

# What Is Climate Change?

by Ross Gelbspan\* (2006)

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## Introduction

It is not news that climate shapes history.

What is news is that the heating of our atmosphere has propelled our climate into a new state of instability. This new era of climate change could well be the most profound threat ever facing humanity. Climate change is far more than a merely environmental issue. Its dimensions cut to the core of our economic and political lives – even to our basic existence as an organized species. The crisis of the global climate clusters together three issues of enormous scope and pervasive impact.

Its natural dimensions are of truly cosmic proportions. Unintentionally, we have set in motion massive systems of the planet with huge amounts of inertia that have kept it relatively hospitable to civilization for the last 10,000 years. We have heated the deep oceans.<sup>1</sup> We have reversed the carbon cycle by more than 600,000 years.<sup>2</sup> We have loosed a wave of violent weather.<sup>3</sup> We have altered the timing of the seasons.<sup>4</sup> We are living on an increasingly narrow margin of stability.

While the world's governments have spent nine years trying to ratify emissions reductions of five to seven percent, a larger reality is being ignored. The science tells us clearly we must cut our emissions by at least 70 percent if we are to allow the climate to re-stabilize.<sup>5</sup>

As Dr. Rajendra Pachauri, the head of the IPCC, declared recently, we have a 10 year window to begin to make "very deep cuts" in our carbon fuel use if "humanity is to survive."<sup>6</sup>

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<sup>1</sup> Sydney Levitus, John I. Antonov, Julian Wang, Thomas L. Delworth, Keith W. Dixon, Anthony J. Broccoli. (4-13-2001) Anthropogenic Warming of Earth's Climate System *Science*.

Tim P. Barnett, David W. Pierce, Reiner Schnur. (4-13-2001) Detection of Anthropogenic Climate Change in the World's Oceans. *Science*

<sup>2</sup> Urs Siegenthaler, Thomas F. Stocker, Eric Monnin, Dieter Lüthi, Jakob Schwander, Bernhard Stauffer, Dominique Raynaud, Jean-Marc Barnola, Hubertus Fischer, Valérie Masson-Delmotte, Jean Jouzel (2005). Stable Carbon Cycle-Climate Relationship During the Late Pleistocene. *Science V. 310, No. 5752, pp. 1313-1317*

<sup>3</sup> Reaping the whirlwind, extreme weather prompts unprecedented global warming alert. *The Independent, (U.K.)* July 3, 2003 (reporting on findings of World Meteorological Organization)

Kerry Emanuel (2005) Increasing destructiveness of tropical cyclones over the past 30 years. *Nature*.

For more information see: <http://www.realclimate.org/index.php?p=173> and <http://www.realclimate.org/index.php?p=140>

<sup>4</sup> David J. Thomson. (1995). The Seasons, Global Temperature and Precession. *Science, v. 268*

David J. Thomson. (1996). Increased activity of northern vegetation inferred from atmospheric CO2 measurements," *Nature, Vol. 382*.

<sup>5</sup> Intergovernmental Panel on Climate Change. (1995). *Second Assessment Synthesis Of Scientific-Technical Information Relevant To Interpreting Article 2 Of The UN Framework Convention On Climate Change*.

<sup>6</sup>"Global Warming Approaching Point of No Return, Warns Leading Climate Expert. *The Independent (U.K.)* Jan. 23, 2005

Conversely, the real solution to the climate crisis may well contain the seeds for solutions to some of the most threatening problems facing humanity today. The solution to climate change has the potential to begin to mend a profoundly fractured world.

Take, for example, our newfound vulnerability to terrorism.

The most obvious connection is that the solution to the climate crisis – a worldwide transition to renewable energy – would dramatically reduce the significance of oil – and with it our exposure to the political volatility in the Middle East.

That volatility will only become more explosive, given the approaching exhaustion of the region's oil reserves.

Much more relevant is the fact that the U.S. generates a quarter of the world's emissions with five percent of its population. And since poor countries are much more immediately vulnerable to the impacts of climate change – our continuing indifference to climate change will almost guarantee more anti-U.S. attacks. This warning was echoed recently by the head of the IPCC.<sup>7</sup>

The real truth about terrorism is that, aside from hardening airports and nuclear plants, there is no way to protect any complex, highly organized society from guerrilla attacks. In the long run, what is really needed is a major change in our posture to developing countries.

