Natural Hazards Observer

NATURAL HAZARDS CENTER

Volume XXXIII · Number 5 May 2009

Focus on Drought and Climate Change

Drought Insurance for Subsistence Farmers in Malawi

—Invited Comment

A pilot project offering drought insurance to farmers in one of southern Africa's most drought-prone nations could help reduce food vulnerability for the world's poorest people.

The project, which launched in Malawi in November 2005, allowed 892 subsistence farmers to purchase insurance covering drought risks to their valuable groundnut crop. In turn, the World Bank-sponsored insurance made the Malawians more creditworthy, allowing them to purchase hybrid seeds that could potentially double agricultural productivity.

Market-based Adaptation

Aside from providing a blueprint for food vulnerability reduction, the Malawi insurance project might also serve as a promising model for market-based adaptation to climate change in drought-prone regions. United Nations scientists reported in 2005 that one in six countries faced a food shortage because of severe drought (Vidal and Radford 2005). Climate change will probably worsen the situation.

Although the Malawi project demonstrates the limitations of micro-insurance systems operating without outside financial and technical support, the lessons learned have motivated similar projects aimed at supporting climate change adaptation in Africa. Providing this support presents an opportunity for international donor communities, as well as for the emerging climate adaptation regime.

Southern and central Malawi were hit by three severe droughts that affected nearly 8.5 million people between 2002 and 2007, according to data collected by the World Health Organization's Collaborating Centre for Research on the Epidemiology of Disasters (CRED). Five hundred people died in the 2002 drought, part of a widespread pattern of drought that affected more than 32 million in eastern Africa

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On the Line

Federal Budget Plans for Disasters

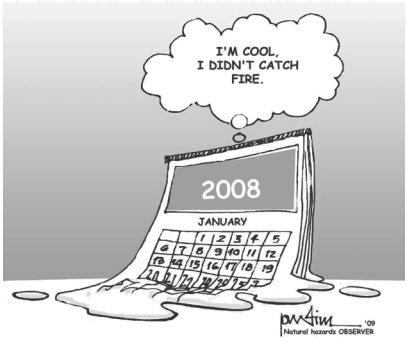
Rather than assume the nation won't be hit by expensive disasters, President Barack Obama's federal budget includes—for the first time—contingency funds to deal with them.

Assessing the statistical likelihood of disasters for any given year, the budget allots $88.2 billion in disaster funds for 2010-2014, and $225.5 billion for 2010-2019. Official disaster declarations have been increasing over the last 55 years or so, according to the Federal Emergency Management Agency. For instance, there were seven official disasters in 1958. By 2008, there were 75. There have been an average of 32 disasters a year in the United States since 1953.

"One can never know what kind of disaster or unexpected emergency may occur that will require the help of the federal government," according to the budget statement, *A New Era of Responsibility*. "If we do not account for these costs as we project the federal government's future fiscal health, we run the risk of allowing these unforeseen events to cause even more economic pain and derail our long-term growth … This omission is irresponsible, and has permitted past administrations to project deficits that were lower than were likely to occur."

2008: A Pretty Cool Year

The year 2008 was the coolest of the new century—but it was the ninth warmest since 1880, according to the NASA Goddard Institute for Space Sciences (GISS). The ten warmest years on record all occurred between 1997 and 2008.



"The GISS analysis found that the global average surface temperature was 0.44 degrees Celsius (0.79 degrees Fahrenheit) above the global mean for 1951 to 1980," the agency stated.

"Given our expectation that the next El Niño will begin this year or in 2010, it still seems likely that a new global surface air temperature record will be set within the next one to two years, despite the moderate cooling effect of reduced solar irradiance," said James Hansen, director of GISS. "The sun is just passing through solar minimum, the low point in its 10- to 12-year cycle of electromagnetic activity, when it transmits its lowest amount of radiant energy toward earth."

Some climate skeptics have taken the 2008 data to mean that global warming has stopped, but—although the year was a little cooler on average than recent ones—it was still among the warmest of the past 130 years. Climate scientists expect year-to-year fluctuations in the data.

Water, Water, Everywhere…

Many semi-arid and arid areas—especially the western United States, the Mediterranean Basin, southern Africa, and northeastern Brazil—will likely "suffer a decrease of water resources due to climate change by the middle of this century," according to a report from the Intergovernmental Panel on Climate Change.

The report, *Climate Change and Water: IPCC Technical Paper VI*, says, "A very robust finding is that warming would lead to changes in the seasonality of river flows where much winter precipitation currently falls as snow, with spring flows decreasing because of the reduced or earlier snowmelt, and winter flows increasing." The greatest impact will be at lower elevations, which have less snowfall.

While the regional influence of climate change on water varies by region—higher latitudes are expected to see an increase in precipitation, for instance—the IPCC report concludes with "high confidence" that "globally, the negative impacts of future climate change on freshwater systems are expected to outweigh the benefits." The area of land experiencing high water stress will double that experiencing decreased water stress. This is in addition to the area classified as "very dry" doubling since the 1970s.

These changes in the global water regime translate into food security problems for poor rural farmers, especially in Asia and southern Africa.

In the United States, a National Research Council (NRC) report, *Restructuring Federal Climate Research to Meet the Challenges of Climate Change*, concludes that by 2025, dry developing countries may have 10 percent of the per capita water available to them that they had in 1950. Even developed countries will see declines, with about 60 percent of 1950 per capita availability.

Water issues are developing in a region not usually thought to be vulnerable to them—the U.S. Southeast has been hit by droughts in Georgia, Alabama, and Florida since 2005, according to the NRC report.

"The Southeast has experienced significant population growth, but has not invested in the major inter-regional water infrastructure and institutional arrangements that might have allowed it to respond to drought," the report notes. In fact, the states failed to act on a water resources compact.

"This case shows that even when climate information is available, unresolved conflicts between upstream and downstream user priorities constrain their use for mitigating negative impacts," the report says.

I Don't Like Ike

Hurricane Ike "placed immediate and long-term strains" on the ability of impacted communities to provide health care, education, support for seniors, child care, and final support to families," according to the *Hurricane Ike Impact Report* (www.fema.gov/news/newsrelease.fema?id=47276), prepared by a multi-jurisdictional group of agencies to assess the storm damage.

Hurricane Ike hit the Texas Gulf Coast on September 13, 2008, with sustained winds of about 110 miles per hour. Although the damages are still being tallied, it may rate as one of the most expensive storms in U.S. history.

Infrastructure in Texas cities and towns suffered at least $3.4 billion in damages, according to the report. Of the losses, 27 percent of wind damage and 61 percent of flood damage was uninsured. The state identified the need for $2.4 billion in erosion control, dredging, and other repairs to navigable waterways, ports, and coastlines.

The report estimated 2.7 million workers in five counties were affected by Ike. The storm also caused environmental havoc, disrupting recreation, leisure, and ecotourism activities.

Hard on the heels of the Hurricane Ike Impact Report, the U.S. Government Accountability Office (GAO) came out with *Past Experiences Offer Recovery Lessons for Hurricanes Ike and Gustav and Future Disasters* (www.gao.gov/products/GAO-09-437T). It will surprise few in the hazards field to learn the GAO found "creating a clear, implementable, and timely recovery plan can provide communities with a road map for the recovery process." Unfortunately, the GAO apparently could find only one American plan—created by Grand Forks, North Dakota, after its 1997 flooding—that accomplished most of the goals. The GAO report instead turned to Japanese response to the 1995 Kobe earthquake as a model of sound disaster planning.

"Creating plans in a timely manner can be a challenge after disasters, as was the case in New Orleans after the 2005 hurricanes," the GAO report notes.

National Planning Flu the Coop

In this age of economic disasters, the black swan has replaced the canary in the coalmine as the avian metaphor of choice. A "black swan" in this construction is a rare, difficult-to-predict event that upends previous assumptions. The term has been popularized by randomness scholar Nassim Nicholas Taleb, a play on the old philosophical saw "all swans are white," therefore black swans can't exist.

But black swans do exist, and one big black swan beating its wings these days is the potential for a bird flu pandemic that could result in 200,000 to two million U.S. deaths, 20 million each in South Asia and Sub-Saharan Africa, and 15 million in East Asia.

Black swans in themselves can be bad or good: avian flu or the rise of the Internet. The idea is not to predict them, but to create systemic resilience that minimizes damage from negatives and captures the usefulness of the positives. The U.S. Government Accountability Office says that's not happening with American flu planning—the United States is falling behind in its efforts to prepare for an outbreak of avian influenza. (www.gao.gov/products/GAO-09-334).

The GAO's critique of the effort is a gently worded restatement of 23 recommendations included in 11 GAO reports over the last three years. Of those suggestions, 13 have been implemented. The recent report states the Departments of Health and Human Services and Homeland Security must clarify federal response leadership and coordination. State and local first responders are still uncertain about how the agencies would work together in the event of an outbreak, according to the GAO.

Furthermore, the report finds targeting assistance to countries at greatest risk—mostly in South Asia—was based on incomplete information. As of April 2008, the United States committed $629 million to nations at risk for outbreaks of the H5N1 influenza. Indonesia was the largest recipient, followed by Vietnam and Cambodia. "Adopting a risk management approach can help manage the uncertainties in an influenza pandemic and identify the most appropriate course of action," the GAO stated. "However … very few countries have a surveillance plan

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that is based on an 'elaborated' risk-analysis."

Human influenza pandemics have occurred every 20 or 30 years for centuries. The 1918 Spanish flu killed between 40 million and 50 million worldwide. In the September 2008 *Natural Hazards Observer*, Tohoku University researcher Dr. Hitoshi Oshitani wrote, "It isn't possible to predict the timing of the next pandemic, but it is believed to be inevitable."

"Continued leadership focus on pandemic preparedness is particularly crucial now as the attention on influenza pandemic may be waning as attention shifts to other more immediate national priorities," cautions the GAO report. "In addition, as leadership changes across the executive branch, the new administration should recognize that the threat of an influenza pandemic remains unchanged and should therefore continue to maintain momentum in preparing the nation for a possible influenza pandemic."

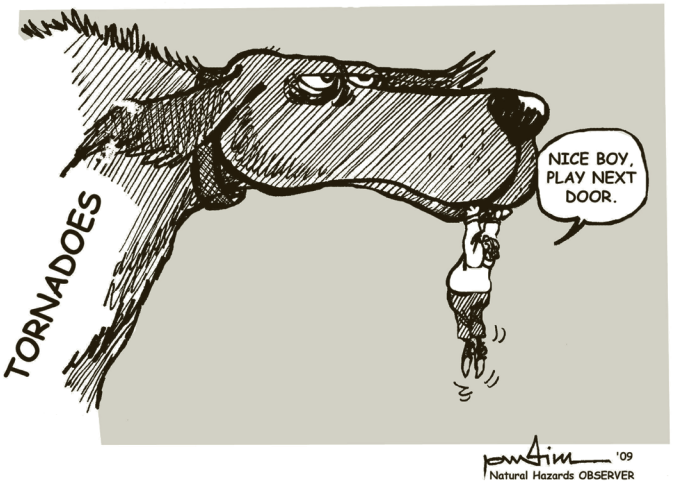
Inside the Tornado With Nowhere to Go

In the wake of the February 5-6, 2008 tornado outbreak—the second deadliest in U.S. history—the National Weather Service examined why people failed to heed evacuation warnings.

The answer is that most of them had nowhere safer to go. The report found two-thirds of people in the storms' path were in mobile homes and 60 percent of them had no safe shelter to retreat to, such as a basement or storm cellar.

"The majority of the survivors … sought shelter in the best location available to them, but most of them also did not have access to a safe shelter," the report stated. "Some indicated they thought the threat was minimal because February is not within traditional tornado season. Several… said they spent time seeking confirmation and went to a safe location only after they saw a tornado. Many people minimized the threat of personal risk through 'optimism bias,' the belief that such bad things only happen to other people."

