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# STATE OF THE WORLD

*Into a Warming World*

THE WORLDWATCH INSTITUTE

# The Perfect Storm

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Something extraordinary happened at the top of our planet in the past three summers. For a few weeks each year—in the final days of the northern summer—a large stretch of open water appeared around the Arctic, making it briefly possible to pilot a ship from the Atlantic to the Pacific without going through the Panama Canal or around the Cape of Good Hope. Never before in recorded human history has it been possible to make that journey.<sup>1</sup>

As a barometer of global environmental change, the loss of the permanent ice cap at the North Pole is like a seismograph that suddenly jumps off the charts. For several decades now, Earth's heat balance has been severely out of equilibrium. Earth is absorbing more heat than it is emitting, and across the planet ecological systems are responding. The changes so far have been almost imperceptible, and even now they appear from the human viewpoint gradual.

But don't be fooled: the changes represented by melting glaciers, acidifying oceans, and migrating species are—on a planetary timescale—breaking all known speed limits.

The planet that humans have known for 150,000 years (encompassing the Pleistocene and Holocene epochs, as geologists describe them) is changing irrevocably thanks to human actions. In 2000 the Nobel Prize-winning chemist Paul Crutzen and his colleague Eugene F. Stoermer concluded that these changes are so profound that the world has entered a new geological epoch—which they aptly named the Anthropocene.<sup>2</sup>

Changing Earth's climate is like sailing a massive cargo ship. Tremendous energy is required to get such a ship moving—and its forward progress is at first almost imperceptible—but once it is traveling at full speed, it is very hard to stop. It is now virtually certain that children born today will find their lives preoccupied with a host of hardships created by an inexorably warming world. Food supplies will be diminished, and many of the world's forests will be destroyed. Not just the coral reefs that nurture many fisheries but the chemistry of the oceans will face disruption. Indeed, the world's oceans are already acidifying rapidly. Coastlines will be

rearranged, and so will the world's wetlands. Whether you are a farmer or an office worker, whether you live in the northern or southern hemisphere, whether you are rich or poor, you will be affected.<sup>3</sup>

## Fiddling While the World Burns

Like a distant tsunami that is only a few meters high in the deep ocean but rises dramatically as it reaches shallow coastal waters, the great wave of climate change has snuck up on people—and is now beginning to break. Climate change was first identified as a potential danger by a Swedish chemist in the late nineteenth century, but it was not until the late 1980s that scientists had enough evidence to conclude that this transformation was under way and presented a clear threat to humanity.

An American scientist, James Hansen of the National Aeronautics and Space Administration, put climate change squarely on the agenda of policymakers on 23 June 1988. On that hot summer day, Hansen told a U.S. Senate Committee he was 99 percent certain that the year's record temperatures were not the result of natural variation. Based on his research, Hansen had concluded that the rising heat was due to the growing concentration of carbon dioxide (CO<sub>2</sub>) and other atmospheric pollutants. "It's time to stop waffling so much and say that the evidence is pretty strong that the greenhouse effect is here."<sup>4</sup>

Hansen's words, joined with those of other scientists, echoed around the world. Within months government officials were beginning to consider steps to reduce greenhouse gas emissions, with much of the focus on the kind of international agreement that would be needed to tackle this most global of problems. In 1992 the United Nations Framework Con-

vention on Climate Change was adopted by heads of state in Rio de Janeiro, and in 1997 the Kyoto Protocol, with its legally binding emissions limits for industrial countries, was negotiated.<sup>5</sup>

As the 1990s came to an end the world appeared to be moving to tackle the largest and most complex problem humanity has ever faced. But fossil fuel interests mobilized a counterattack—pressuring governments and creating confusion about the science of climate change. Taking advantage of the inevitable uncertainties and caveats contained in leading climate assessments, a handful of climate skeptics—many of them PhDs with oil industry funding—managed to position climate change as a scientific debate rather than a grim reality.