To restore our inflamed atmosphere to a hospitable state ultimately requires nothing less than rewiring the entire globe - and replacing every oil burning furnace, every gasoline-burning car, every coal-powered generating plant with renewable and climate-friendly energy sources. The earth's fossil fuel resources have blessed us with a level of prosperity and abundance unimaginable even a century ago; today they are propelling us forward into a century of disintegration.

Finally, the economic dimension of the climate crisis centers around a widening global fault line which threatens to split humanity irreparably between rich and poor. The impact of that inequality on the global climate crisis rests on one simple fact: if tomorrow the US and the rest of the industrial world were to cut its emissions dramatically, that reduction would be overwhelmed by the coming pulse of carbon from China, India, Brazil, Mexico and all the developing nations who are struggling to keep ahead of the relentless undertow of chronic poverty. We simply cannot deal with the crisis of the global climate without dealing with the crisis of global economic inequity.

## **Science**

While some aspects of the science are dizzyingly complex, the facts underlying the science are quite simple. Carbon dioxide traps in heat. For 10,000 years, the amount of carbon dioxide in the atmosphere has remained the same -- 280 PPM—until the late 19th century when the world began to industrialize using more coal and oil. That 280 is now up to 380 – a level this planet has not experienced for at least 650,000 years. That 280 will double later in this century to 560 PPM which correlates with an increase in the global temperature of 3\* to 10\* F.<sup>8</sup>

By contrast, the last Ice Age was only 5\* to 9\* F colder than our current climate. Each year, we are pumping seven billion tons of heat-trapping carbon into our atmosphere whose upper extent is about 10 miles overhead.

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<sup>7</sup> IPCC Chief: Global warming may nurture extremism. *Reuters News Service*, Dec. 9, 2002.

<sup>8</sup> Summary for Policy Makers. (2001). *IPCC Third Assessment Report* [www.ipcc.ch/pub/spm22-01.pdf](http://www.ipcc.ch/pub/spm22-01.pdf)

The first consequence of the small warming that has already occurred is a forcing of the planet's hydrological cycle which is expressing itself in altered rainfall patterns, longer droughts, more severe storms, more temperature extremes, rising nighttime low temperatures, a 5 percent per decade increase in atmospheric humidity since the mid-1970s, and the fact that we are getting much more of our snow and rain in intense, severe downpours than we did 20 years ago.<sup>9</sup>

The industry-sponsored "greenhouse skeptics" are fond of pointing out uncertainties in the science. The science, they tell us, can't specify particular impacts in specific regions. Nor can it predict the future rates of warming -- or the thresholds of carbon dioxide concentrations which will propel the climate into abrupt shifts.

They have made a living off of scientific uncertainty. But they have used it in a very selective and misleading way. Dr. Michael McElroy, chairman of Harvard's Department of Earth and Planetary Sciences, cites a lesson about uncertainty he learned from the early days of the ozone depletion issue. When scientists first thought there might be an ozone problem, they ran a range of computer scenarios. But, a couple of years later, when they were actually able to measure the depletion directly with balloons and satellites, they found that the depletion was far worse than the worst-case computer scenario. "Just because there is uncertainty," McElroy said, "does not imply the reality is benign. It could easily be far worse." McElroy's bottom line on the climate issue is this: "We have no right tampering with an immense system we don't understand."

Carbon dioxide stays in the atmosphere 100 years. If we could magically stop all our coal and oil burning, we would still be subject to a long spell of costly and traumatic disruptive weather. Moreover new research indicates that prehistoric climate changes have happened as abrupt shifts rather than gradual transitions, and that small changes have triggered catastrophic outcomes. Not only are we gambling with our collective futures. We are gambling with our eyes blindfolded. We can't even read the cards we've been dealt.