Super Tuesday, as the outbreak was called, saw 82 tornadoes rake nine southern states, killing 57, injuring 350, and causing $400 million in property damage.



Warming to the Topic

Although the economy has recently dominated public opinion as the nation's most pressing issue, 74 percent of Americans favor at least a "medium-scale effort" to fight climate change, even if moderate costs are involved, according to a poll released in March by researchers from Yale and George Mason universities (envirocenter.research.yale.edu/BlankOfTheMonth/30/67). Thirty-four percent of the public favors a large-scale effort, even at large-scale costs.

The poll seems to show more American interest in global warming than a previous poll, released by the Pew Research Center for the People and the Press in late January. The Pew poll found only 30 percent of the public thought global warming was a "top domestic priority," a level that had slipped five percentage points since January 2007.

Climate change came in at number 10 of the 11 issues of concern the Yale/George Mason poll asked about. In the Pew rankings, global warming placed last of the 20 issues surveyed—behind, among other things, trade policy, lobbyists, immigration, tax cuts, and moral decline.

Nonetheless, according to the Yale/George Mason research, 67 percent of Americans surveyed think that the United States should reduce its emissions of greenhouse gases, though they seem a little uncertain about how this might be accomplished. For instance, more people (23 percent) "strongly opposed" a cap-and-trade system for pricing carbon emissions than "strongly supported" it (11 percent). And only 33 percent favored a 25-cent tax increase on gasoline.

As many polls on the topic find, people don't seem to mind addressing the economic cost of climate change, as long as it doesn't come out of their own pockets.

Hazards We Hadn't Worried About Before

Seventy-five percent of the candidates for jobs in the Massachusetts fire and ambulance services are either overweight or obese, according to researchers from the Boston University School of Medicine and three other Boston-based institutions.

Of 370 young recruits who took pre-placement physical exams between October 2004 and June 2007, "only about 22 percent were of normal weight, 43.8 percent were overweight, and 33 percent were obese," according to a release about the study. The researchers also found today's young recruits are significantly heavier than recruits from the 1980s and 1990s.

"These professionals perform highly psychologically and physically stressful work and are therefore at high risk for cardiovascular events," says Stefanos Kales, an assistant professor at Harvard Medical School and one of the study's authors. "Sudden incapacitation during duty puts these emergency responders, as well as their colleagues and the public, in danger."

Trouble in Paradise

Rising seas may be just the beginning for low-lying Pacific atolls

Inhabited low-lying Pacific atolls risk destruction long before they're inundated by rising sea levels, according to University of Arizona geologist William Dickinson. The atolls were created by material deposited by storms and high tides. When average high tides reach above modern levels, the process will reverse, allowing storms and tides to destroy the low-lying islands.

If sea-level rise were the only factor, the Pacific atolls—home to about 180,000 people—would not be submerged until well into the 22nd century. But the combined action of higher sea level, higher high tides, and accompanying storm activity will begin destroy the atolls as early as 2050, according to Dickinson's paper in the March 2009 journal *GSA Today*.

Tide levels in the Pacific began to decline in the mid-Holocene—about 5,000 years ago—allowing storms and waves to deposit sand and other material onto the cemented limestone reefs that underlie the atolls. The dates of this tidal "crossover" vary from atoll to atoll, but in general were between 500 and 1000 CE.

"There's been plenty of speculation that as sea level rises, it will overtop the atolls completely," Dickinson says. "One of the points is that actually atoll islands will be in trouble before that. When the high tide is no longer breaking on cemented material, it can erode them away.

"This gives us at least a first cut at predicting when the problem may become intense enough so that sort of planning out to take place," he says. "It could be only decades in front of us, so people need to start thinking about what the options are."

There are about 175 Pacific atolls and isolated islets, with a combined land area about half the size of Rhode Island. Many are in danger of submersion and some, such as the Maldives, are preparing to abandon their sinking homelands. Residents of Funafuti, an atoll in Tuvalu, plan to stay put, though. They don't think the changing climate presents a threat to their homes.

Two University of Melbourne researchers—Collette Mortreux and Jon Barnett—asked Funafuti residents how worried they were about climate change impacting their island. The answer they got was, "Not much."

They conducted 28 personal interviews and found 19 of those surveyed planned to stay on Funafuti indefinitely. Of the nine who planned to emigrate, only one cited climate change as a reason. The people who planned to emigrate generally gave economic reasons for leaving.

About half of the people interviewed believed climate change was not a hazard because God is on their side. The authors wrote, "It is clear that religion plays a very significant role in shaping people's responses to climate change in Tuvalu. Of the interviews conducted, around half believed climate change was not an issue of concern because Tuvalu shares a special relationship with God, as well as the promises God made to Noah in the Bible." In the biblical story in Genesis, after flooding the earth, God promised never to do it again.

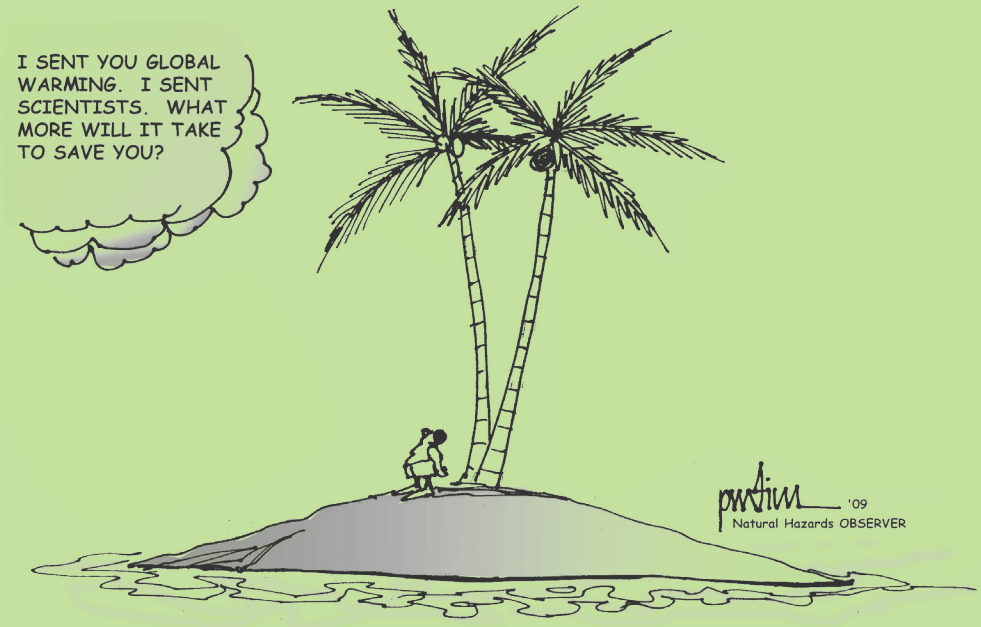
"The strength of this belief is reflected in the national motto *Tuvalu mo te Atua*, meaning 'Tuvalu is for God, God is for Tuvalu.'

"In interviews people consistently referred to the story of Noah as evidence that God would not allow further flooding. There was a sense that Tuvalu was given by God to the Tuvaluan people and that God would ensure that this would remain the case into the future," they write in the journal *Global Environmental Change*.

People also said they have not seen environmental changes they believe to be out of the ordinary. So their personal experience leads them to believe that climate change is not a major issue for them.

Bruce Richmond of the U.S. Geological Survey is currently at work on a project to see how geological data is used by managers to incorporate climate change into long-range planning. In a trip to islands and atolls in Micronesia in April, Richmond is taking part in table-top exercises looking at issues like coastal erosion, seawater inundation, and reef health. He says, "Some disruptions are already occurring. Groundwater contamination, primarily by seawater intrusion and excess nutrients, is a big problem on many islands."

—Dan Whipple



Insurance...

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during the five-year period.

Drought and food insecurity are not Malawi's only problems. AIDS, declining soil fertility, land shortages—most farmers have holdings in the range of one half to three hectares (1.25 to 7.4 acres)—and inappropriate agricultural policies contribute to the country's vulnerability. Climate change is perceived as already impacting agriculture. Frequent droughts and floods, and the uncertainty surrounding them, are eroding assets and increasing vulnerability. Farmers are less certain of when and what to plant (Action Aid 2005).

Recent government policies have exacerbated the problems of weather-related uncertainty. Ending subsidies for maize (the staple crop) and the privatizing of seed companies caused prices to escalate beyond the reach of smallholder farmers. Despite the volatility of its rainfall patterns, experts say Malawi should be able to change its status as a net importer of food because agro-climatic conditions there are relatively good (Hess and Syroka 2005).

A lack of functioning markets further complicates Malawi's situation. Remote areas lack the roads and distribution channels essential for farmers to sell their crops, so they tend to be underserved by traders—especially if they need the government or donors to intervene with free or underpriced food. Markets also fail in rural areas because farmers lack access to financial services. There a high risk of default from drought. Banks seeking to diversify lending portfolios in the agricultural sector aren't able to manage systemic or co-variant drought risk (World Bank 2005).

The Malawi Pilot Project

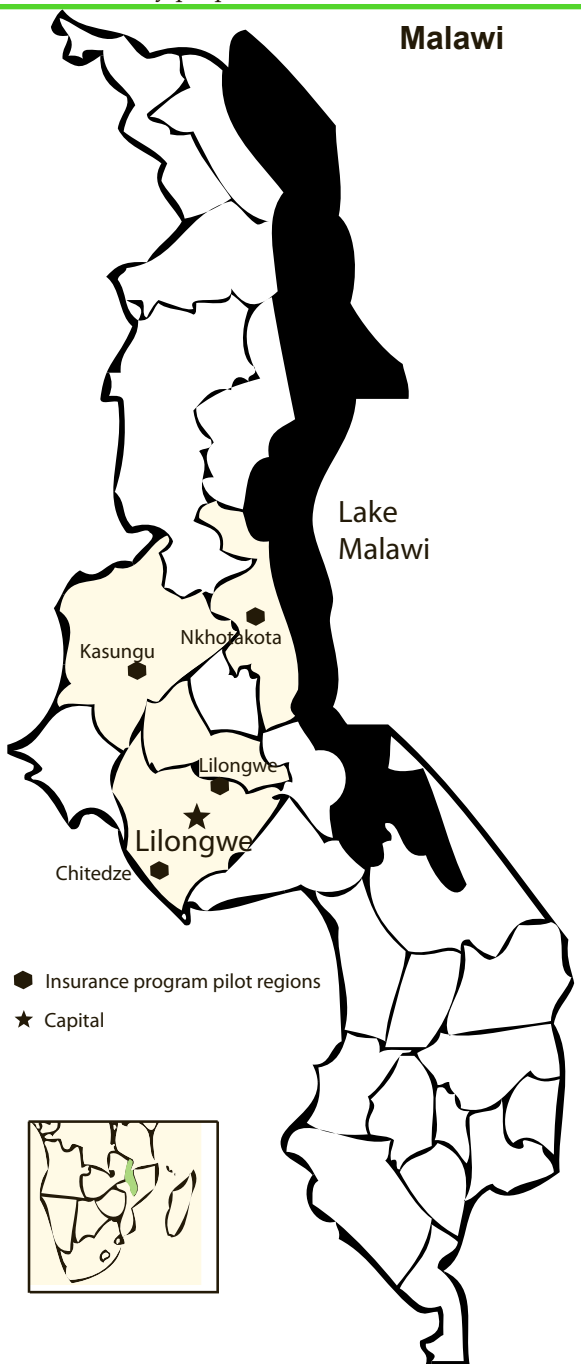
Malawi's drought insurance project began with a stakeholder meeting organized by the World Bank in July 2005. Farmers, bankers, insurers, and other stakeholders realized insurance could break the barrier against loans and expressed a great deal of enthusiasm in participating (Osgood and Warren 2006). The groundnut crop was chosen for the pilot phase of the insurance program because of its relatively high market value and sensitivity to drought.

