1

Entering a New World

During the late summer of 2007, the news of accelerating ice melting arrived at a frenetic pace. In early September, the *Guardian* in London reported, "The Arctic ice cap has collapsed at an unprecedented rate this summer, and levels of sea ice in the region now stand at a record low." Experts were "stunned" by the loss of ice, as an area almost twice the size of Britain disappeared in a single week.[1]

Mark Serreze, a veteran Arctic specialist with the U.S. National Snow and Ice Data Center, said: "It's amazing. If you asked me a couple of years ago when the Arctic could lose all of its ice, then I would have said 2100, or 2070 maybe. But now I think that 2030 is a reasonable estimate."[2]

A few days later, the *Guardian*, reporting from a symposium in Ilulissat, Greenland, said that the Greenland ice cap is melting so fast that it is triggering minor earthquakes as pieces of ice weighing several billion tons each break off the ice sheet and slide into the sea. Robert Corell, chairman of the Arctic Climate Impact Assessment, reported that "we have seen a massive acceleration of the speed with which these glaciers are moving into the sea. The ice is moving at 2 meters an hour on a front 5 kilometers [3 miles] long and 1,500 meters deep."[3]

Corell said that when flying over the Ilulissat glacier he had "seen gigantic holes (moulins) in it through which swirling masses of melt water were falling." This melt water lubricates the surface between the glacier and the land below, causing the glacier to flow faster into the sea. Veli Kallio, a Finnish scientist who had been analyzing the earthquakes, said they were new to northwest Greenland and showed the potential for the entire ice sheet to break up and collapse.[4]

Corell noted that the projected rise in sea level during this century of 18–59 centimeters (7–23 inches) by the Intergovernmental Panel on Climate Change was based on data that were two years old. He said that some scientists now believe the increase could be as much as 2 meters.[5]

In late August, a *Reuters* story began with "a thaw of Antarctic ice is outpacing predictions by the U.N. climate panel and could in the worst case drive up world sea levels by 2 meters (6 feet) by 2100, a leading expert said." Chris Rapley, head of the British Antarctic Survey said, "The ice is moving faster both in Greenland and in the Antarctic than the glaciologists had believed would happen."[6]

Several months earlier, scientists had reported that the Gangotri glacier, the principal glacier that feeds the Ganges River, is melting at an accelerating rate and could disappear entirely in a matter of decades. The Ganges would become a seasonal river, flowing only during the monsoon season.[7]

Glaciers on the Tibet-Qinghai Plateau that feed the Yellow and Yangtze rivers are melting at 7 percent a year. Yao Tandong, one of China's leading glaciologists, believes that at this rate, two thirds of these glaciers could disappear by 2060.[8]

These glaciers in the Himalayas and on the Tibet-Qinghai Plateau feed all the major rivers of Asia, including the Indus, Ganges, Mekong, Yangtze, and Yellow Rivers. It is the water from these rivers that irrigates the rice and wheat fields in the region.

We are crossing natural thresholds that we cannot see and violating deadlines that we do not recognize. Nature is the time keeper, but we cannot see the clock. Among the other environmental trends undermining our future are shrinking forests, expanding deserts, falling water tables, collapsing fisheries, disappearing species, and rising temperatures. The temperature

increases bring crop-withering heat waves, more-destructive storms, more-intense droughts, more forest fires, and, of course, ice melting.

We can see from ice melting alone that our civilization is in trouble. If the Greenland ice sheet melts, sea level rises 7 meters (23 feet). If the West Antarctic Ice Sheet breaks up, and many scientists think it could go before Greenland, it adds another 5 meters to the increase, for a total of 12 meters (39 feet).[9]

The International Institute for Environment and Development has studied the likely effects of a 10-meter (33-foot) rise. Their 2007 study projected more than 600 million refugees from rising seas. More people than currently live in the United States and Western Europe combined would be forced to migrate inland to escape the rising waters.[10]

Now that we are belatedly recognizing these trends and the need to reverse them, time is running out. We are in a race between tipping points in the earth's natural systems and those in the world's political systems. Which will tip first? Will we reach the point where the melting of the Greenland ice sheet is irreversible? Or will we decide to phase out coal-fired power plants fast enough to avoid this wholesale ice melting?

