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LETTERS

Attribution of Disaster Losses

IN HIS VIEWPOINT "INSURANCE IN A CLIMATE OF change" (12 Aug., p. 1040), E. Mills suggests that changes in climate have been responsible for some part of the trend in recent decades of increasing damage related to extreme weather. This claim is not supported by the peer-reviewed literature, including the most recent report of the Intergovernmental Panel on Climate Change (IPCC) (*1*).

Over recent decades, the IPCC found no long-term global trends in extratropical cyclones (i.e., hurricanes or winter storms), in "droughts or wet spells," or in "tornados, hail, and other severe weather" (*2*). Logically, in the absence of trends in these weather events, they cannot be responsible
for any part of the growing economic toll. The IPCC did find "a widespread increase in heavy and extreme precipitation events in regions where total precipitation has increased, e.g., the mid- and high latitudes of the Northern Hemisphere" (*3*). But at the same time, the IPCC warned that "an increase (or decrease) in heavy precipitation events may not necessarily translate into annual peak (or low) river levels" (*3*). Indeed, although the IPCC found some changes in streamflow, it did not identify changes in streamflow extremes (i.e., floods) and concluded on a regional basis, "Even if a trend is identified, it may be difficult to attribute it to global warming because of other changes that are continuing in a catchment" (*4*). These findings are consistent with research seeking to document a climate signal in a long-term record of flood damage that has concluded that an increase in
precipitation contributes to increasing flood damage, but the precise amount of this increase is small and difficult to identify in the context of the much larger effects of policy and the ever-growing societal vulnerability to flood damage (*5*, *6*). A recent study by the International Ad Hoc Detection and Attribution Group concluded that it was unable to detect an anthropogenic signal in global precipitation (*7*). In 2005 several studies reported an increase in the intensity of tropical cyclones (8, 9); however, long-term records of economic damages show no upward trend, once the data are normalized to remove the effects of societal changes *(10, 11).*

Presently, there is simply no scientific basis for claims that the escalating cost of disasters is the result of anything other than increasing societal vulnerability (*12*).

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3. See section 2.7.2.2 of (1) at www.grida.no/climate/ipcc_tar/wg1/090.htm.
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Response

WHILE WORTHY OF DISCUSSION, THE HISTORically oriented questions raised by Pielke Jr. are tangential to the central focus of my Viewpoint, which explores the vulnerability of insurers, their customers, and governments to future climate change.

Climate change cannot be summarily dismissed as a driver of observed growth in global weather-related damages and economic losses. The disaster attribution literature upon which such assertions are based is fraught with data and measurement uncertainties and is decidedly incomplete, especially concerning events outside the United States (*1*). There is particularly scant treatment of important noncatastrophic processes such as small storms, lightning, soil subsidence, permafrost melt, the effects of mold and airborne aeroallergens on human health, coral reef decline, coastal erosion, or crop diseases. Such diffuse or small-scale phenomena today yield aggregate annual losses on a par with headline-catching catastrophes and will be amplified by climate change (*2*, *3*). Indirect effects, such as impacts on energy prices, are significant but rarely quantified.

Damage to oil storage tanks in Cameron, Louisiana, caused by Hurricane Rita.

A nonselective reading of IPCC's 2001 assessment does in fact support the linkage between rising damage costs and a combination of increased weather extremes and societal vulnerability. This is stated directly in the WG2 Technical Summary and elsewhere. IPCC's synthesis of the literature notes observed underlying changes in temperature and precipitation extremes, continental drying, and a range of associated impacts on physical and biological systems. Moreover, the body of literature demonstrating anthropogenic climate change has since bourgeoned, evidencing stronger and more pervasive trends (*1*, *4*) including changes in atmospheric and ocean circulation and elevated ocean heat content, as well as sea-level rise and associated coastal erosion, which, in turn, help drive many impacts of concern (*5*, *6*). The recent literature on the socially and economically devastating European heat wave of 2003 attributes a very high (90%) confidence that human activity doubled the probability of the event's occurrence (*7*).

It is clear that global economic losses from weather-related events are rising far faster than inflation, economic growth, or population. Thorough attribution analysis must address questions such as:

Why are losses from weather-related events rising faster than those from non-weather events?

What are the offsetting effects of human efforts to curb losses (building codes, early warning systems, fire protection, flood defenses, land-use planning, crop irrigation, etc.)? As noted by Pielke Jr. and co-authors with respect to flood risk [(*8*), p. 1081], "[o]ne can easily hypothesize that increasing population and urbanization in the United States has led to a commensurate increase in population at risk. Yet, one can also hypothesize that the various societal responses may have more than compensated for population growth and in fact fewer people are today at risk...." The Army Corps of Engineers estimates that flood control measures have prevented 80% of U.S. losses that would have otherwise materialized (*9*).

How do we explain rising economic losses (e.g., those to crops in the heartland or physical infrastructure built on melting permafrost) that are only weakly linked to oft-cited demographic factors such as populations clustering around coastlines?

Lastly, why would rising numbers of events (*10*) not translate into rising costs?

Assuming that only socioeconomic factors—rather than rising emissions—influence losses may yield ill-founded policy recommendations that focus exclusively on adapting to climate change while dismissing energy policy as a legitimate part of the toolkit for responding (*11*). As an indication of the potential value of emissions reductions, the Association of British Insurers, in collaboration with U.S. catastrophe modelers, estimated that U.S. hurricane or Japanese typhoon losses would vary by a factor of five for scenarios of 40% and 116% increase in pre-industrial atmospheric CO_2 concentrations (*12*). Others have projected a fourfold increase in mid-Atlantic U.S. flood loss costs under climate change (*13*).

In a narrow sense, it would be a relief to learn that the only cause of rising losses is that people are moving more into harm's way. That conclusion would, however, be premature and scientifically indefensible given the paucity of data, limitations of available analyses, and consistency between observed impacts and those expected under climate change. Nor should we make the opposite mistake of attributing the observed growth in losses solely to climate change. Rather than "proof" by vigorous assertion, the constructive approach is to better understand the compounding roles of increasing vulnerability and climate change, and take affordable precautionary steps to reduce greenhouse gas emissions and adapt to the changes rather than waiting for unaffordable consequences.

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Bilateral Action for Right Whales

IN THEIR POLICY FORUM "NORTH ATLANTIC right whales in crisis" (22 July, p. 561), S. D. Kraus *et al.* make clear the plight of the North Atlantic right whale, *Eubalaena glacialis*, and note that whale deaths from ship strikes and fishing gear entanglements have not been diminishing. Kraus *et al.* call for changes to U.S. National Oceanic and Atmospheric Administration (NOAA) management policy to put strong and immediate

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