Four regions—Kasungu, Nkhotakota, Lilongwe, and Chitedze—were selected for their network of weather stations and history of weather data. Pilot planners opted for an index-based system where—unlike traditional loss-based insurance—claims are based on rainfall measured at a local weather station. If rains are good, farmers are expected to pay the loan with proceeds from their harvest. If rainfall is below a predefined trigger value (based on critical stages of the groundnut growing season), then the insurance company pays for at least a portion of the loan.

Although simple on its face, the program has other complexities. For instance, lacking collateral and a cultural understanding of formal contractual obligations, safeguards to assure loan repayment were needed. This was addresse by committing participating farmers to selling their harvest to the National Smallholder Farmers Association of Malawi (NASFAM), thus ensuring a market. All of the pilot's farmers are members of a NASFAM club.

At no time do the farmers handle cash. They sign the loan contract, but NASFAM collects the loan, distributes the groundnut seeds, purchases and sells the crop, and repays the loan. If a farmer should default by not delivering harvests to NASFAM, members of the club are liable to cover the deficit. This arrangement—discussed in the microfinance literature as "social collateral" (see, for example, Brau and Woller 2004)—has worked well, delivering loan recovery rates of at least 95 percent.

Assisted by the International Research Institute for Climate and Society (IRI) and the active participation of Malawi's national meteorological service, the World Bank's Commodity Risk Management Group (CRMG) designed and piloted the drought insurance program for the 2005-2006 crop season (Hess and Syroka 2005; D.E. Osgood and D. Warren 2007, personal communication).Founders were optimistic it would help reduce the poverty of rural farmers. As a key proponent said:



> This is a breakthrough. We want farmers to adopt high return technologies that allow them finally to make the leap and accumulate earnings over time. Correlated risk is the factor impeding this … This Malawi transaction shows that there is a sustainable way to take the big rocks out of the way—drought risks—and clear the path to development! (Hess 2005, personal communication).

"With this insurance product, we are creating among farmers the possibility to dream," added one proponent from a Malawi farmers' association (Mapfumo 2006, personal communication).

Notable Features

The Malawi insurance program is one of the first to be based on insurance against events that cause loss, rather than the loss itself. This has many advantages over traditional crop insurance, including reduced claim handling costs, little moral hazard (claims are independent of farmer practices), and a balance of information about the weather on the part or the insured and insurer (avoiding adverse selection or the risk of an overrepresentation of high risk insured in the pool) (Skees et al. 2008). Mismatches between yield and payout, or basis risk, can be a disadvantage, however.

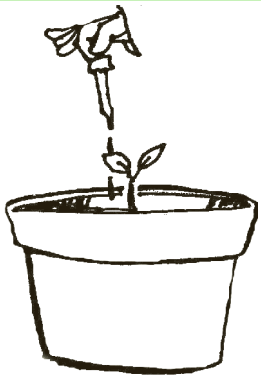
Another notable feature of the Malawi project is that, by enabling farmers to engage in higher-productivity agriculture, it operates without subsidies—a win-win proposition for all involved. Although insurance premiums and loan interest take up about 10 percent of expected revenue in a no-drought scenario, farmers can still expect substantially higher net profits than they receive with conventional farming. Insurers and bankers also foresee a lucrative new market.

Challenges and Risks

The first year the Malawi pilot project was in operation was a success from the perspective of participating farmers. In a stakeholder survey, 86 percent of sampled farmers indicated they would participate again (Suarez et al. 2007).

Still, the first year of operation showed challenges remain. NASFAM was essential to system logistics and proved adept at communicating the insurance package. Survey respondents, however, where sharply divided on the organization's trustworthiness. This flags the potential for problems stemming from vesting responsibility largely in one organization. Farmers' expectations were high and they were disappointed by the negotiated price NASFAM offered for the crop. If market prices are higher than the NASFAM price—as in the project's first year—there is a risk of farmers selling to traders on the side, limiting NASFAM's capacity to repay the loan.

Basis risk also proved controversial. During field visits, two participating farmers who lived about seven kilometers (4.3 miles) apart reported rainfall at each farm was markedly different—and in both cases much lower—than that measured at the local weather station (Suarez et al. 2007). So some farmers were winners and others losers, since rainfall on their farms differed from that at the station.



"With this insurance product, we are creating among farmers the possibility to dream," said one proponent from a Malawi farmers' association

The survey also revealed a lack of understanding of insurance—particularly the index-based system—and distrust of weather station data among many farmers. Since institutional trust is a prerequisite for sustaining the program, the Malawi experience reveals significant challenges.

Finally, there are risks related to insurer capitalization. Bank officials have expressed concern that insurers might not be able to pay in instances of extreme drought. For this reason, World Bank participation is very important to them.

Many of the drawbacks were addressed in the 2006-2007 planting season, when the number of participating farmers increased significantly. Growth in demand outpaced the pilot program's ability to supply bundled credit-insurance services. This was, in part, due to organizational capacity limits at the field level. The program was expanded to include an additional region, as well as another crop, maize. A provision allowing farmers to sell to different buyers was also included (Syroka 2007).

Adapting to a changing climate

Climate change, along with El Niño and Southern Oscillation-related climate variability, will likely put additional stress on Malawi's insurance program (Osgood, et al. 2007). The Intergovernmental Panel on Climate Change reports observations of long-term and widespread changes in extreme weather including droughts, heavy rains, heat waves, and the increased intensity of tropical cyclones (IPCC 2007). In Malawi, many farmers reported that signing up for the insurance program was their preferred way of adapting to climate variability and change. Other adaptations included water harvesting, improving soil fertility, and ensuring markets (Suarez et al. 2007).

Researchers have estimated the potential near- and long-term impacts of climate change on the Malawi insurance program. Although such predictions are limited by input data and the climate and insurance models used, climate-change induced stress is likely to make the Malawian insurance pool less robust in the next 10 years and have even more dramatic effects in the decade following that (Hochrainer et al. 2008). Premium hikes or additional capital would be necessary save the program, but either could spell disaster since the program operates on the margin of financial viability. Moreover, the Malawi system only provides loan guarantees, falling short of protecting farmer households against food shortages or

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Insurance...

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providing a comprehensive safety net against drought.

Although many index-based microinsurance programs operate in Asia—notably the BASIX program serving several million farmers in India—most are not accessible to the very poor (Mechler et al. 2006). Problems of affordability, as well as the reluctance of commercial insurers to supply the market, dampen aspirations for increasing systems to cover billions of subsistence farmers facing weather risks.

This challenge has inspired Oxfam America and Swiss Re, again assisted by IRI, to develop a demand-driven weather index microinsurance product for farmers in Tigray, Ethiopia, experimenting first with the cereal crop, teff, in the village of Adi Ha. This innovative project addresses many limitations of the Malawi scheme. The affordability issue is tackled by a cash-for-work mechanism that will allow farmers to pay for part or all of their insurance premium with labor in the off-season. The project addresses other limitations by extending beyond the sole provision of agricultural inputs, such as seeds, to address other development challenges and non-covered perils including water harvesting techniques, soil infertility, deforestation, and poor market access. It also is looking at ways to reduce basis risk through technical and social means.

Creating the conditions for increasing and extending microinsurance programs in the face of climate change presents an opportunity for the international development community, as well as for international climate negotiators. Several proposals for including insurance mechanisms in the adaptation architecture expected to emerge from the 2009 Copenhagen climate negotiations have been tabled (Linnerooth-Bayer et al. forthcoming). These proposals present practical options for adaptation by suggesting a global climate insurance facility that would provide technical support, capital backup, and pooling arrangements for nascent microinsurance systems, such as those discussed.

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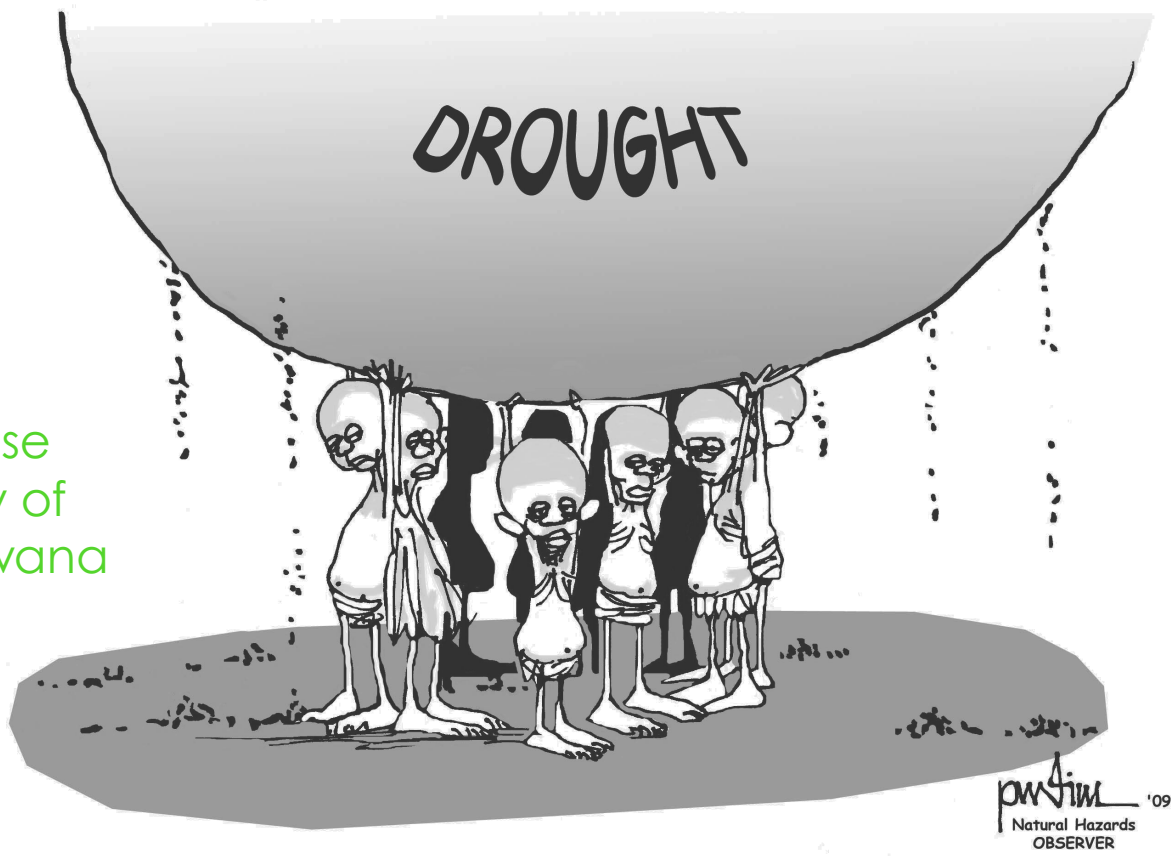
In Malawi, many farmers reported that signing up for the insurance program was their preferred way of adapting to climate variability and change. Other adaptations included water harvesting, improving soil fertility, and ensuring markets.

A Case Study of Botswana



—Invited Comment

Vulnerability of Children in Drought

When there is a drought I am scared that we will be separated and taken to different homes. I want to always be with my brother and sister. We love each other and we want to stay together even if there is a drought (*girl, 14*).

One day I sat by the borehole with some friends waiting for the cows to come back from eating. When there is a drought we have to find boreholes that have some water and then we fetch the water and give the cows. We don't give water every day, only every other day. After waiting for a long time we saw the cows coming. We started to get water from the borehole and putting in the buckets. When the cows were getting near I saw one fall on the ground. I got some water and run to the cow. It was breathing and I put water on its mouth. It could not drink the water. It was very tired to drink. I sat next to the cow and tried to put in the mouth with my hands. It was not drinking. After some time it stopped breathing. I stood up and cried for a long time. I was very sad (*boy, 13*).

