

ALSO BY JARED DIAMOND

Guns, Germs, and Steel

Why Is Sex Fun?

The Third Chimpanzee

COLLAPSE

**HOW SOCIETIES CHOOSE
TO FAIL OR SUCCEED**



JARED DIAMOND

VIKING

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To

Jack and Ann Hirschy,

Jill Hirschy Eliel and John Eliel,

Joyce Hirschy McDowell,

Dick (1929–2003) and Margy Hirschy,

and their fellow Montanans:

guardians of Montana's big sky

I met a traveler from an antique land
Who said: "Two vast and trunkless legs of stone
Stand in the desert. Near them, on the sand,
Half sunk, a shattered visage lies, whose frown,
And wrinkled lip and sneer of cold command,
Tell that its sculptor well those passions read,
Which yet survive, stamp'd on these lifeless things,
The hand that mockt them and the heart that fed:
And on the pedestal these words appear:
'My name is Ozymandias, king of kings:
Look on my works, ye Mighty, and despair!
Nothing beside remains. Round the decay
Of that colossal wreck, boundless and bare
The lone and level sands stretch far away."

"Ozymandias," by Percy Bysshe Shelley (1817)

PROLOGUE

A Tale of Two Farms

**Two farms ■ Collapses, past and present ■ Vanished Edens? ■
A five-point framework ■ Businesses and the environment ■
The comparative method ■ Plan of the book ■**

A few summers ago I visited two dairy farms, Huls Farm and Gardar Farm, which despite being located thousands of miles apart were still remarkably similar in their strengths and vulnerabilities. Both were by far the largest, most prosperous, most technologically advanced farms in their respective districts. In particular, each was centered around a magnificent state-of-the-art barn for sheltering and milking cows. Those structures, both neatly divided into opposite-facing rows of cow stalls, dwarfed all other barns in the district. Both farms let their cows graze outdoors in lush pastures during the summer, produced their own hay to harvest in the late summer for feeding the cows through the winter, and increased their production of summer fodder and winter hay by irrigating their fields. The two farms were similar in area (a few square miles) and in barn size, Huls barn holding somewhat more cows than Gardar barn (200 vs. 165 cows, respectively). The owners of both farms were viewed as leaders of their respective societies. Both owners were deeply religious. Both farms were located in gorgeous natural settings that attract tourists from afar, with backdrops of high snow-capped mountains drained by streams teeming with fish, and sloping down to a famous river (below Huls Farm) or fjord (below Gardar Farm).

Those were the shared strengths of the two farms. As for their shared vulnerabilities, both lay in districts economically marginal for dairying, because their high northern latitudes meant a short summer growing season in which to produce pasture grass and hay. Because the climate was thus suboptimal even in good years, compared to dairy farms at lower latitudes, both farms were susceptible to being harmed by climate change, with drought or cold being the main concerns in the districts of Huls Farm or Gardar Farm respectively. Both districts lay far from population centers to which they could market their products, so that transportation costs and

hazards placed them at a competitive disadvantage compared to more centrally located districts. The economies of both farms were hostage to forces beyond their owners' control, such as the changing affluence and tastes of their customers and neighbors. On a larger scale, the economies of the countries in which both farms lay rose and fell with the waxing and waning of threats from distant enemy societies.

The biggest difference between Huls Farm and Gardar Farm is in their current status. Huls Farm, a family enterprise owned by five siblings and their spouses in the Bitterroot Valley of the western U.S. state of Montana, is currently prospering, while Ravalli County in which Huls Farm lies boasts one of the highest population growth rates of any American county. Tim, Trudy, and Dan Huls, who are among Huls Farm's owners, personally took me on a tour of their high-tech new barn, and patiently explained to me the attractions and vicissitudes of dairy farming in Montana. It is inconceivable that the United States in general, and Huls Farm in particular, will collapse in the foreseeable future. But Gardar Farm, the former manor farm of the Norse bishop of southwestern Greenland, was abandoned over 500 years ago. Greenland Norse society collapsed completely: its thousands of inhabitants starved to death, were killed in civil unrest or in war against an enemy, or emigrated, until nobody remained alive. While the strongly built stone walls of Gardar barn and nearby Gardar Cathedral are still standing, so that I was able to count the individual cow stalls, there is no owner to tell me today of Gardar's former attractions and vicissitudes. Yet when Gardar Farm and Norse Greenland were at their peak, their decline seemed as inconceivable as does the decline of Huls Farm and the U.S. today.

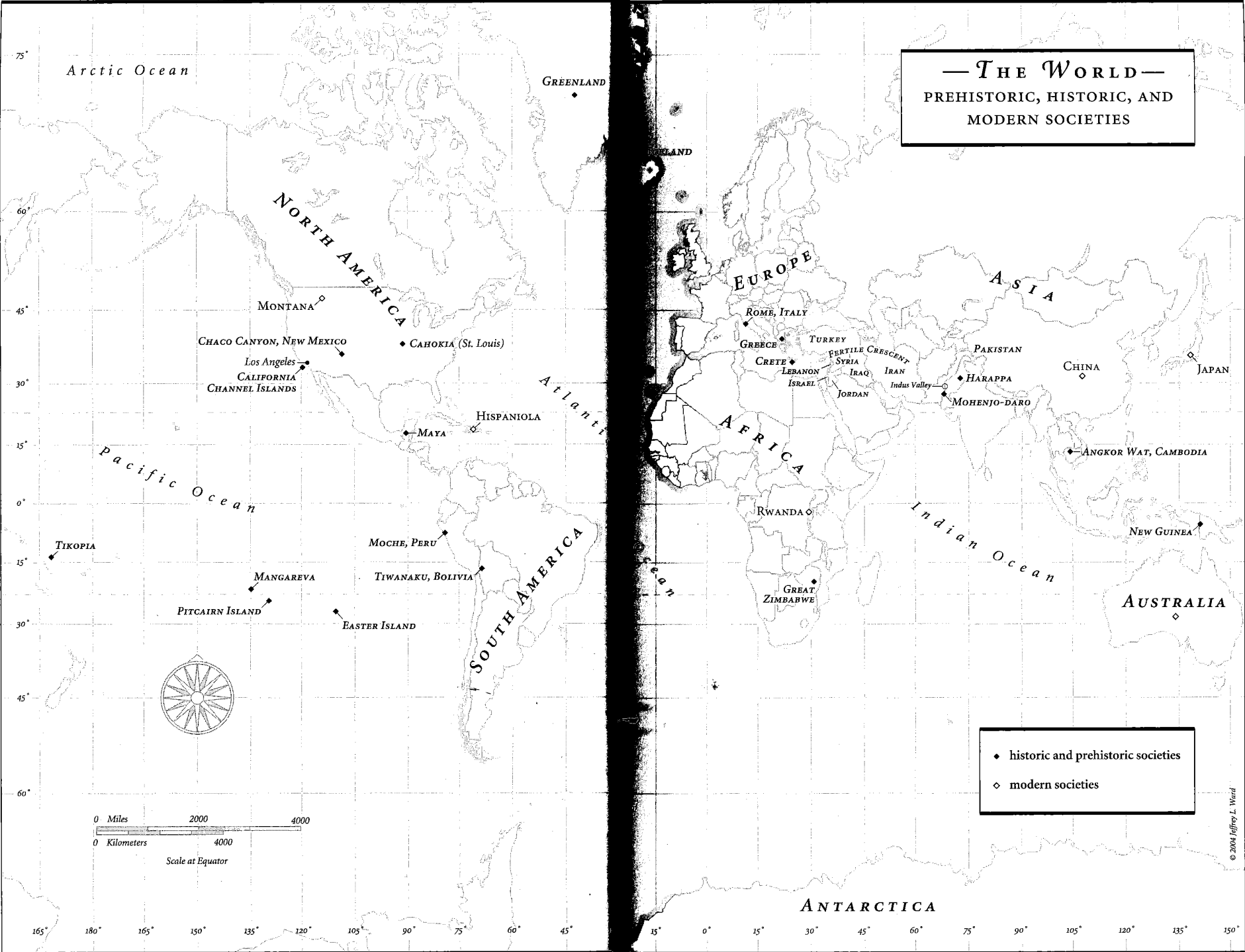
Let me make clear: in drawing these parallels between Huls and Gardar Farms, I am not claiming that Huls Farm and American society are doomed to decline. At present, the truth is quite the opposite: Huls Farm is in the process of expanding, its advanced new technology is being studied for adoption by neighboring farms, and the United States is now the most powerful country in the world. Nor am I claiming that farms or societies in general are prone to collapse: while some have indeed collapsed like Gardar, others have survived uninterruptedly for thousands of years. Instead, my trips to Huls and Gardar Farms, thousands of miles apart but visited during the same summer, vividly brought home to me the conclusion that even the richest, technologically most advanced societies today face growing environmental and economic problems that should not be underestimated. Many of our problems are broadly similar to those that undermined Gardar Farm and Norse Greenland, and that many other past societies also strug-

gled to solve. Some of those past societies failed (like the Greenland Norse), and others succeeded (like the Japanese and Tikopians). The past offers us a rich database from which we can learn, in order that we may keep on succeeding.

Norse Greenland is just one of many past societies that collapsed or vanished, leaving behind monumental ruins such as those that Shelley imagined in his poem "Ozymandias." By collapse, I mean a drastic decrease in human population size and/or political/economic/social complexity, over a considerable area, for an extended time. The phenomenon of collapses is thus an extreme form of several milder types of decline, and it becomes arbitrary to decide how drastic the decline of a society must be before it qualifies to be labeled as a collapse. Some of those milder types of decline include the normal minor rises and falls of fortune, and minor political/economic/social restructurings, of any individual society; one society's conquest by a close neighbor, or its decline linked to the neighbor's rise, without change in the total population size or complexity of the whole region; and the replacement or overthrow of one governing elite by another. By those standards, most people would consider the following past societies to have been famous victims of full-fledged collapses rather than of just minor declines: the Anasazi and Cahokia within the boundaries of the modern U.S., the Maya cities in Central America, Moche and Tiwanaku societies in South America, Mycenaean Greece and Minoan Crete in Europe, Great Zimbabwe in Africa, Angkor Wat and the Harappan Indus Valley cities in Asia, and Easter Island in the Pacific Ocean (map, pp. 4–5).

The monumental ruins left behind by those past societies hold a romantic fascination for all of us. We marvel at them when as children we first learn of them through pictures. When we grow up, many of us plan vacations in order to experience them at firsthand as tourists. We feel drawn to their often spectacular and haunting beauty, and also to the mysteries that they pose. The scales of the ruins testify to the former wealth and power of their builders—they boast "Look on my works, ye mighty, and despair!" in Shelley's words. Yet the builders vanished, abandoning the great structures that they had created at such effort. How could a society that was once so mighty end up collapsing? What were the fates of its individual citizens?—did they move away, and (if so) why, or did they die there in some unpleasant way? Lurking behind this romantic mystery is the nagging thought: might such a fate eventually befall our own wealthy society? Will tourists

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 MODERN SOCIETIES



someday stare mystified at the rusting hulks of New York's skyscrapers, much as we stare today at the jungle-overgrown ruins of Maya cities?

It has long been suspected that many of those mysterious abandonments were at least partly triggered by ecological problems: people inadvertently destroying the environmental resources on which their societies depended. This suspicion of unintended ecological suicide—ecocide—has been confirmed by discoveries made in recent decades by archaeologists, climatologists, historians, paleontologists, and palynologists (pollen scientists). The processes through which past societies have undermined themselves by damaging their environments fall into eight categories, whose relative importance differs from case to case: deforestation and habitat destruction, soil problems (erosion, salinization, and soil fertility losses), water management problems, overhunting, overfishing, effects of introduced species on native species, human population growth, and increased per-capita impact of people.

