

The Climate Is A-Changing

By Alice Loyd

There are words that motivate people to action and words that frighten them into retreat. There are issues that galvanize the public and issues that paralyze. The oft-mentioned, but seldom-acted-upon topic of global climate change is a paralyzer. In my experience, to mention it is a good way to end a conversation or produce an empty room at a workshop. With the media, global warming is seen as a contest between, on the one hand, the nearly unanimous gathering of the world's foremost scientists saying, "It's happening already, humans are causing it, and we need to change," and on the other, a small group of scientific nay-sayers, along with the bulk of the business community arguing against the reality of climate change or the cost-effectiveness of combating it. Claiming to present a balanced picture, commentators usually show both sides as if they were equal regarding the science. The practice leaves the impression that the global phenomenon of climatic transformation is a matter of personal predilection: "You may think this, or you may think that."

Diffidence is reflected in our behavior. The known facts about the global warming trend, its causes, and its current and likely future consequences are being reported daily, no doubt hourly, in newspapers, popular magazines, radio and television, but with faint effect on the way people live, the way schools teach, the way governments govern or the way most justice organizations advocate for their constituencies. The legendary visitor from outer space would have a hard time accounting for the lack of movement around this problem, except among Earth researchers and Earth activists.

Oh, there is talk about it. There is rarely a conference in which the issue of climate change is not mentioned by someone, even if only by using the code term "environment." People know that it is occurring and they know it's important. What is it that



people don't know? As an environmental justice advocate, I often ask myself this question. Maybe knowledge is not what matters when so much is at stake. When the bridges are burning behind and apparently before us, it is not surprising that there is paralysis.

Who wants to leave the comfortable main road before it is fully blocked and barricaded? That's the question of our day in petroleum-fueled, prosperous nations. The researchers have scouted the future and brought back the news that the climate is changing. We have the evidence now to act. Let's listen to what they are saying.

The Scientific and Observational Evidence

In the 2001 summation of their decade-long work, the Intergovernmental Panel on Climate Change (IPCC)¹ reported,

Since 1860, global average temperatures have increased 1 degree Fahrenheit. While the warming record shows significant spatial and temporal variability, the global upward trend is unambiguous. Most of the warming in the 20th century occurred from about 1910 to 1945 and since 1976. Twentieth century warming is likely to be the largest during any century during the past 10,000 years for the Northern hemisphere, with the 1990s the warmest decade and 1998 the warmest year.²

As for the twenty-first century, Carol Goodstein reported in *Nature Conservancy Magazine*, "Today scientists largely agree that if greenhouse gas emissions are not curtailed, the Earth's average surface temperatures could increase by 3 to 10 degrees Fahrenheit by the end of this century. This is a considerably greater rise in average temperature than was estimated just five years ago."³

Observations from all over the planet confirm the warming trend.

- The last century has been the hottest period in the Himalayan Mountains in the past 1,000 years.
- An uncommonly hot and dry summer deprived bears in Colorado of their usual meals of berries and acorns, forcing the animals to forage in trash cans, backyards, and kitchens. Reports of bear sightings are occurring almost daily in town and neighborhoods across the Rockies. Ice cover records of lakes and rivers in North America, Asia, and Europe show a steady warming trend in the Northern Hemisphere

over the last 150 years, according to a study by the University of Wisconsin in Madison.⁴

