Seventh Annual
Roger Revelle Commemorative Lecture

5:30pm Wednesday, March 15, 2006

Disasters, Death, and Destruction: Accounting for Recent Calamities

Ocean Studies Board

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

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Welcome

Dear Lecture Participant:

On behalf of the Ocean Studies Board (OSB) of the National Academies, I would like to welcome you to the Sixth Annual Roger Revelle Commemorative Lecture. This lecture was created by the Ocean Studies Board in honor of Dr. Roger Revelle to highlight the important links between ocean sciences and public policy.

Roger Revelle

For almost half a century, Roger Revelle was a leader in the field of oceanography. Revelle trained as a geologist at Pomona College and at U.C. Berkeley. Then, in 1936, he received his Ph.D. in oceanography from the Scripps Institution of Oceanography. As a young naval officer, he helped persuade the Navy to create the Office of Naval Research (ONR) to support basic research in oceanography and was the first head of ONR's geophysics branch. Revelle served for 12 years as the Director of Scripps (1950-1961, 1963-1964), where he built up a fleet of research ships and initiated a decade of expeditions to the deep Pacific that challenged existing geological theory.

Revelle's early work on the carbon cycle suggested that the sea could not absorb all the carbon dioxide released from burning fossil fuels. He calculated the first continual measurement of atmospheric carbon dioxide, leading to a long-term record that makes present-day discussions on research on global warming possible and very valuable. Revelle kept the issue of increasing carbon dioxide levels before the public and spearheaded efforts to investigate the mechanisms and consequences of climate change.

Revelle was a proponent of daring programs, like Mohole and the International Indian Ocean Expedition, which addressed fundamental scientific questions and pioneered international cooperation. In 1960, Revelle left Scripps for critical posts as Science Advisor to the Department of the Interior (1961-1963) and as the first Director of the Center for Population Studies at Harvard (1964-1976). Revelle applied his knowledge of geophysics, ocean resources, and population dynamics to some of the world's most vexing problems: poverty, malnutrition, security, and education.

In 1957, Revelle became a member of the National Academy of Sciences (NAS) to which he devoted many hours of volunteer service. He served as a member of the Ocean Studies Board, the Board on Atmospheric Sciences and Climate, and many committees. He also chaired a number of influential Academy studies on subjects ranging from the environmental effects of radiation to understanding sea-level change.

Smithsonian
National Museum of Natural History

The Ocean Studies Board is pleased to have the opportunity to present the Revelle Lecture in cooperation with the Smithsonian National Museum of Natural History for the second time. Opened in 1910, the museum is dedicated to maintaining and preserving the world's most extensive collection of natural history specimens and human artifacts. It also fosters critical scientific research, as well as supporting educational programs and exhibitions that present the work of its scientists and curators to the public. The museum is directed by Dr. Cristián Samper and is part of the Smithsonian Institution, the world's largest museum and research complex.

Ocean Science Initiative

The National Museum of Natural History is building upon its substantial foundation in marine science to establish a comprehensive Ocean Science Initiative that will:

- Engage, educate, and inspire the public through state-of the-art displays in the Museum's exciting and ambitious new Ocean Hall,
- Extend access to the exhibition, collections, and research through the integrated and dynamic Ocean Web Portal, and
- Expand understanding of our oceans through the scholarly, multi-disciplinary Center for Ocean Science.

The Ocean Hall

In the Ocean Hall, visitors will find a one-of-a-kind interpretive exhibition, extraordinary in scale and presenting the oceans as never before: over time and in three dimensions. When complete in 2008, it will span more than 26,000 square feet to become the Museum's most prominent hall. Initial funding has been provided by the U.S. National Oceanic and Atmospheric Administration (NOAA), whose mission is to understand and predict changes in Earth's environment and to conserve and manage coastal and marine resources.

Roger Pielke, Jr.