### **Warming-driven Changes**

Researchers at the National Climatic Data Center reported in *Geophysical research letters* (March 2000) that while the planet had been heating at the rate of 1 degree per century until the mid-1970s, (the upper rate to which most ecosystems are able to adapt) it has been warming at the rate of 4 degree per century in the last 20 years.

The economic consequences of our newly unstable climate are visible in the rising disaster relief costs to governments and the escalating losses of the world's property insurers. During the 1980s insurance losses to extreme weather events averaged \$2 billion a year; in the 1990s they averaged \$12 billion a year. In 1998, the insurance industry lost \$89 billion to extreme events -- more than it

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<sup>9</sup> Thomas R. Karl, Richard W. Knight, David R. Easterling and Robert G. Quayle (1995). Trends in U.S. Climate during the Twentieth Century. *Consequences*

Tom Karl. (1997). The Coming Climate. *Scientific American*.

Jake F. Weltzin et al. Assessing the Response of Terrestrial Ecosystems to Potential Changes in Precipitation. *BioScience: Vol. 53, No. 10, pp. 941-952.*

David R. Easterling et al. (2000) Observed climate variability and change of relevance to the biosphere. *Journal of Geophysical Research* vol. 105, No. D15, p.20,101-20

Kerry Emanuel. (2005). Increasing destructiveness of tropical cyclones over the past 30 years. *Nature*

lost during the entire decade of the 1980s. The head of the Re-insurance Association of America has said that unless something is done to stabilize the climate, it could well bankrupt the industry.<sup>10</sup>

But the stakes involve far more than the survival of the insurance industry. In 2004, the UN projected that losses from climate impacts will reach \$150 billion a year within this decade.<sup>11</sup> Munich Re, the world's largest reinsurer, estimates that within several decades, losses from climate impacts will amount to \$300 billion a year.<sup>12</sup> And the largest property re-insurer in Britain projects that, unchecked, the impacts of climate change could bankrupt the global economy within 65 years.<sup>13</sup>

Politically, there is a strong totalitarian threat to climate change. It is easiest to see in certain poor countries whose ecosystems are as fragile as their traditions of democracy. It is not hard to foresee governments resorting to permanent states of martial law in the face of food shortages, droughts, floods, incursions of environmental refugees and epidemics of infectious disease.

Two years ago, the Pentagon released a major planning scenario detailing mass-migrations<sup>14</sup>, wars and all kinds of political chaos that would result from a rapid climate change event. What is really significant about this document is that it reclassifies climate change from an environmental problem to a national security threat.

If you look at the direct, warming-driven impacts on the planet itself, you will see a number of very troubling physical changes on the planet which are independent of computer models and data analysis:

\* Warming expands water. Officials recently relocated 40,000 inhabitants from their island homes in the South Pacific which are being submerged by rising sea levels.<sup>15</sup>

\* Heat changes ecosystems. Two recent studies in the journal Nature reported that animals, insects, birds, fish and whole ecosystems all over the world are migrating toward the poles in a futile search for temperature stability.<sup>16</sup>

Warming is also accelerating in the deep oceans -- down to a depth of two miles. That deep ocean warming is causing the break up of Antarctic ice shelves— three pieces at least the size of Rhode

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<sup>10</sup> 1998 A Disaster For Insurers, Leading Firm Says [Munich Re]. *Reuters News Service*. Dec 29, 1998

<sup>11</sup> Insurer warns of global warming catastrophe. [Swiss Re] *Reuters News Service*. March 4, 2004

<sup>12</sup> Global Warming to Cost \$300 Billion A Year. *Reuters News Service*, Feb. 4, 2001;

Climate Change Costs Could Top \$300 Billion Annually. *Environmental News Service*, Feb. 5, 2001

<sup>13</sup> Climate Change Could Bankrupt Us by 2065. *Environmental News Service*, Nov. 24, 2000 (quoting from British Insurer CGNU)

<sup>14</sup> Peter Schwartz, Doug Randall (Feb 2004) *An Abrupt Climate Change Scenario and Its Implications for United States National Security* <http://www.gbn.com/ArticleDisplayServlet.srv?aid=26231>

CLIMATE COLLAPSE: The Pentagon's Weather Nightmare. *Fortune Magazine*, Jan. 26, 2004

<sup>15</sup> The evacuation of the first 1,000 residents of the Duke of York islands off Papua New Guinea "could be a dress rehearsal for millions of people around the globe affected by rising sea levels." *The Independent*, (U.K.). Nov. 2000.

