The Shadows of Consumption

Consequences for the Global Environment

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Dying of Consumption

The unequal globalization of the costs of consumption is putting ecosystems and billions of people at risk. Many living within small worlds of prosperity, however, end up seeing more progress than peril around them, pointing to better environmental practices and technologies, to energy-efficient appliances, greener architecture, organic foods. Relatively few in power ever question the side effects of a global political economy producing ever more "new and improved" products—even as threats to just about every ecosystem continue to escalate.

The Darkening Skies

Many natural environments are in crisis.[1] Over half of the world's original forests and wetlands are now gone. The tropical rainforests, wonders of biodiversity, remain under severe threat from loggers and industrial farmers. The tropics are now losing over 13 million hectares (32 million acres) of natural forest every year: Brazil alone is losing over 3 million hectares (7 million acres), while Indonesia is losing nearly 2 million (5 million acres).[2] Meanwhile, the once seemingly infinite oceans now swirl with toxins like mercury. Such pollution has done little to discourage fishing, which persists at levels that are pushing many commercial stocks into collapse. The number of Atlantic bluefin tuna, for example, has fallen by at least 80 percent since 1970.[3] The northern cod off the eastern coast of Canada—whose numbers were so plentiful in the 1600s that sailors could fill a bucket simply by lowering it over the side—is now endangered, its population falling by 99 percent over the last four decades.[4]

Such tales are becoming common across the globe. In its analysis of data on 7,800 species of wild seafood, a 14-person team found worldwide catches of 29 percent of these species are now at least 90 percent

below past averages. Unless measures are taken to curtail harvests, the team predicts a "collapse" of much of the remaining commercial wild seafood before 2050.[5] Another 10-year survey of the global oceans found a 90 percent decline in large predatory fish over the last half century, including cod, flounder, marlin, swordfish, and tuna.[6] Indeed, unless the world changes course, the waters of Ernest Hemingway's *Old Man and the Sea* will soon be empty of the fighting marlin, an outcome arising, not from the heroics of men like Hemingway's old man Santiago, but from industrial fishing boats plying the oceans to feed global markets.

Land and freshwater resources are also under great ecological pressures from human activities. The fate of the Aral Sea illustrates the magnitude of some of these changes: once the world's fourth largest lake, it shrank by half in just three decades as its inflows were diverted to agriculture and hydroelectricity, leaving it as salty as an ocean by the early 1990s. Demand from agriculture, industry, and individuals is continuing to deplete scarce water resources elsewhere, too. Over a billion people are now struggling to survive without access to clean water, and current trends suggest billions more will live with severe water shortages within a few decades.

Changes like these are contributing to the death of between 50 and 150 species every day. Many are microscopic, deep in oceans and forests, and still beyond the reach of scientific cataloguers trying to deal with the estimated 5–30 million species of life on earth. Yet even macroscopic plant and animal species are going extinct, at an average rate 50–100 times higher than the natural one (assuming an average life span of 5–10 million years for a species)—over 1,000 since the beginning of the seventeenth century. The Worldwatch Institute believes the planet is now "in the midst of the biggest wave of animal extinctions since the dinosaurs disappeared 65 million years ago."[7]

The exponential growth in consumption is also saturating the global environment with chemicals. Some, like DDT to kill mosquitoes that spread malaria, save millions of lives every year. Yet these "useful" chemicals are also contaminating ecosystems and poisoning people. Some 75,000 chemicals are registered in the United States alone, yet, of these, scientists have tested the carcinogenicity of only 1,500 (or 2 percent). They know even less about the toxicity of the 11,000 commercial organochlorines or the thousands of accidental—and often unknown—chemical by-products.[8]

One of the greatest sources of chemicals is agriculture. Over the last half century, farmers have come to rely more and more on pesticides and

fertilizers. American farmers, for example, were using 50 million pounds of pesticides per year in the 1940s. By the end of the 1970s, it was over 800 million pounds. Globally, from 1961 to 1999, the use of pesticides went up more than 800 percent. In the same period, the use of nitrogenous fertilizers went up more than 600 percent; that of phosphate fertilizers, more than 200 percent.[9] Such growth in the use of chemicals has most likely played a part in the rising rates of diseases like cancer, but few governments or firms seem eager to investigate the environmental sources of such diseases, focusing instead on diagnosis, treatment, and cures.