Those past collapses tended to follow somewhat similar courses constituting variations on a theme. Population growth forced people to adopt intensified means of agricultural production (such as irrigation, double-cropping, or terracing), and to expand farming from the prime lands first chosen onto more marginal land, in order to feed the growing number of hungry mouths. Unsustainable practices led to environmental damage of one or more of the eight types just listed, resulting in agriculturally marginal lands having to be abandoned again. Consequences for society included food shortages, starvation, wars among too many people fighting for too few resources, and overthrows of governing elites by disillusioned masses. Eventually, population decreased through starvation, war, or disease, and society lost some of the political, economic, and cultural complexity that it had developed at its peak. Writers find it tempting to draw analogies between those trajectories of human societies and the trajectories of individual human lives—to talk of a society's birth, growth, peak, senescence, and death—and to assume that the long period of senescence that most of us traverse between our peak years and our deaths also applies to societies. But that metaphor proves erroneous for many past societies (and for the modern Soviet Union): they declined rapidly after reaching peak numbers and power, and those rapid declines must have come as a surprise and shock to their citizens. In the worst cases of complete collapse, everybody in the society emigrated or died. Obviously, though, this grim trajectory is not one that all past societies followed unvaryingly to completion:

different societies collapsed to different degrees and in somewhat different ways, while many societies didn't collapse at all.

The risk of such collapses today is now a matter of increasing concern; indeed, collapses have already materialized for Somalia, Rwanda, and some other Third World countries. Many people fear that ecocide has now come to overshadow nuclear war and emerging diseases as a threat to global civilization. The environmental problems facing us today include the same eight that undermined past societies, plus four new ones: human-caused climate change, buildup of toxic chemicals in the environment, energy shortages, and full human utilization of the Earth's photosynthetic capacity. Most of these 12 threats, it is claimed, will become globally critical within the next few decades: either we solve the problems by then, or the problems will undermine not just Somalia but also First World societies. Much more likely than a doomsday scenario involving human extinction or an apocalyptic collapse of industrial civilization would be "just" a future of significantly lower living standards, chronically higher risks, and the undermining of what we now consider some of our key values. Such a collapse could assume various forms, such as the worldwide spread of diseases or else of wars, triggered ultimately by scarcity of environmental resources. If this reasoning is correct, then our efforts today will determine the state of the world in which the current generation of children and young adults lives out their middle and late years.

But the seriousness of these current environmental problems is vigorously debated. Are the risks greatly exaggerated, or conversely are they underestimated? Does it stand to reason that today's human population of almost seven billion, with our potent modern technology, is causing our environment to crumble globally at a much more rapid rate than a mere few million people with stone and wooden tools already made it crumble locally in the past? Will modern technology solve our problems, or is it creating new problems faster than it solves old ones? When we deplete one resource (e.g., wood, oil, or ocean fish), can we count on being able to substitute some new resource (e.g., plastics, wind and solar energy, or farmed fish)? Isn't the rate of human population growth declining, such that we're already on course for the world's population to level off at some manageable number of people?

All of these questions illustrate why those famous collapses of past civilizations have taken on more meaning than just that of a romantic mystery. Perhaps there are some practical lessons that we could learn from all those

past collapses. We know that some past societies collapsed while others didn't: what made certain societies especially vulnerable? What, exactly, were the processes by which past societies committed ecocide? Why did some past societies fail to see the messes that they were getting into, and that (one would think in retrospect) must have been obvious? Which were the solutions that succeeded in the past? If we could answer these questions, we might be able to identify which societies are now most at risk, and what measures could best help them, without waiting for more Somalia-like collapses.

But there are also differences between the modern world and its problems, and those past societies and their problems. We shouldn't be so naïve as to think that study of the past will yield simple solutions, directly transferable to our societies today. We differ from past societies in some respects that put us at lower risk than them; some of those respects often mentioned include our powerful technology (i.e., its beneficial effects), globalization, modern medicine, and greater knowledge of past societies and of distant modern societies. We also differ from past societies in some respects that put us at greater risk than them: mentioned in that connection are, again, our potent technology (i.e., its unintended destructive effects), globalization (such that now a collapse even in remote Somalia affects the U.S. and Europe), the dependence of millions (and, soon, billions) of us on modern medicine for our survival, and our much larger human population. Perhaps we can still learn from the past, but only if we think carefully about its lessons.

Efforts to understand past collapses have had to confront one major controversy and four complications. The controversy involves resistance to the idea that past peoples (some of them known to be ancestral to peoples currently alive and vocal) did things that contributed to their own decline. We are much more conscious of environmental damage now than we were a mere few decades ago. Even signs in hotel rooms now invoke love of the environment to make us feel guilty if we demand fresh towels or let the water run. To damage the environment today is considered morally culpable.

Not surprisingly, Native Hawaiians and Maoris don't like paleontologists telling them that their ancestors exterminated half of the bird species that had evolved on Hawaii and New Zealand, nor do Native Americans like archaeologists telling them that the Anasazi deforested parts of the southwestern U.S. The supposed discoveries by paleontologists and archaeolo-

gists sound to some listeners like just one more racist pretext advanced by whites for dispossessing indigenous peoples. It's as if scientists were saying, "Your ancestors were bad stewards of their lands, so they deserved to be dispossessed." Some American and Australian whites, resentful of government payments and land retribution to Native Americans and Aboriginal Australians, do indeed seize on the discoveries to advance that argument today. Not only indigenous peoples, but also some anthropologists and archaeologists who study them and identify with them, view the recent supposed discoveries as racist lies.

Some of the indigenous peoples and the anthropologists identifying with them go to the opposite extreme. They insist that past indigenous peoples were (and modern ones still are) gentle and ecologically wise stewards of their environments, intimately knew and respected Nature, innocently lived in a virtual Garden of Eden, and could never have done all those bad things. As a New Guinea hunter once told me, "If one day I succeed in shooting a big pigeon in one direction from our village, I wait a week before hunting pigeons again, and then I go out in the opposite direction from the village." Only those evil modern First World inhabitants are ignorant of Nature, don't respect the environment, and destroy it.

In fact, both extreme sides in this controversy—the racists and the believers in a past Eden—are committing the error of viewing past indigenous peoples as fundamentally different from (whether inferior to or superior to) modern First World peoples. Managing environmental resources sustainably has *always* been difficult, ever since *Homo sapiens* developed modern inventiveness, efficiency, and hunting skills by around 50,000 years ago. Beginning with the first human colonization of the Australian continent around 46,000 years ago, and the subsequent prompt extinction of most of Australia's former giant marsupials and other large animals, every human colonization of a land mass formerly lacking humans—whether of Australia, North America, South America, Madagascar, the Mediterranean islands, or Hawaii and New Zealand and dozens of other Pacific islands—has been followed by a wave of extinction of large animals that had evolved without fear of humans and were easy to kill, or else succumbed to human-associated habitat changes, introduced pest species, and diseases. Any people can fall into the trap of overexploiting environmental resources, because of ubiquitous problems that we shall consider later in this book: that the resources initially seem inexhaustibly abundant; that signs of their incipient depletion become masked by normal fluctuations in resource levels between years or decades; that it's difficult to get people to agree on exercising

restraint in harvesting a shared resource (the so-called tragedy of the commons, to be discussed in later chapters); and that the complexity of ecosystems often makes the consequences of some human-caused perturbation virtually impossible to predict even for a professional ecologist. Environmental problems that are hard to manage today were surely even harder to manage in the past. Especially for past non-literate peoples who couldn't read case studies of societal collapses, ecological damage constituted a tragic, unforeseen, unintended consequence of their best efforts, rather than morally culpable blind or conscious selfishness. The societies that ended up collapsing were (like the Maya) among the most creative and (for a time) advanced and successful of their times, rather than stupid and primitive.

Past peoples were neither ignorant bad managers who deserved to be exterminated or dispossessed, nor all-knowing conscientious environmentalists who solved problems that we can't solve today. They were people like us, facing problems broadly similar to those that we now face. They were prone either to succeed or to fail, depending on circumstances similar to those making us prone to succeed or to fail today. Yes, there are differences between the situation we face today and that faced by past peoples, but there are still enough similarities for us to be able to learn from the past.

Above all, it seems to me wrongheaded and dangerous to invoke historical assumptions about environmental practices of native peoples in order to justify treating them fairly. In many or most cases, historians and archaeologists have been uncovering overwhelming evidence that this assumption (about Eden-like environmentalism) is wrong. By invoking this assumption to justify fair treatment of native peoples, we imply that it would be OK to mistreat them if that assumption could be refuted. In fact, the case against mistreating them isn't based on any historical assumption about their environmental practices: it's based on a moral principle, namely, that it is morally wrong for one people to dispossess, subjugate, or exterminate another people.

That's the controversy about past ecological collapses. As for the complications, of course it's not true that all societies are doomed to collapse because of environmental damage: in the past some societies did while others didn't; the real question is why only some societies proved fragile, and what distinguished those that collapsed from those that didn't. Some societies that I shall discuss, such as the Icelanders and Tikopians, succeeded in solving extremely difficult environmental problems, have thereby been able to persist

for a long time, and are still going strong today. For example, when Norwegian colonists of Iceland first encountered an environment superficially similar to that of Norway but in reality very different, they inadvertently destroyed much of Iceland's topsoil and most of its forests. Iceland for a long time was Europe's poorest and most ecologically ravaged country. However, Icelanders eventually learned from experience, adopted rigorous measures of environmental protection, and now enjoy one of the highest per-capita national average incomes in the world. Tikopia Islanders inhabit a tiny island so far from any neighbors that they were forced to become self-sufficient in almost everything, but they micromanaged their resources and regulated their population size so carefully that their island is still productive after 3,000 years of human occupation. Thus, this book is not an uninterrupted series of depressing stories of failure, but also includes success stories inspiring imitation and optimism.

In addition, I don't know of any case in which a society's collapse can be attributed solely to environmental damage: there are always other contributing factors. When I began to plan this book, I didn't appreciate those complications, and I naively thought that the book would just be about environmental damage. Eventually, I arrived at a five-point framework of possible contributing factors that I now consider in trying to understand any putative environmental collapse. Four of those sets of factors—environmental damage, climate change, hostile neighbors, and friendly trade partners—may or may not prove significant for a particular society. The fifth set of factors—the society's responses to its environmental problems—always proves significant. Let's consider these five sets of factors one by one, in a sequence not implying any primacy of cause but just convenience of presentation.

A first set of factors involves damage that people inadvertently inflict on their environment, as already discussed. The extent and reversibility of that damage depend partly on properties of people (e.g., how many trees they cut down per acre per year), and partly on properties of the environment (e.g., properties determining how many seedlings germinate per acre, and how rapidly saplings grow, per year). Those environmental properties are referred to either as fragility (susceptibility to damage) or as resilience (potential for recovery from damage), and one can talk separately of the fragility or resilience of an area's forests, its soils, its fish populations, and so on. Hence the reasons why only certain societies suffered environmental collapses might in principle involve either exceptional imprudence of their people, exceptional fragility of some aspects of their environment, or both.

