CLIMATE CHANGE

Fixing the Planet?

Kevin E. Trenberth

The Intergovernmental Panel on Climate Change (IPCC) reported in 2007 that global warming is unequivocal and very likely caused by human activities, mainly through increasing carbon dioxide and other greenhouse gases in the atmosphere. Projections suggest future climatic changes at rates that are apt to have major disruptive impacts on societies and the environment. To date, politicians around the world have failed to adequately deal with this major threat. Possible ways forward assessed by the IPCC include "mitigation" through slowing emissions of greenhouse gases and "adaptation" through taking steps that "might ultimately enhance resilience or reduce vulnerability to observed or expected changes in climate" (*1*). One proposed solution is "geoengineering," and Eli Kintisch's *Hack the Planet* examines the prospects of and past attempts at this tactic. Roger Pielke Jr.'s *The Climate Fix* proposes a different approach, one based on decarbonizing the economy and devoting greater efforts to adaptation.

In its series of four major reports since 1990, the IPCC has performed comprehensive assessments of the science of climate change, adaptation, and mitigation options in a policy-relevant but not policy-prescriptive way—at least in principle. IPCC participants come from scores of countries and all political persuasions and, in my experience, have always striven to provide the best science appraisal possible. They have produced a consensus but conservative set of documents. Although the Kyoto Protocol was a first step in addressing the problem politically, lack of further success has led Pielke (a political scientist at the University of Colorado) to slam the scientists, the IPCC, and politicians and to suggest rethinking our approach to climate change and climate policy. Kintisch (a reporter for *Science*) is much more accepting of the science and makes a case that the uncertainties are actually a call for action.

On the heels of the major failures of the December 2009 United Nations Copenhagen conference and the lack of any action in the U.S. Senate, Pielke outlines his view of these results and the factors involved. He highlights the focus on the importance of carbon dioxide. Kintisch goes further and notes the critical impact of burning coal. Neither author adequately addresses the issue of how what is done gets done. Politicians and other decision-makers must embrace the role of enabling sensible planning and implementation of actions to avoid disruption. For instance, we need a climate information system to inform decisions and to feed into a climate service (*2*).

Certain sections of Pielke's book contain a lot of spin. For instance, in his discussion of tradeoffs between the economy and the environment, he offers an "iron law of climate policy": "when environmental and economic objectives are placed into opposition with one another in public or political forums, it is the economic goals that win out." An example that he might have mentioned, but does not, is President George W. Bush's 2001 rejection of the Kyoto Protocol on the grounds that it would hurt the economy. In considering the scope of this law, however, Pielke treats economic and environmental gains as mutually exclusive. Although his law may hold when that premise is accepted, Pielke does not acknowledge that the imposition of a price on carbon emissions can be offset with reductions in taxes elsewhere and made revenue neutral. Nor does he allow for innovative implementation strategies (e.g., increases in efficiency to offset added initial costs) that remove the head-to-head conflict between environmental and economic gains. By painting the issue as black and white, Pielke reaches flawed conclusions.

Other issues are mischaracterized and overplayed by Pielke, such as the minor errors in the 2007 IPCC report and the role of e-mails stolen from the University of East Anglia's Climatic Research Unit (dubbed "climategate"). Although climategate has proven a major setback to climate science policy, that is not because there was any real substance to the charges (other than the way in which the United Kingdom's freedom of information act was abused)—see the independent panel reviews provided in the Oxburgh and Muir Russell reports (*3*, *4*). Kintisch indeed dismisses climategate as having no effect on the validity of the science.

In his discussions, Pielke presents case studies for decarbonizing the economies of different countries and the unrealistic nature of many targets in isolation. The absence of an international framework means a country going it alone is potentially disadvantaged in the international marketplace relative to countries that exploit cheaper subsidized fossil fuels at the expense of climate change. But Pielke does not address the international lobbying for economic advantage inherent in the policy negotiations.

