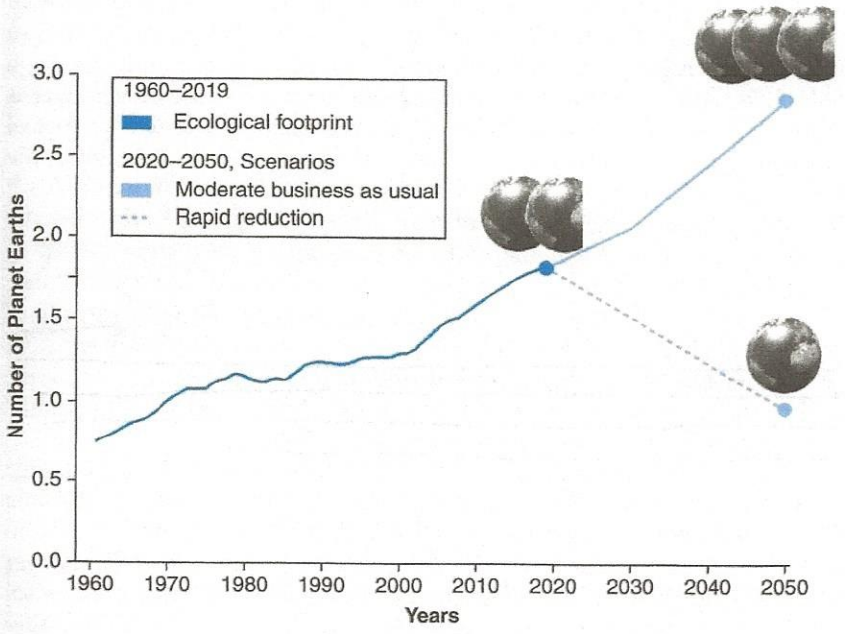
this chapter. In fact, we have more food per capita in the world now than we did in the twentieth century. Plus we lose and waste about a third of what we grow.[89] The UN's Food and Agriculture Organization calculates a vitally important number with a boring name: what it calls the Per Capita Net Production Index, normed at 100 for years 2004 to 2006. In 1994, the index registered 87. As of 2016, the index registered 112—but at huge cost, ecologically, economically, and socially.[90] Can we keep increasing this index? Can we maintain it in the long term? And can we distribute its benefits more justly for humans and nonhumans alike? These are central issues of sustainability—of environmental justice across time—and its implications across social space and species.

Let's face it. We're eating up the world. An increasingly popular way to represent our overconsumption on an ecological scale is ecological footprint analysis, which converts all the demands we make on the Earth's ecosystems to a measure of area. Since about 1975, our collective footprint has been larger than the Earth itself (see Figure 1.6). As of 2019, we are demanding about 1.75 Earths.[91] We are provided with only one. You can't eat your Earth and have it too.

Figure 1.6 Living Beyond Our Means: Global Ecological Footprint, 1961 to 2050



Source: Global Footprint Network (2020).

Unless dramatic steps are taken to reduce consumption, by 2050 humanity will be consuming at a rate of nearly three earths.

The Ozone "Hole"

One of the consequences of how we are eating the Earth is the large "hole" that has appeared in the upper atmosphere ozone layer.

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 up high 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 chlorofluorocarbons (CFCs)—which are also a potent force in climate change—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 dramatically large. 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 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 9 for a sociological discussion about the use of the metaphor of an ozone "hole.") At times, the layer depletes to as low as 25 percent of the levels observed in the 1970s.[92] 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.[93] 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.[94]

Skin cancer rates are growing in the United States too. New cases emerge for about twenty-two people out of every 100,000, as of 2016, versus a rate of around fifteen new cases for every 100,000 in 1999.[95] That's almost a 50 percent increase. Plus it's adjusted for the fact that people tend to live longer now. Why the increase? Lifestyle changes have a lot to do with it. But also, we are seeing significant ozone depletion over the United States too, especially in summer months.[96]

This is scary stuff. But it has galvanized a truculent world into unusually cooperative action.[97] 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 ended throughout the world on December 31, 2010.

There is more good news to report: The ozone hole is no longer increasing. Since 2000, the amount of ozone at the poles has been essentially stable and perhaps now trending down.[98] 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 hydrochlorofluorocarbons (HCFCs) that 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 do not contribute to climate change. Greenfreeze technology now dominates the refrigerator market in Europe and is taking hold in South America, Japan, China, and finally, the United States. Still, 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.[99]

The banning of CFC production and resulting stabilization of the ozone hole 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 like climate change. We know we can because, in the case of CFCs, we have done it.

The Two Kinds of Smog

Less progress, however, has been made on another 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 1.7). Ozone is the principal component of this haze, now 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 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 (VOCs) to produce ozone. (The VOCs themselves are also produced during fossil fuel combustion as well as by off-gassing from drying paint and other 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." More popularly, it is called "brown 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. The 2017 Global Burden of Diseases study, published by the journal *Lancet*, estimated that 472,000 people around the world suffer premature death each year because of ozone pollution.[101] 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.[102] 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

Figure 1.7 Mexico City Disappears in the Smog, Trapped by the Mountains That Surround the City, December 23, 2009

Levels of ground-level ozone that exceed air quality standards occur about half the year in mexico city.[100] But thirty years ago, before a huge cleanup campaign, the figure was more than 300 days a year.

more into their cars and causing even more smog. When it drifts out of the city and into the countryside, the brown smog of ground-level ozone also reduces crop production and damages forests. For example, soybeans suffer a 20 percent loss in yield due to ozone—not an insignificant amount in a hungry world.[103]

And yet there is another form of smog, too—one less recognized but potentially even more dangerous: the "white smog" of particulates in the air, 10 microns or smaller in size. Particularly dangerous are "fine particulates," which are 2.5 microns or smaller in size, much smaller than the diameter of a human hair. The technical term is "PM 2.5." These fine particulates penetrate deeply into lung tissue. In contrast to the brownish color of photochemical smog, particulates envelop cities and suburbs 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.[104] Ammonium and ammonium compounds also contribute significantly to secondary fine-particulate pollution, mainly due to emissions from livestock and fertilizers.

PM 2.5 is not a memorable name, so it's a quiet killer, despite its potency. According to the 2017 Global Burden of Diseases study, 2.94 million people around the world die prematurely each year due to fine particulates.[105] Stop again: That's 2.94 million premature deaths. Another study found that in U.S. cities with the most fine particulates, residents are 15 to 17 percent

more likely to die prematurely.[106] A study in Sydney, Australia, found premature death rates to be double even those of U.S. studies.[107] Children in Los Angeles who live closer to roads have decreased lung capacity, largely because of fine particulates.[108] Fine particulates also increase heart attack rates, 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.[109]

This is serious stuff—really serious stuff. And it's a problem not just for future generations but also for those here right now. Alas, these present consequences are typically quite unequal in their effects across differences in social space—the dimension of environmental justice we turn our focus to now.

respiratory problems are common

Environmental Justice Across Social Space

"It's the worst thing you'd ever want to see: a loved one, lying in that bed, pining away, dying," says Mary Hampton. "Just to sit and look at them, and know you can't do anything about it."[110]

That pain is an everyday experience in Reserve, Louisiana, where the risk of cancer is not just double, not just triple, but fifty times the U.S. national average. Mary's brother used to live next door, but he died of cancer. Another brother's home is on the other side of Mary's. He still lives, but his wife died of cancer. The neighbor across the street died of cancer too.

