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Meltdown

Yelling 'Fire' on a Hot Planet

By [ANDREW C. REVKIN](#)

GLOBAL warming has the feel of breaking news these days.

Polar bears are drowning; an American city is underwater; ice sheets are crumbling. Time magazine proclaimed that readers should be worried. Very worried. There are new hot-selling books and a batch of documentaries, including one starring former Vice President [Al Gore](#) and his climate-evangelist slide show that is touted as "the most terrifying movie you will ever see."

Are humans like frogs in a simmering pot, unaware that temperatures have reached the boiling point? Or has [global warming](#) been spun into an "alarmist gale," as Richard S. Lindzen, a climatologist at M.I.T. wrote in a recent Wall Street Journal op-ed article?

There is enough static in the air to simultaneously confuse, alarm and paralyze the public. Is global warming now a reality? What do scientists know for sure and when are they just guessing?

And what can truly be accomplished by changing behavior? After all, there are still the traditional calls to limit heat-trapped greenhouse-gas emissions, but a growing number of experts are also saying what was once unthinkable: humans may have to adapt to a warmer globe.

Here, an attempt to shed a little light in all the heat.

What We Know

Between the poles of real-time catastrophe and nonevent lies the prevailing scientific view: without big changes in emissions rates, global warming from the buildup of greenhouse gases is likely to lead to substantial, and largely irreversible, transformations of climate, ecosystems and coastlines later this century.

The Earth's average surface temperature rose about 1 degree over the 20th century, to around 59 degrees, but the rate of warming from the 1970's until now has been three times the average rate of warming since 1900. Seas have risen about six to eight inches globally over the last century and the rate of rise

has increased in the last decade.

In 2001, a large team of scientists issued the latest assessment of climate change and concluded that more than half of the recent warming was likely to have been caused by people, primarily because we're adding tens of billions of tons of carbon dioxide and other long-lived greenhouse gases to the atmosphere, mainly by burning coal and oil.

There is no serious debate any more about one thing: more of these gases will cause more warming. Dr. Lindzen, who contends any human climate influence is negligible and has long criticized those calling global warming a catastrophe, agreed on this basic fact in his article.

At the same time, few scientists agree with the idea that the recent spate of potent hurricanes, European heat waves, African drought and other weather extremes are, in essence, our fault. There is more than enough natural variability in nature to mask a direct connection, they say.

Even recent sightings of drowned polar bears cannot be firmly ascribed to human influence on climate given the big cyclical fluctuations of sea ice around the Arctic.

What Is Debated

The unresolved questions concern the pace and extent of future warming and the impact on wildlife, agriculture, disease, local weather and the height of the world's oceans — in other words, all of the things that matter to people.

The latest estimates, including a study published last week in the journal *Nature*, foresee a probable warming of somewhere around 5 degrees should the concentration of carbon dioxide reach twice the 280-parts-per-million figure that had been the norm on earth for at least 400,000 years. This is far lower than some of the apocalyptic projections in recent years, but also far higher than mild warming rates focused on by skeptics and industry lobbyists.

As a result, by 2100 or so, sea levels could be several feet higher than they are now, and the new normal on the planet for centuries thereafter could be retreating shorelines as Antarctic and Greenland ice sheets relentlessly erode.

Rivers fed by mountain glaciers, including those nourishing much of south Asia, could shrivel. Grand plans to restore New Orleans and the Everglades would be rendered meaningless as seawater advances. Manhattan would become New Orleans — a semi-submerged city surrounded by levees. In summers, polar bears would be stuck on the few remaining ice-clotted shores around the largely blue Arctic Ocean.

Projections of how patterns of drought, deluges, heat and cold might change are among the most difficult, and will remain laden with huge uncertainties for a long time to come, said M. Granger Morgan, a physicist and policy expert at Carnegie Mellon University in Pittsburgh.

For example, while computer simulations of the climate consistently show that the centers of big continents are likely to grow drier, and winters and nights generally warmer, they cannot reliably predict conditions in Chicago or Shanghai.

What's the Rush?

By the clock of geology, this climate shift is unfolding at a dizzying, perhaps unprecedented pace, but by time scales relevant to people, it's happening in slow motion. If the bad stuff doesn't happen for 100 years or so, it's hard to persuade governments or voters to take action.

And there is the rub. Many scientists say that to avoid a doubling of carbon dioxide concentrations, energy efficiency must be increased drastically, and soon. And by midcentury, they add, there must be a complete transformation of energy technology. That may be why some environmentalists try to link today's weather to tomorrow's problem. While scientists say they lack firm evidence to connect recent weather to the human influence on climate, environmental campaigners still push the notion.

"The issue clearly has an urgency problem," said Billy Parish, a founder of Energy Action, a coalition of student groups. "Maybe I'm just a paranoid that sees global warming everywhere, but the here-and-now effects do seem to be mounting, and I think we need to connect the dots for people."

A Gallup survey last month shows that people are still not worried about climate change. When participants were asked to rank 10 environmental problems, global warming was near the bottom, far below water pollution and toxic waste (both now largely controlled).

Without a connection to current disasters, global warming is the kind of problem people, and democratic institutions, have proved singularly terrible at solving: a long-term threat that can only be limited by acting promptly, before the harm is clear.

Problems that get attention are "soon, salient and certain," said Helen Ingram, a professor of planning, policy and design at the [University of California](#), Irvine.

Stressing the problem's urgency could well be counterproductive, according to "[Americans and Climate Change](#)," a new book by the [Yale](#) School of Forestry and Environmental Studies.

The book notes that urgency does not appear to be something that can be imposed on people. Moreover, it says, "Urgency is especially prone to being discounted as unreasoned alarmism or even passion."

Among its recommendations, the Yale book suggests something radical: drop the reluctance to accept adaptation as a strategy. Adaptation to climate extremes has long been derided by many environmentalists as defeatism. But, the book says, adaptation may help people focus on the reality of

what is coming — and that may motivate them to cut emissions to limit chances of bigger changes to come.

Actions could range from developing drought-resistant crops to eliminating federal insurance and other subsidies that have long encouraged coastal development.

Could stressing adaptation work? The Yale group calls global warming "the perfect problem" — meaning that a confluence of characteristics make it hard, if not impossible, to solve. Its impact remains clouded with scientific uncertainty, its effects will be felt over generations, and it is being amplified by everything from microwaving a frozen dinner to bringing electricity to an Indian village.

"I wish I were more optimistic of our ability to get a broad slice of the public to understand this and be motivated to act," said David G. Hawkins, who directs the climate program at the Natural Resources Defense Council, a private group.

In an e-mail message, he wrote: "We are sensory organisms; we understand diesel soot because we can smell it and see it. Getting global warming is too much of an intellectual process. Perhaps pictures of drowning polar bears (which we are trying to find) will move people but even there, people will need to believe that those drownings are due to our failure to build cleaner power plants and cars."

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