A rise in temperature to the point where the earth's ice sheets and glaciers melt is only one of many environmental tipping points needing our attention. While the earth's temperature is rising, water tables are falling on every continent. Here the challenge is to raise water use efficiency and stabilize population before water shortages become life-threatening.[11]

Population growth, which contributes to all the problems discussed here, has its own tipping point. Scores of countries have developed enough economically to sharply reduce mortality but not yet enough to reduce fertility. As a result, they are caught in the demographic trap—a situation where rapid population growth begets poverty and poverty begets rapid population growth. In this situation, countries eventually tip one way or the other. They either break out of the cycle or they break down.

Over the last few decades, the world has accumulated a growing number of unresolved problems, including those just mentioned. As the stresses from these unresolved problems accumulate, weaker governments are beginning to break down, leading to what are now commonly referred to as failing states.

Failing states are an early sign of a failing civilization. The countries at the top of the lengthening list of failing states are not particularly surprising. They include, for example, Iraq, Sudan, Somalia, Chad, Afghanistan, the Democratic Republic of the Congo, and Haiti. And the list grows longer each year, raising a disturbing question: How many failing states will it take before civilization itself fails? No one knows the answer, but it is a question we must ask.[12]

A Massive Market Failure

When Nicholas Stern, former chief economist at the World Bank, released his ground-breaking study in late 2006 on the future costs of climate change, he talked about a massive market failure. He was referring to the failure of the market to incorporate the climate change costs of burning fossil fuels. The costs, he said, would be measured in the trillions of dollars. The difference between the market prices for fossil fuels and the prices that also incorporate their environmental costs to society are huge.[13]

The roots of our current dilemma lie in the enormous growth of the human enterprise over the last century. Since 1900, the world economy has expanded 20-fold and world population has increased fourfold. Although there were places in 1900 where local demand exceeded the capacity of natural systems, this was not a global issue. There was some deforestation, but overpumping of water was virtually unheard of, overfishing was rare, and carbon emissions were so low that there was no serious effect on climate. The indirect costs of these early excesses were negligible.[14]

Now with the economy as large as it is, the indirect costs of burning coal—the costs of air pollution, acid rain, devastated ecosystems, and climate change—can exceed the direct costs, those of mining the coal and transporting it to the power plant. As a result of neglecting to account for these indirect costs, the market is undervaluing many goods and services, creating economic distortions.[15]

As economic decisionmakers—whether consumers, corporate planners, government policymakers, or investment bankers—we all depend on the market for information to guide us. In order for markets to work and economic actors to make

sound decisions, the markets must give us good information, including the full cost of the products we buy. But the market is giving us bad information, and as a result we are making bad decisions—so bad that they are threatening civilization.

The market is in many ways an incredible institution. It allocates resources with an efficiency that no central planning body can match and it easily balances supply and demand. The market has some fundamental weaknesses, however. It does not incorporate into prices the indirect costs of producing goods. It does not value nature's services properly. And it does not respect the sustainable yield thresholds of natural systems. It also favors the near term over the long term, showing little concern for future generations.

One of the best examples of this massive market failure can be seen in the United States, where the gasoline pump price in mid-2007 was $3 per gallon. But this price reflects only the cost of discovering the oil, pumping it to the surface, refining it into gasoline, and delivering the gas to service stations. It overlooks the costs of climate change as well as the costs of tax subsidies to the oil industry (such as the oil depletion allowance), the burgeoning military costs of protecting access to oil in the politically unstable Middle East, and the health care costs for treating respiratory illnesses from breathing polluted air.[16]

Based on a study by the International Center for Technology Assessment, these costs now total nearly $12 per gallon ($3.17 per liter) of gasoline burned in the United States. If these were added to the $3 cost of the gasoline itself, motorists would pay $15 a gallon for gas at the pump. In reality, burning gasoline is very costly, but the market tells us it is cheap, thus grossly distorting the structure of the economy. The challenge facing governments is to restructure tax systems by systematically incorporating indirect costs as a tax to make sure the price of products reflects their full costs to society and by offsetting this with a reduction in income taxes.[17]

Another market distortion became abundantly clear in the summer of 1998 when China's Yangtze River valley, home to nearly 400 million people, was wracked by some of the worst flooding in history. The resulting damages of $30 billion exceeded the value of the country's annual rice harvest.[18]

After several weeks of flooding, the government in Beijing

announced a ban on tree cutting in the Yangtze River basin. It justified this by noting that trees standing are worth three times as much as trees cut: the flood control services provided by forests were far more valuable than the lumber in the trees. In effect, the market price was off by a factor of three.[19]

