Natural Hazards Observer

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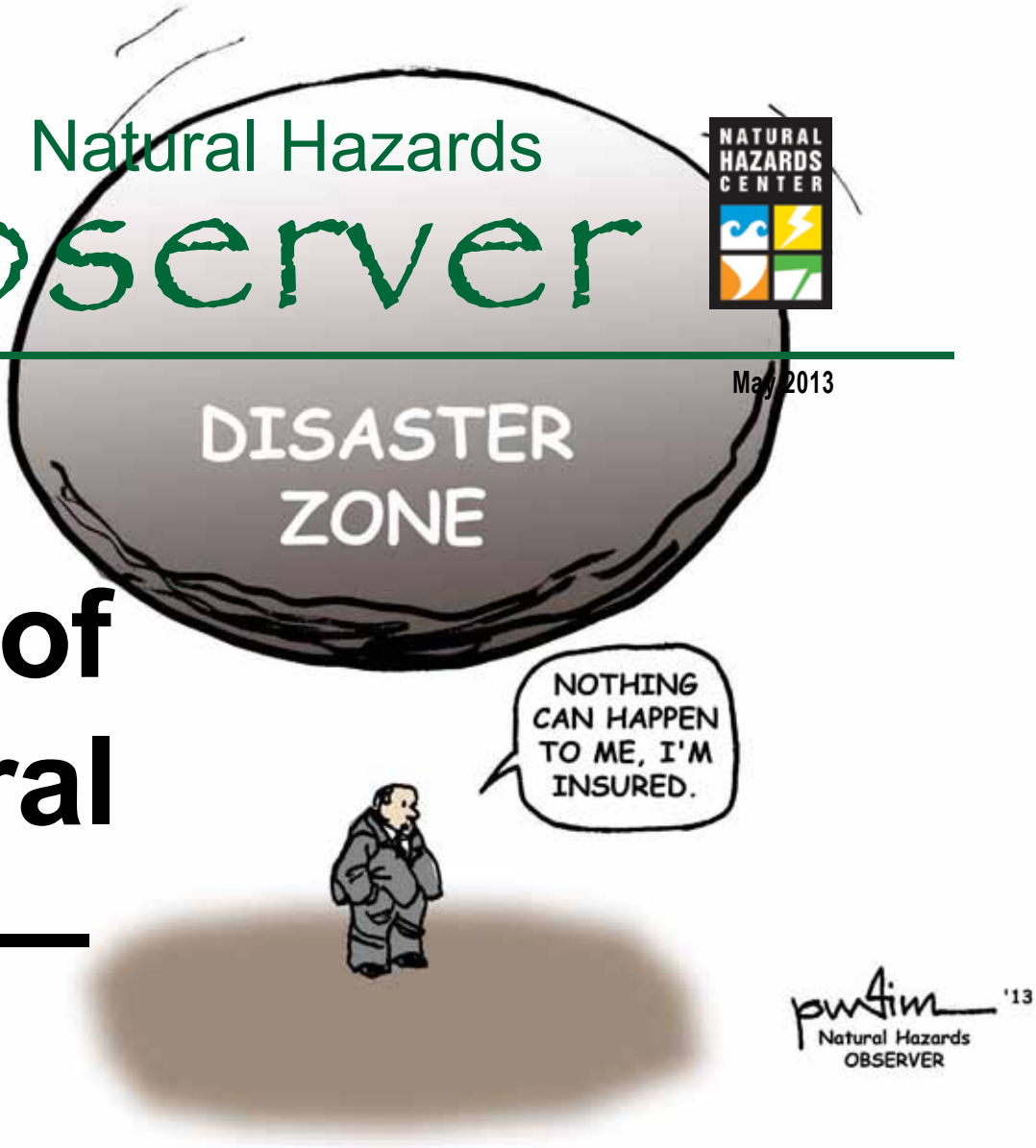
The hazard of the moral hazard—or not



An invited comment by Carolyn Kousky and Leonard Shabman

Americans have long had mixed feelings about disaster relief and aid. In the modern climate, many commentators argue that disaster aid creates a moral hazard—that is, it encourages people to take unwarranted risks because they do not have to bear all the consequences of their actions.

But actually how big is the moral hazard problem in federal disaster aid? The short answer is: We do not believe that the evidence for moral hazard in programs designed for households is compelling. On the other hand, incorrect perceptions and expectations for aid may have some effects on choices made.

> Does disaster aid encourage people to locate in harm's way?

Federal post-disaster programs take two forms. First is emergency relief. This is the immediate assistance of providing temporary shelter, distributing food, water, and clothing, removing debris, and restoring basic services, such as electric power, to stricken communities.

The second is a suite of programs we'll refer to as "disaster aid." Disaster aid includes payments to individuals, businesses, and communities from the federal government to cover the costs of property repair or to offset economic losses.

Federal disaster relief and aid date back to the end of the 18th century. Federal post-disaster intervention became far more prevalent after the Civil War and increased throughout the 20th century. The Relief Act of 1950 began to institutionalize what had been an ad hoc process of federal provision of relief and aid. With that law, Congress for the first time authorized a federal response to major disasters. But no single agency coordinated it until the Federal Emergency Management Agency was established in 1979.

Today, most of FEMA's statutory authority for disaster relief and aid is governed by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, passed in 1988. The last several decades have seen a growing number of disasters generating federal post-disaster relief and aid, as well as increas-

(Please see "Moral hazard," page twelve)

INSIDE ...

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.

Send items of interest to the Natural Hazards Center, University of Colorado at Boulder, 483 UCB, Boulder, CO 80309-0483; (303) 492-6818, (303) 492-2151 (fax); hazctr@colorado.edu. The deadline for the next *Observer* is **May 31, 2013**.

Notes and follow-up

Natural Hazards Workshop

The 38th Annual Natural Hazards Research and Applications Workshop will be held from Saturday, July 13 through Tuesday, July 16, 2013 at the Omni Interlocken Hotel in Broomfield, Colorado.

Request an invitation to this important meeting by contacting Diane Smith at 303-492-6818 or email Diane.Smith@colorado.edu. You can register online using the link you receive in that invitation email.

Free stuff

The Natural Hazards Observer is available for free download at http://www.colorado.edu/hazards/o/. But many people have asked if they can get a printed copy of the publication.

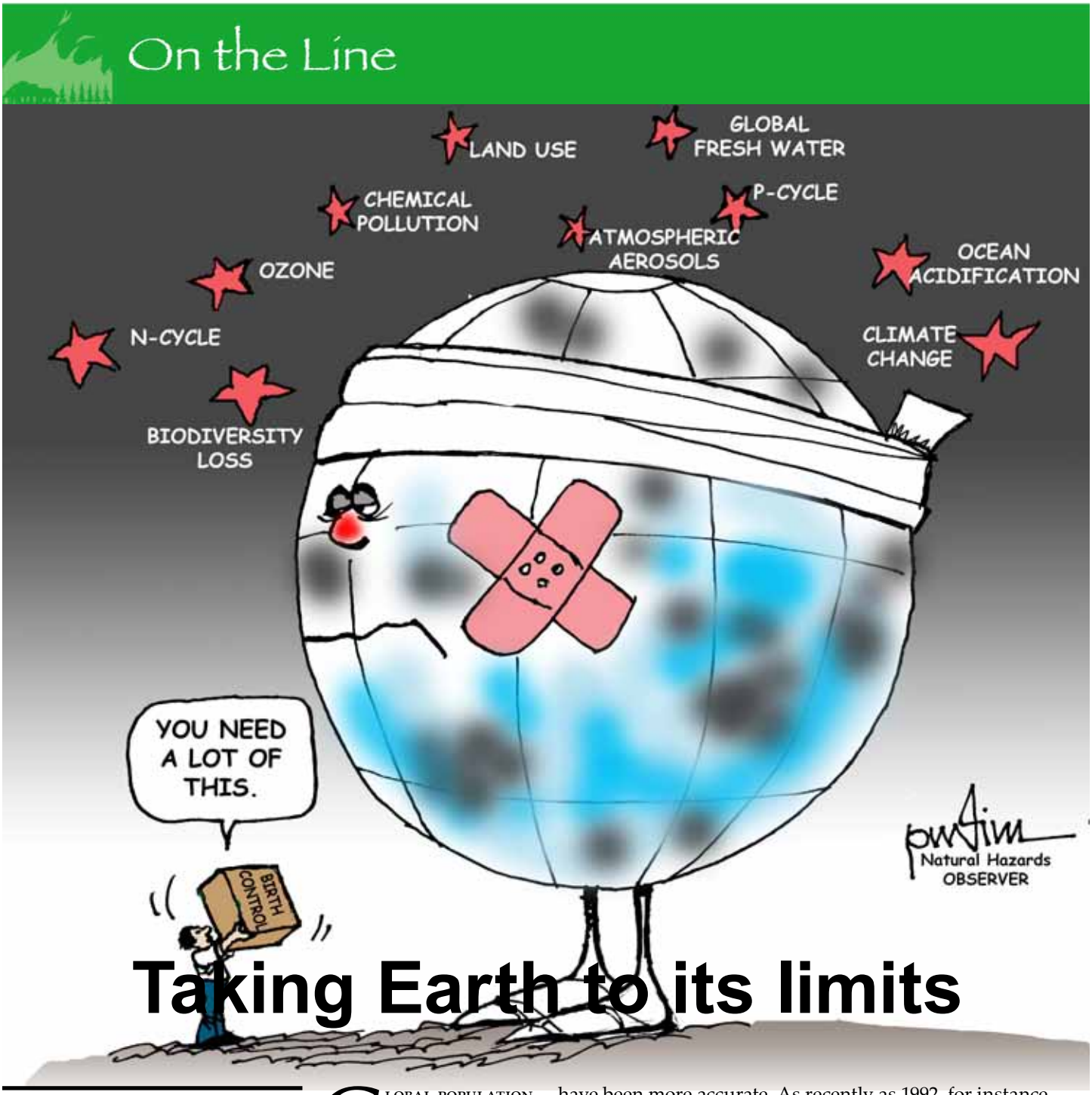
If you're one who likes the print tradition, you can sign up at ibs.colorado.edu/hazards/subscribe to get the *Observer* for only $15 a year.

Call for papers

The U.S. Gender and Disaster Resilience Alliance (http://usgdra.org) is looking for entrants for its fourth annual Gender and Disasters Graduate Student Paper Competition. "This competition recognizes the interdisciplinary nature of gender, hazards, and disaster research, and it showcases up-and-coming scholars and their work in the field," according to the group's announcement.

Authors must be undergradutate or graduate students at an accredited institution for the 2012-13 academic year. "Submissions for this competition can be theoretical arguments, case studies, literature reviews, applied projects, or analyses of research results, but topics must be on gendered aspects of hazards and disasters in the United States," the announcement says.

For more information, please see the USGDRA website.



Taking Earth to its limits

Several measures say we may be outrunning the planet's 'carrying capacity'

Global population will stabilize in the mid-21st century, probably at the lower end of the range estimated by the United Nations, according to a population model by a research team from the Autonomous University of Madrid.

But given the constraints of Earth's systems, this may not be low enough, according to other recent research.

The United Nations provides a wide range of global population estimates by the year 2100 from a high of 15.8 billion people to a low of 6.2 billion. Presently, there are about 6.8 billion people on earth.

So far, however, the lower end of the population trends have been more accurate. As recently as 1992, for instance, predictions estimated about 7.2 billion people by 2010, six percent more than the actual number. Over the last 30 years, global fertility rates have slowed considerably. "Overpopulation was a specter in the 1960s and 70s but historically the UN's low fertility variant forecasts have been fulfilled," said Felix Muñoz, a coauthor on the project.

The Spanish project used a model most often employed by physicists.

The question of Earth's "carrying capacity" has been explored scientifically since the publication of the Club of Rome's controversial *Limits to Growth* report in 1972, which found that by the early 21st century, limits to key resources would be felt.

Though a lot of critics lambasted the report at the time, a reanalysis of the Club of Rome's report by Graham Turner

in the journal *Global Environmental Change* in 2008 found that the study holds up pretty well. "The analysis shows that 30 years of historical data compare favorably with key features of a business-as-usual scenario called the 'standard run' scenario, which results in collapse of the global system midway through the 21st century," Turner wrote.

In the September 24, 2009, issue of the journal *Nature*, author Johan Rockström and colleagues introduced the concept of "planetary boundaries," defining key variables for "safe operating space for humanity with the respect to the Earth system and … associated with the planet's biophysical subsystems or processes." They defined ten "interlinked planetary boundaries": climate change; rate of biodiversity loss; nitrogen cycle; phosphorus cycle; stratospheric ozone depletion; ocean acidification; global freshwater use; land use change; atmospheric aerosol loading; and chemical pollution.

Of these, the first three are already being exceeded, the paper says, and the last two are "to be determined."

In the September 21, 2012 issue of *Science*, the University of Montana's John Running proposes another metric for determining a planetary boundary—net primary plant production (NPP). "Looking at the compete data set," Running writes, "the most striking observation is that for more than 30 years global NPP has stayed near 53.6 Pg [petagrams] per year, with only ~1 Pg of interannual variability … If global NPP is fixed by planetary constraints, then no substantial increase in plant growth may be possible."