The climate change skeptics had their greatest influence in the United States, putting it at loggerheads with the European Union, which since the early 1990s has been the strongest advocate of action on climate change. In November 2000, in the waning days of the Clinton administration, climate negotiators met in The Hague with the intention of finalizing details of the Kyoto Protocol—which in principle had been agreed to three years earlier. Two weeks of intense discussions concluded with an agonizing all-night session that ended in failure. Distrust and miscommunication between American and European negotiators were at the heart of this historic diplomatic failure—a failure that became more significant a short time later when the U.S. Supreme Court decided that Al Gore would not be the next President of the United States.<sup>6</sup>

In the months that followed, many remained optimistic: before his election, President George W. Bush had indicated his support for addressing the climate problem and working cooperatively with other countries. Two months later—under heavy pressure

from Vice President Cheney and the oil industry—he executed an abrupt U-Turn, rejecting the Kyoto Protocol outright and throwing negotiations into a tailspin. Europe, Canada, Japan, and Russia were shocked into completing and ultimately ratifying the Kyoto Protocol in the following years, but time and political momentum had been lost. More significantly, the unilateral actions of the U.S. government deepened North-South fissures on climate change—a divide that has now become the largest obstacle to progress.<sup>7</sup>

## Storm Clouds Gather

The tragedy of these two wasted decades is that during this period the world has moved from a situation in which roughly a billion people in industrial countries were driving the problem—the United States, for example, has 4.6 percent of the world’s population but accounts for 20 percent of fossil-fuel CO<sub>2</sub> emissions—to today’s reality in which the far larger populations of developing countries are on the verge of driving an even bigger problem.<sup>8</sup>

Global emissions of carbon dioxide from fossil fuel combustion and cement production rose from 22.6 billion tons in 1990 to an estimated 31 billion tons in 2007—a staggering 37-percent increase. This is 85 million tons of carbon dioxide spilled into the atmosphere each day—or 13 kilograms on average per person. The annual increase in emissions shot from 1 percent a year in the 1990s to 3.5 percent a year from 2000 to 2007—with China accounting for most of that remarkable leap.<sup>9</sup>

Between 1990 and 2008 U.S. emissions of carbon dioxide from fossil fuel combustion grew by 27 percent—but emissions in China rose 150 percent, from 2.3 billion to 5.9 billion tons. More suddenly and dramatically than experts had expected, China and other developing countries are entering the energy-

intensive stages of economic development, and their factories, buildings, power plants, and cars are consuming vast amounts of fossil fuels. As recently as 2004, the International Energy Agency projected that it would be 2030 before China passed the United States in emissions. It now appears that the lines crossed in 2006.<sup>10</sup>

Accelerating emissions are not the only factor driving increased concern. Tropical deforestation—estimated at 13 million hectares per year—is adding 6.5 billion tons of carbon dioxide to the atmosphere annually. The world’s largest tropical forest, the Amazon, is disappearing at a faster pace as high agricultural prices encourage land clearing. More alarmingly, Earth’s natural sinks—its oceans and biological systems—appear to be losing their ability to absorb a sizable fraction of those emissions. As a result, the increase in atmospheric CO<sub>2</sub> concentrations has accelerated to the fastest rate ever recorded.<sup>11</sup>

Scientists are reticent by nature, and the overwhelming complexity and inevitable uncertainty of the climate problem have led them to produce equivocal and hard-to-interpret studies that have given considerable comfort to those who argue it is too early to act on climate change. In the past year, however, a few brave scientists have cast reticence aside. Speaking in Washington on the twentieth anniversary of his historic testimony, James Hansen had a sharp warning for policymakers: “If we don’t begin to reduce greenhouse gas emissions in the next several years, and get on a very different course, then we are in trouble....This is the last chance.”<sup>12</sup>

Climate scientists have discovered a particularly inconvenient truth: by the time definitive predictions of climate change are adopted by scientific consensus, the climate system may have reached a tipping point at which climate change begins to feed on itself—and becomes essentially irreversible for centuries

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into the future. The loss of Arctic ice, for example, will allow more sunlight to heat the Arctic Ocean, accelerating the buildup of heat and putting the vast Greenland ice sheet at risk. And there are early indications that the rapid rise in Arctic temperatures is thawing the tundra and thereby releasing additional amounts of CO<sub>2</sub> and methane.

