



Amid Worrisome Signs of Warming, 'Climate Fatigue' Sets In

As scientists debate whether climate is changing faster than anticipated, some worry that a drumbeat of dire warnings may be helping to erode U.S. public concerns about global warming

CLIMATE NEWS SEEMS TO HAVE BEEN ALL bad since the Nobel Prize–winning Intergovernmental Panel on Climate Change (IPCC) came out with its fourth assessment in February 2007. Within months of the sober but disquieting report, Arctic summer sea ice coverage plunged to a dramatic new record low, prompting talk about catastrophic tipping points. Glaciologists watched as record meltwater on the Greenland ice plunged into chasms, slicking the bottoms of glaciers and sending them racing to the sea. Swelled by glacier losses both north and south, the sea had been rising as fast as IPCC's worst-case scenario predicted, researchers reported. Lacking ice to hunt on, gaunt polar bears roamed Arctic lands in search of food. And newly crunched numbers showed that greenhouse gas emissions had shot up in the previous 5 years to exceed IPCC's worst scenarios.

"We are basically looking now at a future

climate that is beyond anything that we've considered seriously," ecologist and IPCC author Christopher Field of Stanford University in Palo Alto, California, said in February at the annual meeting of the American Association for the Advancement of Science (which publishes *Science*), according to a media report. In March, a meeting of 2000 climate scientists in Copenhagen prompted the headline "Projections of Climate Change Go From Bad to Worse, Scientists Report" (*Science*, 20 March, p. 1546).

This September, the United Nations Environment Programme issued an IPCC-like report that, according to a UNEP press release, showed that "the pace and scale of climate change may now be outstripping even the most sobering predictions of the last report of the ... IPCC." In the foreword of the UNEP report, U.N. Secretary-General Ban Ki-moon delivered the intended take-home message: The report "is a wake-up

call. The time for hesitation is over." In the run-up to next month's climate summit in Copenhagen, some researchers have argued that the worsening prospects for Earth's climate system make the negotiations all the more urgent.

Others, however, say the picture since the IPCC report is more complicated than that—though no brighter. "Things are looking much worse than was thought in the 1970s and '80s," says climate scientist Stephen Schneider of Stanford University, who has been deeply involved in global climate issues since the 1970s. "But 'much worse than IPCC 2007' is only true for a few things." And some anticipated climate changes are actually behind schedule, at least for the time being, notes the U.K. Meteorological Office's head of climate change advice, Vicky Pope. "It's at least as bad as expected," she says. "I don't think it's worse."

Almost all climate scientists are of one mind about the threat of global warming: It's real, it's dangerous, and the world needs to take action immediately. But they disagree about the best way to convey the urgency of the situation to the public and policymakers. "Where do you go after 'unequivocal'?" asks Roger Pielke Jr., a science policy scholar at the University of Colorado, Boulder, referring to the measure of certainty IPCC applied to its core findings in 2007. By sounding the alarm too loudly, Pielke and others say, scientific climate campaigners could be driving potentially sympathetic audiences to tune them out or could even provoke a backlash. Recent surveys in the United States show such "climate fatigue" may indeed be on the rise.

A glass half-empty

The UNEP report entitled *Climate Change Science Compendium 2009* (www.unep.org/compendium2009) presents the latest and perhaps most comprehensive case for heightened climate concerns. It is not the exhaustively peer-reviewed consensus assessment of peer-reviewed literature that IPCC produces every 5 or 6 years, but UNEP did compile its report "in association with scientists around the world" as a review of "some 400 major scientific contributions ... released through peer-reviewed literature or from research institutions over the last three years," according to its press release.

The UNEP update finds more sobering, even scarier, climate changes under way than IPCC did. The prime driver of global warming, emissions of carbon dioxide from burning fossil fuel, surged between 2000 and 2006, the report notes. The rate of emissions growth nearly tripled compared with the 1990s as economic growth surged, particularly in China and India. According to the report, that spurt has already contributed to a host of sooner-than-expected climate impacts, including "faster sea-level rise, ocean acidification, melting of Arctic sea-ice cover, warming of polar land masses, freshening in ocean currents, and shifts in circulation patterns in the atmosphere and the oceans."