Climate change is perhaps the greatest environmental threat of all.[10] In a 700-page report commissioned by Britain's chancellor of the exchequer, former chief economist of the World Bank Nicholas Stern put the potential economic and social disruption of global climate change on a par with that of both World Wars and the Great Depression combined.[11] Just about every aspect of modern consumer life—manufacturing, traveling, heating, cooling, burning, eating—is producing greenhouse gases, notably carbon dioxide, methane, and nitrous oxide. Deforestation is releasing carbon dioxide, too, and now accounts for 25 percent of anthropogenic emissions of carbon dioxide. As a result of all of these activities, total carbon dioxide emissions increased twelvefold over the twentieth century.[12] In the twenty-first century, the rate of increase for carbon dioxide emissions from burning fossil fuels and making cement has more than doubled, from an average of 1.3 percent per year in the 1990s to 3.3 percent per year from 2000 to 2006. The jump in carbon dioxide emissions from 2000 to 2006, according to a study published in the *Proceedings of the National Academy of Sciences*, was the fastest rate of increase over a seven-year period since modern records began at the end of the 1950s. The concentration of carbon dioxide in the atmosphere is now over 380 parts per million—the highest level in at least 650,000 years (and perhaps the highest in 20 million years).[13]

Greenhouse gases, with global emission rates now over 70 percent higher than in 1970, are warming the planet.[14] The earth's average surface temperature rose by about 0.6 degrees Celsius (1.1 degrees Fahrenheit) over the twentieth century. This may not seem like much. Yet it made the twentieth century the warmest one of the last millennium. One obvious sign of global warming is the melting polar ice caps, which have been shrinking by about 9 percent every decade since 1979. Another is the recent melting of the 11,000-year-old permafrost in western Siberia. And the problem of rising temperatures seems to be

worsening. The 1990s was the warmest decade and 2005 the warmest year over at least the last century. Records were broken in just about every year of the last decade. Tied as the second and third warmest years of all time were 2007 and 1998 (a year with a strong El Niño); the fourth warmest was 2002 (a year with a weak El Niño), followed by 2003 and 2006.[15]

The twenty-first century will likely be even warmer. Six scenarios by the United Nations Intergovernmental Panel on Climate Change (released in 2007) show a likely rise in the average worldwide surface temperature over the next century of another 1.1–6.4 degrees Celsius (2.0–11.5 degrees Fahrenheit) from the 1980–1999 average—with best estimates pointing to the fastest rate of change for at least the last 10,000 years. A rise of 3–5 degrees Celsius (5.5–9 degrees Fahrenheit) would, according to NASA's Drew Shindell, "bring us up to the warmest temperatures the world has experienced probably in the last million years."[16]

The future may see even warmer temperatures, however, if the process reaches a "tipping point."[17] Some scientists now worry that global warming is diminishing the capacity of the earth's "sinks" (land, forests, and oceans) to absorb or retain greenhouse gases. Two examples of the latter are in the Antarctic Ocean, where stronger winds linked to warmer temperatures are now churning up waters rich in carbon dioxide, and in Siberia, where the melting permafrost is releasing methane, a gas with 20 times the greenhouse effect of carbon dioxide. A warmer world means more of this permafrost will melt, which will release more methane, which will raise temperatures, which will melt more permafrost. This self-reinforcing feedback could release around 49 billion metric tons of methane (nearly one-sixth of all of the world's methane stored on land) from the northeast Siberian ice complex alone.[18] Other self-reinforcing feedbacks could further accelerate warming.

Warmer temperatures will have many unpredictable and uneven consequences. Wind, rain, and snow patterns will change, with some places becoming hotter and some colder. Rising oceans will engulf low-lying islands. Droughts will disrupt agricultural yields, especially in places like Africa. Severe weather—hurricanes, tornados, hailstorms, droughts—will occur more frequently and with greater intensity. Although the world is unlikely to see the next ice age charge down the streets of New York City like a giant grizzly bear, as it does in the 2004 movie *The Day After Tomorrow*, global warming will be catastrophic for many species. A temperature rise of just 0.8–2.0 degrees Celsius (1.4–3.6 degrees Fahrenheit), for example, could "commit" 18–35 percent of plant

and animal species to extinction by 2050. Other factors, like higher concentrations of carbon dioxide, could lead to even higher rates of extinction.[19]

Changes to the global environment are already harming billions of people, from the Inuit in the Arctic to the Penan of Sarawak to the Brazilians of Rio de Janeiro. One example is the more than 10 million children under the age of five who are dying every year from preventable and treatable causes, with unhealthy environments contributing to almost half of these deaths.

