

The Skeptical Environmentalist: Measuring the True State of the World. Bjørn Lomborg. Cambridge University Press, Cambridge, UK. 515 pp., paper. 2001. [ISBN 0-521-01068-3]

Statistics never lie. Environmental problems are vastly exaggerated and you can believe me because I'm a political scientist and have given money to Greenpeace in the past. Sound reassuring? That is the hook (loosely paraphrased) used to sell this book written by Bjørn Lomborg, a statistician in the Political Science Department at Aarhus University in Denmark. Lomborg examines some major environmental issues and concludes that the public is being misled by environmentalists and the media, that scientists perpetuate the fraud to increase grant funding for nonexistent problems, and government funding should focus much more on human welfare than on environmental issues.

Here are Lomborg's main points: (1) The environment is getting better in nearly every area; water quality has improved, food production is increasing, air pollution has decreased, forests are not declining, the rate of species extinction is not excessive and does not matter anyway, acid rain is a myth, the risk of cancer from synthetic chemicals is very low, global warming will be more beneficial than harmful, etc. (2) Things will continue to get better because human ingenuity and improved technology will find new solutions. (3) Environmental organizations exaggerate the state of the world to attract attention and increase their bottom line, media lackeys perpetuate these exaggerated claims because bad news sells more newspapers. (4) We should not worry so much about

things because continued improvement via the free-market system will happen “almost automatically.” (5) Policy is largely irrelevant and ineffectual.

This line of reasoning is not new. Lomborg essentially regurgitates and slightly embellishes the flawed arguments of economist Julian Simon (1995). Most of you know that this debate is more about semantics than the actual issues. On the surface his arguments are skillfully crafted and deceptively persuasive. With its vast bibliography and numerous charts and tables, the book has every appearance of an exhaustive and scholarly review of these issues. Lomborg claims to have assessed “all the facts” in reaching his conclusions. But a more detailed examination shows that his analysis is far from objective, he himself is highly selective in the use of data to support his conclusions, and he also misuses statistics. The bottom line is that Lomborg is doing exactly what he charges environmentalists are doing, except that his position is overly optimistic instead of at the other extreme.

In addition to the specific problems outlined below, a more general problem affects this book. In the introduction he makes clear that humans are his first concern, not functioning ecosystems. Therefore, he is not asking the same question as most environmentalists. While environmentalists seek to improve the environment for the benefit of humans and other species, Lomborg’s emphasis is on humans alone. Other species exist only for economic exploitation. This anthropocentric view is the backdrop for the entire book and allows him to sidestep some of the major issues. This point is important because Lomborg is claiming that environmentalists’ efforts to protect species and habitats are misguided and we should instead focus on human welfare. To the contrary, most environmentalists are deeply concerned about human welfare and have

long recognized the environmental benefits of improving living conditions in the developing world.

The best way to illustrate the weaknesses of this book is to examine in detail the chapter I am most qualified to review, namely the chapter on biodiversity and extinction. Readers of this journal are no doubt familiar with the claim that a significant proportion of the earth's species are likely to go extinct in the near future as a result of habitat loss and other effects of economic development unless action is taken.

As with other sections of the book Lomborg's strategy is simple. (1) Start with a false comparison. (2) Distort the data and selectively compile evidence to knock down the straw man. (3) Use outdated sources, non-peer-reviewed sources, citations out of context, and irrelevant examples while ignoring most of the scientific literature. (4) Finally arrive at his predetermined conclusion that environmentalists have exaggerated the situation. He starts with the estimate from Norman Myers (1979) that we may be losing 40,000 species a year. After 9 pages of convoluted discussion he concludes that the "true" extinction rate is closer to 0.7 percent over the next 50 years.

The first problem is that Lomborg does not explain, and perhaps does not understand, how Myers arrived at his estimate. Briefly, it is well known that species diversity is highest in the tropics and that many species, mostly invertebrates, are yet to be discovered. Many tropical species have small geographic ranges and many tropical insects may be host-specific for certain plants. Because it is also well known that habitat loss is a major cause of population decline and extinction, the assumption is that continued habitat loss will inevitably lead to further extinction (Simberloff 1992, Rosenzweig 1999). Lomborg counters that the observed extinction rate of birds and mammals since 1600 is

far lower than Myers' estimate. In other words, Lomborg compares the extinction rate of vertebrates over the conditions of the past 400 years with the predicted loss of mainly tropical invertebrates under a different set of conditions. In short, he is comparing apples with macadamia nuts.

