Chapter 1

The Skeptical Environmentalist

Bjørn Lomborg

IN THE SAME WAY that one can only be for peace and freedom and against hunger and destruction, it is impossible to be anything but for the environment. But this has given the environment debate a peculiar status. Over the past few decades, there has been an increasing fusion of truth and good intentions in the environmental debate (Poulsen 1998). Not only are we familiar with the Litany—that the environment is in poor shape and getting ever worse—we *know* that the Litany is true and that anyone who claims anything else must have disturbingly evil intentions.[1]

That is why I felt it was important to write a book like *The Skeptical Environmentalist* (2001). My motives for writing this book were neither evil nor covert. My understanding, in all simplicity, is that democracy functions better if everyone has access to the best possible information. It cannot be in the best interest of our society for debate about such a vital issue as the environment to be based more on myth than on truth.

In the course of this chapter, I summarize two major points of my

Bjørn Lomborg is an associate professor of statistics in the department of political science, University of Aarhus, Denmark.

book. One of the most important aspects of the book was to confront the environmental myths and the Litany with the reality expressed in empirical data and statistics. The first part of this chapter is centered around this same exercise. Many predictions and claims made by environmental organizations are dismissed, and I hope to give an impression of the argument in my book—that things are indeed getting better.

The second part of this chapter is a condensed version of the explanation provided in my book as to why the myths and the Litany have been able to grow so strong. In the last part of the chapter, I present and respond to some of the criticisms my book has received.

Environmental Reality and Myths

I attempted over the course of *The Skeptical Environmentalist* to describe the principal areas that stake out humankind's potentials, challenges, and problems in the past, the present, and the future. I challenged the usual conception of the collapse of ecosystems because this conception is simply not in keeping with reality.

I found that 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 thirty years: today, we live for sixty-seven years. According to the United Nations, we reduced poverty more in the last fifty years than we did in the preceding 500 years, and it has been reduced in almost every country.

Although its size and future projections are rather unrealistically pessimistic, global warming is probably taking place—but the touted cure of early and radical fossil fuel cutbacks is way worse than the original affliction. Moreover, the total impact of global warming will not pose a devastating problem for our future. Nor will we lose 25 to 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 almost every measurable indicator. But note carefully what I am saying here: that by far the majority of indicators show that mankind's lot has vastly *improved*. This does *not* mean, however, that everything is good enough. The first statement refers to what the world looks like, whereas the second refers to what it ought to look like.[2]

While on lecture tours, I have discovered how vital it is to emphasize this distinction. Many people believe they can prove me wrong, for example, by pointing out that a lot of people are still starving: "How can you say that things are continuing to improve when 18 percent of all people in the developing world are still starving?" The point is that ever fewer people in the world are starving. In 1970, 35 percent of the people in developing countries were starving. In 1996, the figure was 18 percent, and the United Nations expects that the figure will have fallen to 12 percent by 2010 (FAO 1996: I, Table 3; FAO 1999b, 29). This is remarkable progress: 237 million fewer people starving. Two billion more people are getting enough to eat today than in 1970.

The food situation has vastly improved, but in 2010, there will still be 680 million people starving, which is obviously not good enough. The distinction is essential—when things are not going well enough, we can sketch out a vision. And in this case, the vision is that fewer people must starve. This is our political aim. But if things are at least improving, then we know we are on the right track, although perhaps not at the right speed.

What Reality? The Use of References

Matter-of-fact discussion of the environment can be very difficult because everybody has such strong feelings on the issue. But at the same time, even as environmentalists, it is absolutely vital for us to be able to prioritize our efforts in many different fields—for example, health, education, infrastructure and defense—as well as the environment.

Over the course of the last few decades, we have developed a clear impression that the Litany is an adequate and true description of the world. We know that the environment is not in good shape. This is also why it has been possible for people to make erroneous claims, such as those mentioned in the previous pages, without needing to provide the evidence to authenticate them. For that reason, we also tend to be extremely skeptical toward anyone who says that the environment is not in such a bad state. To me, this indicates a natural and healthy reaction. And it's why I went to great lengths to document my claims.

I therefore included an unusually large number of notes in my book. In addition, I tried to source as much of the information from the Internet as possible. Thus, readers can go on to the Internet and download the relevant text to see from where I have retrieved my data and how I interpret that information. Of course, there will always be books and articles central to the relevant literature that are not available on the Internet.

I cannot overemphasize how important it is to me that there be no doubt about the credibility of my sources. For this reason, most of the statistics I used came from official sources that are widely accepted by the majority of people involved in the environment debate. Among these sources are agencies and programs of the Food and Agriculture Organization (FAO), the World Health Organization (WHO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP). Furthermore, I used figures published by international organizations such as World Bank and the International Monetary Fund (IMF), which primarily collate economic indicators.

Just because figures come from official international and national organizations does not, of course, mean that they are free from error—these figures often come from other publications that are less "official" in nature. It is therefore still possible to be critical of the sources of these data, but one does not need to worry to the same degree as one would were less-established sources used about the extent to which I

simply present some selected results that are extremely debatable and that deviate from generally accepted knowledge. Focusing on official sources also means that I avoid one of the big problems of the Internet—that on this highly decentralized network you can find practically anything.

It is important to remember that the statistical material I presented in my book was usually identical to that used by the WWF, Greenpeace, and the Worldwatch Institute. People often ask where the "other" figures are, the ones these other organizations use, but there are no other figures. The figures I used are the official figures everybody uses.

When Lester Brown and I met in a television debate on the state of the world, one of the things we discussed was whether overall forest cover had increased or decreased since 1950. Brown's first reaction was that we should get hold of the FAO's *Production Yearbook*, which is the only work to include calculations of the area of forest cover from 1949 to 1994. This is the same book I had used as a reference, so we agreed on the standard. (In reality we were merely discussing who could look up a number correctly.)

Lester Brown believed there was less forest, whereas I thought there was more. I offered Lester Brown a bet, which he reluctantly declined and also which he would have lost. In 1950, the FAO estimated that the world had 40.24 million square kilometers of forest; in 1994, it estimated the world had 43.04 million square kilometers.

Confronting Myths with Reality

It is crucial to the discussion about the state of the world that we consider the fundamentals. This requires us to refer to long-term and global trends, considering their importance especially with regard to human welfare.

But it also is crucial that we cite figures and trends *that are true*. This demand may seem glaringly obvious, but unfortunately, the environment debate has been characterized by a tendency toward rather

rash treatment of the truth. This is an expression of the fact that the Litany has pervaded the debate so deeply and for so long that blatantly false claims can be made again and again without any references and still be believed.

Take notice—this is not because of primary research in the environmental field which generally appears to be professionally competent and well balanced. It is because of the "knowledge" that is disseminated about the environment, which taps deeply into our doomsday beliefs. Such propaganda is presented by many environmental organizations—including the Worldwatch Institute, Greenpeace, and the WWF—and by many individual commentators, and it is readily picked up by the media. Let me stress that I am glad we have these organizations. They help point to problems that might otherwise be ignored. However, it should also be acknowledged that they represent certain interests, and as such, they present the public with one-sided information. My concern is the asymmetric flow of information that comes from trusting environmental organizations without the healthy critical angle one would normally put forward had the organizations been, for instance, business conglomerates.

Let us look at some of the more outstanding examples of environmental myth making.

Reality Check: Worldwatch Institute

Often the expressions of the Litany can be traced—either directly or indirectly—to the Worldwatch Institute. Its publications are almost overflowing with statements such as: "The key environmental indicators are increasingly negative. Forests are shrinking, water tables are falling, soils are eroding, wetlands are disappearing, fisheries are collapsing, rangelands are deteriorating, rivers are running dry, temperatures are rising, coral reefs are dying, and plant and animal species are disappearing" (Worldwatch Institute 1999a, 4). Powerful statements that

make powerful reading—and they are made entirely without references.[4]

Discussing forests, the Worldwatch Institute states categorically that "the world's forest estate has declined significantly in both area and quality in recent decades" (Worldwatch Institute 1998a, 22).[5] As we previously saw, the decline in forests is simply not true. The longest data series from the FAO show that global forest cover has increased. Such global figures have not been referred to. Nor is reference made to figures regarding the forests' quality—simply because no such global figures exist.

Blatant errors are made with unfortunate frequency. Worldwatch Institute claims that "the soaring demand for paper is contributing to deforestation, particularly in the northern temperate zone. Canada is losing some 200,000 hectares of forest a year" (Worldwatch Institute 1998a, 9). Reference is made to the FAO's *State of the World's Forests 1997*, but if you refer to that source, you will see that in fact Canada added 174,600 hectares of forest each year (FAO 1997, 189).

In their 2000 overview, Worldwatch Institute lists the problems staked out in their very first *State of the World* publication (1984). Here is the complete list: "Record rates of population growth, soaring oil prices, debilitating levels of international debt, and extensive damage to forests from the new phenomenon of acid rain" (Worldwatch Institute 2000, xvii). The turn of the millennium would seem to be the natural point at which to take stock of the important issues, assess this list, ask if earlier problems have been overcome. However, Worldwatch Institute immediately tells us that we have not solved these problems. "Far from it. As we complete this seventeenth *State of the World* report, we are about to enter a new century having solved few of these problems and facing even more profound challenges to the future of the global economy. The bright promise of a new millennium is now clouded by unprecedented threats to humanity's future" (Worldwatch Institute 2000, xvii).

