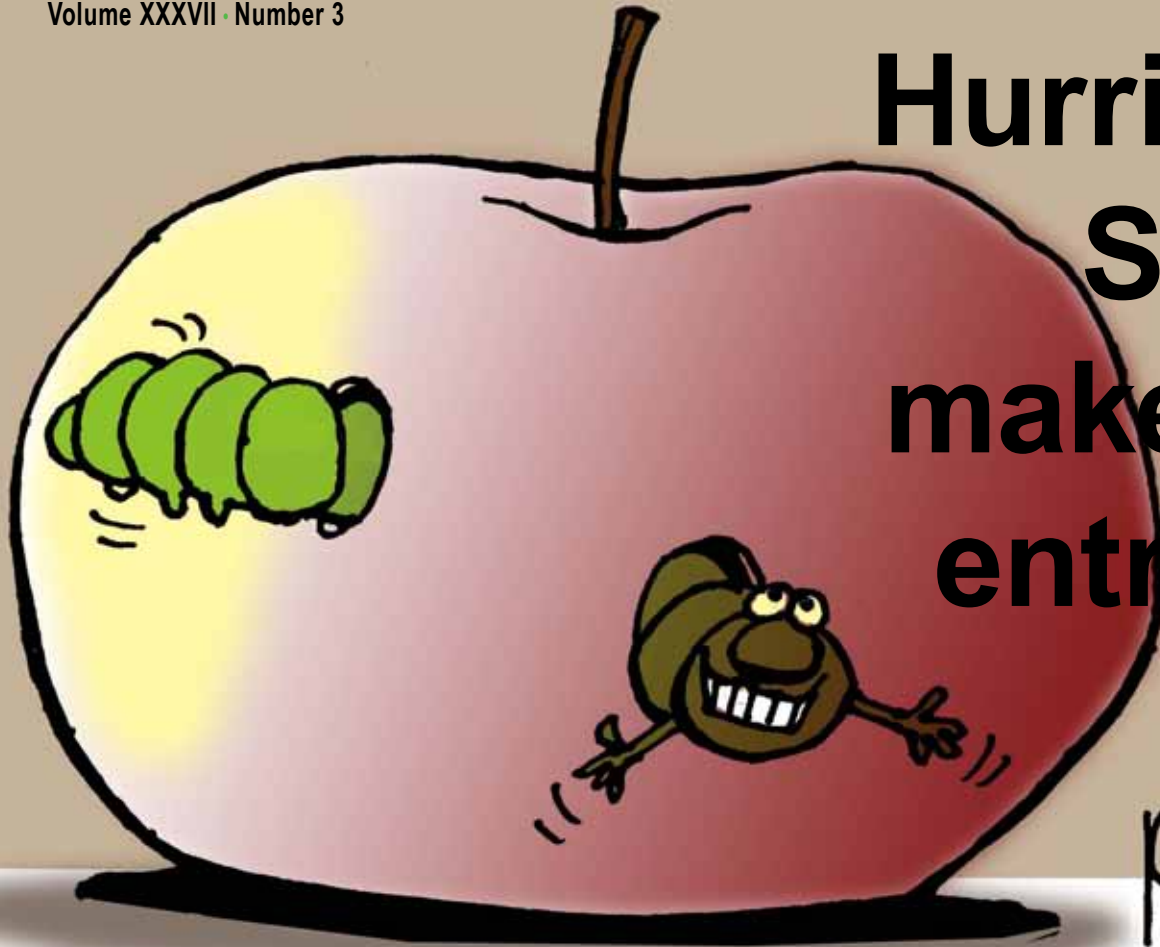


Hurricane Sandy makes an entrance



pmj '13
Natural Hazards
OBSERVER

An invited comment by Gavin Smith

HURRICANE SANDY PROVIDES THE LATEST ILLUSTRATION of the vulnerability of our coastal communities and supporting physical infrastructure. The fact that Sandy struck major population centers along the eastern seaboard not only heightened this reality, but it also dramatizes a number of pre-event conditions that lead to largely predictable disasters.

These include coastal construction techniques that do not comply with codes and standards to better account for known flood hazard exposure, a massive investment in urban infrastructure in known flood hazard areas, and dense urban settlements in these same locales.

Sandy caused 121 deaths. Damage estimates are still coming in, but New York claims \$71 billion in damage, New Jer-

sey, \$36.8 billion. The cost to insurance companies is expected to be between \$10 billion and \$20 billion. The Obama administration is asking for \$60.4 billion in federal aid. Two New York senators are also asking for billions of dollars in tax breaks for Sandy victims.

