

Resource Guide: The Scientific Basis and Policy Solutions

compiled by Craig Holt Segall

Although the science of global warming is complicated, the basic facts of the crisis are surprisingly simple and intuitive. At root, global warming is the result of unrestrained industrial growth based on fossil fuels; a pattern of consumption that has radically altered the natural balance of the planet's atmosphere. As heat-trapping gas concentrations increase, the temperature rises, bringing with it shifts in climate, droughts, floods, more powerful storms, and a rising sea. Below are a few key questions and answers to get communities started as they work to understand the crisis.

Q. What Causes Global Warming?

The science is unequivocal: we do. Earth's temperature is maintained by greenhouse gases—gases that act like the panes of glass in a greenhouse, letting energy in but trapping some portion of the sun's heat inside the planet's atmosphere. Carbon dioxide, methane, and chlorofluorocarbons are all important greenhouse gases, capturing more of the heat that would otherwise radiate back to space, thereby warming the planet. Before the Industrial Revolution, the rate at which these gases entered the atmosphere was equal to the rate at which they left—the planet's breathing was in balance. But as humans began to burn more and more fossil fuels, they released vast quantities of carbon dioxide and other greenhouse gases into the atmosphere—far more than the planet could absorb. Measurements made on Hawaii, far from any local source, have shown carbon dioxide steadily climbing over the century. With increased carbon dioxide comes an increase in the planet's ability to trap heat—and things start getting warmer.

The fossil fuels driving the warming are the remains of tens of millions of years of plant life. All of that carbon is being released in just a few hundred years; it is, then, not surprising that we would see dramatic effects. We are releasing carbon that took millions of years to accumulate in a tiny fraction of that time.

Ice cores from Antarctica, Greenland, and other glaciated areas confirm the link between carbon dioxide levels and global temperatures. By analyzing tiny bubbles of gas trapped in each year's accumulation of ice, scientists can make accurate charts of atmospheric composition stretching far back into history. Sophisticated isotopic analysis of the ice itself allows them to construct temperature data as well. Two facts jump out: first, when greenhouse gases concentrations increase, so do temperatures. Second, both global temperatures and global greenhouse gas concentrations are now far higher than they have been in thousands of years. If current trends continue, they are about to get far higher still—with temperatures predicted as far *above* historical temperatures as the

temperatures of the Ice Age were *below* them. The effects of such a massive temperature rise are likely to be catastrophic.

Other forces and feedbacks are magnifying the problem. Massive deforestation releases greenhouse gases as trees are cleared and burned and also reduces the planet's capacity to absorb increasing carbon dioxide concentrations. As permafrost melts, it releases methane—a potent greenhouse gas—that in turn melts more ice. And growing energy needs in the developing world, if met by building more fossil fuel capacity, will vastly exacerbate the problem.

Unfortunately, a well-funded misinformation campaign, bankrolled by the oil industry, has left the American public confused. Too many Americans still believe that the basic scientific roots of climate change are uncertain. As a result, we continue to debate whether there *is* a problem, even as the problem builds to crisis proportions. We are malingering while the planet burns.

Q. How Serious is the Threat?

We are creating a world unlike any human being has ever experienced, warmer and more violent than it has been in hundreds and thousands of years. The science shows that the threat is serious. Carbon dioxide and other greenhouse gases trap the heat of the sun; in fact, in normal concentrations, they make the world livable, keeping temperatures above freezing. But human activities have vastly increased greenhouse gas concentrations over the last few hundred years due to large increases in the use of fossil fuels. This increase is far above natural variability and has serious implications for the Earth's climate.

The world's top climate scientists, gathered in the Intergovernmental Panel on Climate Change (IPCC), predict disaster. Before the Industrial Revolution, carbon dioxide was found in the atmosphere at a concentration of roughly 280 parts per million (ppm). In 2000, the gas stood at 368 ppm, and is still climbing, carrying temperatures with it. It is now on average already one degree Fahrenheit hotter than it has been in a thousand years. One degree matters: the last ice age was only on the order of six to nine degrees cooler than today. Temperatures in 2100, with unabated warming, may be as much as seven degrees Fahrenheit warmer than the present. This is a forecast for transformation and for chaos.

The IPCC, in the dispassionate language of scientists, predicts a centuries-long increase in sea level, severe storms and droughts, and regional ecosystem collapse. The damage will come soonest and be most severe in already vulnerable areas of the developing world, especially in Africa where climate change will be linked to increasing desertification and the expansion of the Sahara. The monsoon cycle that sustains Asian agriculture will become increasingly unreliable; El Nino floods and droughts will become more severe. The Amazon rainforest, cradle of the world's biodiversity, is currently experiencing climate-linked drought. If warming continues, the forests will continue to dry out, converting from the lungs of the planet into a dry savannah. Crop yields will fall around the world even as global population continues to rise. Climate shifts will put additional pressures on the already failing ecosystems that maintain global ecosystem services. Extinction rates are already far above normal; credible forecasts predict that as

many as half of the planet's species may be threatened with extinction within the next fifty years.

The sea level rise alone is potentially catastrophic and it is happening far more rapidly than anticipated; the seas are already rising at near the maximum rate predicted for the next 1000 years. Land-based ice caps in Greenland and Antarctica have begun to melt. As melt water increases, feedback effects take hold as warmer water infiltrates remaining ice, melting more and more and threatening entire low-lying nations (including the island nations of the Pacific) with destruction. New Orleans, New York City, Washington, D.C., and San Francisco are just a few of the United States cities that will face serious flooding problems. Much of lower Manhattan may ultimately be under water. The influx of meltwater will also alter the dynamics of ocean currents; the Gulf Stream, which carries warm water north and keeps Europe from turning frigid, is particularly at risk.