Worldwatch Institute does not return to look at the list but merely tells us that the problems have not been solved and that we have added

even more problems since then. But does the Litany stand up if we check the data? The level of international debt may be the only place where we have not seen significant improvement: Although the level of debt declined steadily, the decline was slight, from 144 percent of exports in 1984 to 137 percent in 1999 (World Bank 2000a, 2000b).

Acid rain, although it harmed lakes, did very little, if any, damage to forests. Moreover, the sulfur emissions responsible for acid rain have declined in both Europe and the United States—in the European Union, emissions have decreased by a full 60 percent since 1980 (European Environment Agency 2000).

The soaring oil prices that cost the world a decade of slow growth from the 1970s into the mid-1980s declined throughout the 1990s to a price comparable with or lower than the pre–oil crisis price. Even though oil prices have almost doubled since the all-time low in mid-1998, a barrel price of $21.55 in 2001 is still way below the top price of $63 in the early 1980s. Moreover, most consider this spike is a short-term occurrence. The U.S. Energy Information Administration expects an almost steady oil price over the next twenty years at about $22–$24 a barrel (2002, 24–26).

Finally, speaking of record rates of population growth is just plain wrong—the record was set back in 1964 at 2.17 percent per year (U.S. Bureau of the Census 2000). Since that record, the population growth rate has been steadily declining, standing at 1.26 percent in 2000 and expected to drop below 1 percent in 2016. Even the absolute number of people added to the world peaked in 1990 with 87 million. The figure dropped to 76 million added in 2000 and is still decreasing.

Thus, in its shorthand appraisal of the state of the world since 1984, Worldwatch Institute sets out a list of problems, all of which have improved, all but one of which have improved immensely, and one of which is just plain wrong. Not a great score for sixteen years that have supposedly been meticulously covered by the Worldwatch reports. The problem, of course, is not lack of data—Worldwatch Institute publishes

fine data collections, which are also used in my book—but merely a carelessness that comes with an ingrained belief in the Litany.

Reality Check: WWF

Toward the end of 1997, WWF focused on the Indonesian forest fires that were responsible for the thick clouds of smoke over much of Southeast Asia. There is no doubt that this was obnoxious for city dwellers, but WWF said the fires were a signal that the world's forests were "out of balance"—tidings that the Worldwatch Institute actually announced as one of the primary signs of ecological breakdown in 1997 (Worldwatch Institute 1998b, 15).

WWF proclaimed 1997 as "the year the world caught fire" because "in 1997, fire burned more forests than at any other time in history" (1997b, 1997c, 1998b). Summing up, WWF president Claude Martin stated unequivocally that "this is not just an emergency, it is a planetary disaster" (WWF 1997b). But on closer inspection, the figures do not substantiate this claim: 1997 was well below the record, and the only reason 1997 was the year when Indonesia's forest fires were noticed was because it was the first time they really irritated city dwellers. In all, Indonesia's forest fires affected approximately 1 percent of the nation's forests.

Also in 1997, WWF issued a press release entitled "Two-Thirds of the World's Forests Lost Forever" (1997d). In both this press release and its *Global Annual Forest Report 1997* (1997a, 1997d), WWF explained how its "new research . . . shows that almost two-thirds of the world's original forest cover has been lost." This seemed rather amazing to me, because most sources estimate about 20 percent.[6] I therefore called WWF in England and spoke to Rachel Thackray and Alison Lucas, who had been responsible for the press release, and asked to see the WWF research report on which that statement was based. All they were able to tell me, however, was that no report had ever existed and that the WWF had been given the figures by Mark Aldrich of the World

Conservation Monitoring Centre. Apparently, they had looked at some maximum figures and also, because of problems of definition, they had included the forests of the northern hemisphere in the original overview of forest cover, but not in the current one.[7]

From this nonreport, WWF (1997d) tells us: "[N]ow we have proof of the extent of forest already lost. . . . The frightening thing is that the pace of forest destruction has accelerated dramatically over the last five years and continues to rise." The United Nations, however, tells us that the rate of deforestation was 0.346 percent in the 1980s and just 0.32 percent from 1990 through 1995; not a dramatic increase in pace, but a decrease.[8]

WWF confides in us that nowhere is deforestation more manifest than in Brazil, which "still has the highest annual rate of forest loss in the world." In actual fact, the deforestation rate in Brazil is among the lowest as far as tropical forest goes; according to the United Nations, the deforestation rate is at 0.5 percent per year compared with an average of 0.7 percent per year (FAO 1997, 189).

In more recent material, WWF has lowered its estimate of original forest cover from 8,080 million hectares to 6,793 million hectares (about 16 percent) while increasing its estimate of the current forest cover from 3,044 million hectares to 3,410 million (about 12 percent), although this estimate is still about 100 million hectares lower than the U.N. estimate.[9] This means that WWF has lowered its estimates from 62.3 percent to 49.8 percent of the earth's forest that have been lost.[10]

This is still much more than the 20 percent commonly estimated. However, two independent researchers at the University of London and the University of Sussex (Fairhead and Leach 1998; Leach and Fairhead 1999) have tried to assess the sources and data used by WWF, the World Conservation Monitoring Centre (WCMC), and others in making such gloomy estimates of vast forest reductions. Considering the enormous amount of data, they have focused on the assessments of forest loss in West Africa, a place where WWF and the WCMC estimate a forest loss of 87 percent, or about 48.6 million hectares (Leach and

Fairhead 1999, 1). However, the documentation turns out to be based mainly on problematic bioclimatic forest zones, essentially comparing today's forests with where there may have been forests earlier. In general, the researchers find that "the statistics for forest loss in general circulation today massively exaggerate deforestation during the twentieth century" (Fairhead and Leach 1998, xix). The actual deforestation in West Africa is about 9.5 to 10.5 million hectares, or about five times less than what is estimated by WWF and the WCMC (Fairhead and Leach 1998, 183).

WWF (1999, 1) uses these forest estimates, among other measures, to make a so-called Living Planet Index, supposedly showing a decline of 30 percent over the past twenty-five years—"implying that the world has lost 30 percent of its natural wealth in the space of one generation." This index uses three measures: the extent of natural forests (without plantations), and two indices of changes in populations of selected marine and freshwater vertebrate species. The index is very problematic. First, excluding plantations ensures that the forest cover index will fall (because plantations are increasing), but it is unclear whether plantations are bad for nature overall. Plantations produce many of our forest goods, reducing pressure on other forests—in Argentina, 60 percent of all wood is produced in plantations that constitute just 2.2 percent of the total forest area, thus relieving the other 97.8 percent of the forests (FAO 1997, 13, Table 2). Although WWF states that plantations "make up large tracts of current forest area" (WWF 1998a, 6), they in fact constitute only 3 percent of the world's total forest area.[11]

Second, when using 102 selected marine species and 70 selected freshwater species, there is no way of ensuring that these species are representative of the innumerable other species. Indeed, because research is often conducted on species that are known to be in trouble, it is likely that such estimates will be grossly biased toward decline.

Third, in order to assess the state of the world, we need to look at many more and better measures. This is most clear when WWF (WWF

1998a, 24) actually quotes a new study that shows the total worth of the ecosystem to be $33 trillion annually (thus estimating the ecosystem to be worth more than the global production at $31 trillion). According to WWF (WWF 1998a, 24), it implies that the Living Planet Index's having dropped 30 percent means that we now get 30 percent less from the ecosystem each year or that we now lose some $11 trillion each year. Such a claim is almost nonsensical. Forest output has not decreased but increased—some 40 percent since 1970 (Worldwatch Institute 1999b, 77). And the overwhelming value of the ocean and coastal areas are in nutrient recycling, which the Living Planet Index does not measure at all. Also, marine food production has almost doubled since 1970. Thus, by their own measures, we have not experienced a fall in ecosystem services but actually a small increase.

In its *Living Planet Report 2002*, the WWF calculates a global footprint for the entire earth based on the area needed in six categories—cropland, grazing land, forests, fishing, infrastructure, and energy—to accommodate humankind's demand in a sustainable way. Based on its calculation, the WWF tells us that we need 1.2 Earths to satisfy our demand in a sustainable way and that if we do not change our current ways, we will be faced with a collapse in human welfare by 2030.

Energy consumption makes up for more than half of Earth's ecological footprint. How energy consumption can be translated into physical land area in any meaningful way constitutes a serious problem. The solution proposed by WWF is to calculate the area that needs to be covered with forests in order to soak up the carbon dioxide from fossil fuels. The consequence would be that with the current fossil fuel emissions, more than half of Earth's productive surface would be covered with forests—no wonder we are running out of space on paper. The strategy of raising forests to solve the carbon dioxide problem is but one solution—and it is the most space-intensive. By changing the focus away from forest sequestration to technologically feasible types of renewable energy, the ecological footprint is reduced by a factor of more than a hundred, leaving humankind with sustainable space in abun-

dance (Danish Environmental Assessment Institute 2002, 35–38). Even the WWF has championed renewables for three decades—why are they not included in the calculation now?