Just as disturbing, many of us are being exposed to health risks as firms experiment on consumers with a rush of new products. The international legal community rightly applauds its success in phasing out chemicals like chlorofluorocarbons (CFCs). But what about the thousands of other chemical "discoveries" now in our food, air, and water? What will happen when these chemicals combine? Some of the chemicals will prove harmless. But some will prove harmful and some even deadly. Scientists are testing, arguing, and analyzing, as are firms, activists, and government agencies. As with CFCs, it will take years, perhaps decades, to see the full consequences of introducing these chemicals into our environments.

Examples of substances with the potential to harm ecosystems—and thus human health—seem to trickle into the daily press in a steady flow. Some are the result of an activist group or reporter sensationalizing a story. But many arise from scientific tests producing truly worrisome results. As the next section shows, current debates over the use of PBDEs in furnishings and electronic devices call to mind those of decades past over the use of DDT around the home to keep mosquitoes at bay.

Consuming Risks

The DDT, PCBs, and CFCs of today include chemicals like PBDEs (polybrominated diphenyl ethers). For over three decades, firms have put PBDEs into household and office items (mattresses, pillows, rugs, curtains, carpet padding, TVs, computers) as flame retardants. These chemicals were heralded as a great advance in consumer safety in the 1970s, able to prevent a TV from bursting into flame or slow a fire in a mattress. Back then, chemists and medical specialists could see few reasons to worry about putting PBDEs inside hard plastics or soft foams. These were only toxic in large quantities; besides, there was no reason to expect they wouldn't remain safely inside a product.

Swedish scientists set off alarms in the late 1990s after discovering that concentrations of PBDEs in human breast milk were rising in some populations. Soon it was clear these chemicals were migrating from consumer products into humans—not, it seems, primarily through food chains as with other persistent organic pollutants like dioxins or PCBs, but by collecting in home environments, especially in indoor air and household dust.[20] Recent tests show U.S. residents now have the highest levels of PBDEs in the world (followed by Canadians). Residents of North America, on average, have 10–70 times higher PBDE levels than residents of Japan or Europe. Some individuals—between 5 and 10 percent of the North American population—appear to have absorbed especially large quantities, perhaps because of exposure to crumbling foam in mattresses and furniture, or perhaps because of exposure to dust as crawling babies. Tests of breast milk, tissue, and blood show these individuals have levels of PBDEs around 1,000 times higher than those with low readings.

In laboratory experiments, such high levels cause symptoms in animals similar to those of hyperactivity and attention deficit in children. PBDEs appear to lower sperm counts as well. Although their chemical structure resembles that of PCBs (some would call them "chemical cousins"), medical researchers are focusing on the unique qualities of PBDEs, which appear to mimic and interfere with human hormones (such as thyroid hormones). Some specialists now think that, unlike typical toxic chemicals, PBDEs may damage the brain in only trace amounts—which doctors would have thought inconsequential in the past—provided exposure occurs at a critical juncture in growth. Recent experiments to test the effect of trace amounts of PBDEs—amounts already present in some humans—found permanent brain damage in rats and mice.

Over the last decade, European governments have taken steps to eliminate two particularly worrisome formulations of PBDEs: those commonly used in mattresses, on the one hand, and in computer housings and monitors (representing about 15 percent of the global market for PBDEs in 2001), on the other. A number of states in the United States have done the same. The Environmental Protection Agency (EPA) has managed to encourage some of the major producers of PBDEs to phase out these two formulations voluntarily. Some manufacturing and retail firms are also taking steps to stop using PBDEs. The Swedish home furnishing company IKEA was one of the first firms to remove them from its products. The U.S. computer company Dell and the Swedish automaker Volvo are examples of firms now working toward eliminating some of the worst formulations of PBDEs.[21]

