors such as species diversity, carrying capacity, adaptive capabilities, the presence of keystone species, and other indicators of “ecological integrity.”102 It may comfort Lomborg to know that tropical deforestation is nearly being matched by an expansion of Northern hemisphere timber plantations. However, to the many humans and other life forms that depend directly or indirectly on the unique biological qualities of the rainforest, Lomborg’s data are meaningless.

3. Nonrenewable Resources

The treatment of nonrenewable resources in The Skeptical Environmentalist follows a similarly indiscriminate path. According to Lomborg, given technological advances in recovery and exploitation techniques, one may state as a practical matter that “most resources have actually become more abundant” despite enormous increases in resource use over the last century.103 This analysis is somewhat disappointing given that elsewhere in the book Lomborg opines that “[o]ne of the main rhetorical figures of the environmental movement is to pass off a temporary truism as an important indicator of decline.”104 Relevant time horizons may be especially long with respect to the availability of nonrenewable resources, but unless Lomborg has discovered a way to

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99. LOMBORG, supra note 5, at 117.
100. See supra text accompanying notes 57–59.
103. LOMBORG, supra note 5, at 29 (emphasis in original).
104. Id. at 27.
sustain the laws of thermodynamics, his argument suffers from the same conflation of a "temporary truism" with a long-term trend for which he castigates the environmental movement generally.

Moreover, while Lomborg foresees a vague but rosy future of increasing oil availability, the U.S. Energy Information Administration recently has used U.S. Geological Survey data to estimate that world oil production will peak sometime between 2021 and 2112, a range that the authors of the study admit is among the most optimistic available in the literature. Lomborg systematically ignores such evidence because he believes that resource availability is better inferred from price data than from the collective knowledge of geologists: "How should scarcity be measured?... If we want to examine whether oil is getting more and more scarce we have to look at whether oil is getting more and more expensive." In order for such a methodology to produce reliable results, however, Lomborg first would need to remake the world in the image of a perfectly informed, perfectly competitive market, including the seemingly Herculean task of eliminating governmental subsidization of energy production. Even then, one still would be left with the question of why the market's interpretation of U.S. Geological Survey data is preferable to the interpretation of the Energy Information Administration. Lomborg does not answer that question and, given the impact that discounting would have on the market's valuation of future oil demand, it is doubtful that he could.

Perhaps aware that his view of nonrenewable resources is untenable in the long run (and also problematic in the short run given greenhouse emissions and other negative externalities associated with fossil fuels),

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105. See Sustainability, supra note 16, at 21(describing the second law of thermodynamics and its implication that “[t]he fixed quantum of matter-energy with which the universe is endowed must necessarily move from a state of high-availability to low-availability, of low-entropy to high-entropy, and of order to chaos.”).
106. See LOMBORG, supra note 5, at 135 (“[A]ll in all there is oil enough to cover our total energy consumption for the next 5,000 years.”).
108. LOMBORG, supra note 5, at 122.
110. See infra text accompanying notes 243-247.
111. See infra text accompanying notes 218–247. With respect to certain applications such as electricity generation, coal offers a substitute for oil of enormous abundance. See Jeffrey J. Rachlinski, The Psychology of Global Climate Change, 2000 U. ILL. L. REV. 299, 301. Thus, the short run constraint of negative externalities becomes of primary significance. See David Driesen, Sustainable Development and Air Quality: The Need To Replace Basic Technologies With Cleaner Alternatives, 32 ENVTL. L. REP. 10277, 10286 (2002) (“The question really is whether we will have the courage to adopt a sustainable path now, or have it thrust upon us after major climate disruption has already ravaged the earth, the accumulation of even more
Lomborg wisely predicts a future dominated by alternative energy sources: "A thousand years ago we did not use oil, and a thousand years from now we will probably be using solar, fusion or other technologies we have not yet thought of." But the statistician prefers such a transition to happen without government direction or influence. He is content simply to trust that rising energy prices eventually will force substitution away from nonrenewable resources. The concerned citizen justifiably might ask what form such substitutes will take, but Lomborg’s optimism seems equally boundless for nuclear, solar, and wind energy, and even for “some as-of-now unimagined technology.”

To be fair, such technological optimism is not unique to Lomborg; indeed, it is reflected in the standard macroeconomic assumption that man-made capital is a perfect substitute for natural resources. Nevertheless, it seems only fitting that a study billed as The Skeptical Environmentalist would adopt a slightly less credulous posture in making these predictions. After all, littered throughout Lomborg’s tome are unintentional acknowledgments that modern production techniques—indeed, modern civilization—is heavily dependent upon fossil fuels. For instance, when discussing the likelihood that agricultural productivity will keep pace with massive expected population increases, Lomborg vacillates wildly between acknowledging and ignoring the vital role that fossil fuels play in modern agricultural techniques. He claims that “[t]he fall in the price of food is a genuine long-term tendency,” on the same page that he attributes heavy price increases for food during the 1970s to the oil crisis. Later in the book Lomborg argues that “[t]here seem to be no ‘walls’ for top [agricultural] yields ahead,” but on the next page substantial amounts of mercury has harmed the ecosystem, and several more generations have suffered from lung disease caused or exacerbated by air pollution.”.

112. LOMBORG, supra note 5, at 28.
113. See id. at 132 (“The underlying argument is often that we should support renewable energy because the market will discover only too late that we are running out of fossil fuels. But as we have seen... there is no risk of running out of fossil fuels anytime soon... Consequently, the assumption should still be that the market will invest [in] the optimal amount of renewable energy”).
114. Id. at 128–29.
115. Id. at 132–33.
116. Id. at 134–35.
117. Id. at 136.
118. See infra text accompanying notes 128–141.
119. Lomborg himself admits as much at various points in the text. See, e.g., LOMBORG, supra note 5, at 91 (“It is absolutely decisive for our continued existence that we have access to a large number of the Earth’s resources.”), 309 (limiting global warming to a 1.5° C increase “would require a complete cessation of all carbon emission by 2035, essentially shutting down the world as we know it.”).
120. Id. at 62 (noting that “[t]he increase in the price of oil meant that artificial fertilizers became more expensive”).
121. Id. at 98.
he again recognizes that increased yields depend upon fossil-fuel intensive techniques of "irrigation and fertilization." Turn one more page and we are back to the cheery conclusion that "there are good reasons to presume that [agricultural] development . . . will continue with ever higher yields and consequently an ever larger agricultural production."

Lomborg is justifiably enamored with the Green Revolution, but even he must admit that these technological innovations depend upon a supply of fossil fuels that is limited in the long run. The question of whether and how humanity will feed an additional 3.3 billion mouths in the coming half century remains unanswered. In the end, one cannot help but feel that Lomborg's argument amounts to an elaborate shell game in which coal and oil are the little red balls deftly hidden from view. As if to deflect attention from the ruse, Lomborg repeatedly claims that current dependence on fossil fuels for energy production is a temporary anomaly of little long-term significance. After all, Lomborg seems to argue, given that "the global price for energy constitutes less than 2 percent of the global GDP . . .," how significant could it be to human

122. Id. at 99; see also id. at 63 ("The use of fertilizer has increased almost nine-fold since 1950."), ("Irrigated land contributes as much as 40 percent of the Earth's food—even though it only accounts for 18 percent of the total agricultural land mass."). 144 ("Food production is crucially dependent on three resources—soil, water and fertilizer."). 197 ("Today it is estimated that 40 percent of all crop nitrogen comes from synthetic fertilizer, and about one-third of human protein consumption depends on synthetic fertilizer."). ("Had fertilizer use remained at the 1960 level, we would need at least 50 percent more farmland than the present-day use . . . Thus, synthetic fertilizer has been and will continue to be crucially important in feeding the world while leaving sufficient space for other species.").

123. Id. at 100; see also id. at 109 ("Food will get cheaper and ever more people will be able to consume more and better food.").

124. See id. at 62 ("One cannot help asking oneself how development can possibly have been so good. The answer is to be found in a number of technologies which are collectively known as The Green Revolution.").

125. See id. at 47. Nor is food production the only optimistic prediction made by The Skeptical Environmentalist that trades upon an obscured dependency on fossil fuels. The desalination plants that Lomborg posits as a technological solution to freshwater scarcity, see id. at 153, are enormously energy intensive to operate; hence, the location of the majority of the world's existing desalination plants in the Middle East. See California Coastal Commission, Seawater Desalination in California (1993), available at http://www.coastal.ca.gov/desalrpt/dtitle.html#TOCDesalination; see also Peter H. Gleick, Where's Waldo? A Review of the Skeptical Environmentalist (2001), available at http://www.ucsusa.org/publication.cfm?publicationID=393 (noting that the cost information upon which Lomborg bases his optimistic view of desalination is "for a single plant that has yet to be built and that has several atypical characteristics"). Likewise, the solar panels and wind turbines that Lomborg speculates will replace coal and oil in future applications, see LOMBORG, supra note 5, at 132-35, require raw materials that are themselves dependent on fossil fuels for their production, see id. at 141 (describing dependency of iron and steel production on oil). Incomplete references to technological fixes such as these serve only to distract the reader from the more fundamental point that humanity has been given a one-time endowment of fossil fuels that must be distributed equitably between current and future generations. See Kysar, Vision, supra note 16, at 683-93.

126. LOMBORG, supra note 5, at 128.
welfare? Confronted with evidence that modern agriculture depends heavily on fossil fuel inputs, Lomborg might respond similarly that food constitutes only 5 percent of the global GDP.\textsuperscript{127} Surely humanity could survive with a mere 5 percent reduction in its annual economic output? Like the denizens of this hypothetical future, readers seeking answers to the great ecological challenges ahead are left hungry by \textit{The Skeptical Environmentalist}.

\subsection*{B. Lomborg's Counterlitany}

As the previous Section described, Lomborg's glowing assessment of the human condition is marred by his selective analysis of scientific research and his failure to appreciate fully the significance of the research that he does choose to analyze. Were these the only failings of \textit{The Skeptical Environmentalist}, one might be content to discount the work as merely a careless gloss on the findings of environmental science. As will be detailed in this Section, however, Lomborg's book also attempts to provide a positive political account of why the state of the world is so strikingly good (assuming for the moment that Lomborg is correct in believing that it is strikingly good). In delivering this part of the argument, Lomborg relies upon a veritable Counterlitany of assumptions about the tendency for markets to foster technological solutions to resource scarcities, the degree to which government regulation is responsible for environmental improvements, and the potential for international trade and economic development to resolve environmental problems in the Third World. This Section notes that Lomborg's Counterlitany is subject to considerably more uncertainty and debate than the author discloses.

\subsubsection*{1. Asymmetric Skepticism}

For a self-described skeptic Lomborg's optimism regarding the environmental outlook is oddly unqualified: "\textit{Whether we are talking about food, raw materials or energy, no shortages of resources seem to be forthcoming, no serious problems for the continued growth of production and welfare are in the offing.}"\textsuperscript{128} Indeed, throughout \textit{The Skeptical Environmentalist}, the author adopts the view that "\textit{[m]an is in so many and so obvious ways dependent on other life forms, [that] for this reason alone they will be preserved and their welfare appreciated.}"\textsuperscript{129} However, Lomborg is simply wrong to assume that the ways in which humanity is

\begin{itemize}
\item \textsuperscript{127} See \textsc{World Bank, World Development Indicators 2002}, available at http://www.worldbank.org/data/databytopic/gdp.html.
\item \textsuperscript{128} \textsc{Lomborg}, supra note 5, at 211.
\item \textsuperscript{129} \textit{Id.} at 12.
\end{itemize}
dependent on the environment and other life forms are "obvious." To the contrary, the systematic study of nature's dynamic interrelated systems is still in its relative infancy. Moreover, those ecological relationships that have become well understood—such as the flood protection services provided by forests that Lomborg erroneously describes as a finding of "good economics, and not ecology"—have been identified and illuminated only by the serious efforts of dedicated scientists. Such efforts at least in part stand outside of the market processes that Lomborg believes will result in the automatic conservation of essential resources.