**The political will for change is building, thanks to the strong base in science and widening public awareness of climate change and its risks.**

These dramatic changes will affect the entire planet, but the world's poor will suffer first and suffer most. The latest climate models indicate particular vulnerability in the dry tropics, where the food supplies for hundreds of millions of people will be undermined by climate change. Hundreds of millions more who live in the vast Asian mega-deltas will be at risk from rising sea levels and increased storm intensity. Health threats from malaria, cholera, and other diseases that are likely to flourish in a warmer world will add to the burdens facing the world's poor. The fact that many of the 1.4 billion people who now live in severe poverty already face serious ecological debts—in water, soil, and forests—will exacerbate the new problems presented by climate change.<sup>13</sup>

When they were released in 2007, the latest findings of the Intergovernmental Panel on Climate Change were taken as an urgent warning of the dangers ahead. But the torrent of scientific data to emerge since then has led some scientists to sharpen their advice. James Hansen and W. L. Hare of Germany's Potsdam Institute are among those who have concluded that to prevent "dangerous climate change"—the goal that governments have already agreed to—global emissions

must begin declining within the decade and then fall to no more than half the current level—and possibly even to zero—by the middle of this century. (See Chapter 2.)<sup>14</sup>

This is a tall order indeed. Some would call it impossible. But the resources, technologies, and human capacity for change are all in place. The missing ingredient is political will, and that is a renewable resource.

## A New Political Climate

Over the past few years, political will to tackle the climate problem has grown in many countries around the world. The European Union has committed to reducing its emissions to 20 percent below the 1990 level in 2020—and to reaching 30 percent if other industrial countries join them in a strong international agreement. And the political will for change is building, thanks to the strong base in science and widening public awareness of climate change and its risks. In late 2007, Australians voted out a conservative government in part out of impatience with the Prime Minister's unwillingness to support the Kyoto Protocol; the new Prime Minister promptly secured its ratification. His first trip outside Australia was to a climate negotiation in Bali, and his government has been working to build a national climate plan ever since.<sup>15</sup>

In the United States, climate policy is raging like a prairie fire at the state level. By late 2008, some 27 states had adopted climate plans, and groups of eastern and western states are developing their own regional emissions cap and trade systems. In April 2008, the governors of 18 states gathered at Yale University to proclaim: "Today, we recommit ourselves to the effort to stop global warming, and we call on congressional leaders and the presidential candidates to work with us—in partnership—to establish a comprehensive national climate policy." And the U.S.

business community is responding as well: 27 major corporations, including Alcoa, Dow Chemical, General Motors, and Xerox, have announced their support for caps on national greenhouse gas emissions.<sup>16</sup>

Developing countries are joining in too. In June 2008, the prime minister of India released the much-anticipated National Action Plan on Climate Change. It focuses on eight areas intended to deliver maximum benefits in terms of domestic climate change mitigation and adaptation: solar energy, energy efficiency, sustainable habitat, water, sustaining the Himalayan ecosystem, green India, sustainable agriculture, and sustainable knowledge for climate change. China announced a new climate plan in 2007, and during the course of 2008 continued to strengthen its energy efficiency programs, including a new incentive system that ties promotion of local officials to their success in saving energy.<sup>17</sup>

These advances are welcome. But the world needs to change course much faster. To concentrate the attention of policymakers, a mass global movement is needed in support of a new climate treaty that picks up where the Kyoto Protocol leaves off in 2012. It is everyone's planet, after all, and everyone's climate. There are signs that such a public movement is now growing in industrial as well as developing countries, but it is not yet sufficiently strong or pervasive to counter the vested interests that stand on the other side.