Humans currently expropriate about 38 percent of global NPP for their own use. But 53 percent of global NPP may not be harvestable. This means that only about 10 percent of total global plant production may be available for future human use.

This makes the issue of population growth—like the recent estimate from the Madrid group—all the more critical, especially in long-term planning and preparation for slow-onset disasters. If population increases by 40 percent by 2050—at the high end of the UN estimate—"combined with goals to substantially improve standards of living for the poorest 5 billion people on Earth, implies at least a doubling of future resource demand by 2050," Running writes. "As suggested 40 years ago, the limits to growth, as measured by human consumption of NPP, may well be reached in the next few decades."

The Madrid model offers some hope that for NPP, at least—though perhaps not other boundaries like climate change, extinctions and so on—the lower population expectations offer some cause for limited optimism. "This work is another aspect to be taken into consideration in the debate, although we do not deal with the significant economic, demographic and political consequences that the stabilization and aging of the world population could entail," Madrid's Muñoz said.

Drug resistant TB takes its revenge ...

Multidrug resistant and extensively drug resistant strains threaten gains made against the disease

The World Health Organization observed World Tuberculosis Day in late March, but little of the news generated was good. TB was declared a major health emergency 20 years ago, but since then the threat has grown, especially from multidrug resistant TB and extensively drug resistant TB.

Multidrug resistant tuberculosis is doesn't respond to treatment from the two most widely used TB drugs, isoniazid and rifampin. Extensively drug resistant TB is even worse, resistant to an even wider range of drugs.

In South Africa, tuberculosis and HIV have combined in some patients to create a very serious problem. A study in the March 2013 journal *Emerging Infectious Diseases* found a mortality rate of 42 percent and only 22 percent successful treatment outcomes for XDR TB patients with a high incidence of HIV. "Drug-resistant tuberculosis is a critical threat to TB control and global public health," the authors wrote.

In a second study in the same journal, researchers in South Africa found mutations that conferred resistance to

They Said It ...

"Anyone who goes near a difficult or dangerous zone has to do a week's intensive course. Aid workers are kidnapped, and we are under no illusions that we are going to be untouched."—**Save the Children spokesperson, quoted on the IRIN News Service about the rising risk of kidnapping for aid workers.**

"We never pay ransom. Although, to be honest, we at Oxfam have never really been tested. A number of our people have been kidnapped, but we have always been able to rely on our contacts in the country to get them released."—**Heather Hughes, Oxfam UK's security advisor, quoted on the IRIN News Service.**

"Many parishes will no longer be able to sustain current levels of emergency management capacity. Services will be reduced and jobs will be lost. Also, there is a real fear that this decision could bring emergency management in Louisiana back to pre-Katrina levels."—**A letter from four Louisiana homeland security emergency preparedness directors criticizing state cuts in emergency preparedness grants, quoted in the March 14, 2013 *New Orleans Times-Picayune*.**

10 anti-TB drugs. "These findings suggest the emergence of totally drug-resistant TB," the authors wrote.

South Africa's gold mines are estimated to have the highest incidence of new TB cases, according to the IRIN News Service, up to 7,000 cases per 100,000 each year. The country is taking steps to deal with the problem, but progress has been slow. IRIN also reported, "South Africa will expand its rollout of GeneXpert tuberculosis testing machines, which can diagnose TB and drug-resistant TB within 90 minutes, but concerns remain about the capacity to back up this commitment with supplies and treatment."

South Africa may be ground zero for the new dangerous strains of TB, but developed countries may soon feel the impact. A Nepalese man carrying the XDR strain of tuberculosis was detained at the U.S.-Mexico border in late February. He had traveled for three months through 13 countries before being stopped at the U.S. border. And Australia recorded its first death from XDR TB when an immigrant from Papua New Guinea died in a Queensland hospital.

Writing in *The Lancet Series 5*, several authors conclude, "Visionary political leadership is needed to curb the rise of MDR and XDR tuberculosis worldwide, through sustained funding and thee implementation of global and regional action plans."

They urge national policy makers to address the funding shortfall, scale up rapid diagnostics, insure effective infection control practices in health case facilities, and take several other steps to address the issue.

... But the malaria news is encouraging

Death rates are falling, and the gains may be sustainable

While the news on tuberculosis is mostly bad, the global trends in malaria have been positive. Malaria mortality rates have fallen by more than 25 percent since 2000, and by more than 33 percent in Africa, according to the World Health Organization.

The positive trends are the result of several prevention measures, including the increased use of bed nets, the availability of medicines, and better diagnostics.

The problem is still substantial, though, with malaria infecting 216 million people and killing 655,000 in 2010. Globally, 86 percent of victims were children below the age of five years.

The success in reducing malaria is fragile, though, says a paper from *Malaria Journal* (doi:10.1186/1475-2875-11-122). "The gains achieved against malaria in the past decade have no parallel since the Global Malaria Eradication Programme (GMEP), which ended in 1969. Increased funding since 2000 has allowed scale-up of effective interventions, and malaria has declined considerably in many previously highly endemic parts of the world. While these successes confirm that well-funded anti-malaria interventions can have enormous impact, the global increase in malaria burden that occurred in the aftermath of the GMEP underscores the potential fragility of such gains."

Resurgence of malaria after initial strong control programs is fairly common. The authors identified 75 resurgence events in 61 countries between the 1930s and the 2000s. Recently there have been increases in malaria in Rwanda and Zambia, for instance.

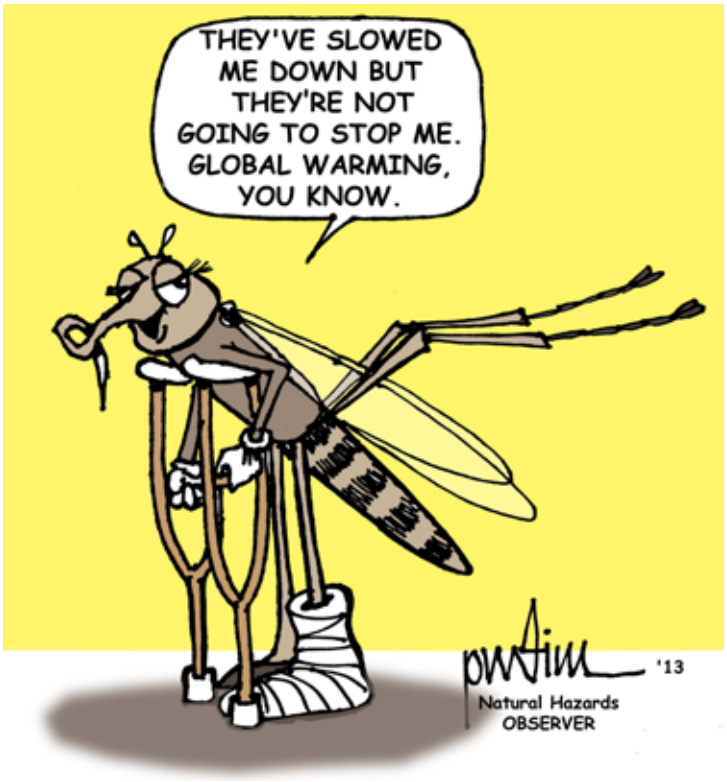
Although there is a certain "baseline" of malaria infections, most of the resurgence problem can be attributed to

a weakening of control programs for various reasons. "Programmatic weakening was attributed to a variety of causes," the authors write, "including funding shortages, complacency and other issues with poor execution, war or disaster, purposeful cessation of control activities, community non-cooperation, or unknown or unstated factors." Funding shortages were responsible for 54 percent of the resurgence and poor execution for 47 percent. Multiple causes were cited for many failures.

Understanding of effective treatment is increasing considerably in malaria research. A February 2013 article in *Malaria Journal* (doi:10.1186/1475-2875-12-62) found that, especially for children, greater gains can be made from the use of both insecticide treated bed nets and indoor residual spraying than from either intervention used alone.

And a group of British and French researchers, writing in the October 9, 2012, *Proceedings of the National Academy of Sciences*, outlined a new potential treatment that used "molecules that interfere with an important stage of the parasite's growth cycle and harnesses this effect to kill them." The procedure kills 90 percent of the parasites in just three hours. Lead researcher Matthew Fuchter, from Imperial College London, said, "We believe we may have identified the parasite's 'Achilles' heel', using a molecule that disrupts many vital processes for its survival and development."

Finally, a University of Florida group, writing in the February 22, 2013, issue of the journal *Science*, say, "Malaria does not have to be eradicated globally for individual countries to succeed at maintaining elimination of the disease." The researchers found that between 1945 and 2010, 79 countries eliminated malaria. Seventy-five of them—or 95 percent of the total—remained malaria-free. The researchers conclude that malaria may be a "sticky state," in which once elimination is achieved, resurgence becomes a rare event.



Our lessons from the Kenya spring elections

Being about how I prepare—and don't prepare—for an obvious hazard

On March 4, Kenya—where we live—held a historic election under its new constitution. The last time the nation vote— in 2007—subsequent violence resulted in about 1,200 deaths and more than 600,000 people internally displaced. There was concern about a repeat of this kind of violence, disruption of basic services, food shortages, and so on—all the sort of things one expects in a disaster.

Many of my Kenyan friends put the risk of election violence in 2013 at about 30 percent—not exactly a low-risk event. But the tensions are mostly among tribes. We *wazungu* are not specifically targeted. Still … 30 percent. There was also concern that locally active terrorist groups like al Shabaab might use the elections to increase insecurity, or that run-of-the-mill thieves and criminals might take advantage of police who might be stretched thin.

My wife Kathy suggested we make ourselves a test case for emergency preparedness. I am, after all, in the business of writing about hazards and the mitigation thereof. We should put together a readiness package for the situation, she said.

Good idea.

Stanford University management professor Elisabeth Paté-Cornell wrote in the November issue of the journal *Risk Management* that terms like "black swan" and "perfect storm"—low probability, high-impact events—have been used too liberally after disasters as an excuse for poor planning. She says a true "black swan"—a unique high-impact event—is extremely rare. Most disasters give at least some warning sign—or can at least be statistically assessed for risk.

So here we're facing a 30 percent risk of violence—hardly a black swan. Maybe a little grayish. How's my planning? What am I gonna do about it?

First up, the U.S. embassy held a meeting about election-related security at the ambassador's residence in Nairobi's posh Muthaiga neighborhood on February 19. So many people wanted to attend—500 eventually did—that after advance registration the meeting was moved from the embassy compound itself to the ambassador's residence. Why the hyper-secure U.S. embassy—in 1998, Osama bin Laden bombed the former embassy site, killing 291 people and wounding about 5,000—is less prepared for a large meeting than the ambassador's residence is a topic probably best left unexamined.

Kathy and I both registered to attend. But when the day arrived, neither of us went. None of our American friends went, either. Kathy works for Nairobi's largest newspaper. The press of business—there's a big election coming up, after all—kept her away. I didn't go because … well, do you know what the traffic is like in Nairobi? A one-hour meeting can turn into a day-long affair. I've got work to do.

The embassy sent out a newsletter afterwards, though. Consul General Elizabeth Jordan told the assembly, "The U.S. Embassy currently has no specific threat information

that Americans in Kenya … would be targeted during any election-related violence … However, the political situation in Kenya is volatile … Thankfully, at this time, an evacuation scenario does not appear likely."

That's a relief.

Otherwise, the emergency preparation advice listed by the embassy was general in the extreme. Monitor social media. Avoid polling stations and demonstrations. Don't go anywhere where you're likely to have fun. They did offer on the web site suggestions for compiling a 72-hour emergency kit.

On February 24, the Aga Khan Development Network—the Aga Khan owns the paper Kathy works for—sent out an 11-page "staff guidance document" with security advice. They listed several potential hotspots—several of the Nairobi slums and the cities of Kisumu, Mombasa, and Garissa. AKDN also suggested many practical points for workplace, home and personal security.

We gathered up three days worth of food and water, made sure the car was filled with petrol. The trouble with this was we didn't really know where we could go. We have no out-of-town relatives. All our friends live in Nairobi and would face the same problems we would.

We stockpiled the recommended three days of food. We kept the petrol tank in the car full. We talked about—but never actually prepared—a "trolley bag" with documents, money, torch and batteries, whistle, towel, blanket, and so on. Furthermore, we never really figured out how to handle the dog. Leave her home with food? Take her and food with us?

AKDN said to "identify an emergency rendezvous point for your family." Good idea. But where? We settled on the house of some friends, a long but achievable walk from both our home (where I work all day) and Kathy's office (in the central business district). But we thought that if there was trouble, we were both likely to be safer simply staying where we were.

But this, say, could happen: I go to the gym, which is about two kilometers from the house and where I go three times a week. There's some upheaval near the Statehouse (near where we live) so I can't return. Kathy has to evacuate downtown. The dog is stuck at home. We walk to our emergency rendezvous point. So far so good. But who feeds the dog? The neighbors are all gone.