"Almost every household has somebody that died with cancer or that's battling cancer," reports Mary. These aren't anecdotes. A 2015 report by the U.S. Environmental Protection Agency (EPA) agrees: This is the highest cancer risk town in the United States.

It is also a working-class, and mainly Black, town.

Why is the cancer rate so high? Direct causal connections are pretty much impossible to establish with any kind of cancer. The molecules of toxic chemicals are the tiniest of bullets, even when they are shot out of a very large gun—like the Pontchartrain Works chemical plant, founded by Dow Chemical in 1968. And, yes, it is a smoking gun. The plant's stacks, which loom over Mary's neighborhood, pour out more than fifty toxic chemicals. Chloroprene is likely the most dangerous. The Pontchartrain Works uses it to make neoprene. But how do you track a molecule of chloroprene into Mary's neighbors' lungs, and then into their muscles and tissues, where it disrupts the normal processes of cell growth?

In short, lawyers can argue about the cause. And they do. But Mary and her neighbors can't afford the lawyers that Dow can, or more precisely, that Dow no longer has to afford because it sold the Pontchartrain Works to Denka, a company from Japan, shortly after the EPA report came out and complicated Dow's lawyers' arguments. Who is liable now? Not Dow, it hopes. It doesn't own the plant anymore. Not Denka, it hopes. It's not a U.S. company.

The residents of Reserve aren't giving up. Lydia Gerard lives a few blocks from Mary. In 2018, Lydia's husband died of cancer, but she's still carrying the fight forward. "We can't give up, and we won't," she says. "We have to

continue to let those plants know that we are looking at them. It may not be in my lifetime that anything gets done, but I'm praying that it is."

The experience of the residents of Reserve, Louisiana, is a vivid example of a common worldwide pattern: Those with the least power get the most pollution. Their experience is also an outrage. Black lives matter. This inequity is a call for us all to reckon with another of the three central issues of environmental justice: its frequent and tragic disparities across social space. We say "social space" and not just physical space because these disparities manifest across the many dimensions of differences in social power, such as heritage, gender, sexuality, class, age, and more. These dimensions commonly show up across differences in physical space, like the extreme cancer rates in Reserve. But they may even manifest in differences within one community, one neighborhood, even one household. And the differences in physical space most fundamentally reflect social differences.

Importantly, disparities in environmental justice across social space find expression in the distribution of environmental costs and environmental benefits alike. There is a striking unevenness in both—in the distribution of what might be termed *environmental bads* and *environmental goods*.[111] The well-connected and well-to-do are typically most able to avoid the bad things in our ecological lives, like chloroprene, and to garner the good things, like food, shelter, clean water, and clean air. We all deserve to be protected from the bad things and to gain a healthy measure of the good things. But the socially well-off are almost always also the environmentally well-off.

Who Gets the Bads?

One prominent basis of being well-off is a person's social heritage, as a large number of sociological studies have depressingly documented, and as everyday social experience routinely proves. Within issues of environmental justice across social space, there are special challenges of *environmental racism*—that is, social heritage differences in the distribution of environmental goods and bads due to either intentional or institutional reasons.

Let's consider the bads first, bads like hazardous wastes. Much research in environmental racism has shown that people of color are more likely to live in communities with hazardous waste problems. In 1987, the United Church of Christ's Commission for Racial Justice released the first of two notable reports. Based on studies of zip codes, the reports concluded that Black people and other people of color were two to three times as likely as other people in the United States to live in communities with commercial hazardous waste landfills.[112] A 1992 study found that 3 percent of all white people and 11 percent of all people of color in the Detroit region live within a mile of hazardous waste facilities—a difference of a factor of nearly four.[113]

Findings like these were central to the emergence in the early 1990s of the *environmental justice movement*. Originally a largely grassroots movement of local activists concerned about pollution disparities, environmental justice now has a prominent place on the agenda of most national and international environmental organizations and has grown to become the principal way by which we understand the challenge of all environmental issues, including those that cross time and species as well as those that cross social

space. Environmental justice has become one of the central civil rights issues in the world, helping create a political climate for change.[114]

Environmental disparities across social space are more than racial. Some studies of hazardous waste siting have found that social class predicts who gets the bads better than race does.[115] But within the United States at least, race and income closely correspond and intertwine. To talk about one is largely (but not entirely) to talk about the other.[116] Moreover, and unsurprisingly, the results vary considerably by specific context. Thus, about a third of empirical studies of environmental justice across social space find that race is significant, a third find that class is significant, and a third find that both are significant. Depressingly, they virtually all find evidence of environmental inequality.[117]

For example, they found that Los Angeles schools with high proportions of students of color tend to be located in areas with high levels of airborne toxics (see Figure 1.8).[118] They found that in Florida, people of color face much higher odds that their homes are located near a toxic chemical plant—up to five times higher in some cases.[119] They found that in Michigan, poor people and people of color are more likely to live in areas subjected to the toxic releases registered in the EPA's Toxic Release Inventory.[120] They found that industrial-scale hog farms in Missouri are more likely to be located in counties with lower average income.[121] They found that in Massachusetts, low-income communities experience 8.5 times as many chemical releases from industry as high-income communities and that communities with a high proportion of people of color receive ten times as many releases as communities with a low proportion of people of color.[122] They found that poor people across the United States experience higher levels of ambient and indoor air pollution, worse drinking water quality, and more ambient noise (e.g., from streets and highways) where they live.[123] They found that people of color disproportionately hold the dirtiest and most dangerous jobs in the United States and typically are poorly paid for their sacrifices.[124] These very kinds of exposures likely play a crucial role in why people of color are particularly afflicted by COVID-19—more than triple the rate of whites in some states, in both proportion of cases and rates of death.[125]

But whether along race or class lines or any other dimension of social difference, such biases are a challenge to the environment and justice we all have a right to enjoy.