Lomborg's treatment of observed extinctions brings up the second problem. In earlier sections of the book he makes a big point of the value of long term data sets and general trends. But here he neglects to show the observed extinction rate graphically. Doing so would show clearly that the extinction rate per century since 1600 has risen exponentially. Thus, the general trend apparent from the data is one of increasing extinction rates.

Lomborg then tackles the theory of island biogeography. One common prediction from this theory is that a 90% reduction in area leads to a 50% reduction in the number of species. He then cites three examples that refute this idea. Unfortunately, all three of his examples are wrong. First, he states that the loss of about 98% of the eastern forest of North America resulted in only 1 bird extinction. The first problem is that not all the forest was cut at the same time so that the total amount of forest at any one time was probably not less than 50% (Pimm and Askins 1995). Second, fewer than 30 species are restricted to forest in this region. The rest of the species breeding in the region are not absolutely dependent upon forest or are not restricted to eastern North American and thus would not be at risk of extinction even if all the forest was eliminated. Third, not one but four species probably have gone extinct [passenger pigeon (*Ectopistes migratorius*), carolina parakeet (*Conuropsis carolinensis*), ivory-billed woodpecker (*Campephilus principalis*), and Bachman's warbler (*Vermivora bachmanii*)] and habitat loss contributed

to, or was the primary reason for, their decline. So, in fact the number of endemic species predicted to be lost based on the extent of forest lost is within reason (Pimm and Askins 1995).

His second example is similarly flawed. The forest on Puerto Rico was reduced by 99% but only 7 of 60 bird species became extinct. As with the previous example, the total amount of forest never fell below 10% and second growth forest has since increased the total to 35-40% (Brash 1987). Few of the species on the island are endemic and many are not restricted to primary forest, thus the total amount of habitat available for some species was greater than 10% of the original. Of the 19 species of endemic birds 5 are extinct (the other 2 species are not globally extinct) and at least 4 others are rare or endangered (Brash 1987, Stotz et al. 1996). *NAJ* readers will find little consolation in Lomborg's astonishment that despite the reduction in forest and loss of 7 species, Puerto Rico now has 97 bird species. He neglects to mention that most (32 of 37) of these additional species were introduced by humans and are not dependent on remnant forest (Brash 1987). Few people are encouraged by the establishment of rock dove (*Columba livia*), and house sparrow (*Passer domesticus*) at the expense of 5 species found nowhere else in the world.

His final example concerns the Atlantic forest of Brazil. He cites a paper that claims not a single species "could be properly declared as extinct" despite widespread reduction and fragmentation. In the footnotes, however, he cites a more recent study that shows 10 species have become extinct and another species exists only in captivity. Furthermore, nearly 200 species in this region are threatened or endangered and many of these species have very small populations. Surveys of birds in forest fragments in this region show that

species are lost locally in proportion to fragment area (Terborgh and Winter 1980, Scott and Brooke 1985). At the regional scale, less-forested areas have a disproportionate number of threatened species, suggesting an imminent risk of extinction with continued habitat loss (Brooks and Balmford 1996).

The Atlantic forest situation brings up two other issues that Lomborg neglects to mention. First, based on documented extinctions, a species may become ecologically extinct before it becomes absolutely extinct. For example, the passenger pigeon lingered at low population size for several decades before finally dying out. Thus, many species may be hanging by a thread and thus “not properly declared as extinct” but are committed to extinction. This concept has also been referred to as the extinction debt (Tilman et al. 1994) and the living dead (Janzen 1986). Identifying areas with concentrations of rare and unique species is one way of prioritizing conservation efforts. Protecting wild populations before they are ecologically extinct will probably be more cost-effective in the long run than rescuing the living dead. Lomborg emphasizes the need to prioritize but fails to acknowledge that conservationists are attempting to do just that.

