"Pass the hominy please."

It was a lovely brunch, with fruit salad, homemade coffee cake, a great pan of scrambled eggs, bread, butter, jam, coffee, tea—and hominy grits. Our friends Dan and Sarah had invited my wife and me and our son over that morning to meet some friends of theirs. The grown-ups sat around the dining room table, and the kids (four in all) careened from their own table in the kitchen to the pile of toys in the living room, and often into each other. Each family had contributed something to the feast before us. It was all good food, but for some reason the hominy grits (which I had never had before) was the most popular.

There was a pleasant mix of personalities, and the adults soon got into one of those excited chats that leads in an irreproducible way from one topic to another, as unfamiliar people seek to get to know each other a bit better. Eventually, the inevitable question came my way: "So what do you do?"

"I'm an environmental sociologist."

"Environmental sociology. That's interesting. I've never heard of it. What does sociology have to do with the environment?"

I used to think, during the first two editions, that the point of this book was to answer that question—a question I often used to get, as in this breakfast conversation from 10 years ago. Today I sense a change in general attitudes. Now I don't get so many blank looks when I say I'm an environmental sociologist. Most people I meet have still never heard of the field, but more and more of them immediately get the basic idea behind it: that society and environment are interrelated.

And more and more, the people I meet recognize that this interrelation has to confront some significant problems, perhaps the most fundamental problems facing the future of life, human and otherwise. They readily understand that environmental problems are not only problems of technology and industry, of ecology and biology, of pollution control and pollution prevention. Environmental problems are also social problems. Environmental problems are problems *for* society—problems that threaten our existing patterns of social organization and social thought. Environmental problems are as well problems *of* society—problems that challenge us to change those patterns of organization and thought. Increasingly, we appreciate that it is people who create environmental problems and it is people who must resolve them.

That recognition is good news. But we've sure got a lot to do, and in this work we'll need the insights of all the disciplines—the biophysical sciences, the social sciences, and the humanities. There is an environmental dimension to all knowledge. The way I now understand the point of this book is to bring the sociological imagination to this necessarily pan-disciplinary conversation.

A good place to begin, I think, is to offer a definition of *environmental sociology.* Here goes: *Environmental sociology is the study of community in the largest possible sense.* People, other animals, land, water, air—all of these are closely interconnected. Together they form a kind of solidarity, what we have come to call ecology. As in any community, there are also conflicts in the midst of the interconnections. Environmental sociology studies this largest of communities with an eye to understanding the origins of, and proposing solutions to, these all-too-real social and biophysical conflicts.

One of sociology's most basic contributions to studying the conflicts behind environmental problems is to point out the pivotal role of social inequality. Not only are the effects of environmental problems distributed unequally across the human community, social inequality is deeply involved in causing those problems. Social inequality is both a product and a producer of global warming, pollution, overconsumption, resource depletion, habitat loss, risky technology, and rapid population growth. As well, social inequality influences how we envision what our environmental problems are. And most fundamentally, it can influence how we envision nature itself, for inequality shapes our social experiences, and our social experiences shape all our knowledge.

Which returns us to the question of community. Social inequality cannot be understood apart from the communities in which it takes place. We need, then, to make the study of community the central task of environmental sociology. Ecology is often described as the study of natural communities. Sociology is often described as the study of human communities. Environmental sociology is the study of both together, the single commons of the Earth we humans share, sometimes grudgingly, with others—other people, other forms of life, and the rocks and water and soil and air that support all life. Environmental sociology is the study of this, the biggest community of all.

written here. Keep that in mind as you carefully and critically evaluate what is in this book. But it is also your scholarly responsibility to be open to the reasoning I present and to have honest reasons for disagreeing.

Sustainability

Let us now turn to some of the reasons that lead many people to believe there is cause for considerable concern about the current condition of ecological dialogue: the challenges to *sustainability, environmental justice,* and the *rights and beauty of habitat.* These, the three central environmental issues, will already be well-known to some readers. Still, as these considerations underlie the rest of the book, it is appropriate to pause and review them here, beginning first with sustainability.

How long can we keep doing what we're doing? This is the essential question of sustainability. The length of the list of threats to environmental sustainability is, at the very least, unnerving. True, much is unknown, and some have exaggerated the dangers we face. Consequently, there is considerable controversy about the long-term consequences of humanity's continuing transformation of the Earth, as the headlines and blogs and podcasts of every week demonstrate. But much relevant evidence has been gathered, and some have underestimated the dangers involved. It is therefore prudent that we all pay close attention to the potential challenges to sustainability.

Global Warming

Perhaps the greatest controversy surrounds what is perhaps the greatest environmental threat: global warming. The debate is pretty much over about whether it is happening. The main controversy now is about what we should do about it. As the 2007 *4th Assessment Report* of the Nobel-Peace-Prize-winning Intergovernmental Panel on Climate Change (IPCC) concludes, global warming is now "unequivocally" here.[6] Moreover, the IPCC states that it has "very high confidence"—meaning the IPCC thinks there is a 9-in-10 chance—that human activities have contributed to the warming. The release of carbon dioxide from the burning of fossil fuels is the biggest and best-known culprit, leading to the "greenhouse effect" through the ability of carbon dioxide to trap heat that would otherwise radiate out into space. But it accounts for only about half of human-induced climate "forcing," as climatologists say. Other greenhouse gasses like methane, nitrous oxide, chlorofluorocarbons (CFCs), and ozone, as well as the soot or "black carbon" released by the myriad combustion processes of human activity, together amount to roughly as much forcing as carbon dioxide.[7] However, most of these forcings also come about through the burning of fossil fuels, directly or indirectly. Here's where the controversy comes, of course. The great engine of modern life is currently utterly dependent on fossil fuels, a recognition that every country's domestic and foreign policy increasingly revolves around.

For a couple of decades, this was a sleeper of an issue, ho-hummed by the uncertainties some scientists and most politicians found in the overall evidence. Environmentalists shouted and the world snored. There is nothing like long technical reports, with their tables and passive prose, to weigh down the eyelids. But now we have wake-me-up evidence that everyone can see and experience. Broiling hot summers. Drought alerts. Floods. Rising sea levels. Record hurricanes. Melting glaciers. Decreased snow cover. Open-water fishing at the North Pole. Palm trees and peaches where they never grew before. Diseases and insects our grandparents' generation never had to contend with in our own regions.

Here it is in numbers. When averages are calculated for the entire globe, the 5 warmest years on record (through 2007) have all occurred since 1998.[8] Eleven of the last 12 years are among the 12 hottest ever recorded.[9] Plus, the trend is upward: The 1970s were hotter than the 1960s,

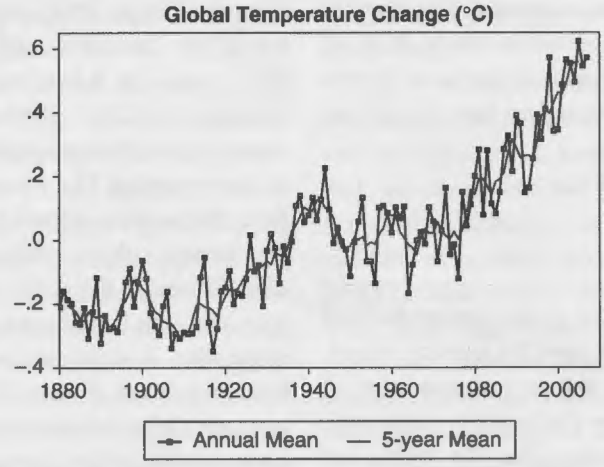

Figure 1.2 A warming world: average global temperature, 1880–2007.

Source: Used by permission of Goddard Institute for Space Studies, NASA.

the 1980s were hotter than the 1970s, the 1990s were still hotter, and the 2000s thus far have been hotter yet. (See Figure 1.2.) At this writing, the hottest 5 years on record are, in descending order, 2005, 2007, 1998 (tied with 2007), 2002, and 2006.[10] In every year since 1977, the annual average world temperature has been at least 14 degrees Celsius (57 degrees Fahrenheit), a level hardly ever reached in the past 200 years.[11] People notice such things in their own lives, and that makes a difference. Plus, the tireless work of another Nobel Peace Prize winner, Al Gore, has helped people focus on what they can experience for themselves.

Longer-term weather records also show that there was a grain of truth to an earlier generation's fireside stories about having to walk to school through three feet of chilling snow, barefoot and uphill both ways. Eighteenth- and nineteenth-century images of the whole town out for a skating party or of Hans Brinker and his silver skates on the frozen canals of the Netherlands are more than merely romantic. It really was colder back then. Winters were longer, blizzards were stronger, and glaciers used to come down farther out of the mountains. 1963 was the last year Dutch canals froze enough that the "Tour of Eleven Towns," once an annual event with thousands of participants, could be skated—until it was moved to the northern coast of Finland in 1977.[12] There are reports that Long Island Sound, the body of salt water between Long Island and the Connecticut coast, used to freeze over some winters and people would drive 15 miles across the ice with a team and wagon. That hasn't happened in 150 years.[13]

It's not warming up everywhere. Different places are experiencing different changes, which is why the issue is often called "global climate change" rather than "global warming." But overall the heat is on, globally. It's not a matter of projections anymore. Global warming is here now. If this warming trend continues over the next 100 years, say almost all climatologists and oceanographers, we will see some major environmental changes. Climatic zones will shift, rainfall patterns will change, weather conditions will become more variable, sea level will rise, and more.