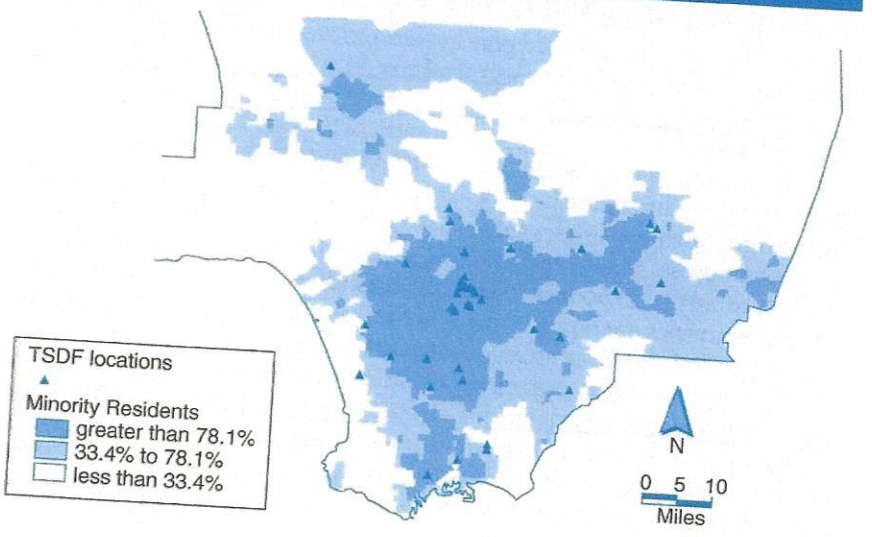
One of those other dimensions of social difference is whether one lives in a rich country or a poor one. Take the hazardous waste crisis, for instance. Wealthy countries are now finding that there is more to disposing of garbage than simply putting it in a can on the curb. One response has been to pay others to take it. We now have a vigorous international trade, much of it illegal, in waste too hazardous for rich countries to dispose of at home. Finding such practices unjust, 186 countries have signed the Basel Convention, which is supposed to control international toxic shipments.[126] (The United States has signed it but not ratified it.) Yet loopholes are large enough and enforcement lax enough that these shipments still go on. Take the 2014 discovery of an illegal toxic waste dump in southern Italy run by the Mafia in cahoots with industrialists looking for a cheap way to dispose of trash. A Mafia insider tipped off officials about a burial site started in the 1990s

that contained millions of tons of waste. Finally, local residents gained an understanding of the causes behind their cancer-borne nickname, "Triangle of Death."[127]

Plus, much that most people regard as environmentally unjust is perfectly legal. Perhaps most glaringly, no international conventions currently stop companies from merely relocating their most hazardous production practices to poorer countries or from purchasing from companies that use the laxer environmental and labor regulations and enforcement in most poorer countries to save on production costs. Like the many companies that buy from the textile, toy, and electronics factories of China, which have so badly polluted the land, water, and people of the "factory to the world." Like the companies that buy from the sweatshops of Southeast Asia, India, Africa, and Latin America. Like Union Carbide, which operated the infamous pesticide plant at Bhopal, India, that killed more than 5,000 people in a single night, due to a chemical leak on December 2, 1984. (See Chapter 2 for the awful story of what happened.) Many of our industrial practices expose workers—generally those on the production line as opposed to those in the head office—to environmental hazards. Exporting hazardous jobs does not lessen the degree of environmental inequality involved, however.

All this seems to take place far away—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

Figure 1.8 Evidence of Environmental Racism



Source: Adapted from Pastor, Sadd, and Hipp (2001).

Sites of toxic releases to the air and percentage minority in los angeles county, based on the federal toxic release inventory.

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 across social space also concerns patterns of inequality in the distribution of environmental goods. These patterns closely reflect inequality in the distribution of wealth and income. In most of the world today, the main way we access environmental benefits is with money. Thus, those who are concerned about environmental justice often point to the huge inequalities in average income, country to country and person to person.

Income Inequality

Let's do the numbers, based on gross national income (GNI) per capita in 2018 in U.S. dollars, beginning with the figures for those on top.[128] The average annual per capita income of economies across the world is $11,098. In contrast, the average annual income in the world's ten wealthiest economies is $70,440. In the United States, it is $62,850. In Switzerland, it is $83,580 per capita. In Monaco, it is $185,741.

With all that income flowing to the top, hardly any is left for those on the bottom. The 10.5 million people of Burundi have the lowest average: just $280 per capita per year. That's 77 cents a day for the average Burundian. The situation is hardly better for the people of the Malawi: just $360, or 99 cents a day. True, the cost of living is unusually low in those countries. That $280 annual income in Burundi buys about what $740 buys in the United States. Still, imagine living on $740 a year—just $14.23 a week.

Moreover, despite the many advances in technology and the change to a more globalized, market-oriented world economy—and some say because of these advances and this change, as Chapters 3 and 4 discuss—income inequality remains severe. As of 2018, the fifth of the world's people living in its richest countries command thirty times as much of the world's income as the fifth of people living in the poorest countries—an average of $37,086 per capita per year versus $1,255 per capita per year. The 20 percent living in the poorest countries receive just 2 percent of the world's income. The good news is that the situation has improved considerably in recent years in the middle income nations. In 2006, the richest fifth commanded fifty-five times as much income as the poorest fifth, but the 60 percent of countries in the middle have seen their economies expand considerably since then. For the poorest, though, there has been little change. Those countries received just 1.5 percent of world income in 2006—hardly different from the 2 percent of world income they get today.[129]

These figures are all based on averages for the populations of whole countries. But there are also substantial levels of income inequality *within* countries. In about half of countries, the income differential between the richest 20 percent and poorest 20 percent within a country is seven to one or less.[130] In many poor and middle-income countries, however, the numbers are far higher. The ratio is twenty-eight to one in South Africa, the world's

most unequal country by this measure. In about ten countries, including Brazil, the ratio is fifteen to one or higher.[131]

Although there is usually less inequality in wealthy countries, some do exceed the world norm of seven to one. In the United States, the ratio is 9.4 to 1.[132] In fact, the United States has the most unequal income distribution of all twenty-six Organisation for Economic Co-operation and Development (OECD) nations, once tax policies are taken into account.[133] The income inequality in the United States is highly stratified by race and gender. The median weekly earnings of Black men in the United States who are employed full time are 75.1 percent of those of white men, and the earnings of Hispanic men are 69.6 percent of those of white men. Black women's and Hispanic women's pay is a bit better—85 percent and 77.7 percent—in comparison to white women. But women in general in the United States earn 79.7 percent as much as men.[134]

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.[135] Today, European countries are all less stratified, in most cases much less so—such as the four-to-one or lower figures for the Scandinavian countries and the five-to-one and six-to-one figures for France, Belgium, Germany, Switzerland, Spain, and the Netherlands. Countries with a Muslim majority typically have exceptionally egalitarian income ratios.[136] The lowest figure in the world is for Azerbaijan, 2.3 to 1.[137]