- Since 1970, the state of Alaska has required a minimum of 6 inches of snow over the fragile tundra and 12 inches of hard ground before it would allow oil companies to fire up exploration vehicles on the North Slope. As winters grow shorter and warmer, the number of days that meet those criteria has dropped by half. The state is now studying whether to relax the requirements.⁵
- European lakes and streams are feeling the effects of the hottest summer in 500 years. Lake Balaton, one of Hungary's main tourist attractions, retreated from shore by as much as 300 feet last year, a phenomenon also attributed to low annual rainfall. Water levels also dropped dramatically in Croatia's Sava River, the Rhine, and the Danube.⁶
- To see how fast the Earth's glaciers are vanishing, look no farther than Glacier National Park, where ice formations thousands of years old may be gone in thirty. Because of rapidly warming temperatures over the past century, Glacier National Park is no longer getting enough snow to replace the ice melting during the summers. In 1850 there were an estimated 150 glaciers in the park. Today a mere 26 remain, and those that are left . . . are fast disappearing.⁷
- The Arctic has warmed faster than any other region on Earth—nearly 5 degrees F. over the past 30 years, compared with only 1 degree F. over the past 100 years globally. The snow and ice that coat the Arctic landscape reflect up to 80 percent of the solar radiation that beams down. But as greenhouse gases cause temperatures to rise, the snow and ice melt back and the darker land and water absorb radiation instead. As they warm up, more ice melts, increasing the radiation absorbed, and causing temperatures to rise even further.⁸
- The brilliant beauty of coral reefs has begun to disappear before our eyes, along with the incredible variety of marine life that surround them. It has taken only a slight increase in sea-surface temperatures to unravel one of the Earth's most ancient ecosystems. . . . A baffling malady called bleaching is draining the color—and the life—from the world's coral reefs. . . . In the two decades since mass bleaching was first identified, it has killed more corals than all other causes combined. More than 16 percent of the world's corals have succumbed to bleaching. Countless millions of marine animals have died as well—anemones, sponges, sea fans, mollusks, crab, shrimp, and fish, not to mention the seabirds and turtles that depend on them. . . . In the past 100

years the ocean's surface temperature has warmed an average of about 1.8 degrees Fahrenheit. Less than 2 degrees doesn't sound like much, but . . . it's too much for coral reefs.⁹

What Causes Global Warming?

A primer on the topic of global warming would distinguish climate from what we think of as weather. "Climate is the average weather of a given area over an extended period of time. One of the foundations of human societies and economies is a stable climate. The Earth's climate is driven by a continuous flow of energy from the sun. This energy arrives mainly in the form of visible light. Ever since life first appeared, natural emissions of water vapor, carbon dioxide and other gases have helped maintain the temperature of Earth within a range at which life can exist. They act like a glass greenhouse to trap the sun's heat in the atmosphere, as an essential part of keeping the planet warm and habitable."¹⁰

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"The planet keeps cool by emitting heat back into space in the form of infrared radiation—the same radiation that warms us when we sit near a campfire or stove. But while the atmosphere is fairly transparent to sunshine, it is almost opaque to infrared radiation. Much like a garden greenhouse, it traps the heat inside. About half of the solar energy that reaches Earth passes through the atmosphere and is absorbed at the surface. In contrast, about 90% of the infrared radiation emitted by the surface is absorbed by the atmosphere before it can escape to space. In addition, greenhouse gases like carbon dioxide (CO₂) as well as clouds can re-emit this radiation, sending it back toward the ground. The fact is, Earth's surface receives almost twice as much energy from infrared radiation coming down from the atmosphere as it receives from sunshine. If all greenhouse gases were removed from the atmosphere, the average surface temperature of Earth would drop from its current value of 59° F. to about 0°. Without the atmosphere's greenhouse effect, Earth would be a frozen and nearly lifeless planet."¹¹

While the warming blanket is necessary, in recent centuries the blanket, as the result of increases in greenhouse gases, has become thicker. This thickening is the primary reason for the increase in temperature. "The greatest warming effect currently stems from CO₂, followed by methane, halocarbons, and nitrous oxide."¹²

Greenhouse Gases

Carbon dioxide is the biggest component of greenhouse gases. Researchers for the National Oceanic and Atmospheric Administration state:

Carbon dioxide gas constitutes a tiny fraction of the atmosphere. Only about one air molecule in three thousand is CO₂. Yet despite their small numbers, CO₂ molecules can have a big effect on the climate. . . . Carbon dioxide has a much longer lifetime in the atmosphere than water vapor. If CO₂ is suddenly added to the atmosphere, it takes 100 to 200 years for the amount of atmospheric CO₂ to establish a new balance, compared to several weeks for water vapor. . . . Through millions of years of Earth's history, trillions of tons of carbon were taken out of the atmosphere by plants and buried in sediments that eventually became coal, oil, or natural gas deposits. In the last two centuries humans have used these deposits at an increasing rate as an economical energy source. In a similar way, cement manufacture releases carbon atoms buried in carbonate rocks. Today humanity releases about 5.5 billion tons of carbon to the atmosphere every year through fossil fuel burning and cement manufacture. Approximately another 1.5 billion tons per year are released through land use changes such as deforestation. These releases result in an increase of atmospheric CO₂ of about one-half percent per year.¹³

Carbon dioxide in the atmosphere is rapidly increasing:

Using universally accepted scientific methods, including analyzing ice cores from the Arctic and Antarctic, ancient tree rings and cross sections of coral, most scientists agree that the level of carbon dioxide emissions has increased 30 percent since 1850.¹⁴

Present concentrations of CO₂ are the highest in the past 420,000 years and likely in the past 20 million years, and the rate of increase is unprecedented in the past 20,000 years.¹⁵

The EPA describes the sources of the increased carbon dioxide this way:

The burning of fossil fuels for energy—coal, oil, and natural gas—is the primary source of emissions. Energy burned to run cars and trucks, heat homes and business, and power factories is responsible for about 80% of global carbon dioxide emissions, about 25% of U.S. methane emissions, and about 20% of global nitrous oxide emissions. Increased agriculture and

deforestation, landfills, and industrial production and mining also contribute a significant share of emissions.¹⁶

While carbon dioxide is the primary greenhouse gas, other gases and aerosols play their roles in the warming.

Other naturally occurring greenhouse gases such as methane and nitrous oxide have also been increasing, and entirely man-made greenhouse gases such as halocarbons have been introduced into the atmosphere. Many of these gases are increasing more rapidly than carbon dioxide. The amount of methane, or natural gas, in the atmosphere has doubled since the Industrial Revolution. Although its sources are many, the increase is believed to come mainly from rice paddies, domestic animals, and leakage from mining.¹⁷

The IPCC's 2001 report states, "While methane emissions are far lower than CO₂ emission, methane is estimated to be 21 times more effective than CO₂ at trapping heat in the atmosphere over a 100-year time horizon."¹⁸

Regarding halocarbons, the report says,

The emission trends of most of those halocarbons controlled under the Montreal Protocol and its Amendments are either declining or increasing at slower rates than in the early 1990s. However, other halocarbons that serve as substitutes for CFCs—such as hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs)—are increasing rapidly, and most of them are significant greenhouse gases.¹⁹

Particulates are also indicted in the literature: "[B]lack soot contributes more to climate change than was recently believed. Black carbon is a product of incomplete combustion and is generated by tailpipes, industrial pollution, outdoor fires and household burning of coal and other fuels."²⁰

Changes in Land Use

In addition, changes in land use may rival greenhouse gases in their contributions to global warming, according to an international study led by an atmospheric scientist at Colorado State University. Land surface changes "redistribute heat within the atmosphere both regionally and globally, and may actually have a greater impact on climate than that due to all greenhouse gases released by human activities. Through land cover changes over the last 300 years, we may have already altered the climate more than would occur associated with the radiative effect of a doubling of carbon dioxide."²¹

What is Being Done

These are the reports brought back to us by the heroes who have gone beyond the near horizon to investigate the road ahead. They tell us that humans have already altered the global climate in these ways, with consequences they have observed and more which they can predict, based on past experience, and to a lesser degree on climate models. Where we are today regarding global climate change is within a brief period of opportunity, years of which have already been squandered. In 1992 when the Framework Convention on Climate Change (FCCC) was formulated in Rio de Janeiro, Brazil, 175 nations signed and ratified it, the U.S. among them.²² The Kyoto Protocol to implement the FCCC was negotiated in December 1997.²³ At that point it seemed likely that Kyoto would mark the beginning of an internationally supported move toward mitigation. In 2004, even its minimal reductions are beyond the vision of U.S. politicians.