Consider the disruptions sea level rise will bring to the settlement patterns of humanity. Sea level has risen significantly as the climate has warmed. (See Figure 1.3). The IPCC projects that average sea level will rise another 0.18 to 0.59 meters—half a foot to two feet—by the beginning of the twenty-second century, as glaciers and the ice caps melt and as ocean water

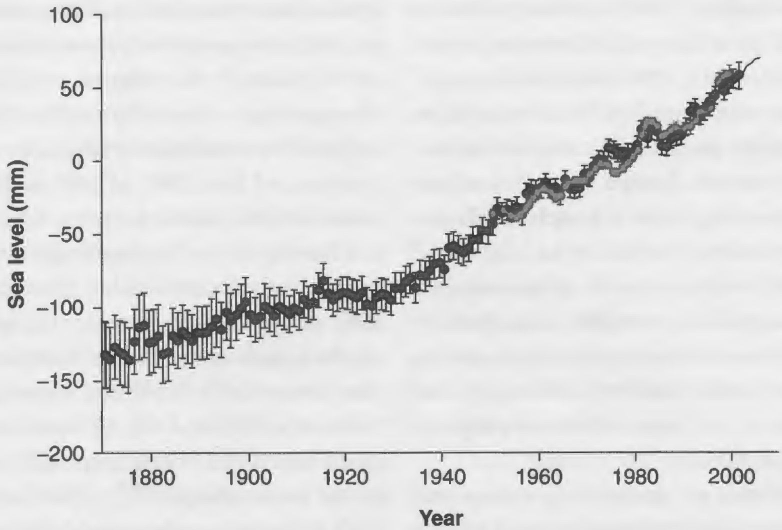

Figure 1.3 Oceans on the rise: Global mean sea level, 1870–2005, based on field evidence, tide gauges, and satellite data.

Source: IPCC (2007b).

heats up and expands.[14] That may not seem like all that much, unless you happen to live in a place like New Orleans, Amsterdam, or the low-lying Pacific Island nations of Tuvalu and Kiribati. Extensive regions of low-lying coastal land (where much of the world's human population lives) would be in grave danger of flooding during storm surges—or even being submerged under water. It is not inconceivable that Tuvalu and Kiribati could be washed away. In view of the threat, the New Zealand government has already made plans for accepting immigrants displaced from Tuvalu.[15]

Or consider the ecological disruptions global warming will bring. Coral reef dieback.[16] Increased wildfires.[17] Increased risk of extinction for up to 30 percent of species.[18] Gradual replacement of tropical forests with savanna in eastern Amazonia.[19] Humans will suffer directly from many of these ecological changes. Increased drinking-water shortages and heat waves. Increased drought stress.[20] Increased incidence of disease, as the new conditions would likely be more hospitable to mosquitoes, ticks, rodents, bacteria, and viruses.[21] Increased incidence of damaging storms, with consequences for shoreline ecologies, including human ones.[22]

The consequences for agriculture would be complex. Some farming areas will likely be stricken with drier conditions. For example, the IPCC projects that rain-fed agriculture in Africa could be down as much as 50 percent in yields by 2020.[23] Farmers in Iowa, the leading corn-producing region in the United States, might have to switch over to wheat and drought-tolerant corn varieties, which would mean overall declines in food production per acre.[24] On the other hand, some regions will likely receive more rain. Yet many of these regions do not have the same quality of soil as, say, Iowa. To add to the complexity, carbon dioxide can stimulate growth in some crop plants; one study has found a 17 percent yield boost in soybeans.[25] However, this stimulation may not result in actual increased crop yields because of other limiting factors, such as low rainfall, poor soil conditions, and the existence of other pollutants in the air.[26]

Indeed, the predictions are coming true already. We are seeing an increase in heat waves, and resulting fatalities and property loss are on the rise. The spell of four days that peaked at around 100 degrees Fahrenheit between July 12 and 15, 1995, blamed for 739 deaths in Chicago.[27] The 2002 heat wave from April to May in India, which killed 1,000 people.[28] The even more horrific 2003 heat wave in Europe, estimated to have killed an astounding 14,802 people in France plus many dozens in other European countries.[29] The July 2007 Western North American heat wave and drought that eventually led to the devastating wildfires of Southern California in October of 2007, which burned 1,500 houses and 400 million acres and forced 1 million people to evacuate their homes.[30]

The occurrence of devastating storms and floods is also way up. The Great Storm of 1987 in Britain. Hurricane Mitch in 1998. Katrina in 2005. The Mumbai floods of 2005. The British floods of 2007. From the too wet to the too windy to the too hot to the too dry, the global rate of severe weather events now is 4 times what it was in the 1960s.[31] The insurance industry is quite worried about the upsurge in claims that has resulted.[32] From 2000 to 2006, worldwide economic losses from catastrophic weather events have averaged $78 billion each year, which is roughly double the 1990s rate, 6 times the 1980s rate, 10 times the 1970s rate, and 16 times the 1960s rate, measured in 2006 constant dollars.[33] In 2005, the worst year yet, worldwide losses were $220 billion.[34] (See Figure 1.4.) Despite better forecasting, some 800 million people were affected by weather-related disasters in the five-year period from 2002 to 2006, as compared with less than 200 million between 1982 and 1986.[35]

There's more. Meteorologists are becoming increasingly alarmed about the successive break-offs of ever-larger chunks of high-latitude ice shelves, such as the Rhode Island–sized patch of the Larsen B Ice Shelf that disintegrated during February 2002 and the 41 square mile Ayles Ice Shelf that broke free of Canada's Ellesmere Island in the summer of 2005.[36] At the North Pole, there isn't as much ice to begin with, but we're showing worrisome signs of losing what there is. By 2006, the winter extent of the Arctic ice cap had declined nearly 8 percent since 1953, and its thickness in summer had dropped 42 percent since the 1950s, from 10.2 feet to 5.9 feet.[37] There are now commonly sizable stretches of open water in the Arctic ice cap during the summer, including a 10-mile by 3-mile-wide stretch quite close to the North Pole itself in 2001, although scientists say this open water may have been going on for some time.[38] But the northern ice cap is clearly retreating and thinning.

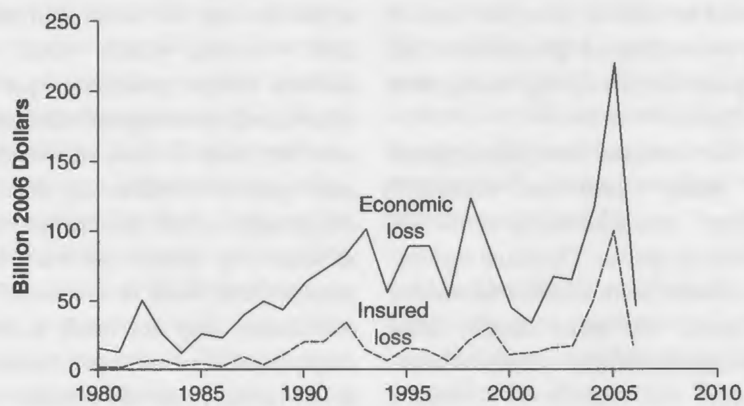

Figure 1.4 The price of global warming: Economic losses from weather-related natural disasters worldwide, 1980–2006.

Source: Worldwatch Institute (2007, p. 45).

Researchers from National Aeronautics and Space Administration (NASA) predict that by 2040, we will have no Arctic ice cap at all at the height of the Northern Hemisphere summer; the British Antarctic Survey thinks it will happen even earlier than that.[39]

Then there are the implications for disease. Warmer world weather has been implicated in the resurgence of cholera in Latin America in 1991 and pneumonic plague in India in 1994, and in the outbreak of a hantavirus epidemic in the U.S. Southwest in 1994. Scientists are wondering if global warming is a factor in about 10 other diseases that resurged or reemerged in the 1990s.[40] Increased allergy complaints may be due to global warming, one study suggests.[41] A 2004 *Journal of the American Medical Association* report notes potential climate change implications for increased malaria, dengue, and some rodent-borne diseases.[42] In areas where a population's disease resistance is already weakened by the AIDS virus, these increases will be particularly problematic.[43]

Meanwhile, greenhouse gas emissions continue to rise. Carbon dioxide, as measured at the famous Mauna Loa Observatory in November 2007, is up to 384 parts per million in the atmosphere.[44] In the mid-eighteenth century, the number was about 277 parts per million, according to data from ice cores drilled in Anarctica.[45] But growth still hasn't leveled out, despite the initial efforts of many nations around the world. Recently, the concentration has been going up about 2 parts per million per year, as we continue to force the climate, and push our luck.[46]

You could think of human-induced climate forcings as acting like extra blankets on a warm night, gradually stifling the planet. I say "on a warm night" because solar radiation is also on the rise, adding a climate forcing about a tenth as strong as human-induced forcings.[47] This is, at the very least, bad timing. Consequently, taking together all the forcings warming as well as cooling the planet—and there are indeed a few working in the direction of cooling, such as increased reflectivity back into outer space from increased cloudiness—the IPCC estimates that average temperatures will rise 1.1 to 6.4 degrees Celsius in the twenty-first century, depending on the scenario and model.[48] These are enormous increases when you consider that an average drop of 6 degrees Celsius caused the ice ages, covering much of the northern latitudes with a mile-thick sheet of ice.[49] Climate is a touchy thing. A few degrees average change one way or the other can make quite a difference. In this case, we could be on the verge of many centuries of generally lousy sleeping weather—and circumstances much more ominous than that.