The latest research findings on the role of pesticides and herbicides in neurodegenerative illnesses are just as alarming as those on PBDEs. In a 2006 epidemiological analysis of the 143,000 participants in an ongoing study by the American Cancer Society, for example, researchers found those regularly exposed to low doses of pesticides and herbicides—such as gardeners, farmers, ranchers, and fishers—had a 70 percent higher incidence of Parkinson's disease than those not so exposed.[22]

Perfluorochemicals are another family of chemicals with worrisome properties for the health of consumers. Researchers are focusing on two members of this family: perfluorooctanoic acid (PFOA) and perfluorooctanyl sulfonate (PFOS). Virtually indestructible, they are used to make Teflon pots and pans nonstick and to make rugs, couches, and raincoats grease-resistant, stain-resistant, and waterproof. You can also find them in pizza boxes, microwave popcorn bags, fast-food burger wrappers, and French-fry containers, as well as in nail polishes and shaving creams.

PFOA and PFOS are migrating (exactly how is still unclear) from consumer goods into the environment and into humans, where, like lead, PBDEs, and pesticides, they are appearing in detectable quantities. Again, as with these other chemicals, an increasing number of doctors now see exposure to low doses over long periods as a potential health threat, especially for children. Recent laboratory tests of PFOA on animals, for example, have found links to low birth weights, damage to thyroid glands, changes in male reproductive hormones, breast cancer, and liver cancer. As tests in the United States and other countries find PFOA and PFOS in some children at levels above those causing measurable harm in laboratory animals, more and more health and environmental specialists are becoming alarmed.[23]

Such findings are particularly disturbing because natural biological processes do not appear to ever break these chemicals down into less harmful substances, as they do with chemicals like DDT. Richard Wiles, vice president of the nongovernmental Environmental Working Group, calls them "the DDT of this millennium," but with much higher stakes because they "last forever." Although humans appear able to excrete PFOA over a period of several decades, still, the wonder chemical that nothing can stick to, seems able to stick to living things long enough for tiny quantities to bioaccumulate until toxic.

DuPont insists its Teflon pots and frying pans are safe if consumers use them properly. Manufacturers use PFOA to produce Teflon, corporate brochures explain, but it's not an "ingredient" in the Teflon itself. David Boothe, DuPont's global manager for products like Teflon,

explains: "When you're using the cookware as it's intended to be used, at the temperatures it's intended to be used, it's perfectly safe."

Many companies—even DuPont—are nevertheless beginning to give up on these chemicals. The first to do so was the U.S. technology firm Minnesota Mining and Manufacturing (called 3M since 2002), when in May 2000, after four decades of production, it began phasing out PFOS from the popular brand Scotchgard. It took steps as well to stop producing PFOA. On the same day 3M made these announcements, the EPA informed governments worldwide of animal tests showing that PFOS "appears to combine persistence, bioaccumulation and toxicity properties to an extraordinary degree." Since 2000, a few other firms have been following 3M's lead in voluntarily reducing use, such as the fast-food chain McDonald's, which no longer uses wrappers containing perfluorochemicals.[24]

Some governments are also now beginning to push firms harder to get rid of PFOA. Both Canada and the United States, for example, began initiating phasedowns and safety reviews of PFOA in 2006. The EPA reached a deal in early 2006 with DuPont and seven other manufacturers to reduce PFOA emissions from their U.S. facilities and PFOA in their products by 95 percent by 2010, with the goal of completely eliminating them by 2015. DuPont took swift measures, cutting back PFOA production by 95 percent in 2006.

Safety reviews of hundreds of other chemicals in widespread use are also now occurring across much of the developed world. On that list is bisphenol A (BPA), a synthetic petrochemical and a main ingredient in polycarbonate plastics and resins. Volumes have been growing steadily since the 1950s—with major producers including Bayer, Dow Chemical, GE Plastics, and Sunoco—and it's now one of the world's most common chemicals in production. Hard, clear plastic water and baby bottles contain bisphenol A. So do compact disks, sports helmets, microwavable plastics, dental sealants, and the lining of many tin cans. Like so many other chemicals, trace amounts of bisphenol A are migrating into the environment and into people. Scientists have known since the 1930s that it can mimic the female hormone estrogen. Still, the scientific consensus for much of the twentieth century was solid: the level of exposure was low and thus posed no danger to health.