The embassy was very diligent about sending out updates and confirming residential locations of American citizens. It sent SMS messages to phones and emails to computers. These emails inevitably included this advice (from a March 9, 2013 security message, while the vote counting was still going on): "U.S. citizens should avoid crowds of all types, as they can turn violent with little or no warning. U.S. citizens are advised to avoid common gathering places and protests sites, such as the central business district, the Nairobi University area, stadiums, large parks, and slum areas. Also, expect major traffic congestion and possible road closures. U.S. citizens are advised to use extreme caution and monitor local media for the latest information on demonstrations and traffic disruptions."

This advice was hard for us to follow. We live right next door to Nairobi University. Kathy had to go to work at the CBD. I go into Kibera, Nairobi's largest slum, pretty often to advise the *Ghetto Mirror*, a slum newspaper. And on election day, March 4, I was asked to come into Kibera, to help with some editing. So I went. It seemed churlish not to.

So far, there's been no violence. The losing side challenged the result in court, which offered a second chance for those who were violently inclined. The court ruled that the election was free and fair, and that Uhuru Kenyatta—the son of Kenya's first president—had won. There was no violence subsequently.

In the United States, a *USA Today*/Gallup Poll a few years ago found that 41 percent of the population doesn't have a stockpile of food and water, 27 percent don't have extra supplies of medicine, and 40 percent don't a rendezvous plan.

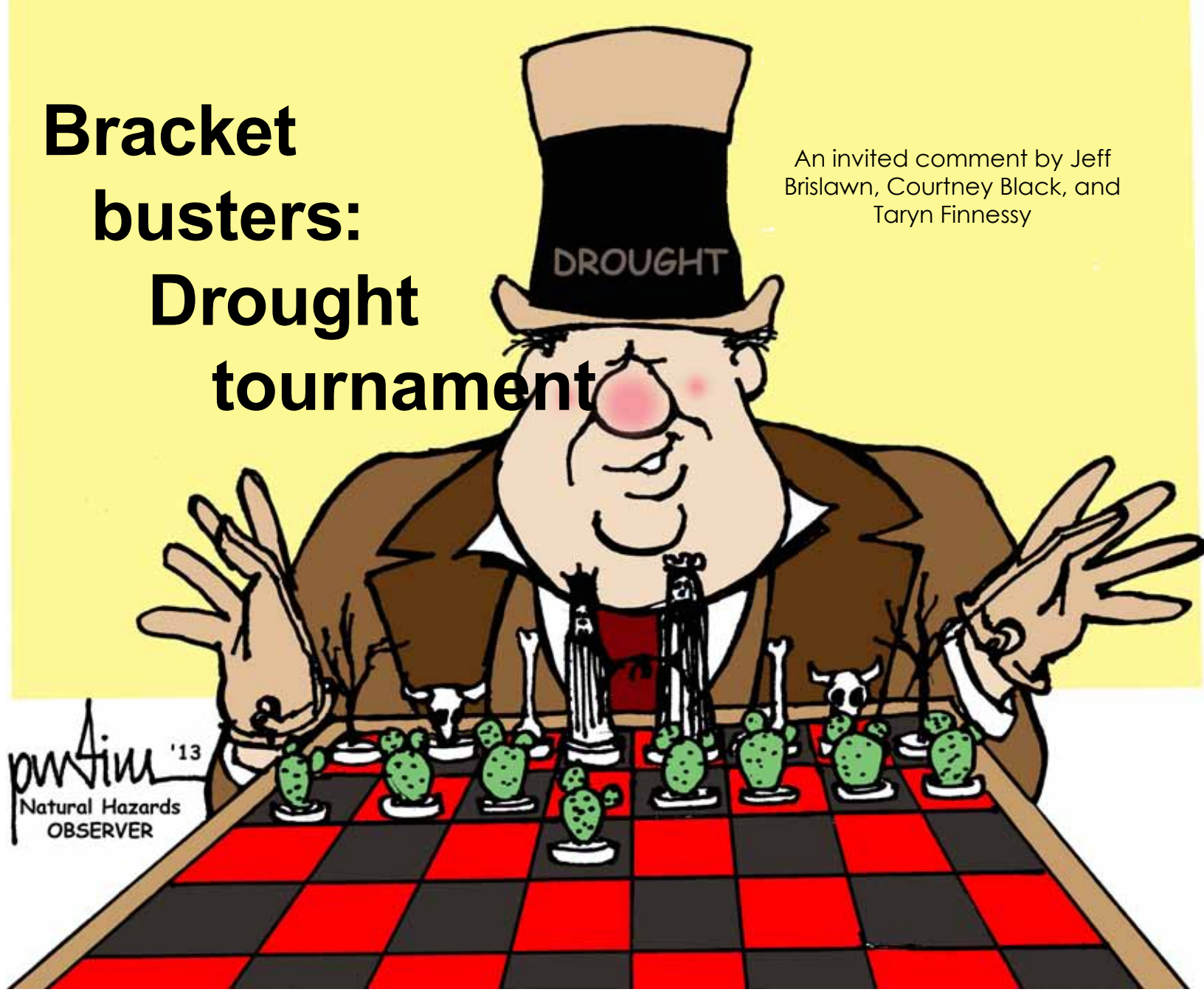
The risks we faced as *wazungu* expats in Kenya are significantly different from those faced by Kenyans. We prepared to be on our own for three days. Many of the Kenyans internally displaced by the 2007/08 post-election violence are still living five years later in IDP camps scattered around the country.

In a January 29, 2013 **speech** in New York (quoted by the *Risk Management Monitor*), Wharton Risk Management Center co-director Robert Meyer said, "We don't have a problem deciding whether to prepare. We have a problem deciding how much to prepare." And in fact if we had faced the kind of serious upheaval that isn't unheard of in Africa, our three-day's worth of supplies would likely not have been enough.

So how did we do on the disaster preparation scale? Not too good, if you ask me. We seem to be pretty typical *USA Today* Americans. Maybe we get a C+.

Bracket busters: Drought tournament

An invited comment by Jeff Brislawn, Courtney Black, and Taryn Finnessy



Natural hazards are a reminder that effective mitigation and response planning are necessary to minimize the impact of these events. Exercises and simulations have proven to be an effective means to ensure preparedness and test established plans.

These exercises usually entail the simulation of the natural hazard, requiring participants to implement and test a plan in actual or compressed time. Droughts, because of their slow onset and multi-sector impacts, are challenging to address under the typical emergency exercise framework. A drought gaming forum was recently introduced in Colorado as a means of engaging preparedness for drought.

Colorado's first "drought tournament" was held September 18, 2012 prior to the State Drought Conference. There are key differences between a gaming forum and a typical emergency exercise. The game doesn't test an existing plan. Instead teams develop their response plans "on the fly." Teams are scored on plan quality, fostering collaboration through competition.

The drought gaming forum was introduced by Harvey Hill of the Agriculture and Agri-Food Department of Canada in June 2011 to the Colorado Water Conservation Board, National Integrated Drought Information System, and AMEC Environment and Infrastructure staff at a NIDIS/National Drought Mitigation Center-sponsored Engaging Preparedness Communities Drought Workshop.

Agriculture and Agri-Food Canada developed the tournament to prepare the agriculture sector for extreme climate events. They've conducted two drought tournaments—one in February 2011 and another in March 2012. The Water Conservation Board and NIDIS funded AMEC to modify the general concept and components introduced in the Canadian games for Colorado. Specific objectives of the Colorado drought tournament included:

- Educating participants on the multidisciplinary and multi-sector implications of drought.
- Encouraging collaboration among stakeholders with different backgrounds.
- Introducing the concept of the "gaming forum" as

a tool to engage stakeholders and develop relationships.

- Providing a forum to develop contacts and information useful for future local, regional and statewide drought planning purposes.
- Creating an environment that was engaging, competitive, and fun.

The drought tournament design was led by AMEC under the guidance of an expert panel that included the CWCB, NOAA-NIDIS, the National Drought Mitigation Center, and Agriculture and Agri-Food Canada. A "simulation day" was held on August 29, 2012. This was a full-day exercise of the draft tournament with the expert panel serving as the "players." The simulation day afforded an opportunity to polish and refine the game, train the referees, and further define referee and sponsor roles, round timing, and game day agenda.

Playing the tournament

About forty people were involved with the tournament, either directly playing or facilitating, coordinating, and developing the game.

- Each team consisted of four or five players representing sectors affected by drought, including agriculture, municipal, industrial, environmental, energy, recreation, and tourism. These teams played the game and provided feedback at the end.
- There were five referees, who were drought and water resource experts from the participating groups. The referees facilitated discussion among the teams, provided clarification and guidance when needed, checked the budgets for each of the teams' response plans, and contributed to the tournament scoring.
- Two "fans" from Oklahoma and Texas observed the tournament.

Each team represented a "basin drought committee." They developed drought response plans for the fictitious Chance Basin. Chance Basin was developed as a politically and geographically neutral basin to avoid common geographic and political water related positions (e.g., East Slope vs. West Slope). This encouraged open, innovative discussion.

Information on the basin was provided by email to all participants in advance of the tournament in the *Chance Times*.

The basin included characteristics typical of many Colorado watersheds. These included a recreational mountainous area with two natural lakes and three storage reservoirs; a ski area; a large agricultural area with lower elevation plains; and three municipalities. The basin's water was administered according to Colorado's prior appropriation system. The scenario also included an interstate compact obligation and transbasin diversions.

Play lasted four rounds. The last three each represented an individual year of a three-year drought. Drought conditions were based on historic hydrologic and climatic data.

The first round focused on pre-drought mitigation. Each team could select three mitigation strategies from six predetermined options. Mitigation was defined as actions or policies implemented prior to the onset of the drought to reduce future drought impacts. These strategies included pro-active measures such as: an established drought contingency fund; pre-drought water leasing and water sharing arrangements; drought monitoring equipment, municipal and industrial water efficiency activities; or leasing arrangements to provide in-stream flows for environmental and recreational needs. Teams used their selected mitigation strategies as a "wild card" during the subsequent rounds to alleviate drought-related impacts. The mitigation strategies enhanced a team's resources to address drought impacts. If played right, mitigation could provide a tournament advantage.

The tournament incorporated a multi-year drought scenario applied to Chance Basin which varied in intensity from year to year. Rounds two and three were the drought response rounds, introduced to the players as if it were the end of April.

Play incorporated a multi-year drought scenario applied to Chance Basin which varied in intensity from year to year. Rounds two and three were the drought response rounds, introduced to the players as if it were the end of April. Colorado's water supply depends on runoff from the winter snowpack, so late spring-early summer snow pack is used as an indicator of water availability for the coming irrigation season. A variety of drought indicator data were presented to the teams, included in an April edition of the *Chance Times*. This data included streamflows, snowpack, precipitation, and temperature based on actual data from weather and streamflow gages in the Colorado Basin recorded during drought years.

The first response round was a training round. Teams familiarized themselves with the materials and concepts of the tournament. The remaining two response rounds were then played out by the teams. With an understanding of the drought conditions, teams characterized the vulnerability of the basin, identified potential impacts, and developed drought response strategies.

Teams chose from a list of pre-determined response strategies to address impending drought conditions. Each strategy had a fixed cost, which required the teams to work within an allocated budget, choosing the options they felt would provide the most "bang for the buck," but also to address multi-sector drought impacts. During round three, the teams could develop up to three innovative responses in addition to the fixed list.

After response rounds two and three, teams presented a synopsis of their response plans to the entire group and referees. Game facilitators then presented a baseline summary of the drought conditions that developed throughout the irrigation season along with impacts that would likely have occurred with minimal response activities. The referees and team players then scored the response plans in relation to these "baseline" summary conditions.

Scoring was based on how well the team addressed drought vulnerability, identified potential drought impacts, and on how effective their portfolio of response strategies could reduce impacts on a multi-sector level throughout the entire basin. Response plans that addressed the social, environmental, and economic aspects of drought on a multi-sector level received higher scores than plans that did not address the multi-dimensional aspect of drought.

The tournament took a full day. Teams had two hours to develop response plans during response rounds two and three. The competitive nature of the event fostered teamwork and animated discussion. Teams responded with an urgency similar to what one would expect to see from exercises to address flooding or other natural hazards with a more immediate onset.