When drought strikes, children often deal with devastating impacts, both physical and emotional. These include limited access to food, shelter, social support, and health care. While young people are often deeply affected by these disasters, adult society pays little attention to them (Jabry 2005). They seldom get the opportunity to voice their concerns.

In 2005, a drought struck western Botswana, a semi-arid nation in southern Africa with about 1.7 million inhabitants. Particularly hard hit were the Matsheng villages in the Kgalagadi district of southwestern Botswana—which includes the famous Kalahari Desert. Matsheng is a collection of small, neglected villages about 500 kilometers (300 miles) west of the capital Gabarone. According to the 2001 census, the Matsheng villages had 7,688 residents. The population of Matsheng is among the poorest in the country.

Dealing with drought there is a permanent way of life. Matsheng means "pans," which are large depressions in rock which hold water. Livestock owners rely on these as the only source of surface water for their animals. The Matsheng area typically receives a mean annual rainfall of 250 millimeters (about 10 inches), according to the Meteorological Services of Botswana. Annual rainfall in the region has been recorded at as little as 134 millimeters (about 5.25 inches). The wettest parts of Botswana—in the north of the country—get about 650 millimeters of rain annually (about 26 inches). Tucson, Arizona, by way of comparison, averages about 12 inches of rain a year.

The villages are remote, surrounded by wildlife management areas set aside for conservation purposes. The Baswara, non-Bantu hunter-gatherers also known as "Bushmen," were the first inhabitants of the Kgalagadi.

See "Children in drought," next page

Children in drought...

(Contined from page nine)

Bantu agro-pastoralists moved into the area in the 19th century. It's now dominated by the Bangologa, semi-nomadic hunter-gatherers.

During the 2005 drought, I interviewed 30 children in Matsheng between the ages of 10 and 18 to determine how they were affected by drought in their community.

Emotional Impact

Emotional impact on some of the boys and girls from their drought experience was evident. Some of the boys under the age of 15 who assisted in herding livestock told of how herds of cattle walk long distances to graze and return to look for water. During drought periods, the pans on which livestock rely for water are dry. The boys, who often witnessed the death of livestock, found this to be very emotional, like the description of the devastated 13-year-old at the beginning of this article who tried to save a cow.

The sight of dead cattle seemed to be most disturbing for the young boys who herd them as part of their daily responsibilities. The older adolescents simply said it was better to have the cows slaughtered for meat or to sell them for money than to leave them to die.

Impact on Play Time and Socialization

Reduced time for play and socialization during drought periods was a concern for all the young people. While the boys and girls under the age of 13 complained about little time to play, the older ones complained about not having time to socialize with friends—the result of increased workloads brought on by the drought. While the boys care for the livestock, the young girls spend a lot of time fetching water for household use. One 10-year-old girl said:

> We have to find the boreholes with water and when we find them, there are people lining up for water. We also have to join the line. Sometimes we take a long time in the line. When we get home we put the water in a big bucket and we go again. We can't play nicely because we fetch water many times.

Play time for children is crucial for their development. It is through play that they develop socially, emotionally, physically, and cognitively. Play also reduces stress in children (Bjorklund and Brown 1998; Bodrova and Leong 1999; Landreth 1993; Strickland 2001).

Food Security

Drought has complex impacts on food security. The older girls and boys (14 to 18 years old), who understood the issues better, explained that even though food has always been expensive, it becomes more expensive during drought. They pointed out that during drought periods their caregivers often cannot afford food. This inability to purchase food is recognized as a threat. So they are grateful when they receive free food from the government:

> I like it when there is a drought because we get free food at home (*boy, 10*).
>
> My mother has less stress during drought because of free food. She does not worry about where our next meal will come from (*girl, 16).*

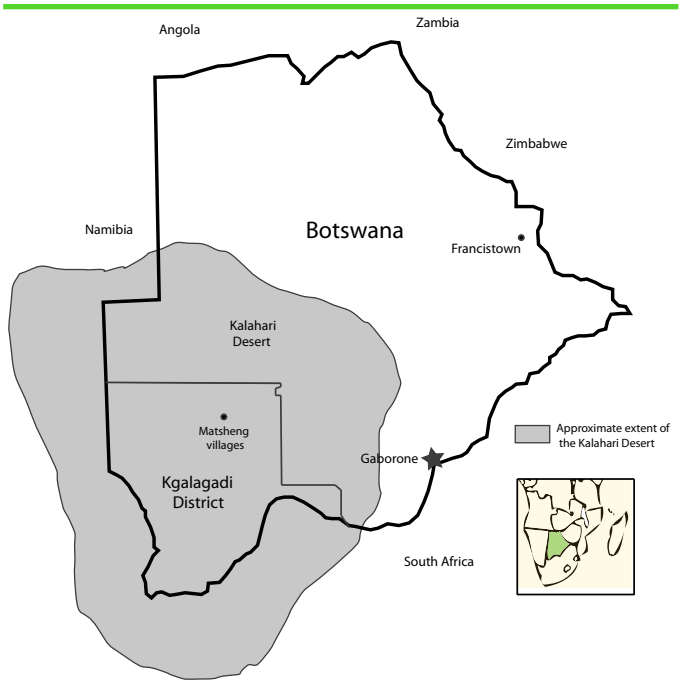
Apart from free food, some of the boys and girls revealed that those caregivers who have no formal employment also benefit from drought. The caregivers often get temporary jobs through the labor-intensive relief program.

> I like it that my mother is working. She can now buy us bread and milk for our tea. Before she did not have a job. She used to go looking for day jobs every day so she can buy us bread. Now she is okay because she will work for a longer time (*boy, 15*).
>
> My mother is better when there is a drought because she can get work. She does not get paid much but it is better than when she has nothing. She can buy us bread (*girl, 18*).

The older girls and boys (14 to 18 years old) did not feel that drought threatened their lives. In terms of food security, they viewed the effects in a largely positive light. Even though the focus of this study was on drought, the boys and girls felt poverty and HIV/AIDS were of greater concern. They wanted to express their thoughts about these issues and the challenges these social disasters bring to their village. Because of the government-subsidized food programs, children in Matsheng are fortunate not to suffer from starvation during droughts.

Pressure and Tension in the Household

Some children experienced pressure and tension within their households, which they largely attributed to the drought. They revealed that their caregivers seem



stressed and inattentive. This happened during drought periods when their caregivers did not have the opportunity to participate in the labor-intensive relief program. Adults who were interviewed said they looked forward to the government employment during drought disasters.

Caregivers worried about not being included in the work programs. During the discussions with the boys and girls, it was evident that they were able to pick up on the moods of their caregivers. Knowing that their caregivers were stressed was upsetting for the boys and girls, making them sad and insecure. As a result, everyone in the household became stressed and felt anger towards each other.

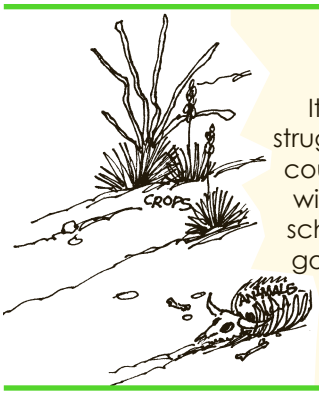
Some boys and girls said their parents or caregivers borrowed money from other family members, which they failed to pay back. This resulted in arguments, leading to family networks being destroyed over the financial disputes. The young people said it was very stressful for them. One 16-year-old boy said:

> One afternoon while my uncle was visiting, my mother asked him for money. She told him she will pay it back when she gets some work to do. I asked my mother why she took money from uncle. She shouted at me. She did not get any work. She told my uncle that she can't pay back the money. My uncle was angry and did not speak to my mother for a long time. Because he was angry with my mother I was scared of him.

The boys and girls from child-headed households also felt sad when their older siblings (also caregivers) experienced stress. A 13-year-old girl from a child-headed household said:

> I feel so sad that my sister left school to take care of us. Both our parents died. We are four children. I am not ashamed to say they died of AIDS. My sister is only 18 years old and she now has to be a mother to us. I am 13 years old, my brother is 11 years and the youngest is 8 years old. We try very hard to help each other but it is hard. The most difficult thing is getting food. We have to buy but we do not always have the money to buy it. My sister has to go out and do piece jobs in order to get money for our food. It is not very easy to get the jobs. Sometimes she does not get anything and we rely on friends and relatives to help us. But they cannot help us all the time. It pains me to see my sister struggling for our sake. I wish she could go back to school. What will her future be like without school? She encourages us to go to school so we can have a better future but what about her? I want to be able to help my sister. I would like to get a job.

It is evident that the children are emotionally and psychologically affected by the pressure and tension built up in their households. When asked if they ever shared these experiences with anyone, most of them said no. They complained no one ever bothered to ask them, so they did not think anyone was interested.



It pains me to see my sister struggling for our sake. I wish she could go back to school. What will her future be like without school? She encourages us to go to school so we can have a better future but what about her?

Family is very important to the children. Separation fears were prevalent. Those in child-headed households were particularly concerned about being separated from their siblings during times of drought. The girls in child-headed households shared their fears of being separated from their siblings, like the 14-year-old girl quoted at the beginning of the story. Another child said:

> Now that there is a drought people have been asking my brother to take me to an orphanage. I will not go there. I never want to stay with anyone else. I am happy with my brother. When I think of not being with my brother I cry (*girl, 13*).

Loss of Educational Opportunities

Throughout southern Africa, boys and girls are taken out of school during droughts. They leave school to support their parents or take charge of household chores when their caregiver must migrate to the city in search of employment. When asked to talk about how they felt about being taken out of school, the Matsheng children indicated they were unhappy. Attending school was important for all of them, since they know they need a good education to get a good job. Growing up in poor homes was a strong motivator for them to attend school. The better life they want in the future is only possible if they go to school.

Participants didn't share these views with their caregivers because they did not want to seem ungrateful or disobedient. Some of the girls said it helped them feel better if they talked to friends. While the girls talked to their friends about their feelings, the boys did not tell anyone. In fact, some of the boys revealed that they talked about their emotions and feelings for the first time in this study.

Boys and girls from child-headed households felt they got family support from their brothers and sisters. They found it easy to speak to an older brother or sister upon whom they also depended for protection and guidance.

The rest of the boys and girls said they lacked emotional support in their families. Most of the young people felt their caregivers already had enough problems to deal with, so they didn't want to burden them. The boys and girls felt some guilt for their caregivers' problems. One 16-year-old boy said:

> My mother is constantly thinking about us. She tries her best to provide for us. We can see things are not easy. Sometimes she day-

See "Children in drought," next page

Children in drought...

(Contined from page eleven)

> dreams and we wonder what she is thinking about. I think if we were not in her life things would be better for her because she will not worry about us. Can you imagine if I troubled her with my concerns?

In general, the boys and girls also believed being young put them at a disadvantage because the adults in their lives were not interested in what they had to say. From early stages of their childhood, they were taught to obey and respect their elders. Their caregivers had never asked them how they felt about drought or about their experiences. They felt no need to tell their caregivers if they did not ask.

Coping Mechanisms

Young people have come to understand that drought is a dominant feature of Botswana's climate. They felt the best way to cope with drought is to learn to live with it. Those over age 15 mentioned the issues of poverty and HIV/AIDS. They said drought would not be difficult to cope with if issues of poverty and HIV/AIDS were addressed.

Most of the young people pointed out that they were raised in spiritual families. They strongly believed in prayer. Through prayer, they could tell God everything and He would listen.

They coped with food insecurity primarily by relying on government programs. The government hands out food during droughts and feeding programs are also available at schools and clinics. These efforts have contributed significantly to low rates of malnutrition among children of poor households in Botswana.

Some of the young people turned to alcohol and smoking. They said drinking and smoking helped them forget about their problems. Money used to purchase alcohol and cigarettes was obtained through begging, doing odd jobs, and occasionally tricking people into giving them money.