The WWF also processes the much-inflated ecological footprint data in a computer model (the same infamous World3-model that was used to generate the flawed predictions in *Limits to Growth* from 1972) to estimate the costs that humankind might have to endure in the future. The model's projections reveal some surprisingly ominous costs for the mid-century generations: a global life expectancy age of 25, a global per-capita GDP equal to present-day Sudan, and a less-and-less-educated world. However, these predictions go against every future projection generated by official international institutes that unanimously conclude future generations are likely to be richer, healthier, and more equal. And a more thorough investigation of the dire predictions reveals that they have been generated using a model that excludes technological progress and human creativity and that the model contains an inherent mathematical tendency to overshoot and collapse (Danish Environmental Assessment Institute 2002, 22–33).

Reality Check: Greenpeace

In the Danish press, I pointed out that we had long been hearing figures for the extinction of the world's species that were far too high—including that we would lose about half of all species within a generation. The correct figure is closer to 0.7 percent in fifty years. This led to Niels Bredsdorff, the chairman of the Danish branch of Greenpeace, pointing out that Greenpeace had long accepted the figure of 0.7 percent. Notwithstanding, Greenpeace's official biodiversity report stated that "it is expected that half the earth's species are likely to disappear within the next seventy-five years."[12] Bredsdorff has never officially commented on this report, but he did manage to persuade Greenpeace International to pull the report off the Internet because it did not contain one single scientific reference.

Norwegian television confronted Greenpeace in Norway with this report. Four days later, having been more or less forced them into a corner, Greenpeace decided to hold a press conference, during which they raised all the general points I had mentioned, and they said that they were reevaluating their effort. The Norwegian daily *Verdens Gang* (March 19, 1998) reported:

> We have had problems adapting the environment movement to the new reality, says Kalle Hestvedt of Greenpeace. He believes the one-sided pessimism about the situation weakens environment organizations' credibility. Yet when most people do not feel that the world is about to fall off its hinges at any moment, they have problems taking the environmental organizations seriously, Hestvedt maintains.

By way of summary, a Greenpeace representative said that "the truth is that many environmental issues we fought for ten years back are as good as solved. Even so, the strategy continues to focus on the assumption that 'everything is going to hell'" (*Verdens Gang*, March 19, 1998).

Confronting Rhetoric and Poor Predictions

When we present an argument, there is never enough space or time to state all assumptions, include all data, and make all deductions. Thus, to a certain extent all argument relies on metaphors and rhetorical shortcuts. However, we must always be very careful not to let rhetoric cloud reality.

One of the main rhetorical shortcuts of the environmental movement is to pass off a temporary truism as an important indicator of decline. Try to see what your immediate experience is of the following quote from the Worldwatch Institute: "As a fixed area of arable land is divided among ever more people, it eventually shrinks to the point where people can no longer feed themselves" (2000, 7). This statement sounds like a correct prediction of problems to come. And yes, it is evidently true—there is a level (certainly a square inch or a speck of soil) below

which we could not survive. But the important pieces of information are missing from Worldwatch's statement—we are not told what this level is, how close we are to it, and when we should expect to cross it.[13] Most people would probably be surprised to know that with artificial light each person can survive on a thirty-six-square-meter plot (forty-three square yards) and that companies produce commercially viable hydroponic food in even less space (Simon 1996, 100–101). Moreover, the FAO (2000b) finds in its newest analysis of food production to 2030 that "land for food production is seen to have become less scarce, not scarcer" (108). Thus the argument as stated is merely a rhetorical trick to make us think, "Oh yes, things must be getting worse."

This "rhetorical trick" has been used a lot by Worldwatch Institute. Talking about increasing grain yields, Lester Brown tells us that "there will eventually come a point in each country, with each grain, when the farmers will not be able to sustain the rise in yields" (1998a, 89) Again, this is obviously true, but the question is, how far away is the limit? This question remains unanswered while Brown goes on to conclude the somewhat unimaginative rerun of the metaphor: "Eventually the rise in grain yields will level off everywhere, but exactly when this will occur in each country is difficult to anticipate" (90). Likewise, Brown tells us that "if environmental degradation proceeds far enough, it will translate into economic instability in the form of rising food prices, which in turn will lead to political instability" (Brown 1996, 199–200). Again, the sequence is probably correct, but it hinges on the untold "if"—has environmental degradation actually proceeded that far? And that information is never demonstrated.

Greenpeace, in its assessment of the Gulf War, used similar rhetoric (1992, 8.1): "Any environment consists of many complex dynamic interactions, but the system will gradually, sometimes almost imperceptibly, break down once a threshold of damage has been passed. Whether this has happened in the Gulf only time will tell." Certainly it sounds ominous, but the important information of whether that threshold has been or is close to being crossed is left out.

Rhetoric, in various forms, is often employed. In one of the background documents for the U.N. assessment on water, the authors see two "particularly discomforting" alternatives for the arid, poor countries: "Either by suffering when the needs for water and water-dependent food cannot be met, manifested as famines, diseases and catastrophes. Or, in the opposite case, by adapting the demand to the available resources by importing food in exchange for other, less water-dependent products" (Falkenmark and Lundqvist 1997, 8). That sounds like a choice between the plague and cholera—until you think about it. Then you realize that they are essentially asking whether an arid country should choose starvation or partake in the global economy.

Worldwatch Institute wants us to change to renewable energy sources. Some of these arguments are entirely powered by rhetoric, as when they tell us: "From a millennial perspective, today's hydrocarbon-based civilization is but a brief interlude in human history" (1999a, 23). This is obviously true. A thousand years ago we did not use oil, and a thousand years from now we will probably be using solar, fusion, or technologies we have not yet thought of. The problem is that this does not really narrow down the point at which we have to change energy supply—now, in fifty years, in two hundred years? When seen from a millennial perspective, many things become brief interludes, such as the Hundred Years War, the Renaissance, the twentieth century, and indeed our own lives.

Likewise, when we argue about the consequences of ecosystem changes, it is easy to think of and mention only negative consequences. This is perhaps most evident when we discuss global warming and global climate change. Take, for instance, this description of climate change from *Newsweek*:

> There are ominous signs that the Earth's weather patterns have begun to change dramatically and that these changes may portend a drastic decline in food production—with serious political implications for just about every nation on Earth. The drop in food output could begin quite soon, perhaps only 10 years from now.

> The evidence in support of these predictions has now begun to accumulate so massively that meteorologists are hard-pressed to keep up with it. In England, farmers have seen their growing season decline by about two weeks since 1950, with a resultant overall loss in grain production estimated at up to 100,000 tons annually. During the same time, the average temperature around the equator has risen by a fraction of a degree Celsius—a fraction that in some areas can mean drought and desolation. Last April, in the most devastating outbreak of tornadoes ever recorded, 148 twisters killed more than three hundred people and caused half a billion dollars' worth of damage in thirteen U.S. states.
>
> To scientists, these seemingly disparate incidents represent the advance signs of fundamental changes in the world's weather. Meteorologists disagree about the cause and extent of the trend as well as over its specific impact on local weather conditions. But they are almost unanimous in the view that the trend will reduce agricultural productivity. (Gwynne 1975)

All this sounds familiar, like the greenhouse worries we hear today, but, surprisingly, it is actually an article from 1975 entitled "The Cooling World"—written during a time when we all worried about global cooling. Of course, our present worry about global warming is based on better arguments and more credible models. And because our societies were and are adjusted to the present temperature, a change, whether a cooling or a warming, will carry with it large costs.

But notice how *Newsweek*'s description conspicuously leaves out any positive consequences of cooling. Today, we worry that global warming will increase the outreach of malaria—consequently, a world believing in cooling should have appreciated the reduction of infected areas. Likewise, if we worried about a shortening of growing seasons with a cooling world, we should be glad that global warming will lengthen the growing season.[14] Obviously, more heat in the United States or the United Kingdom will cause more heat deaths, but it is seldom pointed out that this will be greatly outweighed by fewer cold deaths, which in the United States are about twice as frequent.[15] Notice, this argument

does not challenge that total costs, certainly the total worldwide, from global warming will outweigh total benefits, but if we are to make informed decisions about solutions to global warming, we need to include both costs and benefits. If we focus only on the costs, it will lead to inefficient and biased decisions.

Another recurrent environmental metaphor is the likening of our current situation with that of Easter Island. A small island situated in the Pacific Ocean more than 1,900 miles west of Chile, Easter Island is most well-known for its more than 800 gigantic heads cut in volcanic stone, set all over the island. Archaeological evidence indicates that while producing the stunning statues, a thriving culture also began reducing the forests around A.D. 900. They used the trees for rolling the statues, as firewood, and as building materials. In 1400, the palm forest was entirely gone. Food production declined, statue production ceased in 1500, and, apparently, warfare and hunger reduced the population by 80 percent before an impoverished society was discovered in 1722 by Dutch ships (Brander and Taylor 1998).