Team scores were tallied at the end of rounds two and three. An interesting and unexpected result occurred. Team three (All Stars) and team five (Super Efficient) tied for first place. The budget remaining at the end of the tournament was used as a tie-breaker. The appropriately named Super Efficient had not used all of its money (in fact they had the most budget of any team remaining) whereas the All Stars had spent its entire budget on response strategies. Some of the reasons that Super Efficient came out on top:

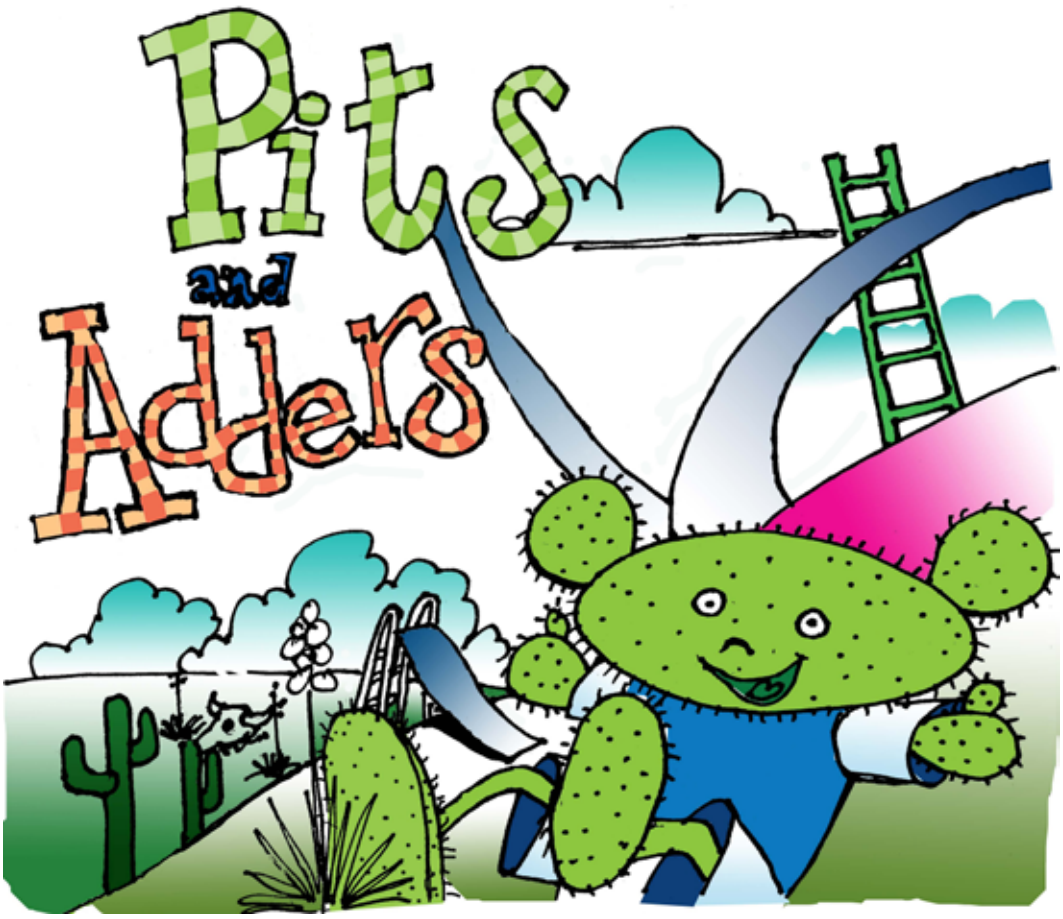
- Consistently utilized low cost, "low-hanging fruit" response options;
- Effectively identified potential drought impacts;
- Developed two innovative, yet moderately priced strategies;
- Had a long-term focus, saving funding for a drought that could extend beyond three years.

Many teams were consistent with the mitigation strategies they chose. The pre-drought water leasing arrangements and drought reserve funds options were popular among all teams and effectively used by team Super Efficient for the win.

Tournament observations and feedback

A post-game feedback session gave participants the opportunity to comment on their experience and provide input. A survey was distributed to collect player, fan, and referee observations. Based on the feedback, the tournament effectively engaged participants in the gaming process.

Several participants commented that the overall concept of the tournament provided an excellent forum for critical thinking about drought. While the basin was fictitious, participants felt that the basin elements, coupled with the realistic drought scenarios, effectively captured many of the drought-related issues that Colorado watersheds face today.



The players enjoyed the opportunity to develop new relationships with people from different sectors with which they normally would not interact. They also enjoyed the multidisciplinary nature of the tournament while working toward a common goal in a fun environment.

Participants collaborated with representatives of other sectors to develop drought-related solutions in a neutral political setting. They were able to bring their experience to the table without following a specific agenda or special interest. The following is a sampling of the positive feedback provided in player feedback forms:

- "Interdisciplinary teams can arrive at better solutions."
- "Allows people with very diverse experience and interests to work in collaborative way to seek common solutions."
- "It was good to see agriculture, wastewater, oil and gas, and environmental reach consensus."

The final results

The competitive nature of the game encouraged respectful, proactive collaboration towards a common goal. The players were creative, benefitting both the participants' experience and the overall success of the forum. Participants reflected that severe, multi-year droughts can result in limited options that water leasing, building new storage or relying solely on conservation will not fix. There must be a willingness to adopt a comprehensive mix of strategies, which could benefit multiple sectors.

The drought response plan "template" required participants to not only address drought response, but to think critically about specific vulnerabilities and drought impacts within the basin. Some players noted they underestimated social and public health impacts. Long-term water "firming" solutions were necessary. The opening round highlighted the importance of implementing mitigation measures prior to drought onset. The multi-sector nature of the tournament emphasized the notion that "we're all in this together." A principal lesson was: Take time to plan.

Future directions

Most participants and observers recognized value in the gaming forum as a tool that can be applied in several applications. Players suggested ways the gaming model could be implemented elsewhere, including developing games for specific entities both in and out of Colorado. Suggestions for future applications included:

- The gaming forum could be used for a variety of real-life planning efforts, including long-term water supply and management planning, climate adaptation planning, drought planning, and for natural hazard mitigation and long-term recovery simulations. The forum could collect specific data and information for planning purposes like drought-related information for updates of the *Colorado Drought Mitigation and Response Plan* or the development of department-level drought management plans.
- Outcomes, findings, and positive stakeholder feedback from this drought tournament support core focus areas of NIDIS, including the Engaging Preparedness Communities initiative. Gaming forums and exercises could be used to assist in encouraging drought planning efforts before a drought occurs. A player suggested that it could be one component of a "drought boot camp" to motivate stakeholders in plan development.
- The forum can be a means to educate and engage stakeholder relationships among diverse economic sectors, water districts, watershed basins, states, and so on. It can build trust among interest groups, useful for decision makers to participate in or simply observe.
- High school and college students could benefit from such a gaming environment. This concept has already been applied in the Academic Invitational Drought Tournament in Canada with University of Saskatchewan students. Simpler and shorter versions

could be implemented at larger forums such as conferences.

- There are many features and technologies that could be incorporated into a gaming forum to both streamline the gaming process and enhance the realism of the scenarios.

Overall, the drought tournament encouraged collaborative decision-making and provided a forum for multi-sector discussion. Most participants agreed that it provided a fun, competitive environment to learn and think of new ideas about drought preparedness and to debate politically sensitive adaptation options and foster innovate thinking.

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Moral hazard ...

(Continued from page one)

ing amounts of funds spent on these two activities.

Over this long history, Americans have been ambivalent about disaster relief and aid. Feelings of sympathy are tempered by fiscal concerns and fears of rewarding risky behavior. In recent times, though, after a large flood, storm, tornado, wildfire or other event, our national impulse is to not only expect, but demand, that the federal government step in to offer aid.

Many commentators and scholars now argue that disaster aid creates a moral hazard problem. "Moral hazard" is a term that has been used to describe federal aid in areas as diverse as the Troubled Asset Relief Program, flood and disaster response, and social safety net programs. Borrowed from insurance economics, moral hazard has come to refer to any situation where people take unwarranted risks because they do not have to bear all the consequences of their actions. Economists argue that if an individual is able to shift costs of risk to others (such as taxpayers in general), they will make poor choices from the point of view of society.

This argument as applied to disaster aid is straightforward. Expectations of generous federal aid encourage development in risky areas, discourage purchase of insurance in hazardous locations, and limit interest in risk reducing measures, such as storm proofing or elevating homes. Most recently after Hurricane Sandy—but also after most large storms—policy analysts and editorial writers have called for rethinking disaster aid because of this asserted moral hazard problem.

There is no compelling evidence for a moral hazard in disaster relief programs for households.

Actual versus expected

But there is no compelling evidence for a moral hazard in disaster relief programs for households.

The distinction between perceptions and expectations and actual program design warrants further discussion. The political posturing that accompanies disaster events, with political leaders making promises of federal support, may lead people to assume they will be made whole by the federal government regardless of whether they had insurance. If individuals believe that aid will fully cover their losses and restore them to predisaster financial conditions, they may pay less attention to the risks of their location decisions and also choose not to purchase insurance. Hence moral hazard may be a problem, but the problem can be attributed not to aid program design, but to a lack of understanding of these programs.

So what aid is actually available? We took a look at the requirements for receiving federal aid to make better informed arguments about whether the way these policies were structured is likely to cause a moral hazard problem.[1] What we found is that policies and programs for giving aid to homeowners already have several provisions designed to minimize moral hazard.

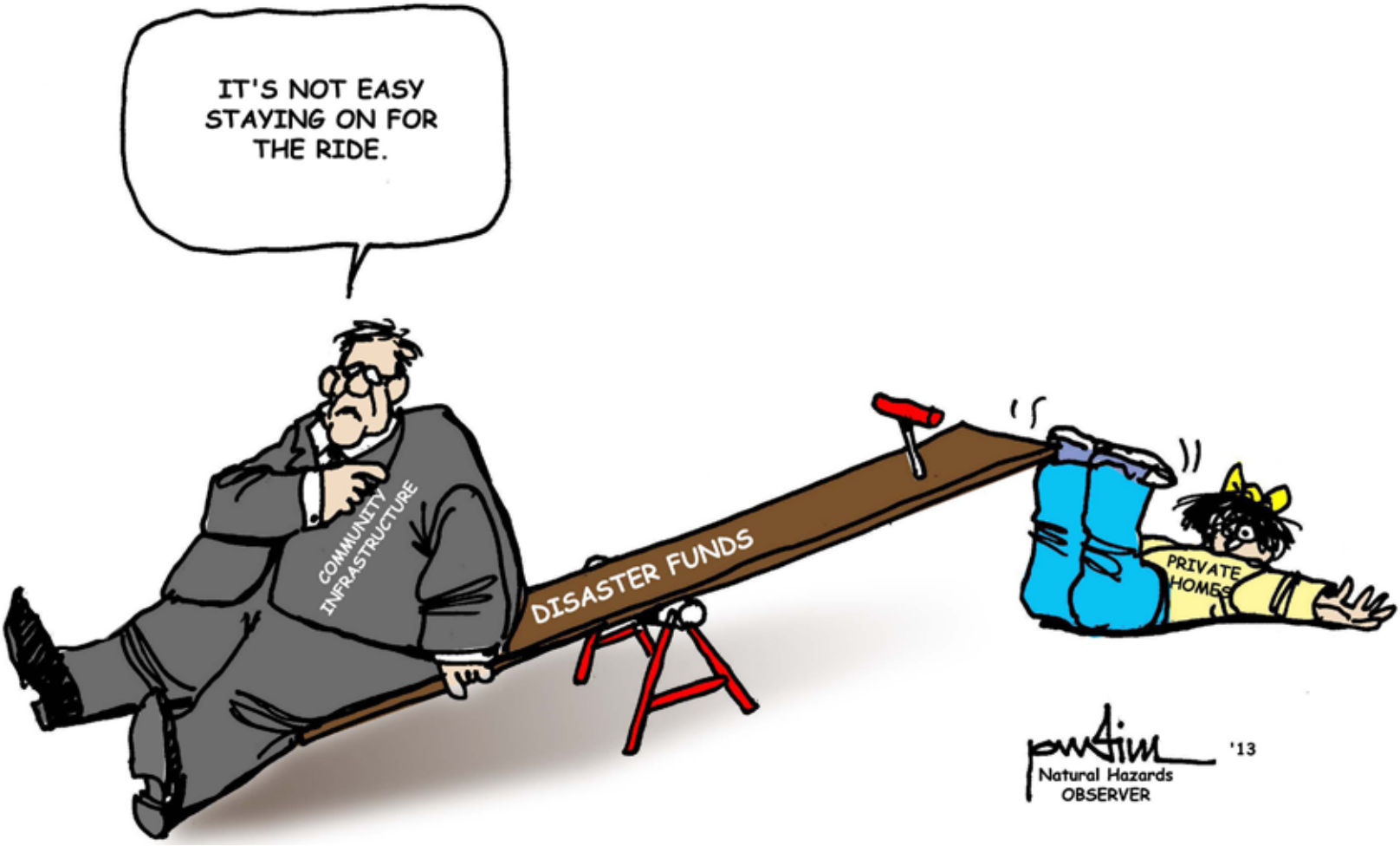
After a presidentially declared disaster, the primary form of aid to individuals and businesses is low interest loans from the Small Business Administration. Such loans are a lower burden to taxpayers than simple cash payments because the principal and some interest will be repaid. Any subsidy in the aid offered is limited to the level of the discount on the loan interest rate. Homeowners are usually first directed to the SBA for financial assistance post-disaster.