Some young people (ages 14 to 18) occasionally migrated to the capital city, Gaborone, in search of jobs.

Though questions about sexual practices were not asked, some girls volunteered that they had engaged in sexual activities to earn money. There were three cases where girls between the ages of 15 and 18 admitted to taking money from men in exchange for sexual favors. These girls were all orphans who said they were willing to perform sexual acts in order to make "quick money" to help sustain their families. During the interviews, the girls were very emotional as they talked about their experiences. The girls who admitted to performing sexual acts for payment did so without the knowledge of their caregivers. One 16-year-old girl said:

> My grandmother takes care of five children. We are all orphans. My brother and I came to stay with her in 2003, after my mother passed away. My mother suffered from AIDS. My father passed away when … I was only three years old … My grandmother does not work and she is really struggling to take care of us. We all rely on her pension which is very little. The most difficult thing is keeping up with the food demands. Even though we get food handouts we ration it. During drought periods food is very expensive. We get tired of eating maize meal and we want nice food every now and then. I can't put my grandmother under pressure to buy different foods. I tried to look for a proper job but I had no luck. My friend told me there was an easier way to getting money quickly and this involved doing sexual favors for men. I am not happy with what I do but at least I help my grandmother. She thinks I have a job. She has no idea what I do. If she found out, I think it would kill her. So I hope she never gets to know. I hope all this will end soon. I will not give up on looking for a proper job but for now this will do.

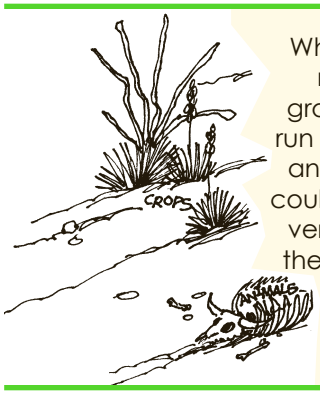
Conclusion

After discussing their thoughts and fears, the young people were asked what could be done to help them deal with their experiences. They felt open communication with caregivers would make a difference. They wanted their caregivers to show an interest in their feelings to encourage more family support.

They also wanted to be consulted before decisions affecting their lives were made, like being taken out of school. They wanted to be involved in both family and community decision-making processes. They want to feel needed.

The opportunity for children to voice their experiences is very important to guide effective decisions to address their vulnerabilities. Young people must be recognized in society as significant subjects whose opinion matters. The United Nations Convention on the Rights of the Child says children and youth have the right to partake in decision-making processes that are relevant to their lives.

One important finding of this study is that the needs of children and youth during a drought go beyond physical survival. They experience emotional distress, growing out of fear of separation from family, the loss of educational opportunities, tensions within the household, a lack of emotional support at the family level, and increased workloads. Most of the adults in their lives are not aware of the young people's struggles, partly because the young people don't want to burden their elders with their



When the cows were getting near I saw one fall on the ground. I got some water and run to the cow. It was breathing and I put water on its mouth. It could not drink the water. It was very tired to drink. I sat next to the cow and tried to put in the mouth with my hands. It was not drinking. After some time it stopped breathing.

problems.

The study also shows children's vulnerability varies by age, gender, family structure, and the role the child plays in the family. Girls bear heavier workloads related to water gathering during times of drought, and are more likely to be removed from school. The loss of educational opportunities, for girls in particular, is a serious concern for the young people of Botswana.

Boys are more likely to participate in cattle herding activities, so are more likely to witness the death of livestock from drought. This led to high levels of emotional distress among the boys.

Children in child-headed households experience more fear of being separated from family, but these children also report receiving higher levels of support within their household.

The young people raised other important issues that were not explored in great detail. Specifically, the young people were aware of the devastating effects of poverty and HIV/AIDS. They saw these as greater threats than drought. The death of parents has left them with the heavy burden of managing households with limited or no resources. Under these conditions, they are missing the opportunity to go to school and experiencing additional burdens. Economic hardships are leading them to look for means of survival that increase their vulnerability, from abuse of alcohol, sex work—which makes them vulnerable to HIV infection—and child labor.

When asked if they ever shared these experiences with anyone, most of them said no. They complained no one ever bothered to ask them, so they did not think anyone was interested.

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Future Proofing Cities

—Invited Comment

Chan Chan, built on the bleak desert plains of coastal Peru, was one of the largest and wealthiest cities in the world from about 850 CE to 1470 CE. Chan Chan harvested a variety of crops that flourished because of a sophisticated network of canals and excellent agricultural practices.

However, this mighty city was abandoned because its technology failed as a result of long-term weather changes (Hathaway 2009). Its lessons may serve as a prologue for western American and eastern Australian coastal cities. California Gov. Arnold Schwarzenegger ordered drastic cuts in water use in February 2009 because his state's cities and farms—fed by an extensive irrigation system much like Chan Chan—are now facing long-term drought.

On the other side of the world, in Victoria, Australia, bushfires are raging because the land is parched after a three-year drought. Australian meteorologists predict an El Niño current pattern will prolong this drought, increasing fire danger and altering crop and animal life for another 13 years. There is little doubt that climate change and natural systems are beginning to produce profound changes in natural systems that will, for many years to come, endanger both cities and farms which rely on our 19th and 20th century water systems.

The danger—as the Chan Chan illustration suggests—is not merely the damage from reduced rainfall, but also from the potential collapse of the water systems from soil compaction and erosion. It may be time for Americans and Australians to rethink how we deal with water for cities in a drastically altered global climate system.

The Australian and American Pacific cities have much in common. They are organized as water consumers fed by distant rivers and reservoirs to pull water to these

See "Cities," next page

Cities...

(Contined from page thirteen)

metropolitan areas. Several factors are already straining this approach, apart from reduced rainfall.

First, throughout the western United States and on Australia's coast, human settlements are extending into the watersheds, reducing tree cover and increasing fire danger. Second, urban sprawl consumes large amounts of water for garden and home use. We are destroying the water systems we depend on through overdrawing them, depleting sub-surface water supplies.

As urban developments increase in the mountains and droughts persist, hill fires like Santa Barbara, San Diego, and Victoria are inevitable. To save our cities we are going to have to do more than take shorter showers and plant native species in our gardens.

In order to develop more resilience, we will have to rethink city building and begin the painful process of retrofitting many of our arid coastal cities. American Pacific Coast and Australian cities are built on the assumption that you can move water and tame nature. This is no longer the case as we are already seeing in many small ways. We should not wait like Chan Chan and numerous ancient civilizations to the end to make fundamental changes in our city systems.

What must we do?

First, we have to analyze cities in their ecological environments and not merely by their jurisdictional boundaries. That is, the ecosystem in which a city rests has to be the template for urban planning. In places like Southern California, the area of the San Diego Basin from Orange County through Tijuana, Mexico, and almost to Phoenix has to be the planning frame. Within this framework, all of the water and other natural requirements for the cities and communities need to be designed and harvested. In simple terms, the cities should be based on the ecological carrying capacity.

Second, new city infrastructures must be developed that harvest local rainfall and use natural energy from wind and sun. We have learned from Hurricane Katrina and other catastrophes that depending on distant energy sources increases the devastation. We are so dependent on external energy supplies that food and other essentials fail, increasing the loss of life and property.

Third, building in redundancy for basic systems is necessary in case of emergencies. In the 19th century, underground cisterns under streets and civic buildings were used as backups for water to fight fires and for other emergencies. We need to rebuild redundant emergency systems in our cities for water and power.

Fourth, downscaling fringe and coastal developments is essential. It is obvious that in an era of climate change certain areas are already vulnerable. These areas, such as coastal habitations along cliffs and mountain settlements that impinge on water and other natural systems, should be systematically reduced. One way to start this is to rebuild more sensibly in areas that are repeatedly burned and flooded. Habitation might be clustered similar to the European pattern rather than stretched out into the forest or wildlands. Some areas will be identified as too risky for development. These actions will take remarkable political courage. However, incentives might be provided to assist in this transformation by easing tensions such as land swaps for people living in sensitive areas for them to move to less risky areas nearby or cash settlements.

Finally, a national movement is required to make this approach work. Consciousness raising is essential so people will feel that they are doing the right thing by insisting cities build alternate water supplies through rainwater retention at homes and in cisterns as a city requirement.

There will be many Chan Chans if action is not taken soon to re-think our urbanization patterns on the Pacific coasts of Australia and the Americas. Large cities were lost in the past because humanity didn't anticipate what might happen. We know now. We should act before it is too late.

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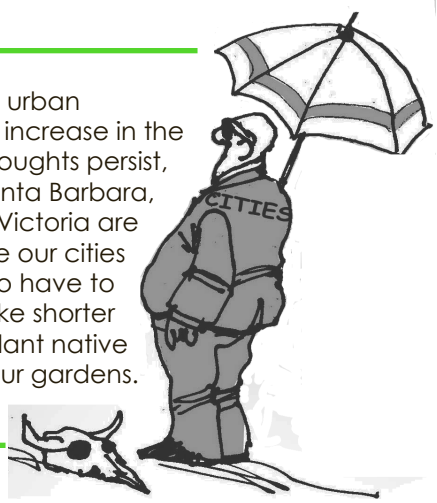


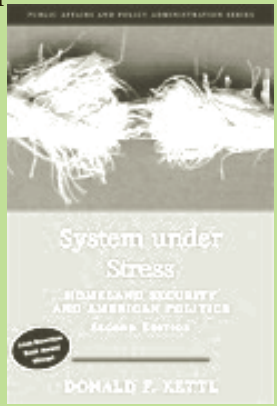
Resources

Below are brief descriptions of some of the resources on hazards and disasters that have recently come to the attention of the Natural Hazards Center. Direct Web links are provided for items that are available free online. Other materials can be purchased through the publisher and/or local and online booksellers.

All of the material listed here is available at the Natural Hazards Center Library. For more information contact librarian Wanda Headley at wanda.headley@colorado.edu

Book Review

System Under Stress: Homeland Security and American Politics. By Donald F. Kettl. 2007. ISBN: 978-0-87289-333-7. 143 pp. $29.95 (softcover). CQ Press. www.cqpress.com



The September 11, 2001, terrorist attacks and Hurricane Katrina subjected the United States to "stress tests" that showed the weaknesses in our response and protection systems. The national response to these stresses was the rise of "homeland security," a policy window that opened to admit a wide range of inhabitants, from the invasion of Iraq to increased guards at power plants to antiterrorism drills. Donald Kettl's *System under Stress* examines the political impacts of the shift to seeing the world through a lens of homeland security. The "new normalcy," he says, "requires that the nation devise a strategy for pursuing its enduring values, reducing fear, and countering the terrorist threat. It means determining how to do what must be done without being distracted by the pursuit of what cannot be done."

Kettl's book offers an introduction to post-9/11 homeland security policy and politics. This short text is well suited for a general audience and those unfamiliar with the recent evolution of homeland security policies. From a public administration perspective, the book delivers a short history without in-depth analysis. This is a shortcoming for an audience more familiar with homeland security. It avoids more technical and legal jargon in favor of a more descriptive narrative.

The book is easily accessible, but Kettl's efforts to "connect the dots"—an ongoing and popular metaphor—result in a simple sketch that highlights rather than illustrates the complexities of the government's efforts. Instead of a detailed portrait, the examples are drawn heavily from media reports, which contribute to the occasionally sensational imagery. This is most readily found in the chapter on federal fumbling following Hurricane Katrina. It is disappointing, focusing too heavily on New Orleans and the extreme examples previously reported. While colorful, they do little to further substantive understanding of homeland security.

Instead of presenting these mainstream examples, this book could have offered a more in-depth review of the mechanisms and structures that reinforce these policies, preventing more constructive feedback. The focus on the federal government largely ignores the state and local levels of government responsible for the execution of policy decisions. It attempts to provide a comprehensive overview of a reactionary system that is repeatedly stressed more often by its own decisions than the events that trigger those reactions and subsequent decisions. Through description rather than prescription, Kettl succeeds in highlighting the historical and ongoing concerns plaguing the politics of homeland security.