By the public record, their inaction cannot be for lack of scientific information or consensus. Asked by the White House to consider the evidence for climate change, the National Academy of Sciences confirmed the findings of the IPCC.²⁴ The Environmental Protection Agency's June 2002 report submitted to the UN as required under the Rio treaty projected the disappearance of Rocky Mountain meadows and coastal barrier islands, as well as the disruption of snow-fed water systems in the West.²⁵

Some scientists have proceeded from reporting research into advising action. In May 2001, seventeen of the world's most conservative scientific societies called on politicians everywhere to honor the Kyoto agreement.²⁶ The Union of Concerned Scientists, calling global warming "the most serious environmental problem of the 21st century," is organizing scientists to educate the public about its causes and solutions.²⁷ The National Academies have released studies by the Committee on Abrupt Climate Change, stating that a "no-regrets" policy would provide benefits whether or not abrupt change occurs."²⁸ James Hansen, Director of the NASA Goddard Institute for Space Studies and one of the first scientists to warn of the warming in the 1980's, writes, "Halting global warming requires urgent, unprecedented international cooperation."²⁹

Based on public record, too, we know that U.S. government officials do believe the research. President Bush himself stated in 2001, "My Administration is committed to a leadership role on the issue of climate change. We recognize our responsibility, and we will meet it—at home, in our hemisphere, and in the world."

With this pledge, he

reiterated the seriousness of climate change and ordered a Cabinet-level review of U.S. climate change policy. He requested working groups to develop innovative approaches that would: (1) be consistent with the goal of stabilizing greenhouse gas concentrations in the atmosphere; (2) be sufficiently flexible to allow for new findings; (3) support continued economic growth and prosperity; (4) provide market-based incentives; (5) incorporate technological advances; and (6) promote global participation.³⁰

On June 6, 2001, Condoleezza Rice, White House national security adviser, said, "This is a president who takes extremely seriously what we do know about climate change, which is essentially that there is warming taking place."³¹ An unclassified report out of the Pentagon was published in January 2004 in *Fortune*, revealing that abrupt climate change is being taken seriously in military planning.³² Global climate change is accepted as fact, as is the accumulation of greenhouse gases in the atmosphere. The lack of interest in reducing emissions is based on business concerns: how the short-term economic picture might be impacted by a change of direction.³³

What Will We Do About It?

And so here we are on the road, with our scouts warning us to find a new path but our leaders continuing onward as if there were not an end to it. They are going on and we are following because to get off the highway would mean changes more monumental than either leadership or followers have yet been willing to face. The United States creates 25% of the emissions³⁴ that form the greenhouse blanket, and we have increased our output 16% from 1990 to 2001.³⁵ How much would we have to alter our behavior to bring down those percentages? "Too much," is apparently our corporate reply. Detrimental human-induced global climate change is occurring, it will intensify to the degree human activities perpetuate it, and the biggest contributors to the problem refuse to alter course.

Obviously, we need more than information if we are to act sensibly in this moment. We need wisdom and, lacking that in elected leaders, it must come from ourselves. The global climate cannot be considered peripheral to any concern. The word "global" informs us that every member of the ecosystem is involved, including ourselves. To add the word "climate" to the phrase means the habitability of the globe is at stake. The scientists are telling us that we have a bit of time to reduce

the rate of the warming, and thus its impacts. Those of us who aspire to live with compassion and courage must apply our collective spiritual, intellectual, economic and political powers during these next years—numbered by many as fifteen, twenty, twenty-five. We must arrange our private and public affairs with the goal of stabilizing Earth's climate. The only questions about climate change, really, are the ones that ask, "What will we do about it?"