In the wake of recent disasters wrought by the Indian Ocean tsunami and Hurricanes Katrina and Rita in the Gulf of Mexico, the Ocean Studies Board is pleased to present Dr. Roger Pielke, Jr. as the Seventh Annual Roger Revelle Commemorative lecturer. Dr. Pielke is a professor at the University of Colorado where he serves as the Director of the Center for Science and Technology Policy Research. His research on the impacts of weather and climate change on society brings a new and thought-provoking perspective on science-based decisionmaking.

I hope you enjoy the lecture.

Shirley A. Pomponi

Shirley A. Pomponi
Chair, Ocean Studies Board

Ocean Studies Board

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Accounting for Recent Calamities

Dr. Roger Pielke, Jr.

Roger Pielke, Jr. is a professor in the Environmental Studies Program and a fellow of the Cooperative Institute for Research in the Environmental Sciences (CIRES) at the University of Colorado. At CIRES, Dr. Pielke has directed the Center for Science and Technology Policy Research since 2001. From 1993-2001 he was a scientist at the Environmental and Societal Impacts Group at the National Center for Atmospheric Research in Boulder, Colorado, where he studied societal responses to extreme weather events, policy responses to climate change, and U.S. science policy. He focuses his research on the relation of scientific information and public and private sector decision making. His current areas of interest include the politicization of science, decision making under uncertainty, and policy education for scientists. He chaired the American Meteorological Society's Committee on Societal Impacts 1999-2002, and has served on the Science Steering Committee of the World Meteorological Organization's World Weather Research Programme and the Board on Atmospheric Sciences and Climate of the National Research Council, among other advisory committees. Dr. Pielke received his Ph.D. in political science from the University of Colorado.

Disasters, Death, and Destruction:

Introduction

A disaster happens when an extreme event occurs in the context of societal vulnerability. Nowhere is the meeting of vulnerability and extreme more tangible than where the land meets the sea. This was horrifically apparent on 26 December 2004 when a powerful earthquake under the eastern Indian Ocean resulted in a massive tsunami that killed more than 280,000 people and caused billions of dollars in damage. Other disasters at the ocean-land boundary are similarly fresh in our minds—the U.S. hurricane seasons of 2004 and 2005 resulted in hundreds of billions of dollars in damage and more deaths than in the previous 35 years combined. We will be responding to Hurricane Katrina for years to come.

We do not have to look too far back in time to recall other tragedies, such as Hurricane Jeanne which killed several thousand people in Haiti in 2004, the Venezuelan coastal landslides in 1999 that killed upwards of 30,000 people, and Hurricane Mitch in 1998 which killed more than 10,000 people, mainly in Nicaragua and Honduras. In 1991 perhaps 150,000 people died in Bangladesh as the result of storm surge and flooding from a tropical cyclone.

The recent spate of disasters has created two common perceptions among decision makers and the general public. First, there is a sense that the economic impacts associated with extreme events have increased in recent years. Second, given that a human influence on the climate system has been well established, a perception exists that the recent increase in weather-related disasters like floods and hurricanes is in some way related to changes in climate.

These perceptions beg two questions:

- Have loss of life and damages associated with extreme weather events actually increased in recent years?
- What factors account for observed trends in the impacts of weather on society?

The answers to these questions are more than simply idle speculations—they underlie policy decisions with important social, economic, and political ramifications, such as disaster preparations, insurance, international climate change negotiations, and how we set priorities for the funding of scientific research. Because policy is based in part on the perceptions that policy makers hold about weather and climate, it is worth determining the answers to the two questions in a scientifically rigorous manner. This lecture discusses trends in loss of life and damages associated with disasters with a focus on extreme weather events, floods, and hurricanes. It also discusses factors which account for the observed trends and the state of our knowledge in this area. It concludes with a discussion of implications for policy and research related to natural hazards and global climate change.

Context: Disasters and Global Warming

One cannot engage in a discussion of the global trend in disasters for too long before the subject of global warming inevitably comes up. The increasing threat of natural disasters has long been cited as one of many reasons why society should reduce greenhouse gas emissions, and the disasters of 2004 and 2005 have only made those calls louder. For example, a day after the Indian Ocean tsunami, Sir David King,

Britain's chief science adviser, told the BBC, "What is happening in the Indian Ocean underlines the importance of the Earth's system to our ability to live safely. And what we are talking about in terms of climate change is something that is really driven by our own use of fossil fuels." Disasters are a powerful symbol in the highly politicized climate debate, and the climate debate is relevant to how we think about disasters and what policies make sense in response.

