The Center for Health and the Global Environment
Harvard Medical School

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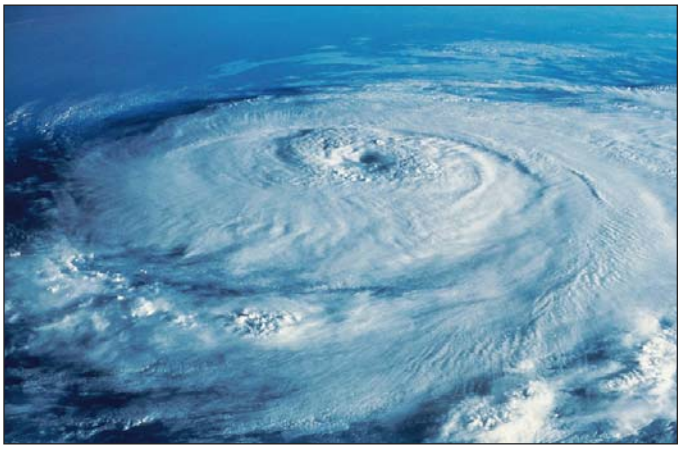
A scientific overview of emerging human health and global environmental change issues

Hurricanes, Climate Change, and Health

With four hurricanes and tropical storms hitting the United States in a recent five-week period, 2004 already is being called "The Year of the Hurricane." But this year's unusually intense period of destructive weather activity could be a harbinger of what is to come as the effects of global warming become even more pronounced in future years, according to leading experts.

The recent onslaught of four major tropical weather disturbances - Charley, Frances, Ivan and Jeanne - that did so much damage in the United States and nearby Haiti have spurred new questions about the relationship between hurricanes and global warming. While experts can't say that climate change will result in more hurricanes in the future, there is growing evidence and concern that the tropical storms that do happen will be more intense than in the past. Fueling concerns about the link between global warming and hurricanes is a new study on hurricane intensity published on September 28, 2004 in "The Journal of Climate." The study used extensive computer modeling to analyze 1,300 future hurricanes and projected major increase in the intensity and rainfall of hurricanes in coming decades.

"Global warming may well be causing bigger and more powerful hurricanes," said James J. McCarthy, a biological oceanographer at Harvard University and lead author of the climate change impacts portion of the Intergovernmental Panel on Climate Change's (IPCC) Third Assessment Report (2001). "Warmer seas fuel the large storms forming over the Atlantic and Pacific, and greater evaporation generates heavy downpours. With warmer, saltier tropical seas, the IPCC has projected larger storms, heavier rainfalls and higher peak winds."



Paul R. Epstein, M.D., associate director of the Center for Health and the Global Environment at Harvard Medical School, said: "Scientists cannot say at present whether more or fewer hurricanes will occur in the future. However, even if the number of storms remained constant, more powerful hurricanes with stronger winds, higher storm surges, and heavier downpours would have an even greater potential for damage, including increased risks to human life and public health, more floods and mudslides, increased coastal erosion and damage to coastal buildings and infrastructure. This is the pattern that we already may be seeing related to the overall increase in extremes."

Precipitation from hurricanes also is seen as being likely to increase, leading to flooding and mudslides. In addition, hurricane storm surges could be larger due to sea-level rise from melting ice and snow and the thermal expansion of ocean waters. In the U.S., the areas at greatest risk of larger storm surges are low-lying coastal areas along the Gulf Coast, such as Florida's Panhandle, Alabama's Gulf Shores and southern Louisiana. More intense hurricane activity also poses a risk to such vulnerable sections of the

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United States as North Carolina and South Carolina.

How would global warming increase the intensity of hurricanes?

One of the consequences of global warming appears to be not only an increase in sea surface temperature, but a rising of the overall energy flux at the tropical ocean surface. Some experts think that this increased surface disequilibrium may lead to more intense tropical storms. In the Pacific, a large ocean water area two degrees warmer than average spawned 20 typhoons this season. Eight hit Japan and meteorologist there have openly attributed that nation's battering to global warming.

"Human activities are changing the composition of the atmosphere and global warming is happening as a result," says Kevin Trenberth, head of the Climate Analysis Section at NCAR and a convening lead author of the 2007 IPCC report for the chapter on observed changes. "Global warming is manifested in many ways, some unexpected. Sea level has risen 1.25 inches in the past 10 years as a result of warming of the oceans and glacier melting. The environment in which hurricanes form is changing. The result was a hurricane in late March 2004 in the South Atlantic, off the coast of Brazil: the first and only such hurricane in that region. Several factors go into forming hurricanes and where they track. But the evidence strongly suggests more intense storms and risk of greater flooding events, so that the North Atlantic hurricane season of 2004 may well be a harbinger of the future."

The insurance industry already is reading the signals. From the 1980s through the 1990s, damages from catastrophes (primarily weather extremes) rose exponentially - from $4 to $40 billion annually (when calculated in 1999 dollars) with about one quarter of that amount insured. In the 1990s, Federal Emergency Management Agency (FEMA) payouts for disasters quadrupled. Estimates of insured losses from this year's hurricanes range from $20 to $40 billion.

With the possibility of more problems to come, weather-related property and casualty costs from extreme events are projected by the UN to reach $150 billion worldwide this decade. In the US some companies already have withdrawn coverage from Cape Cod and the southern coast of Massachusetts. After this brutal hurricane season in Florida, homes and businesses are likely to face higher deductibles and part of the burden will fall on taxpayers.

Matthias Weber, senior vice president and chief property underwriter of the US Direct Americas division of Swiss Re, said: "Not since 1886 have four hurricanes hit one state in a single season. This year, 22 percent of Floridians were affected and two million claims generated by hurricanes and tropical storms. In 2005, we expect the demand for catastrophe reinsurance to continue to rise. Over the last 10 years demand has increased about 10 percent per year."

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