One reason is that climate negotiations are numbingly hard to follow. Outside of a hard-working community of government negotiators, nongovernmental organizations, and academics, most people have little sense of what is happening. In a modest effort to help demystify the process, this book eschews terms of art and uses everyday language as much as possible. (See the Climate Change Guide following Chapter 6 for a glossary of terms used in the climate debate.)

## Ten Key Challenges

Ten challenges must be met in order to create the world of zero net greenhouse gas emissions that will be needed to achieve climate stability.

*Thinking Long-term.* Human beings have evolved to be very good at focusing on an immediate threat—whether it is wild animals the first humans faced on the plains of Africa or the financial panic that gripped the world in late 2008. Climate change is a uniquely long-range problem: its effects appear gradual on a human time scale, and the worst effects will likely be visited on people not yet alive. To solve this problem, we must embrace the future as our responsibility and consider the impact of today's decisions on future generations. Just as Egyptians built pyramids and Europeans built cathedrals to last millennia, we need to start acting as if the future of the planet matters beyond our own short lives.

*Innovation.* The world needs to develop and disseminate technologies that maximize the production and use of carbon-free energy while minimizing cost and optimizing convenience. (Convenience matters: the ease of transporting, storing, and using carbon-based fuels is among their attractions, not captured in price alone.) An effective climate pact will offer incentives that accelerate technological development and ensure that renewable energy and other low-emission technologies are deployed in all countries regardless of ability to pay the costs. (See Chapter 4.) We need to dramatically increase the efficiency with which we use carbon-based energy and lower release into the atmosphere of land-based CO<sub>2</sub>, methane, nitrogen oxides, and greenhouse gases stemming from cooling and various industrial processes. The opportunities for quick and inexpensive emissions reductions remain vast and mostly untapped.

**Population.** It is essential to reopen the global dialogue on human population and promote policies and programs that can help slow and eventually reverse its growth by making sure that all women are able to decide for themselves whether and when to have children. A comprehensive climate agreement would acknowledge both the impacts of climate change on vulnerable populations and the long-term contribution that slower growth and a smaller world population can play in reducing future emissions under an equitable climate framework. And it should renew the commitment that the world's nations made in 1994 to address population not by pressuring parents to have fewer or more children than they want but by meeting the family planning, health, and educational needs of women.<sup>18</sup>

**Changing Lifestyles.** The world's climate cannot be saved by technology alone. The way we live will have to change as well—and the longer we wait the larger the needed sacrifices will be. In the United States, the inexorable increase in the size of homes and vehicles that has marked the past few decades has been a major driver of greenhouse gas emissions and the main reason that U.S. emission are double those of other industrial countries. Lifestyle changes will be needed, some of which seem unattractive today. But in the end, the things we may need to learn to live without—oversized cars and houses, status-based consumption, easy and cheap world travel, meat with every meal, disposable everything—are not necessities or in most cases what makes people happy. The oldest among us and many of our ancestors willingly accepted such sacrifices as necessary in times of war. This is no war, but it may be such a time.

**Healing Land.** We need to reverse the flow of carbon dioxide and other greenhouse gases from destroyed or degraded forests and

land. Soil and vegetation can serve as powerful net removers of the atmosphere's carbon and greenhouse gases. (See Chapter 3.) Under the right management, soil alone could absorb each year an estimated 13 percent of all human-caused carbon dioxide emissions. To the extent we can make the land into a more effective "sink" for these gases we can emit modest levels essential for human development and well-being. Like efficiency, however, an active sink eventually faces diminishing returns. And any sink needs to be secured with "drain stoppers" to prevent easy return of greenhouse gases to the atmosphere when conditions change.<sup>19</sup>

**Strong Institutions.** "Good governance" can be a cliché—until someone needs it to survive. The final months of 2008 laid painfully bare the dangerous imbalance between a freewheeling global economy and a regulatory system that is a patchwork of disparate national systems. And if there was ever a global phenomenon, the climate is it. In fact it is not hard to imagine the climate problem driving a political evolution toward global governance over the long term, but given the public resistance to that idea the next most effective climate-regulating mechanism will be the strength and effectiveness of the United Nations, multilateral banks, and major national governments. New institutions and new funds will be needed, but it could take a major public awakening or a dramatically deteriorating climate to overcome the obstacles to inventing and establishing them.