Second, he neglects the entire literature on habitat fragmentation and extinction of populations. Although he admits that most extinctions are caused by humans, and that the extinction rate has been increasing he rejects the idea that habitat loss is an important predictor of extinctions. This view is at odds with that of the overwhelming majority of scientists, conservationists, and others working on the issue.

So how did Lomborg arrive at an extinction rate of 0.7 percent over the next 50 years? Basically, he found the lowest published estimate and decided that was the most

likely one. This estimate, based on a comparison of extinction rates among British birds and insects and status changes in the IUCN Red List, came with cautionary comments from the authors: “rates of status change tell us more about lack of information...than about extinction” (May et al. 1995), and “whether it is possible to use models from the British fauna and flora to make global predictions is impossible to say” (Stork 1997). This latter paper also states that for undiscovered insects “the chances of extinction may be greater than the chances of description.” And that is exactly what Myers was getting at. Furthermore, this estimate relies on extrapolation of avian extinction rates to other groups despite cautions that “birds are likely to be the poorest possible indicator taxon for extinction of other species” (Simberloff 1992). Thus, it is clear that among the many thousands of pages of peer-reviewed scientific literature, Lomborg seized upon the few sentences he could find that supported his view and used them out of context.

We don't know how many species exist and we don't know how many are going extinct. The issue is best viewed as a range of possible extinction rates under various scenarios of future land use. Critics of the higher predicted rates claim that observed rates are much lower, but in reality the data to assess the higher rates (i.e. tropical invertebrates and plants) are not being measured. The point is not whether 40,000 or 1500 species will be lost every year. The real point in sounding the alarm is that the best available evidence from around the world shows that habitat loss leads to species extinction and the rate of extinction has risen exponentially in parallel with the exponential increase in human population.

This section has numerous other errors that illustrate Lomborg's poor grasp of the issues and lackluster editing on the part of the publisher. He refers to worms as insects.

He states the relationship between area and species richness was established in the 1960's when it actually goes back at least to the 1920's if not earlier. He claims that "species are constantly dying in competition with other species" while elsewhere he notes that background (natural or non-human caused) extinction rates are close to zero. Several footnotes refer to papers not listed in the bibliography and, inexplicably, two footnotes supposedly backing up the 0.7 percent extinction rate lead to a UN document on Gender and Human Development! In addition, one might expect that a review of biodiversity, extinction, and the value of ecosystems might include papers from journals such as Conservation Biology, Biological Conservation, Biodiversity and Conservation, Ecological Economics etc, but references to these journals are absent and references to the primary literature in general are conspicuously rare in Lomborg's bibliography. These examples show that Lomborg simply has not done his homework.

Perhaps the most glaring example of Lomborg's poor scholarship is his treatment of the value of biodiversity. As with other parts of the book his coverage of the issue is so pathetically weak it would be laughable if the public were not so willing to embrace his position uncritically (see reviews on Amazon.com for example). Here again he ignores important literature (e.g. Daily 1997, OECD 1997). His evidence to dismiss the value of biodiversity consists of two non-peer-reviewed discussion papers from the Internet. These papers suggest that the value *for medicine* of a species is extremely low. But Lomborg neglects to add that the paper also cautioned that medicinal use is *but one of many* ways to assess the value of species. Here again Lomborg uses selective data and global averages to obscure the important point. That point is not the value of the average species but the huge benefit from a few species. Lomborg derides conservation efforts by

pointing out that most species on earth are insects, fungi, algae, bacteria, and viruses. Apparently Lomborg is unaware that PCR, a technique that revolutionized genetic research and is worth billions of dollars, is derived from a species of bacteria found in Yellowstone hot springs. Also note that Bt corn (part of the technological advances in agriculture he is such a fan of) derives its pest resistance from a soil bacterium.