A next consideration in my five-point framework is climate change, a term that today we tend to associate with global warming caused by humans. In fact, climate may become hotter or colder, wetter or drier, or more or less variable between months or between years, because of changes in natural forces that drive climate and that have nothing to do with humans. Examples of such forces include changes in the heat put out by the sun, volcanic eruptions that inject dust into the atmosphere, changes in the orientation of the Earth's axis with respect to its orbit, and changes in the distribution of land and ocean over the face of the Earth. Frequently discussed cases of natural climate change include the advance and retreat of continental ice sheets during the Ice Ages beginning over two million years ago, the so-called Little Ice Age from about A.D. 1400 to 1800, and the global cooling following the enormous volcanic eruption of Indonesia's Mt. Tambora on April 5, 1815. That eruption injected so much dust into the upper atmosphere that the amount of sunlight reaching the ground decreased until the dust settled out, causing widespread famines even in North America and Europe due to cold temperatures and reduced crop yields in the summer of 1816 ("the year without a summer").

Climate change was even more of a problem for past societies with short human lifespans and without writing than it is today, because climate in many parts of the world tends to vary not just from year to year but also on a multi-decade time scale; e.g., several wet decades followed by a dry half-century. In many prehistoric societies the mean human generation time—average number of years between births of parents and of their children—was only a few decades. Hence towards the end of a string of wet decades, most people alive could have had no firsthand memory of the previous period of dry climate. Even today, there is a human tendency to increase production and population during good decades, forgetting (or, in the past, never realizing) that such decades were unlikely to last. When the good decades then do end, the society finds itself with more population than can be supported, or with ingrained habits unsuitable to the new climate conditions. (Just think today of the dry U.S. West and its urban or rural policies of profligate water use, often drawn up in wet decades on the tacit assumption that they were typical.) Compounding these problems of climate change, many past societies didn't have "disaster relief" mechanisms to import food surpluses from other areas with a different climate into areas developing food shortages. All of those considerations exposed past societies to increased risk from climate change.

Natural climate changes may make conditions either better or worse for

any particular human society, and may benefit one society while hurting another society. (For example, we shall see that the Little Ice Age was bad for the Greenland Norse but good for the Greenland Inuit.) In many historical cases, a society that was depleting its environmental resources could absorb the losses as long as the climate was benign, but was then driven over the brink of collapse when the climate became drier, colder, hotter, wetter, or more variable. Should one then say that the collapse was caused by human environmental impact, or by climate change? Neither of those simple alternatives is correct. Instead, if the society hadn't already partly depleted its environmental resources, it might have survived the resource depletion caused by climate change. Conversely, it was able to survive its self-inflicted resource depletion until climate change produced further resource depletion. It was neither factor taken alone, but the combination of environmental impact and climate change, that proved fatal.

A third consideration is hostile neighbors. All but a few historical societies have been geographically close enough to some other societies to have had at least some contact with them. Relations with neighboring societies may be intermittently or chronically hostile. A society may be able to hold off its enemies as long as it is strong, only to succumb when it becomes weakened for any reason, including environmental damage. The proximate cause of the collapse will then be military conquest, but the ultimate cause—the factor whose change led to the collapse—will have been the factor that caused the weakening. Hence collapses for ecological or other reasons often masquerade as military defeats.

The most familiar debate about such possible masquerading involves the fall of the Western Roman Empire. Rome became increasingly beset by barbarian invasions, with the conventional date for the Empire's fall being taken somewhat arbitrarily as A.D. 476, the year in which the last emperor of the West was deposed. However, even before the rise of the Roman Empire, there had been "barbarian" tribes who lived in northern Europe and Central Asia beyond the borders of "civilized" Mediterranean Europe, and who periodically attacked civilized Europe (as well as civilized China and India). For over a thousand years, Rome successfully held off the barbarians, for instance slaughtering a large invading force of Cimbri and Teutones bent on conquering northern Italy at the Battle of Campi Raudii in 101 B.C.

Eventually, it was the barbarians rather than Romans who won the battles: what was the fundamental reason for that shift in fortune? Was it because of changes in the barbarians themselves, such that they became more numerous or better organized, acquired better weapons or more horses, or

profited from climate change in the Central Asian steppes? In that case, we would say that barbarians really could be identified as the fundamental cause of Rome's fall. Or was it instead that the same old unchanged barbarians were always waiting on the Roman Empire's frontiers, and that they couldn't prevail until Rome became weakened by some combination of economic, political, environmental, and other problems? In that case we would blame Rome's fall on its own problems, with the barbarians just providing the coup de grâce. This question continues to be debated. Essentially the same question has been debated for the fall of the Khmer Empire centered on Angkor Wat in relation to invasions by Thai neighbors, for the decline in Harappan Indus Valley civilization in relation to Aryan invasions, and for the fall of Mycenaean Greece and other Bronze Age Mediterranean societies in relation to invasions by Sea Peoples.

The fourth set of factors is the converse of the third set: decreased support by friendly neighbors, as opposed to increased attacks by hostile neighbors. All but a few historical societies have had friendly trade partners as well as neighboring enemies. Often, the partner and the enemy are one and the same neighbor, whose behavior shifts back and forth between friendly and hostile. Most societies depend to some extent on friendly neighbors, either for imports of essential trade goods (like U.S. imports of oil, and Japanese imports of oil, wood, and seafood, today), or else for cultural ties that lend cohesion to the society (such as Australia's cultural identity imported from Britain until recently). Hence the risk arises that, if your trade partner becomes weakened for any reason (including environmental damage) and can no longer supply the essential import or the cultural tie, your own society may become weakened as a result. This is a familiar problem today because of the First World's dependence on oil from ecologically fragile and politically troubled Third World countries that imposed an oil embargo in 1973. Similar problems arose in the past for the Greenland Norse, Pitcairn Islanders, and other societies.

The last set of factors in my five-point framework involves the ubiquitous question of the society's responses to its problems, whether those problems are environmental or not. Different societies respond differently to similar problems. For instance, problems of deforestation arose for many past societies, among which Highland New Guinea, Japan, Tikopia, and Tonga developed successful forest management and continued to prosper, while Easter Island, Mangareva, and Norse Greenland failed to develop successful forest management and collapsed as a result. How can we understand such differing outcomes? A society's responses depend on its political,

economic, and social institutions and on its cultural values. Those institutions and values affect whether the society solves (or even tries to solve) its problems. In this book we shall consider this five-point framework for each past society whose collapse or persistence is discussed.

I should add, of course, that just as climate change, hostile neighbors, and trade partners may or may not contribute to a particular society's collapse, environmental damage as well may or may not contribute. It would be absurd to claim that environmental damage must be a major factor in all collapses: the collapse of the Soviet Union is a modern counter-example, and the destruction of Carthage by Rome in 146 B.C. is an ancient one. It's obviously true that military or economic factors alone may suffice. Hence a full title for this book would be "Societal collapses involving an environmental component, and in some cases also contributions of climate change, hostile neighbors, and trade partners, plus questions of societal responses." That restriction still leaves us ample modern and ancient material to consider.

Issues of human environmental impacts today tend to be controversial, and opinions about them tend to fall on a spectrum between two opposite camps. One camp, usually referred to as "environmentalist" or "pro-environment," holds that our current environmental problems are serious and in urgent need of addressing, and that current rates of economic and population growth cannot be sustained. The other camp holds that environmentalists' concerns are exaggerated and unwarranted, and that continued economic and population growth is both possible and desirable. The latter camp isn't associated with an accepted short label, and so I shall refer to it simply as "non-environmentalist." Its adherents come especially from the world of big business and economics, but the equation "non-environmentalist" = "pro-business" is imperfect; many businesspeople consider themselves environmentalists, and many people skeptical of environmentalists' claims are not in the world of big business. In writing this book, where do I stand myself with the respect to these two camps?

On the one hand, I have been a bird-watcher since I was seven years old. I trained professionally as a biologist, and I have been doing research on New Guinea rainforest birds for the past 40 years. I love birds, enjoy watching them, and enjoy being in rainforest. I also like other plants, animals, and habitats and value them for their own sakes. I've been active in many efforts to preserve species and natural environments in New Guinea and elsewhere.

For the past dozen years I've been a director of the U.S. affiliate of World Wildlife Fund, one of the largest international environmentalist organizations and the one with the most cosmopolitan interests. All of those things have earned me criticism from non-environmentalists, who use phrases such as "fearmonger," "Diamond preaches gloom and doom," "exaggerates risks," and "favors endangered purple louseworts over the needs of people." But while I do love New Guinea birds, I love much more my sons, my wife, my friends, New Guineans, and other people. I'm more interested in environmental issues because of what I see as their consequences for people than because of their consequences for birds.

On the other hand, I have much experience, interest, and ongoing involvement with big businesses and other forces in our society that exploit environmental resources and are often viewed as anti-environmentalist. As a teenager, I worked on large cattle ranches in Montana, to which, as an adult and father, I now regularly take my wife and my sons for summer vacations. I had a job on a crew of Montana copper miners for one summer. I love Montana and my rancher friends, I understand and admire and sympathize with their agribusinesses and their lifestyles, and I've dedicated this book to them. In recent years I've also had much opportunity to observe and become familiar with other large extractive companies in the mining, logging, fishing, oil, and natural gas industries. For the last seven years I've been monitoring environmental impacts in Papua New Guinea's largest producing oil and natural gas field, where oil companies have engaged World Wildlife Fund to provide independent assessments of the environment. I have often been a guest of extractive businesses on their properties, I've talked a lot with their directors and employees, and I've come to understand their own perspectives and problems.

While these relationships with big businesses have given me close-up views of the devastating environmental damage that they often cause, I've also had close-up views of situations where big businesses found it in their interests to adopt environmental safeguards more draconian and effective than I've encountered even in national parks. I'm interested in what motivates these differing environmental policies of different businesses. My involvement with large oil companies in particular has brought me condemnation from some environmentalists, who use phrases such as "Diamond has sold out to big business," "He's in bed with big businesses," or "He prostitutes himself to the oil companies."

In fact, I am not hired by big businesses, and I describe frankly what I see happening on their properties even though I am visiting as their guest.

On some properties I have seen oil companies and logging companies being destructive, and I have said so; on other properties I have seen them being careful, and that was what I said. My view is that, if environmentalists aren't willing to engage with big businesses, which are among the most powerful forces in the modern world, it won't be possible to solve the world's environmental problems. Thus, I am writing this book from a middle-of-the-road perspective, with experience of both environmental problems and of business realities.

How can one study the collapses of societies "scientifically"? Science is often misrepresented as "the body of knowledge acquired by performing replicated controlled experiments in the laboratory." Actually, science is something much broader: the acquisition of reliable knowledge about the world. In some fields, such as chemistry and molecular biology, replicated controlled experiments in the laboratory are feasible and provide by far the most reliable means to acquire knowledge. My formal training was in two such fields of laboratory biology, biochemistry for my undergraduate degree and physiology for my Ph.D. From 1955 to 2002 I conducted experimental laboratory research in physiology, at Harvard University and then at the University of California in Los Angeles.

When I began studying birds in New Guinea rainforest in 1964, I was immediately confronted with the problem of acquiring reliable knowledge without being able to resort to replicated controlled experiments, whether in the laboratory or outdoors. It's usually neither feasible, legal, nor ethical to gain knowledge about birds by experimentally exterminating or manipulating their populations at one site while maintaining their populations at another site as unmanipulated controls. I had to use different methods. Similar methodological problems arise in many other areas of population biology, as well as in astronomy, epidemiology, geology, and paleontology.