In the face of these issues—which are germane to many coastal cities across the United States—there are a number of effective risk reduction tools that exist, but remain underutilized. Now is the time to more fully recognize the policies and plans we have at our disposal to confront what may be the defining issue of the 21st century—adapting to a changing climate.

(Please see "Sandy," page thirteen)

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

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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 **January 31, 2013**.

Letters

Lapsed plans? Oh my!

Dear editor:

I was very impressed with the “FEMA fine-tuning hazard mitigation planning” article written by Ann Patton and Edward Thomas in the November *Observer*. Obviously, the timing, post-Sandy, could not be more appropriate.

According to the article, “Since 2000, when the planning program was launched, more than 26,000 jurisdictions have developed their own plans, covering approximately 90 percent of the nation’s population.”

However the preceding paragraph says, “More than 19,000 local jurisdictions are now represented by FEMA-approved hazard mitigation plans, covering 70 percent of the nation’s population.” The footnote seems to clarify the difference in these two numbers by saying, “It should be noted that some local plans have lapsed, and many are involved in current updates.”

Really?

7,000 plans have lapsed or are involved in current updates? Yet the “IG [inspector general] said no further audit is needed for hazard mitigation planning at this time.”

I don’t know about you, but 7,000 lapsed plans or current plans being updated (which means they are probably late in their update cycle) worries me enormously.

Let’s get serious here—only six percent of the \$1.7 billion FEMA granted for hazard mitigation was granted for HM planning, yet “research has shown that the both state plans and local plans vary greatly in quality and effectiveness and often do not include effective land use measures; some research questions whether states are effectively encouraging local jurisdictions to include land use management in their plans.”

Please excuse me if I jump up on my soap box and wave my big red flag!

Until HM planning becomes more than just a prerequisite for HM funding (which is diminishing by the day, I might add), the nation is going to continue to have plans that “vary greatly in quality and effectiveness and lack inclusion land use management in their plans.”

Until HM dollars are awarded in direct proportion to effective HM planning (HM planning that includes land use, safe development measures, etc.—or better still, planning that includes HM into the entire regulatory process within the government—such as all development related codes, building codes, storm water management regulations, and other regulatory processes), we are going to continue to have plans that “vary greatly in quality and effectiveness and lack inclusion land use management in their plans.”

HM Planning has to be more than a paperwork exercise—it has to be a way of life within a community—otherwise federal dollars will continue to be misspent in numerous communities across the United States (for ineffectual HM planning—plans that sit on a shelf and gather dust, but have met the requirement for HM funding!) and not be spent effectively in communities where that money can do the most good—in communities that work every day to reduce repetitive losses

to all hazards, to improve health, safety and welfare for its citizens, to promote and regulate sound development, and where sustainability and resiliency are at the forefront of everything that is being done within the community.

Whew! Glad I got that out of my system!

Again, this was a great article—I hope you get the space to do a follow-up once the HM Planning Committee White Paper is ready for the public.

Terri L Turner
Augusta, Georgia

DHS keeps me up at night

Dear editor:

In the excellent article in the November 2012 *Natural Hazards Observer*, the authors of the “What Keeps Me Up

At Night” quote Department of Homeland Security grants personnel as stating, “Well, if we throw all grants together and compete, natural hazards cannot get funded because it is subject to the 9/11 Act which says if there is no terrorism link it does not get funded.”

First, not all grants have been thrown together. And second, reading the 9/11 Implementation Act (which can be found by clicking on the key statutes section of the Vacation Lane Blog found at <http://www.vlg338.blogspot.com/>) in full text, one finds in section 101 of that statute a laundry list of grant programs specifically exempted from its application. This is in plain English and DHS grant officials are simply wrong.

William R. Cumming
Reedville, Virginia

On the Line

Turning up the heat on climate change

Reports paint dire picture of warmer world

FOR THOSE WHO WORRY ABOUT THESE things—which didn’t seem to include U.S. presidential candidates—there hasn’t been much good news on the issue of climate change.

In mid-November, the World Bank issued *Turn Down the Heat: Why a 4°C Warmer World Must be Avoided*, a report whose title succinctly summarizes its contents. The report says that even if countries fulfill all of their existing emissions reductions targets, mean temperatures could increase to as high as 4°C–0.8°C above pre-industrial levels. This is at the highest range of estimates made in the most recent reports from the Intergovernmental Panel on Climate Change.

“No nation will be immune to the impacts of climate change,” the report says in its executive summary. “However, the distribution of impacts is likely to be inherently unequal and tilted against many of the world’s poorest regions, which have the least economic, institutional, scientific, and technical capacity to cope and adapt.”