Inequality within countries means that the thirty-to-one ratio of income between the fifth of people living in the richest countries and the fifth living in the poorest considerably understates the level of global inequality. Consider the ratio if the richest and poorest of the world population from all countries were put together. If we apply the average seven-to-one income ratio of richest fifth to poorest fifth within countries as a rough approximation, we get a world figure of 210 to 1 (see Figure 1.9). And the higher up and lower down you go, the wider the disparities grow. As of 2016, the top 1 percent of the world takes home 20 percent of the world's income, whereas the entire bottom 50 percent takes home only 10 percent.[138]

And with each passing year, the gap gets wider yet. Yes, the world's poor are on the whole doing a bit better in recent years—or were before the spread of COVID-19. Over the period from 1980 to 2016, the poorest 50 percent of the world gained 12 percent of the value of all the economic growth in that period, roughly doubly their incomes. But the top 1 percent gained 27 percent of the fruits of economic growth, and their income more than tripled. The poor got a bit more, but the rich got a lot more.[139]

Consequently, taking the world's population as a whole, the number of poor people is staggering. The World Bank defines "extreme poverty" as living on $1.90 a day or less in terms of local purchasing power.[140] As of 2015, 736 *million* people live in this deplorable condition—about 10 percent of the world's total population.[141] The economic contraction associated with COVID-19 seems certain to send tens of millions more into these dire straits,

7.91 Billion people in World

possibly as many as 80 million more with a 5 percent contraction and 180 million more with a 10 percent contraction, according to a UN estimate.[142]

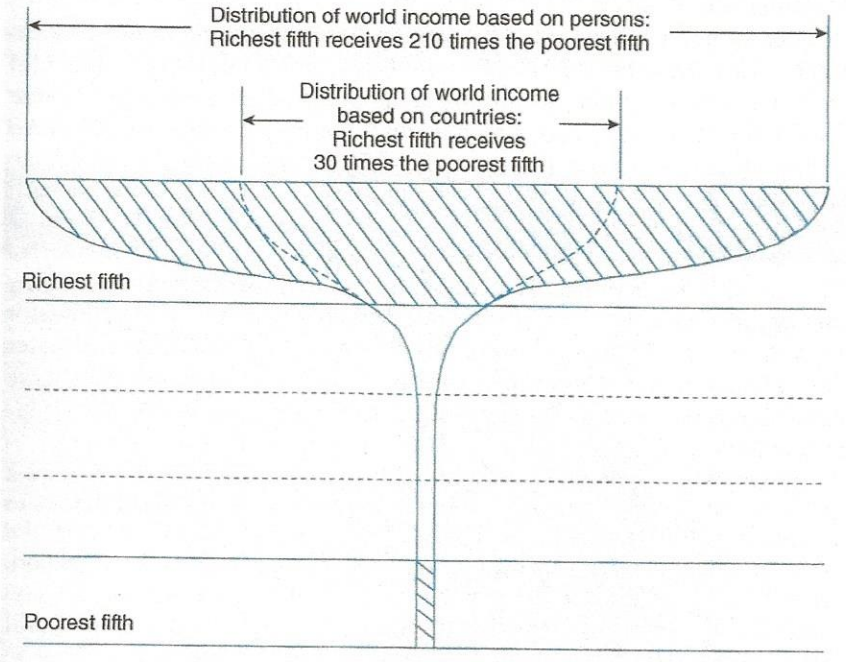
The good news is that there have been substantial improvements. In 1990, a total of 1.895 billion were living on $1.90 a day or less—about 36 percent of the world.[143] But $1.90 a day is a tiny sum, especially in the wealthier nations. That's about $700 a year—barely enough for a single month's rent in most U.S. cities, let alone food or any other necessities. So the World Bank also tabulates rates for two less extreme definitions of poverty: $3.20 a day and $5.50 a day—$1,169 a year and $2,009 a year. As of 2015, 26 percent of the world lives on $3.20 a day or less, and 46 percent live on $5.50 a day or less.[144]

Imagine trying to get by on so little. Billions have to.

Wealth Inequality

Income isn't the same as wealth, though. One's command of riches can come in many forms: savings accounts, land, buildings, possessions, investments,

Figure 1.9 The Champagne Glass of World Income Distribution



Source: Authors' calculations, based on Korten (1995) and World Bank (n.d.).

The fifth of world population from the world's richest countries receives about 30 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 210 to 1 or more.

and more. The discrepancy in distribution of environmental goods gets even more extreme when we calculate it by wealth instead of income because the wealth of the poor is usually pretty much only in the form of income because their assets are so minimal. So try this comparison. The 400 richest people in the United States have a combined wealth of $2.96 trillion as of 2019.[145] That's a lot of money—an awful lot. In fact, it's more than the combined wealth of nearly the poorest two-thirds (64 percent to be exact) of U.S. households.[146] The richest three people in the United States—Jeff Bezos, Warren Buffett, and Bill Gates—have as much wealth of the poorest 50 percent of people in the United States.[147] Three people are as wealthy as 160 million of their fellow citizens combined. Not even feudal lords had it so rich.

As with income inequality, wealth inequality in the United States is highly racialized. The median Black household in the United States has 12 percent as much wealth as the median white household: $15,000 versus $140,000. Moreover, there has been essentially no change in this ratio in fifty years, despite continuing economic growth.[148] Because of inflation, the significance of being a millionaire (as opposed to a billionaire) is much less than it was. Notably, as of 2016, one in seven white households in the United States were millionaires, which is more than double the proportion in 1992. But as of 2016, only one in fifty Black households and only one in forty-four Hispanic households in the United States were millionaires.[149]

Global figures show much the same pattern of extreme wealth concentration. Incredibly, as of 2019, the wealth of just 26 billionaires totals $1.4 trillion, the same amount as the world's poorest half of the world.[150] Pause for a moment. That's twenty-six individuals holding the same wealth as 3.8 billion people. And it's getting worse. In 2014, it took eighty billionaires to sum up to the wealth of the poorest half of the world.[151] We are talking such enormous inequality that it's hard to fully fathom.

As of 2019, the world's richest person is Jeff Bezos, the founder of Amazon, at a staggering $131 billion. Microsoft co-founder Bill Gates, long the world's richest person, is now number two at $96.5 billion. Investor Warren Buffett is number three at $82.5 billion. At least Buffett and Gates are planning to give most of their wealth away and have already given huge sums to charity. Nice. (There's no word yet on what Jeff Bezos plans ultimately to do with it all.)

Meanwhile, Jeff Bezos's dragon's hoard continues to swell—by $22.2 billion in 2018 alone, and growing, with the returns piling up in thanks to a surge in COVID-19 home deliveries.[152] To put that income in scale, the entire 2018 Gross National Income (GNI) of Afghanistan was $20.3 billion, yet one person made more money than all 32 million people in Afghanistan combined. And not just Afghanistan. Eighty-two countries around the world had a lower 2018 GNI than Jeff Bezos's $22.2 billion in gains.