Think about it the next hot summer evening as you ponder whether you should crank the air-conditioner up another notch, causing your local utility to burn just that much more carbon-based fuel, and to release that much more smog and soot to generate the necessary electricity.[50] More cooling will also mean more heating.

The Two Ozone Problems

There are several other threats to our atmosphere. While perhaps not quite as drastic in their potential consequences as global warming, they are plenty drastic enough for considerable concern. Two of these threats involve ozone, although in quite different ways.

Ozone forms when groups of three oxygen atoms bond together into single molecules, which chemists signify as O_3. Most atmospheric oxygen is in the form of two bonded oxygen atoms, or O_2, but a vital layer of O_3 in the upper atmosphere helps protect life on the Earth's surface from the effects of the sun's ultraviolet radiation. Ultraviolet light can cause skin cancer, promote cataracts, damage immune systems, and disrupt ecosystems. Were there no ozone layer in the upper atmosphere, life on Earth would have evolved in quite different ways—if indeed it had begun at all. In any event, current life forms are not equipped to tolerate much more ultraviolet radiation than the surface of the Earth currently receives. We badly need the upper-atmosphere ozone layer.

In 1974, two chemists, Mario Molina and Sherwood Rowland, proposed that CFCs—which, as we have seen, are also a potent global-warming forcing—could be reacting with the ozone layer and breaking it down. Molina and Rowland predicted that CFCs could ultimately make their way into the upper atmosphere and attack the integrity of the ozone layer. In 1985, scientists poring over satellite imagery of the atmosphere over Antarctica discovered (almost accidentally) that the ozone layer over the South Pole had, in fact, grown dangerously depleted.

Many studies later, we now know that this "ozone hole," as it has come to be called, is growing in overall size. We also know that it changes in size with the seasons, has a much smaller mate over the North Pole, and stretches to some degree everywhere on the planet except the tropics. In fact, it's really not a hole. It is more accurate to say that, outside the tropics, the ozone layer is *depleted,* particularly over the South Pole. (See Chapter 8 for an extensive discussion about the metaphor of an ozone "hole.") At times, the layer depletes to as low as 25 percent of the levels observed in the 1970s.[51] Most worrisome is that the area of high depletion might spread to heavily populated areas. In 2000, the high-depletion area passed over the tip of South America for nine days, including the Chilean city of Punta Arenas. The perimeter of the hole skirts Punta Arenas most years now.[52] Australians and New Zealanders have yet to experience this, but they're plenty worried. Levels of depletion there are already worse than in other populated regions, skin cancer rates are the highest in the world, and classes in "sun health" have become an essential feature of the school curriculum.[53] And in Punta Arenas, the world's most southerly city, skin cancer rates shot up 66 percent between 1994 and 2001.[54]

This is scary stuff. Skin cancer is no fun. But it has galvanized a truculent world into unusually cooperative action.[55] In 1987, the major industrial countries signed the first of a series of agreements, known as the Montreal Protocol, to reduce the production of CFCs. As a result of these agreements, CFC production for use in these countries ended on December 31, 1995, and will end throughout the world after 2010. By 1996, annual CFC production had already fallen to about 150,000 tons—down from more than 1,000,000 tons in late 1980s—although it has declined only slightly since then.[56]

It will be many decades until the depletion is repaired, however. The ozone-damaging chlorine that CFCs contain remains resident in the atmosphere for some time, and the HCFCs (hydrochlorofluorocarbons) industrial countries first turned to as a substitute also damage the ozone layer to some extent. Plus, like CFCs, HCFCs are a potent greenhouse gas. Chlorine-free "greenfreeze" refrigerants do not damage the upper atmosphere ozone layer and don't contribute to global warming. Greenfreeze technology now dominates the refrigerator market in Europe and is taking hold in South America, Japan, China, and elsewhere. But greenfreeze is just now reaching the North American market and, at this writing, is not yet available in its refrigerators—for reasons of protectionism, argue some.[57] Meanwhile, an extensive black market in CFCs has arisen in North America.[58] Thus, the current expert view is that ozone depletion will be with us until the middle of the century at least, and likely longer than that.[59]

The reduction of CFC production is nevertheless one of the great success stories of the environmental movement, and perhaps the greatest. Despite our differences, sometimes we can achieve the international cooperation necessary to make major progress on big problems. We know we can, because in the case of CFCs we have done it.

Much less progress, however, has been made on the other ozone problem: ozone at ground level. Hardly a city in the world is free of a frequent brown haze above which only the tallest buildings rise. (See Figure 1.5.) Ozone is the principal component of this brown smog that has become an unpleasantly familiar feature of modern urban life.

Ground-level ozone forms when sunlight glares down on a city's dirty air. As a result of fossil fuel combustion, cars and factories discharge large

Figure 1.5 Montreal's skyscrapers push through an afternoon smog layer, as seen from Parc du Mont-Royal, July, 2006.

Source: Author.

volumes of a whole array of nitrogen oxide compounds. NO_X (pronounced "knocks") is the usual term for this varied nitrous mixture. In sunlight, NO_X reacts with volatile organic compounds (or VOCs) to produce ozone. (The VOCs themselves are also produced during fossil fuel combustion, as well as by off-gassing from drying paint and by various industrial processes.) If the day is warm and still, this ozone will hug the ground. Because it needs sunlight to form, scientists often call the resulting haze "photochemical smog."

Although we need ozone up high to protect us from the sun, down low, in the inhabited part of the atmosphere, ozone burns the lung tissue of animals and the leaf tissue of plants. This can kill. A 2006 study estimated that over 100,000 Americans suffer premature death each year because of photochemical smog.[60] Stop for a moment: That's a huge number of premature deaths. A 2004 study found that even small differences in ozone concentration have measurable effects on mortality.[61] Smog alerts have become an everyday feature of big-city life in all industrial countries. Walking and bicycling are increasingly unhealthful and unpleasant—driving people even more into their cars and causing even more smog. Mexico City is the worst; unhealthy levels of ozone, as defined by the World Health Organization, continue to occur there more than 200 days each year.[62] When it drifts out of the city into the countryside, smog also reduces crop production and damages forests. For example, soybeans suffer a 20 percent yield loss due to ozone—not an insignificant amount in a hungry world.[63]

To put the matter simply, there's too much ozone down low, not enough up high, and no way to pump ozone from down here to up there.

Particulates and Acid Rain

Big cities and their surrounding suburbs also face the hazard of fine particulates in the air.

These particles are microscopic—the definition of "fine particulates" is particles 2.5 microns or smaller in size, way smaller than the diameter of a human hair—and they penetrate deeply into lung tissue. In contrast to the brownish color of photochemical smog, fine particulates envelop cities with a whitish smog. About half of these particulates are basically dust, mainly released because of poor fuel combustion in cars, trucks, power plants, wood stoves, and outdoor burning or kicked up by traffic, construction, and wind erosion from farms. Most of the rest are tiny pieces and droplets of sulfates, nitrates, and VOCs formed in the atmosphere following the burning of fossil fuels, such as the coal used for electric generation; together, these are called "secondary" particulates.[64] Ammonium and ammonium compounds also contribute significantly to secondary fine-particulate pollution, mainly due to emissions from livestock and fertilizers.

According to a 2006 study, over 160,000 Americans die prematurely each year due to fine particulates.[65] Stop again: That's 160,000 premature deaths. Another study found that in American cities with the most fine particulates, residents are 15-to-17 percent more likely to die prematurely.[66] Children in Los Angeles who live closer to roads have decreased lung capacity, largely because of fine particulates.[67] Fine particulates also increase heart attack rates, according to a 2006 study, which, along with studies of lung capacity and asthma effects, helps explain the higher death rates associated with areas that have higher levels of fine particulates.[68] This is serious stuff, even worse than the much better-known problem of photochemical smog.