<sup>16</sup> Terry L. Root, Jeff T. Price, Kimberly R. Hall, Stephen H. Schneider, Cynthia Rosenzweig, J. Alan Pounds (2003) Fingerprints of global warming on wild animals and plants, *Nature*.

Camille Parmesan And Gary Yohe. (2003) A globally coherent fingerprint of climate change impacts across natural systems. *Nature*.

Island have broken off since 1995. A little more than a year ago, the largest ice shelf in the Arctic -- 3,000 years old, 80 feet thick and 150 square miles in area -- collapsed.<sup>17</sup>

\* The oceans are also becoming acidified from the fallout of our carbon emissions. The pH of the world's oceans has changed more in the last 100 years than it did in the previous 10,000 years.<sup>18</sup>

\* High above the oceans, most of earth's glaciers are retreating at accelerating rates. The biggest glacier in the Peruvian Andes was retreating by 14 feet a year 20 years ago; today it is shrinking by 99 feet a year.<sup>19</sup>

\* The Siberian and Alaskan Tundras, which for thousands of years absorbed methane and CO<sub>2</sub>, is now thawing and releasing those gases back into the atmosphere;<sup>20</sup>

\* 2005 apparently surpassed 1998 as the hottest year on record.<sup>21</sup>

\* And we have actually altered the timing of the seasons. Because of the buildup of atmospheric CO<sub>2</sub>, spring is now arriving almost two weeks earlier in the northern hemisphere than it did 20 years ago.<sup>22</sup>

Without realizing it, we are changing the rhythms of nature by which we have planted our crops, and lived our lives and written our poetry for 10,000 years.

### Human Health Effects

Finally, climatic instability is bad for human health. The most obvious impact comes from heating. Recently, the UN's World Meteorological Organization predicted a worldwide doubling of deaths due to heat waves in the next 20 years.<sup>23</sup> Witness the 35,000 heat deaths in Europe in the summer of 2003.

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<sup>17</sup> Arctic's Biggest Ice Shelf, a Sentinel of Climate Change, Cracks Apart. *The Los Angeles Times*, Sept. 23, 2003.

<sup>18</sup> Alarm over Acidifying Oceans. *The New Scientist*, Sept. 25, 2003.

Ken Caldeira and Michael E. Wickett. (2003). Oceanography: Anthropogenic carbon and ocean pH. *Nature* v. 425.

For more information see: <http://www.realclimate.org/index.php?p=169>

<sup>19</sup> As Andean Glaciers Shrink, Water Worries Grow. *The New York Times*, Nov. 24, 2002

For more information see: <http://www.realclimate.org/index.php?p=129>

<sup>20</sup> Climate warning as Siberia melts. *NewScientist.com news service*, Aug. 11, 2005

<sup>21</sup> 2005 Was Warmest Year on Record – NASA. *Planetark.org*, Jan. 25, 2006

For more information see: <http://www.realclimate.org/index.php?p=209>

<sup>22</sup> David J. Thomson. (1995). The Seasons, Global Temperature and Precession. *Science*, v. 268.

Increased activity of northern vegetation inferred from atmospheric CO<sub>2</sub> measurements. *Nature*, Vol. 382

<sup>23</sup> "Global warming seen as doubling heat deaths by 2020," Reuters News Service, Nov. 22, 2000

There is another, more complex set of health impacts – and they involve the warming-driven northward migration of tropical diseases. Warming accelerates the breeding rates and the biting rates of insects. It accelerates the maturation of the pathogens they carry. And it expands their range by allowing them to live longer at higher altitudes and higher latitudes. As a result, mosquitoes are now spreading yellow fever, malaria and dengue fever to populations which have never previously been exposed. Globally malaria quadrupled between 1990 and 1995.<sup>24</sup> (Find out more about the human health effects of climate change at: <http://www.med.harvard.edu/chge/>)