Consumption Inequality

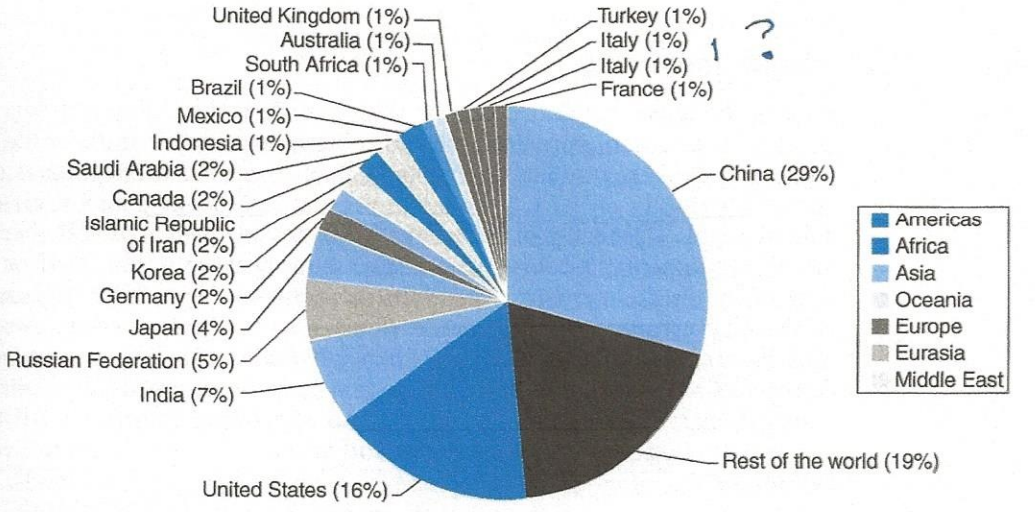
The wealth of the average person in rich countries leads to a substantial global consumption gap. The average person in rich countries consumes three times as much grain, fish, and fresh water; six times as much meat; ten times as much energy and timber; thirteen times as much iron and steel;

and fourteen times as much paper as the average resident of a poor country. And that average person from a rich country uses eighteen times as much in chemicals along the way.[153]

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, take a look at the world's top global contributors to carbon dioxide emissions based on energy consumption (see Figure 1.10).[154] Even though China produces more carbon dioxide emissions in total than the United States, per capita China's emissions are 6.4 metric tons versus the United States' 15.0 tons. 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 noted earlier.

The consumption gap in food is especially significant. The Global Information and Early Warning System of the Food and Agriculture Organization (FAO) regularly reports that thirty or more countries at any one time are in need of external food assistance. As of early 2020, even before COVID-19 began to spread widely, forty-one countries were in need of food. Mostly, those needy countries are in Africa and Asia.[155] In 2018, the FAO estimated that about 822 million people were chronically undernourished, that is, around 10.8 percent of the world.[156] Things were getting a bit better. In the mid-1990s, the chronically malnourished percentage of the world was generally around 13 to 14 percent. But in 2015, the needle got stuck—meaning that the number of hungry people in the world began increasing at the same

Figure 1.10 Each Country's Share of 2016 Total Carbon Dioxide Emissions From the Consumption of Energy



Source: Union of Concerned Scientists (2019).

rate as the population increased. And since COVID-19, reports from around the world suggest that the needle is now moving alarmingly upward.

It wouldn't take all that much to do a whole lot better. An estimate by the World Food Programme in 2014 found that only $3.2 billion is needed to reach 66 million hungry school-age children across the world.[157] That $3.2 billion is only 14 percent of Jeff Bezos's 2018 income. And hunger and malnutrition cause 45 percent of child mortality worldwide.[158] Even if hungry children survive, they often grow up smaller, have trouble learning, and experience lifelong damage to their mental capacities.[159]

Hunger can also exist in conditions of prosperity. Take the United States, for example. Some 11.1 percent of U.S. households experienced *food insecurity* in 2018, 2.7 million of which included children. Here too there are wide racial disparities; rates of food insecurity are 21.2 percent for Black non-Hispanic households in the United States, and 16.2 percent for Hispanic households, versus 8.1 percent (which is quite bad enough) for white non-Hispanic households.[160] As a result, people are forced to reduce the "quality, variety, or desirability" of their diet without necessarily experiencing hunger, according to the U.S. Department of Agriculture (USDA) definition of food insecurity.[161] But some 4.3 percent of U.S. households experienced "very low food security" during the year, meaning they experienced hunger—what the USDA defines as "multiple indications of disrupted eating patterns and reduced food intake."

We do make efforts to respond to these needs. For example, as of 2018, a total of 40.4 million people in the United States were receiving food stamps, or 12 percent of the U.S. population.[162] In that year, the USDA provided 29.7 million schoolchildren with low-cost or free lunches.[163] Wealthy countries also donate food internationally. In 2018, the United States gave $1.7 billion, or about 1.4 million metric tons of food, in food assistance to hungry people overseas—great[164]. True, that's a miniscule fraction—0.04 percent—of the U.S. federal budget, yet it's something. But shouldn't we also address what leads to these dire situations to begin with?

Health Inequality

Among the most crucial of the good things in life is the ability to protect you and your community from the bad things—an ability that the world's poor often find they do not have or only barely have. As of 2014, an estimated 30 percent of the world's urban populations live in slums—over a billion people—generally in shelter that does not adequately protect them from environmental hazards such as rain, snow, heat, cold, filth, and rats and other disease-carrying pests.[165] In sub-Saharan Africa, 61.4 percent of the total urban population lives in slums—slums like Alexandra Township in Johannesburg, South Africa, where 200,000 people live in 7 square kilometers of squalor, sometimes ten people or more crammed into a one-room shack.[166] (Mike works with an urban agriculture project for AIDS orphans in Alexandra.) Moreover, the world's poor are more likely to live on steep slopes prone to landslides and in low-lying areas prone to floods.