Since then, Easter Island has been an irresistible image for the environmentalists, showcasing a society surpassing its limits and crashing devastatingly. A popular book on the environment uses Easter Island as its repeated starting point, even on the front cover (Gonick and Outwater 1996). Worldwatch Institute tells us in its millennium edition:

> As an isolated territory that could not turn elsewhere for sustenance once its own resources ran out, Easter Island presents a particularly stark picture of what can happen when a human economy expands in the face of limited resources. With the final closing of the remaining frontiers and the creation of a fully interconnected global economy, the human race as a whole has reached the kind of turning point that the Easter Islanders reached in the sixteenth century. (1999a, 11)

Isaac Asimov (Asimov and Pohl 1991, 140–41) merely tells us that "if we haven't done as badly as the extinct Easter Islanders, it is mainly

because we have had more trees to destroy in the first place." Again, the problem is rhetoric that only indicates that crashing is indeed possible, but makes no effort to explain why such crashing should be likely. It is worth realizing that of the 10,000 Pacific islands, only twelve, including Easter Island, seem to have undergone declines or crashes, whereas most societies in the Pacific have indeed been prosperous (Brander and Taylor 1998, 122). Moreover, a model of Easter Island seems to indicate that its unique trajectory was due to a dependence on a particularly slow-growing palm tree, the Chilean wine palm, which takes forty to sixty years to mature (Brander and Taylor 1998, 129). This sets Easter Island apart from all the other Polynesian islands, where fast-growing coconut and Fiji fan palms make declines unlikely.

Moreover, the models predicting an ecological collapse need increasing populations with increasing need for resources to produce an overshoot. But in the modern world, such a scenario seems very unlikely, because increased wealth has caused a fertility decline (Brander and Taylor 1998, 135). And finally, it is worth pointing out that today's world is much less vulnerable, because trade and transport effectively act to reduce local risks.

The consequences of relying on rhetoric instead of sound analysis are many, primarily poor forecasts and the resulting biased decisions. Perhaps the most famous set of predictions came from the 1972 global bestseller *Limits to Growth*, which claimed we would run out of most resources. Indeed, gold was predicted to run out in 1981, silver and mercury in 1985, and zinc in 1990 (Meadows et al. 1972, 56). Needless to say, gold, silver, mercury, and zinc are still here, and most resources have actually become more abundant (Lomborg).

Let us end this section with two examples from one of America's foremost environmentalists, professor Paul Ehrlich, a prolific writer and discussant.

In 1970, as the first Earth Day approached, Ehrlich wrote an article in *The Progressive* styled as a fictitious report to the president of the United States and looking back from the year 2000. The fictitious report

underlines how environmental scientists in the 1960s and 1970s had "repeatedly pointed out" that overcrowding, hunger and environmental deterioration would lead to "environmental and public health disasters" (25). Unfortunately, people had not heeded the warnings, and Ehrlich tells of a United States that is almost unrecognizable, with a severely decimated population at 22.6 million (8 percent of current population) and a diet of 2,400 daily calories per person (less than the current African average).[16] As an almost ironic glimmer of hope, Ehrlich does not expect that the United States is faced with any immediate limits-to-growth threat of running out of resources because of the "small population size and continued availability of salvageable materials in Los Angeles and other cities which have not been reoccupied" (24).

This view was fleshed out in the book *The End of Affluence*, written by Ehrlich with his wife Anne (Ehrlich and Ehrlich 1974). Here they worried about how global cooling would diminish agricultural output and forecast trouble with the fisheries, because the global catch had reached its maximum (28–30). They saw a society that was driven by deluded economists "entrapped in their own unnatural love for a growing gross national product" (158). The ultimate consequence was clear: "It seems certain that energy shortages will be with us for the rest of the century, and that before 1985 mankind will enter a genuine age of scarcity in which many things besides energy will be in short supply. . . . Such diverse commodities as food, fresh water, copper, and paper will become increasingly difficult to obtain and thus much more expensive. . . . Starvation among people will be accompanied by starvation of industries for the materials they require" (33).

Though rhetorically eloquent, time has not been kind to these predictions. Thus, when we evaluate the data on the state of the world, it is important that we not be swayed by rhetoric or simplistic models and that we use and present the best indicators and the best models.

Summing Up

Many people have pointed out at lectures that although I may be right in claiming that things are not as bad as we thought they were, such arguments should not be voiced in public as they might cause us to take things a bit too easy. Although one can argue such a position, it is important to understand how antidemocratic such an attitude really is: We (the few and initiated) know the truth, but because general knowledge of the truth will cause people to behave "incorrectly," we should refrain from broadcasting it. Moreover, such a course of argument will also be harmful to the environmental movement in the long run since it will erode its most valuable asset, its credibility. I think that, in general, pretty strong arguments would have to be presented for it to be permissible to withhold the truth for the sake of some elitist, general good.

This does not mean that I am a demonic free-market individualist. I believe that there are many circumstances in which environmental intervention is necessary if we are to prevent unnecessary pollution and keep people from shunning their responsibilities. However, we should only intervene if it is reasonable to do so, not simply because myth and worry lead us to believe that things are going downhill.

Often we hear that environmental worry has been and is an important factor in getting action on cleaning up the environment, that essentially many of the global indicators go in the right direction because people worried in earlier times. However, this is often misleading, even incorrect. Air pollution in London has declined since the late nineteenth century, but the decline for most of the twentieth century has been mainly because of a change in infrastructure and fuel use and only slightly, if at all, because of environmental worries expressed in concrete policy changes. Moreover, even to the extent that worries have mattered in policy decisions, as they undoubtedly have during the past thirty years in, say, air pollution, this does not assure us that our resources could not have been put to better use.[17] To the extent that worries have prodded us to spend more money on the environment than we would

have done if we'd had the best available information, the argument for environmental worries is a replay of the democratic dilemma above. Although kindling public concern clearly makes people choose more "correctly" as seen from an environmental viewpoint, it leads to an "incorrect" prioritization as seen from a democratic viewpoint because it skews the unbiased choice of the electorate.

In general we need to confront our myth of the economy undercutting the environment.[18] We have grown to believe that we are faced with an inescapable choice between higher economic welfare and a greener environment.[19] But surprisingly, and as documented throughout my book, environmental development often stems from economic development—only when we get sufficiently rich can we afford the relative luxury of caring about the environment.

This also has implications for our discussions on prioritization. Many people love to say that we should have a pollution-free environment. This is a delightful thought, of course. It would be nice as well to have a country with no disease or the best possible education for all its young people. The reason this does not happen in real life is that the cost of getting rid of the final disease or educating the slowest student will always be ridiculously high. We invariably choose to prioritize in using our limited resources.

One American economist pointed out that when we do the dishes, we are aiming not to get them clean but to dilute the dirt to an acceptable degree (Simon 1996, 226–27). If we put a washed plate under an electron microscope we are bound to see lots of particles and greasy remnants. But we have better things to do than spend the whole day making sure that our plates are a little cleaner (and besides, we could never get them completely clean). We prioritize and choose to live with some specks of grease. Just how many specks we will accept depends on an individual evaluation of the advantages of using more time doing dishes versus having more leisure time. But the point is that we—in the real world—never ask for 100 percent.

Similarly, we have to find a level at which there is sufficiently little

pollution such that our money, effort, and time are better spent solving other problems. This calls for access to the most accurate and thorough and least myth-based knowledge.

Why Do We Hear So Much Bad News?

In the vast majority of nations, people believe that the environment is worse "somewhere else" than in their own country. It is not unthinkable that the environmental problems we experience at a national and international level either are not localized or occur in sparsely populated areas. But it still points to the fact that our knowledge of things close to us, which is derived from our own experiences, is not the primary source of our fears for the environment. On the contrary, we seem more worried about conditions the further away from us they are, both physically and mentally.

This points to the fact that our fears for the environment are, to a high degree, communicated, and here I will look at three of the most important communicators: researchers, organizations, and the media. I will argue that there is good reason to believe that all three communicators will present us with a preponderance of negative tidings. And finally, comment should be passed on our own willingness to listen to and believe bad news.

Research

Research is basically a question of revealing truths about ourselves and our surroundings, be these manmade or natural. But research does not simply come about of its own accord; it has to be financed. This means that the problems to be investigated are influenced, to some degree, by the interests of those who finance the research.

In our modern society, much research is publicly funded, which means there will be certain expectations as to the relevance of the research to society.[20] There is nothing at all suspicious about this, as we

probably expect to get a reasonable return on our tax money, but it does have consequences for the characteristics of the research.

Research basically has built-in lopsidedness. If a scientist says that she has investigated her field and not found any general problems, we as a society need do no more. If, on the other hand, the scientist investigates her field and finds a potentially momentous problem, it would be common sense to take action and at least research the field more thoroughly. This means that, other things being equal, we have research that tends to investigate areas in which problems can arise.

At the same time, another imperfection also exists. It is not always easy to identify exactly what constitutes a problem. If there have always been periodic oxygen shortages in the Gulf of Mexico, then the phenomenon is probably not a problem. But if occurrences have become more frequent because of an excess of nutrients, then the problem could well be serious. Identification of a problem depends on the theory by means of which we interpret what we observe in the world.

