LETTER

Tipping Points, Great and Small

PAGE 473

The Forum by *Jordan et al.* [2010] addressed environmental problems of various scales in great detail, but getting the critical message through to the formulators of public policies requires going back to basics, namely, that exponential growth (of a population, an economy, or most anything else) is not sustainable. When have you heard any politician or economist from anywhere across the ideological spectrum say anything other than that more growth is essential?

There is no need for computer models to demonstrate "limits to growth," as was done in the 1960s. Of course, as one seeks more details, the complexity of modeling will rapidly outstrip the capabilities of both observation and computing. This is common with nonlinear systems, even simple ones. Thus, identifying all possible "tipping points," as suggested by *Jordan et al.* [2010], and then stopping just short of them, is impractical if not impossible. The main thing needed to avoid environmental disasters is a bit of common sense.

The book review in the same issue of *Eos* [*Lim*, 2010] presents a different argument. Lim believes that climate change, rather than other factors such as the decline of petroleum production, is the ultimate limit to growth. Maybe he is correct, but even in the 1960s, when climate change was not even on the list of possible limits to growth, exponential growth was shown to be unsustainable. This narrow view seems dominant in climatology and the rest of geophysics, but there are many competitors, such as freshwater shortages. Growth is consuming nonrenewable resources and destroying renewable ones. The policies of most nations resemble a drag race with a bridge abutment at the finish line. There is something comic as well as tragic about this.

According to the Global Footprint Network (http://www.footprintnetwork.org), we now need one and a half Earths to sustain us, meaning that it takes 1.5 years for the Earth to regenerate the resources humanity uses in 1 year. Even if the estimate is high, with current growth rates, humanity will soon need one and a half Earths, or whatever it takes, to reach a global tipping point.

The environmental catastrophe in the Gulf of Mexico has provided an example of a tipping point that cannot be managed by the methods suggested by *Jordan et al.* [2010]. Think of what it will be like if economic growth overshoots a tipping point and precipitates an environmental or economic collapse due to the depletion of resources.

References

Jordan, T. E., et al. (2010), Recommendations for interdisciplinary study of tipping points in natural and social systems, *Eos Trans. AGU*, *91*(16), 143–144.

Lim, B., (2010), *Demands of Expanding Populations and Development Planning*, *Eos Trans. AGU*, *91*(16), 147.

—Foster Morrison, Turtle Hollow Associates, Inc., Gaithersburg, Md.; E-mail: turtlehollowinc@verizon.net

MEETINGS

Climate Variability and Change in South America

ENSO, Decadal Variability and Climate Change in South America: Trends, Teleconnections, and Potential Impacts; Guayaquil, Ecuador, 12–14 October 2010

PAGE 473

El Niño and the Southern Oscillation (ENSO) have profound effects on South American climate. Warm ENSO events (El Niños) and cold ENSO events (La Niñas), which occur on year-to-year time scales, are associated with droughts, floods, and other extreme weather events across the continent. Anthropogenic greenhouse gas warming of the planet will also likely have a profound effect on South America, through both gradual shifts in the baseline climate and increases in extreme events, including possible changes in the ENSO cycle.

There are indications that climate change may already be having an impact in South America, with temperature trends observed in the Galápagos and in the altiplano of the northern Andes and in the shrinking of tropical mountain glaciers. There has also been a shift in the behavior of El Niño, with an increased tendency for warm sea surface temperature anomalies to be concentrated in the central Pacific rather than in the eastern Pacific during the past 2 decades. These central Pacific (or "Modoki," which means "similar but different" in Japanese) El Niños have a different signature than eastern Pacific El Niños in terms of teleconnection patterns on weather variability in South America and in terms of effects on marine ecosystems and fisheries along the west coast of the continent. However, the instrumental climate record is relatively short, and many of the observed trends could simply be the result of natural decadal climate variability that is unresolved in observations.

Understanding the causes and consequences of climate variability and change in South America was the theme of an international workshop convened at the University of the Pacific in Ecuador. The workshop attracted 92 participants from 19 countries on six continents. Presentations covered a wide range of topics including physical processes in the eastern Pacific and their influence on the regional climate; ocean-atmosphere-land interactions; local-, regional-, and global-scale perspectives on the consequences of climate variability and change in South America; paleoclimate perspectives from Galápagos coral archives that put the modern climate record in the context of changes over the past 5000 years; the effects of the physical climate system on the terrestrial and marine biosphere; and the interface between science and society, where knowledge gained from studies of the climate system is applied for practical benefit.

Presentations highlighted the need for more research and observational efforts to advance scientists' understanding of and ability to predict climate in the region on seasonal and longer time scales. The workshop also underscored the importance of authoritative and reliable scientific information for developing effective risk management, mitigation, and adaption strategies in a world changing under the influence of human activity. The workshop was sponsored by the Climate Variability and Predictability (CLIVAR) program of the World Climate Research Programme (WCRP), the International Geosphere-Biosphere Programme (IGBP), the Institut de Recherche pour le Développement (IRD), and the Centro Internacional para la Investigación del Fenómeno de El Niño (CIIFEN).

—Michael J. McPhaden, Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration, Seattle, Wash.; E-mail: michael.j.mcphaden@noaa.gov; Carolina Susana Vera, Consejo Nacional de Investigaciones Científicas y Técnicas, University of Buenos Aires, Buenos Aires, Argentina; and Centro de Investigaciones del Mar y la Atmósfera, Ciudad Universitaria, Buenos Aires, Argentina; and Rodney Martínez Guingla, CIFFEN, Guayaquil, Ecuador