In short, the statistician has given only an explanation of why market processes might conserve environmental goods and services that have been identified as essential to human well-being; he has not attempted to describe the manner in which such goods and services actually are identified.

We have seen this type of black box from Lomborg before. As noted in the previous Section, Lomborg assures his reader that humanity will devise substitutes for fossil fuels in due course, but the actual form that such substitutes will take is left unspecified. In making such claims, Lomborg borrows an idea from Julian Simon that has constituted the primary counterargument to ecological prognosticators who foresee dramatic troubles ahead. Stripped of technical adornment, the idea simply is that human ingenuity is limitless and that no individual feature of the environment truly is essential to human survival. After all, throughout history humans have circumvented apparent natural resource constraints by relying upon technology, substitution, and adaptation—why should we have reason to doubt that such triumphs will continue in the future?

As The Skeptical Environmentalist demonstrates, no aspect of the environmentalists' agenda can withstand this relentless optimism. Worried about rising sea levels? "[I]t seems likely that rich countries . . . will protect their citizens at such a low price that virtually no one will be exposed to sea flooding." Concerned about reliance on

130. Most scientists who study systems ecology trace the discipline's origin to E.P. Odum's 1953 classic, Fundamentals of Ecology. See Sven E. Jorgensen & Felix Muller, Ecosystems as Complex Systems, in HANDBOOK OF ECO SYSTEM THEORIES AND MANAGEMENT 5, 6 (Sven E. Jorgensen & Felix Muller eds., 2000); see also Ruhl, supra note 67, at 527-28 (describing recent evolution of ecosystem dynamics as a field of study).

131. LOMBORG, supra note 5, at 15.

132. See supra text accompanying notes 103-127.

133. See supra text accompanying notes 103-127.

134. See Kysar, Sustainability, supra note 16, at 55-61.

135. LOMBORG, supra note 5, at 290; see also id. at 291 ("[E]conomically rational foresight will make sure that [coastal] protection will be afforded only to property that is worth more than the protection costs and [human] settlements will be avoided where costs will outweigh benefits.").
unsustainable draw-down rates from freshwater aquifers? "[I]t is unlikely that we will not become better at utilizing and distributing water."  

Fearful that agricultural productivity will not keep pace with population growth? "[G]rain production will continue to rise as far into the future as can be seen." Troubled by any other of the environmental problems that collectively form the Litany? "[I]t is likely that by humanity's creativity and collected efforts we can handle and find solutions to these problems."  

Lomborg's argument is slightly more sophisticated than this treatment would suggest. It begins with the proposition that labor and human-made capital have proven to be widely substitutable for each other over the past century. It then assumes that human-made capital also must be perfectly substitutable for the various natural resources and ecosystem services provided by the environment, and that no market failures such as negative externalities, informational deficits, or public goods problems confound the process by which substitutes are developed. So long as these assumptions hold, Lomborg may be correct to discount the implications of the Litany on the theory that "we continuously find new resources, use them more efficiently, and are able to recycle them and to substitute them." But Lomborg nowhere attempts to examine the empirical foundation for his critical and arguably non-intuitive assumption. As such, everything that follows in The Skeptical Environmentalist is simply an article of faith, not a matter of knowledge about the "real state of the world." Lomborg should express it as such.

2. Whither Regulation?

Some of Lomborg's claims regarding the improving state of the environment are meritorious. Most notably, as Lomborg emphasizes, several harmful sources of air pollution have been reduced throughout most of the developed world over the last century and particularly within the last thirty years. What is striking about Lomborg's discussion of these improvements, however, is his steadfast refusal to attribute them in

136. Id. at 154.
137. Id. at 95. Lomborg relies upon an FAO study for this bold projection "as far into the future as can be seen," but fails to emphasize that the study's time horizon extended only to the year 2010. See id. at 95, figure 51.
138. Id. at 330.
139. See id. at 119.
140. Lomborg is by no means alone in drawing this conclusion, as many prominent economists have argued essentially the same point. See Kysar, Sustainability, supra note 16, at 49–50.
141. See LOMBORG, supra note 5, at 148.
142. See id. at 167–75 (documenting emissions reductions in the United States and the United Kingdom for particulate matter, lead, sulfur dioxide, ozone, nitrogen oxides, and carbon monoxide).
any significant way to the impact of environmental regulation. In describing air quality improvements in London, for instance, Lomborg states that "for the greater part of the twentieth century [the improvements have] been due to a change in infrastructure and fuel use and only slightly, if at all, connected to environmental worries expressed in concrete policy changes." Elsewhere he attributes falling particle concentration levels for the European Union and the United States to "reducing consumption of fossil fuels, especially high-sulfur coal, [to] using smoke scrubbing equipment on power plant smokestacks and [to] increasing energy efficiency" without mentioning the role of regulation in spurring or requiring those changes. In fact, Lomborg concludes that regulation of air pollution has not had any documented "noteworthy effect" on air quality.

This is a remarkably strong statement for Lomborg to make based upon only two studies, one nearly three decades old and one that expressly contradicts his conclusion. It is all the more remarkable given the numerous studies not cited by Lomborg that also contradict his view that regulation has not produced documented benefits in environmental quality. Readily available from the EPA, for instance, is the agency's 1997 multi-million dollar report to Congress analyzing the costs and benefits of the Clean Air Act over the period from 1970 to 1990. This report, completed over six years and peer reviewed by a panel of distinguished economists, scientists, and public health experts, found that without the adoption of national air pollution standards such as the Clean Air Act of 1970, the nation would have suffered an additional 205,000 premature deaths in the year 1990 alone. Although the precise amount of such estimates clearly can be debated, as Paul Portney has concluded it nevertheless "seems indisputable that the Clean Air Act and

143. Id. at 32.
144. Id. at 169.
145. Id. at 170.
147. See Mark R. Powell, Three-City Air Study, Resources for the Future Discussion Paper 97-29 at 19 (1997) ("Overall, the results of this analysis suggest that mandated pollution control investments have often had a significant effect in reducing maximum air pollutant concentrations.").
148. A succinct and helpful overview can be found in A. Myrick Freeman III, Environmental Policy Since Earth Day I: What Have We Gained?, 16 J. ECON. PERSP. 125 (2002).
its amendments have played an important role in improving U.S. air quality and in preventing its further degradation.\textsuperscript{152}

Lomborg's ignorance of the impact of environmental regulation is not limited to air pollution. Throughout \textit{The Skeptical Environmentalist} he takes pains to avoid admitting any role of government action in achieving the favorable conditions that he describes. When discussing the problem of ozone depletion, for instance, Lomborg reassures his reader that "even at ozone depletion's greatest impact, it will cause a relatively slight increase in the cancer incidence and death rate."\textsuperscript{153} But in drawing this conclusion, he discreetly assumes full compliance with the Montreal Protocol, an international agreement limiting the use of ozone-damaging chlorofluorocarbons that can only be described as a form of regulation.\textsuperscript{154} Elsewhere he attributes the decline of nitrogen oxide and carbon monoxide emissions solely to catalytic converters,\textsuperscript{155} as if these devices had appeared through the voluntary benevolence of automakers rather than through a fiercely fought legislative battle that ultimately was won by environmental and consumer groups.\textsuperscript{156} Regulatory phase-outs of leaded gasoline,\textsuperscript{157} untreated sewage wastes,\textsuperscript{158} and certain carcinogenic pesticides\textsuperscript{159} receive similar treatment from Lomborg.

To be sure, the role of regulation in bringing about environmental improvements is not unequivocal. Other factors such as shifts in

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\item \textsuperscript{152} Paul R. Portney, \textit{Air Pollution Policy}, in \textit{PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION} 77, 99 (Paul R. Portney & Robert N. Stavins, eds., 2000). Lomborg also presents data showing declines in particulate matter prior to the enactment of major United States and United Kingdom statutes addressing air emissions, see \textit{LOMBORG, supra} note 5, at 165, 168–69, as if to demonstrate that the role of legislation in achieving subsequent improvements has been minor. However, he neglects to note that pollution control ordinances have been traced back at least to King Edward I's ban on the burning of certain types of coal in thirteenth century England. See Portney, \textit{supra} note 152, at 78. In the United States, Chicago and Cincinnati began a nationwide trend of municipal air quality control by enacting laws to regulate smoke and soot in the year 1881. See \textit{id}. Thus, long before the Clean Air Act of 1970, improvements in air quality were “hastened by state and local ordinances that regulated the incineration of garbage and the burning of coal or high-sulfur fuel oil in residential, commercial, and industrial furnaces.” See \textit{id}. at 98.
\item \textsuperscript{153} \textit{LOMBORG, supra} note 5, at 276.
\item \textsuperscript{154} See \textit{id}. at 275 (“Assuming... full compliance with the CFC protocols, it is estimated that the current ozone minimum will lead to more cancers in the future, reaching a maximum in 2060 of 27,000 extra annual skin cancers in the U.S., or an increase in total skin cancer of about 3 percent.”).
\item \textsuperscript{155} See \textit{id}. at 174–75.
\item \textsuperscript{157} See \textit{LOMBORG, supra} note 5, at 171.
\item \textsuperscript{158} See \textit{id}. at 203.
\item \textsuperscript{159} See \textit{id}. at 195, 204–5.
\end{itemize}
consumer demand, changes in weather patterns, macroeconomic conditions, non-induced technological improvements, and demographic changes among affected populations also undoubtedly are in operation. Attribution of every promising trend solely to governmental controls therefore would be downright fanciful. Equally fanciful, however, is Lomborg’s apparent view that no promising trend is even partially attributable to governmental controls.

3. The Environmental Kuznets Curve

The last prong of Lomborg’s Counterlitany is built upon an empirical relationship between economic growth and environmental quality that has become known as the Environmental Kuznets Curve (EKC). The EKC refers to an inverted-U relationship in which environmental quality tends to decline in the early stages of industrialization but then improve as countries achieve middle-income and higher levels of per capita GDP. The connection appears first to have been demonstrated in a 1992 World Bank study finding that particle and sulfur dioxide pollution in 48 cities around the world peaked at income levels around $5,000 to $8,000 per capita and subsequently declined at higher income levels. A large number of additional studies have replicated this result using other pollutants, time frames, and geographic locations. Lomborg’s interpretation of this promising data is that environmental problems in the developing world can be ameliorated only through economic growth. Moreover, he appears to believe that economic growth by itself will provide the necessary catalyst to invest in environmental quality: “It is . . . reasonable to expect that as the developing countries of the world achieve higher levels of income, they will—as we in the developed world have done—opt for and be able to afford an ever clearer environment.”