In this connection, a simple, easily comprehensible theory is fundamental: a theory that links human action (how we damage nature) and a clearly identifiable problem. At the same time, most environmental problems are incredibly complex, and it can be difficult to accept or reject a theory within a short period of time. Global warming, the eradication of species, and oxygen depletion are problems the causes and connections of which can only be determined over a long period and at great cost.

A situation with a potential problem and an easily explained theory will therefore attract sizable grants for more research, and we can expect this research to continue over long periods of time. There is nothing wrong with this situation per se. In reality, it is an indication of a well-functioning society: Many researchers look into many different problems, thereby providing us with the knowledge we need to make sure that only a very few problems ever develop into big ones.

We must expect that efficient research will provide information about many potential future problems. But hearing so many stories, as

we do now, should not necessarily be taken as an indication that doomsday is nigh. On the contrary.

Acid rain is a good example. In the late 1970s and early 1980s, there was a considerable loss of foliage in the forests of central Europe. This alone would probably have triggered considerable interest among researchers in the affected countries. However, German scientists also believed that they were able to link foliage loss to industrial pollution. They predicted that all forests exposed to acid rain would suffer substantial damage. This led to fears on a much wider scale, and national research programs were initiated throughout most of the Western World. This also presented the potential for a whole series of research projects. Some of Norway's foremost acid rain scientists wrote that "the possibility for reduced forest growth was the main reason why it was possible to get large funding for research on the effects of acidic rain" (Abrahamsen, Stuames, and Tveite 1994, 298). Ten years later all fears had evaporated—acid rain only damages trees under very rare conditions—but during these ten years we heard an incredible number of theories, partial research results, and popular—primarily negative—explanations.

All the same, it was still a good idea to investigate the connections. Had an unambiguous explanation been found, it would have provided us with the best premise for handling the potential problems. But in going ahead with the investigations, we also ought to prepare ourselves for hearing many a negative story—many of which will not necessarily turn out to be true.

Organizations

As further funding comes on tap, research becomes a veritable industry. Researchers begin to investigate subsidiary fields and special cases within the original problem field without necessarily having an interest in or any breadth of view of the field as a whole.

Although the field naturally retains its professional integrity, it grad-

ually becomes increasingly difficult to challenge the consolidating problem. For one thing, a natural tendency to secure funding for their own special field will encourage scientists not to criticize the overall field of research. For another, many participants only investigate problems within the field and will not challenge the premises of the field. In this way, the field achieves a certain degree of independence and begins to define its own reality.

One critic of such institutionalization is retired professor Aksel Wiin-Nielsen, a former secretary-general of the U.N. World Meteorological Organization. On the question of global warming, he commented: "The most important explanation as to why so much extensive theoretical work in the development of climate models has been done during the last ten years is that the development of models sustains funding and secures jobs at research institutions."[21] Of course, criticism as far-reaching as this is extremely difficult to substantiate adequately, and the U.N. Intergovernmental Panel on Climate Change (IPCC) has criticized Wiin-Nielsen for his failure to do so.[22] My point is simply to stress that in important fields of research it can be difficult to present information that goes against institutional interests.

One researcher has argued in the esteemed journal *Energy Policy* that it was actually the climate researchers, together with, for example, the windmill manufacturers and environment bureaucracies, who were the primary political initiators of the climate negotiations (Boehmer-Christiansen 1997). In other words, it was institutionalized interests, not, as you may have thought, the prospect of possible global warming, that was behind the tremendous support for the carbon dioxide restrictions included in the Kyoto Protocol of December 1997.

But there also are other, more politically oriented organizations that disseminate environmental research. Such organizations include the obvious environmental movements such as Greenpeace, WWF, and the Worldwatch Institute, but also the more traditional organizations like the National Federation of Independent Business (NFIB) and the American Farm Bureau Federation (AFBF) in the United States[23] or

the Confederation of British Industry and the National Farmers Union in the United Kingdom. All these organizations have vested interests in the political consequences and decisions that result from research. The NFIB and the AFBF have an interest in protecting their members, and they work to promote decisions that are to the advantage of their members. In the same way, environmental organizations base their activities on a desire to promote decisions that are good for their members.

The difference is that while the traditional organizations usually fight for traditional values, such as the distribution of time and money, the environmental organizations fight for bigger forests, diversity of species, restoration of natural environments, strict regulations of chemicals, and so on. Nevertheless, we can argue that the environmental organizations are fighting for the interests of their members because in the last analysis they are able to do only what their members, sympathizers, and supporters believe is good and necessary—because without their backing the organizations' campaigns would be more or less worthless. The organizations may present themselves as the patrons of the penguins and the pine trees, but they are dependent on people who sympathize with their points of view and contribute money, prestige, and influence through their democratic vote and pressure on the politicians.

Most people seem to be perfectly aware that when the NFIB tells us that an environmental regulation of industry is unnecessary, they may have good and sensible arguments, but they certainly also have a clear interest in avoiding such regulation. Many people tend to view the NFIB's arguments with a certain natural skepticism because they know that the argument could also be a cover for ulterior motives. This considered, it seems amazing that many people are not equally aware that the environmental organizations also have an interest in environmental regulation.[24] It may be that the environmental organizations have better arguments for regulation (but, of course, their arguments may also be poorer), but it ought to be obvious that they, too, have an interest in arguing toward a particular end.

Thus, just as the industry and farming organizations have an obvious interest in portraying the environment as just-fine and no-need-to-do-anything, so do the environmental organizations have a clear interest in telling us that the environment is in a bad state and that we need to act now. And the worse they can make this state appear, the easier it is for them to convince us we need to spend more money on the environment rather than on hospitals, kindergartens, and so on. Of course, if we were equally skeptical of both sorts of organizations, there would be less of a problem. But because we tend to view environmental organizations with much less skepticism, this might cause a grave bias in our understanding of the state of the world.

Note, however, that this is only a theoretical argument as to the environmental organizations' having an interest in portraying the world as gloom and doom. The extent to which they actually do so is one of the themes of my book, *The Skeptical Environmentalist*.

The Media

The media are our primary information source. They pass on the results of research, possibly helped along by the organizations. The media play a central role in this path of communication because the world has become so complex that we can no longer rely primarily on our own experiences. Instead, the mass media provide much of our understanding of reality.

But their particular way of providing us with news profoundly influences our view of the world. There is rarely much doubt that facts reported in an article or a news report are generally true. In that sense, the media simply reflect the world as it is. What is interesting, however, is the long and winding path between an event taking place in the world and its possible appearance and placement in the media. Looking at news reporting in this way shows how the media systematically present us with a lopsided version of reality: a picture of reality that is incoherent and sporadic, though at the same time reassuringly predictable and

familiar; a picture in which problems fill every column and the emphasis is on drama and conflict. As an editor-in-chief has put it, "Producing a paper is a question of distorting proportions" (Bent Falbert, quoted in Meilby 1996, 53).

This media-based reality has numerous consequences. First, the incoherent information we are given provides us with too little knowledge of concrete problems to enable us to take part in a democratic decision-making process. Second, we feel sufficiently comfortable that we believe we *do* have sufficient knowledge to partake in the debate and to make valid decisions. Third, we will often get a far too negative and distorted impression of problems.

One consequence of the demand for rapid news delivery is that our view of the world becomes fragmented. Our demand for interesting and sensational news means that our picture of the world becomes distorted and negative. Coupled with problem-oriented research and the finely tuned public relations units of the environmental organizations, this can provide serious bias toward a negative appraisal of the state of the world.

Note, however, that it is not anybody's "fault." We get primarily negative news not because the journalists have evil intentions, but because the news media are placed in an incentive structure that makes it profitable to focus on negative occurrences. The environmental organizations are interest groups like all others, and they argue in favor of their own cause. That we primarily believe their negative news is not their fault, but ours, because we are only skeptical of the AFBF arguments and not of those from the environmental lobby. Research is mainly concerned with potential problems. This is socially beneficial because it gives us the best opportunity to handle problems in the future, but it also means that we are continuously faced with news of potential disasters.

We cannot change this negative lopsidedness. Instead, we must come to grips with the fact that the stream of information we receive is inherently lopsided and compensate for it. Unfortunately, this may be

very difficult because we inherently tend to think that things were better in the old days and that everything is going in the wrong direction. The Scottish philosopher David Hume wrote in 1754 that "the humour of blaming the present, and admiring the past, is strongly rooted in human nature, and has an influence even on persons endued with the profoundest judgment and most extensive learning" ([1987], 464).

Sal Baron wrote in his book about the history of the Jews that prophets who made optimistic predictions were automatically considered to be false prophets (quoted in Simon 1995, 19–24). An Assyrian stone tablet, many thousands of years old, tells us of the obstinate feeling of decline: "Our earth is degenerate in these latter days; bribery and corruption are common; children no longer obey their parents; every man wants to write a book, and the end of the world is evidently approaching" (quoted in Simon 1996, 17). Moreover, it has been suggested that the spirit of ascetic Calvinism still hovers over Western civilization (Knudsen 1997): In a sense, when we have done so very well, maybe we ought to be punished? In that light, the worry over global warming could be seen as a search for a nemesis, to punish our overconsumption, a penalty for our playing the Sorcerer's Apprentice.