The UNEP report also appears to update IPCC 2007 by citing an unofficial but peer-reviewed revision of IPCC 2001's "reasons

for concern." The 2001 assessment used a color-coded diagram to lay out the risk of five climate-change consequences expected for a range of possible future warmings. The risk of having more extreme-weather events, for example, was considered low at small warmings of 1°C or less (coded yellow at the bottom of a column), but it would be high (red at the top of a column) at large warmings of more than 3°C or 4°C (see figure).

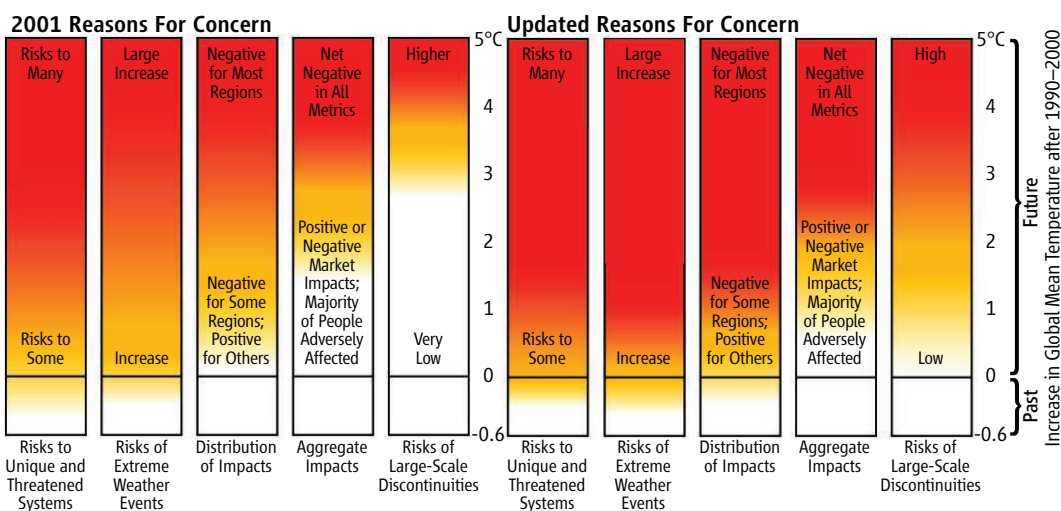
IPCC 2007 didn't update the "burning embers diagram." But 15 climate scientists, including some of the 2001 IPCC authors, did so in a March 2009 paper in the *Proceedings of the National Academy of Sciences (PNAS)*. Things now look worse in all

know more, and the trends are all in the wrong direction." Especially worrying, Somerville says, is that greenhouse-gas emissions have increased faster than in IPCC's most pessimistic scenario, leaving even less time to rein them in before great harm is done. The world's ice also seems to be in particular trouble, threatening to raise sea level by a meter or more by the end of the century instead of the few tens of centimeters that IPCC projected.

No more, no less concerned

Amid the calls for action, other climate researchers—equally concerned but less vocal—are advising caution in interpreting recent trends. The departures from IPCC 2007, they say, are not that large, not that

Online
scienemag.org
Podcast interview
with author
Richard A. Kerr.



Burning brighter. The red denoting high risk has crept down to smaller warmings since 2001.

five risk categories; the red of high risk has inched down to smaller warmings in each column. Several factors caused the reassessments, says *PNAS* author Gary Yohe of Wesleyan University in Middletown, Connecticut. After Hurricane Katrina struck in 2005, for example, the group realized that developing countries aren't the only ones at considerable risk of intensified coastal storms aggravated by rising sea level.