Many people have no homes at all, even in the wealthy countries. In the United States, as of January of 2019, 567,715 people are homeless, some 6 percent of whom are youth living on their own.[167] A 2016 study estimated

that 860,000 people in Germany are homeless.[168] Typically, some 5,000 in England are "sleeping rough," with no roof at all.[169] Between 2012 and 2016, one estimate found that more than 13,000 homeless people died on the streets of France.[170]

Sanitation is also crucial to health. But as of 2017, about 2 billion people have no access to toilets and latrines, and for 673 million, their conditions are so limited that they are forced to defecate in the open.[171] And 2 billion people drink water that is contaminated with feces.[172] Half a million children under five die of diarrheal diseases every year, which often result from poor water, inadequate sanitation, and poor hygiene.[173]

It is also possible to have too much of the good things in life. Around the world, 39 percent of adults are overweight—about 2 billion in all. Of that 2 billion, about 650 billion are obese, or 13 percent of all adults, according to WHO.[174] The situation is most severe in the wealthy countries. In the United Kingdom, as of 2017, 64 percent of adults are now overweight, including 28 percent who are obese.[175] The numbers for the United States are even higher, with some 72 percent of all adults being overweight and 40 percent obese as of 2016.[176] Adult obesity in the United States has nearly quadrupled since 1962, and for children age 6 to 11 it has gone up by almost a factor of five.[177] 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 undernutrition and overnutrition can exist side by side in the same population and across the life course in the same person—what epidemiologists call the *double burden of malnutrition*. People need good food to eat, not just lots of food. The double burden exists in rich countries too but is starker in poorer nations. Alongside widespread hunger, weight problems are rising dramatically in less developed countries, 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, nutrient-dense foods less readily available for the poor. Snack foods and soda are widely sold in small shops in even the most remote rural areas, and people increasingly turn to them to relieve an otherwise dull and sparse diet. In North Africa and the Middle East, 58 percent of the population is obese or overweight. In many regions, we also find substantial gender disparities in obesity, as in southern sub-Saharan Africa, where 18.7 of men and 36.7 of women are obese.[178] The problem is particularly pronounced in urban areas. In some cities in China, 20 percent or more are obese.[179] In urban Samoa, as many as 75 percent of adults are obese—not just overweight but obese.[180] 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 wealthy countries typically live nearly two decades longer than those in the poor countries—80.6 years versus 60.8—despite great advances in the availability of medical care.[181] In six poor countries, life expectancy is fifty-five years or less. In Sierra Leone, it is just 52.2 years.[182] In six countries, 10 percent or more won't even make it to age 5.[183] The good news is that in recent

years, the life expectancy gap between rich and poor has closed a good bit. But it remains wide and stark.

Income and wealth, food and health—these are the most basic of benefits we can expect from our environment. Yet people's capabilities to attain them are highly unequal. As Tom Athanasiou has observed, ours is a "divided planet."[184]

Environmental Justice for Everyone

But you don't have to be poor or a person of color to live in a social space with environmental injustice. Many environmental hazards cross social boundaries as they cross bodily ones.

Take the nine people, including journalist Bill Moyers, who in 2003 volunteered to let Mount Sinai Hospital researchers search their bodies for traces of industrial chemicals and pollutants—chemicals that their own bodies did not make. None of the nine had jobs that exposed them to hazardous chemicals in their workplace, and none of them lived near industrial facilities; these were middle-class and upper-class folks. Yet when researchers took blood and urine samples, they found in the volunteers' bodies an average of ninety-one different chemical pollutants. Among these chemicals, the volunteers averaged fifty-three that cause cancer, sixty-two neurotoxins, fifty-three immune system disrupters, fifty-five that cause birth defects or disrupt the body's normal development, and thirty-four that damage hearing. (Many of these chemicals have more than one effect.) Of course, these chemicals were present in only trace amounts, and the researchers used sophisticated equipment to detect them. But they were there. And although this was a comprehensive assessment of individual *body burden*, as toxicologists call it, there were many kinds of common chemical pollutants that the researchers were not able to study. Indeed, some 80,000 chemicals circulate in products on the market in the United States today, and only a few hundred of them have been screened for their safety.[185] So it is likely that ninety-one was a low estimate of the number of trace pollutants.[186]

Can trace amounts sometimes amount to something? Many observers now think unfortunately yes. Increasingly, the leading medical journals are filling up with studies that link environmental chemicals with a host of diseases. Not all the studies show this link. But more and more do. For decades, cancer researchers had estimated that environmental factors account for 2 to 4 percent of all cancers and have attributed most cancer to inheritance and pathogens, matters that are largely unavoidable and therefore apolitical.[187] Then in 2010, the President's Cancer Panel—appointed earlier by President George W. Bush—declared that those low estimates are "woefully out of date" and that "the true burden of environmentally induced cancer has been grossly underestimated."[188] These were controversial statements, and many voices rushed to rebut them, including the American Cancer Society. However, many voices, such as the Science and Environmental Health Network, also rushed to support them.[189]

No matter how socially advantaged you are, you can't run far enough, or build a gated community secure enough, to escape the body burden of industrialism. True, the wealthy and racially privileged are better able to avoid these effects through buying organic food, working cleaner jobs,

and living in less-polluted neighborhoods. For example, poor and minority sections of major cities often experience temperatures on hot days that are as much as 20 degrees higher than the leafier, whiter suburbs—days that climate change has made more frequent.[190] The hotter conditions and higher levels of air pollution are not just unpleasant: They increase rates of premature, underweight, and stillborn children, especially among Black mothers, according to a study published in the *Journal of the American Medical Association*.[191] There is definitely huge inequality in the impact of industrialism's dirty side. But it wouldn't make it just if there were some way to divide the impact equally. Even if everyone suffers from something that is preventable, it is still preventable suffering. Environmental justice is an issue for everyone.

Environmental Justice Across Species

Moreover, environmental justice isn't just something for humans, argue many. It's for us all, human and nonhuman alike.

Some find such a broad concern to be an ethical stretch. Shouldn't we care first and foremost about people, given that we are people? Perhaps so. But even from a human point of view (which, after all, is the only point of view we humans can have), the well-being of other creatures is a concern. It's a concern for us because we depend on ecological relations for our own well-being. And even putting our own interests aside, many humans find it deeply troubling to see other creatures suffer, lose their habitat, and even go extinct. Many think that's just a romantic feeling. But it's a true and widespread human feeling nonetheless.

"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."[192] 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. Leopold's words direct our attention to a sense of a biotic community—to a sense of *ecos*, of home, of the habitat we share with so many others. Understood in this way, environmental justice does indeed concern not only the conditions of human life but also the conditions of the lives of nonhumans. For to talk about a sense of biotic community—what we earlier termed the "biggest community of all"—is to talk about the interdependence of justice for all.

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*.[193] Romantic or not, few humans are unmoved by the wonders of ecology. The forms of our appreciation may differ, but the existence of the pull of ecological beauty seems nearly universal in human experience. The unfathomable complexity of ecology continues to capture even us who live in modern industrialized settings. We are never quite demystified of its charms (see Figure 1.11).

For many, and we include ourselves here, an essential part of beauty is the justice of what we behold. To speak about the beauty of ecology, then, is to speak about every living thing's capacity to have a home, a habitat that is sustainably beautiful and beautifully sustainable.