A frequent solution is to apply what is termed the "comparative method" or the "natural experiment"—i.e., to compare natural situations differing with respect to the variable of interest. For instance, when I as an ornithologist am interested in effects of New Guinea's Cinnamon-browed Melidectes Honeyeater on populations of other honeyeater species, I compare bird communities on mountains that are fairly similar except that some do and others don't happen to support populations of Cinnamon-browed Melidectes Honeyeaters. Similarly, my books *The Third Chimpanzee: The Evolution and Future of the Human Animal* and *Why Is Sex Fun?*

The Evolution of Human Sexuality compared different animal species, especially different species of primates, in an effort to figure out why women (unlike females of most other animal species) undergo menopause and lack obvious signs of ovulation, why men have a relatively large penis (by animal standards), and why humans usually have sex in private (rather than in the open, as almost all other animal species do). There is a large scientific literature on the obvious pitfalls of that comparative method, and on how best to overcome those pitfalls. Especially in historical sciences (like evolutionary biology and historical geology), where it's impossible to manipulate the past experimentally, one has no choice except to renounce laboratory experiments in favor of natural ones.

This book employs the comparative method to understand societal collapses to which environmental problems contribute. My previous book (*Guns, Germs, and Steel: The Fates of Human Societies*) had applied the comparative method to the opposite problem: the differing rates of buildup of human societies on different continents over the last 13,000 years. In the present book focusing instead on collapses rather than on buildups, I compare many past and present societies that differed with respect to environmental fragility, relations with neighbors, political institutions, and other "input" variables postulated to influence a society's stability. The "output" variables that I examine are collapse or survival, and form of the collapse if a collapse does occur. By relating output variables to input variables, I aim to tease out the influence of possible input variables on collapses.

A rigorous, comprehensive, and quantitative application of this method was possible for the problem of deforestation-induced collapses on Pacific islands. Prehistoric Pacific peoples deforested their islands to varying degrees, ranging from only slight to complete deforestation, and with societal outcomes ranging from long-term persistence to complete collapses that left everybody dead. For 81 Pacific islands my colleague Barry Rolett and I graded the extent of deforestation on a numerical scale, and we also graded values of nine input variables (such as rainfall, isolation, and restoration of soil fertility) postulated to influence deforestation. By a statistical analysis we were able to calculate the relative strengths with which each input variable predisposed the outcome to deforestation. Another comparative experiment was possible in the North Atlantic, where medieval Vikings from Norway colonized six islands or land masses differing in suitability for agriculture, ease of trade contact with Norway, and other input variables, and also differing in outcome (from quick abandonment, to everybody dead af-

ter 500 years, to still thriving after 1,200 years). Still other comparisons are possible between societies from different parts of the world.

All of these comparisons rest on detailed information about individual societies, patiently accumulated by archaeologists, historians, and other scholars. At the end of this book I provide references to the many excellent books and papers on the ancient Maya and Anasazi, the modern Rwandans and Chinese, and the other past and present societies that I compare. Those individual studies constitute the indispensable database for my book. But there are additional conclusions that can be drawn from comparisons among those many societies, and that could not have been drawn from detailed study of just a single society. For example, to understand the famous Maya collapse requires not only accurate knowledge of Maya history and the Maya environment; we can place the Maya in a broader context and gain further insights by comparing them with other societies that did or didn't collapse, and that resembled the Maya in some respects and differed from them in other respects. Those further insights require the comparative method.

I have belabored this necessity for both good individual studies and good comparisons, because scholars practicing one approach too often belittle the contributions of the other approach. Specialists in the history of one society tend to dismiss comparisons as superficial, while those who compare tend to dismiss studies of single societies as hopelessly myopic and of limited value for understanding other societies. But we need both types of studies if we are to acquire reliable knowledge. In particular, it would be dangerous to generalize from one society, or even just to be confident about interpreting a single collapse. Only from the weight of evidence provided by a comparative study of many societies with different outcomes can one hope to reach convincing conclusions.

So that readers will have some advance idea where they are heading, here is how this book is organized. Its plan resembles a boa constrictor that has swallowed two very large sheep. That is, my discussions of the modern world and also of the past both consist of a disproportionately long account of one society, plus briefer accounts of four other societies.

We shall begin with the first large sheep. Part One comprises a single lengthy chapter (Chapter 1), on the environmental problems of southwestern Montana, where Huls Farm and the ranches of my friends the Hirschys (to whom this book is dedicated) are located. Montana has the advantage of

being a modern First World society whose environmental and population problems are real but still relatively mild compared to those of most of the rest of the First World. Above all, I know many Montanans well, so that I can connect the policies of Montana society to the often-conflicting motivations of individual people. From that familiar perspective of Montana, we can more easily imagine what was happening in the remote past societies that initially strike us as exotic, and where we can only guess what motivated individual people.

Part Two begins with four briefer chapters on past societies that did collapse, arranged in a sequence of increasing complexity according to my five-point framework. Most of the past societies that I shall discuss in detail were small and peripherally located, and some were geographically bounded, or socially isolated, or in fragile environments. Lest the reader thereby be misled into concluding that they are poor models for familiar big modern societies, I should explain that I selected them for close consideration precisely because processes unfolded faster and reached more extreme outcomes in such small societies, making them especially clear illustrations. It is not the case that large central societies trading with neighbors and located in robust environments didn't collapse in the past and can't collapse today. One of the past societies that I do discuss in detail, the Maya, had a population of many millions or tens of millions, was located within one of the two most advanced cultural areas of the New World before European arrival (Mesoamerica), and traded with and was decisively influenced by other advanced societies in that area. I briefly summarize in the Further Readings section for Chapter 9 some of the many other famous past societies—Fertile Crescent societies, Angkor Wat, Harappan Indus Valley society, and others—that resembled the Maya in those respects, and to whose declines environmental factors contributed heavily.

Our first case study from the past, the history of Easter Island (Chapter 2), is as close as we can get to a “pure” ecological collapse, in this case due to total deforestation that led to war, overthrow of the elite and of the famous stone statues, and a massive population die-off. As far as we know, Easter's Polynesian society remained isolated after its initial founding, so that Easter's trajectory was uninfluenced by either enemies or friends. Nor do we have evidence of a role of climate change on Easter, though that could still emerge from future studies. Barry Rolett's and my comparative analysis helps us understand why Easter, of all Pacific islands, suffered such a severe collapse.

Pitcairn Island and Henderson Island (Chapter 3), also settled by Polynesians, offer examples of the effect of item four of my five-point framework: loss of support from neighboring friendly societies. Both Pitcairn and Henderson islands suffered local environmental damage, but the fatal blow came from the environmentally triggered collapse of their major trade partner. There were no known complicating effects of hostile neighbors or of climate change.

Thanks to an exceptionally detailed climate record reconstructed from tree rings, the Native American society of the Anasazi in the U.S. Southwest (Chapter 4) clearly illustrates the intersection of environmental damage and population growth with climate change (in this case, drought). Neither friendly or hostile neighbors, nor (except towards the end) warfare, appear to have been major factors in the Anasazi collapse.

No book on societal collapses would be complete without an account (Chapter 5) of the Maya, the most advanced Native American society and the quintessential romantic mystery of cities covered by jungle. As in the case of the Anasazi, the Maya illustrate the combined effects of environmental damage, population growth, and climate change without an essential role of friendly neighbors. Unlike the case with the Anasazi collapse, hostile neighbors were a major preoccupation of Maya cities already from an early stage. Among the societies discussed in Chapters 2 through 5, only the Maya offer us the advantage of a deciphered written record.

Norse Greenland (Chapters 6–8) offers us our most complex case of a prehistoric collapse, the one for which we have the most information (because it was a well-understood literate European society), and the one warranting the most extended discussion: the second sheep inside the boa constrictor. All five items in my five-point framework are well documented: environmental damage, climate change, loss of friendly contacts with Norway, rise of hostile contacts with the Inuit, and the political, economic, social, and cultural setting of the Greenland Norse. Greenland provides us with our closest approximation to a controlled experiment in collapses: two societies (Norse and Inuit) sharing the same island, but with very different cultures, such that one of those societies survived while the other was dying. Thus, Greenland history conveys the message that, even in a harsh environment, collapse isn't inevitable but depends on a society's choices. Comparisons are also possible between Norse Greenland and five other North Atlantic societies founded by Norse colonists, to help us understand why the Orkney Norse thrived while their Greenland cousins were succumbing.

One of those five other Norse societies, Iceland, ranks as an outstanding success story of triumph over a fragile environment to achieve a high level of modern prosperity.

Part Two concludes (Chapter 9) with three more societies that (like Iceland) succeeded, as contrast cases for understanding societies that failed. While those three faced less severe environmental problems than Iceland or than most of those that failed, we shall see that there are two different paths to success: a bottom-up approach exemplified by Tikopia and the New Guinea highlands, and a top-down approach exemplified by Japan of the Tokugawa Era.

Part Three then returns to the modern world. Having already considered modern Montana in Chapter 2, we now take up four markedly different modern countries, the first two small and the latter two large or huge: a Third World disaster (Rwanda), a Third World survivor-so-far (the Dominican Republic), a Third World giant racing to catch up with the First World (China), and a First World society (Australia). Rwanda (Chapter 10) represents a Malthusian catastrophe happening under our eyes, an overpopulated land that collapsed in horrible bloodshed, as the Maya did in the past. Rwanda and neighboring Burundi are notorious for their Hutu/Tutsi ethnic violence, but we shall see that population growth, environmental damage, and climate change provided the dynamite for which ethnic violence was the fuse.

The Dominican Republic and Haiti (Chapter 11), sharing the island of Hispaniola, offer us a grim contrast, as did Norse and Inuit societies in Greenland. From decades of equally vile dictatorships, Haiti emerged as the modern New World's saddest basket case, while there are signs of hope in the Dominican Republic. Lest one suppose that this book preaches environmental determinism, the latter country illustrates what a big difference one person can make, especially if he or she is the country's leader.

China (Chapter 12) suffers from heavy doses of all 12 modern types of environmental problems. Because China is so huge in its economy, population, and area, China's environmental and economic impact is important not only for China's own people but also for the whole world.

Australia (Chapter 13) is at the opposite extreme from Montana, as the First World society occupying the most fragile environment and experiencing the most severe environmental problems. As a result, it is also among the countries now considering the most radical restructuring of its society, in order to solve those problems.

This book's concluding section (Part Four) extracts practical lessons for

us today. Chapter 14 asks the perplexing question arising for every past society that ended up destroying itself, and that will perplex future earthlings if we too end up destroying ourselves: how could a society fail to have seen the dangers that seem so clear to us in retrospect? Can we say that their end was the inhabitants' own fault, or that they were instead tragic victims of insoluble problems? How much past environmental damage was unintentional and imperceptible, and how much was perversely wrought by people acting in full awareness of the consequences? For instance, what were Easter Islanders saying as they cut down the last tree on their island? It turns out that group decision-making can be undone by a whole series of factors, beginning with failure to anticipate or perceive a problem, and proceeding through conflicts of interest that leave some members of the group to pursue goals good for themselves but bad for the rest of the group.

Chapter 15 considers the role of modern businesses, some of which are among the most environmentally destructive forces today, while others provide some of the most effective environmental protection. We shall examine why some (but only some) businesses find it in their interests to be protective, and what changes would be necessary before other businesses would find it in their interests to emulate them.

