6

Plan A: Business as Usual

If we continue with business as usual—Plan A—the troubles described in the preceding five chapters will worsen. Plan A is failing environmentally and, as a result, it will eventually fail economically. The environmental bubble economy created by overdrawing the earth's natural assets will eventually burst unless we deflate it.

As noted in Chapter 1, the food bubble economy is based on the unsustainable use of groundwater and of cropland. If we were to cease overpumping in order to stabilize water tables, the world grain harvest would drop sharply. No one knows by precisely how much, but Sandra Postel of the Global Water Policy Project estimated a decade ago that the world was overpumping its aquifers by 160 billion tons of water a year. This is equal to 160 million tons of grain, or 8 percent of the world grain harvest. In effect, 8 percent of the world's people—some 500 million people—are fed with grain produced with the unsustainable use of water.[1]

Global assessments such as Postel's are difficult partly because the extent of overpumping varies widely by country. A World Bank report indicates that the pumping of water in Yemen's Sana'a Basin is four times the rate of recharge. In India, some analysts think that pumping may

be nearly double the rate of recharge. In Saudi Arabia and the southern Great Plains of the United States, where pumping is from fossil aquifers, virtually all pumping is overpumping since there is little or no recharge. Once a fossil aquifer is depleted, pumping ends.[2]

A similar situation exists with cropland. To produce the current grain harvest of nearly 1.9 billion tons, many farmers are tilling land that is too steeply sloping or too dry to sustain cultivation. In some countries, this share of cropland is negligible; in others, it is large. For the world, it could easily be 10 percent. Kazakhstan, an extreme case, has abandoned half of its grainland since 1980. The United States and China, the world's largest grain producers, are returning highly erodible cropland to grass or planting it to trees before it becomes wasteland. In each country, roughly one tenth of cropland is going into grass and trees. The United States has largely completed its land use conversion. China is just getting under way.[3]

With oceanic fisheries, long the world's leading protein source, no one knows exactly how much the catch exceeds the sustainable yield. In its *State of the World's Fisheries* annual report, the U.N. Food and Agriculture Organization reports that 75 percent of all fisheries are fished at or beyond capacity, some to the point of collapse. A Canadian study based on 10 years of painstaking research, which was published in *Nature* in May 2003, reports that 90 percent of world stocks of the larger predatory species, including cod, halibut, tuna, swordfish, and marlin, disappeared over the last half-century. No one knows the extent of overfishing, but like overpumping aquifers, it is a practice designed to expand food production in the short term that will almost certainly lead to a decline over the long term.[4]

Although rangeland deterioration does not get much media attention, overgrazing is at least as common as

overfishing. Data on the extent of overgrazing by country are hard to find. We do know that the demands of the world's 3.1 billion cattle, sheep, and goats are overwhelming the sustainable forage yields of rangelands. In China, where the government is asking its pastoralists to voluntarily reduce their flocks of sheep and goats by 40 percent as it tries to halt advancing deserts, we at least get a hint of the perceived extent of overgrazing.[5]

With carbon emissions, we have a better sense of the excess. Of the 6.5 billion tons of carbon released into the atmosphere each year from fossil fuel burning, roughly half is fixed by nature. The other half accumulates in the atmosphere, feeding the greenhouse effect. In this case, carbon emissions are now double nature's carbon-fixing capacity.[6]

In sum, no one knows exactly the extent of our excessive claims on the earth in this bubble economy. The most sophisticated effort to calculate this, the one by Mathis Wackernagel and his team, estimates that in 1999 our claims on the earth exceeded its regenerative capacity by 20 percent. If this overdraft is rising 1 percent a year, as seems likely, then by 2003 it was 24 percent. As we consume the earth's natural capital, the earth's capacity to sustain us is decreasing. We are a species out of control, setting in motion processes we do not understand with consequences that we cannot foresee.[7]

Accelerating Environmental Decline

Most disruptive environmental trends, whether it be shrinking forests, falling water tables, or rising temperature, are accelerating. For example, atmospheric carbon dioxide (CO_2) levels rose from an estimated 280 parts per million (ppm) at the beginning of the industrial era in 1760 to 316 ppm in 1960. By 2002, the CO_2 concentration had climbed to 373 ppm. After rising at less than 0.2 ppm

each year during the preceding two centuries, it has climbed by 1.3 ppm per year since 1960—more than six times as fast.[8]