The problems with the biodiversity chapter are representative of most of the other chapters. In the section on fisheries, data cited by Lomborg himself shows that some fisheries are indeed declining but he masks this by showing that total marine harvest has increased because of a rise in near-shore fish-farming. In the section on forests, Lomborg concludes that we are not losing our forests, but what he really means is that although primary tropical forests are being cut, the total world forest has not declined much because of the increase in secondary forest in the temperate zone. While he claims that human ingenuity will continue to find new, better, and cheaper solutions to various problems, in the footnotes he makes the astounding statement “we must assume that the best recycling ideas have already been exploited and that yields from further recycling will be lower.” This statement is not supported by any data or references and apparently contradicts one of his main points. In the section on pesticides he notes that *at current levels of exposure* the risk of cancer from pesticides is slight, and that “we should worry much more about coffee, basil and lettuce than about synthetic pesticides.” Consider the key phrase “at current levels of exposure” and it becomes clear that he is not showing that the chemicals are not dangerous but rather that regulations to keep our exposure levels low have been successful. On virtually every issue he finds the most optimistic scenario and declares it is the most reasonable prediction.

Thus, despite Lomborg's rosy outlook, a careful examination of the data in the book reveal current or looming problems with water availability, air pollution, loss of biodiversity, declining fisheries, and all the effects of exploding population growth in developing countries. Many other issues are not mentioned or dismissed without discussion: the increase of drug-resistant diseases such as malaria and TB, the spread of invasive species, overgrazing public lands, degradation of coral reefs, and the deterioration of inland seas and freshwater lakes, and declines in ecosystem services such as pollination. Having said that, however, I agree that we can solve some of these problems if they are given sufficient attention. On the other hand, Lomborg's assertion that we shouldn't worry so much about environmental problems is misguided at best and counterproductive at worst.

Lomborg's claim that funding priorities are misplaced also falls flat. It is true that developed countries should do more to alleviate poverty in developing countries but that does not mean that spending on environmental issues is out of proportion to the problem. He cites one study showing the cost per year of human life saved for environmental incidents (for example toxic waste remediation) is higher than for spending on human welfare. But he does not mention that *total* spending in the US, both at the state and national levels, is far greater for human services than for the environment. He also does not mention that eliminating environmentally harmful subsidies, estimated at \$1 trillion annually (OECD 1997), would help the environment and economy directly (Myers 1998, James et al. 2001). Lomborg repeatedly claims that once people get rich enough they will care about the environment. Not only is this view painfully Western and disrespectful of

other cultures, but it also disregards evidence that the number of species threatened with extinction increases along with economic prosperity (Naidoo and Adamowicz 2001).

It may be true that some environmentalists exaggerate the issues, but clearly not all do. Rather than acknowledging that a range of opinions exists, he starts with the most extreme view, giving the impression that most people believe that view. Then he proceeds to disprove the extreme view and finally arrives at the conclusion the least extreme view is correct. Thus, the book does little more than counter the alleged fear-mongering with a call for apathy and business as usual.

No doubt these important issues are fraught with uncertainty. Indeed, this uncertainty creeps into the book with exceedingly vague sentences such as “The report notes *indications that to a certain extent increased nutrients may increase fishery stocks.*” Each issue is complex enough that the few pages Lomborg devotes hardly suffice to explain the complexity and uncertainty to the average reader. Linkages among issues are given even less space. We need an accessible book that clearly and objectively evaluates the data and suggests possible solutions. Lomborg’s book falls far short of the academic standards he claims to follow. Instead, he rehashes the standard arguments and the book boils down to a version of the tiresome economics vs. the environment debate. Economists and environmentalists speak different languages and this book could have helped bridge that gap. Unfortunately it will serve to further polarize rather than to mediate the debate.

Indeed, some of Lomborg’s chief targets have responded with a vengeance. E.O Wilson referred to him as a parasite (Scientific American, Jan. 2002), a comment the *Economist* (Feb. 22, 2002) considered “insufferable arrogance.” Although such language

does not lend itself to the academic debate, the frustration of Wilson and other scientists is understandable. Whether intentional or not, by presenting superficial and misleading coverage as an objective assessment of the environment, Lomborg has produced a book that is likely to confuse and mislead the public. His poor understanding of the science behind the issues, obvious lack of serious literature review on the background material, and misuse of statistics has led to serious misrepresentation of years of research by thousands of dedicated professionals. This book therefore amounts to Lomborg's own insufferable arrogance; an attempt to make a name for himself in the guise of scientific objectivity, while contributing nothing new. We need good data and reasoned debate on these issues. This book, while highly successful as a political manifesto, is an utter failure as a scientific analysis and a disservice to all those working to improve the world.

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