These observations seem to suggest that historically, and perhaps biologically, we are disposed to welcome negative news. But if we are to have a rational political-decision-making process and choose the best means to the right objectives, we must bear in mind that the stream of information we are receiving is unbalanced. We hear many negative and problematic stories every day that should not necessarily be taken at face value. Television networks try to attract attention, environmental organizations argue for their causes, and research science already is examining a variety of solutions to cover us if and when the problem occurs.

Of course, this does not mean that we can just sit back and ignore all problems. But it does imply that we must view the world with a healthy portion of skepticism and take on the challenges because we

know that we are being confronted systematically with a surplus of negative news.

Criticism: Science Defending Itself Against the Skeptical Environmentalist?

The Skeptical Environmentalist spurred much controversy and debate. It was not surprising, albeit a little depressing, that several environmental pundits did not engage in a discussion of the substance of the book but instead engaged in a discussion of my person by questioning my motives. In this section, I will present and respond to some of the criticism that actually did engage a discussion of the book's facts. This type of criticism mainly stemmed from two prestigious scientific magazines, namely, the review of the book in *Nature* (Pimm, Stuart, and Harvey 2001) and the article series "Misleading Math About the Earth: Science Defends Itself Against *The Skeptical Environmentalist*," in *Scientific American* (January 2002). In both cases, I attempted to get a reply published in the magazines only to be denied the space. Five months later, I was allowed about a page in *Scientific American*. It was immediately followed by the editor's equally long condemnation of my letter.

The criticism focused on five major areas, which I will address one by one.

References

Much of the criticism focused on my use of references. In *Nature*, Pimm and Harvey carried out some statistics of my references in order to illustrate a bias toward secondary literature. They found that of the approximately 2,000 references (it's actually closer to 3,000), 5 percent come from news sources, 30 percent come from Web downloads and 1 percent are original papers in *Nature* (149). They concluded that my

book relies heavily on secondary sources and nonpeer-reviewed material.

That 5 percent are from news sources is not surprising—the book was also trying to document what Greenpeace thinks about global warming, organic farmers about sperm quality, indeed, people in general about the environment in general. That 30 percent are from the Web says nothing—by far the majority is from the United Nations, World Bank, the Worldwatch Institute, the European Union, and so on, as I state clearly in the book. That Pimm and Harvey find it problematic that there are only 1 percent *Nature* articles seems somewhat strange—why should my book have referenced *Nature* articles more? Are *Science* articles not as good?

Scientific American also questioned my use of references. One of the authors, Stephen Schneider, wrote the following in the beginning of his article: "Before providing specifics of why I believe each of these assertions is fatally flawed, I should say something about Lomborg's methods. First, most of his nearly 3,000 citations are to secondary literature and media articles. Moreover, even when cited, the peer-reviewed articles come elliptically from those studies that support his rosy view that only the low end of the uncertainty ranges will be plausible" (2002).

I would argue that there is an important distinction between secondary sources and media articles. When discussing the entire state of the world, it would be incredibly inefficient not to use the vast collection of data and theory offered by secondary sources—this is exactly the reason for secondary literature and in general why it is possible to have specialization in science. However, almost all of these secondary sources are exactly the ones used by almost all discussants of the state of the world—U.N. agencies (the FAO, the UNDP, the UNEP, WHO, and so on), the IMF, World Bank, the Organisation for Economic Cooperation and Development, the World Resources Institute, the Worldwatch Institute, the European Union, and U.S. government agencies. Surely most people—including myself—would consider these reports

the best available summary of our understanding of climate science, which was my argument for primarily using them as references.

Population Growth

One of the articles in the *Scientific American* series included a section that criticized my apparent lack of interest in demographic changes and population growth. In that section, John Bongaarts (Bongaarts 2002) challenges my contention that "the number of people is not the problem." As we will later see, it is symptomatic that my critics actually agree with me on my major points. This is also the case with Bongaarts, who starts off by writing that "people are living longer and healthier lives" and that "environmentalists who predicted widespread famine and blamed rapid population growth for many of the world's environmental, economic and social problems overstated their cases." However, he then goes on to challenge the more marginal arguments in my book.

Bongaarts claims that I use selective statistics to generate the impression that the population problem is a thing of the past. First, he neglects to write that when I say the number of people is not the problem, I then identify what is the problem: poverty. Second, I do not use selective statistics. Indeed, the ensuing documentation seems to point its accusing finger the other way. In his article, Bongaarts says that the global population growth rate has indeed declined slowly, but that absolute growth remains close to the top. I would say that the population growth rate has declined more than "slowly," as it has actually declined from 2.17 percent in 1964 to 1.26 percent today (a decline of more than 40 percent). Bongaarts's second claim, that the absolute growth remains close to the very high levels of the recent decades, is not convincing—the 76 million added today is the lowest number in the last two decades.

Although he accepts that the world would probably be able to feed the future population, Bongaarts fears that this might have severe environmental consequences (the Earth might turn into a "giant human

feedlot") and accuses me of not dealing adequately with these problems. However, according to FAO (2000b) estimates, we are currently using about 11 percent of the Earth's land surface area for agriculture, and in 2030, when we will be feeding more than 8 billion people better than we are now (3,100 calories per person compared with a little more than 2,800 today), we will be using 12 percent—this would hardly turn "the Earth into a giant human feedlot." Moreover, had Bongaarts accessed the available statistics, he could have seen that the increase in agricultural land use was actually *greater* over the last twenty-five years than it is projected to be over the coming thirty years (105).

In the case of migration from rural to urban areas in the developing world, Bongaarts correctly cites me for considering this a welcome development because urban dwellers generally have higher standards of living than villagers. Bongaarts argues, however, that the flow of migrants is now so large that it overwhelms the absorptive capacity of the cities thus resulting in "health conditions in slums that are often as adverse as in rural areas." This makes Bongaarts conclude that the traditional urban advantage is eroding in the poorest countries—unfortunately, an unsubstantiated claim without any references. Where does this claim come from? It cannot be deduced from his previous thoughts on health in the slums compared with the rural areas. Such logic is flawed because it compares health conditions among the worst areas of the city (slums) with the average rural areas, a typical and incorrect comparison, as I point out in my book (Lomborg 2001, 49).

All in all, Bongaarts' criticism supported my major points, found no convincing examples of incorrect or selective data, and ended up discussing marginal issues based on his own conviction without backing up his statements with statistics.

Biodiversity

Both *Nature* and *Scientific American* criticized my chapter on biodiversity. In *Scientific American*, Thomas Lovejoy (2002) found it "discon-

certing" that I had begun the biodiversity chapter with questioning whether biodiversity is important before discussing its size. I understand why this would be disconcerting to an environmental advocate or policy participant, but why would it be disconcerting to a scientist that we question the basis for our concern? Lovejoy seems to indicate that it should be obvious to any good man or woman that I am wrong, simply because I dare to ask the question.

When it comes to the substantial issues such as the rate of extinction, my book refutes both Norman Myers's (1979) assertion that 40,000 species are lost from the globe every year and the general application of Edward O. Wilson's rule of thumb, which claims that a 90 percent reduction in area would halve the number of species (Mann 1991, 737). Myers's figure of 40,000 species lost was not based on scientific research, and Wilson's theory—although based on empirical evidence—was developed in order to explain the number of species on islands. If the island gets smaller, the species will have nowhere to escape. However, the same is not the case in a mainland rain forest because many animals and plants can go on living in the surrounding areas. Empirical evidence suggests that this is exactly what they do; therefore, Wilson's rule of thumb could lead to a significant overestimate of the extinction rate. It seems that Lovejoy also used a "Myers estimate" in the *Global 2000 Report to the President of the U.S.: Entering the 21st Century*, wherein he predicted that 15 percent to 20 percent of all species would have vanished by 2000 (Barney 1980, II, 331). My chapter showed that, until recently, such estimates still provided the basis for environmental projections and press releases. It was therefore necessary to present the more likely prediction—based on detailed empirical evidence—that we probably are losing 0.7 percent of all species over the next fifty years. Assuming that the extinction of species presents humankind at least with an ethical predicament, the central point of my chapter on biodiversity was thus to present the reader with the right proposition of the problem. It is noteworthy that none of the critiques actually challenged this estimate. Instead the critiques more or less

concentrated on minor arguments and field studies—presumably because if you cannot catch the big fish you should concentrate on the smaller.

One of the arguments was that Myers's estimate might have been off the mark but that "he deserves credit for being the first to say the number is large and for doing so at a time when it was difficult to make more accurate calculations" (Lovejoy 2002). Here Lovejoy essentially acknowledges that Myers did not have scientific basis for claiming that 40,000 species are lost every year, but nevertheless feels it was good that Myers said it. This is not how I understand good science.