For those outside the academic arena, the book may offer the historical insight into the origins of the contemporary bureaucracy. The more experienced practitioner will find the narrative provides a quick summary without getting lost in the day-to-day details of homeland security policy. This book can certainly be added as a complement to introductory-level courses in emergency management, public administration, political science, sociology, and those looking to incorporate an element of homeland security into their courses.

—Christine Bevc

All Hazards

The Phoenix of Natural Disasters: Community Resilience. Kathryn Gow and Douglas Paton, editors. 2008. ISBN: 978-1-60456-161-6. 275 pp. $80.10 (hardcover). www.novapublishers.com.

Hazards research is showing that communities hit by disasters have a remarkable ability to regenerate—to rise from the ashes like the phoenix in this book's title. *The Phoenix of Natural Disasters* offers the perspective of 18 researchers on what makes a community resilient.

Research into resilience is in its infancy. One chapter title, for instance, is "Measuring Resilience to Psychological Outcomes of Natural Disasters: More Questions Than Answers." Chapter authors Marek J. Celinski and Judith Pilowsky write, "The main shortcoming in current resilience research is the absence of a measure to assess the traumatic event from both objective and subjective perspectives."

Curiously, disasters are not disastrous for everyone who experiences them. Editor Douglas Paton writes, "While evidence for physical loss and psychological deficits associated with disaster is extensive, the existence of beneficial consequences has often been overlooked … research on survivors of natural disasters [has] concluded that not only did the majority of those so exposed overcome the victimizing aspects of the experience, but many actually benefited from it." For instance, 90 percent of survivors of a ferry disaster "reported strong positive changes in their

outlook on life, feeling more experienced about life, and over half rated their life as changed for the better."

Paton concludes, "By identifying how these factors operate, emergency planners can have at their disposal a model that can be used to assess levels of resilience, identify areas where intervention is required, monitor change over time, and evaluate the effectiveness of readiness strategies, irrespective of the hazardscape prevailing within a specific community."

Natural Hazards Analysis: Reducing the Impact of Disasters. By John C. Pine. 2009/ ISBN: 978-1-4200-7038-5. 285 pp. $79.95 (hardcover). CRC Press, Taylor & Francis Group. www.taylorandfrancis.com.

This book can serve as a text for anyone assessing the impact of disasters in both quantitative and qualitative fields. It takes a broad approach to hazards from its initial definition of natural hazards and their varying impacts on areas around the globe to its chapter on planning for sustainable and disaster resilient communities. The book is peppered with examples from Hurricane Katrina. The handbook "emphasizes resilient policies, rather than rigid philosophy" when assessing and responding to disaster.

Risk

Worst-Case Scenarios. By Cass R. Sunstein. 2007. ISBN: 978-0-674-02510-3. 340 pp. $24.95 (hardcover). Harvard University Press. www.hup.harvard.edu.

"Suppose," writes Cass Sunstein, "that in 2000 a member of Congress had aggressively argued for much of the same legislation that followed the attacks of 9/11, including the Patriot Act, increased security measures at airports, and new presidential authority to detain suspected terrorists for years without trial. Congress would have immediately rejected any such effort; and any legislator who argued for it would probably have been characterized as an alarmist and a serious threat to civil liberties."

This is only one example in this eminently readable book of the different ways that risk is perceived based on context, publicity, available information, and heuristics.

Worst-Case Scenarios is about those unlikely disasters which, when they occur, have outsized consequences. Sunstein argues for a Catastrophic Harm Precautionary Principle, calling for "close attention to both the magnitude and the probability of harm and hence to expected value. It demonstrates, for example, that a one percent chance of 10,000 deaths is not worth less attention than a 50 percent chance of 200 deaths."

Sunstein—recently appointed to head the White House Office of Information and Regulatory Affairs in the Obama administration—also argues for assigning monetary values to these risk variables, a contentious issue in intergenerational debates.

Uncertainty and Risk: Multidisciplinary Perspectives. Gabriele Bammer and Michael Smithson, editors. 2008. ISBN: 978-1-84407-474-7. 382 pp. $94.45 (hardcover). Earthscan. www.earthscan.co.uk.

This book focuses on the many faces of uncertainty, but with an emphasis of its presence in the policy arena. In his introduction, Jerome Ravetz says, "There has recently been a shift in the politics of uncertainty. The invocation of uncertainty is nearly always a defensive manoeuvre, intended to stop something happening. … but now, facing global climate change, we are generally aware of our ignorance of its detailed effects. The side on the defensive is that of the big fossil-fuel corporations, so for the last decade we have had uncertainty invoked against measures designed to mitigate anthropogenic climate change."

"The thesis underlying this book," writes editor Gabriele Bammer, "is that bringing together knowledge about and approaches to uncertainty from a range of disciplines and practice areas will provide a richer appreciation of uncertainty."

The book takes the broad view, looking at uncertainty in religion, philosophy, visual art, and musical improvisation, as well as more often-explored fields.

Earthquakes

The L.A. Earthquake Source Book. By Richard Koshalek and Mariana Amatullo. 2008. ISBN: 978-0-9618705-0-8. 342 pp. Price unavailable (hardcover). Art Center College of Design.

The *Source Book* is part emergency preparedness effort, part art project. It includes work by an eclectic group of authors, from the University of Colorado's hazards guru Dennis Mileti to novelist Joan Didion with stops along way at, among others, non-fiction author John McPhee and former FEMA director James Lee Witt. It offers both contemplation on earthquake hazards and tips on preparing for them. But it is presented as "book as work of art," including drawings, reproductions of paintings and comics, along with dramatic (and sometimes annoying) typography.

Drought and Desertification

The Socio-Economic Causes and Consequences of Desertification in Central Asia. Roy Behnke, editor. 2008. ISBN: 978-1-4020-8543-7. 252 pp. $75.95 (softcover). Springer. www.springer.com.

This book examines a variety of the causes and impacts of desertification in central Asia, including livestock grazing, the impact of pollutants on fish health, land reform, and other human impacts. But for those who are not so familiar with the "-stans"—Kazakhstan, Turkmenistan, and other former Soviet regions that make up the bulk of the study—the reasons to care are laid out in the first chapter, "The link between desertification and security." The aim in the region should be "creating long-term sustainable livelihood conditions and, hence, contribute to prevent conflicts and crises due to negative environmental changes."

Climate

Plows, Plagues and Petroleum: How Humans Took Control of Climate. By William F. Ruddiman. 2005. ISBN: 978-0-691-13398-0. 202 pp. (softcover). Princeton University Press. wpress.princeton.edu.

Modern climate orthodoxy has it that human beings really started to impact the globe's climate beginning with the industrial revolution in the late 18th century, then accelerating (with pauses in the trend) from about 1870 until the present day. Humans began pouring carbon dioxide and other greenhouse gases into the atmosphere at increasing, then finally startling, rates, raising the earth's average temperature, and eventually melting the glaciers,

changing the nesting habits of birds, expanding the northerly ranges of butterflies, melting the Arctic ice. And so on.

But in *Plows, Plagues & Petroleum,* William Ruddiman presents a persuasive alternative scenario that humans have been changing the planet's climate not for merely two centuries, but since the invention of agriculture. "Carbon dioxide concentrations began their slow rise 8,000 years ago when humans began to cut and burn forests in China, India, and Europe to make clearings for croplands and pastures," Ruddiman writes in his first chapter. "Methane concentrations began a similar rise 5,000 years ago when humans began to irrigate for rice farming and tend livestock in unprecedented numbers."

Ruddiman doesn't dispute that the industrial era impact has accelerated greenhouse gas concentrations, only that human impact has been going on for longer than generally acknowledged. Looking at long-term climate cycles—really long term—Ruddiman says, "The northern hemisphere (and the planet as a whole) has been gradually drifting toward a more refrigerated state for the last three million years." Further, for a variety of cyclical reasons related mostly to solar radiation, both methane and carbon dioxide concentrations in the atmosphere should be naturally decreasing over the past 5,000 to 8,000 years. Instead they've increased.

Ruddiman finds the reasons for these increases to be the clearing of forests for crop lands since the invention of agriculture. He presents impressive back-of-the-envelope calculations on how much these two potent greenhouse gases would have been expected to rise based on assumptions of human population and forest clearing. He also shows intriguing correlations between disease epidemics that reduced human populations, which in turn lowered the gas concentrations, providing circumstantial evidence for the linking of human activity and pre-industrial warming. When people died in pandemics, they abandoned their farmland. Trees grew back. Carbon dioxide was removed from the atmosphere.

Ruddiman's hypothesis about an earlier onset of the anthropocene era in climate change got some support from European researchers at the December 2008 fall meeting of the American Geophysical Union in San Francisco. Swiss geographers Jed Kaplan and Kristen Krumhardt tracked deforestation in Europe over the last three millennia. "We might underestimate how much deforestation had already gone on during the prehistoric or pre-industrial times," Kaplan says in the March 2009 *Earth* magazine. "We didn't live in the Garden of Eden 1,000 or 2,000 years ago even. There was a lot of impact that had happened by that time."

Human activity may have prevented a return to the glaciation that would have been the natural fate of the earth, absent the agricultural revolution, Ruddiman says. It seems likely that, for humans at least, global warming is preferable to global cooling. The question is how narrow a band of climate temperatures provides a fertile ground for the development and sustenance of civilization.

"If greenhouse gas concentrations fell all the way back to their natural levels, Earth would probably cool enough to allow an ice sheet to begin accumulating in northeastern Canada, a return to overdue glaciation. But this will not happen. At least not for many millennia," Ruddiman writes.

Just One Planet: Poverty, Justice and Climate Change. By D. Mark Smith. 2006. ISBN: 978-1-85339-643-4. 123 pp. $21.95 (softcover). Intermediate Technology Publications. **www.itpubs.org.uk**.

There seem to be two kinds of books published about climate these days. The first kind is explanatory, a dispassionate explanation of the issues we're facing, avoiding the charges of "hysteria" on the topic. These are often written by scientists who want to inform but not advocate—or at least not appear to advocate.

The second type are calls-to-arms, assuming the scientific issues are settled, arguing that something must be done—the sooner the better—unconcerned about being labeled "hysterical." If anything, these latter books argue, a little hysteria is overdue.

Without reading a word of the text, the astute reader can predict—within an acceptable margin of error—which type she is holding simply from the title. If the title includes the word "warming" (instead of climate change), or "planet," or "earth" or "world," the book is probably one of the second kind. If the title has a variation of the words "globe," or "assessment" or the phrase "climate change," it is probably of the first type.

Referring to the modern climate, um, issues as "climate change" instead of "global warming" has lately come under attack from some climate skeptics as mealy-mouthed, an attempt to lighten the political freight of the issue to make the costs of adaptation and mitigation more acceptable to the taxpayer. But in fact the phrase originally took hold several years ago as a mild concession to those same skeptics, mostly by climate scientists who didn't want to seem to be hysterical on the topic (see book Type I, above). "Climate change" seemed less alarmist—and maybe a touch more accurate, since not every acre of the earth is getting hotter—than the buzzwords "global warming."

So here we have D. Mark Smith's book, whose title includes the word "planet" (Type II) and the words "climate change" (Type I). But Smith's book falls decidedly in the call-to-arms category, although he seems more exercised by the injustices of global poverty than by the exigencies of global warming, … er, climate change.

And who wouldn't be? Smith cites the depressing statistics that 1.1 billion of the world's people live in "extreme poverty," subsisting on less than $1 a day. Another 1.6 billion live in "moderate poverty," getting by on $2 a day. So 40 percent of the world's population survives on $2 a day or less.

"There is not a choice between climate change and poverty reduction," he writes. "Climate change will make poverty worse. In the 21st century, therefore, action on climate change is integral to poverty reduction."