¹ Organized under UN Environment Program and World Meteorological Organization auspices, the Intergovernmental Panel on Climate Change (IPCC) is composed of several hundred climate scientists for each of three working groups, selected from nominations of one hundred member governments at five-year intervals beginning in 1988. The fourth volume of the report was published in October 2001 following an exacting process in which each scientist reviewed all the peer-reviewed literature on a particular aspect of the problem. By the end of a five-year cycle, at least 1,500 experts, including nearly every important climatologist on Earth, were involved. Bill McKibben, "Some Like It Hot," *The New York Review*, July 5, 2001, 35.

² IPCC, "Climate Change 2001: The Scientific Basis", *Summary for Policymakers*, January 22, 2001.

³ Carol Goodstein, "A Sea Change," *Nature Conservancy*, September/October 2001, 24.

⁴ *Amicus Journal*, Winter 2001, 12, quoting Science.

⁵ *Amicus Journal*, Winter 2001, 12.

⁶ *Sierra*, March/April 2004, 17.

⁷ *Ibid.*

⁸ Tom Yulsman, "Meltdown," *Audubon*, 12/2003, 40.

⁹ Jennifer Bogo, "The Hottest Spot," *Audubon*, 12/2003, 50.

¹⁰ Susan McGrath, "Color Blindness," *Audubon*, 12/2003, 67.

¹¹ Shantilal P. Bhagat, "Breaking the Cycle of Denial," *Between the Flood and the Rainbow*, Vol. V. No. 1, Winter 2002.

¹² University Corporation for Atmospheric Research, "Our Changing Climate," *Report To The Nation*, Fall 1997.

¹³ IPCC, "Climate Change 2001".

¹⁴ "Our Changing Climate," *Report to the Nation*, 17.

¹⁵ Gerald F. Talbert, "Global Climate Change: Emerging Issue of a New Century," National Association of Conservation Districts, 2.

¹⁶ IPCC, "Climate Change 2001."

¹⁷ United States Environmental Protection Agency, "Climate Change and North Carolina", EPA 236-F-98-007q, September 1998.

¹⁸ "Our Changing Climate," *Report to the Nation*, 19.

¹⁹ IPCC, "Climate Change 1995: The Scientific Basis," Cambridge University Press. www.ipcc.ch/pub/sarsum1.htm.

²⁰ IPCC, "Climate Change 2001."

²¹ Goddard Institute for Space Studies, "NASA finds soot has impact on global change," May 2003; www.giss.nasa.gov/research/stories/20030513/.

²² Cat Lazaroff, "Land Use Rivals Greenhouse Gases in Changing Climate," Environmental News Service, October 2, 2002.

²³ President George Herbert Walker Bush signed the FCCC.

²⁴ Taking 1990 emissions as the baseline, it allowed each country to decide how much to reduce GHGs during a period ending 2009 to 2012. The U.S. selected 7% as its goal and President Clinton signed the protocol, but it never reached the floor of the Senate.

²⁵ National Academy of Sciences press release June 6, 2001.

²⁶ Tim Radford and Ian Black, *London Guardian*, June 7, 2001.

²⁷ *Ibid.*

²⁸ Howard Ris, "Viewpoint," *Nucleus*, Summer 2001, inside cover.

²⁹ National Academies, "Abrupt Climate Change: Inevitable Surprises," *Report in Brief*, 2004.

³⁰ James Hansen, "Overview/Global Warming," *Scientific American*, March 2004, 70.

³¹ U.S. Climate Action Report (U.S. Department of State, May 2002) :<http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsUSClimateActionReport>.

³² Tim Radford and Ian Black, *London Guardian*, June 7, 2001.

³³ David Stipp, "The Pentagon's Weather Nightmare," *Fortune*, January 26, 2004.

³⁴ Bonner R. Cohen, "The EPA's Ill-advised Hot Air," Knight Ridder/*Tribune*, June 12, 2002: "The Kyoto treaty would severely damage the U.S. economy." (President Bush to reporters on June 4, 2002.)

³⁵ Andrew C. Revkin, "Delegates Work Late On a Treaty," *New York Times*, November 10, 2001.

³⁶ Jeremy Leggett, *The Carbon War: Global Warming and the End of the Oil Era*, Penguin Books, 2001 edition.