In addition, the Federal Emergency Management Agency offers grants though the Individual Assistance program for repair of damage to homes or contents (when authorized by the president). Such grants, however, have restrictions and eligibility requirements. Grants are not available for second or vacation homes or for damages insurance will cover. Both SBA loans and IA grants for flood-related disasters require the recipient to purchase and maintain a flood insurance policy if the homeowner lives in a FEMA-mapped 100-year floodplain.[2]

If a community does not participate in the National Flood Insurance Program, residents in those 100-year floodplains are not eligible for any IA. Grants have a per-household cap of $31,900 (in 2012 dollars). The cap is indexed to inflation. The average grant, however, is under $4,000. These grants are not designed to bring a structure (or contents) back to pre-disaster conditions but only to make a home safe and livable. FEMA will not provide replacement values or funds for non-essential

1 Kousky, C. and L. Shabman (2012). The Realities of Federal Disaster Aid: The Case of Floods. *RFF Issue Brief* 12-02.

2 There are other restrictions, such as aid being limited to citizens or qualified aliens and rental aid not being available to homeowners with adequate rent-free housing (such as a second home or unoccupied rental property).



items. This aid, therefore, is not enough to cover the losses of residents who have faced severe damage from an event. It will not make whole an individual who has suffered a large disaster loss.

Individuals might also receive limited aid from other federal agencies. The Department of Housing and Urban Development has some disaster programs, such as mortgage insurance. Disaster recovery costs can be deducted from taxable income so that those taxpayers who itemize deductions find their losses reduced by their marginal tax rate. For large disasters, Congress might appropriate funds to other programs. Of note, Congress has repeatedly used Community Development Block Grants to direct post-disaster assistance to stricken areas. Most often, CDBG funds are used for repairing damage to public infrastructure, future disaster mitigation, and for promoting risk resilient community economic development, not as funds for households. On a few occasions, though, local governments have used these funds to funnel more aid to households. The amounts given through CDBGs have only been substantial following Hurricane Katrina, Hurricane Ike, and now Hurricane Sandy.

Location and insurance

Two of the most frequently offered moral hazard arguments are that federal aid influences location choices and discourages insurance purchases. Based on our review of aid programs, we believe it is unlikely that the design of disaster aid programs will influence location decisions, especially by those who understand the aid programs. After a disaster, homeowners do not get "free money" to bring their properties back to pre-disaster conditions. The IA grants are small and the SBA loans need to be repaid, albeit at a lower interest rate.

Household grants from CDBG funds are rare.[3] Even if such grants are approved, the amount is uncertain, decided by each state.

Consider two situations. First, take an affluent homeowner with a million dollar property on the Florida coast. Aid as currently structured would provide very little, as a percentage of the property, should it be damaged. Affluent homeowners will also have other resources at their disposal and are less likely to count on limited aid when making a decision about investing in a property. They also will receive a much smaller interest rate discount for SBA loans. Currently the rate cap for those who can obtain credit elsewhere is 8 percent and 4 percent for those who have no other source of credit. Even if all federal aid were reduced to zero, the amenities of living on the coastline are so large it is unlikely affluent residents would be discouraged from living there.

As a second case, consider a low-income homeowner in an inland floodplain. This homeowner is living in the risky location because the flood risk has depressed land prices making the location affordable. This homeowner, too, is unlikely to make a different decision due to federal aid, since they cannot afford to live elsewhere.

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Another—and to us more plausible—hypothesis is that

3 GAO (2009). *Community Development Block Grant Program Guidance to States Needs to be Improved*. Washington DC: United States Government Accountability Office.

individuals may view disaster aid as zero-premium insurance, with payouts that compensate ex-post for damages. Since IA grants are usually limited to a few thousand dollars, however, aid cannot fully compensate for insurance. If homeowners want to be made whole following a disaster event, they must have purchased an insurance policy. More likely than IA grants replacing insurance, SBA loans could be considered by some as a substitute for insurance.[4] We have not seen a comparison of the costs of paying insurance premiums ex ante versus interest payments ex post.

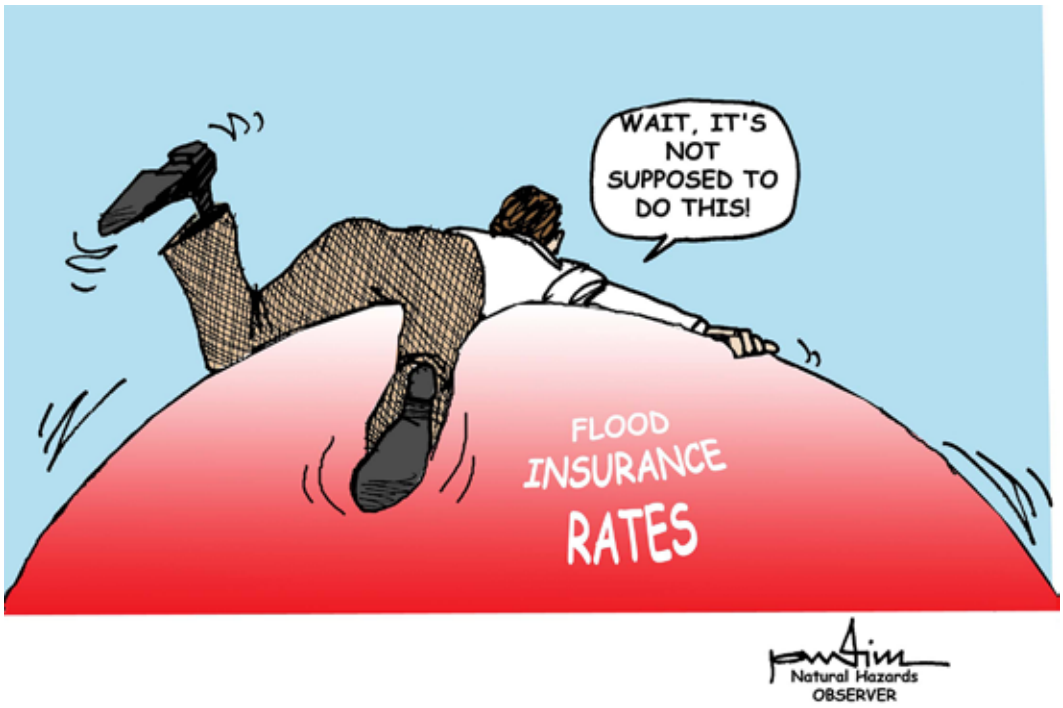
Moral hazard arguments tend to rest on the assumption that individuals are rational and have full information about the risks they face. If individuals fully understood disaster risks, however, they would be aware of the many costs of disasters not covered by aid or insurance: the suffering and worry; the time lost to recovery and rebuilding; the loss of irreplaceable items, particularly those that may carry sentimental value, such as family photographs; not to mention the possibility of injury or even loss of life. For an individual rationally evaluating alternatives, disaster aid is unlikely to be enough to offset these costs of a disaster that can never be reimbursed and that create a strong incentive to invest in risk reduction.

Further, risk research suggests that failure to insure or reduce risks is likely not due to incentive effects from aid, but rather from myopia, optimism, or budget constraints.

As mentioned earlier, we don't know what perceptions and expectations individuals and businesses may have about aid. Perceptions and expectations, as opposed to the reality of aid programs, may influence choices. The eligibility requirements on IA grants, the low cap on IA funds, and the fact that the average IA grant is fairly small are facts not widely advertised by FEMA, media outlets, or elected officials. In fact, the vast majority of FEMA documents on disaster aid we reviewed fail to mention the cap on available IA aid. Whatever the reasons for this lack of information, individual aid programs have been designed to limit moral hazard, particularly with respect to insurance. But failure to understand this reality could create the very moral hazard effects the programs have been designed to minimize.

Media and politics

If such perceptions are widespread, it suggests the National Flood Insurance Program would benefit from investing in educating homeowners about the limits to federal disaster aid and the fact that only an insurance policy will fully cover losses. We are not aware of any recent large-scale surveys asking residents in disaster-prone areas if they are aware of the cap on disaster aid, the average amount of aid given, or the fact that these are not grants to repair a property to pre-disaster conditions.[5] Data on a limited number of disasters that we have reviewed suggests the denial rate for applications can at times be around 50 percent. Many people are applying for aid and not receiving it, suggesting there may be persistent misperceptions about aid requirements.



One possible source of confusion about the realities of aid is that assistance to local governments is often in the news and the focus of the political dialogue. However, that aid is quite different from aid given to individuals. FEMA has a program called Public Assistance offering assistance for local governments to repair and rebuild damaged infrastructure and buildings, and to cover the costs of debris removal and other recovery actions. Unlike individual assistance, there is no cap on these funds and local governments may be completely reimbursed to return infrastructure and buildings to pre-disaster condition. The president, when issuing a disaster declaration, can choose to make PA funds available, IA, or both.

A 2012 GAO report found that 94 percent of declared disasters make PA available for local governments while only 45 percent make IA for individuals available.[6] While there is a PA cost-share, it can be lowered or waived. There are also not the same insurance requirements.[7] So as the news media cover debates over aid and report on large aid packages, the impression may be left that large amounts of aid go to individuals, when the dollars are for immediate disaster relief, clean-up, and to help repair local government infrastructure.

Given this review of the current requirements surround-

4 Carolyn Kousky, Erwann Michel-Kerjan, and Paul Raschky have begun empirical research on the influence of FEMA IA grants and SBA loans on ex-post insurance purchases. It will be issued as a working paper in early 2013.

5 Howard Kunreuther led a pioneering survey in the 1970s, but much has changed since that time.

6 The report also notes that FEMA's guidelines for issuing PA are based on a per capita damage indicator to proxy for a jurisdiction's ability to respond to the disaster, but that it has not been adjusted for inflation and is artificially low, leading to more PA funding being offered. (See: GAO (2012). *Improved Criteria Needed to Assess a Jurisdiction's Capability to Respond and Recover on Its Own*. Washington, DC, United States Government Accountability Office.)

7 While aid is not available to individuals living in communities that do not participate in the National Flood Insurance Program, aid to those local governments is available; even though the local government decision to not join the program denies aid to its citizens, the community can still get aid.

ing federal aid, if reducing moral hazard for individuals is the policy goal, what changes should be made? We believe that IA and other individual aid programs, as currently designed, already do much to minimize moral hazard by limiting amounts of direct grants and requiring disaster insurance. However, to make informed decisions, individuals need to understand not only the risks in their area, but also the federal programs available to them when a disaster strikes. If individuals are unaware of the requirements and limits on aid, they may make decisions based on incorrect understanding. Failure of FEMA to widely publicize the limits on aid and continual political overpromising post-disaster make it difficult for individuals to obtain the facts. This is a communication issue and not a policy design flaw, but should be addressed.

There is, however, some indication our individual aid policies may be changing and the federal government may be offering more assistance to individuals than in the past. Exceptions were made to the use of community development funds after two of the recent large disasters. The *New York Times* reported that FEMA was increasing aid amounts and waiving certain requirements after Sandy. If such trends continue, the incentive effects of IA may change.

Meanwhile, the disaster aid given to local governments could be a matter of much greater concern. Federal disaster aid to local governments, in contrast to individuals, is extremely generous. It is true that in many places the benefits of development in hazardous areas will outweigh the costs—including the expected damages from disasters. But there may be locations where the federal dollars do make a difference to decision making on the margin when communities consider where to locate public buildings and infrastructure, and whether to adopt building regulations or zoning requirements for hazardous areas.

This could especially be the case considering that private development often follows public infrastructure and investments. To minimize the incentive effects of aid to local governments, program design changes may be warranted. Such changes, however, should be based on more rigorous examination of the incentive effects from the range of programs available and circumstances in which they operate.

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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. Web links are provided for items that are available free online. Other materials can be purchased through the publisher 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**.

TORNADO

A History of Alabama's Deadliest Tornadoes: Disaster in Dixie. By Kelly Kazek. 2011. ISBN: 978-1-5962-9911-5. 128 pp., $19.99 (softcover). **The History Press**. http://historypress.net.

This short tornado thriller delivers what it promises in the title, a rundown of Alabama's worst tornado disasters, or at least those since the beginning of the 20th century—which ought to be enough for anyone. Kazek, an editor with the *News Courier* in Athens, Alabama, applies engaging storytelling skills to her subject.

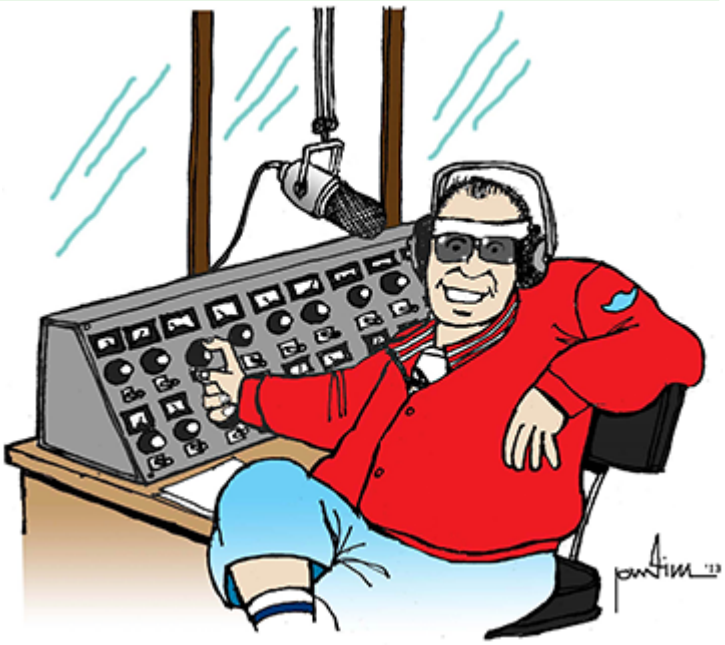
There's no lack of drama in tornado stories. Kazek doesn't try to produce a disaster manual here, but relates the human stories behind tornado tragedies. She does offer three pages of preparation advice and "myths and facts" at the end of the book.