And then there's acid rain. This is an issue that has largely dropped from sight, after a flurry of concern in the 1970s and early 1980s over sharp declines in the populations of some fish and frogs and extensive signs of stress and dieback in many forests. But acid rain is still falling from the sky, despite substantial efforts to reduce acidifying emissions of sulfur dioxide and NO_X (which also have other dangerous impacts, as we have seen). These pollutants combine with water in the atmosphere to acidify rain, resulting in direct damage to plant tissues, as well the leaching of nutrients from soil and the acidification of lake waters, which, in turn, affect most wildlife—particularly in areas with normally acidic conditions, where ecosystems have less capacity to buffer the effects of acid fallout. When things get bad enough, lakes die and trees refuse to grow, like the miles of blasted heath in the acid deposition zone surrounding the old nickel smelters in Sudbury, Ontario. The situation is especially severe in northern Europe, where more than 90 percent of natural ecosystems have been damaged by acid rain; a year 2000 survey by the European Union found that 22 percent of all trees in Europe have lost 25 percent or more of their leaves.[69] Conditions are also quite worrisome in much of Canada and in China. One 2007 study found defoliation rates as high as 40 percent in some Chinese forests.[70]

Efforts to reduce acidifying emissions of sulfur dioxide and NO_X have made a difference in some regions. There does seem to be some slight improvement in the condition of Canadian lakes and forests—but only slight.[71] Deposition rates for sulphate from rain are down considerably in much of the United States. But there are areas of the United States, mostly in the Northeast, that still receive more than 25 kilograms per hectare of sulphate from the sky each year—10 times more than falls in the West.[72] A 2000 review of the scientific literature by the federal government's General Accounting Office found that the condition of lakes in New England and the Adirondack Mountains of New York was either stable or getting worse, but none seemed to be improving.[73] Some 43 percent of Adirondack lakes are expected to be acidic by 2040—up from the 19 percent observed to be acidic in 1984.[74] Between 1992 and 1999, the condition of trees in Europe did improve in 15 percent of the test sites, but deteriorated in a further 30 percent of sites.[75] In Taiwan, the Central Weather Bureau has registered increasingly severe acid rain events in recent years.[76]

In other words, the situation is at best a mixed bag. Why after so many years of effort does acid rain still threaten? Technological improvements, international treaties, and domestic legislation have all contributed to a sharp decline in sulfur emissions in most countries. But we have made little overall progress in reducing nitrogen emissions. Industry's nitrogen emissions have been reduced, but these advances have been overwhelmed by increased emissions from automobiles and trucks as the world comes to rely ever more on these highly polluting forms of transportation.[77] Plus, there is evidence that the ability of sensitive ecosystems to handle acid rain has been damaged such that slight improvement in the acidity of rain often does not result in any improvement in the condition of lakes and forests.[78]

Acid rain is still a big problem.

Threats to Land and Water

There's a well-known saying about land: They aren't making any more of it. The same is true of water. And in a way, there is less of both each year as the expansion of industry, agriculture, and development erodes and pollutes what we have, reducing the world's capacity to sustain life.

Consider soil erosion in the United States. Soil erodes from farmland at least 10 times faster than it can be replaced by ecological processes, according to a 2006 study.[79] Despite decades of work in reducing soil erosion, largely in response to the lessons of the Dust Bowl, it still takes a bushel of soil erosion to grow a bushel of corn.[80] The Conservation Reserve Program, implemented by the U.S. Congress in 1985, has resulted in significant improvements by offering farmers 10-year contracts to take the most erodable land out of production. Many farmers have also switched to much less erosive cropping practices. Consequently, soil erosion dropped 43 percent from 1982 to 2003, water erosion dropped from 4.0 to 2.6 tons per acre, and wind erosion dropped from 3.3 to 2.1 tons per acre.[81] But those numbers are still way too high, most observers in and out of agriculture agree.

Elsewhere, the situation is equally grim. Soil erosion exceeds replacement rates on a third of the world's agricultural land.[82] Worldwide, almost a quarter—23 percent—of the world's cropland, pasture lands, forests, and woodlands have been become degraded.[83] True, fertilizers can make up for some of the production losses that come from eroded soils, at least in the short term, but only at increased cost to farmers and with increased energy use from the production of fertilizer and the application of it to fields—and increased water pollution as the fertilizer washes off into streams, rivers, and groundwater.

Soil erosion is only one of many serious threats to farmland. Much of the twentieth-century's gains in crop production was due to irrigation. But irrigation can also salinize soils. Because most irrigation occurs in parched regions, the abundant sunlight of dry climates evaporates much of the water away, leaving salts behind. In China, nearly half of the cropland is irrigated, and 15 percent of the irrigated land is affected by salinization. In the United States, only about 10 percent of cropland is irrigated, but almost a quarter of that 10 percent has experienced salinization. In Egypt, virtually 100 percent of cropland is irrigated, and almost a third of it is affected by salinization.[84]

Irrigation can also waterlog poorly drained soils. Clearing of land is doing the same thing in Australia. Once the land is cleared of its native woodland and bush, rates of transpiration—the pumping of water through the leaves of plants, enabling plants to "breathe"—slow down. Water tables in the dry wheat belt of western Australia are rising by up to one meter a year, waterlogging these poorly drained soils. This, in turn, can lead to salinization as waterlogged soils bake in the sun. A 2006 estimate found that 16 percent of Australia's agricultural land has been degraded by salinization.[85] Thus, overirrigation can turn soils both swampy and salty at the same time.

Irrigation of cropland, combined with the growing thirst of cities, is leading to an even more fundamental problem: a lack of water. One study has categorized 36 nations around the world as "water-stressed"—that is, they do not have sufficient water resources to provide for their population's agricultural, industrial, and residential needs.[86] Some 15 nations, mainly in the Middle East, now use more water than their climates can replenish it.[87] How do they survive? Mainly by importing food, a strategy that leaves them dependent on world markets. Even in countries not classified as water-stressed, the situation is increasingly dire. Take the United States and Mexico. By the time it reaches the ocean in the Gulf of California, the Colorado is probably the world's most famous "non-river," for not a running drop remains after the farms and cities of the United States and Mexico have drunk their fill. Further development in the regions dependent on the Colorado River will require water from other sources—and it is not obvious where those generally dry territories can easily find other sources—or greatly improved efficiency in current water use.

In the Murray-Darling Basin of Australia, the country's richest agricultural region, the story is much the same. Now only one-fifth of the water that enters the basin's rivers is still there by the time the Murray reaches the sea, and the comparative trickle of water that remains is salty and prone to bacterial blooms and fish kills.[88] Perhaps the most dramatic example of overuse of water sources is the Aral Sea in central Asia—once the world's fourth-largest lake. Diversion for irrigation reduced the Aral's surface area by 60 percent and its water volume by nearly 80 percent, as well as dividing it into two separate bodies of water: what are now called the North Aral Sea (also known as the Small Aral Sea) and the South Aral Sea. Salinity has quadrupled, former fishing ports lie miles inland, thousands of square miles of lake bottom have turned to desert, the 24 species of native fish are all gone because of the salinity, as are half the bird and mammal species, and the region's economy has collapsed.[89] Some good news is that a dike funded by the World Bank has begun restoring some of the lake area in the North Aral Sea.[90] But the overall situation remains grim in the much larger South Aral Sea.

Not only surface water, but groundwater too is being rapidly depleted. Overirrigation can lead to rising water tables and the waterlogging of soils in some regions, but the more general problem is falling water tables from the depletion of groundwater stocks. Around the world, extraction of groundwater for cities and farms is exceeding replenishment rates. Recent production gains in agriculture in India have relied heavily on irrigation from groundwater, but now, because of what one observer has called a "race to the bottom of the aquifer," local villagers are being forced to pump from as deep as 700 feet.[91] Water levels are dropping in some 90 percent of wells in the Indian state of Gujarat.[92] In the dry Great Plains of the United States, farmers pump the famous Ogallala Aquifer eight times faster than it recharges from precipitation, endangering 15 percent of U.S. corn and wheat production and 25 percent of U.S. cotton production. Nearly one-fifth of the Ogallala's water reserves have already been pumped out, and the taps have had to be turned off in many places.[93] In the North China Plain, a major grain-producing area, water tables have been dropping at the rate of three to five feet each year, due to overdraw for irrigation.[94] In some regions, the lowering of water tables is causing major land subsidence. Downtown Mexico City has dropped nearly 25 feet.[95] Some parts of the Central Valley of California and the Hebei Province surrounding Beijing have dropped as much.[96] Venice has dropped 10 centimeters because of pumping the freshwater aquifer beneath it—which may not sound like a lot, but for a city at the water line, that is an alarming figure.[97]

Overextraction can degrade the quality of the groundwater that remains. The main threat here again is salinization, either through the overapplication of irrigated water to the land's surface or through the invasion of seawater into shrinking groundwater aquifers. Ten percent of wells in Israel have already been abandoned because of seawater invasion, and many more will soon have to be given up.[98] In the Indian state of Gujarat, half the hand-pumped wells are now salty.[99]

When irrigated water is overapplied, the salinization of the soil can be carried down into the aquifer, as the water percolates down past crop roots. In many areas, only some 30 to 40 percent of irrigated water actually reaches crops, with the rest being lost through evaporation and percolation, promoting salinization of groundwater. In the lower Indus River Valley of India and Pakistan, the situation is so bad that engineers have installed an expensive system of pumps and surface drains to carry some of the salinized groundwater away to the sea.[100]

Much of the freshwater that remains is badly polluted. "The amount of water made unusable by pollution," Donella Meadows, Denis Meadows, and Jorgen Randers have noted, "is almost as great as the amount actually used by the human economy."[101] In fact, we are very close to using, or making unusable, all the easily accessible freshwater—freshwater that is close to where people live (as opposed to rivers in the Arctic, say) and that can be stored in rivers, lakes, and aquifers (as opposed to the huge amounts of freshwater lost to the sea during seasonal floods, which cannot be easily stored).[102] The remaining margin for growth in freshwater use is disturbingly narrow.

Cleaning up water pollution is one way to increase that vital margin, and industrial water pollution has diminished in many areas, particularly in the wealthier countries. We have also made progress in controlling agricultural water pollution. But we still have a long way to go. Since 1950, farmers across the world have upped their use of commercial fertilizers eightfold and their use of pesticides thirty-two-fold.[103] In the United States, the development of stronger pesticides for a number of years led to substantial drops in the number of pounds of pesticides farmers applied. But since the late 1980s, the U.S. trend has been up once again, with about a 10 percent increase since that time.[104] The resulting runoff continues to threaten the safety of many drinking water supplies. As Chapter 5 discusses in detail, many pesticides are quite hazardous for human health. Excess nitrogen fertilizer in the water is, too. We all need something to eat and something to drink, but our efforts at maintaining food production through the use of agricultural chemicals are putting us in the untenable position of trading one for the other: food to eat for water to drink.