Smith places a good deal of faith in the international frameworks established to deal with climate change. He also urges "preventing further delay in initiating action on climate change is key … Delay in adaptation will allow the growing impacts of climate change to cumulatively weaken livelihoods, leaving poor people more and more vulnerable to disruption and disasters."

The Stimulus Has Landed—Sort Of

The recently passed economic stimulus package is good—but not great—news for hazards researchers hoping for grant approvals. Two of the agencies most heavily funding hazards research, the National Science Foundation and the National Institutes of Health, made off with the bulk of the stimulus swag, but a relatively small amount can be expected to go to hazards work—and even that is likely to go to grants already in the pipeline, not to new proposals.

The stimulus plan provides a total of about $22.5 billion among about 10 research agencies. NIH got the plurality of the funds—about $10.4 billion. The Department of Energy came in a distant second at $5.5 billion and NSF third with $3.0 billion.

A spokeswoman for NSF says that the agency doesn't know yet how much funding might be directed toward hazards and disaster research. The agency is still preparing its spending plans "so we can do it right the first time," she says.

NSF said in a release, "NSF currently has many highly rated proposals that it has not been able to fund. For this reason, NSF is planning to use the majority of the $2 billion available in Research and Related Activities for proposals that are already in house and will be reviewed and/or awarded prior to September 30, 2009." The other billion will go to various programs that are not hazards related.

The administration has requested a total budget for fiscal year 2010 of $7 billion, $950 million (16 percent) more than the amount for FY 2008.

The Department of Homeland Security got a total of about $3.5 billion in stimulus funds, including some funds given to the General Services Administration "in support of DHS programs." A large chunk—$650 million—is going for the construction of a headquarters building. FEMA is getting a total of about $615 million for several programs, including grants to assist firefighters and build firehouses ($210 million); port security funds ($150 million); and transit and rail security grants ($150 million).

NIH made $1.5 billion available almost immediately, with $200 million going to challenge grants "to support research on topics that address specific scientific and health research challenges in biomedical and behavioral research that would benefit from significant 2-year jump start funds; $1 billion in construction grants twoo help build new or improve existing research facilities and help grow the economy; (and) $300 million in shared instrumentation grants to facilitate the purchase of research equipment that will enable scientists and researchers to complete their critical work."

Interested observers can follow the distribution of stimulus spending at www.recovery.gov.

Below are descriptions of some recently awarded contracts and grants related to hazards and disasters.
An inventory of awards from 1995 to the present is available at www.colorado.edu/hazards/resources/grants/

International Workshop: Toward Understanding the Effects of the Wenchuan Megaquake of 12 May 2008; Guangzhou, People's Republic of China; February 2009. Funding Organization: National Science Foundation. $38,328. One year. Principal Investigator: Mete Sozen, Purdue University. sozen@ecn.purdue.edu.

The Wenchuan event of May 12, 2008 is reported to have caused over 80,000 fatalities and left a population of five million people without shelter. At the same time, it was a grand experiment for science and engineering. It was a megaquake that broke through to the ground leaving a surface rupture extending 270 kilometers (168 miles), damaging a region of approximately 250,000 square kilometers (97,000 square miles). A new array of 398 strong-motion records is recorded in the affected region. Study of these data in conjunction with well documented geotechnical and structural damage is bound to result in new technology that will enable improved planning to protect society from such events in the future.

This proposal is to provide travel support for a U.S. delegation to attend an international workshop to be held in Guangzhou, China, in February, 2009.

The specific goals of the workshop are to: specify research initiatives that will lead to major improvements in the technology for the protection of society from earthquakes; assure a thorough documentation of the available information on the effects of the Wenchuan Earthquake; identify the data that may be missing and arrange for the missing data to be obtained and documented; develop a mechanism for maintaining

the momentum and the quality of the selected research initiatives; and, plan procedures for timely exchange of information during the conduct of the research.

Mitigating Disaster and Terrorism Impacts to Critical Infrastructure. Funding Organization: National Science Foundation. $111,620. Eighteen months. Principal Investigator: Timothy Matisziw, University of Missouri-Columbia. matisziw.1@osu.edu.

Critical network infrastructures—transportation, communication, and utility systems—are designed to facilitate the movement of essential goods and services over geographic space. Many of these vital infrastructures are geographically extensive, increasing vulnerability to disruption by natural disasters, accidents, or sabotage. Planning for and managing the vulnerability of critical infrastructure to extreme events is a challenging task. This is particularly true given the uncertainty associated with the timing and severity of these events and the network components involved.

This collaborative research project will develop several new approaches for assessing network vulnerability to interdiction, which is broadly defined as the debilitation of network elements due to disaster, accident, or intentional harm. The investigators will develop a general spatial optimization modeling framework for addressing the interdiction of system flow. The modeling interdiction impact will better inform mitigation and remediation efforts. A final goal of this research project will be an operational modeling framework to support system recovery in the event of interdiction.

This research will advance work in geographic information science and network modeling to facilitate identification of infrastructure risks and vulnerabilities.

A Functional Approach for the Analysis of Peak Wind Loads on Houses Exposed to Hurricanes and Validation of Wind Tunnel Simulations. Funding Organization: National Science Foundation. $224,998. Three years. Principal Investigator: Muhammad Hajj, Virginia Polytechnic Institute. mhajj@vt.edu.

Field data collected under the Florida Coastal Monitoring Program (FCMP) during recent hurricane seasons on prototype buildings has revealed that measured pressure coefficients exceeded the provisions of building codes and that wind damage occurred at wind speeds well below the design wind speeds presented in these codes. Because the current code provisions for wind loads are based on the reduction of many wind tunnel observations into a few numbers, the question arises as to what constitutes a proper wind tunnel simulation of the flow in the atmospheric surface layer and associated wind loads on low-rise structures and what procedures should be followed in translating pressure coefficients as measured in these simulations to full scale applications.

This research will determine whether generic wind tunnel simulations of low-rise structures can predict wind loads under hurricane conditions. This will be achieved by contrasting full scale peak pressure and wind load coefficients measured during recent hurricane seasons with model scale measurements with the same probability of non-exceedence. The comparison will be based on a probabilistic procedure that will be employed to obtain the distribution of peak pressure and load coefficients from single sample records.

The recent measurements conducted in Florida provide a unique database that can be used to assess the reliability of simulated wind loads.

Perceived Risk and Compliance with a Mandatory Evacuation Order. Funding Organization: National Science Foundation. $19,986. 18 months. Principal Investigator: Susan Weller, University of Texas Medical Branch at Galveston. sweller@utmb.edu.

This study focuses on risk perceptions among people who did and did not comply with a mandatory hurricane evacuation order, as well as the civil defense authorities who issued the order. On September 11, 2008, a mandatory evacuation order was issued for Galveston Island as Hurricane Ike approached. But when the storm hit, approximately 40 percent of the population had not evacuated. The study uses qualitative methods (in-depth, open-ended, ethnographic interviews) to elicit reasons, motives, and beliefs about what a "mandatory" evacuation means, why people did or did not comply, what they might do next time and why, and what they would like others to know when given a mandatory order in the future.

The goal is to understand whether there are important differences in the understanding of risk between those who issue mandatory evacuation orders and the public who is expected to respond to them.

Effects of Prolonged Droughts, Severe Fires, and Forest Parasites on Regional Ecosystem Pattern in the Rocky Mountains Over the Past 5000 Years. Funding Organization: National Science Foundation. $66,430. One Year. Principal Investigator: Bryan Shuman, University of Wyoming. bshuman@uwyo.edu.

Regions like the Rocky Mountains have experienced significant warming from climate change in the past decade. The warming has reduced snowpack and related runoff, facilitated extensive forest damage from insects and other pathogens, and increased areas burned by wildfires.

Characterizing past climate changes and their impacts provides a means to place such regional changes in a long-term context and to anticipate how such impacts on ecosystems and the goods and services they produce will develop in the future. This project focuses on the role of disturbances (i.e., fires and forest-parasite infestations) in mediating vegetation responses to persistent droughts over the past 5000 years to document the interactions and regional differences influencing regional responses to climate change.

The project will study sediments from six lakes in the Park Range of northern Colorado. Sedimentary evidence of episodes of low lake-levels in the past will be used to document past droughts, and then will be compared with fossil evidence of vegetation change, forest fires, and forest-parasite outbreaks to document possible climate-disturbance-vegetation interactions and their spatial patterns. The results will show how the lower border between forest and steppe was shifted through time by drought, fire, and parasites, and how the density of forest cover at mid- and high-elevations affected the sensitivity of fire regimes, and thus forest composition, to climate change.

Letters

To the Editor,

"Exploring links between natural hazards and global warming" by William Travis (*Natural Hazards Observer*, March 2009) answers some questions and raises many more while advocating for further cross-fertilization between the hazard field and the climate research community.

Cross-fertilization should not stop with the hazards and the climate research communities, but must engage several sectors—the emergency management community, the building design and construction professions, professional licensing sectors, and higher education.

This process must go beyond exchanging of knowledge across fields and disciplines. It must aggressively foster contributions, participation, collaboration, and action by practitioners in fields that up to now may have barely acknowledged one another.

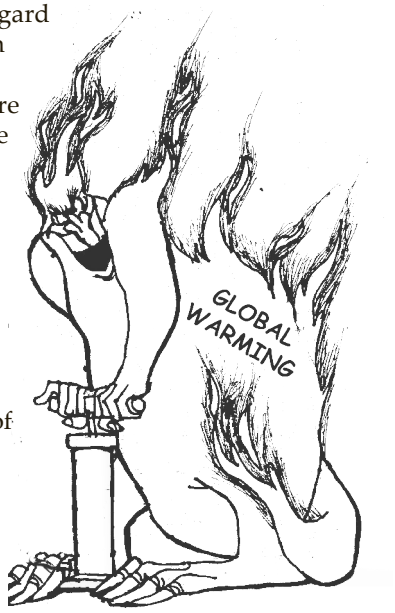
One clear example is the current scientific debate on whether climate change has caused an increase in tropical cyclogenesis and/or the incidence of major hurricanes. Respected scientists argue that with increased global warming, we have seen a direct increase in the annual number of major hurricanes across several oceanic basins worldwide pointing to a link between global warming and tropical cyclones.

Other equally respected scientists argue increases in the number and intensity of tropical cyclones are just the result of multidecadal cycles of variability, independent of global warming.

To set the context for my argument, the following must be considered:

- On the issue of climate change, research and public discourse in the United States has taken place against a background of noise created by political interference with scientific work and campaigns of disinformation fueled by special interests over the past several years.
- Over the past decade or so in the United States and globally, the emphasis of climate change work has been on greenhouse gas emissions, the use of non-renewable energy sources, and on what to do to mitigate the impact of human activity on the global climate, with much less attention paid to adaptation to reduce the potential for damage to humans and the built environment from climate change.
- The national emergency management community has by and large paid little attention to the links between climate change and natural hazards. As a result, state and local mitigation plans, which have been required by law since 2000, usually fail to include climate change, sea level rise, or extreme precipitation in hazard assessments.
- The building design and construction professions—the engineering sector in particular—have been mostly absent from the climate change arena, especially with regard to adapting the built environment to potential impacts from climate change.

A commonly held view among architects and engineers is that, with regard to potential damage from hazards exacerbated by climate change, all you are required to do is meet the pertinent building code.