ALL HAZARD

A Workbook on Planning for Urban Resilience in the Face of Disasters: Adapting Experiences from Vietnam's Cities to Other Cities. By Fatima Shah and Federica Ranghieri. 2012. ISBN: 978-0-8213-8878-5. 168 pp., free download. **World Bank**. https://openknowledge.worldbank.org/handle/10986/2235.

This book lets planners follow a step-by-step plan adapting the experiences of the Vietnamese cities of Can Tho, Dong Hoi, and Hanoi to develop local resilience action plans.

The steps involved include meeting with stakeholders and making them aware of the issues; conducting a technical



analysis and identifying targets; taking stock of the situation and performing a needs assessment; prioritizing those needs; and creating and implementing the plan.

The book provides insight into the work needed for producing an action plan in the face of changing conditions. It also provides references and resource material for each step along the way.

One thing the book emphasizes is that resilience is a moving target. "The experiences of the three pilot cities in Vietnam," the authors write, "have demonstrated that, to be successful, the LRAP [local resilience action plans] process needs a great deal of support, coordination, and sustained work. The process was subsequently undertaken in Iloilo, the Philippines; Ningbo, China; and Yogyakarta, Indonesia—with each city adapting the LRAP process to fit its own circumstances and needs."

They add, "The creation of a local resilience action plan is not the end of the process of improving a city's climate resilience. Completion of the plan marks the beginning of the next phase: implementation of the various actions that have been established as the highest priorities and inclusion of those actions among traditional urban planning activities. In other words, the plan is not a collection of wishes but a guide for actual change mainstreamed into a city's planning regime."

Critical Incident Management: A Complete Response Guide. By Vincent Faggiano, John McNall, and Tom Gillespie. 2011. ISBN: 978-1-4398-7454-7. 246 pp., $69. CRC Press. http://www.crcpress.com.

This is the second edition of the book, which deals primarily with terrorism and issues like workplace violence and school shootings. The book is written as a text for emergency responders, with a summary at the beginning of each chapter about what should be learned.

The authors list five types of incidents, based primarily on the level of response required. Type five needs few resources and six people. Type one requires national resources and perhaps 1,000 professionals involved.

But the authors reinforce the fact that despite the varying size of the incident, there are many common characteristics. They write, "Most interestingly, responses are generally the same regardless of the *specific nature* of the incident. It does not matter what type of incident you face. The issues described in this chapter apply equally to all, be they barricaded gunmen, hazardous-material spills, or mass-casualty incidents." (Emphasis in original.)

The guide is a thorough training tool for the rapid onset issues that most emergency managers deal with.

Hidden Impact: What You Need to Know for the Next Disaster: A Practical Mental Health Guide for Clinicians. Frederick J. Stoddard, Jr., Craig L. Katz, and Joseph Merlino, eds. 2010. ISBN: 978-0-7637-6875-1. 254 pp., $62.95 (softcover). Jones and Bartlett Publishers. http://www.jblearning.com.

Mental health professionals are important responders in disasters. An early chapter here provides a list of things that they should prepare ahead of time and do immediately before leaving to help.

The book covers everything mental health professionals might need, and it includes some cautionary tales urging them to try to look deeper into the issues surrounding disaster relief. In a chapter on common diagnoses after disaster, the authors write, "Despite your many responsibilities as a primary care clinician in the aftermath of a disaster, there are ways to efficiently screen for mental health problems, including general psychiatric assessment, suicidality, medically unexplained symptoms and bereavement."

This advice is again accompanied by checklists to aid clinicians in this effort. And as research has continually shown, lists are good.

Catastrophic Impact and Loss: The Capstone of Impact Assessment. By Kevin D. Burton. 2012. ISBN 978-1-4665-0464-6. 348 pp., $59 (hardcover). CRC Press. http://www.crcpress.com.

This is a "sister" volume to Burton's earlier *Managing Emerging Risk*, which considered risk assessment and the "wild variance found in what passes for many risk assessments today." Burton emphasizes that the current volume is not about risk, but about impacts. "Impact assessments are entirely different," he writes, "in that they inform our stakeholders about what goods, persons, or other important items *are in harm's way*." (Emphasis in original.)

Burton looks at what he calls "postmodern businesses," arguing that new approaches are needed to address the issues of impacts and loss. "Potential impacts are the true deliverables found in an impact assessment. They are subject to change, and are based on the fluid nature of business, human life, culture, and the perceptions of value to the organizations we serve," he writes.

The book is organized like a textbook. It promises that "readers who master the principles in this book will better understand the link between the potential damage of an event and how information informs every decision to prepare for, respond to, mitigate, and recover."

Impact: A History of Disasters in Manitoba. By Brock Holowachuk. 2009. ISBN: 978-1-894283-90-8. 160 pp., $29.92 (softcover). Great Plains Publications. http://www.greatplains.mb.ca.

Holowachuk is an emergency manager who has written an entertaining history of the disasters in the area in which he works. He says looking at disasters of the past can make for better present-day planning. He writes, "Emergency managers often talk about the need to record and analyze the events around a disaster, and then to share the lessons learned so the same mistakes aren't made again. But speaking candidly, most will admit that it is rarely done, and the chance to learn from what happened quickly slips away. These lessons are even harder to capture with the passage of years—memories fade, documents are lost, the people who have knowledge to share move on, and the chance to learn is lost."

Holowachuk digs through Manitoba's disaster history, from an 1826 flood level that "statistically happens only once every 667 years." Then he dishes out storms, tornadoes, heat, ice, and the region's most serious disaster, the 1918-19 influenza pandemic which "wasn't just a public health emergency; it was the most serious disaster in Manitoba's history. If measured by loss of life, response activities, and disruption to the community, no other disaster even comes close."

EARTHQUAKES

Earthquake Preparedness and Response for Nuclear Power Plants. By the International Atomic Energy Agency. 2011. ISBN: 978-92-0-108810-9. 185 pp., $67 (softcover). IAEA. http://www-pub.iaea.org.

Somewhere in every story about nuclear power the phrase "uncertain future" creeps in. A potential partial response to global warming, something always goes wrong just when nuclear power starts to look good again. The most recent setback was the Japanese tsunami. This report laconically says, "In more recent years, a number of nuclear power plants, mainly in Japan, have been affected by strong earthquakes."

This book is really a set of preparedness and response

standards for nuclear plants that provides guidance for earthquakes. "Very few national standards have been established that systematically reflect the concepts mentioned herein, particularly for those cases in which the seismic design bases are significantly exceeded … The intention of this report is to provide guidance to operating organizations in the formulations" of earthquake safety systems.

As you might expect, this doesn't make for light Saturday afternoon reading, but it provides specialists with standards to draw on for evaluating and responding to quake risks. A free copy is available for download here: http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1473_web.pdf.

WATER

Water and the City: Risk, Resilience and Planning for Sustainable Future. By Iain White. 2010. ISBN: 978-0-415-55333-9. 210 pp., $48 (softcover). Routledge. http://www.routledge.com/books/details/9780415553339.

Everybody needs water. No one wants too little water, nor too much. Water scarcity issues loom in even advanced countries—like the desert Southwest in the United States. And floods occur around the world.

This book offers students a concise discussion of the risks surrounding water scarcity, floods, planning, vulnerability, and sustainability. White writes, "Flooding is a worldwide natural event that only becomes a disaster with an interaction between either people or the built environment. The spatial nature of these sources, pathways and receptors of flood risk points toward the possibility of an integrated spatial and managerial solution. The rising amount of both flood events and socioeconomic impacts suggests that the prevailing methods of dealing with an excess of water in the city may not be as appropriate within a twenty-first-century context."

Disasters and Mine Water: Good Practice and Prevention. By Harvey Wood. 2012. ISBN: 978-1-7804-0006-8. 160 pp., $142.20. IWA Publishing. http://www.iwapublishing.com.

Mine water disasters are the sort that often make a big media splash, but then are quickly forgotten. This book remembers. It covers the issues surrounding mine water hazards and their environmental threats and consequences. It also offers modern case studies from every continent.

"The areas of mining that engender danger from water are many, and involve a range of engineering responses to deter disaster," Wood writes. "Much that the engineer is required to undertake is not state of the art or groundbreaking, but everyday, and times boring and tedious; two reasons already for accidents to occur."

CLIMATE

A Dictionary of Climate Change and the Environment: Economics, Science, and Policy. By R. Quentin Grafton, Harry W. Nelson, N. Ross Lambie, and Paul R. Wyrwoll. 2012. ISBN: 978-1-84980-387-8. 496 pp., $198. Edward Elgar Publishing. http://www.e-elgar.co.uk.

Our *Associated Press Stylebook*, which covers the whole world of publishing words, is only 427 pages long—and that includes a briefing on media law at the back. Can there really be 496 pages worth of meaningful definitions about climate change?

Apparently. Starting off with a **primer** on environmental **systems, dynamics** and **modeling**—with lots of **bold-faced** words-to-be-defined spread through the text, the authors strive for comprehensiveness. In just four pages on environmental modeling, they give us **species adapt** and **random shocks** and **antibiotics** and **Cambrian period** and **k-strategists** and a lot more.

The book covers definitions for more 3,700 words in the climate and environment field. Or so says the Edward Elgar summary of the book—we didn't count them ourselves. The authors don't pussyfoot around with their definitions. None of this climate denialist nonsense for them. Here's their definition of "**global warming**. The rise in mean global temperature due to anthropogenic emissions of greenhouse gases. Scientists believe there is a high probability that committed future warming from past emissions may already be 1.5º C above preindustrial levels. Without significant and urgent mitigation it is thought that warming will exceed the international target of 2º C, and potentially 3º C, whereupon tipping points in the climate system may initiate catastrophic climate change. Inertia and feedbacks within the climate system delays the full extent of warming from the current emissions being realized for decades and even centuries."

This is a **basic book** for anyone who works in depth with the complex issues of climate, environment, and economics.

British Weather and the Climate of Enlightenment. By Jan Golinski. 2011. ISBN: 978-0-22630-203-4. 272 pp., $27.50 (softcover). University of Chicago Press. http://press.uchicago.edu/ucp/books/book/chicago/B/bo5356649.html.

"All human experience unfolds in the dimension of time," writes Jan Golinski. "We shape accounts of our days, of events that happen to us, even of our lives as a whole, to make the passage of time meaningful for us. Experiences of the weather are also by their nature temporal. Weather is just what happens in the atmosphere as time passes."

Golinski has put together a very interesting look at the "history" of weather, primarily through British eyes. He's not interested in whether it was rainy or sunny, warm or cold, but rather examines weather and climate as intellectual constructs. He places the modernization of our ideas of weather at the time of the Enlightenment, in the 17th and 18th centuries.

Golinski frames "three strands" of argument. First, that the idea of climate was "reconceived in the eighteenth century … to normalize the weather, to reduce it to some kind of regularity." Second, that the changing British attitude toward climate was woven into the changes that were coming about as a result of the Enlightenment. And finally, that they became further aware that weather and climate were too wild to be fully accommodated into rational Enlightenment thinking.

To illustrate his points, Golinski shows us some of the occasionally eccentric observers who measured the weather. Thomas Barker, for instance, kept a virtually unbroken, twice-a-day record of the weather for sixty years—barometer and thermometer readings, rain gauge and so on. Barker also measured how fast his fingernails grew and buried a piece of flint in his garden, digging it up twelve years later to learn whether it had gotten heavier (it hadn't).

The Enlightenment quest for a more rational approach to weather has lessons for us today. "Our society's vulnerability to meteorological crises and catastrophes shows that scientific rationality has never completely mastered the natural environment," he writes. "Hence, the weather has come to bear the burden of some of our most profound concerns about modern society, its past transgressions, and its future prospects."

Contracts and Grants

Below are descriptions of some recently awarded contracts and grants related to hazards and disasters.

Constraining slip distribution of the Cascadia Subduction Zone offshore Central Oregon with seafloor geodesy. National Science Foundation grant #1249876. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1249876. Three years. $313,211 to principal investigator, C. David Chadwell, University of California-San Diego, cchadwell@ucsd.edu.

This project initiates geodetic measurements of plate motion in the Cascadia subduction zone. Three sites off the Oregon coast, one on the incoming plate to measure relative plate motion and two on the continental slope to measure motions related to fault motions and deformation will be monitored for horizontal displacement at the centimeter scale.