Or are we trading them both away? In addition to the threats to agricultural production caused by soil erosion, salinization, waterlogging, and water shortages, we are losing considerable amounts of productive farmland to the expansion of roads and suburbs, particularly in the wealthiest nations. Cities need food; thus, the sensible place to build a city is in the midst of productive agricultural land. And that is just what people have done for centuries. But the coming of the automobile has made possible (although not inevitable) the sprawling forms of low-density development so characteristic of the modern city. The result is that cities now gobble up not only food but also the best land for growing it. The problem is worst in the United States, which has both a large proportion of the world's best agricultural land and also some of the world's most land-consuming patterns of development. Some 86 percent of fruit and vegetable production and 63 percent of dairy production come from urban counties or from counties adjacent to urban counties. A 2002 study found that the United States loses about 2 acres of farmland every minute, or about 1.2 million acres per year, an area the size of Delaware.[105] Given that the United States has almost a billion acres of agricultural land, this may not seem worth worrying about. But in most cases, we are losing our best land, and in the places where we most need it: close to where people live.

Then factor into the calculation the effects of global warming, photochemical smog, and acid rain on crop production. And then add some major issues I have not even mentioned: increased resistance of pests to pesticides, declining response of crops to fertilizer increases, the tremendous energy inputs of modern agriculture, loss of genetic diversity, desertification due to overgrazing, and pesticide residues in food.

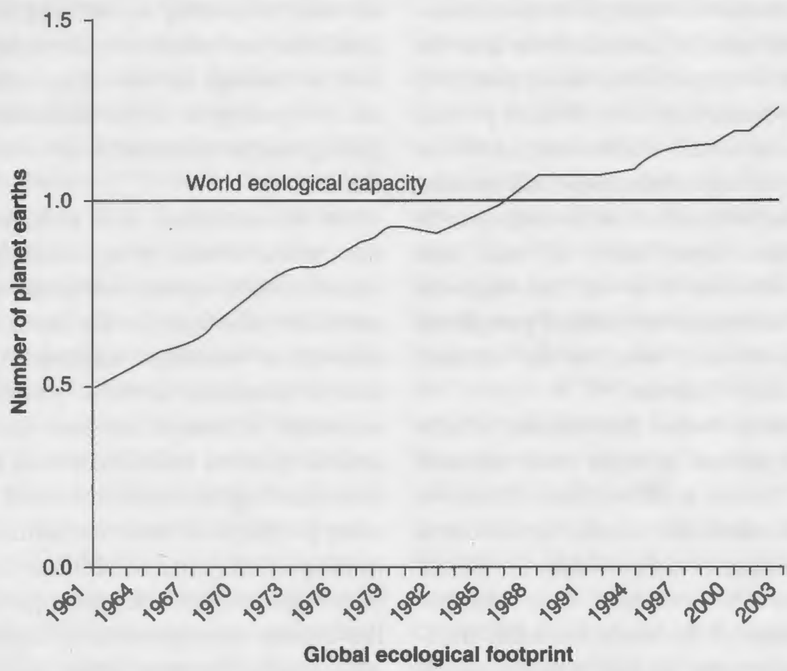

Figure 1.6 Living beyond our means: Global ecological footprint, 1961 to 2003.
Source: Global Footprint Network (2007).

It is no wonder that increases in agricultural production have been falling behind increases in human population. The result is that after decades of steady increases, world grain production per person per year declined from the historical high of 343 kilograms in 1985 to 297 kilograms in 2002, the first year below 300 kilograms since 1970.[106] The world record harvest of 2004 brought grain back to 324 kilograms per person, but by 2006, the world harvest had fallen back below 310 kilograms per person. Plus, the growth of biofuels threatens to divert a sizable proportion of grain away from food, as many have tried to point out.[107]

Let's face it. We're simply eating the world up. An increasingly popular way to represent our overconsumption on an ecological scale is *ecological footprint analysis,* which converts all the various demands we make on the earth's ecosystems to area. (See Figure 1.6.) Since about 1985, our collective footprint has been larger than the Earth itself. We are now demanding about 1.4 Earths. We are provided with only one. You can't eat your Earth and have it too.

Environmental Justice

On the morning of January 4, 1993, 300,000 Ogoni rallied together. The protesters waved green twigs as they listened to speeches by Ken Saro-Wiwa, a famous Ogoni writer, and others. With such a huge turnout, the Ogoni—a small African ethnic group, numbering only a half million in all—hoped that finally someone would pay attention to the mess that Shell Oil Company had made of their section of Nigeria. Leaking pipelines. Oil blowouts that showered on nearby villages. Disrupted field drainage systems. (Much of Ogoniland has to be drained to be farmed.) Fish kills. Gas flares that fouled the air. Water so polluted that just wearing clothes washed in it caused rashes. Acid rain from the gas flares so bad that the zinc roofs people in the area favor for their houses corroded away after a year. Meanwhile, the profits flowed overseas to Shell and to the notoriously corrupt Nigerian government. The Ogoni got only the pollution.[108]

Such open protest by the relatively powerless is a courageous act. And for the Ogoni, the consequences were swift and severe. During the next two years, Nigerian soldiers oversaw the ransacking of Ogoni villages, the killing of about 2,000 Ogoni people, and the torture and displacement of thousands more.[109] Much of the terror was carried out by people from neighboring regions whom the soldiers forced or otherwise enticed into violence so that the government could portray the repression as ethnic rivalry.[110] The army also sealed the borders of Ogoniland, and no one was let in or out without government permission. Ken Saro-Wiwa and other Ogoni leaders were repeatedly arrested and interrogated. Finally, the government trumped up a murder charge against Saro-Wiwa and eight others and, despite a storm of objection from the rest of the world, executed them on November 10, 1995.[111] The torture and killing of protestors continued for some years. For example, on June 15, 2001, police shot Friday Nwiido, a few weeks after Nwiido had led a peaceful protest against the April 29, 2001, oil blowout that rained Shell's crude onto the surrounding countryside for nine days.[112] Recently, there have been efforts to broker a peace process for the region between Shell, the Nigerian government, the United Nations Environment Programme (UNEP), and the Ogoni people. But as of this writing, the situation remains chaotic, with a recent death threat against Ledum Mitee, the current president of the Movement for the Survival of the Ogoni People (MOSOP), as well as continued oil fires and oil spills.[113]

The Ogoni experience is a vivid example of a common worldwide pattern: Those with the least power get the most pollution.

The Ogoni experience is also an outrage, as virtually the entire world agrees.[114] This outrage is a reminder of another of the three central issues of environmentalism: the frequent and tragic challenges to environmental justice. There is a striking unevenness in the distribution of environmental benefits and environmental costs—in the distribution of what might be termed *environmental goods* and *environmental bads*.[115] Global warming, sea level rises, ozone depletion, photochemical smog, fine-particulate smog, acid rain, soil erosion, salinization, waterlogging, desertification, loss of genetic diversity, loss of farmland to development, water shortages, and water pollution: These have a potential impact on everyone's lives. But the well-to-do and well connected are generally in a better position to avoid the worst consequences of environmental problems, and often to avoid the consequences entirely.

Who Gets the Bads?

Take the hazardous waste crisis, for instance. Wealthy countries are now finding that there is more to disposing of garbage than simply putting it in a can on the curb. One response has been to pay others to take it. We now have a lively international trade, much of it illegal, in waste too hazardous for rich countries to dispose of at home.

There has been considerable protest about this practice. In 1988, Nigeria even went so far as to commandeer an Italian freighter with the intent of loading it up with thousands of barrels of toxics that had arrived from Italy under suspicious circumstances and shipping it back to Europe. After a heated diplomatic dispute, the waste—which turned out to originate in 10 European countries and the United States—was loaded on board the *Karin B.*, a West German ship, and sent back to Italy. But harbor officials in Ravenna, Italy, where the waste was supposed to go, refused the load because of vigorous local opposition to it. The *Karin B.* was later refused entry in Cadiz, Spain, and banned from French and British ports, where it also tried to land. Months later it was finally accepted into Italy.[116]

In 1989, in response to diplomatic crises like these, 105 countries signed the Basel Convention, which is supposed to control international toxic shipments. Yet loopholes are large enough and enforcement lax enough that these shipments still go on. Nor do international conventions control domestic companies like COINTERN of Mexico, which dumped 20,000 tons of illegal waste near the Mexican town of Guadalcazar between 1989 and 1993. Nor do international conventions stop foreign companies from merely relocating their most hazardous production practices to poorer countries—like Metalclad, Inc., of Illinois, which purchased the Guadalcazar site, promising to clean up the dump but only if the Mexican government would allow Metalclad to reopen the dump afterward.[117] When local people and government officials tried to stop them, Metalclad filed a successful suit in international court, using a provision of the North American Free Trade Agreement. They were even awarded $16.7 million in damages.[118]

Toxic wastes are typically local in their effects, and typically the local communities that are the least politically empowered—whether because of class, heritage, nationality, or rural location—receive the bulk of them.[119] So too for the siting of hazardous industrial facilities. These are realities painfully well-known to the people of Bhopal, India; Minamata, Japan; Toulouse, France; Diamond, Louisiana; Love Canal, New York; and the thousands of communities subjected to lesser-known local toxic disasters. Although individually smaller, these disasters are collectively just as significant as the better-known ones, and perhaps more significant.[120]

Toxic wastes have an impact not only where people live but also where they work. Consider the cumulative effects of pesticides and toxic chemicals on those who work with them every day. Many of our industrial practices expose workers—generally those on the production line, as opposed to those in the head office—to environmental hazards. Increasingly, the wealthy countries are exporting these kinds of jobs overseas, where workers have less choice over their conditions of employment, and then importing the goods back home (but still scooping up the profit in between). Exporting hazardous jobs does not lessen the degree of environmental inequality involved, however. Indeed, the inequality often increases because of lax environmental regulation in poorer countries.