Pielke makes a big deal about differences in the definitions of climate change used by the United Nations Framework Convention on Climate Change and the IPCC. The former defines the topic narrowly in terms of human influences, whereas the latter defines it to be climate change from all causes. Although many of us would agree that more attention is warranted to adaptation and planning for future climate changes, his logic about IPCC bias against adaptation is contorted: He objects to Working Group III's favoring of mitigation (which is, after all, its mission) while ignoring Working Group II (whose mission is adaptation). His claims that "the science of climate change becomes irrevocably politicized" because "[s]cience that suggested large climatic impacts on Russia was used to support arguments for Russia's participation in the [Kyoto] protocol"—as if there would be no such impacts and Russia would be a "winner"—look downright silly given the record-breaking drought, heat waves, and wildfires in Russia this past summer.

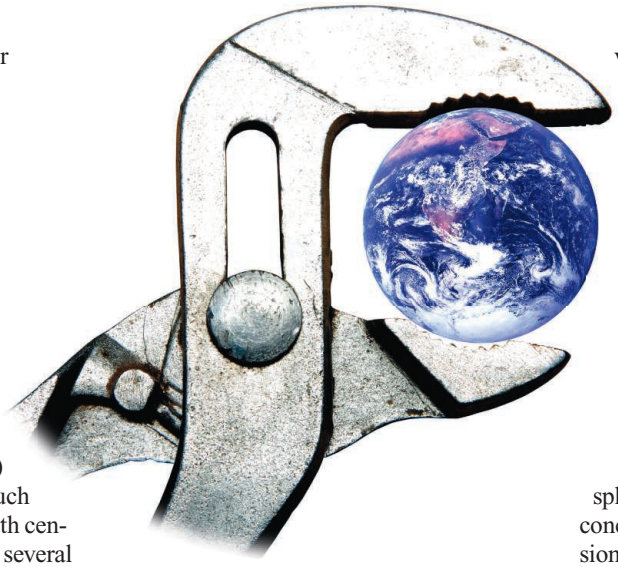
Unlike Kintisch, Pielke evidently does not appreciate how climate change is manifested mainly through changes in extremes. If a region undergoes only a modest shift in climate, the weather most of the time will fall within the same range experienced prior to the change. (For example, when probability distribution curves for temperature differ only by a small change in the mean value, they share nearly all of the area under them.) Pielke's discussion of changes in extremes (as detailed in the chapter "Disasters, Death, and Destruction") can only be described as

The Climate Fix
What Scientists and Politicians Won't Tell You About Global Warming
by Roger Pielke Jr.
Basic Books (Perseus Books Group), New York, 2010.
288 pp. $26, C$32.95, £15.99.
ISBN 9780465020522.

Hack the Planet
Science's Best Hope—or Worst Nightmare—for Averting Climate Catastrophe
by Eli Kintisch
Wiley, Hoboken, NJ, 2010.
285 pp. $25.95, C$30.95, £17.99, €20.80.
ISBN 9780470524268.

The reviewer is at the National Center for Atmospheric Research, Post Office Box 3000, Boulder, CO 80307, USA. E-mail: trenbert@ucar.edu

Published by AAAS



a diatribe against the IPCC and other scientists that is based on highly selective and distorted figures and his own studies.

Pielke stresses economic data and dismisses the importance of loss of life. (For instance, he gives nary a mention of the over 50,000 lives lost to heat stress during the summer 2003 heat waves in Europe, which are discussed by Kintisch.) He makes "corrections" for some things (notably, more people putting themselves in harm's way) but not others. Some adjustments, such as for hurricane losses for the early 20th century, in which the dollar value goes up several hundred–fold, are highly flawed. But he then uses this record to suggest that the resulting absence of trends in damage costs represents the lack of evidence of a climate component. His record fails to consider all tropical storms and instead focuses only on the rare land-falling ones, which cause highly variable damage depending on where they hit. He completely ignores the benefits from improvements in hurricane warning times, changes in building codes, and other factors that have been important in reducing losses. Nor does he give any consideration to our understanding of the physics of hurricanes and evidence for changes such as the 2005 season, which broke records in so many ways (*5*).