The British medical journal, the Lancet, has called indifference to climate change a form of "biopolitical terrorism."<sup>25</sup>

So the consequences to our social existence are truly profound. As one world-class scientist co-chaired the IPCC told me: "If this newly unstable climate had begun 150 years ago, the planet would likely never have been able to support its current population."<sup>26</sup>

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Carbon dioxide stays in the atmosphere 100 years. If we could magically stop all our coal and oil burning, we would still be subject to a long spell of costly and traumatic disruptive weather. Moreover new research indicates that prehistoric climate changes have happened as abrupt shifts rather than gradual transitions,<sup>27</sup> and that small changes in a very delicately balanced atmosphere have produced very large outcomes. Not only are we gambling with our future. We are gambling with our eyes blindfolded. We can't really read the cards we've been dealt.

## **Solutions**

The solution to the climate crisis is as simple as it is overwhelming. To pacify our inflamed climate requires emissions reductions of 60-70 percent – and that means a rapid global energy transition away from oil and coal and to low-carbon, high efficiency and renewable energy sources. The job of the energy industry now is to reorient itself towards renewable energy.

First, in the US, we need to divert the subsidies for fossil fuels to renewable energy industry. In the US, those subsidies amount to \$20 billion a year, globally they amount to \$300 billion. The redirection of subsidies would raise the price of gasoline and discourage excess consumption. More important, it would provide a huge incentive for the oil companies to follow the subsidies and become aggressive developers of solar, fuel cell, biomass and wind technologies.

### **Unfortunately there remains the stumbling block of political resistance.**

Even despite the puny reach of the Kyoto Protocol, the Senate in 1997 voted 95 to 0 not to ratify it because it exempts the large developing nations from the first round of emissions cuts. That fall, the fossil fuel industry launched a \$13 million ad campaign to reinforce that resistance. What the

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<sup>24</sup> Paul R. Epstein. (8-2000). Is Global Warming Harmful to Health?, *Scientific American*

<sup>25</sup> Climate change—the new bioterrorism. Editorial *The Lancet*, Vol 358, November 17, 2001.

<sup>26</sup> Author's conversation with Dr. James McCarthy, co-chair, Intergovernmental Panel on Climate Change, Working Group II, 2001

<sup>27</sup> Harvey Weiss and Raymond S. Bradley. (2001). What Drives Societal Collapse? *Science*.

industry lobby, as well as many Senators, must stop denying is that most developing nations are too burdened by debt, poverty and social instability to absorb energy restrictions. Most can barely feed and educate their poverty-stressed populations. They are in no position to finance energy transitions.

A number of political conservatives are now embracing this issue. William F. Buckley has warned readers that this is “not an Al Gore issue” – that we are producing too many greenhouse gases for the planet to accommodate. A few years ago, Jim Woolsey, former head of the CIA and Republican Senator Richard Lugar of Indiana wrote about the urgency of the issue in Foreign Affairs. Paul O’Neill, the former Treasury Secretary, has likened the coming impacts of climate change to a nuclear holocaust.<sup>28</sup> And conservative Senator John McCain is taking the lead in the Congress in beginning to address with this issue.

On the ground today, many activist groups are now taking up climate as their central issue. The religious community has become involved with the climate issue in a very big way.

### **The Tufts Climate Initiative Is Part of a Larger US Movement**

Tufts University is not alone in its efforts to stop climate change. Many US organizations have decided not to wait any longer for Washington to take action. There is an extraordinary amount of political activity underway in the U.S. Below just three examples of initiatives and groups active in the North East.