160. See Portney, supra note 152, at 97–98.
161. See LOMBORG, supra note 5, at 175–77 (describing, but not naming, the Environmental Kuznets Curve).
162. See James Salzman, Seattle’s Legal Legacy and Environmental Reviews of Trade Agreements, 31 ENVTL. L. 501, 518 (2001) (describing the EKC as the “hypotheses [that] once income reaches a certain per capita level, pollution decreases because additional resources can now be devoted to pollution prevention and control.”); J.B. Ruhl, Sustainable Development: A Five-Dimensional Algorithm for Environmental Law, 18 STAN. ENVTL. L. J. 31, 51 n. 59 (1999) (noting that the “positive reinforcing relationship [between income and pollution] eventually reverses as income continues to rise”).
163. See WORLD BANK, THE WORLD DEVELOPMENT REPORT (1992); see also Lomborg, supra note 5, at 176–77.
165. See LOMBORG, supra note 5, at 33 (“[O]nly when we get sufficiently rich can we afford the relative luxury of caring about the environment.”).
166. Id. at 210.
Lomborg is right to find a link between poverty and environmental degradation and therefore to cite protection of the environment as an additional reason to encourage economic development in the Third World. However, he ignores a variety of factors that render reliance on the EKC alone problematic as a solution to pollution, deforestation, and other unsustainable environmental conditions in the developing world. First, and most notably, the EKC simply has not been demonstrated for many actual or potential sources of pollution, including carbon dioxide and other greenhouse gases, municipal solid waste, and a variety of potentially toxic pollutants such as organic chlorine compounds. Moreover, some sources of pollution that eventually do decline per unit of output nevertheless continue to increase in terms of aggregate emissions. That is, while developed nations may pollute more efficiently at higher income levels, their total output of certain pollutants continues to rise. Finally, it bears noting that some forms of environmental harm, like biodiversity loss, are simply irreversible, such that the second half of the supposed inverse-U curve never can occur. Lomborg nowhere acknowledges these complications of the EKC.

Moreover, the fact that some pollutants such as greenhouse gases do not appear to conform to the inverted-U shape of the EKC highlights another potential problem with relying entirely on economic growth dynamics to resolve issues of international environmental import. Specifically, many of the most pressing environmental problems today concern pollutants with cumulative, transboundary effects. Greenhouses gases are only the most obvious example—persistent organic pollutants, nitrogen oxides, sulfur dioxides, chlorofluorocarbons, and fertilizer runoff also raise problems with potentially compounding, cross-border consequences. An important issue, therefore, is whether the global environment can tolerate the ecological transition costs necessarily implied by the EKC scenario, particularly in light of the fact that nations


169. Actually, buried amidst Lomborg's 2,930 footnotes is the rather unhelpful statement, "Note, that a number of later studies have discussed and questioned the approach [of the EKC proponents]." LOMBORG, supra note 5, at 390 n. 1280.

such as those in sub-Saharan Africa ($1,440 GPD per capita), India ($2,060), Indonesia ($2,407), and China ($3,051) appear to remain decades away from the supposed peak of the growth-abatement curve.\textsuperscript{171}

A final problem with Lomborg's argument is that, by concluding that what has been true for the developed world will invariably become true for the developing world, he may have committed the fallacy of composition. That is, the environmental improvements witnessed in nations like the United States and captured by the EKC data may have occurred not simply because the environment is a luxury good that only wealthy people can afford,\textsuperscript{172} but also because the United States has been able to "export" some of its environmentally degrading activity to developing nations.\textsuperscript{173} If that analysis is correct, the EKC would not be as readily generalizable as Lomborg wants to believe, given that elementary principles of logic would prevent all nations from becoming net exporters of environmental degradation.

Unfortunately for Lomborg, a remarkable recent study has supported this very hypothesis. Using a complex system dynamics analysis that models inter alia deforestation rates, domestic GNP, and the GNP of a country's trading partners, Corey Lofdahl has shown that between 1976 and 1991, "an increase in either the percentage trade with a high GNP trading partner or an increase in a traditional trading partner's GNP results in decreased local forest area for the country in question."\textsuperscript{174} In other words, economic growth in the developed North is highly correlated with deforestation in the developing South. Thus, when Lomborg argues that "the primary solution to [tropical deforestation] will be higher growth and a better economic foundation so as to secure the countries concerned the resources to think long-term,"\textsuperscript{175} he overlooks the very real possibility that favorable reforestation trends in the developed world depend upon contrary trends in less-developed tropical

\textsuperscript{171} Dasgupta, supra note 167, at 148. Indeed, by combining a variety of EKC studies with projected global per capita GDP distributions and population estimates, two researchers have concluded that emissions will continue to increase for most pollutants through the year 2100. See T. Selden & D. Song, Environmental Quality and Development: Is There a Kuznets Curve for Air Pollution Emissions?, 27 J. ENVTL. ECON. & MGMT. 147 (1994).

\textsuperscript{172} Cf. LOMBORG, supra note 5, at 327 ("[O]ur historical experience tells us that only when we are sufficiently rich can we start to think about, worry about and deal with environmental problems.").

\textsuperscript{173} EKC studies tend to consist of cross-country data rather than single-country time-series data, thus raising the possibility that the EKC actually is just a conflation of two distinct trends: one of decline in the developing world and one of improvement in the developed world. See J. R. Vincent, Testing for Environmental Kuznets Curves Within a Developing Country, 2 ENVTL. & DEV. ECON. 417, 417 (1997) (arguing that the EKC "may simply reflect the juxtaposition of a positive relationship between pollution and income in developing countries with a fundamentally different, negative one in developed countries").

\textsuperscript{174} COREY L. LOFDAHL, ENVIRONMENTAL IMPACTS OF GLOBALIZATION AND TRADE: A SYSTEMS STUDY 121–22 (2002).

\textsuperscript{175} LOMBORG, supra note 5, at 117.
nations. The EKC that Lomborg believes is universally replicable may in fact be contingent upon a developing world whose resources are open to international exploitation.

To the extent that the EKC has been empirically demonstrated for a given environmental contaminant and to the extent that the fallacy of composition is not a barrier to generalization, Lomborg may be right to expect better environmental conditions to arise as a matter of course from economic development in the Third World. Nevertheless, given the interconnectedness of the atmosphere, the oceans, and other significant ecological systems, the developed world still has an interest in helping both to flatten and shorten the EKC of developing nations (as well as to forge an EKC of its own with respect to the many pollutants, including especially greenhouse gases, that continue to rise monotonically with per capita income). Toward that end, a growing body of evidence suggests that, whatever the robustness of the EKC, certain factors other than income per capita may emerge as stronger determinants of environmental quality. Specifically, studies suggest that literacy, political rights, and civil liberties are highly correlated with environmental quality even in low-income countries. Regrettably, Lomborg makes no mention of this important line of research.

II

HOW THE BODIES ARE COUNTED

As one can see, the results of Lomborg’s survey of scientific literature fall considerably short of an account of the “real state of the world.” At his best, Lomborg puts to rest some rather extreme concerns that have surfaced from time to time in the environmental debate. His great failing, however, is to think that by debunking a handful of nightmare scenarios, he justifies ignoring the vast areas of concern that remain both well documented and potentially of great significance to human welfare. Biodiversity provides an excellent example. Lomborg devotes significant energy to debunking Norman Myers’s long-superseded quotation regarding species loss estimates, yet he fails utterly to appreciate that one does not need Myers’s extreme case of species loss to be concerned about the rate of extinction. Lomborg’s own estimate of 1,500 times the background rate would seem to raise the eyebrows of most observers, but the author cannot appreciate that point because he is too busy slaying dragons made of straw.


177. Similarly, his treatment of global warming begins by criticizing statements made by Isaac Asimov, a science fiction writer. See LOMBORG, supra note 5, at 8–9.
In recent years, a variety of important voices have been attempting to move beyond this polarized, reductionist form of debate in the environmental arena.\textsuperscript{178} It remains to be seen whether the prominence of Lomborg’s polemic will impede their efforts. Despite the author’s attempt to portray the book as a simple, even-handed review of relevant scientific literature,\textsuperscript{179} what The Skeptical Environmentalist actually demonstrates to great effect is that scientific inquiry in the modern regulatory state has become a game of competing Litanies. It is no coincidence that the Competitive Enterprise Institute sponsored a Capitol Hill luncheon to promote The Skeptical Environmentalist.\textsuperscript{180} Nor is it a coincidence that the Union of Concerned Scientists\textsuperscript{181} and the World Resources Institute\textsuperscript{182} sponsored web sites that are highly critical of the book. Each of these entities is an active competitor in the contest to manage public perceptions of risk and thereby influence the regulatory agenda. As Cass Sunstein and Timur Kuran have put it, these actors “focus attention on isolated events, select information to support their preferred interpretations, and make anyone who questions their objectives appear ignorant, duped, or depraved,”\textsuperscript{183} all in the name of advancing their pro- or anti-regulatory interests.

More specifically, legal scholars have noted that public demand for regulation is a function of risk perceptions that are themselves subject to manipulation, particularly by those actors able to influence the

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\textsuperscript{179} See LOMBORG, supra note 5, at 42 (noting that “we must start searching for the facts to measure the real state of the world,” and introducing the author’s survey as the “start” of that process).


\textsuperscript{181} See id.


\textsuperscript{183} Timur Kuran & Cass R. Sunstein, Availability Cascades and Risk Regulation, 51 STAN. L. REV. 683, 761 (1999). Cf. LOMBORG, supra note 5, at 253 (“It is not clear how much political backing the rainforest lobby could have attracted if the biologists had emphasized that what would be lost [from tropical deforestation] would primarily be insects, bacteria and viruses.”).
availability and presentation of relevant scientific information. As a result, science becomes a contested space in which competitors vie for the legal authority to impose costs on other parties, whether in the form of regulatory compliance costs or externalized physical and environmental harms. Risk assessment and risk management become blurred, as players learn that it is possible to determine the outcome of the latter by influencing the content of the former. Well-intentioned scientists then face the unenviable choice of either abandoning their professional reluctance to draw broad policy conclusions from their research or instead watching from the sidelines as interest groups contort their findings into the newest plank of whatever Litany the group happens to espouse.

This phenomenon is not entirely unknown to Lomborg. Indeed, a critical element of his argument is that the Litany is made possible by the coordinated efforts of environmental organizations and a few radical scientists to manipulate the media and the public. The public, in Lomborg's view, is easily led to mass delusions about the state of the environment because "the communication of environmental knowledge ... taps deeply into our doomsday beliefs." What Lomborg


186. Cf. McGarity, supra note 26, at 25 (describing "the unattractive prospect of 'adversarial science' and 'dueling risk assessments' as groups with conflicting stakes in the outcome of the regulatory process draw varying inferences from the data and plug different assumptions into the model").

187. Consider the reaction of one exasperated scientist who was asked to draw conclusions for human health from his study demonstrating sexual mutation in frogs following small exposures to a common pesticide: "I'm not saying it's safe for humans. I'm not saying it's unsafe for humans. All I'm saying is that it makes hermaphrodites of frogs." Randolph E. Schmid, Pesticide Blamed for Frog Mutations, ASSOCIATED PRESS, April 15, 2002, available at 2002 WL 19257050. The pesticide at issue, atrazine, is one of the most commonly used weed-killers in North America. See John H. Cushman, Jr., New Study Adds to Debate on E.P.A. Rules for Pesticide, N.Y. TIMES, June 2, 2002, at L28. Yet the scientist's study revealed significant developmental disruptions in frogs at levels far below the E.P.A. standard. Journalists, policymakers, and the public obviously desire to know what implications for humans, if any, can be drawn from the deformity of the frogs. The scientist merely wants to perform the descriptive exercise that he has been trained to perform, but he has been drawn into a public debate far more politicized (and far more impatient) than his usual disciplinary exchanges.