Hundreds of experiments over the last decade, however, have found possible links between bisphenol A and prostate cancer, diabetes, low sperm counts, and the early onset of puberty. The converging findings of much of this research challenge a commonsense tenet of toxicology

going back to at least the fifteenth century: that a higher dose equals *more* harm. An increasing number of scientists are coming to conclude that trace amounts of bisphenol A, which the body treats as a hormone (turning on receptors in cells), may in fact cause more harm than larger quantities, which the body treats as a poison (causing receptors to overload and stop functioning). Class action lawsuits are just beginning to draw on this research. The first was against five manufacturers of baby bottles, filed in Los Angeles in March 2007. Cases like this one will raise further questions about the safety of numerous other consumer products containing chemicals that can disrupt hormonal systems.

Efforts to phase out chemicals like PBDEs, PFOA, and BPA will no doubt take considerable time. Manufacturers like DuPont will continue to insist on "science-based approaches" (including funding research). Litigation will drag on, as firms file appeals and countersuits. And the progress across different jurisdictions will inevitably be uneven as these same firms shuffle risk overseas to keep sales and profits healthy. Steven Hentges of the American Plastics Council sounds no different today than most of the other corporate spokespeople of the last century: "BPA is not a risk to human health at the extremely low levels at which people might be exposed from use of, for example, polycarbonate plastic." The reaction of scientists sounds equally familiar. Biology professor Frederick vom Saal, a specialist on hormones and synthetic chemicals, responds: "The chemical companies think they can lie with impunity about the published scientific literature."[25]

Meanwhile, as these debates rage, other chemicals with other side effects, by themselves and in combinations, are entering the global marketplace, adding further to the total ecological burden, with unpredictable consequences for human and environmental health. Clearly, particular chemicals and combinations of chemicals are harming the health of some people, although the pathways of causality are so complex it's impossible to determine precisely how and to what extent. Still, a glance at global cancer rates reveals some disquieting trends.

A Shadow of Cancer?

Could the annual worldwide use of 400 million metric tons of chemicals in part explain the rising cancer rates? What about other environmental changes like ozone depletion, air and water pollution, or climate change? Or factors like the increasing consumption of processed and fast food? Globally, around eight million die every year from cancer—a figure the

World Health Organization predicts will increase to more than 10 million over the next two decades (with more than 15 million new patients a year). It remains, in the prophetic words of French surgeon Stanislas Tanchou in 1843, a "disease of civilization."

Cancer is now the second most common cause of death in the developed world, after cardiovascular disease. Cancer rates in the United States, even after adjusting for longer life expectancies and excluding lung cancer, have been rising steadily (several studies put the increase at around 35 percent since the 1950s).[26] Cancer is now responsible for almost one-quarter of all deaths in the United States. The American Cancer Society estimates the lifetime chance of getting cancer in the United States at nearly one in two for men and just over one in three for women.

Why are cancer rates rising? The reasons are complex: eating habits, exercise choices, ever better diagnostic techniques. It's certainly simplistic to blame chemicals or power lines or pollution alone. Still, it seems sensible to worry about the thousands of recent laboratory results linking cancer in animals to chemicals common in consumer products (from shampoo to gasoline to French fries), drinking water, and air (both indoor and outdoor).[27] I find it just as sensible—even without scientific proof of causality—to worry about the brews of environmental toxins scientists are now finding in the bloodstreams of many people.

How can consumers avoid exposure to chemicals with potentially deadly effects? There's only one way, Ana Soto of Tufts University School of Medicine wryly explains: "Don't eat, don't drink, and don't breathe."[28]

Mapping Ecological Shadows

At the start of the twentieth century, average life expectancy was 30. Today, it's over 66, and just listing all of the medical advances of the last 100 years—antibiotics, obstetrics, heart transplants, pasteurization, vaccines—could fill a book. Still, this does not excuse governments and companies for failing to do more to protect consumers and ecosystems. But to understand what action must be taken, we need to map particular shadows of consumption in detail—to learn how they are affecting us and *why* they are advancing or receding.