Each decade, the rise in global average temperature has been greater than the decade before. As the earth's temperature rise accelerates, so does ice melting, as described in Chapter 4. Within a decade the melting of large glaciers on the west coast of Alaska and in northern Canada has gone from raising sea level by 0.14 millimeters a year to raising it by 0.32 millimeters—more than twice as fast.[9]

These studies are reinforced by one from the U.S. Geological Survey that describes an accelerating melting of glaciers in several of the world's mountainous regions. In the Peruvian Andes, for example, data collected on the Qori Kalis glacier show that the rate of retreat since 1995 has been doubling roughly every three years.[10]

As temperatures rise, so does the amount of energy driving storm systems. As noted in Chapter 4, Munich Re reports that the number of weather-related events, including hurricanes, typhoons, and winter storms, with $1 billion or more of insured damage increased from 3 in the 1980s to 25 during the 1990s. Even after adjusting for variables such as a disproportionate share of building in high-risk coastal regions and river floodplains, it is clear that storms are becoming more frequent and more destructive. The meteorological actuaries who project storm frequency and intensity expect this acceleration to continue as long as the temperature keeps rising.[11]

A similar trend exists with water tables. Thirty years ago, reports of falling water tables and wells going dry were rare. Today they are commonplace, as described in Chapter 2. In several places in the southern Great Plains of the United States, water tables have dropped by at least 100 feet (30 meters) over the last few decades. Under the

North China Plain, where the annual drop in the water table was 1.5 meters a year during the early 1990s, the decline is now reported to be 3 meters in many areas.[12]

The acceleration of problems can be seen with rivers too: Several decades ago, if the Colorado failed to reach the sea, it was news. Now it would be news if it did so. In China, the Yellow River ran dry for the first time in 1972, and then occasionally in subsequent years, but by the early 1990s it was running dry every year.[13]

The earth's forest cover, another basic indicator of the planet's health, is also shrinking at an accelerating rate. Although it expanded by 36 million hectares in the industrial world between 1990 and 2000, it shrank by 130 million hectares in the developing world. This net loss of 96 million hectares in 10 years far exceeded that of any previous decade.[14]

Over the last 50 years, Indonesia's once vast tropical rainforest shrank from 162 million hectares to 98 million hectares—an average loss of 1.3 million hectares a year. In the new century, it is shrinking by 2 million hectares a year. Iran is also being deforested at an accelerating rate. *The Economist* reports that from 1955 to 1967, northern Iran lost 9,250 hectares a year. Then from 1967 to 1994, forests disappeared at 18,000 hectares per year. Since then the figure has jumped to 29,000 hectares per year. At this exponential pace, it is only a matter of time before Iran is deforested.[15]

In Southeast Asia, Myanmar (formerly Burma) is fast exporting its remaining tropical hardwoods. My colleague Janet Larsen writes that log exports to China are growing much faster than the trees—many of which are hundreds of years old—can be replaced. In the western hemisphere, deforestation is concentrated in Brazil and Mexico, both of which appear to be losing forests at an accelerating rate.[16]

One manifestation of overgrazing, deforestation, and

overplowing is desertification and dust storms. Data for major dust storms in China compiled by the China Meteorological Administration indicate that desertification is accelerating. After increasing from 5 major dust storms in the 1950s to 14 during the 1980s, the number leapt to 23 in the 1990s. The new decade has begun with more than 20 major dust storms in 2000 and 2001 alone. If this rate is sustained throughout the decade, the total will exceed 100—a fourfold increase in just one decade.[17]

A similar acceleration appears to be under way for species extinction, which is now estimated to be at least 1,000 times the natural rate of extinction. Take primate species—some 240 in total, and our closest living relatives. Ten thousand years ago, as the last Ice Age was ending, baboons reportedly outnumbered humans by at least two to one. Now, as our numbers multiply, the numbers of other primates are diminishing, often to the point where their survival is in question. In 1996, the World Conservation Union–IUCN reported that 13 species of primates were critically endangered. By 2000, this number had increased to 19, a gain of one half. During the same period, the number of species endangered (the next most threatened category) went from 29 to 46, also expanding by half.[18]

Spreading Hunger, Growing Unrest

Hunger is concentrated in two regions of the world: the Indian subcontinent and Africa south of the Sahara. Up to a fourth of India's grain harvest may be based on the overpumping of aquifers. This overpumping, which has been instrumental in helping India develop a food bubble economy, virtually assures a future decline in food production.[19]