188. LOMBORG, supra note 5, at 12. Oddly, Lomborg later notes that the environment "seldom rises above 2 percent in most-important-problem polls." Id. at 333. Such an assertion seems to cast doubt on both Lomborg's claim that the Litany exists and that it has a pernicious influence on democratic prioritizing. See id. at 32 ("Although kindling public concern clearly makes people choose more 'correctly' as seen from an environmental viewpoint, it leads to an
fails to appreciate, however, is that the politicization he decries is not limited to public discussions concerning a given risk, but also affects the academic and scientific presentation of that risk.\textsuperscript{189} The review presented in Part I, with its competing Litanies, its debatable abstractions, and its overbroad conclusions on all sides of the fence, demonstrates that the "real state of the world" is observable from multiple vantage points, clouded by omnipresent dissent, and subject to constant reinterpretation. In other words, \textit{The Skeptical Environmentalist} itself casts doubt on Lomborg's notion of a "real state of the world."

This Part examines the implications of the foregoing observations for Lomborg's preferred method of policy review, cost-benefit analysis. In theory, cost-benefit analysis offers a straightforward method for evaluating regulatory proposals by identifying and summing expected outcomes. As will be seen, however, the actual practice of cost-benefit analysis in regulatory decisionmaking becomes considerably more difficult once one acknowledges the political, ethical, and scientific uncertainties that unavoidably characterize it.

\textbf{A. The Paralysis of Hypothesis}

Before addressing the more philosophical issues that complicate the use of cost-benefit analysis in environmental, health, and safety decisionmaking, this Section will address two relatively minor difficulties that arise from the politicized nature of the scientific and regulatory processes. Specifically, two decisionmaking heuristics frequently associated with cost-benefit analysis—comparison of a regulatory proposal against hypothetical alternate uses of public funds, and analysis of the myriad "opportunity benefits and substitute risks"\textsuperscript{190} created by a proposal—raise the possibility of being used in strategic ways that can impede the regulatory process in any given risk context.\textsuperscript{191} Both heuristics

\textsuperscript{189} Lomborg does argue that public funding of scientific research can bias its results, given that the public would tend to fund research likely to identify problems over research likely to confirm the status quo. \textit{See id.} at 36. Similar reasoning might suggest that privately funded research would be more likely, other things equal, to find that the status quo is optimal. As Lomborg derisively puts it, "There are many grants at stake." \textit{Id.} at 254. In fact, the link between funding source and research outcome is considerably more complex, see Sheldon Krimsky, \textit{The Profit of Scientific Discovery and Its Normative Implications}, 75 CHI.-KENT L. REV. 15, 28-35 (1999), but the critical point is that there is some connection that likely complicates any attempt to rely on scientific knowledge to resolve risk regulation disputes in a purely technocratic manner.


\textsuperscript{191} Cf. Cass Sunstein, \textit{Is Cost-Benefit Analysis for Everyone?}, 53 ADMIN. L. REV. 299, 313 (2001) (noting that "lawyers opposing costly regulation are likely to be both talented and well-
are sound as a conceptual matter and with good reason: they have been devised and supported by some of the leading thinkers in the area of risk regulation. However, like the public presentation of risk information that concerns Lomborg and others, both also may be employed by lobbyists, interest groups, and other availability entrepreneurs in ways that ultimately defeat the analytical clarity that they were designed to bring.

1. Comparative Risk Assessment and Public Lawmaking

To begin with, the practice of cost-benefit analysis may indirectly handicap regulatory decisionmaking by inviting comparison of proposed regulations against hypothetical alternate uses of public funds. Lomborg, for instance, repeatedly admonishes, “we have to realize that investing in an ever better environment is only one of the many ways we can invest in a better world, and that we must prioritize the environment as against better education, more health care, and better infrastructure as well as improving conditions in the Third World.” There is nothing intrinsically wrong with such advice, of course. Allocating scarce public funds among competing uses is the essence of political decisionmaking and a reasonable polity surely would want to know whether its expenditures could be made more wisely. Lomborg, in fact, argues that failure to so evaluate life-saving regulations amounts to “statistical funded, and such lawyers are likely to be able to find holes in any agency decision that is rooted in [cost-benefit analysis], even if the agency has done its job quite well”).

192. See sources cited infra notes 194, 196, 201.
193. See supra text accompanying notes 179–189.
194. The type of comparison I am describing here should be distinguished from cost-effectiveness analysis. The latter method of policy review compares the costs of various approaches to achieving the same identified regulatory goal. See Robert H. Frank & Cass R. Sunstein, Cost-Benefit Analysis and Relative Position, 68 U. CHI. L. REV. 323, 332 n. 49 (2001) (defining cost-effectiveness analysis as “[t]he idea that agencies should seek the lowest cost way of achieving a goal” and arguing that such a principle must not be confused with cost-benefit analysis). In this Section, I am considering the comparison of a particular proposal against different regulatory goals altogether, often as a ground for rejecting the proposal under consideration. See Pildes & Sunstein, supra note 25, at 43 (noting that comparative risk assessment seeks to achieve “better priority setting by ranking risks in terms of their seriousness [and] ensuring that the most serious risks are addressed first”). A familiar device in this regard—the cost-per-life-saved table originally devised by John Morrall and since reproduced prolifically in the risk regulation literature—is trotted out one more time by Lomborg in The Skeptical Environmentalist. See LOMBORG, supra note 5, at 340 (reproducing a version of the table that appeared in Tammy O. Tengs et al., Five-Hundred Life-Saving Interventions and Their Cost-Effectiveness, 15 RISK ANALYSIS 369 (1995)). Lisa Heinzerling provides a sustained genealogy and devastating critique of this table in Regulatory Costs of Mythic Proportions, 107 YALE L. J. 1981, 2042 (1998). [hereinafter Heinzerling, Regulatory Costs]. The objection raised in this Section is simply the narrow one that, in the absence of some comprehensive means for allocating funds among competing risk regulation priorities, comparison of regulatory proposals to hypothetical alternate uses of public funds can unintentionally impede regulatory action.
195. LOMBORG, supra note 5, at 327.
murder,\textsuperscript{196} as the opportunity cost of an inefficient health and safety regulation consists of additional lives that could have been saved pursuant to some other, more cost-effective regulation.

A difficulty arises, however, when such opportunity cost comparison is treated as more than simply a cautionary reminder about the relative efficiency of public projects. After all, it takes little effort or imagination to hypothesize more cost-effective alternate uses of social resources. Lomborg has a favorite: "[I]f we could secure clean drinking water and sanitation for everyone [at an estimated one-time cost of $200 billion], this would avoid several million deaths every year and prevent half a billion people from becoming seriously ill every year.\textsuperscript{197} Such illustrations are helpful, so long as they serve merely to remind regulatory decisionmakers of the importance of achieving any given regulatory goal with the lowest practical expenditure of public resources. When they are cited as independent reasons for rejecting the regulatory goal itself, however, the hypothetical alternate uses become a potentially harmful distraction.

Specifically, as Thomas McGarity has noted,\textsuperscript{198} when hypothetical alternate uses of funds are raised as persuasive grounds for defeating a

\textsuperscript{196} Id. at 342; see also id. at 327 ("If the Litany makes us demand regulation of particular areas of the environment while we fail to consider how the money could otherwise have been spent, we actually create a societal structure in which fewer people survive."). This argument has been made several times before in the risk regulation literature. See ROBERT HAHN ET AL., DO FEDERAL REGULATIONS REDUCE MORTALITY? (2000); Tammy O. Tengs & John D. Graham, The Opportunity Costs of Haphazard Social Investments in Life-Saving, in RISKS, COSTS AND LIVES SAVED: GETTING BETTER RESULTS FROM REGULATION 167 (Robert W. Hahn ed., 1996); Randall Lutter & John F. Morrall, III, Health-Health Analysis: A New Way to Evaluate Health and Safety Regulation, 8 J. RISK & UNCERTAINTY 43, 49 table 1 (1994); W. Kip Viscusi, Mortality Effects of Regulatory Costs and Policy Evaluation Criteria, 25 RAND J. ECON. 94 (1994); W. Kip Viscusi & Richard Zeckhauser, The Fatality and Injury Costs of Expenditures, 8 J. RISK & UNCERTAINTY 19 (1994); Ralph Kenny, Mortality Risks Induced by the Costs of Regulation, 10 RISK ANALYSIS 147 (1990). McGarity provides an insightful discussion and critique in McGarity, supra note 26, at 42-49. See also, Heinzerling, Regulatory Costs, supra note 194, at 2066-67.

\textsuperscript{197} LOMBORG, supra note 5, at 20; see also id. at 200 ("[I]f we want to do good with our $2 billion, we might consider that we could save about 30 million people each year in the Third World for the same amount."); 322 ("UNICEF estimates that just $70-80 billion a year could give all Third World inhabitants access to the basics like health, education, water and sanitation."). Domestically, the detection and prevention of radon gas is an oft-invoked example. See id. at 247 ("With a regulatory program to identify, test and mitigate radon, we could save about 800 lives at a cost of a little less than $1 million per life.").

\textsuperscript{198} See McGarity, supra note 26, at 34-35 ("Even under the highly contestable assumption that a cost-benefit decision criterion would eliminate waste, no vehicle exists for channeling the savings to the most deserving social programs."); see also Robert W. Hahn & Cass R. Sunstein, A New Executive Order for Improving Federal Regulation? Deeper and Wider Cost-Benefit Analysis, at 21 (University of Chicago Law School John M. Olin Program in Law & Economics, Working Paper No. 150, 2002); Henry S. Richardson, The Stupidity of the Cost-Benefit Standard, 29 J. LEGAL STUD. 971, 987-90 (2000); Steve P. Calandrillo, Responsible Regulation: A Sensible Cost-Benefit, Risk Versus Risk Approach to Federal Health and Safety Regulation, 81 B.U. L. REV. 957, 1028 (2001); Geistfeld, supra note 25, at 126. To add another layer of complexity, as
regulatory initiative, no reliable mechanism exists to ensure that the proposed alternate use actually is undertaken. That is, regulators are not empowered to maximize collective welfare by allocating public funds among all manner of social problems. They face discrete issues that demand concrete responses. Even legislators, with their broad lawmaking authority, must work within the constraints of the political process. Thus, if proponents of every piece of legislation or regulatory initiative had to demonstrate that no more cost-effective potential use of public funds existed, systems of governance in the areas of health, environment, and safety might quickly break down. Even those areas for which sufficient political support of regulation had been mustered would face a risk of paralysis by hypothesis.

2. Risk-Risk Analysis and the General Equilibrium

Cost-benefit analysis exerts a potentially paralyzing influence on environmental, health, and safety decisionmaking in a second way. The growing prominence of “risk-risk analysis” focuses decisionmakers on

David Driesen has pointed out, priority-setting in the environmental, health, and safety arenas is a far more complicated task than simply ranking risks according to severity, or even according to cost-benefit ratios. See David Driesen, Getting Our Priorities Straight: One Strand of the Regulatory Reform Debate, 31 ENVTL. L. REP. 10003 (2001).