This situation has occasional parallels in the commercial world. In the late 1990s Enron, a Texas-based energy trading corporation, may have appeared on the cover of more business magazines than any other U.S. company. It was spectacularly successful. The darling of Wall Street, it was the seventh most valuable corporation in the United States in early 2001. Unfortunately, when independent auditors began looking closely at Enron in late 2001 they discovered that the company had been leaving certain costs off the books. When these were included, Enron was worthless. Its stock, which had traded as high as $90 a share, was suddenly trading for pennies a share. Enron was bankrupt. The collapse was complete. It no longer exists.[20]

We are doing today exactly what Enron did. We are leaving costs off the books, but on a far larger scale. We focus on key economic indicators like economic growth and the increase in international trade and investment, and the situation looks good. But if we incorporate all the indirect costs that the market omits when setting prices, a very different picture emerges. If we persist in leaving these costs off the books, we will face the same fate as Enron.

Today, more than ever before, we need political leaders who can see the big picture, who understand the relationship between the economy and its environmental support systems. And since the principal advisors to government are economists, we need economists who can think like ecologists. Unfortunately they are rare. Ray Anderson, founder and chairman of Atlanta-based Interface, a leading world manufacturer of industrial carpet, is especially critical of economics as it is taught in many universities: "We continue to teach economics students to trust the 'invisible hand' of the market, when the invisible hand is clearly blind to the externalities and treats massive subsidies, such as a war to protect oil for the oil companies, as if the subsidies were deserved. Can we really trust a blind invisible hand to allocate resources rationally?"[21]

Environment and Civilization

To understand our current environmental dilemma, it helps to look at earlier civilizations that also got into environmental trouble. Our early twenty-first century civilization is not the first to face the prospect of environmentally induced economic decline. The question is how we will respond.

As Jared Diamond points out in his book *Collapse*, some of the early societies that were in environmental trouble were able to change their ways in time to avoid decline and collapse. Six centuries ago, for example, Icelanders realized that overgrazing on their grass-covered highlands was leading to extensive soil loss from the inherently thin soils of the region. Rather than lose the grasslands and face economic decline, farmers joined together to determine how many sheep the highlands could sustain and then allocated quotas among themselves, thus preserving their grasslands. The Icelanders understood the consequences of overgrazing and reduced their sheep numbers to a level that could be sustained. Their wool production and woolen goods industry continue to thrive today.[22]

Not all societies have fared as well as the Icelanders. The early Sumerian civilization of the fourth millennium BC had advanced far beyond any that had existed before. Its carefully engineered irrigation system gave rise to a highly productive agriculture, one that enabled farmers to produce a food surplus, supporting formation of the first cities. Managing Sumer's irrigation system required a sophisticated social organization. The Sumerians had the first cities and the first written language, the cuneiform script.[23]

By any measure it was an extraordinary civilization, but there was an environmental flaw in the design of its irrigation system, one that would eventually undermine its food supply. The water that backed up behind dams built across the Euphrates was diverted onto the land through a network of gravity-fed canals. As with most irrigation systems, some irrigation water percolated downward. In this region, where underground drainage was weak, this slowly raised the water table. As the water climbed to within inches of the surface, it began to evaporate into the atmosphere, leaving behind salt. Over time, the accumulation of salt on the soil surface lowered the land's productivity.[24]

As salt accumulated and wheat yields declined, the Sumerians shifted to barley, a more salt-tolerant plant. This postponed Sumer's decline, but it was treating the symptoms, not the cause, of their falling crop yields. As salt concentrations continued to build, the yields of barley eventually declined also. The resultant shrinkage of the food supply undermined this once-great civilization. As land productivity declined, so did the civilization.[25]

Archeologist Robert McC. Adams has studied the site of ancient Sumer on the central floodplain of the Euphrates River, an empty, desolate area now outside the frontiers of cultivation. He describes how the "tangled dunes, long disused canal levees, and the rubble-strewn mounds of former settlement contribute only low, featureless relief. Vegetation is sparse, and in many areas it is almost wholly absent....Yet at one time, here lay the core, the heartland, the oldest urban, literate civilization in the world."[26]

The New World counterpart to Sumer is the Mayan civilization that developed in the lowlands of what is now Guatemala. It flourished from AD 250 until its collapse around AD 900. Like the Sumerians, the Mayans had developed a sophisticated, highly productive agriculture, this one based on raised plots of earth surrounded by canals that supplied water.[27]

As with Sumer, the Mayan demise was apparently linked to a failing food supply. For this New World civilization, it was deforestation and soil erosion that undermined agriculture. Changes in climate may also have played a role. Food shortages apparently triggered civil conflict among the various Mayan cities as they competed for something to eat. Today this region is covered by jungle, reclaimed by nature.[28]

The Icelanders crossed a political tipping point that enabled them to come together and limit grazing before grassland deterioration reached the point of no return. The Sumerians and Mayans failed to do so. Time ran out.