Against this background emerges a position that can be simply stated as follows:

- Hazards, whether natural or anthropogenic, must be viewed as sources of potential damage.
- Vulnerability results from the interaction of human activity with hazards.
- All hazards incorporate damage components, which have the capability of causing direct damage to the built environment or to human activity. Wind-velocity pressure applied to buildings by hurricane winds, and hydrodynamic pressure applied to buildings and infrastructure by storm surge are examples of damage components.
- Climate change must be viewed as a slow-acting hazard.
- Sea level rise is already exacerbating storm surge during hurricanes. It will continue to do so into the foreseeable future. Sea level rise results in deeper coastal waters, which in turn lead to higher, faster flowing storm surge, which in turn produce higher waves. The net results are much stronger hydrodynamic pressure and wave impact on buildings affected by storm surge generated by hurricanes.
- Global warming has increased the capability of the atmosphere for holding moisture and may be elevating the threshold for precipitation to occur. Empirical data shows an increase in the incidence of extreme rain events in certain locations. These conditions will exacerbate the potential for damage during "wet" hurricanes.
- The connection between sea level rise and the exacerbation of storm surge, and between global warming and extreme precipitation events, is clear. Based on this, the link between climate change and hurricanes is undeniable.

It is imperative that we take a careful look at the method currently used for establishing building design criteria in regions vulnerable to hurricanes, specifically regarding external loads acting on buildings as a result of storm surge impact.

At present, a structural design team uses the American Society of Civil Engineers-7 standard to establish minimum design loads for buildings and other structures, including those exerted by wind, flood, storm surge and

wave impact. Applicable parameters for calculating such minimum design loads on a local or site-specific basis come from a range of sources such as Basic Wind Speed map, pertinent FEMA Flood Insurance Rate Maps (FIRM), or the appropriate Surge Atlas based on the NOAA Sea, Lake and Overland Surge from Hurricanes (SLOSH) model.

In the case of storm surge, the sources of information used to determine surge depth and wave height at a given location, such as the FIRM, SLOSH runs, and Surge Atlases, estimate these parameters with respect to a reference point such as National Geodetic Vertical Datum of 1929 or North American Vertical Datum of 1988, which are measurements of mean sea level as of 1929 and 1988, respectively, and are largely based on historical events.

A critical problem with this approach is that the effect of continuous sea level rise is not taken into account requiring corrections to establish accurate parameters for storm surge depth and wave height at the specific project location. The main consequences of this are:

- Buildings are being built today using minimum design criteria based on historical data and outdated points of reference that, in the specific case of storm surge, do not include the current and future effects of sea level rise.
- Because of this, new buildings in coastal locations may suffer external loads from storm surge and wave impact in the future, which exceed their original design criteria by a factor of 150 to 200 percent, creating the potential for catastrophic damage.
- New buildings on sites that, on the basis of current storm atlases, are outside the influence of storm surge impact or subject to minimal levels of storm surge may find themselves in more hazardous storm surge zones in the future as a result of sea level rise, potentially subject to loads from hydrodynamic pressure and from wave impact that will exceed their minimum design loads.
- A large portion of the existing stock of buildings and structures in the hurricane-vulnerable states is at risk of future catastrophic damage from storm surge and wave impact, depending on when they were built.

This dire scenario requires a critical paradigm shift that must at a minimum include the following elements:

- The scientific community needs to acknowledge the influence of climate change in the exacerbation of specific damage components of hurricanes.
- The emergency management community needs to start viewing specific components of climate change as hazards, hence as sources of potential damage to the built environment, to human activity and to the environment.

- The emergency management community needs to include such climate change-driven hazards in risk assessments that support the federally required mitigation planning.
- The scientific community—in collaboration with the engineering sector and the emergency management community—must pursue research with the objective of enhancing capabilities for establishing realistic parameters for future storm surge depth, rate of flow, and wave heights, which can be used in defining design criteria for building construction.
- Building design professionals, architects, and engineers must radically change the current approach to building design. A method that is based on future potential loads, especially in the case of storm surge and wave impact, that may occur during the expected service life of a new building needs to replace the existing approach.
- The higher education community must upgrade its curricula to reflect these critically needed changes, and to equip future building design professionals, emergency managers, and scientists with practical tools to reduce the potential for damage from the impacts of climate change through the adaptation of buildings, structures, and infrastructure using forward-looking design criteria.
- The regulatory community must incorporate pertinent requirements in the professional licensing process, to ensure that professionals in many fields are equipped with the knowledge to confront current and future impacts of climate change.

The time to bring these changes about is now.

Ricardo A. Alvarez
Florida Atlantic University
Boca Raton, Florida

To the Editor,

Thank you for the interesting March 2009 issue highlighting the intersection of climate change and hazards, and especially for the letters to the editor regarding the recovery phase after a major disaster. Contrary to some assertions in one or two of the letters, such a phase was indeed covered by Title III of the act—the exact name of which escapes me at the moment—that was added to the original legislation sometime in the early 1980s.

Unfortunately, appropriations were never made for this title, despite efforts by some of us to add funds during the annual budget preparation process. Toward the end of that decade, the title was deleted by Congress at the initiative of the then administration, which maintained that there were other means to fund recovery—again over recommendations to keep and fund it made by some of us at the working level.

Ugo Morelli
FEMA, retired
Washington, D.C.

Conferences and Training

May 4-7, 2009
2009 West Regional Conference
Association of State Dam Safety Officials
Coeur d'Alene, Idaho
Cost and Registration: $325 before April 20, open until filled

Dam safety affecting dam owners, governments, and engineers in western states will be the focus in Coeur d'Alene. Sessions include discussions of hazardous discoveries, hazard mitigation, and dam operation and maintenance.

www.damsafety.org

May 4-8, 2009
Eleventh Annual New Jersey Emergency Preparedness Conference 2009
New Jersey Emergency Preparedness Association
Atlantic City, New Jersey
Cost and Registration: $100, open until filled

This conference presents preparedness information and training for emergency managers and provides a forum for emergency professionals, managers, and volunteers to exchange ideas and information.

www.njepa.org

May 5-7, 2009
Great Lakes Homeland Security Training Conference and Expo
Michigan State Police
Grand Rapids, Michigan
Cost and Registration: $350 before April 10, closes April 24

A wide range of security topics will be discussed at this annual workshop, which brings together local, state, and federal emergency management and homeland security experts. They'll focus on public health, critical infrastructure protection, communications, school safety, response, preparedness, and technology..

www.michigan.gov/emhsd

May 10-15, 2009
23rd Annual Governor's Hurricane Conference
Florida Emergency Preparedness Association, National Weather Service, and others
Ft. Lauderdale, Florida
Cost and Registration: $195, open until filled

This conference provides training to ensure the ability to respond to and recover from tropical cyclones. Tracks will include communications and public information, emergency management and services, policy and planning, and recovery mitigation.

www.flghc.org

May 11-13, 2009
Seventh International Conference on Earthquake Resistant Engineering Structures
Wessex Institute of Technology
Limassol, Cyprus
Cost and Registration: $1869, open until filled

This forum for earthquake structural design engineering disciplines will discuss earthquake effects on state-of-the-art structures and the importance of upgrading existing buildings and infrastructure.

www2.wessex.ac.uk/09-conferences/eres-2009.html

May 11-14, 2009
Disaster Forum 2009
Disaster Conferences Inc.
Banff, Alberta, Canada
Cost and Registration: $1075, open until filled

A range of experts versed in preventing and responding to emergencies, as well as attacks on critical infrastructure, will present their work here. Sessions will be geared toward emergency managers and preparedness officials interested in business continuity.

www.disasterforum.ca/events.html

May 11-22, 2009
GIS for Disaster Risk Management
Asian Disaster Preparedness Center
Bangkok, Thailand
Cost and Registration: $2,000, open until filled

This conference will create awareness on the importance of spatial data and GIS in disaster risk management. Applying spatial data to better understand vulnerability assessment, disaster preparedness, recovery, and reconstruction will be addressed.

www.adpc.net/v2007

May 13-15, 2009
Fourth International Conference on Sustainable Development and Planning
Wessex Institute of Technology
Limassol, Cyprus
Cost and Registration: $1825, open until filled

This conference will address an integrated approach to regional development, with an emphasis on sustainability principles. Topics include regional and city planning, territorial and environmental risk analysis, urban landscapes, and responses to world events.

www2.wessex.ac.uk/09-conferences/sustainable-development-2009.html

May 18-21, 2009
NHWC Eighth Conference and Exposition
National Hydrologic Warning Council
Vail, Colorado
Cost and Registration: $550 before April 15, open until filled

This conference will focus on real-time hydrologic warning systems and how they support storm readiness, emergency response, and disaster recovery. Partnerships between warning system operators, equipment providers, consultants, news media, and emergency managers will be promoted.

www.hydrologicwarning.org

May 24-29, 2009
Fifth International Conference on Recent Advances in Geotechnical Earthquake and Soil Dynamics
Missouri University of Science and Technology
San Diego, California
Cost and Registration: Not posted

Improvements in earthquake engineering and providing direction for future research in the field will be the main topics of this conference. Professionals from more than 40 countries will present research findings and exchange information on earthquake engineering practices.

conference.mst.edu/5geoeqconf2010/

May 26-27, 2009
Second Annual Conference on Disaster Risk Reduction: Water-Related Disasters
University of the Free State
Bloemfontein, South Africa
Cost and Registration: $265, open until filled

This conference will present the results of research and training initiatives related to risk reduction in Africa. Interdisciplinary session topics include climate change impacting flood damage, implementing disaster risk reduction in mitigation project design, and the effectiveness of business continuity for African banks.

www.ufs.ac.za/apps/congress/index.php?FCode=05

June 7-12, 2009
33rd Annual National Conference: Green Works to Reduce Flood Losses
Association of State Floodplain Managers
Orlando, Florida
Cost and Registration: $610 before May 29, closes June 3, 2009

This conference will present state-of-the-art techniques, programs, and resources to better improve flood mitigation, watershed management, and other community goals

www.floods.org/Conferences,%20Calendar/Orlando.asp

June 8-11, 2009
2009 Conference and Expo
National Fire Protection Association
Chicago, Illinois
Cost and Registration: $895, open until filled

This conference will examine best practices in fire protection and electrical safety. Conference tracks include emergency preparedness and business continuity, fires and emergency services, fire protection engineering, and facility fire safety.

www.nfpa.org

June 9-11, 2009
2009 National Urban Area Security Initiative (UASI) Conference
Urban Area Security Initiative
Charlotte, North Carolina
Cost and Registration: $250

This conference provides a forum for exchanging technical and administrative UASI information, as well as an opportunity to share best practices in emergency management, public health, and evacuations, and mass care planning.

urbanareas.org/con/

June 10, 2009
The National Risk Conference
ARUP, London First, Crisis Response, and others
London, England
Cost and Registration: $568, open until filled

This conference will encourage debates that increase resilience and safety, facilitate effective business continuity, and provide perspective on risks faced by organizations and the community.

www.nationalrisk.co.uk/Index.html

June 21-24,2009
National Conference on Community Preparedness
International Association of Emergency Managers and the Department of Homeland Security
Alexandria, Virginia
Cost and Registration: $325 before June 15, open until filled

This conference is aimed at those seeking to create safer, stronger, and better-prepared communities, regardless of the hazards faced. Attendees will share best practices in collaborative emergency planning, discuss preparedness outreach and education, discover innovative funding approaches, and receive updates on preparedness research.

iaem.com/NCCP2009.htm

Natural Hazards Observer
ISSN 0737-5425
Printed in the USA.
Published bimonthly.

The *Observer* is free to subscribers within the United States. Subscriptions outside the United States cost $24.00 per year. Back issues of the *Observer* are available for $4.00 each, plus shipping and handling. Orders must be prepaid. Checks should be payable to the University of Colorado. Visa, MasterCard, and American Express cards are also accepted.

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www.colorado.edu/hazards/about/contribute.html

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The mission of the Natural Hazards Center is to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery. Using an all-hazards and interdisciplinary framework, the Center fosters information sharing and integration of activities among researchers, practitioners, and policy makers from around the world; supports and conducts research; and provides educational opportunities for the next generation of hazards scholars and professionals. The Natural Hazards Center is funded through a National Science Foundation grant and supplemented by contributions from a consortium of federal agencies and nonprofit organizations dedicated to reducing vulnerability to disasters.

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