200. Cass Sunstein’s recent critique of the precautionary principle offers a somewhat parallel line of objection. See Sunstein, supra note 190. Sunstein argues that the precautionary principle, a decisionmaking heuristic prominent in international environmental law, “is literally paralyzing – forbidding inaction, stringent regulation, and every step in between” because the opportunity costs of precaution frequently involve the same type and degree of harm as the activity being cautioned against. See also id. at 19 (“[I]f the precautionary principle is taken literally, it is offended by regulation as well as by nonregulation.”). To be sure, the reasoning is not precisely parallel: if society were to adopt the type of comprehensive risk agency described supra note 199, comparison of regulatory initiatives to hypothetical alternate uses of resources might no longer have a paralyzing effect. Rather, it would simply help to produce an ordinal ranking of risk priorities. In the absence of such an agency, however, the risk of decisionmaking paralysis is real.

the secondary effects that may be expected from adopting any particular health or safety standard, being careful to avoid those standards that produce ancillary harms of greater magnitude than their direct benefits. Lomborg uses a hypothetical ban on chemical pesticides as an example. According to Lomborg's calculations, removing the use of pesticides from agricultural production would save some twenty deaths a year currently caused by chemical exposure, but would add approximately 26,000 deaths a year as higher food prices reduce the intake of fruits and vegetables which are, of course, a primary defense against various forms of cancer.

Surely no rational policymaker would cause 26,000 deaths to save twenty, yet, according to Lomborg, that is precisely what purveyors of fear like the Sierra Club would have us do.

Lomborg's reasoning sounds impeccable and, indeed, it is so long as he has taken account of all significant secondary effects of a hypothetical ban on chemical pesticides. That is, once one determines to set sail on the uncertain seas of general equilibrium analysis—attempting to account not just for the direct and intended effects of a regulatory intervention, but also its myriad secondary economic and behavioral consequences—then one had better trawl with a pretty wide net or be prepared to face charges of poaching. In addition to the effect of fruit and vegetable price elasticity on nutrient intake, Lomborg also would have to consider numerous other factors including the distinct health hazards faced by farm workers due to chemical exposure; the effect of pesticides on wildlife and habitat functioning; the portion of municipal water treatment costs that are attributable to pesticides; the effect of farm runoff on freshwater and marine ecosystems; and the numerous ways in which the government subsidizes industrial agricultural inputs including, arguably, the costs and lives expended by the military to ensure an adequate and continuous national oil supply. He also would have to explain his apparent belief

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200. Lomborg, supra note 5, at 248; see also id. at 10 (“[S]crapping pesticides would actually result in more cases of cancer because fruits and vegetables help to prevent cancer, and without pesticides fruits and vegetables would get more expensive, so that people would eat less of them.”).

203. See id. at 245.

204. See id. at 230 (“[S]everal studies have shown that farmers, who are far more exposed to pesticides than most, do face a greater risk of getting cancer.”). Lomborg's figure of twenty deaths directly caused by pesticides only considered cancer deaths from ingestion.


206. See id. at 284.

207. See id. at 288-91.

that no effective non-carcinogenic pest management techniques could be
developed to replace chemical pesticides, a curious omission in light of
the apparently limitless faith that Lomborg places in market ingenuity in
other contexts. In short, Lomborg would have to do much more than he
has done.

This is not to say that chemical pesticides are not, on net, beneficial
to society. It is simply to say that the question is dauntingly complex. The
scholars who have advanced the notion of risk-risk analysis are aware of
such complexity and take pains in their work to produce the most
thorough accounting of regulatory consequences practicable. Less careful
thinkers such as Lomborg, however, are capable of utilizing risk-risk
analysis in a more selective manner, identifying only those secondary
effects that point in the analyst's preferred policy direction. The danger
of such a practice stems from what Cass Sunstein terms "system neglect":
"[w]hen a single problem is placed in view, it can be difficult to see the
full consequences of legal interventions." As Sunstein notes, system
neglect can cause the decisionmaker to ignore the "off screen" implications of a given environmental problem or regulatory initiative. Presumably, then, it also can cause the decisionmaker to pay undue
attention to those implications that do happen to get emphasized by
"availability entrepreneurs" and other purveyors of Litanies.

Perhaps to cover such an objection, Lomborg rather uncritically
takes comfort in a Resources for the Future survey of studies regarding
the negative externalities caused by various forms of electricity
production. Lomborg bills this survey as an attempt to "examine all costs
associated with electricity production, all the way from the mortal risks of
mining coal... to the consequences of tax codes and occupation plus a
long, long list of similar considerations and costs"—in other words, as
precisely the type of study that should form the basis for a comprehensive
risk-risk analysis. Based on the survey, Lomborg happily advises readers
to ignore the negative externalities of coal-fired electricity, given that the
available cost estimates of such externalities are lower than the price

http://www.cato.org/pubs/pas/pa409.pdf. As noted supra text accompanying notes 119–125, many
widely used pesticides and fertilizers are petroleum-based.
209. See supra text accompanying notes 128–141. I am grateful to Jim Salzman for this
observation.
210. Sunstein, supra note 190, at 8.
211. Id. Cf. J.B. Ruhl & James Salzman, Regulatory Accretion in the Administrative State, __
Geo. L. J. __ (forthcoming 2003) (noting that regulatory rules must be assessed in light of both
direct and indirect effects and that, given the nature of complex systems, "costs of large
magnitude can be experienced far away from the event under study").
212. See Kuran & Sunstein, supra note 183, at 687.
213. LOMBORG, supra note 5, at 19.
premium currently commanded by alternative electricity sources. Yet Lomborg fails to disclose, as the Resources for the Future authors quite clearly did, that the data analyses excluded costs associated with global warming, costs that "can easily swamp conventional environmental damage differentials across fuel sources."215

The refusal even to acknowledge the absence of global warming cost estimates from this survey is deeply disappointing. It is also a prime example of why risk-risk analysis requires thorough, non-strategic evaluations of the type offered by the researchers at Resources for the Future, not Bjørn Lomborg.216

B. The Perils of Precision217

The foregoing, largely political obstacles to effective cost-benefit analysis can be overcome through careful, conscientious review by independent analysts and policymakers. More fundamentally problematic are the ethical implications of cost-benefit analysis. This Section reviews such implications through an examination of Lomborg's chapter on global warming. The reader should note at the outset that the prediction of ecological and socioeconomic consequences of global warming is an

214. See id. at 19. The authors of the study report an average estimate of 0.64 cents/kWh which Lomborg dutifully reproduces, but they also are careful to note that this number is derived from a considerable range of estimates, extending from at least eight times smaller to 150 times larger than the number Lomborg presents as definitive. See Alan J. Krupnick & Dallas Burtraw, The Social Costs of Electricity: Do the Numbers Add Up?, Resources for the Future Discussion Paper 96-30 at 20 (August, 1996).

215. Id. The studies also ignored costs associated with chronic respiratory disease and energy security, lending further support to the authors' conclusion that "the comparison across [fuel sources will be] problematic until issues regarding these endpoints are resolved." Id. Lomborg also failed to consider a subsequent study by researchers from the Environmental Law Institute which concluded that reducing coal-fired electricity generation by 50 percent by 2010 would entail direct costs of $25.9 billion per year that would be outweighed by $26.4 billion in annual health benefits derived from particulate reduction alone. See BYRON SWIFT, CLEANER POWER: THE BENEFITS AND COSTS OF MOVING FROM COAL GENERATION TO MODERN POWER TECHNOLOGIES 18 (2001).

216. Cf. Thomas A. McGarity, Professor Sunstein's Fuzzy Math, 90 Geo. L. J. 2341, 2364 (2002) ("[I]t is critical to understand that in the real world, [cost-benefit] analyses will be prepared and 'peer reviewed' by highly opinionated participants . . . ").

immensely complicated task currently being undertaken by literally thousands of experts from multiple disciplines across the globe. The present discussion can only hope to scratch the surface of this vital body of research. Unfortunately, as will be seen, Lomborg's ambitions appear to have been even more limited.

1. Benefits of Climate Change Mitigation

As Lomborg notes, "climate change has become the environmental trump card,"\textsuperscript{218} threatening to tilt all manner of policy discussions in a direction away from the industrialized status quo. It is with a palpable sense of relief, then, that Lomborg reports the results of an economic accounting of the costs and benefits of various approaches to regulating greenhouse gas emissions: "Despite our intuition that we naturally need to do something drastic about... global warming, economic analyses clearly show that it will be far more expensive to cut CO\textsubscript{2} emission radically than to pay the costs of adaptation to the increased temperatures."\textsuperscript{219} In other words, international climate treaties such as the Kyoto Protocol should be avoided because the economic benefits of continued fossil fuel consumption more than outweigh the physical, agricultural, and ecological costs that would be averted by restricting emissions. The take-home message from such studies, as Lomborg puts it, is that "global warming is not anywhere near the most important problem facing the world. What matters is making the developing countries rich and giving the citizens of the developed world even greater opportunities."\textsuperscript{220}

Were it only so simple. Like many of the arguments contained in The Skeptical Environmentalist, whatever superficial appeal Lomborg's treatment of global warming has rapidly dissipates once one begins to ask the fundamental questions that Lomborg and his team of researchers apparently did not. Most importantly, one must ask how Lomborg is able to state with such apparent precision, "the total and long-term damages from emitting an extra ton of carbon today is the equivalent of $7.50."\textsuperscript{221} Weighed against the costs of cutting emissions, this figure implies that a "4 percent cut in 1995 [emissions levels] is the optimal carbon reduction for the globe,"\textsuperscript{222} far more modest than Kyoto's cut of 5.2 percent below 1990 emissions levels.\textsuperscript{223} Obviously, the $7.50 per ton of carbon damage

\begin{itemize}
  \item \textsuperscript{218} LOMBORG, \textit{supra} note 5, at 258.
  \item \textsuperscript{219} \textit{Id.} at 318.
  \item \textsuperscript{220} \textit{Id.} at 323.
  \item \textsuperscript{221} \textit{Id.} at 306.
  \item \textsuperscript{222} \textit{Id.}
  \item \textsuperscript{223} \textit{See id.} at 302. Even Kyoto's target cuts would produce only a modest reduction in warming trends. As Lomborg notes, "the reduction in temperature [from the Kyoto pact] corresponds to a mere six years' difference—the temperature that we would have reached in
figure performs a great deal of work for Lomborg and his conclusion that climate change is a relatively minor threat. Before gleefully starting one's engines, therefore, one should understand exactly how this figure was derived.

Lomborg essentially adopts his cost-benefit analysis wholesale from a recent study by prominent economist and climate modeler William Nordhaus.224 He does momentarily acknowledge the existence of numerous other models that attempt to measure the economic consequences of greenhouse gas emissions levels, but he erroneously claims, "they have all produced more or less the same results." 225 In fact, estimates for the direct benefits of reducing greenhouse gas emissions levels range from as little as $5 to as much as $125 per ton in 1990 U.S. dollars.226 Among the causes of such wide variation are the base level assumptions included in the models regarding population, economic growth, and anticipated future emissions levels—all matters about which researchers legitimately may disagree.227 In addition, although Lomborg’s figure includes only direct benefits, increasing attention also is being paid to possible ancillary benefits produced by global warming policies such as the incidental reduction of other air pollutants (e.g., sulfur dioxide, nitrogen oxides, volatile organic compounds, and particulates). Current estimates of such benefits range up to an additional $20 per ton (1990

2094 (1.92° C) without a deal, Kyoto has now postponed to 2100.” Id. Lomborg deploys this calculation to suggest that Kyoto would produce only insignificant effects on atmospheric temperature, but his treatment is unfair given that Kyoto always has been viewed as simply the first step in what would become an ongoing process of international negotiation and cooperation. See Eileen Clusussen, Carping at Kyoto, 34 GEO. WASH. INT’L L. REV. 247, 255 (2002) (“[The Kyoto Protocol’s] initial targets for emissions reductions take us only to the 2008-2012 period, and they represent just a very small down payment on the level of emissions reductions that scientists say we must achieve in order to have a real effect on mitigating climate change.”).