Today, our successes and problems flow from the extraordinary growth in the world economy over the last century. The economy's annual growth, once measured in billions of dollars, is now measured in the trillions. Indeed, just the growth in the output of goods and services in 2007 exceeded the total output of the world economy in 1900.[29]

While the economy is growing exponentially, the earth's natural capacities, such as its ability to supply fresh water, forest products, and seafood, have not increased. A team of scientists led by Mathis Wackernagel concluded in a 2002 study published by the U.S. National Academy of Sciences that humanity's collective demands first surpassed the earth's regenerative capacity around 1980. Today, global demands on natural systems exceed their sustainable yield capacity by an estimated 25 percent. This means we are meeting current demands by consuming the earth's natural assets, setting the stage for decline and collapse.[30]

In our modern high-tech civilization, it is easy to forget that the economy, indeed our existence, is wholly dependent on the earth's natural systems and resources. We depend, for example, on the earth's climate system for an environment hospitable to agriculture, on the hydrological cycle to provide us with fresh water, and on long-term geological processes to convert rocks into the soil that has made the earth such a biologically productive planet.

There are now so many of us placing such heavy demands on the earth that we are overwhelming its natural capacities to meet our needs. The earth's forests are shrinking. Each year overgrazing converts vast areas of grassland into desert. The pumping of underground water exceeds natural recharge in countries containing half the world's people, leaving many without adequate water as their wells go dry.[31]

Each of us depends on the products and services provided by the earth's ecosystems, ranging from forest to wetlands, from coral reefs to grasslands. Among the services these ecosystems provide are water purification, pollination, carbon sequestration, flood control, and soil conservation. A four-year study of the world's ecosystems by 1,360 scientists, the Millennium Ecosystem Assessment, reported that 15 of 24 primary ecosystem services are being degraded or pushed beyond their limits. For example, three quarters of oceanic fisheries, a major source of protein in the human diet, are being fished at or beyond their limits, and many are headed toward collapse.[32]

Tropical rainforests are another ecosystem under severe stress, including the vast Amazon rainforest. Thus far roughly 20 percent of the rainforest has been cleared either for cattle

ranching or soybean farming. Another 22 percent has been weakened by logging and road building, letting sunlight reach the forest floor, drying it out, and turning it into kindling. When it reaches this point, the rainforest loses its resistance to fire and begins to burn when ignited by lightning strikes.[33]

Scientists believe that if half the Amazon is cleared or weakened, this may be the tipping point, the threshold beyond which the rainforest cannot be saved. We will have crossed the tipping point, with consequences that will reverberate around the world. Amazonian ecologist Philip Fearnside says "with every tree that falls, we increase the probability that the tipping point will arrive." Geoffrey Lean, summarizing the findings of a symposium on the Amazon in the *Independent*, says that the alternatives to a rainforest in the Amazon would be "dry savannah at best, desert at worst."[34]

Daniel Nepstad, an Amazon-based senior scientist from the Woods Hole Research Center, sees a future of "megafires" sweeping through the drying jungle. He notes that the carbon stored in the Amazon's trees equals roughly 15 years of human-induced carbon emissions in the atmosphere. If we reach this tipping point we will have triggered yet another climate feedback, taken another step that could help seal our fate as a civilization.[35]

The excessive pressures on a given resource typically begin in a few countries and then slowly spread to others. Nigeria and the Philippines, once net exporters of forest products, are now importers. Thailand, now largely deforested, has banned logging. So has China, which is turning to Siberia and to the few remaining forested countries in Southeast Asia, such as Myanmar and Papua New Guinea, for the logs it needs.[36]

A similar situation exists with fisheries. At first only a few fisheries were under excessive pressure, mostly in the North Sea, off the east coast of North America, and off the coast of East Asia. Now with fishing fleets replete with factory processing ships and modern technologies, overfishing is the rule, not the exception. In the absence of intervention, the decline in scores of fisheries will culminate in collapse. Some, such as the cod fishery off the coast of Newfoundland and the Atlantic tuna fishery, may never recover. The Chilean sea bass fishery in the Southern Ocean and the sturgeon fishery in the Caspian Sea may also be approaching the point of no return.[37]

As wells go dry, as grasslands are converted into desert, and as soils erode, people are forced to migrate elsewhere, either within their country or across national boundaries. As the earth's natural capacities at the local level are exceeded, the declining economic possibilities generate a flow of environmental refugees.