In *Nature*, Pimm and Harvey found that the extinction rate of 0.7 percent over the next fifty years was "strikingly discordant with the 10–40 percent of well-known species that teeter on the brink of extinction" (2001, 149). However, the extinction rate and the percentage of species on the brink of extinction are two entirely different measures. Actually, an analysis of the 1,000 birds claimed to be teetering on extinction found that, primarily because of conservation efforts, "relatively few of these species are likely to become extinct by 2015" (Heywood and Stuart 1992, 28). Thus, merely contrasting the two numbers to imply that I am wrong in my biodiversity loss estimate is plainly an incorrect argument.

Another argument seems to be based on the typical environmental Litany: It might not have gone wrong yet but it will go wrong soon. In other words, the reason we do not see species becoming actually extinct in many areas despite a significant habitat loss is because the species are just barely hanging on, essentially as "living dead." This should apparently explain that even though the Brazilian Atlantic rain forest has been cut down by about 90 percent, the Brazilian Society of Zoology could not find a single species that had died out in a group of 300 animals, likewise when they examined their list of plants. The species-area formula would have expected a loss of about half of all species. The statement that the species are essentially "living dead"—just barely hanging on, but will eventually die out—seems almost farcical. The

clearing of the Brazilian Atlantic rain forest happened in the 1800s, so we have had more than 100 years to see the "barely hanging-on species" die out, and they haven't.

In the case of Puerto Rico, where primary forest has been reduced by 99 percent over a period of 400 years, I am accused of ignoring that this loss of habitat actually resulted in the loss of seven out of sixty bird species. Yet, I clearly stated this specific fact: "*Only* seven out of sixty species of birds had become extinct" (Lomborg 2001, 254).

My main argument in *The Skeptical Environmentalist* was not that we are *not* losing biodiversity, but that we are not losing it at the rate the environmental organizations would have us believe. The criticisms presented above were not able to refute this statement—they could not provide any case-specific evidence that contradicted it. This seems like a rather poor scientific defense.

Energy

I had expected the energy chapter to be one of the chapters that was left largely unopposed. Whereas it is relatively easy to identify a problem (of course, the question is how much of a problem) in other major environmental issues, such as global warming and biodiversity, energy seems to be a clear-cut issue. The Litany that we are running out of energy has been proven wrong by history. Yet *Scientific American* (January 2002) contained an article by John P. Holdren on this specific topic. Holdren agrees that we are not running out of energy and this was precisely the main point of the chapter, so we are again faced with a critique that is concerned with more marginal issues.

Some of these issues are almost not worth mentioning. While agreeing that the coal reserves are huge, Holdren accuses me of not specifying the rate of coal use when I claim that the world has enough coal for 1,500 years. Furthermore, I wrote, air pollution control devices have removed a vast part of sulfur dioxide and nitrogen dioxide emissions in the United States. According to Holdren, I should merely have stated

that the controls have caused a "moderate reduction." Aside from the insignificance of these objections, they are not very clear-cut. In the United States, sulfur dioxide pollution per quantity of coal has dropped by 75 percent since 1970. Is that only a "moderate reduction"?

Other counterarguments had more substance but were equally wrong. One of these was simply denying that concern for the depletion of resources had actually been the mainstream environmental position for decades. This line of argument is effectively contradicted by the many examples in the chapter's first section. Many influential publications at the time expressed their concern in a very direct manner: *Limits to Growth* (Meadows et al. 1972), which was translated into more than thirty languages and sold more than thirty million copies, and *The Global 2000 Report* (Barney 1980).

Holdren also claimed that although we might not be running out of energy, we are running out of environment—meaning the Earth's ecological capacity to absorb the use of energy—and we lack the ability to manage other risks of energy supply. These risks include "the political and economic dangers of overdependence on Middle East oil and the risk that nuclear systems will leak weapons materials and expertise into the hands of proliferation-prone nations or terrorists" (Holdren 2002).

This is exactly the kind of exposition that I try to counter in my book. Without using any references, Holdren manages to describe everything as growing ever worse (and even to include into the environmental agenda concepts that are far removed from its core, such as nuclear proliferation, terrorism, and economic recession from oil price hikes). Look at just one area: air pollution (estimated by the U.S. EPA to be by far the most important area). We are plainly not running out of environment or running out of the air's capacity to absorb without intolerable consequences for human well-being—all criteria pollutants in the United States have diminished in concentration over the past few decades. But Holdren simply chose a good-sounding quote ("running out of environment"), presumably in the quest to defend science, but without references and plainly incorrect.

When it is not possible to claim that we are running out of energy, the Litany seemingly urges environmentalists to point to other future problems. One is that the transition from oil to other energy sources might not be smooth and might be expensive. It is true that this could be the case (nobody can predict anything 100 percent), but my basic argument is that a crisis like that is indeed very unlikely—we have had this kind of fear, of running out, many times, and each time it has proven incorrect. Moreover, we have good reason to believe that the many different energy sources can give us sufficient energy in the future and at competitive prices.

Global Warming

Contrary to the response I anticipated to the chapter on energy, I knew that my chapter on global warming would draw attention. I hoped that this attention could spur a constructive debate. Although this has fortunately turned out to be the case in many public spheres, this has not happened in a circle of some environmental experts. In *Scientific American* (January 2002), Stephen Schneider launches an attack on my chapter on global warming. Besides criticizing my use of references, as I mentioned earlier, Schneider challenges my basic arguments:

- Temperature changes will turn out to be at the low end of the IPCC uncertainty range, which is from 1.5°C to 5.8°C if carbon dioxide were to double and be held fixed over time. Similarly, temperatures will increase much less than the maximum IPCC estimates. The temperature rise might even be lower than the lowest IPCC scenario.
- Benefits of avoiding climate change could be substantial. However, compared with the costs of trying to constrain carbon dioxide emissions, it is likely that the most economical option is to conduct business close to business-as-usual.

- The Kyoto Protocol is very expensive and will have a negligible impact on the future temperature.

Schneider sweeps aside as wishful thinking my main argument that renewable energy will crowd fossil fuel off the market in the future so effectively that the IPCC overestimates the increase in carbon dioxide. He is wrong to do so. For one thing, it is important to realize that the IPCC's scenarios are not predictions of the future but narratives—or "computer-aided storytelling" as the IPCC calls them—of possible futures. And if these stories generating the worst outcome are consistently unlikely, then there could be a real risk that we end up spending a vast amount of resources to combat threats that only occur in highly unlikely storytelling. The more likely prediction is that fossil fuels will be phased out within this century. A peer-reviewed model that I included in the book shows that if the current efficiency trend continues for renewable energy, it would mean the end of fossil fuels before the end of the century (Chakravorty, Roumasset, and Tse 1997). Thus, there is nothing to indicate that the prediction is based on wishful thinking. If Schneider was aware of any other study that has looked at the relative costs of renewables and fossil fuels over time, taking into account the remarkable increase in efficiency of renewables over the past decades, that showed that renewables will not take over, it is puzzling that these have not been presented.

Schneider also engages in a critique of the book's presentation of the cost-benefit calculations in connection with global warming. He finds it perplexing that I only cite one figure for the benefits of avoiding global warming but a whole range of estimates for trying to constrain carbon dioxide emissions. In addition, Schneider refers to studies that show that carbon dioxide emissions could actually be reduced below zero costs in order to show that the cost estimates presented might be biased upward.

It is correct that I present one cost estimate for global warming ($5 trillion), which is to be interpreted as the price we would have to pay if

we do nothing about global warming. This is the figure estimated by Nordhaus and Boyer (2000) and is well in accordance with the IPCC's estimate of an annual cost of 1.5 percent to 2 percent of the global GDP toward the end of the century. It is also true that I cite a range of climate policy costs, spanning from $3 trillion to $33 trillion. However, these figures are the extra costs of choosing different emission-cut policies. Hence, they are the additional cost to the world after the cost of doing nothing has been subtracted. For instance, the Nordhaus-Boyer estimate for global stabilizing policies (a kind of global Kyoto) would be around $8.5 trillion, which is $3.5 trillion more than had we done nothing. Clearly, you cannot compare the $5 trillion with the range of $3 trillion to $33 trillion, because the $5 trillion includes the cost of global warming while the range denotes the extra cost. This also shows that why the complaint of range versus single number is entirely misplaced. You can only "do nothing" in exactly one way, whereas you can do "other things" in many ways.

Schneider's argument that some carbon dioxide emissions could be cut with net benefits is totally valid—it is also totally standard and not in any way in opposition to my arguments. The question is not whether there are below-zero-cost ways to cut some emissions, but how much can be cut at below-zero cost and the cost of more stringent cuts.

I try to point out the costs and benefits of our different policy choices, and yes, I point out that the benefit of Kyoto will be to postpone global warming in 2100 by six years yet the cost of Kyoto each year will be as great as the one-off cost of giving clean drinking water and sanitation to every single human being forever (Lomborg 2001, 315).