Such arguments have a rich pedigree. Only nine days before the tsunami, Klaus Toepfer, executive director of the U.N. Environment Programme, said, "Climate scientists anticipate an increase [in] intensity of extreme weather events." Environmental groups use the threat of increasing disasters to advocate decisive action to reduce the emission of greenhouse gases and to implement the Kyoto Protocol on climate change. The advocacy group Scientists and Engineers for Change supported John Kerry in the 2004 election by posting billboards in storm-ravaged Florida with the message, GLOBAL WARMING = WORSE HURRICANES. GEORGE BUSH JUST DOESN'T GET IT (Figure 1). But as logical and enticing as it may seem to connect the ever-growing toll of disasters with global warming, the current state of science simply does not support making such a connection.

Figure 1. Billboard put up along highways in Florida during the 2004 presidential election by the groups Environment 2004 and Scientists and Engineers for Change.

While politicians and political advocates might be expected to stretch the bounds of scientific accuracy, it is particularly troubling to see leading scientists join them. For instance, the former head of the United Nation's Intergovernmental Panel on Climate Change (IPCC), Sir John Houghton, testified before the U.S. Senate last July that increasing disaster losses could be attributed to increased storminess. And Rajendra Pachuri, the current head of the IPCC, suggested in February, 2004 that the escalating costs of disasters could be attributed in part to climate change. Yet such claims are simply not supported by existing scientific research.

It is crucial to observe that global climate change is, of course, real and that developing alternative energy sources and reducing global carbon-dioxide emissions are essential. But the claim that action to slow climate change is justified by the rising toll of natural disasters—and, by extension, that reducing emissions can help stanch these rising losses—is both scientifically and morally insupportable. To address ever-escalating damage from hurricanes, floods, and other extreme events, we need to expand our focus beyond simply reducing emissions to reducing our vulnerability to disasters. This requires understanding of why it is that disasters have been increasing in number and intensity.

Disasters, Death, and Destruction:

Understanding Disaster Trends

The first thing to understand about disasters is that they have indeed been rapidly increasing worldwide over the past century, in both number and severity, and that the causes of this increase are well understood. Data from the Center for Research on the Epidemiology of Disasters in Brussels, Belgium, as well as the Red Cross and the reinsurance industry, show that the number of disasters affecting at least 100 people or resulting in a call for international assistance has increased from an average of about 100 per year in the late 1960s to between 500 and 800 per year by the early twenty-first century. The reason is not an increase in the frequency or severity of storms, earthquakes, or similar events, but an increase in vulnerability because of growing populations, expanding economies, rapid urbanization, and migrations to coasts and other exposed regions.

These changes are reflected in the costs of major disasters, which, according to the German insurance company Munich Re, rose more than tenfold in the second half of the twentieth century, from an average of about $4 billion per year in the 1950s to more than $40 billion in the 1990s, in inflation-adjusted dollars. The great Miami hurricane of 1926, for example, caused about $76 million in damage; when Hurricane Andrew, of similar force, struck South Florida in 1992, it caused more than $30 billion in damage, again adjusted for inflation. Our research suggests that, if the same 1926 storm were to hit Miami today, it would cost more than $110 billion.