These will be the first offshore monitors of upper-plate Cascadia motion and fault behavior. This work will lead to a better understanding of earthquake and tsunami risk in Cascadia. It implements a new autonomous approach to data collection. It places permanent benchmarks on the sea floor so that monitoring can continue into the indefinite future.

Investigations of the impact of Superstorm Sandy on the South Shore of Long Island. National Science Foundation grants #1322835, #1322784, and #1322746. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1322835. One year. Three grants. $18,220 to principal investigator, Beth Christensen, Adelphi University, christensen@adelphi.edu, and $22,415 to principal investigator, Cecilia Gonzalez-McHugh, CUNY Queens College, cmchugh@qc.cuny.edu, and $30,360 to principal investigators, Roger Flood, and Bruce Brownawell, SUNY at Stony Brook, roger.flood@sunysb.edu.

Superstorm Sandy had historic impact on the New York and New Jersey coastlines. This project will assess the effect of Sandy in estuarine and shallow coastal environments, focusing on the western bays and Jamaica Bay.

The project will leverage pre-existing geophysical and sedimentological data collected prior to the storm, and will complement a related field program planned by investigators at the University of Texas Institute for Geophysics. Previously sampled sites will be reoccupied for sediment sampling (gravity and box cores, grab samples) and textural and geochemical tracer analyses.

Multibeam bathymetry will be collected in previously surveyed areas and will cover a new ebb-tidal delta system and smaller estuarine channels. These data will be combined with transport indicator and debris field mapping to evaluate the pathways and mechanisms of sediment transport during Superstorm Sandy.

Examining the climatology of extreme storms in the Northeast United States and putting Hurricane Sandy in context. National Science Foundation grants #1313867 and #1313859. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1313867. One year. Two grants. $34,987 to principal investigator, Ning Lin, Princeton University, nlin@princeton.edu, and $25,168 to principal investigator, Jeffrey Donnelly, Woods Hole Oceanographic Institution, jdonnelly@whol.edu.

This work will lead to a better understanding of Hurricane Sandy by placing it in the context of the regional paleohurricane record.

To compare Hurricane Sandy with past storm events, the project will conduct numerical surge and wave modeling, as well as textural analyses of Sandy-related and paleo-overwash deposits. This work will leverage previous surge modeling and paleo-overwash studies to develop a more comprehensive paleohurricane record for the New York/New Jersey/Connecticut area.

Cross-scale assessment of spatiotemporal patterns and drivers of fire effects in mixed-severity fire regime forests of the Northern Rockies. National Science Foundation grant #1302233. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1302233. Two years. $15,983 to principal investigators, Thomas Veblen, and Cameron Naficy, University of Colorado at Boulder, Thomas.Veblen@colorado.edu.

This project is about the influence of climatic variability and topographic gradients on the spatial and temporal variation of landscape patterns of fire severity from the 1700s to the present. Both fire frequency and the annual area burned are strongly related to regional climate, which has exhibited increasing trends over recent decades in relation to global warming.

However, the ecological effects of increased fire activity are not clearly understood. As a measure of tree mortality, fire severity directly describes one of the major ecological impacts of wildfires. But how sensitive fire severity is to climatic factors or other controls (i.e. topographic factors, vegetation characteristics) is poorly understood.

Because fire severity in many forest ecosystems varies over both space and time, long time series of fire severity that quantify spatial patterns of heterogeneity are necessary. This is especially true for forests characterized by mixed-severity fire regimes where fire severity is known to be highly variable.

This research will adopt a spatially explicit nested research design combining intensive tree-ring sampling, extensive analyses of historical high resolution aerial photography and satellite-based change detection methods to address three primary research goals: (1) to quantify the spatiotemporal variability of fire severity within multiple watersheds from about 1700-present; (2) to evaluate the strength of climatic and topographic controls on landscape patterns of fire severity; and (3) to compare fire severity patterns between historical and contemporary wildfires to assess the role of climate change on fire regime shifts between the two periods. These questions will be examined for Douglas fir dominated forests and mixed-conifer western larch dominated forests, two of the dominant low-middle elevation forests in the northern Rocky Mountains known to exhibit mixed-severity fire regimes.

Spruce beetle and wildfire interactions under varying climate in the Rockies. National Science Foundation grants #1262691 and #1262687. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1262691. Two and a half years. $170,000 to principal investigator, Dominik Kulakowski, Clark University,

dkulakowski@clarku.edu, and $169,991 to principal investigator, Thomas Veblen, University of Colorado at Boulder, Thomas.Veblen@colorado.edu.

This research project examines relationships between outbreaks of spruce bark beetles and wildfire activity in coniferous forests of the Rocky Mountains. Coincident with warmer temperatures, since the early 1990s synchronous outbreaks of native bark beetles have been occurring throughout coniferous forests of western North America from Alaska to the U.S. Southwest. Extensive tree mortality caused by bark beetle outbreaks is triggering major changes in forest landscapes and their associated ecosystem services.

This project will address the following questions about interactions between wildfire and spruce beetle outbreaks under varying climate and their consequences for ecosystem services: (1) How does climatic variation affect the initiation and spread of spruce beetle outbreaks across complex landscapes? (2) How does prior disturbance by windstorm, logging, and fire affect the subsequent occurrence and severity of spruce beetle outbreak? (3) In the context of a recently warmed climate, how do spruce beetle outbreaks affect forest structure and composition? (4) How do spruce beetle outbreaks affect fuels and potential wildfire activity under varying climatic conditions? (5) How will climate change and the climate-sensitive disturbances of wildfire and spruce beetle activity affect future ecosystem services in the subalpine zone of the southern Rocky Mountains under varying scenarios of adaptive forest management?

The first four questions will be addressed through empirical research, including extensive tree-ring reconstructions of past disturbances, re-measurement of permanent forest plots, field measurements of effects of spruce beetle outbreaks on fuels, fire behavior modeling, and spatiotemporal analyses of the spread of recent spruce beetle outbreaks. The fifth question will be examined through simulation modeling of future forest conditions and their consequences for key selected ecosystem services, including biodiversity, wildlife habitat, and resilience to environmental change.

The project will contribute to understanding of fire-beetle interactions under varying climate conditions and their consequences for ecosystem services.

The 2012-2013 eruptions of Copahue Volcano, Argentina. National Science Foundation grant #1331167. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1331167. One year. $28,273 to principal investigator, Johan Varekamp, Wesleyan University, jvarekamp@wesleyan.edu.

Volcanic eruptions impact global climate, geothermal energy is derived from volcanic heat, and many ore bodies are formed through volcanic processes. Active volcanism provides a direct means to study how our planet functions.

Copahue volcano in Argentina started a new eruption on December 22, 2012 and is still active at a low level today. This volcano emits compositionally extreme hydrothermal fluids that derive directly from a very acid and hot magmato-hydrothermal system at one to two kilometer depth. Such fluids are thought to be responsible for epithermal ore deposits, e.g., gold, silver and lead and may overlay systems that form porphyry ore bodies.

The composition of these fluids changes with the state of activity of the volcano. Shallow intrusions lead to hotter and more concentrated fluids that are expelled into the ambient and acidify local rivers and lakes. Monitoring the composition of such streams during a period of volcanic activity aids in developing tools for eruption forecasting.

Data collected on fluids during the 2000 eruption of Copahue suggested several parameters that indicate the intrusion of shallow magma prior to an eruption. The 2012-2013 eruptive period provides an ideal venue to test and refine these ideas. A large glacial lake that is stratified during the austral summer contains compositional information of the pre-eruptive fluids in the bottom waters, whereas the surface waters represent recent inputs. It is imperative to sample the lake prior to its seasonal overturn in late April, when the water column homogenizes and all detailed information is lost.

Virginia's volcanoes: A window into eastern North America mantle processes. National Science Foundation grants #1249438 and #1249412. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1249438. Three years. Two grants. $81,485 to principal investigator, Elizabeth Johnson, James Madison University, johns2ea@jmu.edu, and $271,612 to principal investigator, Esteban Gazel, Virginia Polytechnic Institute and State University, egazel@vt.edu.

The recent 5.8 Mw earthquakes in Mineral, Virginia, impacted major metropolitan areas on the East Coast of the U.S. and sparked a need to better understand the geologic characteristics the of eastern North America margin (ENAM). A group of more than 100 volcanic bodies approximately 47-49 million years old exposed in Virginia and West Virginia are the youngest known eruptions on the East Coast of the United States.

These magmas and the fragments of rock they collected from the crust and mantle during their ascent and eruption are the only direct samples of the crust and the mantle in recent geologic times. The results from this study will be used in conjunction with data from the EarthScope Transportable Array of seismometers currently being deployed along the East Coast as well as other seismic studies to create a comprehensive picture of the state of the crust and mantle underneath the Eastern United States, providing context for the potential of future seismic hazards.

Few constraints currently exist on the composition and structure of the asthenosphere and lithosphere under the ENAM. Geochemical and petrologic data are critical for interpretation of seismic data in the region and understanding the long-term, continued evolution of the rift-to-drift transition for ENAM, as well as for rift margins worldwide.

A swarm of Eocene volcanic bodies exposed in Virginia and West Virginia are the youngest known magmatism in the Eastern United States and are the only petrologic window into Cenozoic processes in the mantle and lower crust in ENAM.

We hypothesize that: (1) the Eocene magmas were generated through adiabatic melting of shallow asthenosphere (e.g., lithospheric delamination, edge-driven convection, or effects from deep subduction); and (2) melting is related to the lithospheric response to the breakup of Pangaea and/or Farallon subduction that continued under this passive margin at least through the Eocene.

We will test these hypotheses with an array of geochemical, spectroscopic, and petrologic observations and modeling. Geochronology of the melts and basement xenoliths will evaluate melting processes, constrain the structure and evolution of the lithosphere, and evaluate the age of the volcanic activity relative to the age of the xenoliths. The EarthScope Transportable Array is currently being deployed along the

East Coast through 2013 and the location of our project lies within the "Richmond Transect" proposed for concentrated seismic studies. Our data will produce a vertical cross-section deep into the ENAM that will provide important constraints on basement and mantle composition, lithospheric and asthenospheric structures, and volatile contents for large-scale geodynamic and seismic studies.

Developing the next generation of cost-effective high performance damping systems for seismic and wind hazards mitigation. National Science Foundation grant #1300960. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1300960. Three years. $200,691 to principal investigator, Simon Laflamme, Iowa State University, laflamme@iastate.edu.

High performance damping devices for structural systems should be robust, reliable, and deliver large damping force to be effective at mitigating earthquake and wind loading impact. A semi-active modified friction device using technology of drum brakes has a potential of providing large damping force under small velocity of the structural system movement. It is proposed to develop such a device in a laboratory and assess its performance under dynamic loading. If the laboratory model is found to be viable, a prototype can be fabricated in the future to perform large scale testing for its efficacy in practice.

The research will: (1) construct a laboratory scale modified friction device; (2) characterize its dynamic behavior; and (3) assess its cost-effectiveness for use as dampers in multistory buildings. The key components of the device are robust drum-brake technology and battery-based semi-active control. The laboratory tests will involve assessing relationship between the damping force at varying control inputs and movement of the structural system. Effectiveness of the damping device in building frames under earthquake and wind loading will be pursued numerically. Analyses will be performed to assess cost-effectiveness of the device.

The dynamics of hurricanes. National Science Foundation grant #1250966. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1250966. Three years. $513,649 to principal investigator, Wayne Schubert, Colorado State University, waynes@atmos.colostate.edu.

Researchers will apply a combination of theory, numerical models, and analysis of existing observations to advance understanding of a number of key aspects of hurricane dynamics. The investigators contend that fundamental understanding of underlying atmospheric dynamics has come primarily from studies with balanced models and potential vorticity dynamics.

The approach will be to examine data with guidance from the basic dynamical concepts developed in theoretical and numerical work. There will be coordinated examination of a number of specific topics that include: (1) Warm ring thermal structure; (2) balanced wind and mass fields and their relation to eyewall slope; (3) hypersensitivity of intensification rates to eyewall position (as a diabatic heating source relative to the zone of highest inertial stability); (4) Burger's shock structures produced by strong radial inflow in the hurricane boundary layer; (5) lower-stratospheric structure above a hurricane; and (6) inadequacies of the Saffir-Simpson scale.

This research will also address a significant issue, viz. the need for improved physical understanding and forecasts of mechanisms leading to rapid changes in the intensity and resulting societal impacts of hurricanes.

Featuring EarthScope in coastal Cascadia earthquake and tsunami hazards education by linking teachers, interpreters, and emergency managers. National Science Foundation grant #1250822 and #1250563. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1250822. Three years. Two grants. $69,136 to principal investigator, Beth Pratt-Sitaula, Central Washington University, psitaula@geology.cwu.edu, and $40,585 to principal investigator, Robert Butler, University of Portland, butler@up.edu.