It's more than just beauty, there's concern that the ecosystem will get off balance & this will affect humans

Figure 1.11 The Beauty of Ecology: Sunrise Over Grenadier Island, St. Lawrence River, 2007

Decline and Loss of Species

And yet, threats to the integrity, stability, and beauty of ecology are manifold. Take the loss of species. For example, of the 11,126 known species of birds, some 14 percent were threatened with extinction as of 2019.[194] Many have already gone, such as the passenger pigeon, the dodo, and the ivory-billed woodpecker. Since 1800, at least 103 have gone extinct.[195] New Zealand has perhaps been the hardest hit. Before people arrived around 1300 CE, New Zealand's birds had no mammalian predators and thus no evolutionary pressure to adapt to them. Since then, half the bird species of the North and South Islands have disappeared, including all eleven species of moa—among them the wondrous *Dinornis robustus* and *Dinornis novaezealandiae*, which grew to 500 pounds and 12 feet tall.[196]

Many of these losses are not just of obscure birds in obscure places. One of the most striking everyday declines is the drastic shrinking of the population of starlings. The bird once often called the "common starling" is no longer so common, having suffered a 66 percent decline in Britain, where it is a native species, and a 49 decline in the United States, where it was introduced in the 1890s.[197] The starling is now even considered to be threatened with extinction in Britain.[198]

Who cares about starlings, especially out of their native range? Whether or not one has experienced the exhilaration of a murmuration of starlings—hundreds or even thousands of birds swooping through the sky in tightly

coordinated, quickly shifting patterns and shapes, like a single organism—it's telling to consider that this once common sight has become rare. The fate of the starling makes it a kind of canary in the mine shaft of industrialism, an indicator of a broader threat. For bird populations are plummeting overall. The sheer number of birds in the United States and Canada is down 29 percent since 1970—some 2.9 billion birds lost.[199] Common birds have declined 14 percent since 1980 in Europe, and farmland birds have declined 57 percent.[200]

Why this loss of birds? There's a lot of debate here, but some scientists point to the alarming evidence of an "insect Armageddon" of vast declines in insect numbers. A 2017 study of nature reserves in Germany found a 76 percent drop in the total biomass of flying insects since monitoring began in 1989.[201] Pesticides and agricultural intensification seems to be the main cause because humans compete with insects for food. That means less food for birds, like starlings, which dote on insects.

The overall decline of insects is another quiet loss of what was once everyday. It used to be a common annoyance of a long car trip in the summer in North America that you would have to periodically stop to scrape a spattered layer of insects off your windshield and scrub your front grill when you arrived. Mike and Loka (the oldest of us four authors) remember doing it a lot years ago. And one still has to from time to time. But these 65- and 70-mile-an-hour insect collection traps—that is, cars—are also showing a significant decline in the biomass they register. Again, why should we care? Isn't it great not to have insect mess all over the front of your car? But what annoys us in the moment is often, like a rain shower, a vital part of what sustains us all long term.

And with these declines come the risk of outright extinction. 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 1.12). As of 2020, the Red List registered 31,030 species as threatened with extinction. In addition to the 14 percent of bird species, extinction is now a real and present possibility for 25 percent of mammal species and 40 percent of amphibians, according to the 2020 Red List.[202] But although the IUCN has reviewed the status of all bird species and about 72 percent of all vertebrate species, little is yet known about the status of invertebrates and plants.

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 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

Figure 1.12 A Leaking Gene Pool: The IUCN Estimated "Red List" of Threatened Species, an Annually Updated Inventory

	Estimated Number of described species[1]	Number of species evaluated by 2020 (IUCN Red List version 2020-1)	% of described species evaluated by 2020 (IUCN Red List version 2020-1)	Number of threatened species[2] by 2020 (IUCN Red List version 2020-1)	Estimated % threatened species in 2019 (IUCN Red List version 2020-1)[2,3,4]		
					Lower estimate (threatened spp. as % of extant evaluated species)	Best estimate (threatened spp. as % of extant data sufficient evaluated species)	Upper estimate (threatened and DD spp. as % of extant evaluated species)
VERTEBRATES							
Mammals[5]	6,495	5,851	90%	1,246	22%	25%	37%
Birds	11,147	11,147	100%	1,486	14%	14%	14%
Reptiles	11,136	7,830	70%	1,408		*Insufficient coverage*	
Amphibians	8,126	6,824	84%	2,202	32%	41%	53%
Fishes	35,423	20,341	57%	2,721		*Insufficient coverage*	
Subtotal	**72,327**	**51,993**	**72%**	**9,063**			
INVERTEBRATES							
Insects	1,053,578	9,425	0.9%	1,759		*Insufficient coverage*	
Molluscs	90,213	8,748	10%	2,250		*Insufficient coverage*	
Crustaceans[6]	80,604	3,181	4%	733		*Insufficient coverage*	
Corals	2,175	864	40%	237		*Insufficient coverage*	
Arachnids	110,615	344	0.31%	197		*Insufficient coverage*	
Velvet Worms	183	11	6%	9		*Insufficient coverage*	
Horseshoe Crabs	4	4	100%	2	50%	100%	100%
Others	164,209	839	0.51%	146		*Insufficient coverage*	
Subtotal	**1,501,581**	**23,416**	**2%**	**5,333**			

PLANTS[7]							
Mosses[8]	21,925	281	1.3%	164		*Insufficient coverage*	
Ferns and Allies[9]	11,800	656	6%	261		*Insufficient coverage*	
Gymnosperms	1,113	1,015	91%	402	40%	40%	42%
Flowering Plants	369,000	38,445	10%	15,624		*Insufficient coverage*	
Green Algae[10]	11,620	13	0.1%	0		*Insufficient coverage*	
Red Algae[10]	7,298	58	0.8%	9		*Insufficient coverage*	
Subtotal	**422,756**	**40,468**	**10%**	**16,460**			
FUNGI & PROTISTS[11]							
Lichens	17,000	30	0.2%	27		*Insufficient coverage*	
Mushrooms, etc.	120,000	255	0.2%	141		*Insufficient coverage*	
Brown Algae[10]	4,275	15	0.4%	6		*Insufficient coverage*	
Subtotal	**141,275**	**300**	**0.2%**	**174**			
TOTAL	**2,137,939**	**116,177**	**5%**	**31,030**			

Source: IUCN (2020).

the Earth's living things. That's why Leakey and Roger Lewin call the current period the "sixth extinction."[203] When we add in the extinction of subspecies and subvarieties, 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 (we'll get to that more in Chapter 9). 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 both a moral issue of justice and an instrumental issue of sustainability for all. 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.

Loss of Landscapes

The loss is not only of forms of life but also of forms of landscape. Take deforestation. The Earth has lost nearly a third of its original area of forestland, as world forest cover has decreased from 45 percent of the Earth's land area to 31 percent as of 2015, the most recent global assessment.[204] Between 1990 and 2015, 7.6 million hectares of forested landscapes were converted to other uses every year. A lot of forest was also replanted—about 4.3 million hectares a year. But that resulted in a net loss of 3.3 million hectares of forest every year. All told over that period, the total amount of forest land declined by 129 million hectares, an area about the size of South Africa and about three times the size of California.[205] Alarmingly, 80 percent of the continuing net loss—some 4 million hectares annually—is of these primary forests with their richness of species and habitat.[206] Only a third of the forests that remain are primary.[207] Replanted forests are poor substitutes for the primary forests 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.