All this seems to take place faraway—until a toxic disaster happens in your own community. The growing placelessness of the marketplace makes it easy to overlook the devastating impact untempered industrialism can have on the daily lives of the farmworker applying alachlor in the field and the factory worker running a noisy machine on a dirty and dangerous assembly line. When we shop, we meet a product's retailers, usually not the people who made it, and the product itself tells no tales.

Who Gets the Goods?

Environmental justice also concerns patterns of inequality in the distribution of environmental goods. These patterns are usually closely associated with inequality in the distribution of wealth. Thus, those who are concerned about environmental justice often point to the huge inequalities in average income between countries. Here are the numbers, based on gross national income (GNI) per capita in 2005 in U.S. dollars.[121]

The average annual income in the world is $6,987. In contrast, the average income in the world's 57 wealthiest countries is $35,131. In the United States, it is $43,740—and the United States is not the world's richest country. That distinction goes to Luxembourg, at $65,630 per capita, and $65,340 in per capita buying power when we take into account the higher cost of living there.[122] (The United States ranks as the second-richest country in the world in per capita buying power at $41,950 annual income.)

With all that income flowing to the top, hardly any is left for those on the bottom. The 2.4 billion people of the 54 poorest nations average just $580 per capita per year—hardly more than a dollar a day. The 8 million people of Burundi have the lowest average: just $100 per capita per year. The situation is hardly better for the people of the Democratic Republic of the Congo: just $120. In Malawi, it's $160. True, the cost of living is unusually low in those countries. That $100 annual income in Burundi buys about what $640 buys in the United States. But even $640 is not very much. Imagine living on so little.

Moreover, despite the many advances in technology and the change to a more market-oriented world economy—and some say *because* of these advances and this change, as Chapter 3 discusses—income inequality has dramatically increased in recent decades. In 1960, the fifth of the world's people living in its richest countries commanded 30 times as much of the world's income as the fifth of people living in the poorest countries—a figure that, in most people's view, was bad enough.[123] Roughly 100 years earlier, in 1879, it was 7 to 1.[124] But today, that richest fifth commands *66 times* as much of the world's income as the poorest fifth.[125]

These figures are all based on the populations of whole countries. But there are also substantial levels of inequality *within* countries. Typically, the income differential between the richest 20 percent and poorest 20 percent within a country is 7 to 1 or less.[126] In many poor and middle-income countries, however, the numbers are far higher. The situation is most extreme in Sierra Leone, where the richest fifth command 57.6 times the income of the poorest fifth. In another half-dozen countries, such as Brazil and South Africa, the ratio is 30 to 1 or higher.[127] In 13 other countries, it is 15 to 1 or higher.

Although there is usually less inequality in wealthy countries, some do exceed the world norm of 7 to 1. In Germany, the ratio of richest to poorest 20 percent is 8 to 1. In the United States, it is 9 to 1. Interestingly, the situation in the United States represents a historical reversal. In the 1920s (the first decade for which these figures are available), the United States was one of the most economically egalitarian countries, giving America the image of the land of opportunity. In comparison, most European countries, such as Britain, were more wealth stratified at the time.[128] Today, European countries are all less stratified, in most cases much less so—such as the 4-to-1 figures for the Scandinavian countries and the 5-to-1 and 6-to-1 figures for France, Belgium, Switzerland, Spain, and the Netherlands. The lowest figure in the world is for Japan, 3.4 to 1.[129] Many countries with a majority of Muslims also have quite egalitarian income ratios.[130]

Inequality within countries means that the 66-to-1 ratio of income between the fifth of people living in the richest countries and the fifth living in the poorest understates the level of global inequality. If the richest fifth of the world population from all countries, rich and poor, were put together, their income would likely total 150 times that of the poorest fifth of the world's population.[131] (See Figure 1.7.)

Consequently, taking the world's population as a whole, the number of very poor people is staggering. As of 2004, some 969 million—nearly a billion—were living on less than $1 a day.[132] Some 2.5 billion were living on less than $2 a day.[133] The good news is that there have been substantial improvements. In 1981, 1.5 billion were living on less than $1 a day, half a billion more than today.[134] Plus, world population has risen quite a bit since then, so the proportion of the poor has fallen even further. So there have been some encouraging changes. But there are also significant regional differences, with the numbers of the very poor on the rise in India, Latin America, and Africa over this time period. Almost all of the worldwide gains in poverty alleviation have been in just one country, albeit a very large one: China. And most of those who used to be on the very bottom haven't moved up very far. In fact, the overall number of those living on $2 a day or less has actually gone up a bit since 1981—by about 100 million.[135]

The wealth of the world's richest people is equally staggering. As of 2007, the world had 946 billionaires worth a combined $3.5 trillion dollars, or an average of a tad over $3.5 billion each.[136] Now consider the wealth of the 2.4 billion people living in the world's 54 poorest countries.

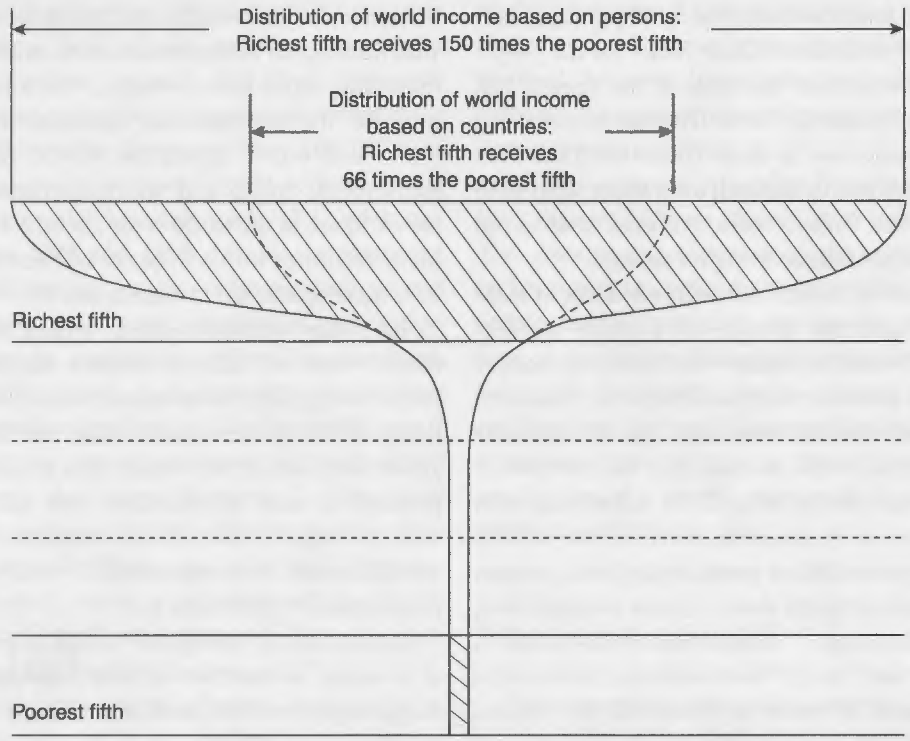

Figure 1.7 The champagne glass of world wealth distribution. The fifth of world population from the world's riches countries receives about 66 times the income of the fifth of world population from the poorest countries. When calculated on the basis of the richest fifth of persons from all countries versus the poorest fifth from all countries, the ratio of income disparity likely rises to 150 to 1.

Source: Based on Korten (1995) and World Bank (2007a).

As their assets are so minimal, we can, roughly speaking, consider their annual income to be the same as their wealth. Pretty much all they've got is what they make. Their annual income together amounts to $1.4 trillion, less than half of the wealth of the 946 richest people.[137] Now let's guess that they do usually have a few assets—some clothes, tools, housing of some sort, perhaps a radio and some other saleable possessions—and estimate the value of those as equal to their income. That brings their wealth up to $2.8 trillion, still less than the wealth of the 946 richest individuals. Think of it: 946 people are wealthier than 2.4 billion people put together.

That's a rough calculation, of course. So let's narrow it down to one person, Bill Gates, worth $56 billion in early 2007. And let's make the comparison straight on annual income this time. Gates's assets increased by 6 billion during 2006.[138] The national incomes of 31 countries—Cambodia (population, 14 million), Madagascar (population, 19 million), Nicaragua (population, 5 million), Zimbabwe (population, 13 million) and 27 others—are currently less than that.[139] In other words, Bill Gates is a modest national economy all on his own.