So if you have a sense that the frequency of disaster is increasing, then you would be correct. They are increasing. And with them is coming an ever-escalating economic toll on society. Figure 2 shows how dramatically the costs of disasters has been rising in recent years

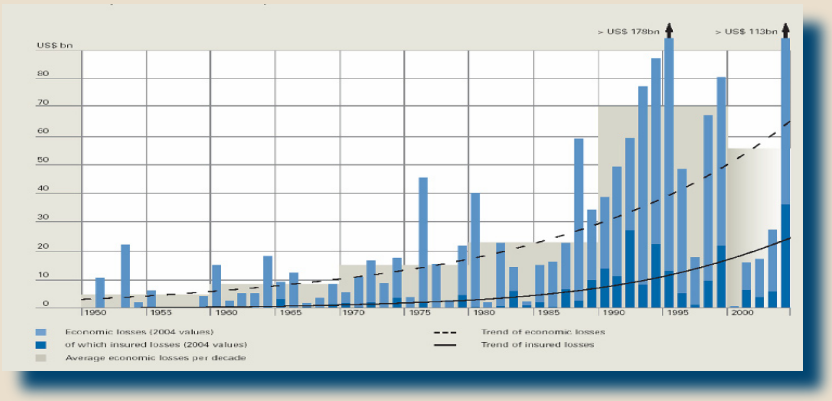

Figure 2. The growing global toll of disasters, according to data collected by Munich Re.

The economic losses from disasters are increasingly concentrated in the affluent world. But, as a percentage of GNP, the economic effects of natural disasters on poor countries can be hundreds of times greater. For example, Hurricane Mitch, which devastated Central America in 1998, caused damages estimated between $5 and $7 billion—or almost the annual combined total economic activity of the two hardest-hit nations, Honduras and Nicaragua. Their economies still have not recovered. By comparison, the magnitude 6.7 earthquake that struck California in 1994, one of the costliest disasters in U.S. history, caused an estimated $20 to $40 billion in losses, but this amounted to only 2 to 4 percent of California's economic activity.

Disasters disproportionately harm poor people in poor countries because those countries typically have densely populated coastal regions, shoddily constructed buildings, sparse infrastructure, and grossly inadequate public health capabilities. Poor land use leads to widespread environmental degradation, such as deforestation and wetlands destruction, which in turn exacerbates flooding and landslides. Emergency preparation and response capabilities are often inadequate and hazard insurance is usually unavailable, further slowing recovery. Thus, while the world's poorest 35 countries make up only about 10 percent of the world's population, they suffered more than half of the disaster-related deaths between 1992 and 2001.

Disparities in disaster vulnerability between rich and poor will continue to grow. About 97 percent of population growth is occurring in the developing world. This growth, in turn, drives urbanization and coastal migration. The result is that, in the next two decades, the population of urban areas in the developing world will likely increase by two billion people. And this population is being added to cities that are mostly located on coastal or flood plains—or in earthquake zones—and are unable to provide the quality of housing, services, infrastructure, and environmental protection that can help reduce vulnerability. Uncontrolled urban growth exacerbates exposure to extreme events.

Some Details and Data

If we hypothesize that changes in weather patterns are responsible for some part of the trend of increasing disaster losses, then it is logical that the first place we might look is for changes in the behavior of weather extremes. The most recent IPCC report took a close look at research on extreme weather events and found little evidence for changes over time.

Consider that over recent decades, the IPCC found no long-term global trends in extra-tropical cyclones (i.e., winter storms), in "droughts or wet spells," or in "tornados, hail, and other severe weather." In the absence of trends in these weather events, they cannot be responsible for any part of the growing economic toll. More recently, Massachusetts Institute of Technology's Kerry Emanuel published a study in the journal Nature that described an increase in the intensity of hurricanes in the North Atlantic and North Pacific, but this trend is not related to increasing damage. Emanuel writes on his website, "There is a huge upward trend in hurricane damage in the U.S., but all or almost all of this is due to increasing coastal population and building in hurricane-prone areas. When this increase in population and wealth is accounted for, there is no discernible trend left in the hurricane damage data." Another prominent study has found an increase in the proportion of the strongest storms, and scientists have differing expectations about the cause of this trend, but no one has connected such trends to increasing disasters.

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." 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." Indeed, while the IPCC found some changes in streamflow, it did not identify changes in streamflow extremes (i.e., floods), and concluded on a regional basis that, "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." A recent study by the International Ad Hoc Detection and Attribution Group, published in the May 2005 Journal of Climate, was unable to detect a greenhouse gas signal in global precipitation.