Many climate scientists share the heightened sense of urgency. A group of 25 or so researchers has prepared a document "very similar in tone" to the UNEP report. They will deliver it in a press conference to attendees in Copenhagen next month, says longtime climate researcher Richard Somerville, a professor emeritus at Scripps Institution of Oceanography in San Diego, California, and an author of the report. "We're seeing things happen more rapidly" than IPCC 2007 anticipated, he says. "I think IPCC has done a very responsible job, but now we

unexpected, or not that indicative of future trends. Accelerating emissions growth is a case in point, says economist James Edmonds of the Joint Global Change Research Institute in College Park, Maryland. The speedup of the past 5 to 10 years marked a spurt in the world economy. Soon, Edmonds says, "we're going to see the effects of the recession." Such near-term fluctuations are a bad basis for forecasting far-future emissions, he says, and the IPCC scenarios were never intended to track them. Over the long term, however, "the trend is really clear: If there's no intervention, emissions are going to rise. Up, up, up is inconsistent with stabilization" of atmospheric greenhouse gases below dangerous levels, which is the stated goal of "every country on the face of the earth."

Most of UNEP's other "sooner-than-expected" climate effects—from ocean acidification to shifts in ocean circulation—have likewise failed to heighten concern among more guarded scientists. The lone exception,

says glaciologist and IPCC author Richard Alley of Pennsylvania State University, University Park, is dwindling ice. The cryosphere—both floating sea ice and ice sheets on land—is reacting to the warming faster than IPCC projected, Alley says. In the Arctic, the 2007 report noted that some model projections had late-summer sea ice almost entirely disappearing “by the latter part of the 21st century.” Models and sea-ice specialists now point to summer sea ice being gone by about 2030 (*Science*, 27 March, p. 1655).

On land, IPCC authors did recognize that losses from both the Greenland and West Antarctic ice sheets had picked up in recent years, owing in part to a surprising acceleration of glacier tongues draining ice to the sea (*Science*, 9 October, p. 217). But even with the observed accelerations factored in, IPCC projected that sea level would rise by only a few tenths of a meter by the end of the century. Subsequent analysis has suggested that the rise in sea level is running near the extreme high end of IPCC projections and could reach about a meter by century’s end (*Science*, 8 June 2007, p. 1412).

The UNEP report dwells in detail on such fast ice responses. But some researchers say that the plight of the ice—although serious—is old news and is symptomatic of deeper concerns. Pope, for one, sees Arctic sea ice decline as a combination of a long-term loss due to global warming and bursts of ice loss like 2007’s that are due to natural, temporary changes such as wind shifts. The long-term threat was already obvious to IPCC authors, Pope says.

Likewise, the recent faster rise in sea level fed by wasting ice sheets certainly concerns geoscientist Michael Oppenheimer of Princeton University, but he’s long had a greater fear. “We still can’t project sea-level rise,” he says. “That worries me.” A major problem is understanding how glaciers would behave in a warmer world—faster or slower than today’s—and getting them to act that way in predictive models. Compounding the uncertainty is the slow response of kilometers-thick ice sheets to warming. Humans could put enough greenhouse gases in the atmosphere this century to guarantee that Greenland’s ice will melt centuries from now,

Oppenheimer says. The UNEP report discussed such irrevocable climate commitments, but they got little public attention.

And finally, the new “burning embers” do indeed tell an ominous story, says Schneider, who was second author on the *PNAS* paper that presented the updated graph. But it is a story, he says, of which the IPCC 2007 was already largely aware.

Unintended consequences?

Why does it matter whether the bad news is old news or new? Climate scientists feel that they are speaking with two voices, one much louder than the other. That worries Arctic climate researcher John Walsh of the University of Alaska, Fairbanks. “We have a delicate task of

“One of the strengths of the IPCC is it can make a pretty solid claim to be a consensus process,” he says. “I’m a little bit leery of the process at [the meeting in] Copenhagen earlier this year and the UNEP effort. They don’t have the same institutional legitimacy” as IPCC.