Finally, Chapter 16 summarizes the types of environmental dangers facing the modern world, the commonest objections raised against claims of their seriousness, and differences between environmental dangers today and those faced by past societies. A major difference has to do with globalization, which lies at the heart of the strongest reasons both for pessimism and for optimism about our ability to solve our current environmental problems. Globalization makes it impossible for modern societies to collapse in isolation, as did Easter Island and the Greenland Norse in the past. Any society in turmoil today, no matter how remote—think of Somalia and Afghanistan as examples—can cause trouble for prosperous societies on other continents, and is also subject to their influence (whether helpful or destabilizing). For the first time in history, we face the risk of a global decline. But we also are the first to enjoy the opportunity of learning quickly from developments in societies anywhere else in the world today, and from what has unfolded in societies at any time in the past. That's why I wrote this book.

Why Do Some Societies Make Disastrous Decisions?

Road map for success ■ Failure to anticipate ■ Failure to perceive ■
Rational bad behavior ■ Disastrous values ■ Other irrational failures ■
Unsuccessful solutions ■ Signs of hope ■

Education is a process involving two sets of participants who supposedly play different roles: teachers who impart knowledge to students, and students who absorb knowledge from teachers. In fact, as every open-minded teacher discovers, education is also about students imparting knowledge to their teachers, by challenging the teachers' assumptions and by asking questions that the teachers hadn't previously thought of. I recently repeated that discovery when I taught a course, on how societies cope with environmental problems, to highly motivated undergraduates at my institution, the University of California at Los Angeles (UCLA). In effect, the course was a trial run-through of this book's material, at a time when I had drafted some chapters, was planning other chapters, and could still make extensive changes.

My first lecture after the class's introductory meeting was on the collapse of Easter Island society, the subject of this book's Chapter 2. In the class discussion after I had finished my presentation, the apparently simple question that most puzzled my students was one whose actual complexity hadn't sunk into me before: how on earth could a society make such an obviously disastrous decision as to cut down all the trees on which it depended? One of the students asked what I thought the islander who cut down the last palm tree said as he was doing it. For every other society that I treated in subsequent lectures, my students raised essentially the same question. They also asked the related question: how often did people wreak ecological damage intentionally, or at least while aware of the likely consequences? How often did people instead do it without meaning to, or out of ignorance? My students wondered whether—if there are still people left alive a hundred years from now—those people of the next century will be as astonished

about our blindness today as we are about the blindness of the Easter Islanders.

This question of why societies end up destroying themselves through disastrous decisions astonishes not only my UCLA undergraduates but also professional historians and archaeologists. For example, perhaps the most cited book on societal collapses is *The Collapse of Complex Societies*, by the archaeologist Joseph Tainter. In assessing competing explanations for ancient collapses, Tainter remained skeptical of even the possibility that they might have been due to depletion of environmental resources, because that outcome seemed a priori so unlikely to him. Here is his reasoning: "One supposition of this view must be that these societies sit by and watch the encroaching weakness without taking corrective actions. Here is a major difficulty. Complex societies are characterized by centralized decision-making, high information flow, great coordination of parts, formal channels of command, and pooling of resources. Much of this structure seems to have the capability, if not the designed purpose, of countering fluctuations and deficiencies in productivity. With their administrative structure, and capacity to allocate both labor and resources, dealing with adverse environmental conditions may be one of the things that complex societies do best (see, for example, Isbell [1978]). It is curious that they would collapse when faced with precisely those conditions they are equipped to circumvent. . . . As it becomes apparent to the members or administrators of a complex society that a resource base is deteriorating, it seems most reasonable to assume that some rational steps are taken toward a resolution. The alternative assumption—of idleness in the face of disaster—requires a leap of faith at which we may rightly hesitate."

That is, Tainter's reasoning suggested to him that complex societies are not likely to allow themselves to collapse through failure to manage their environmental resources. Yet it is clear from all the cases discussed in this book that precisely such a failure has happened repeatedly. How did so many societies make such bad mistakes?

My UCLA undergraduates, and Joseph Tainter as well, have identified a baffling phenomenon: namely, failures of group decision-making on the part of whole societies or other groups. That problem is of course related to the problem of failures of individual decision-making. Individuals, too, make bad decisions: they enter bad marriages, they make bad investments and career choices, their businesses fail, and so on. But some additional factors enter into failures of group decision-making, such as conflicts of interest among members of the group, and group dynamics. This is obviously a

complex subject to which there would not be a single answer fitting all situations.

What I'm going to propose instead is a road map of factors contributing to failures of group decision-making. I'll divide the factors into a fuzzily delineated sequence of four categories. First of all, a group may fail to anticipate a problem before the problem actually arrives. Second, when the problem does arrive, the group may fail to perceive it. Then, after they perceive it, they may fail even to try to solve it. Finally, they may try to solve it but may not succeed. While all this discussion of reasons for failure and societal collapses may seem depressing, the flip side is a heartening subject: namely, successful decision-making. Perhaps if we understood the reasons why groups often make bad decisions, we could use that knowledge as a checklist to guide groups to make good decisions.

The first stop on my road map is that groups may do disastrous things because they failed to anticipate a problem before it arrived, for any of several reasons. One is that they may have had no prior experience of such problems, and so may not have been sensitized to the possibility.

A prime example is the mess that British colonists created for themselves when they introduced foxes and rabbits from Britain into Australia in the 1800s. Today these rate as two of the most disastrous examples of impacts of alien species on an environment to which they were not native (see Chapter 13 for details). These introductions are all the more tragic because they were carried out intentionally at much effort, rather than resulting inadvertently from tiny seeds overlooked in transported hay, as in so many cases of establishment of noxious weeds. Foxes have proceeded to prey on and exterminate many species of native Australian mammals without evolutionary experience of foxes, while rabbits consume much of the plant fodder intended for sheep and cattle, outcompete native herbivorous mammals, and undermine the ground by their burrows.

With the gift of hindsight, we now view it as incredibly stupid that colonists would intentionally release into Australia two alien mammals that have caused billions of dollars in damages and expenditures to control them. We recognize today, from many other such examples, that introductions often prove disastrous in unexpected ways. That's why, when you go to Australia or the U.S. as a visitor or returning resident, one of the first questions you are now asked by immigration officers is whether you are carrying any plants, seeds, or animals—to reduce the risk of their escaping

and becoming established. From abundant prior experience we have now learned (often but not always) to anticipate at least the potential dangers of introducing species. But it's still difficult even for professional ecologists to predict which introductions will actually become established, which established successful introductions will prove disastrous, and why the same species establishes itself at certain sites of introduction and not at others. Hence we really shouldn't be surprised that 19th century Australians, lacking the 20th century's experience of disastrous introductions, failed to anticipate the effects of rabbits and foxes.

In this book we have encountered other examples of societies understandably failing to anticipate a problem of which they lacked prior experience. In investing heavily in walrus hunting in order to export walrus ivory to Europe, the Greenland Norse could hardly have anticipated that the Crusades would eliminate the market for walrus ivory by reopening Europe's access to Asian and African elephant ivory, or that increasing sea ice would impede ship traffic to Europe. Again, not being soil scientists, the Maya at Copán could not foresee that deforestation of the hill slopes would trigger soil erosion from the slopes into the valley bottoms.

Even prior experience is not a guarantee that a society will anticipate a problem, if the experience happened so long ago as to have been forgotten. That's especially a problem for non-literate societies, which have less capacity than literate societies to preserve detailed memories of events long in the past, because of the limitations of oral transmission of information compared to writing. For instance, we saw in Chapter 4 that Chaco Canyon Anasazi society survived several droughts before succumbing to a big drought in the 12th century A.D. But the earlier droughts had occurred long before the birth of any Anasazi affected by the big drought, which would thus have been unanticipated because the Anasazi lacked writing. Similarly, the Classic Lowland Maya succumbed to a drought in the 9th century, despite their area having been affected by drought centuries earlier (Chapter 5). In that case, although the Maya did have writing, it recorded kings' deeds and astronomical events rather than weather reports, so that the drought of the 3rd century did not help the Maya anticipate the drought of the 9th century.

In modern literate societies whose writing does discuss subjects besides kings and planets, that doesn't necessarily mean that we draw on prior experience committed to writing. We, too, tend to forget things. For a year or two after the gas shortages of the 1973 Gulf oil crisis, we Americans shied away from gas-guzzling cars, but then we forgot that experience and are

now embracing SUVs, despite volumes of print spilled over the 1973 events. When the city of Tucson in Arizona went through a severe drought in the 1950s, its alarmed citizens swore that they would manage their water better, but soon returned to their water-guzzling ways of building golf courses and watering their gardens.

Another reason why a society may fail to anticipate a problem involves reasoning by false analogy. When we are in an unfamiliar situation, we fall back on drawing analogies with old familiar situations. That's a good way to proceed if the old and new situations are truly analogies, but it can be dangerous if they are only superficially similar. For instance, Vikings who immigrated to Iceland beginning around the year A.D. 870 arrived from Norway and Britain, which have heavy clay soils ground up by glaciers. Even if the vegetation covering those soils is cleared, the soils themselves are too heavy to be blown away. When the Viking colonists encountered in Iceland many of the same tree species already familiar to them from Norway and Britain, they were deceived by the apparent similarity of the landscape (Chapter 6). Unfortunately, Iceland's soils arose not through glacial grinding but through winds carrying light ash blown out in volcanic eruptions. Once the Vikings had cleared Iceland's forests to create pastures for their livestock, the light soil became exposed for the wind to blow out again, and much of Iceland's topsoil soon eroded away.

A tragic and famous modern example of reasoning by false analogy involves French military preparations from World War I. After the horrible bloodbath of World War I, France recognized its vital need to protect itself against the possibility of another German invasion. Unfortunately, the French army staff assumed that a next war would be fought similarly to World War I, in which the Western Front between France and Germany had remained locked in static trench warfare for four years. Defensive infantry forces manning elaborate fortified trenches had been usually able to repel infantry attacks, while offensive forces had deployed the newly invented tanks only individually and just in support of attacking infantry. Hence France constructed an even more elaborate and expensive system of fortifications, the Maginot Line, to guard its eastern frontier against Germany. But the German army staff, having been defeated in World War I, recognized the need for a different strategy. It used tanks rather than infantry to spearhead its attacks, massed the tanks into separate armored divisions, bypassed the Maginot Line through forested terrain previously considered unsuitable for tanks, and thereby defeated France within a mere six weeks. In reasoning by false analogy after World War I, French generals made a

common mistake: generals often plan for a coming war as if it will be like the previous war, especially if that previous war was one in which their side was victorious.

The second stop on my road map, after a society has or hasn't anticipated a problem before it arrives, involves its perceiving or failing to perceive a problem that has actually arrived. There are at least three reasons for such failures, all of them common in the business world and in academia.

First, the origins of some problems are literally imperceptible. For example, the nutrients responsible for soil fertility are invisible to the eye, and only in modern times did they become measurable by chemical analysis. In Australia, Mangareva, parts of the U.S. Southwest, and many other locations, most of the nutrients had already been leached out of the soil by rain before human settlement. When people arrived and began growing crops, those crops quickly exhausted the remaining nutrients, with the result that agriculture failed. Yet such nutrient-poor soils often bear lush-appearing vegetation; it's just that most of the nutrients in the ecosystem are contained in the vegetation rather than in the soil, and are removed if one cuts down the vegetation. There was no way for the first colonists of Australia and Mangareva to perceive that problem of soil nutrient exhaustion—nor for farmers in areas with salt deep in the ground (like eastern Montana and parts of Australia and Mesopotamia) to perceive incipient salinization—nor for miners of sulfide ores to perceive the toxic copper and acid dissolved in mine runoff water.