These findings are consistent with research seeking to document a climate signal in a long-term record of flood damage, which has concluded that an increase in precipitation does indeed contribute 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. Figure 3a shows how flood damage has increased dramatically in the United States, but figure 3b shows that it has stayed pretty constant when growing national wealth is considered.

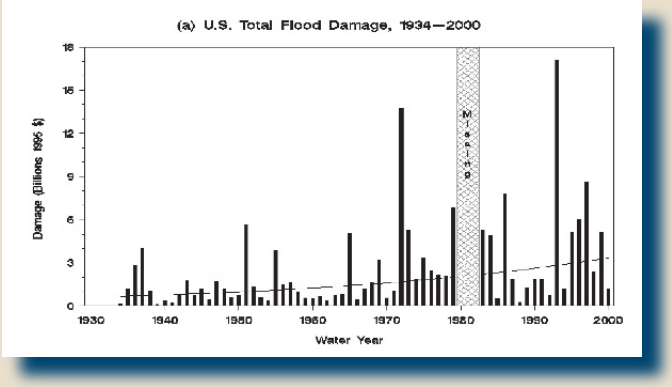

Figure 3a. Trends in U.S. flood damage, 1934-2000, adjusted for inflation. Source: www.flooddamagedata.org.

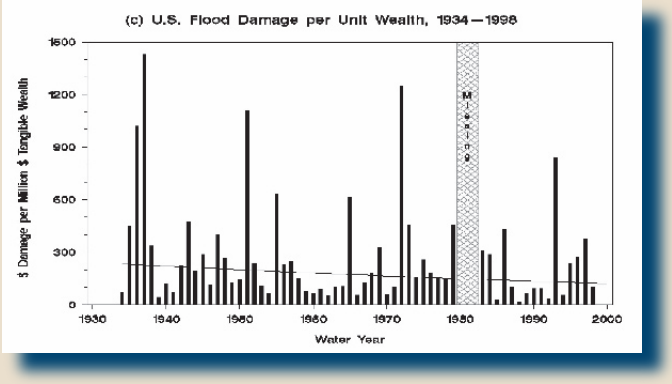

Figure 3b. Trends in U.S. flood damage per unit of wealth, 1934-2000.
Source www.flooddamagedata.org

The case of hurricane impacts in the United States is similarly instructive. Consider economic damage (adjusted for inflation) related to hurricane landfalls in the United States, 1900–2005, as shown in Figure 4. Although damage is growing in both frequency and intensity, this trend does not reflect increased frequency or strength of hurricanes. In fact, while hurricane frequencies have varied a great deal over the past 100 + years, they have not increased in recent decades in parallel with increasing damages. To the contrary, although damage increased during the 1970s and 1980s, hurricane activity was considerably lower than in previous decades.

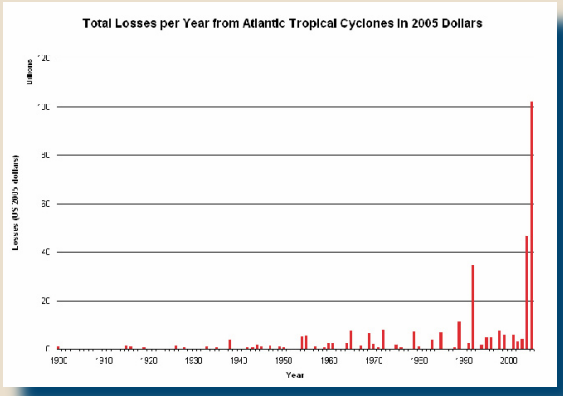

Figure 4. Trend in U.S. hurricane damage, 1900-2005. Source: NOAA/NHC.

To explain the increase in damage, it is therefore necessary to consider factors other than variability or change in climate. Society has changed enormously during the past century and coastal development has exploded. Figures 5a and b show this dramatically. Figure 5a shows a stretch of Miami Beach in 1926. Figure 5b shows another perspective of Miami Beach from recent years. The reason for increasing damages is apparent from the changes easily observable in these figures: today there is more potential for economic damage than in the past due to population growth and increased wealth (e.g., personal property).