The book clearly showed the Kyoto Protocol will have very little effect on global warming, and it is good to see that Schneider concurs with that finding. However, he then claims that the Kyoto Protocol is a "straw-man" policy because we should be doing much more. Now, this entails both an analytic and a democratic problem. To take the democratic first: Almost all democratic discussions are about choosing or not choosing Kyoto. As this is the deal offered, would it not be reasonable

to discuss the actual outcome of the deal? Likewise, if Schneider contends that the real issue is not Kyoto but something much more restrictive, would it not be democratically more honest to say that the decision is not Kyoto but something much more stringent (and hence, much more costly)?

The other analytic problem is that Schneider only talks about my analysis of Kyoto and actually neglects that I dealt with a range of much more stringent policies (which was where the $3 trillion–33 trillion range came from). This seems odd, to say the least. Of course, if Schneider wants to advocate a policy of much-more-than-Kyoto, that is fine, but the cost-benefit analyses are very clear on the issue. Almost irrespective of how it is implemented, Kyoto is a bad deal, and going even further is a much worse deal.

This was absolutely the central issue of the book, which Schneider ignores: All cost-benefit analyses show that high carbon reductions are not justified. "A central conclusion from a meeting of all economic modelers was: Current assessments determine that the 'optimal' policy calls for a relatively modest level of control of CO_2" (Lomborg 2001, 318).

In conclusion, the critics have not shown why there is a need for science to defend itself against my book. My book clearly makes a claim to be science and to be factually based. I openly state the facts and my sources, and thus anybody is free to point out where these are faulty or incorrect. None of the claims of "misrepresentation," "incomplete use of data," and "misunderstanding of the underlying science" are substantiated by the above critics. Science has no reason to defend itself against my book—whether the same is the case with alarmist environmentalism seems to be another matter.

Conclusion

The world is not going down the drain. In many areas, we are experiencing significant progress; in other areas, the pace of improvement is

more moderate; and in some areas, we are without a doubt faced with problems that call for particular attention and mobilization of resources. That is why it is so necessary to measure and prioritize among the world's many problems without being blinded by the environmental Litany. In the course of this chapter, various environmental myths have been confronted with empirical facts, and the reader has been presented with the type of criticism that followed in the wake of my challenging the existing myths. I hope this has left the reader not only with an awareness that environmental doom and degradation are not just around the corner, but also with an impression of the dismay that saying this has caused in some parts of the scientific community. Equally important, the reader should have obtained a notion of the magnitude of many of the environmental problems facing the world. To make the best decisions, we need to be rational and well-considered in our use of resources and compare the benefits with the costs—this holds true not only for environmental issues but also for other major issues influencing our livelihood and the planet we inhabit.

It has to be recognized that trying to fix one problem draws resources away from fixing other problems. Hence, addressing the problem of global warming now in order to help the developing world in the future must be compared with dealing with other current, pressing issues in the developing world such as hunger, poverty, and lack of clean drinking water.

This chapter's message is a simple one: We need to do what *does* good—not just what feels good. In order to do this, we need to base our prioritizations not on fear, but on facts.

This is not always easy because the information we receive contains predominately negative news about an ever-deteriorating environment. Environmental organizations (being interest organizations) argue for their own causes, the media rely mostly on bad news to attract attention, and an important part of any researcher's job is to research a wide range of potential future problems. Therefore, to have a rational, political-decision-making process we must bear in mind that the stream of

information we are receiving about the environment could very well be unbalanced. The real state of the world is that children born today will live longer, be healthier, and have access to more food. They will be better educated and benefit from more civil and political liberties. They will grow up in a world where the environment is not being destroyed, but where ecological problems in some form or another will surely continue to exist and environmental politics will still be called for. The hope is that the politics will be guided more by reason and less by the environmental Litany of doom.

Notes

1. A prime example is Al Gore comparing anyone not entirely convinced of the supremacy of the environmental question with nazism (see, for example, Gore 1992, 272).
2. Strictly speaking, this is not true because "better and better" also has ethical connotations (what is better?), but this will usually be quite uncontroversial. For example, is it better for an infant to have a better chance of survival? The difference between "is" and "ought" presented here stems originally from David Hume (1740, 468–69).
3. It should be pointed out that these small fluctuations up or down are not really decisive, given the great uncertainties and model estimates inherent in the data. Probably the best one can say about the forests is that they have neither declined nor increased significantly since 1950.
4. The rest of the Worldwatch Institute's books naturally contain many examples of these claims, but as mentioned in note 3, such singular examples are practically useless in terms of global evaluation.
5. They continue with "As noted earlier, almost half the forests that once blanketed the Earth are gone." Even setting aside the fact that this estimate is greatly exaggerated (Goudie [1993, 43] estimates 20 percent and Richards [1990, 164] 19 percent during the last three hundred years), it suggests an unreasonable comparison between a trend over a couple of decades and a trend over a couple of millennia.
6. For the last three hundred years, Goudie (1993, 43) estimates 20 percent, Williams (1994, 104) 7.5 percent, and Richards (1990, 164) 19 percent. The Intergovernmental Panel on Climate Change estimates a global forest area reduction of 20 percent from 1850 to 1990 (IPCC 2001, 3.2.2.2).

7. A problem of definition that could be applied to as much as 33 percent of the currently forested area—this is unclear from provisional descriptions, although the northern forests cover 1.2 billion ha (Stocks 1991, 197). Aldrich was not aware of other historical accounts of forest loss and was happy to receive a copy of the references in note 6.
8. In the period 1980–1995, the world lost 180 million ha (FAO 1997, 16) and for 1990–1995, 56.3 million ha (17), which is the total forested area at 3,454 million ha (10). For the 1980s (in million ha): 3,634 $(1 - 0.346 \text{ percent})^{10} = 3510.3$ and for 1990–1995 (in million ha): 3510.3 $(1 - 0.32 \text{ percent})^{5} = 3{,}454$. When I told Mark Aldrich at the WCMC about the claims of increasing deforestation, he said candidly, "Well, that sounds like the WWF."
9. WWF 1997c; 1998b, 36; 1999, 27, with the forest cover for 1990 being 3,410 million ha, compared with $3{,}454 + 56.3 = 3{,}510.3$ million ha in 1990 (FAO 1997, 10, 17).
10. $1 - 3{,}410 \div 6{,}793 = 49.8$ percent instead of $1 - 3{,}044 \div 8{,}080 = 62.3$ percent.
11. "Only about 3 percent of the world's forests are forest plantations" (FAO 1999a, 1). Compare, however, an FAO estimate in 1997: Plantations in the industrialized world total approximately 80 to 100 Mha, in the developing world 81.2 Mha out of a total forest area of 3,454 million ha, that is, 5.2 percent (FAO 1997, 10, 14; WWF 1998a, 36).
12. Greenpeace, *Protecting Biodiversity*. Online: http://www.greenpeace.org/comms/cbio/bdfact.html. This link is now removed because of my criticism.
13. We will ignore here that the whole metaphor is biased toward stationary thinking. Although it is likely that population will increase, we will also develop ever better grains, making the minimum area smaller and smaller.
14. Of course, this also includes a distributional issue. If England has a longer and more agreeable growing season, Ethiopia may get more stifling heat—but then under the cooling scenario, when England got colder climates, Ethiopia must have benefited.
15. 4,131 deaths from excessive cold versus 2,114 deaths from excessive heat, 1987–1989 and 1994–1996 (National Safety Council 1990, 10; 1999, 16). For the United Kingdom, Subak et al. (2000, 19) find that "a warmer climate would lead to additional deaths in extreme summer heat waves but these would be more than offset by the decrease in winter mortality." See Moore (1998) for other considerations of heat benefits.
16. Each African had 2,439.4 calories/day in 1998 (FAO 2000a).

17. Although I of course would like to document the (in)efficiency of past decisions, such evaluations are rarely ever available. Apparently, making a cost-benefit analysis of a decision already made and effectuated would be somewhat pointless as it could make no difference.
18. This myth is invoked by, for example, the Worldwatch Institute: "Just as a continuously growing cancer eventually destroys its life-support systems by destroying its host, a continuously expanding global economy is slowly destroying its host—the Earth's ecosystem" (Worldwatch Institute, 1998a, 4; compare Worldwatch Institute 2001, 12). It stems originally from the 1973 Ehrlich claim of negative environmental impact being determined multiplicatively by population size, affluence, and technology (sometimes written I = PAT; see Common 1996). Consequently, this relationship by definition makes affluence affect the environment negatively (although its impact can be temporarily tempered by technological progress).
19. Conspicuously, this tradeoff is central to the new IPCC scenarios, where a choice between the economy and the environment is one of the two main dimensions. See IPCC (2000, 28).
20. Not all research, of course. However, basic research generally does not generate any public awareness, and if it should do so, there is no reason to suppose that it will systematically do so in a positive way, negating the following mechanism of negative lopsidedness.
21. *Ingeniøren* (*The engineer*), 26 (1996): 14.
22. *Ingeniøren* (*The engineer*), 28 (1996): 8.
23. Named the second and the twenty-first most powerful lobbies in Washington by *Fortune* (Birnbaum and Graves 1999). See also critical discussion of the AFBF as lobbyists in Rauber and McManus (1994).
24. Polls show that people have much more trust in the environmental groups to protect the environment than they have in business (78 percent versus 38 percent) or even in the EPA (72 percent) (Dunlap 2000).

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