225. LOMBORG, supra note 5, at 305.


227. See John P. Weyant, Economic Models: How They Work & Why Their Results Differ, in CLIMATE CHANGE: SCIENCE, STRATEGIES, & SOLUTIONS 193, 195–96 (Eileen Clusussen et al. eds., 2001). In contrast, Lomborg’s bullish view seems to leave little room for disagreement. When discussing an emissions reductions scenario in which cuts are delayed far into the future, Lomborg asserts without qualification that “cuts in the future will be cheaper because of better technology and higher fossil fuel prices, and because we will be richer then.” LOMBORG, supra note 5, at 308.
Lomborg largely ignores these niceties, a surprising omission given that he elsewhere goes out of his way to disparage the variability in scientific models that attempt to predict the range of temperature increases associated with emissions levels.\(^\text{229}\)

Returning, then, to Lomborg's already questionable $7.5 per ton of carbon damage figure, one can expect that the number is comprised of a variety of predicted physical, environmental, and socioeconomic consequences of climate change. What one might not expect, however, is the actual manner in which these consequences have been reduced to a dollars-per-ton denomination. Take, for instance, human life. Lomborg relies upon Nordhaus's calculation of human health impacts from global warming, which in turn relies upon a study that is restricted to climate-related diseases.\(^\text{230}\) The IPCC reports with high confidence that global warming also will result in an increase in heat-related deaths and illnesses due to more frequent heat waves, an increase in drowning, diarrhoeal and respiratory diseases due to more frequent flooding, and an increase in malnutrition due to reduced crop yields in certain regions of the world,\(^\text{231}\) but these consequences do not figure in Lomborg and Nordhaus's calculations. With regard solely to the increase in climate-related diseases, Nordhaus notes that 37,836,000 years of life will be lost worldwide due to climate-related diseases between 1990-2020.\(^\text{232}\) He then estimates the percentage of such losses that will be attributable to global warming using three different methods, all of which are expressed as percentages of GDP based upon the value of years of life lost due to global warming.\(^\text{233}\)

At this point, one naturally might wonder how the value of a diminished life span is calculated. Lomborg never answers this question, but Nordhaus provides a succinct response: "To value [years of life lost], we assume that a [year of life lost] is worth two years of per capita

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\(^{228}\) See Weyant, supra note 227, at 206.

\(^{229}\) See LOMBORG, supra note 5, at 272 (arguing that the range in temperature predictions "basically means that the noise from the models is bigger than the signal we are supposed to draw policy from").

\(^{230}\) See NORDHAUS & BOYER, supra note 224, at 80 ("In the absence of systematic estimates of health impacts, we have relied on estimates based on the current prevalence of climate-related diseases.").

\(^{231}\) See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: IMPACTS, ADAPTATION, AND VULNERABILITY ch. 4.7 (2001) [hereinafter IPCC], available at http://www.grida.no/climate/ipcc_tar/wg2/. Lomborg does attempt to dismiss heat-related deaths and illnesses by invoking an argument from the "let-them-eat-cake" school of reasoning: "The IPCC does not discuss the fact that a much richer world will be far more able to afford most people access to air-conditioning." LOMBORG, supra note 5, at 291.

\(^{232}\) See NORDHAUS & BOYER, supra note 224, at 81 (citing CHRISTOPHER J.L. MURRAY & ALAN D. LOPEZ, THE GLOBAL BURDEN OF DISEASE (1996)).

\(^{233}\) See id., at 82–83.
Using current World Bank data on per capita gross national income, this method implies that the value of a single year of life lost by a person in the United States is $68,200. Assuming a life expectancy of 77.1 years, the total non-discounted value of a U.S. resident’s life would be $5,258,220, an amount that fits comfortably within the range of values used by United States government agencies when evaluating health and safety regulations.

A threshold question, of course, is whether it is appropriate at all to convert lives saved into strictly monetary figures in this manner. The practice of monetizing human lives, endangered species, breathtaking vistas, and other arguably noncommodifiable values has received numerous thoroughgoing critiques from philosophers, legal academics, and other scholars. Rather than reiterate those critiques, this discussion will accept arguendo that some method of monetizing the value of life is necessary for cost-benefit calculation to work in practice and that the method used by Nordhaus is at least a plausible one. Nevertheless, a disturbing reality emerges once one leaves the United States and examines the implication of Nordhaus’s valuation method for the developing world. The nations comprising Sub-Saharan Africa, for instance, are projected to be harmed disproportionately by the impacts of global warming. Indeed, Nordhaus’s own data show that over the next thirty years, Sub-Saharan Africa will suffer fully seventy percent of all life years expected to be lost in the world due to climate-related diseases. But these life years are not valued at an amount equal to those lost in the developed world. Again using World Bank data on per capita gross national income, the non-discounted value of a life year lost in Sub-Saharan Africa is a mere $940. Because life expectancy is just 46.5 years in these nations, the implied value of a full life for a Sub-Saharan African is only $43,710, less than one percent of the value of a U.S. resident’s life.

234. Id. at 82.
235. Such figures are available at http://www.worldbank.org/data/ (last visited March 10, 2003). World Bank data are used here for illustrative purposes because the country-specific income data used by Nordhaus and Boyer was not specifically delineated in their book.
236. See Heinzerling, Regulatory Costs, supra note 194, at 1985 (“Studies commonly cite a range of $3 million to $7 million for the value of a statistical life.”).
237. See, e.g., ACKERMAN & HEINZERLING, supra note 27; ELIZABETH ANDERSON, VALUES IN ETHICS AND ECONOMICS (1993).
238. See IPCC, supra note 231, at ch. 10.1.1 (noting that “assessments [have] concluded that the African continent is particularly vulnerable to the impacts of climate change because of factors such as widespread poverty, recurrent droughts, inequitable land distribution, and overdependence on rainfed agriculture”).
239. See NORDHAUS & BOYER, supra note 224, at 81.
A normative judgment is being made here about the relative worth of lives, one that Lomborg nowhere attempts to defend. In essence, just as Lomborg teaches us that fertilizer-induced asphyxiation “is the price we let some marine organisms pay for our success in feeding humanity,”241 a vastly diminished life expectancy appears to be the price that we will let future Sub-Saharan Africans pay to avoid disrupting present patterns of production and consumption in the developed world. Fundamental ethical and distributive issues such as these are obscured by Lomborg’s simplistic brand of cost-benefit analysis with its deceptively uniform damage function of $7.5 per ton of carbon.

A similar problem stems from the effect of discounting. Given the atmospheric persistence of greenhouse gases, relevant time frames for global warming cost-benefit analyses stretch into the hundreds of years. As a result, many of the benefits of climate change mitigation policies consist of deaths, illnesses, and other tragedies that otherwise would afflict generations far into the future. Researchers therefore must articulate some method of comparing the impacts of global warming across time, even if it is the simple method of assuming that a life today is worth the same amount as a life tomorrow.242 Economic models such as Nordhaus’s instead generally use a mathematical discount rate that tends to significantly reduce the value of future harms.243 The moral basis for doing so is rarely articulated. To his credit, Lomborg does attempt a justification in The Skeptical Environmentalist,244 but he seriously misunderstands the issue. He argues, for instance, that discounting of future harms is appropriate “because we know that future generations will have more money to spend.”245 But using Lomborg’s own method for computing the value of life, this argument suggests that a future person should be weighted more, not less, than a presently living person.246

Lomborg also argues that by discounting future lives to a present value, governments will ensure that global climate mitigation policies produce a “return on investment” at least as high as the discount rate that is utilized. In that manner, regulatory expenditures can be avoided that might be invested more profitably in other social projects or in capital

241. LOMBORG, supra note 5, at 201.
243. See LOMBORG, supra note 5, at 314 (“Almost all evaluations of the costs and advantages of global warming make use of discounting”).
244. See id. at 314–15.
245. Id. at 314.
246. See Heinzerling, Regulatory Costs, supra note 194, at 2051.
markets. This argument appears to make sense until one recalls that the benefits of regulatory investment consist at least partially of saved human lives. Lomborg's supposed ethical argument for discounting—that it will leave future citizens with a more valuable resource base—is embarrassed by the fact some of those very citizens are killed as part of the tradeoff. What Lomborg really has intended to say is that a life in the future may be compensated for at lower cost than a life today (assuming that any life may be so compensated). That is, the cost today of a $5,258,220 life insurance policy for a currently living U.S. resident would be much higher than the cost today of an equally-sized policy for a U.S. resident who will be born in the year 2100. The issuer of such a policy could rely upon the time value of money to guarantee future proceeds of $5,258,220 using a much smaller current investment. Notice, though, that nowhere in this analysis has anyone made the judgment that the future life actually is worth less than the current life. That is a moral judgment that would require far more deliberate treatment.

Such complications highlight the fact that discounting is simply an awkward method for making fundamentally ethical decisions about who is to die when. Discounting may be an appropriate means of determining how the present generation's resources should be allocated among competing market and non-market investment opportunities. However, such allocations must take place separate from and subsequent to collective social judgments regarding the distribution of resources between generations, including resources devoted to the prevention of death, disease, and illness. In devising his $7.50 per ton of carbon damage figure, Lomborg makes no effort to undertake this type of pre-calculative ethical deliberation. Instead, relying upon Nordhaus, he simply monetizes future lives and discounts their supposed value along with the price of future crop yields, flood control projects, storm damages, and a host of other items that one might not ordinarily view as perfectly commensurate with human life. In the process, deeply moral issues simply disappear from view.

247. See LOMBORG, supra note 5, at 312 ("[A] sensible investment with a good yield will leave our descendants and future generations of poor people with far greater resources, and this is probably a far better way of looking after their interests than investing in low-yielding greenhouse gas reductions."). 314-15 ("If we chose an artificially low discount rate of 2 percent (so as to make greenhouse gas cuts more profitable) we would leave investments to future generations that were only worth 2 percent. If on the other hand our discount rate was set at 5 percent, we would spend the money on projects that make a profit of more than 5 percent.").

248. See Jason F. Shogren & Michael A. Toman, Climate Change Policy, in PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION, supra note 152, at 125, 139 ("Economic efficiency only means a lack of waste given some initial distribution of resources. Specifically how much climate change mitigation to undertake is a different question, one that refers to the distribution of resources across generations."); see also Richard L. Revesz, Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives, 99 COLUM. L. REV. 941 (1999).
2. **Costs of Climate Change Mitigation**

In addition to the potential benefits of complying with global warming mitigation policies, one also must attend to the cost side of the equation. Lomborg again relies nearly exclusively on Nordhaus's estimate of the costs of the Kyoto Protocol and various other policy options for reducing emissions. He concludes that unless Kyoto was implemented with full global trading of emissions credits, the policy would entail compliance costs greater in magnitude than any averted physical and environmental harms.\(^ {249} \) In other words, Kyoto would fail a cost-benefit test. As some observers have noted,\(^ {250} \) however, estimates of abatement costs of proposed environmental regulations historically tend to be significantly overestimated. A standard example comes from the sulfur allowance trading scheme established by the Clean Air Act Amendments of 1990.\(^ {251} \) While analysts expected the clearing price for permits under the scheme to be as high as $1,500 per ton, a recent allowance auction conducted by the Chicago Board of Trade resulted instead in a clearing price of only $66.05 per ton.\(^ {252} \) Similarly, as Robert Percival points out, "the petroleum industry estimated in 1971 that phasing lead additives out of gasoline would cost $7 billion per year [but in 1990, when 99 percent of the phaseout had been completed, costs had proven to be 95 percent less than estimated].\(^ {253} \) In light of such experiences, the truly skeptical analyst might have assessed climate change mitigation cost estimates such as Nordhaus's with less credulity than Lomborg does in *The Skeptical Environmentalist*.