Figure 5a. A view of Miami Beach in 1926. Source: Wendler Collection.

Figure 5b. A view of Miami Beach ~2000. Source: NOAA.

Given the significance of societal change in trends of hurricane damage, one way to present a more accurate perspective on such trends is to consider how past storms would affect present society. We developed a methodology for "normalizing" past hurricane damage to present day values (using wealth, population, and inflation). Figure 6 shows the historical losses of Figure 4 normalized to 2001 values. The normalized record shows that the impacts of Hurricane Andrew, at close to $51 billion (2005 values), would have been far surpassed by the Great Miami Hurricane of 1926, which would have caused an estimated $129 billion damage had it occurred in 2005, exceeding similarly accounted costs of Katrina. We can have some confidence that the normalized loss record accounts for societal changes because, unlike the unadjusted data, the adjusted damage data accurately reflect well-understood patterns of climate variability, such as the signal of El Niño and La Niña in hurricane frequencies.

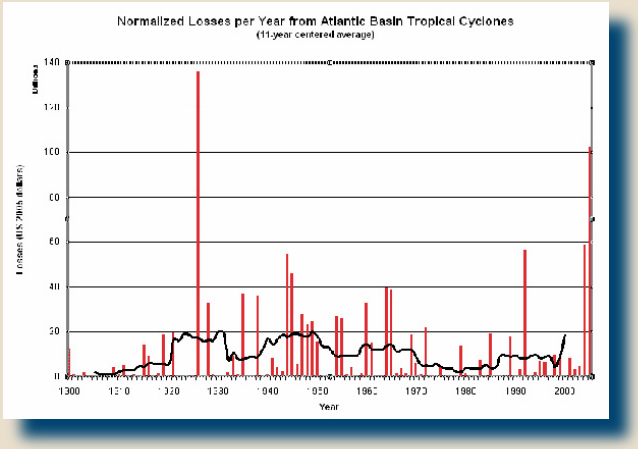

Figure 6. Estimated hurricane damages 1900-2005 if storms of the past made landfall with coastal development of 2005. Source: Roger Pielke, Jr.

The normalization methodology provides an opportunity to perform a sensitivity analysis of the relative contributions of climate changes and societal changes, as projected by IPCC, to future topical cyclone damages. Figure 7 shows the results of this analysis. The three blue bars show three different calculations (named for their respective authors) used by IPCC in its Second Assessment Report for the sensitivity of tropical cyclone-related damage in 2050 (relative to 2000) resulting from changes in climate, independent of any changes in society. The four green bars show the sensitivity of tropical cyclone-related damage in 2050 (relative to 2000) resulting from changes in society based on four different IPCC population and wealth scenarios used in its Third Assessment Report. These changes are independent of any changes in climate.

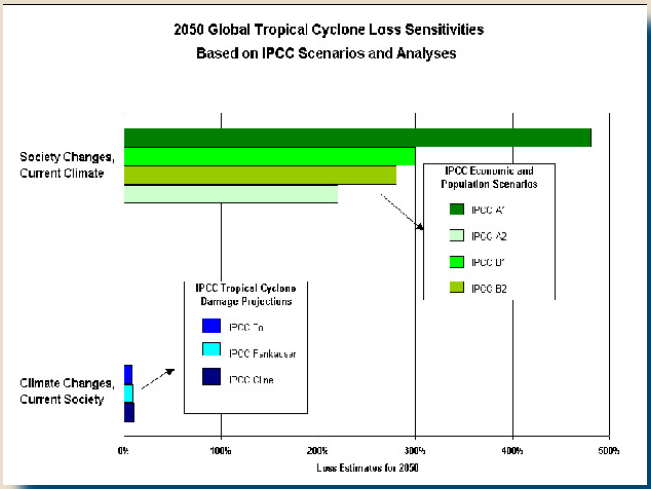

Figure 7. Relative contributions of climate change and societal change to global tropical cyclone (hurricane) damages in 2050 according to the assumptions of the Intergovernmental Panel on Climate Change. Source: Roger A. Pielke, Jr.