While the continuing erosion of the economy's environmental support systems has convinced environmentalists, natural scientists, and others of the need to restructure the global economy, many others are not yet convinced. What is happening in China may change their minds.

China: Why the Existing Economic Model Will Fail

For almost as long as I can remember we have been saying that the United States, with 5 percent of the world's people, consumes a third or more of the earth's resources. That was true. It is no longer true. Today China consumes more basic resources than the United States does.[38]

Among the key commodities such as grain, meat, oil, coal, and steel, China consumes more of each than the United States except for oil, where the United States still has a wide (though narrowing) lead. China uses a third more grain than the United States. Its meat consumption is nearly double that of the United States. It uses three times as much steel.[39]

These numbers reflect national consumption, but what would happen if consumption per person in China were to catch up to that of the United States? If we assume that China's economy slows from the 10 percent annual growth of recent years to 8 percent, then in 2030 income per person in China will reach the level it is in the United States today.[40]

If we also assume that the Chinese will spend their income more or less as Americans do today, then we can translate their income into consumption. If, for example, each person in China consumes paper at the current American rate, then in 2030 China's 1.46 billion people will need twice as much paper as is produced worldwide today. There go the world's forests.[41]

If we assume that in 2030 there are three cars for every four people in China, as there now are in the United States, China will have 1.1 billion cars. The world currently has 860 million cars. To provide the needed roads, highways, and parking lots, China would have to pave an area comparable to what it now plants in rice.[42]

By 2030 China would need 98 million barrels of oil a day. The world is currently producing 85 million barrels a day and may never produce much more than that. There go the world's oil reserves.[43]

What China is teaching us is that the western economic model—the fossil-fuel-based, automobile-centered, throwaway economy—is not going to work for China. If it does not work for China, it will not work for India, which by 2030 may have an even larger population than China. Nor will it work for the other 3 billion people in developing countries who are also dreaming the "American dream." And in an increasingly integrated global economy, where we all depend on the same grain, oil, and steel, the western economic model will no longer work for the industrial countries either.[44]

The overriding challenge for our generation is to build a new economy—one that is powered largely by renewable sources of energy, that has a much more diversified transport system, and that reuses and recycles everything. We have the technology to build this new economy, an economy that will allow us to sustain economic progress. Can we build it fast enough to avoid a breakdown of social systems?

Mounting Stresses, Failing States

States fail when national governments lose control of part or all of their territory and can no longer ensure the personal security of their people. When governments lose their monopoly on power, law and order begin to disintegrate. When they can no longer provide basic services such as education, health care, and food security, they lose their legitimacy. A government in this position may no longer be able to collect enough revenue to finance effective governance. Societies can become so fragmented that they lack the cohesion to make decisions.

Failing states often degenerate into civil war. As warring groups vie for power, they become a threat to neighboring countries when internal conflict spills over national borders. They provide possible training grounds for international terrorist groups, as in Afghanistan, Iraq, and Somalia, or they become sources of drugs, as in Myanmar (formerly Burma) or Afghanistan (with the latter accounting for 92 percent of the world's opium supply in 2006). Because they lack functioning health care services, weakened states can become a source of infectious disease, as Nigeria has for polio.[45]

In failed states, where governments are no longer in control, power is typically assumed by other elements in society. In Afghanistan, it is local warlords; in Somalia, tribal chiefs; in Haiti, street gangs. New governing groups may also include drug rings or organized crime.

In the past, governments have been concerned by the concentration of too much power in one state, as in Nazi Germany, Imperial Japan, and the Soviet Union. But today it is failing states that provide the greatest threat to global order and stability. As *Foreign Policy* magazine notes, "World leaders once worried about who was amassing power; now they worry about the absence of it."[46]

The U.S. Central Intelligence Agency estimates the number of failing states at 20 or so. The British government's international development arm has identified 46 so-called fragile states. The World Bank focuses its attention on 35 low-income countries under stress, which it also describes as fragile states.[47]