Another frequent reason for failure to perceive a problem after it has arrived is distant managers, a potential issue in any large society or business. For example, the largest private landowner and timber company in Montana today is based not within that state but 400 miles away in Seattle, Washington. Not being on the scene, company executives may not realize that they have a big weed problem on their forest properties. Well-run companies avoid such surprises by periodically sending managers “into the field” to observe what is actually going on, while a tall friend of mine who was a college president regularly practiced with his school's undergraduates on their basketball courts in order to keep abreast of student thinking. The opposite of failure due to distant managers is success due to on-the-spot managers. Part of the reason why Tikopians on their tiny island, and New Guinea highlanders in their valleys, have successfully managed their re-

sources for more than a thousand years is that everyone on the island or in the valley is familiar with the entire territory on which their society depends.

Perhaps the commonest circumstance under which societies fail to perceive a problem is when it takes the form of a slow trend concealed by wide up-and-down fluctuations. The prime example in modern times is global warming. We now realize that temperatures around the world have been slowly rising in recent decades, due in large part to atmospheric changes caused by humans. However, it is not the case that the climate each year has been exactly 0.01 degree warmer than in the previous year. Instead, as we all know, climate fluctuates up and down erratically from year to year: three degrees warmer in one summer than in the previous one, then two degrees warmer the next summer, down four degrees the following summer, down another degree the next one, then up five degrees, etc. With such large and unpredictable fluctuations, it has taken a long time to discern the average upwards trend of 0.01 degree per year within that noisy signal. That's why it was only a few years ago that most professional climatologists previously skeptical of the reality of global warming became convinced. As of the time that I write these lines, President Bush of the U.S. is still not convinced of its reality, and he thinks that we need more research. The medieval Greenlanders had similar difficulties in recognizing that their climate was gradually becoming colder, and the Maya and Anasazi had trouble discerning that theirs was becoming drier.

Politicians use the term “creeping normalcy” to refer to such slow trends concealed within noisy fluctuations. If the economy, schools, traffic congestion, or anything else is deteriorating only slowly, it's difficult to recognize that each successive year is on the average slightly worse than the year before, so one's baseline standard for what constitutes “normalcy” shifts gradually and imperceptibly. It may take a few decades of a long sequence of such slight year-to-year changes before people realize, with a jolt, that conditions used to be much better several decades ago, and that what is accepted as normalcy has crept downwards.

Another term related to creeping normalcy is “landscape amnesia”: forgetting how different the surrounding landscape looked 50 years ago, because the change from year to year has been so gradual. An example involves the melting of Montana's glaciers and snowfields caused by global warming (Chapter 1). After spending the summers of 1953 and 1956 in Montana's Big Hole Basin as a teenager, I did not return until 42 years later,

in 1998, when I began visiting every year. Among my vivid teenaged memories of the Big Hole were the snow covering the distant mountaintops even in mid-summer, my resulting sense that a white band low in the sky encircled the basin, and my recollection of a weekend camping trip when two friends and I clambered up to that magical band of snow. Not having lived through the fluctuations and gradual dwindling of summer snow during the intervening 42 years, I was stunned and saddened on my return to the Big Hole in 1998 to find the band almost gone, and in 2001 and 2003 actually all melted off. When I asked my Montana resident friends about the change, they were less aware of it: they unconsciously compared each year's band (or lack thereof) with the previous few years. Creeping normalcy or landscape amnesia made it harder for them than for me to remember what conditions had been like in the 1950s. Such experiences are a major reason why people may fail to notice a developing problem, until it is too late.

I suspect that landscape amnesia provided part of the answer to my UCLA students' question, "What did the Easter Islander who cut down the last palm tree say as he was doing it?" We unconsciously imagine a sudden change: one year, the island still covered with a forest of tall palm trees being used to produce wine, fruit, and timber to transport and erect statues; the next year, just a single tree left, which an islander proceeds to fell in an act of incredibly self-damaging stupidity. Much more likely, though, the changes in forest cover from year to year would have been almost undetectable: yes, this year we cut down a few trees over there, but saplings are starting to grow back again here on this abandoned garden site. Only the oldest islanders, thinking back to their childhoods decades earlier, could have recognized a difference. Their children could no more have comprehended their parents' tales of a tall forest than my 17-year-old sons today can comprehend my wife's and my tales of what Los Angeles used to be like 40 years ago. Gradually, Easter Island's trees became fewer, smaller, and less important. At the time that the last fruit-bearing adult palm tree was cut, the species had long ago ceased to be of any economic significance. That left only smaller and smaller palm saplings to clear each year, along with other bushes and treelets. No one would have noticed the falling of the last little palm sapling. By then, the memory of the valuable palm forest of centuries earlier had succumbed to landscape amnesia. Conversely, the speed with which deforestation spread over early Tokugawa Japan made it easier for its shoguns to recognize the landscape changes and the need for preemptive action.

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The third stop on the road map of failure is the most frequent, the most surprising, and requires the longest discussion because it assumes such a wide variety of forms. Contrary to what Joseph Tainter and almost anyone else would have expected, it turns out that societies often fail even to attempt to solve a problem once it has been perceived.

Many of the reasons for such failure fall under the heading of what economists and other social scientists term "rational behavior," arising from clashes of interest between people. That is, some people may reason correctly that they can advance their own interests by behavior harmful to other people. Scientists term such behavior "rational" precisely because it employs correct reasoning, even though it may be morally reprehensible. The perpetrators know that they will often get away with their bad behavior, especially if there is no law against it or if the law isn't effectively enforced. They feel safe because the perpetrators are typically concentrated (few in number) and highly motivated by the prospect of reaping big, certain, and immediate profits, while the losses are spread over large numbers of individuals. That gives the losers little motivation to go to the hassle of fighting back, because each loser loses only a little and would receive only small, uncertain, distant profits even from successfully undoing the minority's grab. Examples include so-called perverse subsidies: the large sums of money that governments pay to support industries that might be uneconomic without the subsidies, such as many fisheries, sugar-growing in the U.S., and cotton-growing in Australia (subsidized indirectly through the government's bearing the cost of water for irrigation). The relatively few fishermen and growers lobby tenaciously for the subsidies that represent much of their income, while the losers (all the taxpayers) are less vocal because the subsidy is funded by just a small amount of money concealed in each citizen's tax bill. Measures benefiting a small minority at the expense of a large majority are especially likely to arise in certain types of democracies that bestow "swing power" on some small groups: e.g., senators from small states in the U.S. Senate, or small religious parties often holding the balance of power in Israel to a degree scarcely possible under the Dutch parliamentary system.

A frequent type of rational bad behavior is "good for me, bad for you and for everybody else"—to put it bluntly, "selfish." As a simple example, most Montana fishermen fish for trout. A few fishermen who prefer to fish for a pike, a larger fish-eating fish not native to western Montana, surreptitiously and illegally introduced pike to some western Montana lakes and

rivers, where they proceeded to destroy trout fishing by eating out the trout. That was good for the few pike fishermen and bad for the far greater number of trout fishermen.

An example producing more losers and higher dollar losses is that, until 1971, mining companies in Montana on closing down a mine just left it with its copper, arsenic, and acid leaking out into rivers, because the state of Montana had no law requiring companies to clean up after mine closure. In 1971 the state of Montana did pass such a law, but companies discovered that they could extract the valuable ore and then just declare bankruptcy before going to the expense of cleaning up. The result has been about \$500,000,000 of cleanup costs to be borne by the citizens of Montana and the U.S. Mining company CEOs had correctly perceived that the law permitted them to save money for their companies, and to advance their own interests through bonuses and high salaries, by making messes and leaving the burden to society. Innumerable other examples of such behavior in the business world could be cited, but it is not as universal as some cynics suspect. In the next chapter we shall examine how that range of outcomes results from the imperative for businesses to make money to the extent that government regulations, laws, and public attitudes permit.

One particular form of clashes of interest has become well known under the name "tragedy of the commons," in turn closely related to the conflicts termed "the prisoner's dilemma" and "the logic of collective action." Consider a situation in which many consumers are harvesting a communally owned resource, such as fishermen catching fish in an area of ocean, or herders grazing their sheep on a communal pasture. If everybody overharvests the resource, it will become depleted by overfishing or overgrazing and thus decline or even disappear, and all of the consumers will suffer. It would therefore be in the common interests of all consumers to exercise restraint and not overharvest. But as long as there is no effective regulation of how much resource each consumer can harvest, then each consumer would be correct to reason, "If I don't catch that fish or let my sheep graze that grass, some other fisherman or herder will anyway, so it makes no sense for me to refrain from overfishing or overharvesting." The correct rational behavior is then to harvest before the next consumer can, even though the eventual result may be the destruction of the commons and thus harm for all consumers.

In reality, while this logic has led to many commons resources becoming overharvested and destroyed, others have been preserved in the face of harvesting for hundreds or even thousands of years. Unhappy outcomes in-

clude the overexploitation and collapse of most major marine fisheries, and the extermination of much of the megafauna (large mammals, birds, and reptiles) on every oceanic island or continent settled by humans for the first time within the last 50,000 years. Happy outcomes include the maintenance of many local fisheries, forests, and water sources, such as the Montana trout fisheries and irrigation systems that I described in Chapter 1. Behind these happy outcomes lie three alternative arrangements that have evolved to preserve a commons resource while still permitting a sustainable harvest.

One obvious solution is for the government or some other outside force to step in, with or without the invitation of the consumers, and to enforce quotas, as the shogun and daimyo in Tokugawa Japan, Inca emperors in the Andes, and princes and wealthy landowners in 16th-century Germany did for logging. However, that is impractical in some situations (e.g., the open ocean) and involves excessive administrative and policing costs in other situations. A second solution is to privatize the resource, i.e., to divide it into individually owned tracts that each owner will be motivated to manage prudently in his/her own interests. That practice was applied to some village-owned forests in Tokugawa Japan. Again, though, some resources (such as migratory animals and fish) are impossible to subdivide, and the individual owners may find it even harder than a government's coast guard or police to exclude intruders.

The remaining solution to the tragedy of the commons is for the consumers to recognize their common interests and to design, obey, and enforce prudent harvesting quotas themselves. That is likely to happen only if a whole series of conditions is met: the consumers form a homogeneous group; they have learned to trust and communicate with each other; they expect to share a common future and to pass on the resource to their heirs; they are capable of and permitted to organize and police themselves; and the boundaries of the resource and of its pool of consumers are well defined. A good example is the case, discussed in Chapter 1, of Montana water rights for irrigation. While the allocation of those rights has been written into law, nowadays the ranchers mostly obey the water commissioner whom they themselves elect, and they no longer take their disputes to court for resolution. Other such examples of homogeneous groups prudently managing resources that they expect to pass to their children are the Tikopia Islanders, New Guinea highlanders, members of Indian castes, and other groups discussed in Chapter 9. Those small groups, along with the Icelanders (Chapter 6) and the Tokugawa Japanese constituting larger groups, were further motivated to reach agreement by their effective isolation: it

was obvious to the whole group that they would have to survive just on their resources for the foreseeable future. Such groups knew that they could not make the frequently heard "ISEP" excuse that is a recipe for mismanagement: "It's not my problem, it's someone else's problem."