As crops fail, the sea rises, and the weather becomes steadily more violent, no one will be safe. Global warming will exacerbate the divide between rich and poor and North and South, triggering famines, resource wars, and massive population displacements. Those of us who have witnessed the devastation of Hurricane Katrina know that a forecast for rising seas and more and stronger storms will alone devastate millions of lives. As we demand ever more energy, we make the crisis ever more pressing. We are all complicit in the tragedy, but we can also all be part of its solution.

Q. What Can We Do?

It is not too late to change. Although the greenhouse gases already released will contribute to warming throughout our lifetimes, we can choose to put the world on a very different trajectory, restraining warming to one or two degrees Fahrenheit rather than seven or more degrees by century's end. We can choose to research and implement renewable energy systems, fund equitable and efficient energy infrastructure in the developing world, and to create jobs and climate stability with our decisions today. Communities are acting at local, regional, and national levels.

Individual congregations can work to retrofit sanctuary spaces to be more energy efficient and, in some areas, to purchase renewable energy. Replacing incandescent light bulbs with compact fluorescents, purchasing double-paned windows that insulate and reduce heating needs, and adding solar panels to rooftops are all possibilities. Some utilities now also offer the option of purchasing energy generated by renewable sources for a nominal additional fee. It is also possible to buy "carbon credits," which fund development of renewable energy, thereby offsetting some of one's own emissions.

College campuses can choose to reduce their emissions or even become carbon-neutral. Colleges and universities across the country are beginning to acknowledge their obligations to their students to ensure a sustainable future and to model responsible global citizenship. Carbon credits, campus efficiency projects, and renewable energy purchases can all be part of a campus-wide effort.

Cities and States are taking action and need the support of people of conscience. California has recently committed to reducing its emissions to 1990 levels by 2020 and to keep on cutting after that. On the East Coast, Delaware, Connecticut, New York, Vermont, New Hampshire, and Maine have formed the Regional Greenhouse Gas

Initiative which will use carbon credit trading to reduce greenhouse emissions throughout that area. Mayors across the country have signed on to the US Mayors Climate Protection Agreement, committing their cities to comply with the Kyoto Protocols. As of October 2006, 323 mayors, representing 51.8 million Americans, have signed on. If your city or state have not yet taken action, they need to hear from you.

Nationally, Congress is on the verge of accepting responsibility. After getting off to a slow start, Congress has now begun to consider multiple bills on climate change. The most important of these is the Safe Climate Act (H.R. 5642), sponsored by Rep. Henry Waxman. The Safe Climate Act would freeze national emissions at current levels by 2010, cutting to 1990 levels by 2020 and to 80% *below* 1990 levels by 2050. The Act works through a flexible cap-and-trade system, setting a national cap and allowing companies to trade carbon credits to comply efficiently. This method was tried before for acid rain control and exceeded expectations. Our Representatives and Senators hold the fate of the world in their hands; it is up to all of us to help them bear their burden.

“The very existence of life—life that religious people are called to protect—is jeopardized by our continued dependency on fossil fuels for energy. Every mainstream religion has a mandate to care for creation.”

—Interfaith Power and Light (<http://www.theregenerationproject.org/About.htm>)

Further Resources

Reliable, scientifically-reviewed information on climate change is easy to find.

The Intergovernment Panel on Climate Change

<http://www.ipcc.ch/>

- The website of the Intergovernmental Panel on Climate Change, the world body charged with studying the matter, is a good starting point. They provide global and national overviews of every aspect of the issue.

The World Conservation Union

<http://www.iucn.org/themes/climate/>

- Information on the extinction threat posed by climate change.

RealClimate.org

www.realclimate.org

- For up-to-date coverage of climate issues, turn to this website run by IPCC members and dedicated to covering climate news.

The Natural Resources Defense Council and Environmental Defense

<http://www.nrdc.org/globalWarming/default.asp>

<http://www.fightglobalwarming.com/>

- National environmental groups have devoted considerable effort to gathering resources on climate change. The Natural Resources Defense Council and Environmental Defense have particularly good sites.

The Discovery of Global Warming

<http://www.aip.org/history/climate/index.html>

- Spencer Weart, Director of the Center for History of Physics of the American Institute of Physics in College Park, Maryland, recently published *The Discovery of Global Warming*, a comprehensive history of the scientific process that unmasked the crisis. His website is an astonishingly complete resource.

An Inconvenient Truth

<http://www.climatecrisis.net/>

- Al Gore has gathered background information supporting his film *An Inconvenient Truth* and provides suggestions for further action.

The Safe Climate Act

<http://www.house.gov/waxman/safeclimate/index.htm>

- Information on the Safe Climate Act can be found here.

Regional Efforts: California and the Northeastern States

<http://www.climatechange.ca.gov/>

<http://www.rggi.org/>

- California's efforts are summarized at <http://www.climatechange.ca.gov/> and the Northeastern states lay out their plan at <http://www.rggi.org/>

Energy Efficiency Guide for Congregations

http://www.energystar.gov/index.cfm?c=small_business.sb_congregations

- The Environmental Protection Agency has prepared an energy efficiency guide for congregations.

Campus Climate Challenge

www.climatechallenge.org

- This youth movement has led over 400 campuses to opt to buy all or a majority of their energy from renewable sources and provides guides to the larger youth movement against climate change.