For the 700 million people in sub-Saharan Africa, the situation is also difficult. The production of grain, which

supplies half of the calories humans consume directly and a substantial share of the remainder consumed indirectly as meat, milk, eggs, and farmed fish, is a useful indicator of diet adequacy. Annual grain production per person, which averaged 147 kilograms between 1961 and 1980, fell to 120 kilograms between 2000 and 2002, a drop of 18 percent. Africa's ribs are beginning to show. This unfolding food emergency does not exist in a vacuum. Desperate Africans are turning to bushmeat in an effort to survive, threatening various forms of wildlife—from herbivores to gorillas. Efforts to protect wildlife by setting up parks are breaking down as hungry Africans try to survive.[20]

Africa is not well endowed agriculturally. Its soils are typically thin, depleted of nutrients, low in organic matter, and highly erodible. Except for the Congo basin, nearly all the continent is arid or semiarid. Africa has not had a Green Revolution for the same reason that Australia has not had one: it does not have enough water to use much fertilizer. Now it is also facing the heavy loss to AIDS of able-bodied adults who work in the fields.

With business as usual, the prospect of eradicating world hunger is slim to nonexistent. Too many trends are currently headed in the wrong direction. Grain production per person for the world, which climbed from 250 kilograms in 1950 to the historical high of 344 kilograms in 1984, has been declining since then. In 2002 it fell to 290 kilograms, the lowest in 26 years.[21]

The recent loss of momentum in expanding the grain harvest has been cushioned by drawing down grain reserves. But as of 2003, reserves are at their lowest level in a generation, and they cannot be drawn down much further.[22]

With the prospect of water shortages driving more countries into the world grain market for imports, we may well wake up one morning and discover that there is

no longer enough grain to go around—and not enough water to produce enough grain. Such a situation will lead to rapid, potentially dramatic, rises in world grain prices, making it difficult for many low-income, grain-importing countries to procure enough grain to feed their people. Avoiding such a prospect depends on a worldwide reordering of investment and research priorities.

Streams of Environmental Refugees

We are familiar with political refugees who are escaping persecution and with economic refugees seeking jobs, but environmental refugees are not as well known. Such refugees include those whose land is turning to desert, those who are attempting to escape toxic environments, those whose wells are going dry, and those whose land is being submerged by rising seas. In the United States, the first large wave of environmental refugees was formed by those fleeing the Dust Bowl in the southern Great Plains during the 1930s.[23]

A generation later, the United States experienced the first toxic-waste refugees. Love Canal, a small town in New York, part of which was built on a toxic waste disposal site, made national and international headlines during the late 1970s. Beginning in 1942, the Hooker Chemical Company had dumped 21,000 tons of toxic waste, including chlorobenzene, dioxin, halogenated organics, and pesticides. In 1952, it closed the site, capped it over, and deeded it to the Love Canal Board of Education. An elementary school was built on the site, taking advantage of the free land.[24]

But during the 1960s and 1970s people began noticing odors and residues from seeping wastes. Birth defects and other illnesses were common. In August 1978, 239 families were permanently relocated at government expense. They were reimbursed for their homes at market prices.

In September 1979, 300 more families were temporarily relocated. And in October 1980, 900 additional families received government money to move. In all, several thousand people were permanently relocated.[25]

A few years later, the residents of Times Beach, Missouri, began complaining about a rash of health problems. A firm spraying oil on roads to control dust was, in fact, using waste oil laden with toxic chemical wastes. Among other things, investigators discovered dioxin levels many times higher than the tolerance level. The federal government arranged for the permanent evacuation and relocation of more than 2,000 people.[26]

Early one morning in April 1986, a nuclear reactor at the Chernobyl nuclear power plant in Kiev exploded. It started a powerful fire that lasted for 10 days. Massive amounts of radioactivity were spewed into the atmosphere, showering communities in the region with heavy doses of radiation. As a result, the residents of the nearby town of Pripyat and several other communities in Ukraine, Belarus, and Russia were evacuated, requiring the resettlement of 350,400 people. As recently as 1992, Belarus was devoting 20 percent of its national budget to resettlement and the many other costs associated with the accident.[27]

