Probable Cause

Are scientists too cautious to help us stop climate change?

BY KERRY EMANUEL | NOVEMBER 9, 2012

Conventional wisdom about climate change may have begun to gel in the aftermath of Sandy, but did global warming *really* cause the vicious hybrid storm that devastated much of the eastern seaboard last week? The short answer is no. Attributing Sandy or any other single event to long-term climate trends is rather like blaming El Niño for a car accident on the Santa Monica Freeway. But that's hardly an excuse for policymakers to keep kicking the climate can down the road. Science actually doesn't tell us much about that kind of causality, so it's time to stop acting like it does.

At its best, climate science deals in probabilities. This means that under ideal conditions, scientists can estimate how a given climate signal alters the chances of a particular event. For example, we can now begin to estimate how global warming changes the probability of destructive hurricane landfalls. But in the case of hybrid storms like Sandy, which combine hurricane and winter storm characteristics, science hasn't even progressed to the point of assessing probabilities.

Although this point may seem straightforward, it is routinely spun and misinterpreted. My colleagues and I try

to make concise statements such as "Science has not established a link between hybrid events and climate change." But often, such statements are spun by climate skeptics into "Science has established that there is no link between Sandy and climate change." Others see Sandy as a harbinger of what climate change may look like, or emphasize (as I have) that sea level rise and increased atmospheric moisture can only worsen the effects of storms like Sandy.

But there is a more fundamental reason that science has failed to properly inform public debate -- its inherent conservatism. For scientists, an asymmetric reward structure means that it is better to be a little late in what proves to be an important discovery than to publish too soon and be proved wrong. As a result, scientists often ignore apparent patterns in their data if there is as little as a 5 percent probability that they could have arisen by chance. But while this philosophy makes sense for science, it can be disastrous when applied to risk assessment.

For example, the Fukushima Dai-ichi nuclear disaster occurred, in part, because the plant was built to withstand tsunamis triggered by offshore earthquakes up to magnitude 8.3 -- the largest earthquake that scientists conservatively estimated might be possible. But what was a "conservative" estimate for science was anything but conservative in the arena of risk management. Given the enormous potential downside, it would have made far more sense to build in a margin of error that might have withstood the magnitude 9.0 quake that did occur.

The same can be said of climate change policy. The world has suffered an extraordinary string of weather disasters over the past decade, ranging from crippling droughts and floods, to severe tornado and hail outbreaks, to highly destructive hurricanes. Insurance industry statistics reflect a substantial increase in damages from these events, but in only a few cases can scientists confidently attribute them to climate change. (For example, increased incidence of droughts, floods, and high category hurricanes may be partly pinned on climate change.)

But we know next to nothing about the relationship between climate change and other weather phenomena, such as tornadoes, and we have yet to establish a link to hybrid storms like Sandy. For all but a few of these phenomena, the scientifically correct conclusion is that we can't rule out the possibility that they were purely manifestations of natural variability. But from a public policy perspective, it would be prudent to assume that climate change might be behind some of these changes, given that it is manifestly changing the environment in which these events develop.

Consider the following thought experiment. Suppose we begin **pumping sulfate aerosols** into the stratosphere in an attempt to slow the pace of global warming. Suppose further, that over the next two years we suffer unprecedented drought, summer freezes, and a series of crippling blizzards. When confronted, scientists say that they need at least ten more years of data to establish with 95 percent confidence whether or not these phenomena were made substantially more likely by the sulfate aerosols. My guess is that most everyone, including scientists, would want the experiment terminated right away. A small chance that the signal is real justifies taking action, given the magnitude of the consequences.

The real experiment we are performing by increasing greenhouse gas concentrations in our atmosphere differs from the thought experiment in several crucial respects. First, it is accidental rather than intentional, thereby entailing a different moral culpability. Second, turning off the experiment would be costly, especially for many of the most profitable industries on the planet. And finally, we must terminate the experiment very soon to minimize risks that will continue for hundreds of years.

Yet the outcome asymmetry of global warming is real and must be accounted for in any rational assessment of its risks. The most likely outcomes would have serious but manageable consequences for our descendents. Somewhat less probable, but not impossible, are benign outcomes. On the far side of the probability distribution are dire consequences ranging from flooded coastal cities to global armed conflict brought about by natural disasters and chronic food and water shortages. Reasonable people will differ on how far we should go to mitigate these highly asymmetric risks. But the argument that there is no risk or that we should do nothing is both scientifically and morally indefensible.

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