The same geological forces that form the spectacular beaches and headlands of the Pacific Northwest also threaten lives and infrastructure with earthquakes and tsunamis. This project, known as the Cascadia EarthScope, Earthquake, and Tsunami Education Program (CEETEP), helps to mitigate the effects of these potential disasters through collaboration building and professional development for K-12 teachers, park and museum interpreters, and emergency management outreach professionals in communities along the Oregon and Washington coast.

The March 11, 2011 great earthquake and tsunami that devastated Japan has heightened public concern about similar geologic hazards in our own country. As part of a nationwide effort, the NSF EarthScope Program has been deploying hundreds of seismic, GPS, and other geophysical instruments to measure movement of the Earth's crust and detect earthquakes along the Cascadia Subduction Zone. These instruments provide detail for ongoing research showing that coastal regions are storing energy that will be released in the next great Cascadia earthquake, with the resulting tsunami arriving onshore in 30 minutes or less.

NSF and other organizations have compiled a list of Earth Science Literacy Principles that the educated public should know and appreciate (http://www.earthscienceliteracy.org). CEETEP, by drawing on EarthScope observations and results, especially helps to convey three of these concepts to students and the public: "Earth scientists use repeatable observations and testable ideas to understand and explain our planet;" "Earth is continuously changing;" and "Natural hazards pose risks to humans."

Tens of thousands of Oregon and Washington residents live within severe earthquake-shaking and tsunami-inundation zones. Millions of tourists visit state and federal parks in these same areas each year. Teachers in the K-12 school systems convey some basics about geological hazards to their students, and park rangers and museum educators likewise engage visitors at their sites. Both of these groups also at times work with emergency managers. CEETEP is strengthening these efforts by providing community-based workshops that bring together all of these professionals to review the basic science of earthquakes and tsunamis, learn about EarthScope and other research efforts that monitor the dynamic Earth in the region, and develop ways to collectively engage students and the general public on the mitigation of coastal geologic hazards.

The CEETEP effort involves geoscience educators from Oregon State University, Central Washington University, and the University of Portland. From 2013 to 2015, approximately eight workshops are being conducted in coastal communities of Oregon and Washington. Participating K-12 teachers and park interpreters are learning about ongoing research on Cascadia plate tectonics, earthquakes and tsunamis, and about

how EarthScope is advancing frontiers of knowledge about geologic hazards in the region.

Emergency management outreach leaders are also training the participants on emergency preparedness actions. Master teachers offer pedagogical guidance and ideas about assessment and interaction, while experienced interpreters discuss how to reach a variety of audiences in settings outside the classroom. This exchange of pedagogies among educators facilitates their collaboration and helps them communicate common messages about the science and mitigation of Cascadia geohazards. In follow-ups, the teachers and interpreters showcase how they have crafted their new knowledge into Earth science and emergency preparedness learning experiences for K-12 students and visitors to parks and museums.

Observations of physical impacts following Hurricane Sandy. National Science Foundation grant #1312813. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1312813. One year. $27,910 to principal investigators, Robert Weiss, and Jennifer Irish, Virginia Polytechnic Institute and State University, weiszr@vt.edu.

Hurricane Sandy made landfall near Atlantic City, New Jersey, on October 29th 2012. Sandy was classified as a Category I hurricane. However, a non-tropical weather system merged with Sandy and created a unique situation that resulted in catastrophic damage along the shores of New Jersey and New York.

The surges produced by Hurricane Sandy resulted in record damages in built and natural environments in New York and New Jersey. Hurricane Sandy provides the unusual opportunity to observe and collect information for the purpose of comparing sedimentary deposits resulting from storms versus those originating from recent tsunamis.

The research will focus on New Jersey and New York due to the magnitude of the impact and severity of the damages. Reconnaissance surveys will measure flood elevations and inundations of the storm surge, which are similar data collected during tsunami reconnaissance field surveys. This is important in designing protective infrastructure for either or both and for deciphering in the stratigraphic record whether there is a key signature for distinguishing tsunami from storm deposits.

Assessing the effects of risk interdependency, social norms, and costs on homeowners' wildfire mitigation decisions using choice experiments. National Science Foundation grant #1259448. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1259448. Three years. $298,045 to principal investigators, Hannah Brenkert-Smith, and Nicholas Flores, University of Colorado at Boulder, hannahb@colorado.edu.

Homeowners' decisions in fire-prone areas play a crucial role in shaping wildfire occurrence and impacts. These decisions are interdependent: each household's actions can affect the choices of neighbors. This study explores two pathways linking homeowners' choices: risk interdependency (i.e., the fact that the risk that any individual faces is affected by the level of mitigation on neighboring properties) and social norms (specifically, the possibility that comparative information highlighting high levels of mitigation among neighbors may encourage households to increase their mitigation levels).

The research involves a web-based survey of homeowners living in fire-prone areas of Colorado's Western Slope to measure the effects of risk interdependency, social norms, and costs on risk reduction decisions. The approach combines both observational and experimental data collection in order to separately identify the influence of risk interdependency and social norms messages on hazard mitigation behavior.

Specifically, the survey instrument involves both: (1) observational data on current knowledge, risk perceptions, and practices; and (2) choice experiments that vary neighbors' mitigation levels, social norms messages, and costs in order to assess the impact of these factors on wildfire mitigation behaviors.

The intellectual merit of this project lies in the integration of two strands of research that have separately pursued the understanding of risk interdependency and social norms. The use of choice experiments also overcomes the challenge of purely observational studies, in which it is difficult to separate causal social effects from other explanations for common patterns of behavior within social groups, such as shared characteristics or influences. At the same time, the observational data puts the experimental results in context and helps to inform the data analysis and policy recommendations.

In the past 10 years, areas throughout the United States have incurred increased economic and social costs due to wildfire. In the face of increasing wildfire hazards, action at multiple scales is required to effectively reduce fire risk. In particular, individual homeowners play a central role through the actions they take (or do not take) to mitigate wildfire risk on their private property.

This study contributes to a growing body of knowledge on the factors that shape wildfire-related behaviors by homeowners in fire-prone areas. More specifically, by focusing attention on the ways in which households can influence each other in the face of wildfire risk, the results can help to inform policies that harness the power of social norms to increase private mitigation actions in the face of interdependent risk.

The research tests whether a program giving homeowners social comparison messages (e.g., "You are doing less wildfire mitigation than 75 percent of your neighbors.") could induce behavior change. The insights gained can provide direct feedback to forest and fire managers currently engaged in community outreach, potentially informing the design of programs aimed at reducing wildfire risk.

Conferences and Training

April 30 to May 2, 2013
Great Lakes Homeland Security Training Conference
Michigan Emergency Management and Homeland Security
Grand Rapids, Michigan
Cost: $350

This conference will discuss a wide range of homeland security responsibilities, such as school security planning, cyber security programs, emergency healthcare credentialing, and lessons learned from Hurricane Sandy. Topics include business continuity in disaster recovery, smart phones as mobile toolboxes for emergency preparedness and response, public health response to radiation emergencies, and partnerships for preventing and managing school emergencies.

http://1.usa.gov/XMBnJ6

May 8-10, 2013
Preparedness, Emergency Response, and Recovery Consortium
Chesapeake Health Education Program
Orlando, Florida
Cost: $500

This conference will provide up-to-date disaster preparedness, response, and recovery training. Topics include evacuation decisions and implications, objective risk assessment methodologies, the role of social media in disaster, mental health intervention for disaster response, volunteer integration, preparedness and emergency response for children with special health care needs, healthcare facility workplace violence, emergency preparedness in rural areas, and incorporating the Hospital Incident Command System into healthcare emergency management programs.

http://www.perrc.org/

May 19-22, 2013
Emergency Public Health and Disasters Conference
Southwest Regional Public Health Training Center
Torrance, California
Cost: $475

This conference will discuss the public health consequences of natural and intentional disasters with and emphasis on the impacts of Hurricane Sandy. Topics include public health perspectives of Hurricane Sandy, community partnerships, measuring and assessing preparedness, climate change, and community resiliency.

http://emergencypublichealthconference.com/

May 19-23, 2013
World Environmental and Water Resources Congress
American Society of Civil Engineers
Cincinnati, Ohio
Cost: $820

This conference will discuss economic stresses, developing technologies, and emerging requirements in water management. Topics include decision support tools for drought monitoring and forecasting, advances in rainwater capture and reuse, emerging contaminants in groundwater, past floods, alternate water supply planning, and hazardous, toxic, and radioactive waste.

http://content.asce.org/conferences/ewri2013/call.html

May 20-22, 2013
Seventh National Seismic Conference on Bridges and Highways
Federal Highway Administration, Caltrans, and others
Oakland, California
Cost: $550

This conference will focus on teaching engineers best practices for mitigating earthquake damage to bridges and highways. Topics include the design and use of seismic isolation bearings, post-earthquake repair and recovery, performance-based seismic design, liquefaction, lateral spreading, and ground movement, tsunami loads and design, multi-hazard design, monitoring bridge performance in extreme events, and innovative technologies and materials for improved bridge resilience.

http://www.7nsc.info/

May 21-22, 2013
Aid and International Development Forum
Aid and International Development Forum
Washington, D.C.
Cost: Free

This forum will discuss challenges faced by the aid and development sector after disaster. Topics include post-disaster coordination of shelter, water, and sanitation, halting the spread of malaria and other diseases, innovations in humanitarian relief, using social media to improve disaster preparedness and crisis response initiatives, and building state capacities to reduce disaster risks.

http://www.aidforumonline.org/

May 27 to June 1, 2013
National Professional Development Symposium
U.S. Fire Administration
Emmitsburg, Maryland
Cost: Free

This symposium will discuss fire service safety culture, first responder safety training, and subjects such as fire operations and prevention, emergency medical services, higher education, and technology. Sessions will focus on residential sprinklers, pipeline safety education, alternative fuels and electric vehicles, promoting educational programs, mobile learning for higher education, and the Geospatial Location Accountability and Navigation System for Emergency Responders.

http://www.usfa.fema.gov/nfa/higher_ed/feshe/feshe_conf.shtm

May 28-31, 2013
Floodplain Management Association National Conference
Australian Floodplain Management Association
New South Wales, Australia
Cost: $1,149

This conference will examine lessons learned from recent major floods. Topics include better land use planning,

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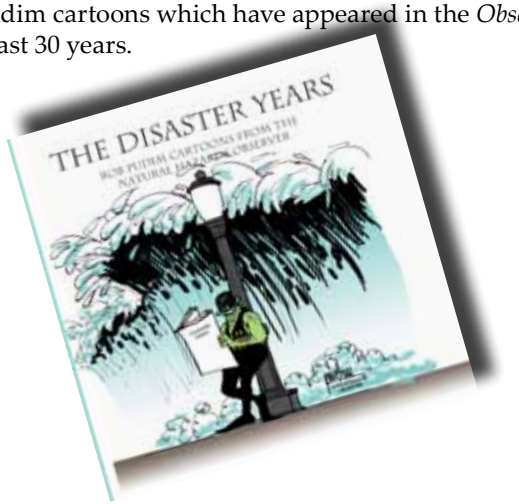

disparities in flood information across jurisdictions, how to determine acceptable risk, managing flood risk through statutory planning, and developing and maintaining flash flood warning systems.

http://www.floodplainconference.com/

May 29-31, 2013
Australian and New Zealand Disaster and Emergency Management Conference
Disaster Management Conference
Brisbane, Australia
Cost: $799

This conference will discuss post-disaster psychological and physical problems, as well as community ability to prepare for and recover from disasters. Topics include managing animals in disasters, current trends in emergency management education, the role of local government in business recovery, trauma and disaster mental health mitigation, national response to jurisdictional emergencies, decision support systems for evacuation planning, and New Zealand's first public alert system with mobile apps.

http://anzdmc.com.au/

June 2-4, 2013
Emergency Communication Conference
Emergency Media and Public Affairs
Brisbane, Australia
Cost: $1,387

This conference will discuss pre- and post-disaster planning and communication between emergency management, public and private sectors, non-governmental organizations, and communities. Topics include the safety benefits of public-private partnership, community engagement campaigns, community behavior modification, media and emergencies in the United States, the future of social media and emergency management, and Auckland's cloud-based public alert system.

http://www.emergencymedia.org.au/site/conferences_2013.htm

June 9-14, 2013
ASFPM 2013 Conference
Association of State Floodplain Managers
Hartford, Connecticut
Cost: $605 before June 1

This conference will look at improvements that can be made in flood risk management and national policy. Topics include Risk MAP communication challenges, community-funded mitigation programs, coastal risk communication, modeling stormwater management, community outreach and social media, sea level rise planning and adaptation, dam and levee management tools, and post-disaster damage assessment tools.

http://www.asfpmconference.org/

June 23-26, 2013
World Conference on Disaster Management
World Conference on Disaster Management
Toronto, Canada
Cost: $790

This conference will discuss a wide range of topics related to risk management, resilience, and recovery. Topics include crisis management simulations, catastrophic incident planning, mitigation of concentrated risk, ethics in emergency management, reputation management during critical incidents, critical steps in post-disaster recovery, and public-private partnerships in recovery and reconstruction.

http://bit.ly/XMEfWy

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