**The Equity Imperative.** A climate agreement that can endure and succeed will find mechanisms for sharing the burden of costs and potential discomforts. Per capita fossil fuel CO<sub>2</sub> emissions in the United States are almost five times those in Mexico and more than 20 times the levels in most of sub-Saharan Africa. An effective climate agreement will acknowledge the past co-optation of Earth's greenhouse-

gas absorbing capacity by the wealthiest and most industrialized countries and the corresponding need to reserve most of what little absorbing capacity is left for countries in development. Most people live in such countries, and they bear little responsibility for causing this problem—though it is worth recalling that a small but growing share of their populations already have large carbon footprints.<sup>20</sup>

**Economic Stability.** In the fall of 2008 the global economy foundered, raising the obvious question: can a world heading into hard economic times add to its burdens the costs of switching from fossil to renewable fuels or managing precious land for carbon sequestration? Any climate agreement built on an assumption of global prosperity is doomed to failure. And as growing and increasingly affluent populations demand more of the resources of a finite planet, we may have to balance the future of climate against present realities of hunger, poverty, and disease. A robust international climate regime will need to design mechanisms that will operate consistently in anemic as well as booming economic times. And a strong pact will be built on principles and innovations that acknowledge and accommodate the problem of cost—while building in monitoring techniques to ensure that efficiency is not achieved at the expense of effective and enduring emission cuts and adaptation efforts.<sup>21</sup>

**Political Stability.** A world distracted by major wars or outbreaks of terrorism will not be able to stay focused on the more distant future. And just such a focus is needed to prevent future changes in climate and adapt to the ones already occurring. A climate pact could encourage preemptive action to diminish insecurity caused or exacerbated by climate change. But unless nations can find ways to defuse violent conflict and minimize the chance that terrorism will distract and disrupt

societies, climate change prevention and adaptation (along with development itself) will take a back seat. On the bright side, negotiating an effective climate agreement offers countries an opportunity, if they will only seize it, to practice peace, to look beyond the narrowness of the interests within their borders at their dependence on the rest of the world, to see humanity as a single vulnerable species rather than a collection of nations locked in pointless and perpetual competition.

**Solving the climate problem will create the largest wave of new industries and jobs the world has seen in decades.**

**Mobilizing for Change.** As fear of climate change has grown in recent years, so has political action. But opponents of action have repeatedly pointed to the vast costs of reducing emissions. At a time of serious economic problems, the power of that argument is growing, and some of those who are persuaded are going straight from denial to despair. The most effective response to both of those reactions is, in the words of Common Cause founder John Gardner, to see global warming as “breathtaking opportunities disguised as insoluble problems.” Solving the climate problem will create the largest wave of new industries and jobs the world has seen in decades. Michigan, Ohio, and Pennsylvania in the United States are among those that have devoted enormous efforts to attracting new energy industries—with a glancing reference to climate change and a major focus on creating new jobs to revive “rustbelt” economies.<sup>22</sup>

In November 2009, the world faces a test. Will the roughly 200 national governments that meet in Copenhagen to forge a new climate agreement come up with a new proto-

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col that provides both vision and a roadmap, accelerating action around the globe? The challenges are many: Will the global financial crisis and conflict in the Middle East distract world leaders? Will the new U.S. president have time to bring his country back into a leadership position? Will the global North-South divide that has marked climate talks in recent years be overcome?

*State of the World 2009* presents some potential answers to these challenges. One vital theme stands out from the rest: climate change is not a discrete issue to be addressed

apart from all the others. The global economy fundamentally drives climate change, and economic strategies will need to be revised if the climate is ever to be stabilized—and if we are to satisfy the human needs that the global economy is ultimately intended to meet.

We cannot afford to have the Copenhagen climate conference fail. The outcome of this meeting will be written in the world's history books—and in the lasting composition of our common atmosphere.

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