

FORUM

Weather- and Climate-Related Extreme Events: Teachable Moments

PAGE 120

It is difficult for the public to grasp the significance of global warming because the mildness of its early symptoms belies the gravity of its long-term consequences. Mindful of the human tendency to discount the importance of events seen as occurring far in the future, many scientists and science writers have come to regard newsworthy weather- and climate-related extreme events as “teachable moments” that serve to illustrate the importance and immediacy of the impacts of human-induced climate change.

The problem with this approach is that the attribution of extreme events to human-induced climate change is often viewed as gratuitous and labeled as fear mongering. A more effective communications strategy, in my view, is to use these events to illuminate society’s increasing vulnerability to natural disasters in the face of our deteriorating planetary life-support system.

Claims that the severity of heat waves, droughts, floods, and storms is increasing dramatically in response to global warming should, in fact, be viewed with caution for the following reasons:

- The subtle early warning signs of global warming are beginning to be detectable in the statistics of extreme events such as droughts and episodes of heavy rainfall averaged over intervals of a few decades, but the changes reported thus far do not qualify as “dramatic” [Easterling et al., 2000; Intergovernmental Panel on Climate Change (IPCC), 2007].
- The attribution of individual events—such as the current droughts in the Horn of Africa and Texas, the floods in Pakistan and Thailand, or the 2009 summer heat wave in Russia—to global warming is problematic because extreme events would occur from time to time even in an unchanging climate.
- Even in the presence of climate change, extreme events do not occur often enough to enable scientists to track decade-to-decade changes in their statistics in real time, as they successfully do with more aggregated quantities such as global mean temperature and sea level [Palmer and Räisänen, 2002].

In recognition of these statistical limitations, experts on risk assessment and authors of review articles on the impacts of climate change and chapters of IPCC assessments have been circumspect in their language relating to observed changes in the severity of extreme events [Easterling et al., 2000; IPCC, 2007]. A recurrent theme in the risk assessment literature is that increases

in extreme events due to climate change are occurring in combination with alarming rises in vulnerability, and hence that the additional risks due to climate change should not be analyzed or treated in isolation but instead integrated into broader efforts to reduce the risk of natural disasters [Van Aalst, 2006, p. 5; see also Kunkel et al., 1999; Meehl et al., 2000].

When scientists and science writers insist on framing the narrative about extreme events mainly in terms of climate change, they fall into a rhetorical trap. If they claim that heat waves, droughts, floods, and storms that qualify as extreme events today will become much more common toward the latter part of this century [Meehl and Tebaldi, 2004; Burke et al., 2006], their warnings do not convey a sense of urgency because they relate to the statistics of events occurring in the distant future.

On the other hand, if scientists emphasize the contribution of global warming in accounting for the severity of today’s extreme events [Trenberth, 2011], they can be faulted for not being able to provide a credible, quantitative measure of just how much it contributes. Opponents of environmental protection exploit the inherent limitations of what statistics can tell us about today’s extreme events to cast doubt on the immediacy, seriousness, and policy relevance of human-induced environmental degradation and to portray the scientific community as “crying wolf.” This rhetorical loophole will gradually tighten and close as the impacts of climate change become more pronounced later in this century, but we can ill afford to wait that long to address global warming and other pressing global environmental issues.

To take the initiative in the policy debate, I believe that scientists need to place climate change within a broader framework. For example, the U.S. Global Change Research Act (1990) established a research program encompassing “changes in the global environment (including alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems) that may alter the capacity of the Earth to sustain life.” More recently, a group of 28 environmental scientists [Rockstrom et al., 2009] listed climate among nine planetary life-support systems that are being stressed by human activities. When viewed in this broader context, weather- and climate-related extreme events take on greater significance because they serve as early warning signs, not only of climate change but also of increasing societal vulnerability to naturally occurring disruptions.

Just as deterioration in the health of a human sometimes first becomes apparent

when specific sites within the body become vulnerable to opportunistic infections, the declining resilience of our planetary life-support systems is becoming apparent within specific geographical regions where acute environmental degradation renders the local inhabitants highly vulnerable to naturally occurring disruptions such as weather- and climate-related extreme events. Loss of topsoil and ground cover [Montgomery, 2007; Brown, 2011] and the depletion of groundwater in fossil aquifers [Rodell et al., 2009; Qiu, 2010; Milesi et al., 2010; Brown, 2011] have rendered some of the world’s most productive agricultural regions much more vulnerable to drought. Deforestation and the appropriation of wetlands for residential and industrial use are increasing susceptibility to flooding. With the growth and globalization of the world economy, regional flood damage and drought-related disruptions in food production are having increasingly global impacts [Friedman, 2008; Gilding, 2011]; in terms of the biological analogy, opportunistic, local infections are posing more serious threats to the body as a whole.

Arguing about whether or not today’s extreme events are early indicators of climate change does nothing to advance the priority of global warming and other pressing environmental issues on our national policy agenda. The real significance of extreme events is as harbingers, not just of a changing climate but also of a changing world in which human society and the infrastructure that supports it are becoming increasingly vulnerable to natural disasters. The mounting disruptions in their wake reveal the progressive deterioration of our planetary life-support systems. Extreme events are, indeed, teachable moments: “wake-up calls” that an environmental crisis of global proportions is imminent—much more so than the subtle and sometimes ambiguous early warning signs of global warming might lead us to believe.

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