The Dust Bowl refugees, the two U.S. evacuations from toxic waste sites, and the far larger resettlement from the nuclear explosion at Chernobyl were early examples of environmental migration, but they are small compared with what lies ahead if we continue with business as usual. Among the new refugees are those being forced to move because of aquifer depletion and wells running dry. Thus far the evacuations have been of villages, but eventually whole cities might have to be relocated, such as Sana'a, the capital of Yemen, or Quetta, the capital of Pakistan's Baluchistan province. Originally

designed for 50,000 people, Quetta now has 1 million, all of whom depend on 2,000 wells pumping water from a deep aquifer, depleting what is believed to be a fossil aquifer. Like Sana'a, Quetta may have enough water for the rest of this decade, but then its future will be in doubt. In the words of one study assessing the water prospect, Quetta will soon be "a dead city."[28]

Water refugees are likely to be most common in arid and semiarid regions where populations are outgrowing the water supply. Villages in northeastern Iran have been abandoned because the villagers could no longer reach water. A similar situation is found in villages in India, especially in the west and parts of the south. Countless villagers in northern and western China and in parts of Mexico may have to migrate because of a lack of water.

Spreading deserts are also displacing people. In China, where the Gobi Desert is expanding by 10,400 square kilometers (4,000 square miles) a year, the refugee stream is swelling. Chinese scientists report that there are now desert refugees in three provinces—Inner Mongolia (Nei Monggol), Ningxia, and Gansu. An Asian Development Bank preliminary assessment of desertification in Gansu province has identified 4,000 villages that face abandonment.[29]

In Iran, villages abandoned because of spreading deserts and a lack of water already number in the thousands. In the eastern provinces of Baluchistan and Sistan, some 124 villages have been buried by drifting sand. In the vicinity of Damavand, a small town within an hour's drive of Tehran, some 88 villages have been abandoned.[30]

Another source of refugees, a potentially huge one, is rising seas. The Intergovernmental Panel on Climate Change, in its early 2001 study, reported that sea level could rise by nearly 1 meter during this century, but research completed since then indicates that ice is melting much faster than earlier reported, suggesting that the possible rise may be much higher. Even a 1-meter rise in sea level would inundate half of Bangladesh's riceland, forcing the relocation of easily 40 million people. In a country with 144 million people, internal relocation would not be easy. But where else can they go? How many countries would accept even 1 million of these 40 million? Other Asian countries with rice-growing river floodplains would also face an exodus from the rising seas. Among them are China, India, Indonesia, Myanmar, Pakistan, the Philippines, South Korea, Thailand, and Viet Nam.[31]

Coastal cities that would be vulnerable to rising sea level include New Orleans, New York, Washington, London, Cairo, and Shanghai. A 1-meter rise would put one third of Shanghai under water.[32]

Today, the refugee flows from wells that are going dry and deserts that are expanding are beginning. How large these flows and those from rising seas will become over time remains to be seen. But the numbers could be huge. In the quiet desperation of trying to survive, people often cross national borders. In some cases, this desperation drives migrants to their deaths—as tragically seen in the bodies of Mexicans who regularly perish trying to enter the United States by crossing the Arizona desert and in the bodies of Africans washing ashore in Spain and Italy when their fragile watercraft come apart as they try to cross the Mediterranean.[33]

Population Growth and Political Conflict

Population growth can lead to political conflict not only between societies but also within them. Some insights into this were offered in an engaging *World Watch* magazine article by James Gasana, who was Minister of Agriculture and Environment in Rwanda in 1990–92 and then

Minister of Defense in 1992–93. As the chair of a national agricultural commission in 1990, he had warned that without "profound transformations in its agriculture, [Rwanda] will not be capable of feeding adequately its population under the present growth rate. Contrary to the tradition of our demographers, who show that the population growth rate will remain positive over several years in the future, one cannot see how the Rwandan population will reach 10 million inhabitants unless important progress in agriculture, as well as other sectors of the economy, were achieved. Consequently, it is time to fear the Malthusian effects that could derive from the gap between food supply and the demand of the population and social disorders, which could result."[34]

Gasana's warning of possible social disorder was prophetic. He further described how siblings inherited land from their parents and how, with an average of seven children per family, plots that were already small got much smaller. Many tried to find new land, moving onto marginal land, including steeply sloping mountains. By 1989, almost half of Rwanda's cultivated land was on slopes of 10 to 35 degrees, land that is universally considered uncultivable.[35]

In 1950, Rwanda's population was 1.9 million. By 1994, it was nearly 8 million, making it the most densely populated country in Africa. As population grew, so did the demand for firewood. By 1991, the demand was more than double the sustainable yield of local forests. As a result, trees disappeared, forcing people to use straw and other crop residues for cooking fuel. With less organic matter in the soil, land fertility declined.[36]