Figure 7 illustrates dramatically the profound sensitivity of future climate impacts to societal change, in the context of climate and societal changes projected by the IPCC. While IPCC data and predictions indicate that human-caused climate change may have an effect on future disasters, our analysis of hurricanes and tropical cyclones, using IPCC data and assumptions, shows that for every $1 of additional disaster damage scientists expect will be caused by the effects of global warming by 2050, an additional $22 to $100 of damages will result from the growth of economies and populations. Other studies of hurricanes, flooding, and heat waves lead to a similar conclusion: socioeconomic trends, not climate change, will continue to drive increasing disaster losses.

Clarity from Confusion

While it is understandable why some advocacy groups might stretch the bounds of present scientific understanding to link recent disasters and climate change to advance a political agenda, why is it that many scientists, who should know better, make the same claims?

One important reason for some confusion among scientists stems from a claim made by the 2001 IPCC (by its Working Group II) attributing some part of the trend of increasing disaster losses to changes in climate. However, upon closer look, the claim seems unfounded. The IPCC relied on a report published in 2000 by Munich Re that found that global disasters resulted in $636 billion in losses in the 1990s compared with $315 billion in the 1970s, after adjusting for changes in population and wealth. The Munich Re report concludes that disaster costs have increased by a factor of two (i.e., 636/315), independent of societal changes, and the IPCC suggests that climate change is responsible for the difference.

Methodologically, the calculation is suspect for a number of reasons. First, Munich Re provides neither their methods nor data. Second, Munich Re admits that data on changes in wealth are not available

around the world and changes in GDP are not always a good proxy for data on wealth. Third, Munich Re's data apparently includes weather and non-weather events (e.g., it appears to also include earthquake damages).

But let's assume that all of the issues raised above can be overcome, and in the end there remains a 2-to-1 ratio. The fact is that the large decadal variability in disaster losses makes it quite dodgy to assert a trend by comparing two different ten-year periods over a period of 30 years. This can be illustrated with an example from our database of hurricane losses. If we adjust the hurricane loss data, accounting for trends in population, wealth, and inflation, to 2005 values and then compare decades, we see some interesting things. Figure 6 shows this data. First, the ratio of the 1990s to the 1970s is quite similar to the Munich Re analysis, 2.1 ($91B/$43B). But if we look at other decadal comparisons, the picture looks quite different, the 1990s to the 1940s = 1.0 ($91B/$90B) and the 1990s to the 1920s = 0.6 ($91B/$154B). The bottom line is that the 2000 Munich Re analysis tells us nothing about the attribution of the causes for increasing disasters, yet its results were used by the IPCC to suggest otherwise.

Where from Here?

Assertions that global warming is directly linked to rising disaster losses persist. Such assertions may have short-term political benefits in the global warming debate, but they detract from serious efforts to prepare for disasters. Global climate change has been a potent focusing lens for environmental groups, governments, the scientific research establishment, and international bodies, especially the United Nations. The U.N. Framework Convention on Climate Change—and its Kyoto Protocol mandating emissions reductions—occupies thousands of advocates, diplomats, scientists, lawyers, and journalists. The climate change policy agenda has also sucked into its maw a wide range of other issues, such as energy policy, water policy, public health and infectious diseases, deforestation, and, of course, disasters. Climate change thus captures a huge proportion of the public attention, political energy, and financial and intellectual resources available for addressing global environmental challenges—including disaster preparedness.

To emphasize, humans have an effect on the global climate system and reducing greenhouse gas emissions makes good sense. But reducing emissions will not discernibly affect the trend of escalating disaster losses because the cause of that increase lies in ever-growing societal vulnerability. Faced with the inescapable momentum of these socioeconomic trends the crucial question is this: What can be done to better prepare the world—especially the developing world—for future disasters?

Once we understand that the chief reason for increasing disaster losses is the role of demographics in making a country vulnerable to disaster, we can better focus responses on managing vulnerability. But the climate debate has prevented a clear focus on vulnerability.