The most systematic ongoing effort to analyze failed and failing states is one undertaken jointly by the Fund for Peace and the Carnegie Endowment for International Peace, which is updated annually and published in each July/August issue of *Foreign Policy*. This invaluable service, which draws on thousands of information sources worldwide, is rich with insights into the changes that are under way in the world and, in a broad sense, where the world is heading.[48]

In this analysis, countries are graded on 12 social, economic, political, and military indicators, with scores that range from 1 to 10. Scores for each indicator are aggregated into a single country indicator: the Failed States Index. A score of 120, the maximum, means that a society is failing totally by every measure.[49]

In the first *Foreign Policy* listing, based on data for 2004 and published in 2005, 7 countries had scores of 100 or more. In 2005 this increased to 9 countries, and in 2006 it was 12—nearly doubling in two years. This short trend is far from definitive, but both the rise in country scores near the top and the near doubling of countries with scores of 100 or higher suggest that state failure is increasing.[50]

Most of the top 10 countries in 2006 (see Table 1–1) were

near the top of the list in the two preceding years. In reviewing the data for 2006, *Foreign Policy* noted that "few encouraging signs emerged in 2006 to suggest the world is on a path to greater peace and stability." The one bright spot was the improvement in Liberia, which moved from ninth in 2004, on the verge of state failure, to twenty-seventh in 2006. When Liberia, after years of turmoil, held an election that brought Ellen Johnson-Sirleaf to the presidency in late 2005, it restored both a measure of political stability and hope for the country's future.[51]

Ranking on the Failed States Index is closely linked with key demographic and environmental indicators. Of the top 20 failing states, 17 have rapid rates of population growth, many of

Table 1–1. *Top 20 Failing States, 2006*

Rank	Country	Score
1	Sudan	113.7
2	Iraq	111.4
3	Somalia	111.1
4	Zimbabwe	110.1
5	Chad	108.8
6	Ivory Coast	107.3
7	Democratic Republic of the Congo	105.5
8	Afghanistan	102.3
9	Guinea	101.3
10	Central African Republic	101.0
11	Haiti	100.9
12	Pakistan	100.1
13	North Korea	97.7
14	Burma	97.0
15	Uganda	96.4
16	Bangladesh	95.9
17	Nigeria	95.6
18	Ethiopia	95.3
19	Burundi	95.2
20	Timor-Leste	94.9

Source: Fund for Peace and Carnegie Endowment for International Peace.

them expanding at close to 3 percent a year or 20-fold per century. In 5 of these 17 countries, women have an average of nearly seven children each. Viewed in terms of the demographic transition, these 17 countries are caught in the demographic trap. They have progressed far enough economically to reduce mortality but not far enough to create the economic and social conditions for fertility decline.[52]

In all but 6 of the top 20 failing states, at least 40 percent of the population is under 15. Such a large share of young people often signals future political instability. Young men, lacking employment opportunities, often become disaffected, making them ready recruits for insurgency movements.[53]

Not surprisingly, there is also often a link between the degree of state failure and the destruction of environmental support systems. In a number of countries on the list—including Sudan, Somalia, and Haiti—deforestation, grassland deterioration, and soil erosion are widespread. The countries with fast-growing populations are also facing a steady shrinkage of both cropland and water per person. After a point, as rapid population growth, deteriorating environmental support systems, and poverty reinforce each other, the resulting instability makes it difficult to attract investment from abroad. Even public assistance programs from donor countries are often phased out as the security breakdown threatens the lives of aid workers, forcing their withdrawal.

State failure is not neatly contained by national boundaries. It often spreads to neighboring countries, much as the genocide in Rwanda spilled over into the Democratic Republic of the Congo, eventually drawing several other countries into the war that claimed some 3.9 million lives in the Congo over several years. More recently, the killings in Darfur have spread into Chad.[54]

As the number of failing states grows, dealing with various international crises becomes more difficult. Actions that may be relatively simple in a healthy world order of functioning nation states, such as controlling the spread of infectious diseases, could become difficult or impossible in a world with many disintegrating states. Even maintaining international flows of raw materials could become a challenge. At some point, spreading political instability could disrupt global economic progress,

suggesting that we need to address the causes of state failure with a heightened sense of urgency.

A Civilizational Tipping Point

In recent years there has been a growing concern over thresholds or tipping points in nature. For example, scientists worry about when the shrinking population of an endangered species will fall to a point from which it cannot recover. Marine biologists are concerned about the point where overfishing will trigger the collapse of a fishery.