Similarly, in discussing floods, Pielke fails to acknowledge that many governing bodies (especially local councils) and government agencies (such as the U.S. Army Corps of Engineers) have tackled the mission of preventing floods by building infrastructure. Thus even though heavy rains have increased disproportionately in many places around the world (thereby increasing the risk of floods), the inundations may have been avoided. In developing countries, however, such flooding has been realized, as seen for instance this year in Pakistan, China, and India. Other tenuous claims abound, and Pielke cherry-picks points to fit his arguments. For example, a box titled "U.S. Extreme Events: Excerpts from a 2008 U.S. Government Report" presents six points related to changing extremes, but Pielke's biased selection of those particular points from the numerous ones included in the report (*6*) completely changes the actual conclusions.

Pielke believes that there has been "systematic misrepresentation of the science of disasters and climate change … in the leading scientific assessments produced to inform policy," an action that he blames on "political dynamics." Only by dismissing any role of climate change in the increasing frequency or magnitude of disasters around the world is he able to make such outlandish claims. He goes on to say that "using disasters to advocate for mitigation policies is misguided at best and misleading at worst" and has led to "some of the most egregious errors in leading scientific assessments of climate change." Pielke's faulty premise drives his subsequent arguments. His utter failure to adequately appreciate climate science and the implications of its projections for the future means that *The Climate Fix* falls far short of adequately addressing major issues. Although progressively decarbonizing the economy and adopting an approach of building more resiliency to climate events would be good steps in the right direction, they are not enough. Planned adaptation to climate change may work for modest changes, but over 50 years from now, one form of adaptation will have to be to suffer the consequences—as, in fact, we are already doing. Or is geoengineering the answer?

Whereas Pielke's account tends to minimize the risks associated with climate change, Kintisch's very readable book emphasizes them. Each chapter opens with an example of past human attempts to forge geoengineering solutions to various kinds of problems, few of which were successful. The essence of geoengineering is not to attempt to directly forestall the problem but rather to implement alternative devices to deal with the symptoms. The difficulty with this approach is that even when it proves possible to alleviate the immediate predicament, there are often unintended consequences and side effects that could prove even worse than the original problem. This is certainly a major worry in regards to some suggested geoengineering fixes of global warming. For instance, emulating volcanoes by injecting a veil of aerosol into the stratosphere may well stem (or at least reduce) increases in global mean temperatures, but doing so could also cause major droughts or other undesired regional effects (*7*). After all, global mean temperature is simply one indicator of climate change and does not reflect most aspects of the threat. Moreover, the bandage approach has substantial costs and diverts attention away from a lasting solution to the problems caused by our transfer of carbon from fossil fuels into the atmosphere. It also raises major ethical questions concerning who is entitled to make the decision (on behalf of all humanity) to intentionally change the climate—as opposed to the unintentional changes we are making at present. In addition to exploring the issues and difficulties (including legal entanglements and the legitimacy of carbon offsets), Kintisch provides vignettes of several scientists active in geoengineering.

Geoengineering is also dealt with by Pielke, but only briefly. He makes a reasonable case that the level of uncertainty and ignorance with regard to climate change and the risk of unintended consequences limit its prospects. He suggests that "carbon remediation" (by which he means removing carbon dioxide from the atmosphere) may be feasible. However, he does not address the practicality of storing all of the carbon dioxide. Both carbon remediation and carbon sequestration are considered much more thoroughly by Kintisch.

Unfortunately, *The Climate Fix* often toys with the truth and uses highly selective evidence to bolster its case, further politicizing climate change science. Readers of *Hack the Planet* will gain a better understanding of the severe challenges posed by anthropogenic changes to Earth's climate.

References

1. www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter17.pdf.
2. K. E. Trenberth, *WMO Bull.* **57**, 17 (2008).
3. www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAP.
4. www.cce-review.org/pdf/FINAL REPORT.pdf.
5. R. A. Anthes *et al.*, *Bull. Am. Meteorol. Soc.* **87**, 623 (2006).
6. T. R. Karl *et al.*, Eds., "Weather and climate extremes in a changing climate. Regions of focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands" (U.S. Climate Change Science Program, Department of Commerce, Washington, DC, 2008); http://downloads.climatescience.gov/sap/sap3-3/sap3-3-final-all.pdf.
7. K. E. Trenberth, A. Dai, *Geophys. Res. Lett.* **34**, L15702 (2007).

10.1126/science.1197874