Clashes of interest involving rational behavior are also prone to arise when the principal consumer has no long-term stake in preserving the resource but society as a whole does. For example, much commercial harvesting of tropical rainforests today is carried out by international logging companies, which typically take out short-term leases on land in one country, cut down the rainforest on all their leased land in that country, and then move on to the next country. The loggers have correctly perceived that, once they have paid for their lease, their interests are best served by cutting its forest as quickly as possible, renegeing on any agreements to replant, and leaving. In that way, loggers destroyed most of the lowland forests of the Malay Peninsula, then of Borneo, then of the Solomon Islands and Sumatra, now of the Philippines, and coming up soon of New Guinea, the Amazon, and the Congo Basin. What is thus good for the loggers is bad for the local people, who lose their source of forest products and suffer consequences of soil erosion and stream sedimentation. It's also bad for the host country as a whole, which loses some of its biodiversity and its foundations for sustainable forestry. The outcome of this clash of interests involving short-term leased land contrasts with a frequent outcome when the logging company owns the land, anticipates repeated harvests, and may find a long-term perspective to be in its interests (as well as in the interests of local people and the country). Chinese peasants in the 1920s recognized a similar contrast when they compared the disadvantages of being exploited by two types of warlords. It was hard to be exploited by a "stationary bandit," i.e., a locally entrenched warlord, who would at least leave peasants with enough resources to generate more plunder for that warlord in future years. Worse was to be exploited by a "roving bandit," a warlord who like a logging company with short-term leases would leave nothing for a region's peasants and just move on to plunder another region's peasants.

A further conflict of interest involving rational behavior arises when the interests of the decision-making elite in power clash with the interests of the rest of society. Especially if the elite can insulate themselves from the consequences of their actions, they are likely to do things that profit themselves, regardless of whether those actions hurt everybody else. Such clashes, flagrantly personified by the dictator Trujillo in the Dominican Republic and

the governing elite in Haiti, are becoming increasingly frequent in the modern U.S., where rich people tend to live within their gated compounds (Plate 36) and to drink bottled water. For example, Enron's executives correctly calculated that they could gain huge sums of money for themselves by looting the company coffers and thereby harming all the stockholders, and that they were likely to get away with their gamble.

Throughout recorded history, actions or inactions by self-absorbed kings, chiefs, and politicians have been a regular cause of societal collapses, including those of the Maya kings, Greenland Norse chiefs, and modern Rwandan politicians discussed in this book. Barbara Tuchman devoted her book *The March of Folly* to famous historical examples of disastrous decisions, ranging from the Trojans bringing the Trojan horse within their walls, and the Renaissance popes provoking the Protestant succession, to the German decision to adopt unrestricted submarine warfare in World War I (thereby triggering America's declaration of war), and Japan's Pearl Harbor attack that similarly triggered America's declaration of war in 1941. As Tuchman put it succinctly, "Chief among the forces affecting political folly is lust for power, named by Tacitus as 'the most flagrant of all passions.'" As a result of lust for power, Easter Island chiefs and Maya kings acted so as to accelerate deforestation rather than to prevent it: their status depended on their putting up bigger statues and monuments than their rivals. They were trapped in a competitive spiral, such that any chief or king who put up smaller statues or monuments to spare the forests would have been scorned and lost his job. That's a regular problem with competitions for prestige, which are judged on a short time frame.

Conversely, failures to solve perceived problems because of conflicts of interest between the elite and the masses are much less likely in societies where the elite cannot insulate themselves from the consequences of their actions. We shall see in the final chapter that the high environmental awareness of the Dutch (including their politicians) goes back to the fact that much of the population—both the politicians and the masses—lives on land lying below sea level, where only dikes stand between them and drowning, so that foolish land planning by politicians would be at their own personal peril. Similarly, New Guinea highlands big-men live in the same type of huts as everyone else, scrounge for firewood and timber in the same places as everyone else, and were thereby highly motivated to solve their society's need for sustainable forestry (Chapter 9).

All of these examples in the preceding several pages illustrate situations in which a society fails to try to solve perceived problems because the maintenance of the problem is good for some people. In contrast to that so-called rational behavior, other failures to attempt to solve perceived problems involve what social scientists consider "irrational behavior": i.e., behavior that is harmful for everybody. Such irrational behavior often arises when each of us individually is torn by clashes of values: we may ignore a bad status quo because it is favored by some deeply held value to which we cling. "Persistence in error," "wooden-headedness," "refusal to draw inference from negative signs," and "mental standstill or stagnation" are among the phrases that Barbara Tuchman applies to this common human trait. Psychologists use the term "sunk-cost effect" for a related trait: we feel reluctant to abandon a policy (or to sell a stock) in which we have already invested heavily.

Religious values tend to be especially deeply held and hence frequent causes of disastrous behavior. For example, much of the deforestation of Easter Island had a religious motivation: to obtain logs to transport and erect the giant stone statues that were the object of veneration. At the same time, but 9,000 miles away and in the opposite hemisphere, the Greenland Norse were pursuing their own religious values as Christians. Those values, their European identity, their conservative lifestyle in a harsh environment where most innovations would in fact fail, and their tightly communal and mutually supportive society allowed them to survive for centuries. But those admirable (and, for a long time, successful) traits also prevented them from making the drastic lifestyle changes and selective adoptions of Inuit technology that might have helped them survive for longer.

The modern world provides us with abundant secular examples of admirable values to which we cling under conditions where those values no longer make sense. Australians brought from Britain a tradition of raising sheep for wool, high land values, and an identification with Britain, and thereby accomplished the feat of building a First World democracy remote from any other (except New Zealand), but are now beginning to appreciate that those values also have downsides. In modern times a reason why Montanans have been so reluctant to solve their problems caused by mining, logging, and ranching is that those three industries used to be the pillars of the Montana economy, and that they became bound up with Montana's pioneer spirit and identity. Montanans' pioneer commitment to individual freedom and self-sufficiency has similarly made them reluctant to accept their new need for government planning and for curbing individual rights. Communist China's determination not to repeat the errors of capitalism led

it to scorn environmental concerns as just one more capitalist error, and thereby to saddle China with enormous environmental problems. Rwandans' ideal of large families was appropriate in traditional times of high childhood mortality, but has led to a disastrous population explosion today. It appears to me that much of the rigid opposition to environmental concerns in the First World nowadays involves values acquired early in life and never again reexamined: "the maintenance intact by rulers and policy-makers of the ideas they started with," to quote Barbara Tuchman once again.

It is painfully difficult to decide whether to abandon some of one's core values when they seem to be becoming incompatible with survival. At what point do we as individuals prefer to die than to compromise and live? Millions of people in modern times have indeed faced the decision whether, to save their own life, they would be willing to betray friends or relatives, acquiesce in a vile dictatorship, live as virtual slaves, or flee their country. Nations and societies sometimes have to make similar decisions collectively.

All such decisions involve gambles, because one often can't be certain that clinging to core values will be fatal, or (conversely) that abandoning them will ensure survival. In trying to carry on as Christian farmers, the Greenland Norse in effect were deciding that they were prepared to die as Christian farmers rather than live as Inuit; they lost that gamble. Among five small Eastern European countries faced with the overwhelming might of Russian armies, the Estonians and Latvians and Lithuanians surrendered their independence in 1939 without a fight, the Finns fought in 1939-40 and preserved their independence, and Hungarians fought in 1956 and lost their independence. Who among us is to say which country was wiser, and who could have predicted in advance that only the Finns would win their gamble?

Perhaps a crux of success or failure as a society is to know which core values to hold on to, and which ones to discard and replace with new values, when times change. In the last 60 years the world's most powerful countries have given up long-held cherished values previously central to their national image, while holding on to other values. Britain and France abandoned their centuries-old role as independently acting world powers; Japan abandoned its military tradition and armed forces; and Russia abandoned its long experiment with communism. The United States has retreated substantially (but hardly completely) from its former values of legalized racial discrimination, legalized homophobia, a subordinate role of women, and sexual repression. Australia is now reevaluating its status as a rural farming

society with British identity. Societies and individuals that succeed may be those that have the courage to take those difficult decisions, and that have the luck to win their gambles. The world as a whole today faces similar decisions about its environmental problems that we shall consider in the final chapter.

Those are examples of how irrational behavior associated with clashes of values does or doesn't prevent a society from trying to solve perceived problems. Common further irrational motives for failure to address problems include that the public may widely dislike those who first perceive and complain about the problem—such as Tasmania's Green Party that first protested foxes' introduction into Tasmania. The public may dismiss warnings because of previous warnings that proved to be false alarms, as illustrated by Aesop's fable about the eventual fate of the shepherd boy who had repeatedly cried "Wolf!" and whose cries for help were then ignored when a wolf did appear. The public may shirk its responsibility by invoking ISEP (p. 430: "It's someone else's problem").

Partly irrational failures to try to solve perceived problems often arise from clashes between short-term and long-term motives of the same individual. Rwandan and Haitian peasants, and billions of other people in the world today, are desperately poor and think only of food for the next day. Poor fishermen in tropical reef areas use dynamite and cyanide to kill coral reef fish (and incidentally to kill the reefs as well) in order to feed their children today, in the full knowledge that they are thereby destroying their future livelihood. Governments, too, regularly operate on a short-term focus: they feel overwhelmed by imminent disasters and pay attention only to problems that are on the verge of explosion. For example, a friend of mine who is closely connected to the current federal administration in Washington, D.C., told me that, when he visited Washington for the first time after the 2000 national elections, he found that our government's new leaders had what he termed a "90-day focus": they talked only about those problems with the potential to cause a disaster within the next 90 days. Economists rationally attempt to justify these irrational focuses on short-term profits by "discounting" future profits. That is, they argue that it may be better to harvest a resource today than to leave some of the resource intact for harvesting tomorrow, on the grounds that the profits from today's harvest could be invested, and that the investment interest thereby accumulated be-

tween now and some alternative future harvest time would tend to make today's harvest more valuable than the future harvest. In that case, the bad consequences are born by the next generation, but that generation cannot vote or complain today.

Some other possible reasons for irrational refusal to try to solve a perceived problem are more speculative. One is a well-recognized phenomenon in short-term decision-making termed "crowd psychology." Individuals who find themselves members of a large coherent group or crowd, especially one that is emotionally excited, may become swept along to support the group's decision, even though the same individuals might have rejected the decision if allowed to reflect on it alone at leisure. As the German dramatist Schiller wrote, "Anyone taken as an individual is tolerably sensible and reasonable—as a member of a crowd, he at once becomes a blockhead." Historical examples of crowd psychology in operation include late medieval Europe's enthusiasm for the Crusades, accelerating overinvestment in fancy tulips in Holland peaking between 1634 and 1636 ("Tulipomania"), periodic outbursts of witch-hunting like the Salem witch trials of 1692, and the crowds whipped up into frenzies by skillful Nazi propagandists in the 1930s.

A calmer small-scale analog of crowd psychology that may emerge in groups of decision-makers has been termed "groupthink" by Irving Janis. Especially when a small cohesive group (such as President Kennedy's advisors during the Bay of Pigs crisis, or President Johnson's advisors during the escalation of the Vietnam War) is trying to reach a decision under stressful circumstances, the stress and the need for mutual support and approval may lead to suppression of doubts and critical thinking, sharing of illusions, a premature consensus, and ultimately a disastrous decision. Both crowd psychology and groupthink may operate over periods of not just a few hours but also up to a few years: what remains uncertain is their contribution to disastrous decisions about environmental problems unfolding over the course of decades or centuries.