One obvious potential for overestimation to occur in the climate change literature arises from the fact that many integrated assessment

\(^{249}\) See *Lomborg*, supra note 5, at 310–11.


\(^{252}\) *Tom Tietenberg, Environmental and Natural Resource Economics* 396 (5th ed., 2000); see also Robert V. Percival, *Regulatory Evolution and the Future of Environmental Policy*, 1997 U. CHI. LEGAL F. 159, 168–70 ("The low prices for which emissions allowances are selling demonstrates that industry estimates of the costs of complying with Title IV were greatly exaggerated.").

\(^{253}\) Percival, *supra* note 252, at 168–70.
models, including Nordhaus's, fail to model greenhouse gases other than CO₂. This omission is significant because these other gases, which include halocarbons, methane, and nitrous oxide, are estimated to have been responsible for approximately 40 percent of the human-induced change in temperature between 1750 and 1998. Moreover, as climate expert Michael Grubb notes, "[m]ost of these gases appear cheaper to control than CO₂." Failure to model such gases therefore would tend to substantially overstate the expected costs of compliance with global warming mitigation policies, an inflationary tendency that Lomborg neglects to acknowledge.

Integrated assessment models such as Nordhaus's also frequently neglect to consider what, if anything, will be done with revenues generated under carbon taxes, permit auctions, or other policy interventions designed to ensure achievement of mitigation goals. Research suggests, however, that climate policy cost estimates can be impacted significantly by the possibility of "revenue recycling"—that is the possibility of returning carbon tax revenues to the economy through reductions in other taxes that may have more distortionary effects than the carbon tax. At one point Lomborg notes that such a reduction could improve social welfare, but he neglects to realize that the climate model he relies upon is not similarly attuned.

Lomborg also hastily dismisses the possibility of so-called "no regrets" carbon emissions reductions. Under this scenario, opportunities exist to reduce carbon emissions that would be beneficial on net to society even without considering the costs of global warming. Lomborg discounts this view because he believes that "if it really is possible to implement profitable restructuring then it would be reasonable to expect that the possibility would already have been exploited." Nowhere does he consider, however, the many market imperfections that significantly undermine his argument. Indeed, Lomborg must have been shocked by British Petroleum's recent announcement that it had reduced corporate greenhouse gas emissions to

254. LOMBORG, supra note 5, at 259 fig. 132.
256. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: MITIGATION 56 (2001) [hereinafter MITIGATION].
257. See LOMBORG, supra note 5, at 308.
258. See id. at 312–13.
259. See MITIGATION, supra note 256, at 52.
260. LOMBORG, supra note 5, at 313.
261. See MITIGATION, supra note 256, at 53.
a level ten percent below the company's 1990 emissions profile at no aggregate cost.\textsuperscript{262}

A final manner in which the overestimation of mitigation policy compliance costs can occur is through a failure to consider the impact of technological innovations induced by the adopted regulatory regime. Nordhaus's original model did not allow for induced technological innovation when estimating the costs of compliance with global warming policies.\textsuperscript{265} This treatment was criticized heavily and, as a result, Nordhaus has begun to model technological change by allowing for a reduction in the ratio of CO\textsubscript{2} emissions to carbon-energy inputs within the production function.\textsuperscript{264} Even this improvement, however, may understate the impact of technological change by excluding the possibility for zero emissions energy sources.\textsuperscript{265} Lomborg, after all, repeatedly assures his reader that future energy needs will be met through such alternative sources as solar or wind energy.\textsuperscript{266} Indeed, Lomborg goes so far as to opine that "under any reasonable scenario of technological change and without policy intervention, carbon emissions...will decline towards the end of the century, as we move towards ever cheaper renewable energy sources."\textsuperscript{267}

It is difficult to understand, then, why Lomborg would uncritically accept the conclusions of an economic model that does not allow for development of the very renewable energy sources that he believes will save the day. The skeptical environmentalist apparently is less skeptical as an economist.\textsuperscript{268}


\textsuperscript{263} See Nordhaus, An Optimal Transition Path for Controlling Greenhouse Gases, supra note 224, at 1315 (noting that "technological change [is] exogenous").

\textsuperscript{264} See NORDHAUS \& BOYER, supra note 224, at 11.

\textsuperscript{265} Nordhaus and his co-author assume a decline in carbon intensity (the ratio of energy services to industrial carbon emissions) of 1.03 percent per year between 1995-2005, with the rate of decline dropping to zero in subsequent decades. See id. at 51. In other words, the researchers assume that producers can become marginally more efficient at extracting energy services from carbon-emitting fossil fuels, but they do not allow for more dramatic substitutions away from fossil fuels altogether. See MITIGATION, supra note 256, at 592("Models without a backstop technology will tend to estimate higher economic impacts of a carbon tax, because they rely completely on conventional fuels, so that the tax rate has to rise indefinitely to keep carbon concentrations constant, to offset the effects of economic growth.").

\textsuperscript{266} LOMBORG, supra note 5, at 305.

\textsuperscript{267} Id. at 286.

\textsuperscript{268} Elsewhere, Lomborg heavily criticizes a food security model devised by Lester Brown of the Worldwatch Institute because it ignores the effects of technological change. See id. at 104. His failure to similarly criticize integrated assessment models in the global warming context simply reinforces the perception that Lomborg's skepticism is asymmetric.
3. Scientific Uncertainty

The foregoing discussion illustrates the significant degree of political, ethical, and economic uncertainty that pervades cost-benefit analysis. In addition, one must not forget the degree of uncertainty that pervades the scientific knowledge base upon which the entire calculating exercise is built. Global warming again provides a paradigmatic example as scientists repeatedly caution their audiences that, although there is widespread agreement that changes in the global climate are occurring as a result of human activity, "there is considerable uncertainty in current understanding of how the climate system varies naturally and reacts to emissions of greenhouse gases and aerosols . . ."\(^{269}\)

Despite such admonitions, Lomborg does not hesitate to offer his own interpretation of various areas of debate in the climate science literature, particularly the little understood impact of aerosols on radiative forcing, the relationship between atmospheric warming and water vapor, and the interaction between radiation and clouds.\(^{270}\) Perhaps not surprisingly, the statistician's view turns out to be that each of these areas of uncertainty "point[] toward a smaller climate sensitivity,"\(^{271}\) despite the fact that the experts comprising the United Nations Intergovernmental Panel on Climate Change (IPCC) were unable to draw even a timid inference to that effect.

In that regard, it is worth noting that the judgments of the IPCC are subject to review and comment by thousands of climatologists, meteorologists, atmospheric scientists, and physicists from numerous nations around the globe.\(^{272}\) Lomborg's opinions on the other hand appear not to have been peer-reviewed by a single natural scientist.\(^{273}\) One safely can discount Lomborg's non-credentialed views on those aspects of climate science that he treats explicitly. Less transparent and therefore less easily avoided, however, are the numerous ways in which such views impact the assumptions underlying his global climate model and the seemingly precise cost-benefit comparisons that result.

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\(^{270}\) See LOMBORG, supra note 5, at 266-73.

\(^{271}\) Id. at 317.

\(^{272}\) See David M. Driesen, Free Lunch or Cheap Fix?: The Emissions Trading Idea and the Climate Change Convention, 26 B.C. ENVTL. AFF. L. REV. 1, 6 n.13 (1998) ("Thousands of scientists in more than 150 countries participate in IPCC assessments.").

\(^{273}\) See supra text accompanying note 22.
C. Beyond Technocracy

At times Lomborg appears to be aware that cost-benefit analysis is fraught with complexities and uncertainties such as those described in the preceding Sections. He writes, for instance, "It is exceptionally difficult to determine exactly how dangerous a substance is. This is both because our knowledge is often inadequate and because the substances have so many and different consequences." Elsewhere he acknowledges at least in part that the decision whether to discount future costs and benefits is an ethical one and that environmental action or inaction often entails distributive impacts that deserve serious consideration. Still, Lomborg seems to insist that the exercise of quantification has its own intrinsic benefits that outweigh such difficulties: "Even so, one can try to calculate the overall cost of any pollutant—from more coughs to lowered intelligence to early death."

By endorsing the practice of cost-benefit calculation while simultaneously acknowledging (some of) its defects, Lomborg places himself in good company. A range of influential scholars, including Kenneth Arrow, Cass Sunstein, Matthew Adler and Eric Posner, and others have argued in favor of the use of cost-benefit analysis in public decisionmaking, despite their awareness of the type of problems summarized above. As a result, these and other scholars increasingly are making calls for a "modest, nonsectarian" brand of cost-benefit analysis, encouraging regulators and other implementers of public policy to undertake "a full accounting of the consequences of an action, in both quantitative and qualitative terms," without binding themselves to the results like dogmatic mathematicians. To these scholars, the cost-benefit exercise may best be conceived as a procedural check on regulatory decisionmaking, rather than a substantive meta-rule: "If regulators are to proceed [with an action], they should be prepared to explain either how

274. LOMBORG, supra note 5, at 165.
275. See id. at 314 (noting that the practice of discounting the future may be "morally lamentable, but it ought not to get in the way of a realistic analysis of how the wealth distribution in society functions").
276. See id. at 289 ("As far as agriculture is concerned, global warming will be tough on the developing countries while probably being advantageous to the industrialized world.").
277. Id. at 165.
279. See sources cited supra note 25.
281. Hahn & Sunstein, supra note 198, at 7.
282. Id.
the benefits exceed the costs, or if they do not, why it is nonetheless worthwhile to go forward.\textsuperscript{283}

Unfortunately, Lomborg's version of cost-benefit balancing displays none of the modesty, nuance, and inclusiveness that characterizes these discussions of cost-benefit analysis. Lomborg blithely ignores, for instance, the very real threat of catastrophic or irreversible consequences from global warming,\textsuperscript{284} when in fact it is possibilities of that nature that lend extra urgency to the problem of climate change. Indeed, a specially appointed committee of the National Research Council recently concluded, "greenhouse warming and other human alterations of the earth system may increase the possibility of large, abrupt, and unwelcome regional or global climatic events."\textsuperscript{285} Such abrupt climatic events could include "changes in coupled modes of atmospheric-ocean behavior, the occurrence of droughts, and the vigor of thermohaline circulation in the North Atlantic."\textsuperscript{286} Each of these events could be accompanied by ecological and socioeconomic effects of enormous consequence.\textsuperscript{287}

Despite the vastness of the stakes involved, Lomborg believes that he has adequately addressed such possibilities simply because Nordhaus’s model includes a cost estimate of the risks of catastrophic events.\textsuperscript{288} What Lomborg does not disclose, however, is that Nordhaus’s estimate is based not on a scientific understanding of actual catastrophic risks of global warming, but rather on "a survey of experts" who were asked to respond to the following question:

Some people are concerned about a low-probability, high consequence output of climate change. Assume by "high consequence" we mean a 25 percent loss in global income indefinitely, which is approximately the loss in output during the Great Depression . . . . What is the probability of such a high consequence outcome . . . . if the warming is 3 degrees C in 2090 . . . . ?\textsuperscript{289}

Expert probability estimates in hand, Nordhaus then calculates the global "WTP [willingness-to-pay] to avoid catastrophic risk"\textsuperscript{290} by multiplying the likelihood of a catastrophe occurring by its dollar equivalent and adjusting the result upward to reflect society's general aversion to risks of this magnitude.\textsuperscript{291} These calculations are made

\begin{itemize}
  \item \textsuperscript{283} Id.
  \item \textsuperscript{284} See LOMBORG, supra note 5, at 315–17.
  \item \textsuperscript{285} COMMITTEE ON ABRUPT CLIMATE CHANGE OF THE NATIONAL RESEARCH COUNCIL, ABRUPT CLIMATE CHANGE: INEVITABLE SURPRISES 1 (2002).
  \item \textsuperscript{286} Id. at 108.
  \item \textsuperscript{287} See id. at 118–52.
  \item \textsuperscript{288} See LOMBORG, supra note 5, at 316 ("An estimate of the risks from such damage are of course included in the RICE/DICE models").
  \item \textsuperscript{289} NORDHAUS & BOYER, supra note 224, at 87.
  \item \textsuperscript{290} Id. at 88.
  \item \textsuperscript{291} See id. at 88–89.
\end{itemize}
tractable by the fact that Nordhaus conveniently has defined a catastrophe as a percentage reduction in income. In this manner, the economist concludes that the world currently is willing to sacrifice only one percent of global GDP in order to avoid the consequences of a catastrophic global warming event. As noted above, this amount, combined with estimates of other harmful consequences of climate change, translates into only a very modest optimal reduction of global carbon emissions.