- In August 2001, the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) adopted the first regional action plan in North America for addressing climate change. This landmark agreement, known as the Climate Change Action Plan 2001, reflected the conviction of the NEG/ECP that climate change is a significant environmental concern that will have a major impact on the region’s environment and economy. <http://www.neg-ecp-environment.org/page.asp?pg=46>
- The Regional Greenhouse Gas Initiative, or RGGI, is a cooperative effort by Northeastern and Mid-Atlantic states to reduce carbon dioxide emissions – a greenhouse gas that causes global warming. Currently, nine states that include Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont are participating in the RGGI effort. In addition, Maryland, the District of Columbia , Pennsylvania, the Eastern Canadian Provinces and New Brunswick are observers in the process. <http://www.rggi.org/>
- Mass. Climate Action Network (MCAN) is composed of local and statewide groups that have joined together in a cooperative effort to halting the threat of global climate change, through reducing emissions of greenhouse gases. There are 14 local groups and 4 regional or statewide environmental groups in MCAN at present. The groups' efforts are principally devoted to conducting public education and influencing municipal governments in their home communities, to achieve local reductions in greenhouse gas emissions. MCAN is also striving to change climate policy at the state level in Massachusetts, through influencing the state's climate action plan; legislation related to energy efficiency, renewable energy, and transportation; and regional planning efforts. [www.massclimateaction.org](http://www.massclimateaction.org)

We have the technology. We have the institutional mechanisms. And we have an extraordinary opportunity to begin to pacify the climate and to heal the human economic environment at the same time. What we need now is the will to think big and make it happen.

Briefly referenced below are three interactive policy strategies that could easily be accommodated within the Kyoto framework. They represent a model of the scope and scale of the kind of effort

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<sup>28</sup> Quote from Paul O’Neill, Treasury Secretary, reported in *Grist Magazine*, "Heatbeat," March 14, 2001

that is needed. [More information on these policy strategies in Ross Gelbspan's newest book: Boiling Point] (with link)

- A change of energy subsidy policies in industrial countries -- redirecting the \$25 billion that the US government spends<sup>29</sup> -- and the \$200 billion that industrial nations overall -- spend -- on subsidizing fossil fuels<sup>30</sup> -- and putting those subsidies behind renewable technologies.
- The creation of a large fund, of about \$300 billion a year for several years -- to jumpstart renewable energy infrastructures in developing countries; this could be funded by carbon taxes in the north, a tax on international airline travel or a tax on international currency transactions -- in essence, a tax on international commerce to address a threat to the global environment; and,
- The adoption within the Kyoto framework of a binding, progressively more stringent Fossil Fuel Efficiency Standard that rises by 5 percent per year.

The time for action is very short. The deep oceans are warming; the tundra is thawing; the glaciers are melting; infectious diseases are spreading; violent weather is increasing and the timing of the seasons has changed. And all that has resulted from one degree of warming. By contrast, the earth will warm from 3 to 10 degrees later in this century, according to the IPCC.

Our civilization is standing at an extraordinary crosspoint. And while a positive prognosis may be overly visionary, the alternative – given the escalating instability of the climate and the intensifying desperation of global poverty – is truly horrible to contemplate.

For most of our history, we have thought of ourselves as helpless children of nature, dependent on her whims for our shelter and survival. Today, we are no longer children. Somewhere in the recent past, with the growth of our population and the power of our technology, we have grown into a collective force as powerful as any force of nature. We are no longer mere inhabitants of the planet. We are also its shapers. And as we continue to act like adolescents by testing its physical limits and denying the destructive consequences of our newfound, adult power, we are putting our entire history at risk.

\*TCI would like to thank Ross Gelbspan for making his writing available for our webpage.

Ross Gelbspan has been an editor and reporter for thirty years at The Philadelphia Bulletin, The Washington Post and The Boston Globe. He won a Pulitzer Prize in 1984. In 1997, he published two books on the global climate crisis: ***The Heat Is On: The High Stakes Battle Over Earth's Threatened Climate*** Perseus Publishing; Updated edition (September 1, 1998) and ***Boiling Point: How Politicians, Big Oil and Coal, Journalists and Activists Have Fueled the Climate Crisis -- And What We Can Do To Avert Disaster*** (Basic Books, Aug. 2004) You can learn more about his work on climate change on his webpage: [www.heatisonline.org](http://www.heatisonline.org)

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<sup>29</sup> Douglas Koplow and Aaron Martin. (6-1998). Fueling Global Warming: Federal Subsidies to Oil In The United States. *Industrial Economics*

<sup>30</sup> Technologies, Policies and Measures for Mitigating Climate Change: IPCC Technical Paper I, 1998