The wealth of the average person in the rich countries leads to a substantial global *consumption gap.* The average person in the rich countries consumes 3 times as much grain, fish, and fresh water; 6 times as much meat; 10 times as much energy and timber; 13 times as much iron and steel; and 14 times as much paper as the average resident of a developing country. And that average person from a rich country uses 18 times as much in chemicals along the way.[140] These consumption figures are lower than the 66-to-1 income differential because the comparison here is between the roughly 20 percent of the world's people who live in industrial countries and the roughly 80 percent who don't—not the richest fifth and poorest fifth of countries. If the 60 percent in the middle were removed from the calculations, the consumption gap for many of these items would probably reach or exceed the 66-to-1 ratio of income. (For some items, however, it would not—even a very wealthy person can eat only so much grain, fish, and meat.)[141]

Along with the consumption gap comes an equally significant *pollution gap*. The wealthy of the world create far more pollution per capita than do the poor. For example, in the rich countries, per capita emissions of carbon dioxide are 12 times higher than in poor countries.[142] Moreover, the rich countries are also more able to arrange their circumstances such that effects of the pollution they cause are not as significantly felt locally, as with the export of toxic wastes and dirty forms of manufacturing.

The consequences of these differentials are serious indeed. As of 2003, some 854 million people in the world are undernourished, a figure that is virtually unchanged from 10 years previously.[143] Twenty-five percent of the world's children under age five are malnourished.[144] In the 54 poorest countries, 39 percent of the children under five years old are malnourished—a figure that reaches as high as 48 percent in Bangladesh, one of the world's poorest nations.[145] Hunger and malnutrition annually cause the death of almost 6 million children before they reach the age of five.[146] Because of rampant malnourishment, adults face a reduced capacity to work and children grow up smaller, have trouble learning, and experience lifelong damage to their mental capacities.[147]

Many of the world's poor find it difficult to protect themselves from environmental bads. As of 2001, 924 million people live in slums, generally in shelter that does not adequately protect them from such environmental hazards as rain, snow, heat, cold, filth, and rats and other pests.[148] And the number is rising fast; by 2030, it could be 2 billion, the United Nations Human Settlements Agency projects.[149] Moreover, the world's poor are more likely to live on steep slopes and in low-lying areas that are prone to landslides and floods. More than 1 billion lack access to safe drinking water.[150] Two and a half billion do not have adequate sanitation.[151] The poor also typically find themselves relegated to the least productive farmland, undermining their capacity to provide themselves with sufficient food (as well as income). Compounding the situation are the common associations between poor communities and increased levels of pollution and between poverty and environmentally hazardous working conditions.

It is also possible to have too much of the good things in life. In the United Kingdom, two-thirds of men and half of women are now either overweight or obese.[152] From 1993 to 2005, the prevalence of obesity in the United Kingdom shot up from 16 to 24 percent of women and 13 to 24 percent of men.[153] The situation in the United States is even worse, with some 66 percent of all adults overweight or obese in 2004. Obesity in the United States has more than doubled since 1980, to 33 percent.[154] Other wealthy countries have also experienced rapid rises as lifestyles have become more sedentary and calorie intake has increased. The diseases associated with too much food are increasing as well: diabetes (especially type II), hypertension, heart disease, stroke, and many forms of cancer.

But the problem of overweight is not limited to the wealthy nations. Weight problems are increasing dramatically in poorer nations, as people increasingly take up more sedentary lives there, too, and as food consumption shifts more into the marketplace and away from home production, making healthier foods less readily available for the poor. The World Health Organization (WHO) estimates that, worldwide, 1.6 billion adults were overweight and 400 million were obese, as of 2005.[155] More than

30 percent of adults in Egypt and Kuwait are obese.[156] The problem is particularly pronounced in urban areas. In China, the obesity rate as of 2002 was 7 percent, double what it was in 1992. But the rate was double in the cities in comparison with the countryside.[157] In some cities in China, 20 percent or more are obese.[158] In urban Samoa, as many as 75 percent of adults are obese—not just overweight, but obese.[159] With excess weight comes its many deleterious effects on health. Yet the world's wealthy are generally better able to protect themselves from the consequences of high weight. Medical treatments for diabetes, circulation problems, and cancer are far less accessible for the poor.

Considering these stark facts, it comes as no surprise that people in the wealthy countries live an average of almost 28 years longer than those in the poor countries—78.1 years versus 50.4 years—despite great advances in the availability of medical care.[160] In 14 very poor countries, the average person has no better than a 50 percent chance of reaching age 40.[161] In the least developed countries, 24 percent won't even make it to age 5.[162]

Within-country differences in income have a substantial impact on the quality of life for the poor, even in rich countries. In the United States, some 3.5 million Americans experience a period of homelessness during the year, about one-third of them children, according to a 2000 study.[163] Although conditions have substantially improved in the European Union since the mid-1990s, some 270,000 people in Germany, 80,000 in France, and 107,000 in the United Kingdom are living in accommodations for the homeless at any one time, according to a 2006 study.[164] Some 5,000 in France, 20,000 in Germany, and 8,000 in Spain are sleeping rough, with no roof at all.[165]

Hunger can also exist in conditions of prosperity. Take the United States, for example. Thirty million Americans—about 11 percent of the U.S. population—live in conditions of "food insecurity," the U.S. Department of Agriculture's term for households that face difficulty meeting basic food needs for all its members. About one-third of these households reported experiencing involuntary hunger at some point during the year. Rates of food insecurity are twice as high for black and Hispanic households as they are for white households. A 2001 study found that 7 million Americans receive food assistance from emergency food pantries and other sources in any given week.[166] The USDA reports that in 2004, 38 million Americans were eligible for food stamps in any given month and that in 2006, states provided 359.5 million pounds of emergency free food.[167]

Food, shelter, longevity—these are the most basic of benefits we can expect from our environment. And yet people's capabilities to attain them are highly unequal. As Tom Anthanasiou has observed, ours is a "divided planet."[168]

The Rights and Beauty of Habitat

"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."[169] These are probably the most famous lines ever written by Aldo Leopold, one of the most important figures in the history of the environmental movement. His words direct our attention to a broader sense of the sustainability of our community and, in a way, to a broader sense of equality and inequality. Understood in this way, sustainability and environmental justice concern not only the conditions of human life but also the conditions of the lives of nonhumans. Leopold also directs our attention to a word that is certainly one of the hardest of all to define but is no less significant for that difficulty: *beauty.* (Indeed, the difficulty of defining beauty may be much of what makes it so significant.) Plus it is all about home—about *ecos* and habitat—and every living thing's right to one that is sustainably beautiful and beautifully sustainable. As the eco-bard Bill Oliver sings, "You have to have a habitat to carry on."

Threats to the integrity, stability, and beauty of habitat are manifold. Take the loss of species. For example, of the 9,956 known species of birds,

	Number of described species	Number of species evaluated by 2007	Number of threatened species in 2007	Number threatened in 2007, as % of species described	Number threatened in 2007, as % of species evaluated
Vertebrates					
Mammals	5,416	4,863	1,094	20%	22%
Birds	9,956	9,956	1,217	12%	12%
Reptiles	8,240	1,385	422	5%	30%
Amphibians	6,199	5,915	1,808	29%	31%
Fishes	30,000	3,119	1,201	4%	39%
Subtotal	59,811	25,238	5,742	10%	23%
Invertebrates					
Insects	950,000	1,255	623	0.07%	50%
Molluscs	81,000	2,212	978	1.21%	44%
Crustaceans	40,000	553	460	1.15%	83%
Corals	2,175	13	5	0.23%	38%
Others	130,200	83	42	0.03%	51%
Subtotal	1,203,375	4,116	2,108	0.18%	51%
Plants					
Mosses	15,000	92	79	0.53	86%
Ferns and allies	13,025	211	139	1%	66%
Gymnosperms	980	909	321	33%	35%
Dicotyledons	199,350	9,622	7,121	4%	74%
Monocotyledons	59,300	1,149	778	1%	68%
Green Algae	3,715	2	0	0.00%	0%
Red Algae	5,956	58	9	0.15%	16%
Sub total	297,326	12,043	8,447	3%	70%
Others					
Lichens	10,000	2	2	0.02%	100%
Mushrooms	16,000	1	1	0.01%	100%
Brown Algae	2,849	15	6	0.21%	40%
Subtotal	28,849	18	9	0.03%	50%
TOTAL	1,589,361	41,415	16,306	1%	39%

Figure 1.8 A leaking gene pool: The IUCN "Red List" of threatened species, an annually updated inventory.

Source: IUCN (2007).

some 12 percent were threatened with extinction as of 2007.[170] Many have already gone; the passenger pigeon, the dodo, the ivory-billed woodpecker, and the 11 species of moa are only some of the best known. Since 1800, 103 have gone extinct.[171] With its moa and other species that developed without pressure from mammalian predators, New Zealand has perhaps been the hardest hit; about half the bird species of the North and South Islands have disappeared in the past 800 years.[172]

Estimates of extinction rates for all species vary widely because we still do not have a good count of how many there are, or ever were. Many species are still unknown or survive in such low numbers that they are hard to study. But even the low estimates are staggering. Perhaps the most widely regarded account, based entirely on individual assessments for each species, is the "Red List" of the World Conservation Union, known by the acronym IUCN, a 140-nation organization. (See Figure 1.8.) As of 2007, the Red List registered 16,306 species of plants and animals as threatened with extinction. In addition to the 12 percent of bird species, extinction is now a real and present possibility for 20 percent of mammal species, 4 percent of fish, 5 percent of reptiles, and 29 percent of amphibians, according to the 2007 Red List.[173] But while the IUCN has reviewed the status of all bird species and about 42 percent of all vertebrate species, very little is yet known about the status of invertebrates and plants. All told, as of 2007, the IUCN had evaluated the status of less than 3 percent of known species.[174] Most have been barely studied.