Acid rain is another threat to landscapes, reminding us of the stark consequences for all species when humans live as if the future will not come and as if their ecology is not larger than themselves. 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 plant 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 NOx (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 as 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 survey by the European Union found that 22 percent of all trees in Europe have lost 25 percent or more of their leaves.[208] Conditions are also quite worrisome in much of Canada and in China. One study found defoliation rates as high as 40 percent in some Chinese forests.[209] A 2013 compilation of recent studies calls acid rain a "severe" threat to India, China, and other developing countries.[210]

Efforts to reduce acidifying emissions of sulfur dioxide and NOx have made a great difference in some regions.[211] For example, across a 20,000-square-kilometer area in southern Norway in the 1990s, salmon were virtually wiped out by acid rain. But by 2014, the most recent assessment, reduced emissions and the application of lime to many lakes and rivers had restored healthy water to all but some 7 percent of Norway's area.[212] Deposition rates for sulfate from rain are down considerably in much of the United States. But there are many areas of the country, mostly in the Midwest and Mississippi Valley, that as of 2018 are still receiving more than 5 kilograms per hectare of sulfate from the sky each year—five times more than falls in most of the western United States. A few spots are receiving 10 or more kilograms per hectare of sulphate.[213] Ecologists have established an estimate of the "critical load" of acid pollution that a lake's ecology can tolerate without significant harm. In the late 1980s, acid rain exceeded the critical load in 45 percent of the lakes in New York's Adirondack Mountains. Between 2006 and 2008, the most recent comprehensive assessment, it was still 30 percent—a significant improvement but still pretty high.[214] Unfortunately, the U.S. National Atmospheric Deposition Program has been badly underfunded in recent years, and we don't really know the current situation.

In other words, as far as we know, the situation is encouraging but remains problematic. 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 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.[215] 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.[216]

Loss of Intimacy

Whether humans, or birds, or insects, or trees, species-related losses that shape matters of injustice are not just about life and death. 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. It's another romantic concern, perhaps. But do we want a world without romance? Given the widespread experience of the pull of ecological beauty, apparently not.

Moreover, the loss of quiet intimacy is not merely a philosophical matter. There can be a physical dimension as well. 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 you need 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. Late into the summer night, the air-conditioners 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 printer cranks, 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.

Is it just for us 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 the Earth's surface constantly changes as a result. But geologists now recognize humans to be the most significant erosive force on the planet.[217] 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 we have not covered the question of environmental justice across species in much detail, let us conclude here. After all these pages on the challenges of environmental justice, we're exhausted. Maybe that's the most difficult of the challenges to environmental justice: There are so many of them.

The Social Constitution of Environmental Problems and Solutions

Well, that was all pretty grim. We've got issues, folks, lots of them.

So what do we do? Load up second helpings of fruit salad, coffee cake, scrambled eggs, bread, butter, and maybe some hominy grits, as Mike did at that brunch some years ago? Get used to living with a bit of guilt over your environmental gilt because it's all so big and beyond your control anyway?

Do you refuse to turn on the switch on the electric oven to bake the coffee cake you want to bring to a brunch because the power in your community comes from a nuclear or a coal plant? Do you refuse the food others

bring because the scrambled eggs weren't from free-range hens and because the fruit salad has bananas likely raised on deforested land and picked by laborers poorly protected from pesticides? And do you refuse the invitation to even come to the brunch because the buses don't run regularly on a Sunday morning, because a twenty-minute ride in the bike trailer in below-freezing weather seems too harsh and long for your five-year-old, and because no one nearby enough to carpool with is coming to the meal? The switch is there for the flipping, the food is there for the eating, and that car is there for the driving. Do you refuse them?

Likely not.

So here's some good news—really, really good news. What leads to this sidelining of environmental concern and action is the same thing that can lead to environmental solutions: 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.[218] 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. The environmental justice implications of those conditions, ideas, and practices are seldom a prominent part of how we socially constitute our situation. We have so many other things to worry about, after all.

But that's not necessarily a bad thing.

Let's cut to the quick of it: If it is hard for people to be environmentally just, well, then being environmentally just will be hard. So let's make it easy to be environmentally just. Let's make it cheap, convenient, safe, beautiful, and even fun. Let's make being environmentally just what everyone just does. Let's make it routine, something you don't have to think about amid all the other stresses and concerns of your day because it is built into the pattern of ordinary life. Let's remake the way we do things into what we will term throughout this book *normal environmentalism*—environmentalism you don't have to worry about because you just find yourself doing it anyway. It's simply the normal thing to do—no fuss, no bother, no extra expense, no weird looks. You no longer have to make a fuss for justice because the structure is already there to reduce disparities across time, social space, and species that keep holding back the community of all for all. What's just becomes what's normal.

Like environmentalism in the usual sense, normal environmentalism is walking or taking your bicycle to work. It's using less heating, cooling, construction materials, and water. It's replacing old appliances with energy-efficient ones. It's buying food produced with sustainable production methods and where workers get a fair wage and decent working conditions. Yet normal environmentalism means doing these things not because you've made a conscious decision to be environmentally just today but because these were the cheapest, safest, most convenient, and most enjoyable things

to do. Normal environmentalism is being environmentally good without having to be environmentally good.

We think it is safe to say that normal environmentalism is a lot more likely to be popular with the general public than environmentalism by guilt, cajoling, and shaming.

So how do we get normal environmentalism? How do we induce people to be environmentally good without having to be environmentally good?

By organizing social life so that it encourages environmentally friendly decisions. So it's enjoyable, safe, and convenient to bike to work. So there are frequent buses and centrally located businesses, stores, schools, government offices, restaurants, and places of worship that are easily accessible. So the foods and products we buy are made in ways that do not undermine the well-being of the places and people that made them without having to check the labels and research them online. So everybody is doing things in these ways, and you're not an oddball who makes everyone else uncomfortable by acting on behalf of the planet.

In short, we have to reconstitute the constitution of everyday life.

Normal environmentalism, then, means making environmentalism easy. The trouble is that it is often hard to make things easy. Social reconstitution usually requires a terrific effort. But when we do reconstitute society, we've really done something, something lasting and important—precisely *because* it is so hard to do. If social reconstitution were easy, it probably wouldn't be social reconstitution at all. It can be done. And it is done all the time. But we have to do it. We can become environmental without trying—but only if we try.

What is necessary is to think carefully about how we as a community organize 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 usually be the case, they are not at that moment consciously considering the environmental consequences of those actions. What is necessary is ecological dialogue about how to bring our material circumstances in line with our commitments to all three dimensions of environmental justice, reconstituting our lives so what we daily find ourselves doing compromises neither our social nor our environmental values. What is necessary is to have a truly social ecology.

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