We know there were social tipping points in earlier civilizations, points at which they were overwhelmed by the forces threatening them. For instance, at some point the irrigation-related salt buildup in their soil overwhelmed the capacity of the Sumerians to deal with it. With the Mayans, there came a time when the effects of cutting too many trees and the associated loss of topsoil were simply more than they could manage.[55]

The social tipping points that lead to decline and collapse when societies are overwhelmed by a single threat or by simultaneous multiple threats are not always easily anticipated. As a general matter, more economically advanced countries can deal with new threats more effectively than developing countries can. For example, while governments of industrial countries have been able to hold HIV infection rates among adults under 1 percent, many developing-country governments have failed to do so and are now struggling with much higher infection rates. This is most evident in some southern African countries, where up to 20 percent or more of adults are infected.[56]

A similar situation exists with population growth. While populations in nearly all industrial countries except the United States have stopped growing, rapid growth continues in nearly all the countries of Africa, the Middle East, and the Indian subcontinent. Nearly all of the 70 million people being added to world population each year are born in countries where natural support systems are already deteriorating in the face of excessive population pressure, in the countries least able to support them. In these countries, the risk of state failure is growing.[57]

Some issues seem to exceed even the management skills of the more advanced countries, however. When countries first detected falling underground water tables, it was logical to

expect that governments in affected countries would quickly raise water use efficiency and stabilize population in order to stabilize aquifers. Unfortunately, not one country—industrial or developing—has done so. Two failing states where overpumping and security-threatening water shortages loom large are Pakistan and Yemen.

Although the need to cut carbon emissions has been evident for some time, not one country—industrial or developing—has succeeded in becoming carbon-neutral. Thus far this has proved too difficult politically for even the most technologically advanced societies. Could rising carbon dioxide levels in the atmosphere prove to be as unmanageable for our early twenty-first century civilization as rising salt levels in the soil were for the Sumerians in 4000 BC?

Another potentially severe stress on governments is the coming decline in oil production. Although world oil production has exceeded new oil discoveries by a wide margin for more than 20 years, only Sweden and Iceland actually have anything that remotely resembles a plan to effectively cope with a shrinking supply of oil.[58]

This is not an exhaustive inventory of unresolved problems, but it does give a sense of how their number is growing as we fail to solve existing problems even as new ones are being added to the list. The risk is that these accumulating problems and their consequences will overwhelm more and more governments, leading to widespread state failure and eventually the failure of civilization.

Analytically, the challenge is to assess the effects of mounting stresses on the global system. These stresses are perhaps most evident in their effect on food security, which was the weak point of many earlier civilizations that collapsed. Several converging trends are making it difficult for the world's farmers to keep up with the growth in food demand. Prominent among these are falling water tables, the growing conversion of cropland to nonfarm uses, and more extreme climate events, including crop-withering heat waves, droughts, and floods. As a result, world grain production has fallen short of consumption in seven of the last eight years, dropping world grain stocks to their lowest level in 34 years. Corn prices nearly doubled and wheat prices nearly tripled between late 2005 and late 2007.[59]

Just when it seemed that things could not get much worse, the United States, the world's breadbasket, is planning to double the share of its grain harvest going to fuel ethanol—from 16 percent of the 2006 crop to 30 percent or so of the 2008 crop. With this enormous growth in the U.S. capacity to convert grain into fuel, the world price of grain is moving up toward its oil-equivalent value. This ill-conceived U.S. effort to reduce its oil insecurity has helped drive world grain prices to all-time highs, creating unprecedented world food insecurity. Under this stress, still more states may fail.[60]

State failure can come quickly—and often unexpectedly. In looking back at earlier civilizations, it was often a single environmental trend that led to their demise. But countries today are facing several simultaneously, some of which reinforce each other. The earlier civilizations such as the Sumerians and Mayans were often local, rising and falling in isolation from the rest of the world. In contrast, we will either mobilize together to save our global civilization, or we will all be potential victims of its disintegration.

Plan B—A Plan of Hope

Plan B is shaped by what is needed to save civilization, not by what may currently be considered politically feasible. Plan B does not fit within a particular discipline, sector, or set of assumptions.

Implementing Plan B means undertaking several actions simultaneously, including eradicating poverty, stabilizing population, and restoring the earth's natural systems. It also involves cutting carbon dioxide emissions 80 percent by 2020, largely through a mobilization to raise energy efficiency and harness renewable sources of energy.