Chapters 3–22 do this by analyzing the evolution of how automobiles, gasoline, refrigerators, beef, and seals have been made, raised, or hunted and how they have been consumed. The chapters cover diverse

geographies, eras, sectors, governance structures, and political economies (from low-end natural resource extraction in the seventeenth century to high-end manufacturing in the twenty-first century). Without doubt, however, even this wide-ranging set of cases does not exhaust the nuances of change occurring in the thousands of political economies of consumption. Analyzing other consumer goods, from coffee, bananas, sugar, and tea to whales, elephants, tigers, and pigs would help shed light on some of those nuances. So would analyzing sectors like fisheries, forestry, and mining or issues like biodiversity, pesticides, coal, hazardous waste, and persistent organic pollutants.[29] Still, the five cases that follow survey enough ground in enough depth to reveal the consistent forces of environmental change and the consequences of ecological shadows.

In every case, environmental management is improving some matters, for example, the efficiency of resource use, production processes, per unit impacts, and recycling. Such improvements are occurring for many reasons. Education is altering societal values; more consumers are recycling goods (such as newspapers and bottles) and conserving energy (such as household electricity); norms among some consumers are evolving (such as forgoing a fur coat for moral or environmental reasons); and eco-labeling programs (such as for timber and seafood) and eco-markets (such as for organic beef) are expanding. New technologies (such as catalytic converters for cars or cooling systems for refrigerators) and more efficient production (such as just-in-time assembly lines) are also reducing impacts. Corporate jockeying for market shares and profits and, to a lesser extent, policies like corporate social responsibility are also advancing environmental efficiencies (particularly for higher-end manufacturing sectors like automobiles and refrigerators). Many other forces are shifting ecological shadows, too. Government regulations—not just for the environment, but also for trade and investment—play a key role. So do pressures from nongovernmental organizations like Greenpeace or the WWF (World Wildlife Fund / World Wide Fund for Nature), international agreements to prevent ozone depletion or protect endangered species, and international aid from organizations like the World Bank and Global Environment Facility.

The evidence from this book's five cases is unequivocal: ecological shadows *do* shift, wane, even fade away. But all five also reveal that the *incremental* advances under today's current forms of environmental management are failing to prevent irreparable damage to the global environment. The cumulative progress is not keeping pace with the impact of rising consumption in a globalizing economy of ever more

economic growth and ever more people. Across all of the cases, short-term economic and political factors tend to slow the speed of change. This does not mean a particular pattern of consumption in a particular location never changes appreciably for political, scientific, legal, economic, environmental, or health reasons. There are in fact countless examples arising from consumer boycotts, scientific discoveries, government bans, market crashes, and corporate bankruptcies. On occasion, a sudden change in one location even sets off a chain reaction producing better environmental management worldwide.

Still, stepping back reveals a *global* process of change that is failing to stop the environmental crisis from escalating. It also reveals that many "environmental advances" are permitting—and sometimes even causing—shadows of consumption to intensify. This process of change can also reinforce the tendency of global trade, multinational corporations, and global financing to deflect environmental costs to places and people with less economic and political power and less capacity to adapt, on the one hand, and to transfer benefits to consumers with more political and economic power, on the other.

Such a process of change, as the five cases will document in detail, has many damaging consequences. It tends to aggravate inequalities across and within states, with some people awash in excess and others bereft of the necessities to survive. It tends to allow multinational companies to expand sales in poorer countries during a phasedown of "suspect" products in wealthier ones. It tends to make it difficult to track and assign responsibility, leaving states and firms and consumers less accountable for environmental damage. It tends to expose future generations to health risks as firms pursue profits and states pursue economic growth. And it tends to cause unpredictable spillover effects across time and ecosystems.

As with lead poisoning, the thinning of the ozone layer, climate change, and rising cancer rates, the consequences of consumption can take decades, even generations, to develop. The five cases show that policy makers need to address consequences having no clean lines of causality and to take precautionary steps against effects flowing through complex systems with unpredictable outcomes. The cases also show that states should *not* assume that free trade and capitalism will significantly diminish ecological shadows, much less do away with them. Rather, international rules and institutions need to guide globalization to prevent double standards for multinational corporations, to tighten controls over the ecological impacts of trade, and to ensure that global financing supports

sustainability. They show that consumers need to act locally and governments globally—at the same time. And, finally, they show that environmentalism needs to be transformed to promote more balanced personal consumption and a more balanced global political economy.

Let's turn now to the first case—the automobile—arguably, the most harmful consumer product ever for people's health and safety and for the stability of the earth's environment, yet one under relatively few international controls.