As the health of the land deteriorated, so did that of the people dependent on it. Eventually there was simply not enough food to go around. A quiet desperation developed among the people. Like a drought-afflicted countryside, it could be ignited with a single match. That match was the crash of a plane on April 6, 1994, shot down as it approached the capital of Kigali, killing President Juvenal Habyarimana. The crash unleashed an organized attack by Hutus, leading to an estimated 800,000 deaths, mostly of Tutsis. In the villages, whole families were slaughtered lest there be survivors to claim the family plot of land. Gasana notes that the deaths were concentrated in communities where caloric intake was the lowest. Population pressure contributed to the tensions and the slaughter, although it was by no means the only factor.[37]

He sees four lessons that can be learned from this tragic chapter in Africa's history. First, rapid population growth is the major driving force behind the vicious circle of environmental scarcities and rural poverty. Second, conserving the environment is essential for long-term poverty reduction. Third, to break the links between environmental scarcities and conflict, win-win solutions—providing all sociological groups with access to natural resources—are essential. And fourth, preventing conflicts of the kind that ravaged Rwanda in 1994 will require a rethinking of what national security really means.[38]

Many other countries in Africa face a similar situation, including Nigeria, the continent's most populous country with 121 million people. President Olusegun Obasanjo is trying desperately in his strife-torn country to maintain peace between the Christian south and the Muslim north and among various tribes. However, as the desert claims 350,000 hectares of rangeland and cropland each year, people are forced southward into already densely populated areas. The same population pressures, land degradation, and hunger that ignited social tensions in Rwanda are building in Nigeria.[39]

Many African countries, largely rural in nature, are on a similar demographic track. Tanzania's population of 37 million in 2003 is projected to increase to 69 million by 2050. Eritrea, where the average family has seven children, is projected to go from 4 million to 11 million by 2050. In the Congo, the population is projected to triple, going from 53 million to 152 million.[40]

Africa is not alone. India faces a possible intensification of the conflict between Hindus and Muslims. In India, as a second generation subdivides already small plots, pressure on the land is intense. So, too, is the pressure on water resources.

With India's population projected to grow from just over 1 billion in 2000 to 1.5 billion in 2050, a collision between rising human numbers and falling water tables is inevitable. In the absence of effective leadership, India could face social conflicts that would dwarf those in Rwanda. As Gasana notes, the relationship between population and natural systems is a national security issue, one that can spawn conflicts along geographic, tribal, ethnic, or religious lines.[41]

Disagreements over the allocation of water among countries that share river systems is a common source of international political conflict, especially where populations are outgrowing the flow of the river. Nowhere is this potential conflict more stark than among the three principal countries of the Nile River valley—Egypt, Sudan, and Ethiopia. Agriculture in Egypt, where it rarely rains, is almost wholly dependent on water from the Nile. Egypt now gets the lion's share of the Nile's water, but its current population of 71 million is projected to reach 127 million by 2050, thus greatly expanding the demand for grain and for water. Sudan, whose 33 million people also depend heavily on the Nile, is expected to have 60 million by 2050. And the number of Ethiopians, in the country

that controls 85 percent of the headwaters of the Nile, is projected to expand from 69 million to 171 million.[42]

Since little water is left in the Nile when it reaches the Mediterranean Sea, if either Sudan or Ethiopia takes more water, Egypt will get less, making it increasingly difficult to produce food for an additional 55 million people. Although there is an existing water rights agreement among the three countries, Ethiopia receives only a minuscule share. Given its aspirations for a better life, and with the headwaters of the Nile being one of its few natural resources, Ethiopia will undoubtedly want to take more. With income per person there averaging only $90 a year compared with nearly $1,300 in Egypt, it is hard to argue that Ethiopia should not get more of the Nile water.[43]

To the north, Turkey, Syria, and Iraq share the waters of the Tigris and Euphrates river system. Turkey, controlling the headwaters, is developing a massive project on the Tigris to increase the water available for irrigation and power. Syria and Iraq, which are both projected to more than double their respective populations of 17 million and 25 million, are concerned because they too will need more water.[44]