Not only is the scale of this save-our-civilization plan ambitious, so is the speed with which it must be implemented. We must move at wartime speed, restructuring the world energy economy at a pace reminiscent of the restructuring of the U.S. industrial economy in 1942 following the Japanese attack on Pearl Harbor. The shift from producing cars to planes, tanks, and guns was accomplished within a matter of months. One of the keys to this extraordinarily rapid restructuring was a ban on the sale of cars, a ban that lasted nearly three years.[61]

We face an extraordinary challenge, but there is much to be upbeat about. All the problems we face can be dealt with using existing technologies. And almost everything we need to do to move the world economy back onto an environmentally sustainable path has already been done in one or more countries.

We see the components of Plan B—the alternative to business as usual—in new technologies already on the market. On the energy front, for example, an advanced-design wind turbine can produce as much energy as an oil well. Japanese engineers have designed a vacuum-sealed refrigerator that uses only one eighth as much electricity as those marketed a decade ago. Gas-electric hybrid automobiles, getting nearly 50 miles per gallon, are twice as efficient as the average car on the road.[62]

Numerous countries are providing models of the various components of Plan B. Denmark, for example, today gets 20 percent of its electricity from wind and has plans to push this to 50 percent. Some 60 million Europeans now get their residential electricity from wind farms. By the end of 2007, some 40 million Chinese homes will be getting their hot water from rooftop solar water heaters. Iceland now heats close to 90 percent of its homes with geothermal energy. In so doing, it has virtually eliminated the use of coal for home heating.[63]

With food, India—using a small-scale dairy production model that relies almost entirely on crop residues as a feed source—has more than quadrupled its milk production since 1970, overtaking the United States as the world's leading milk producer. The value of India's dairy production now exceeds that of its rice harvest.[64]

Fish farming advances in China, centered on the use of an ecologically sophisticated carp polyculture, have made this the first country where fish farm output exceeds the oceanic catch. Indeed, the 32 million tons of farmed fish produced in China in 2005 was equal to roughly a third of the world's oceanic fish catch.[65]

We see what a Plan B world could look like in the reforested mountains of South Korea. Once a barren, almost treeless country, the 65 percent of South Korea now covered by forests has checked flooding and soil erosion, returning environmental health and stability to the Korean countryside.[66]

The United States—which over the last two decades retired

one tenth of its cropland, most of it highly erodible, and shifted to conservation tillage practices—has reduced soil erosion by 40 percent. At the same time, the nation's farmers expanded the grain harvest by more than one fifth.[67]

Some of the most innovative leadership has come from cities. Curitiba, Brazil, a city of 1 million people, began restructuring its transport system in 1974. Since then its population has tripled, but its car traffic has declined by 30 percent. Amsterdam has developed a diverse urban transport system, where nearly 40 percent of all trips within the city are taken by bicycle. Paris has a transport diversification plan that also includes a prominent role for the bicycle and is intended to reduce car traffic by 40 percent. London is relying on a tax on cars entering the city center to attain a similar goal.[68]

Not only are new technologies becoming available, but some of these technologies can be combined to create entirely new outcomes. Gas-electric hybrid cars with an enhanced battery and a plug-in capacity, combined with investment in wind farms feeding cheap electricity into the grid, permit most daily driving to be done with electricity, and at a cost equivalent of less than $1-a-gallon gasoline. In much of the world, domestic wind energy can be substituted for imported oil.[69]

The challenge is to build a new economy and to do it at wartime speed before we miss so many of nature's deadlines that the economic system begins to unravel. This introductory chapter is followed by five chapters outlining the principal environmental, demographic, and economic challenges facing civilization. Then there are seven chapters that outline Plan B, the roadmap of where the world needs to go and how to get there.

Our civilization is in trouble because of trends we ourselves have set in motion. The good news is that momentum is building in efforts to reverse damaging environmental trends. Just to cite one example, in early 2007 Australia announced that it would ban incandescent light bulbs by 2010, replacing them with highly efficient compact fluorescents that use only one fourth as much electricity. Canada quickly followed with a similar initiative. Europe, the United States, and China are expected to do the same soon. The world may be approaching a tipping point on a political initiative that can drop world electricity use by nearly 12 percent, enabling us to close 705 coal-

fired power plants. This "ban the bulb" movement could become the first major win in the battle to stabilize climate.[70]

Participating in the construction of this enduring new economy is exhilarating. So is the quality of life it will bring. We will be able to breathe clean air. Our cities will be less congested, less noisy, less polluted, and more civilized. A world where population has stabilized, forests are expanding, and carbon emissions are falling is within our grasp.