The U.N. Framework Convention, for example, refused to fund disaster preparedness efforts at its last conference in December unless states could demonstrate exactly how the disasters they feared were linked to climate change. Consider, too, the amount spent on scientific research. According to a recent RAND study, U.S. funding for disaster loss-reduction research in 2003 amounted to about $127 million—only 7 percent of the amount invested in climate change research for that year. Efforts in Congress to

create a coordinated research program focused on reducing disaster losses have never gained momentum. By contrast, the U.S. government has sponsored a coordinated, multi-agency framework for climate change research for more than 15 years, with total investments, by our calculations, of more than $30 billion, adjusted for inflation.

This is not to say that many thousands of people and hundreds of organizations worldwide are not productively confronting disaster vulnerability, but their efforts do not begin to address the magnitude of the problem. Thousands of participants from most of the world's nations, along with scientists and political advocates, have come together every year since 1995 to work toward concerted international action on climate change. But, when the U.N. World Conference on Disaster Reduction met in January 2005, it was the first such meeting in more than a decade.

While the prospects for global climate change are constantly in the public eye, Hurricane Katrina and the South Asian earthquake and tsunami poignantly demonstrate that the crisis of growing disaster vulnerability only becomes news after disaster strikes. Yet we know that effective action is possible to reduce disaster losses even in the face of poverty and dense population. During the 2004 hurricane season, Haiti and the Dominican Republic, both on the island of Hispaniola, provided a powerful lesson in this regard. As Julia Taft of the U.N. Development Program explained: "In the Dominican Republic, which has invested in hurricane shelters and emergency evacuation networks, the death toll was fewer than ten, as compared to an estimated two thousand in Haiti.... Haitians were a hundred times more likely to die in an equivalent storm than Dominicans."

Most tools needed to reduce disaster vulnerability already exist, such as risk assessment techniques, better building codes and code enforcement, land-use standards, and emergency-preparedness plans. The question is: Why is disaster vulnerability so low on the list of global development priorities? Says Brian Tucker, president of GeoHazards International: "The most serious flaw in our current efforts is the lack of a globally accepted standard of acceptable disaster vulnerability, and an action plan to put every country on course to achieve this standard. Then we would have a means to measure progress and to make it clear which countries are doing well and which are not. We need a natural disaster equivalent to the Kyoto Protocol."

Those who justify the need for greenhouse gas reductions by exploiting the mounting human and economic toll of natural disasters worldwide are either ill-informed or disingenuous. This is not, as Britain's Sir David King suggested, "something we can manage" by decreasing our use of fossil fuels. Prescribing emissions reductions to forestall the future effects of disasters is like telling someone who is sedentary, obese, and alcoholic that the best way to improve his health is to wear a seat belt.

In principle, fruitful action on both climate change and disasters should proceed simultaneously. In practice, this will not happen until the issues of climate change and disaster vulnerability are clearly separated in the eyes of the media, the public, environmental activists, scientists, and policymakers. There are good reasons for more substantial action on energy policies, particularly in the United States; and there are good reasons for concern about the growing toll of disaster losses around the world. But suggestions that the escalating disaster losses should motivate action on energy policy are not grounded in science and cannot be an effective approach to disaster management. As long as people think that GLOBAL WARMING = WORSE HURRICANES, global warming will also equal less preparation. And disasters will claim ever more money and lives.

Want to learn more?

My publications can be found online at http://sciencepolicy.colorado.edu/

Also, the Center for Science and Technology Policy hosts a weblog, that I contribute to regularly, which often engages in discussions related to today's lecture. The weblog can be found at http://sciencepolicy.colorado.edu/prometheus/

I welcome your comments and feedback: pielke@colorado.edu

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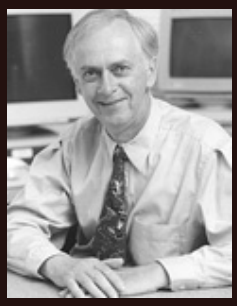

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