In the Aral Sea basin in Central Asia, there is an uneasy arrangement among five countries over the sharing of the two rivers, the Amu Darya and the Syr Darya, that drain into the sea. The demand for water in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan already exceeds the flow of the two rivers by 25 percent. Turkmenistan, which is upstream on the Amu Darya, is planning to develop another half-million hectares of irrigated agriculture. Racked by insurgencies, the region lacks the cooperation needed to manage its scarce water resources. On top of this, Afghanistan, which controls the headwaters of the Amu Darya, plans

to use some of the water for its own development. Geographer Sarah O'Hara of the University of Nottingham, who studies the region's water problems, says, "We talk about the developing world and the developed world, but this is the deteriorating world."[45]

We can now see early signs of potential conflicts emerging. Population pressure and land hunger in northern China are pushing migrants across the border into sparsely populated Russia. Illegal Chinese migrants are seeking jobs in Siberia, much as Mexican workers do in the southwestern United States. Expanding commerce between the two countries is also increasing the Chinese presence, particularly in the Russian communities near the Chinese border. As population pressure drives people across national borders, it can create ethnic conflicts within the recipient societies and strain relations between the countries of origin and destination.[46]

Plan A: Overwhelmed by Problems

One of the biggest risks in this new century is that governments will be overwhelmed by the challenges that are now emerging. Now that we have several decades of unprecedentedly rapid population growth behind us, we can begin to see some of its effects. It comes as no surprise that many governments are showing signs of demographic fatigue. Worn down by the struggle to deal with the consequences of fast-multiplying human numbers, they are unable to respond to new threats, such as the HIV epidemic, aquifer depletion, and land hunger.

One of the first big tests of governments' ability to cope was the HIV epidemic. Many governments moved quickly to contain the virus once it was identified, holding infection rates to less than 1 percent of the adult population. But many others, mainly in Africa, failed to do so. The result is that the countries with the highest infection rates will likely lose close to half of their adult populations over the next decade. Populations in some countries in Africa are declining not because of falling fertility, but because of rising mortality. As noted earlier, this rise in the death rate marks a tragic reversal in world demography as the unthinkable becomes a reality.

Just as scores of countries failed to respond to rising HIV infection rates, scores of others are failing to respond to falling water tables. These countries will be forced to confront overpumping when aquifers are depleted, but by then they may be facing drops in food production.

In countless other countries, continuing population growth is shrinking the cropland per person below the survival level. However hard people work, they will not be able to make it. They will either face hunger and rising death rates or they will join the swelling flow of migrants to cities where they will have at least a slim chance of getting a job or food relief. If we continue with business as usual and let social stresses build, the experience in Rwanda with large-scale social conflict could become all too common. With business as usual, there almost certainly will be other groups who are driven to violence by quiet desperation, by a loss of hope.

Developing countries that were successful in their early efforts to reduce fertility, such as South Korea, Taiwan, and Thailand, are advancing rapidly. Others that are already pressing against the limits of land and water resources and whose populations are projected to double again may face falling living standards that will in turn further reinforce the prevailing high fertility. This reinforcing mechanism, referred to by demographers as the demographic trap, could keep living standards at subsistence level and eventually lead to rising mortality as the land and water resource base deteriorates and food pro-

duction declines. Among the countries at risk of being trapped if they cannot quickly check their population growth are Afghanistan, Ethiopia, Ghana, Haiti, Honduras, India, Myanmar, Nigeria, Pakistan, Sudan, Tanzania, and Yemen.

Climate change is proving to be an overwhelming challenge for both industrial and developing-country governments. Only one country, Iceland, has a strategy to eliminate fossil fuel use and thus reduce carbon emissions to zero. In contrast to the issues just discussed, climate change is primarily the responsibility of the industrial countries, although its effects will be felt everywhere.[47]

What happens when people lose confidence in their governments? The risk in times of extreme stress is that states will fail and that demagogues will assume power. There is a tendency to assume that in the modern world, social breakdown cannot occur, but this is a dangerous illusion. We have no idea what the psychological effects might be if it becomes clear that we have triggered the melting of the Greenland ice sheet and that we cannot stop it. Nor can we even guess at the international political fallout if the Gulf Stream abruptly shifted southward, leaving Western Europe with a Siberian climate.

Once particular climate change and aquifer depletion thresholds are crossed, change can come rapidly and unpredictably. Whether it be in ocean currents, rainfall patterns, ice melting, or rising grain prices, it could leave a bewildered and frightened world in its wake. Will our political institutions, which could not prevent these mega-scale changes, be able to deal with them as they occur? The one thing that now seems certain is that it is time for a new approach—Plan B.