The overall extinction rate is thus in the realm of educated guesswork, given the spotty data we have. Richard Leakey, the famous paleontologist, is one who has made a try. He suggests that we could lose as many as 50 percent of all species on Earth in the next 100 years, largely because of very high rates of extinction among invertebrates, the group we know the least about. (For example, nearly half of the insect species that the IUCN has assessed are threatened. However, evaluations often focus on species at risk.) If Leakey is anywhere near right, that would put the current period of extinction on the same scale as the one that did in most dinosaurs and much of everything else 65 million years ago, and four earlier periods that had a similar effect on the Earth's biota. That's why Leakey and Roger Lewin call the current period the "sixth extinction."[175] Some biologists have placed the current rate of extinction for all species at between 5,000 and 100,000 each year, somewhere between 1 species every 10 minutes and 1 every 30 minutes, depending on how many species actually exist in the world.[176] If so, that means it is likely that another species, probably an insect, went extinct since you began reading this chapter. When we add in the extinction of subspecies and varieties, the decreasing diversity of planetary life is even more dramatic.

Of course, species have always come and gone, as Charles Darwin famously observed in his theory of natural selection. But the rate of these losses has greatly increased since the beginning of the Industrial Revolution. Some have disappeared because of habitat loss, as forestlands have been cleared, grasslands plowed, and wetlands drained and filled. Some have suffered from pollution of their habitat. Some have found themselves with no defenses against animals, plants, and diseases that humans have brought, often unintentionally, from other regions of the world into their habitat. The Earth is a single, gigantic preserve for life, and we have not been honoring its boundaries and protecting its inhabitants.

The loss of species is an instrumental issue of sustainability. The leaking global gene pool means a declining genetic resource base for the development of new crops, drugs, and chemicals. In addition, most ecologists suspect that decreased diversity destabilizes ecosystems—ecosystems that we, too, need to survive. But the ethical and aesthetic impact of the loss of so many forms of life may be as great, if not greater.

The loss is not only one of forms of life but also forms of landscape. Take deforestation. The world has lost about half of its original area of forestland.[177] Between 2000 and 2005, the loss continued as another 1 percent of the world's forested landscapes disappeared, some 36.6 million hectares—an area about the size of Germany.[178] Africa lost 3.2 percent, and South America lost 2.5 percent, just in those five years.[179] In Brazil, home to most of the Amazon rainforest, we lost another 3.2 percent, despite many efforts to slow deforestation there.[180] About one-third of the world's remaining forestlands are what ecologists call *primary forests,* little disturbed by human use. Alarmingly, most of the continuing loss—some 30 million hectares during the period from 2000 to 2005—is of these primary forests, with their richness of species and habitat.[181] The good news is that the rate of forest loss is now slowing somewhat, due largely to replanting efforts.[182] But replanted forests are poor substitutes for the woods they replace, at least in terms of biodiversity—the ecological equivalent of exchanging the paintings in the Louvre for a permanent display of engineering blueprints.

There's another loss, too—the disappearance of a kind of quiet intimacy with the Earth, the sense of being connected to the land and to each other through land. It is a common complaint that modern technology removes us from contact with a greater, wilder, and somehow realer reality. This removal, it should be said, has been the whole point of modern technology, but some have come to wonder whether our lives are emptier because of it. A romantic concern, perhaps. But do we want a world without romance?

Moreover, the loss of quiet intimacy is not merely a philosophical matter. It is physical, too. We in the industrialized world are seldom away from the sound of machines, and we generally interact with the world by means of machines. Got something to do? Get a machine. Try to escape from the constant sound of machines? Good luck. Saturday morning in the suburbs, and the lawn mowers and leaf blowers are at it, and late into the summer night, the air-conditioners

Figure 1.9 The beauty of habitat: Sunrise over Grenadier Island, St. Lawrence River, 2007.
Source: Author.

hum and the highways growl. Out in the countryside, the situation is often no better: tractors, snowmobiles, Jet Skis, motorcycles, passing airplanes, chain saws, all manner of power tools, and the nearly inescapable sound of the highway except in the remotest locations. Back at the office, the lights buzz, the computer whines, the air-handling equipment rushes with a constant Darth Vader exhale, and the traffic—always the traffic—invades the sanctum of the ear with an ever-present tinnitus of technology. And we hardly seem to notice. We have lost our hearing, our hearing for habitat.

And finally, there's the question of our right to make such great transformations in the world. Nothing lasts forever, of course. Over millions of years, even a mountain is worn away by erosion. Wind, rain, ice, and changes in temperature constantly sculpt the land, and the shape of Earth's surface constantly changes as a result. But geologists now recognize humans to be the most significant erosive force on the planet.[183] Agriculture, forest cutting, road building, mining, construction, landscaping, and the weathering effects of acid rain—all these have resulted in enormous increases in the amount of sediment that rivers carry into the oceans. We wield the biggest sculptor's chisel now. Perhaps it is our right. If so, then it is also our responsibility.

Although I have not covered the question of the rights and beauty of habitat in much detail, let me conclude here. After all these pages on our environmental problems, I'm exhausted. Maybe that's the most difficult environmental problem of all. There are so many of them.

The Social Constitution of Environmental Problems

These matters seemed quite remote at that lovely brunch as we loaded up our plates with fruit salad, coffee cake, scrambled eggs, bread, butter, and those great hominy grits. Remote but ironic. Here I was amid a group of three families whose incomes, although not unusually high by Western standards, were sufficient to command a brunch that two centuries ago would have been seen as lavish even by royalty. And what was I doing? Once I had finished explaining environmental sociology, I was reaching for seconds.

My point is not that there is something wrong with pigging out every once in a while. Nor is it that consumption is necessarily a bad thing. (To consume is to live.) Rather, I tell this story to highlight how social circumstances can lead to the sidelining of concern and action about environmental consequences.

Everything we do has environmental implications, as responsible citizens recognize today. Although at the time sociology's relevance for the environment was less widely recognized, the adults at that brunch 10 years ago were genuinely interested in my explanation of environmental sociology. They listened avidly for the two minutes the dynamics of politeness grant in such a setting. But the currents of social life quickly washed over the momentary island of recognition and concern that my explanation had created. Soon we were all reaching for more of the eggs from chicken-factory hens; the fruit salad with its bananas raised on deforested land and picked by laborers poorly protected from pesticides; the coffee cake made with butter and milk from a dairy herd likely hundreds of energy-consuming miles away; the grits made from corn grown at the price of one bushel of soil erosion for one bushel of grain. Meanwhile, the conversation moved on to other matters. And shortly, we guests got into our cars and drove home, spewing greenhouse gases, smog, and fine particulates all along the way.

A completely ordinary brunch. But do you refuse to invite friends over because you cannot easily get environmentally friendly ingredients for the dishes you know how to prepare? Do you refuse a host's food because it was produced in a damaging and unjust manner? And do you refuse an invitation to brunch because the buses don't run very regularly on a Sunday morning, because a 20-minute ride in the bike trailer in below-freezing weather seems too harsh and long for your 5-year-old, and because no one nearby enough to carpool with is coming to the party? Do you refuse, especially when you have your own car sitting in the driveway, as is almost certainly the case in the United States?

Likely not.

What leads to this sidelining of environmental concern and action is the same thing that manufactures environmental problems to begin with: the *social constitution of daily life*—how we as a human community institute the many structures and motivations that pattern our days, making some actions convenient and immediately sensible and other actions not.[184] Caught in the flow of society, we carry on and carry on and carry on, perhaps pausing when we can to get a view of where we're eventually headed, but in the main just trying to keep afloat, to be sociable, and to get to where we want to go on time. Our lives are guided by the possibilities our social situation presents to us and by our vision of what those possibilities are—that vision itself being guided in particular directions by our social situation. That is to say, it is a matter of the social organization of our material conditions, the ideas we bring to bear upon them, and the practices we therefore enact. Yet the environmental implications of those conditions, ideas, and practices are seldom a prominent part of how we socially constitute our situation. Instead, that constitution typically depends most on a more immediate presence in our lives: other people.

We need, I believe, to consider the environment as an equally immediate (and more social) presence in our lives. That does not mean we need to be always thinking about the environmental consequences of what we do. As an environmental sociologist, I cannot expect this—especially when I don't always think about environmental consequences myself. People have lots and lots of other concerns. Nor should it be necessary to think constantly about environmental consequences. Rather, what is necessary is to think carefully about how we as a community constitute the circumstances in which people make environmentally significant decisions. What is necessary is to create social situations in which people take the environmentally appropriate action, even when, as will often be the case, they are not at that moment consciously considering the environmental consequences of those actions. What is necessary is to reconstitute our situations so what we daily find ourselves doing compromises neither our social nor our environmental lives.

The challenge of environmental sociology is to illuminate the issues such a reconstitution must consider.