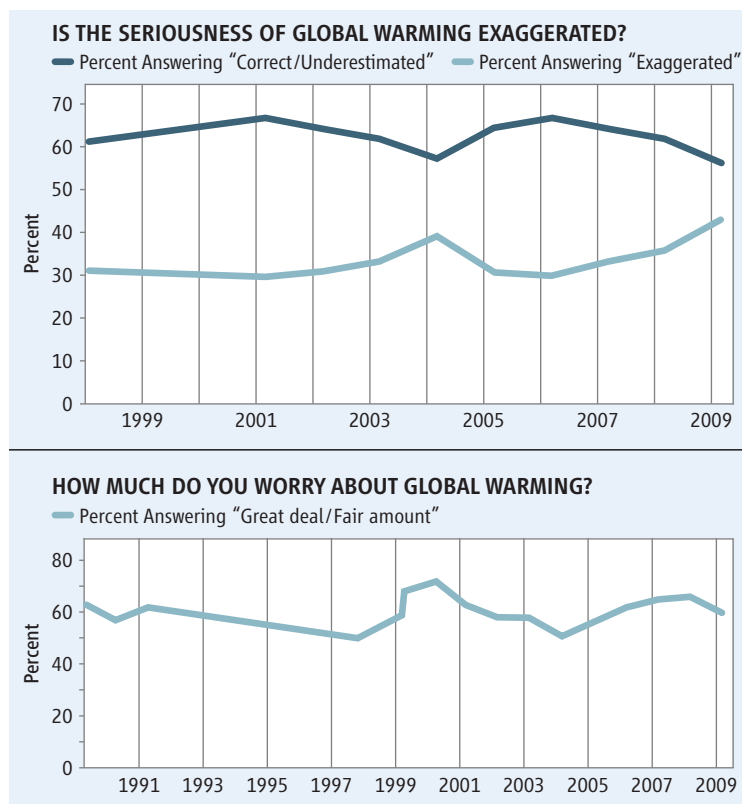
Whether or not the public is hearing the right tone of voice from the right places, it doesn’t seem to be getting the message anymore. Recent polling suggests that U.S. citizens, at least, are if anything less concerned about global warming than they were a few years ago. In polling at the end of September conducted by the Pew Research Center for the People and the Press, the proportion of Americans who “think there is solid evidence that the average temperature on earth has been getting warmer

over the past few decades” dropped to 57% from 71% in April 2008, according to Pew pollsters. The proportion of the American public that views global warming as a very serious or somewhat serious problem dropped from 73% to 65%. And in a Gallup poll released in March, the proportion of Americans who believe that the seriousness of global warming is exaggerated hit 41%, a record high in the 12 years Gallup has asked that question.

Apparently, anxious warnings of imminent climate crises are no longer getting through. Matthew Nisbet thinks he knows why. The political communications researcher at American University in Washington, D.C., says that “it’s very difficult for any single [climate] event to break through competing issues and information.” For Americans, those issues now include two wars, a lurching economy, and health care reform.

“Given the complexity of climate change,” Nisbet says, “any one event will be downplayed [by partisan critics]. I think the real long-term challenge is public education, to prepare people. What does it mean to be an American in an era of climate change?” Climate scientists need to refocus their message, he says, from the broad sweep of global warming to small regions such as New England and the Southwest and to immediate issues such as personal health. At the same time, new conduits to individuals need to be created to replace crumbling traditional media. A tall order.

—RICHARD A. KERR



Declining concern. Gallup polls suggest that more Americans feel that the seriousness of global warming is exaggerated and fewer are worried about it.

conveying the seriousness of the situation without overselling it as a done deal. We have a [climate] process that comes in fits and spurts,” he says, referring to the big loss of summer sea ice in 2007 as well as recent losses from Greenland. “We have to be careful not to extrapolate” a short spurt far into the future. With all the attention given Arctic ice after the heavy 2007 loss, “I am a little concerned the imminence of rapid [Arctic] change is being oversold or the uncertainties aren’t being conveyed,” he says.

And Pielke wonders whether the louder, more insistent voice is the best one for the job.