The final speculative reason that I shall mention for irrational failure to try to solve a perceived problem is psychological denial. This is a technical term with a precisely defined meaning in individual psychology, and it has been taken over into the pop culture. If something that you perceive arouses in you a painful emotion, you may subconsciously suppress or deny your perception in order to avoid the unbearable pain, even though the practical results of ignoring your perception may prove ultimately disastrous. The emotions most often responsible are terror, anxiety, and grief. Typical

examples include blocking the memory of a frightening experience, or refusing to think about the likelihood that your husband, wife, child, or best friend is dying because the thought is so painfully sad.

For example, consider a narrow river valley below a high dam, such that if the dam burst, the resulting flood of water would drown people for a considerable distance downstream. When attitude pollsters ask people downstream of the dam how concerned they are about the dam's bursting, it's not surprising that fear of a dam burst is lowest far downstream, and increases among residents increasingly close to the dam. Surprisingly, though, after you get to just a few miles below the dam, where fear of the dam's breaking is found to be highest, the concern then falls off to zero as you approach closer to the dam! That is, the people living immediately under the dam, the ones most certain to be drowned in a dam burst, profess unconcern. That's because of psychological denial: the only way of preserving one's sanity while looking up every day at the dam is to deny the possibility that it could burst. Although psychological denial is a phenomenon well established in individual psychology, it seems likely to apply to group psychology as well.

Finally, even after a society has anticipated, perceived, or tried to solve a problem, it may still fail for obvious possible reasons: the problem may be beyond our present capacities to solve, a solution may exist but be prohibitively expensive, or our efforts may be too little and too late. Some attempted solutions backfire and make the problem worse, such as the Cane Toad's introduction into Australia to control insect pests, or forest fire suppression in the American West. Many past societies (such as medieval Iceland) lacked the detailed ecological knowledge that now permits us to cope better with the problems that they faced. Others of those problems continue to resist solution today.

For instance, please think back to Chapter 8 on the ultimate failure of the Greenland Norse to survive after four centuries. The cruel reality is that, for the last 5,000 years, Greenland's cold climate and its limited, unpredictably variable resources have posed an insuperably difficult challenge to human efforts to establish a long-lasting sustainable economy. Four successive waves of Native American hunter-gatherers tried and ultimately failed before the Norse failed. The Inuit came closest to success by maintaining a self-sufficient lifestyle in Greenland for 700 years, but it was a hard life with frequent deaths from starvation. Modern Inuit are no longer willing to subsist traditionally with stone tools, dogsleds, and hand-held harpooning of

whales from skin boats, without imported technology and food. Modern Greenland's government has not yet developed a self-supporting economy independent of foreign aid. The government has experimented again with livestock as did the Norse, eventually gave up on cattle, and still subsidizes sheep farmers who cannot make a profit by themselves. All that history makes the ultimate failure of the Greenland Norse unsurprising. Similarly, the Anasazi ultimate "failure" in the U.S. Southwest has to be seen in the perspective of many other ultimately "failed" attempts to establish long-lasting farming societies in that environment so hostile for farming.

Among the most recalcitrant problems today are those posed by introduced pest species, which often prove impossible to eradicate or control once they have become established. For example, the state of Montana continues to spend over a hundred million dollars per year on combatting Leafy Spurge and other introduced weed species. That's not because Montanans don't try to eradicate them, but simply because the weeds are impossible to eradicate at present. Leafy Spurge has roots 20 feet deep, too long to pull up by hand, and specific weed-controlled chemicals cost up to \$800 per gallon. Australia has tried fences, foxes, shooting, bulldozers, myxomatosis virus, and calicivirus in its ongoing efforts to control rabbits, which have survived all such efforts so far.

The problem of catastrophic forest fires in dry parts of the U.S. Intermontane West could probably be brought under control by management techniques to reduce the fuel load, such as by mechanically thinning out new growth in the understory and removing fallen dead timber. Unfortunately, carrying out that solution on a large scale is considered prohibitively expensive. The fate of Florida's Dusky Seaside Sparrow similarly illustrates failure due to expense, as well as due to the usual penalty for procrastination ("too little, too late"). As the sparrow's habitat dwindled, action was postponed because of arguments over whether its habitat really was becoming critically small. By the time the U.S. Fish and Wildlife Service agreed in the late 1980s to buy its remaining habitat at the high cost of \$5,000,000, that habitat had become so degraded that its sparrows died out. An argument then raged over whether to breed the last sparrows in captivity to the closely related Scott's Seaside Sparrow, and then reestablish purer Dusky Seaside Sparrows by back-crossing the resulting hybrids. By the time that permission was finally granted, those last Dusky captives had become infertile through old age. Both the habitat preservation effort and the captive breeding effort would have been cheaper and more likely to succeed if they had been begun earlier.

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Thus, human societies and smaller groups may make disastrous decisions for a whole sequence of reasons: failure to anticipate a problem, failure to perceive it once it has arisen, failure to attempt to solve it after it has been perceived, and failure to succeed in attempts to solve it. This chapter began with my relating the incredulity of my students, and of Joseph Tainter, that societies could allow environmental problems to overwhelm them. Now, at the end of this chapter, we seem to have moved towards the opposite extreme: we have identified an abundance of reasons why societies might fail. For each of those reasons, each of us can draw on our own life experiences to think of groups known to us that failed at some task for that particular reason.

But it's also obvious that societies don't regularly fail to solve their problems. If that were true, all of us would now be dead or else living again under the Stone Age conditions of 13,000 years ago. Instead, the cases of failure are sufficiently noteworthy to warrant writing this book about them—a book of finite length, about only certain societies, and not an encyclopedia of every society in history. In Chapter 9 we specifically discussed some examples drawn from the majority of societies that succeeded.

Why, then, do some societies succeed and others fail, in the various ways discussed in this chapter? Part of the reason, of course, involves differences among environments rather than among societies: some environments pose much more difficult problems than do others. For instance, cold isolated Greenland was more challenging than was southern Norway, whence many of Greenland's colonists originated. Similarly, dry, isolated, high-latitude, low-elevation Easter Island was more challenging than was wet, less isolated, equatorial, high Tahiti where ancestors of the Easter Islanders may have lived at one stage. But that's only half of the story. If I were to claim that such environmental differences were the sole reason behind different societal outcomes of success or failure, it would indeed be fair to charge me with "environmental determinism," a view unpopular among social scientists. In fact, while environmental conditions certainly make it more difficult to support human societies in some environments than in others, that still leaves much scope for a society to save or doom itself by its own actions.

It's a large subject why some groups (or individual leaders) followed one of the paths to failure discussed in this chapter, while others didn't. For instance, why did the Inca Empire succeed in reforestation of its dry cool environment, while the Easter Islanders and Greenland Norse didn't? The

answer partly depends on idiosyncrasies of particular individuals and will defy prediction. But I still hope that better understanding of the potential causes of failure discussed in this chapter may help planners to become aware of those causes, and to avoid them.

A striking example of such understanding being put to good use is provided by the contrast between the deliberations over two consecutive crises involving Cuba and the U.S., by President Kennedy and his advisors. In early 1961 they fell into poor group decision-making practices that led to their disastrous decision to launch the Bay of Pigs invasion, which failed ignominiously, leading to the much more dangerous Cuban Missile Crisis. As Irving Janis pointed out in his book *Groupthink*, the Bay of Pigs deliberations exhibited numerous characteristics that tend to lead to bad decisions, such as a premature sense of ostensible unanimity, suppression of personal doubts and of expression of contrary views, and the group leader (Kennedy) guiding the discussion in such a way as to minimize disagreement. The subsequent Cuban Missile Crisis deliberations, again involving Kennedy and many of the same advisors, avoided those characteristics and instead proceeded along lines associated with productive decision-making, such as Kennedy ordering participants to think skeptically, allowing discussion to be freewheeling, having subgroups meet separately, and occasionally leaving the room to avoid his overly influencing the discussion himself.

Why did decision-making in these two Cuban crises unfold so differently? Much of the reason is that Kennedy himself thought hard after the 1961 Bay of Pigs fiasco, and he charged his advisors to think hard, about what had gone wrong with their decision-making. Based on that thinking, he purposely changed how he operated the advisory discussions in 1962.

In this book that has dwelt on Easter Island chiefs, Maya kings, modern Rwandan politicians, and other leaders too self-absorbed in their own pursuit of power to attend to their society's underlying problems, it is worth preserving balance by reminding ourselves of other successful leaders besides Kennedy. To solve an explosive crisis, as Kennedy did so courageously, commands our admiration. Yet it calls for a leader with a different type of courage to anticipate a growing problem or just a potential one, and to take bold steps to solve it before it becomes an explosive crisis. Such leaders expose themselves to criticism or ridicule for acting before it becomes obvious to everyone that some action is necessary. But there have been many such courageous, insightful, strong leaders who deserve our admiration. They include the early Tokugawa shoguns, who curbed deforestation in Japan long before it reached the stage of Easter Island; Joaquín Balaguer, who (for

whatever motives) strongly backed environmental safeguards on the eastern Dominican side of Hispaniola while his counterparts on the western Haitian side didn't; the Tikopian chiefs who presided over the decision to exterminate their island's destructive pigs, despite the high status of pigs in Melanesia; and China's leaders who mandated family planning long before overpopulation in China could reach Rwandan levels. Those admirable leaders also include the German chancellor Konrad Adenauer and other Western European leaders, who decided after World War II to sacrifice separate national interests and to launch Europe's integration in the European Economic Community, with a major motive being to minimize the risk of another such European war. We should admire not only those courageous leaders, but also those courageous peoples—the Finns, Hungarians, British, French, Japanese, Russians, Americans, Australians, and others—who decided which of their core values were worth fighting for, and which no longer made sense.

Those examples of courageous leaders and courageous peoples give me hope. They make me believe that this book on a seemingly pessimistic subject is really an optimistic book. By reflecting deeply on causes of past failures, we too, like President Kennedy in 1961 and 1962, may be able to mend our ways and increase our chances for future success (Plate 32).

CHAPTER 15

Big Businesses and the Environment: Different Conditions, Different Outcomes

**Resource extraction ■ Two oil fields ■ Oil company motives ■
Hardrock mining operations ■ Mining company motives ■
Differences among mining companies ■ The logging industry ■
Forest Stewardship Council ■ The seafood industry ■
Businesses and the public ■**

All modern societies depend on extracting natural resources, both non-renewable resources (like oil and metals) and renewable ones (like wood and fish). We get most of our energy from oil, gas, and coal. Virtually all of our tools, containers, machines, vehicles, and buildings are made of metal, wood, or petrochemical-derived plastics and other synthetics. We write and print on wood-derived paper. Our principal wild sources of food are fish and other seafoods. The economies of dozens of countries depend heavily on extractive industries: for instance, of the three countries where I've done most of my fieldwork, the main props of the economy are logging followed by mining in Indonesia, logging and fishing in the Solomon Islands, and oil, gas, mining, and (increasingly) logging in Papua New Guinea. Thus, our societies are committed to extracting those resources: the only questions involve where, in what amounts, and by what means we choose to do so.

Because a resource extraction project usually requires large capital inputs up front, most of the extraction is done by big businesses. Familiar controversies exist between environmentalists and big businesses, which tend to view each other as enemies. Environmentalists blame businesses for harming people by damaging the environment, and routinely putting the business's financial interests above the public good. Yes, those accusations are often true. Conversely, businesses blame environmentalists for routinely being ignorant of and uninterested in business realities, ignoring the desires of local people and host governments for jobs and development, placing the welfare of birds above that of people, and failing to praise businesses when