Although Lomborg accepts these results without pause, a more skeptical reviewer might have questioned whether Nordhaus's methodology provides policymakers with a sufficiently textured basis for decision. Consider just one example of the threats which are subsumed by Nordhaus's reduction of ecological catastrophes to a percentage reduction in economic activity: the possibility of significant increases in sea levels due to global warming-induced melting in polar regions. Although the impact of sea level rises on the United States has been thoroughly investigated, less well understood, but potentially far more dramatic, are the consequences of rising oceans for the developing world. A senior official with UNEP, for instance, has studied the impact of various climate change scenarios on Pacific island nations and ranked those nations in terms of their vulnerability to sea-level rise. The researcher concluded that the Marshall Islands, Tuvalu, and Kiribati would suffer "profound" impacts from global warming, including in the worst-case scenario outright disappearance from the face of the Earth. Similarly, Micronesia, Nauru, and Tonga would experience "severe impacts" resulting in massive population displacement.

The nation of Tuvalu, to take just one of these endangered island civilizations, lies in Oceania about midway between Australia and Hawaii. Its total land area is about one tenth the size of Washington, D.C., and never reaches higher than five meters above sea level. As the CIA World Factbook puts it, Tuvalu is "one of the smallest and most remote countries on Earth." It also is home to a population of nearly

292. See id. at 90.
293. See supra text accompanying notes 221-223.
295. See NORDHAUS & BOYER, supra note 224, at 77.
297. See id.
299. Id.
11,000 people, primarily ethnic Polynesians who share a unique Tuvaluan language and cultural history that dates to the early fourteenth century. Despite the diminutive size of their island nation, the Tuvaluans made international news in recent years for being the only country in the world deemed above reproach for human rights violations by a panel of observers. In the future, they also may make news for being the first people in the world to see their ancestral home eliminated by human-induced global warming.

To be sure, the eradication of human cultures such as Tuvalu, when translated into a monetary damage figure, might fit comfortably within Nordhaus's estimate that catastrophic global warming consequences are tantamount to a 25 percent reduction in global GDP. Nevertheless, if global warming really may cause the disappearance of entire island nations, then that possibility should be identified explicitly to policymakers and the public, rather than included as an unidentified line item on a multi-trillion dollar balance sheet. Put differently, simply calculating the worth of the Tuvaluan people by discounting their national income to a present value does not provide a level of human detail commensurate with the moral calculus that must be undertaken.

Indeed, by obscuring such distributive consequences of global warming within seemingly fungible categories of calculation, one might argue that Lomborg's brand of cost-benefit analysis actually hinders moral judgment.

The IPCC, in its most recent Third Assessment Report, acknowledges the dangers of practicing cost-benefit analysis in this cavalier manner: "Application and extension of the economic paradigm

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301. See supra text accompanying note 289.

302. See Pildes & Sunstein, supra note 25, at 65 ("We do not do well if we see such diverse goods as greater employment, protection of endangered species, lower prices, distributional effects, and cleaner air along a single metric, one that erases the qualitative differences among these goods.").

303. Nordhaus and his collaborator attempt to account for the vulnerability of island nations and other low-lying settlements by assuming "that the capital value of climate-sensitive human settlements and natural ecosystems range from 5 to 25 percent of regional [economic] output...." NORDHAUS & BOYER, supra note 224, at 86. The researchers then "assume that each region has an annual willingness to pay 1 percent of the capital value of the vulnerable system (which is one-fifth of the annualized value at a discount rate on goods of 5 percent per year) to prevent climate disruption associated with a 2.5°C rise in mean temperature." Id. Such a methodology again entails a variety of ethical judgments that deserve more explicit and thorough treatment. It is not immediately clear, for instance, why the value attached to the existence of a unique human culture should be reduced according to "a discount rate on goods." Nor is it obvious that the disparities inherent in national economic output should be incorporated into judgments regarding the relative worth of human settlements.
certainly focuses attention of cost measures that are denominated in currency, but... these measures inadequately recognize non-market costs [such as] loss of life, changes in the quality of life..., species or biodiversity loss and distributional equity."304 Rather than perform a traditional cost-benefit exercise that likely would have failed to overcome these limitations, the IPCC instead utilizes a scenario-based approach in the Third Assessment Report. That is, the organization develops a set of richly described alternative courses that human development may take over the near- to long-term future and examines the ecological and socioeconomic ramifications of each course.305

Lomborg harshly criticizes the IPCC for using this scenario-based approach rather than the strict cost-benefit analysis that he prefers. He calls the IPCC scenarios "naive and clichéd,"306 and appears to suggest that the IPCC is engaged in a widespread social engineering project rather than a straightforward assessment of the problem of global warming.307 In making these criticisms, however, Lomborg has failed entirely to appreciate the reasoning behind the IPCC approach. Preferences, lifestyles, production methods, transportation systems, income distributions, and a wide variety of other issues vary across the IPCC scenarios not because the IPCC harbors undisclosed ambitions to redefine the world order, but rather because the IPCC recognizes that global warming is an emphatically multi-dimensional problem. It involves myriad, inextricably interrelated components of the earth's systems, including within them the patterns of production and consumption that characterize human economic activity. Lomborg wants to abstract away from such messiness. He believes that "in order to think clearly we should try to the utmost to separate the issues."308 As the IPCC recognizes, however, it is precisely that brand of categorical, reductionist thinking that must be overcome in order to appreciate fully the magnitude of the global warming problem and the variety of possible responses that humanity must identify and evaluate.309

304. See supra text accompanying note 22.
306. LOMBORG, supra note 5, at 284.
307. See id. at 319-20 ("[C]limate policy may be used as a tool and a justification for charting an alternative course of development."). 320 ("Essentially, what the IPCC suggests—and openly admits—is that we need to change individual lifestyles and move away from consumption."). ("The IPCC has entered the fray in telling us that climate deliberations is not only climate policy but a 'wide range of issues, including development, equity, sustainability, and sustainable development.'").
308. Id. at 322.
309. In its Summary for Policymakers, the IPCC explains that climate policies can be more effective when consistently embedded within broader strategies designed to make national and regional development paths more sustainable. This occurs because the impact of climate variability and change, climate
Lomborg's narrow assessment of climate change instead leaves no possibility for individuals to adapt their preferences and lifestyles to accommodate changing ecological or socioeconomic conditions. Any deviation from the status quo of fossil fuel intensity therefore becomes a cost of unthinkable magnitude: "[S]hould we want to limit the [global-warming induced] temperature increase to 1.5° C, this would require complete cessation of all carbon emissions by 2035, essentially shutting down the world as we know it."\(^{310}\) Lomborg elsewhere similarly laments, "One sometimes hears that the use of pesticides and intensive farming methods is harmful to the environment. But what alternative do we have, with more than 6 billion people on Earth?"\(^{311}\) The IPCC's point is simply that we have many alternatives, once one gets beyond unimaginative agnosticism with respect to preferences and lifestyles. By depicting a variety of possible courses of human development, the IPCC implicitly argues that selecting which scenario will determine the world's fate is not a function of cost-benefit balancing, but rather of the social and political will of the global community. Such choices must be made with an awareness that humanity's decisionmaking responsibility entails far more than mathematical reflex. It entails a duty of logic and morality.

One wonders why Lomborg would praise international organizations such as the IPCC at the outset of his study,\(^ {312}\) but reject their considered judgment at such a crucial moment later in his discussion of global warming. After all, his expressed hope is that "we ought not to let the environmental organizations, business lobbyists or the media be alone in presenting truths and priorities. Rather, we should strive for a careful democratic check on the environmental debate, by knowing the real state of the world . . . ."\(^ {313}\) The IPCC's latest assessment of the scientific, social, and economic implications of global warming seems to provide exactly that type of careful analysis, not just with respect to the state of the world as it is, but also with respect to the world as it may become. Because Lomborg instead utilizes only the most bare form of cost-benefit balancing to address an issue as complex and morally imbued as global

\(^{310}\) LOMBORG, supra note 5, at 309.

\(^{311}\) Id. at 64.

\(^{312}\) See id. at 31.

\(^{313}\) Id. at xx.
warming, one cannot help but suspect that his real hope is simply to bury the ethical dimensions of climate change within a graveyard of footnotes.

CONCLUSION

As much as Lomborg would like his reader to believe otherwise, \textit{The Skeptical Environmentalist} is a book about scientific uncertainty, not scientific knowledge. Specifically, it is a book about how to behave in the face of uncertainty, given that society inevitably must make decisions regarding the prioritization of its resource expenditures based upon limited scientific knowledge. Understood in that light, Lomborg has provided a coherent, albeit not particularly new, argument in favor of explicit cost-benefit analysis as a means of ensuring maximum beneficial use of social resources in environmental, health, and safety decisionmaking. As I have attempted to demonstrate, however, the argument is not without its problems. Most notably, it ignores the many ways in which cost-benefit analysis can confound equitable decisionmaking, unless its practice is sufficiently tempered by context and humility.

As if to demonstrate these dangers, Lomborg asks in one revealing passage, "[Why is it that global warming is not discussed with an open attitude, carefully attuned to making big and costly mistakes to be paid for by our descendants, but rather with a fervor more fitting for preachers of opposing religions?]" L. Lomborg's question fails to acknowledge that his preferred method of policy review is built upon its own tenets of faith. They are less transparent than the frequently charged rhetorical appeals of environmentalists, but they exist and often are backed by the same fervor that Lomborg appears to deride as non-rational. The decisions to treat all types of harms as perfectly commensurable, to value humans and other forms of biological life based upon debatable market evidence, to discount the lives of future generations, and to exclude the distributional effects of global warming—these decisions are all normative in nature. Their reliability depends not upon scientific evidence but upon the quality of their moral justification. Lomborg, regrettably, appears not to have comprehended this point, an omission that leaves the careful reader decidedly skeptical about \textit{The Skeptical Environmentalist}.

\footnotesize{314. See id. at 359 n. 249 ("I would prefer not to state my political position because I believe my strength lies in arguing on the basis of fact and not in how to use these facts to pursue policy.").

315. \textit{Id.} at 319.