Turn Down the Heat then lists the usual litany of likely hazards—impacts on tropical ecosystems, sea level rise, increases in tropical cyclones, increasing aridity and drought, water cycle changes, more heat waves, ocean acidification, and so on.

A report from DARA, a Spanish nongovernmental orga-



nization, and the Climate Vulnerable Forum, *A Guide to the Cold Calculus of a Hot Planet*, outlines some of the ways these hazards are already playing out in less developed countries. “This report estimates that climate change causes 400,000 deaths on average each year today, mainly due to hunger and communicable diseases that affect above all children in developing countries ... Continuing today’s pattern of carbon-intensive energy use is estimated, together with climate change to cause 6 million deaths per year by 2030, close to 700,000 of which would be due to climate change.”

Climate change has already cost the world economy about

1.6 percent of annual world gross domestic product, the report says. This percentage will double by 2030, the report says.

These trends are also generally confirmed by a late November [paper](#) in the journal *Environmental Research Letters* by Potsdam Institute for Climate Impact Research's Stefan Rahmstorf and colleagues. Comparing projections with observations, they found, "Global temperature continues to increase in good agreement with the best estimates of the IPCC ... The rate of sea-level rise of the past few decades, on the other hand, is greater than projected by the IPCC models. This suggests that IPCC sea-level projections for the future may also be biased low."

Sea level is rising 60 percent faster than the IPCC estimated in its most recent report. The IPCC projected a rate of two millimeters per year, but the actual satellite recorded rate is 3.2 mm per year, the report says.

What to do, what to do? Two geoscientists say its already too late to curb greenhouse gas emissions to reach temperature targets. In a [paper](#) in *Nature Climate Change*, Jasper Knight of Wits University in South Africa and Stephan Harrison of the UK's University of Exeter argue, "At present, governments' attempts to limit greenhouse-gas emissions through carbon cap-and-trade schemes and to promote renewable and sustainable energy sources are probably too late to arrest the inevitable trend of global warming."

The scientists say that efforts are better directed toward adaptation to the impacts of climate change. Knight and Har-

ison say that policy makers are currently focused on carbon caps instead of earth system impacts that will have larger long-term effects on sustainability, biodiversity and food security.

Research by two scientists from the National Center for Atmospheric Research, Kevin Trenberth and John Fasullo, also suggests that we're now looking at—eventually—the high end of projected temperature increases. "Climate model projections showing a greater rise in global temperature are likely to prove more accurate than those showing a lesser rise," the scientists said in a news release. The reason for this is the way that clouds are included in scientific models of climate. Models which most accurately captured moisture processes and clouds are the ones that have predicted the greatest amount of warming.

For the last 10 or 15 years, an informal goal has been to limit the temperature increase caused by the changing climate to two degrees C above pre-industrial levels. These recent reports would tend to indicate that this goal will have to be abandoned for a higher one. The World Bank says, "Despite the global community's best intentions to keep global warming below a 2°C increase above pre-industrial climate, higher levels of warming are increasingly likely. Scientists agree that countries' current United Nations Framework Convention on Climate Change emission pledges and commitments would most likely result in 3.5 to 4°C warming. And the longer those pledges remain unmet, the more likely a 4°C world becomes."

The fire this time

Dry U.S. conditions likely to spark more big fire seasons

2012 WAS A BIG YEAR FOR WILDFIRES. Colorado's Front Range saw the two most destructive wildfires in its history. In all, 56,000 fires burned 9.1 million in the United States in the first 11 months of 2012, according to the [National Climatic Data Center](#).

The year didn't set a new record. It was only the second worst fire year of the 13 years that NCDC has kept records—2006 holds top honors, with 9.5 million acres burned. The number of fires in 2012 was the least on record, but the number of acres burned per fire was the [most](#) since 2000.

These data are not an outlier. NCDC says its climate models predict "drier conditions likely will cause increased fire activity across the United States in the coming decades."

"Climate models project an increase in fire risk across the U.S. by 2050, based on a trend toward drier conditions that favor fire activity and an increase in the frequency of extreme events," NASA Goddard Space Flight Center scientist Doug Morton told the American Geophysical Union's fall meeting in San Francisco.

These fires can have unexpected consequences. Also at the AGU, Ohio State University geography professor Jason Box said that satellite observations have shown the first direct evidence of smoke from Arctic wildfires drifting over the Greenland ice sheet "tarnishing the ice sheet with soot and making it more likely to melt under the sun," according to a news release.

Earlier, researchers found a six percent drop in reflectivity of Greenland's ice over the last decade. Box says this may be enough to bring the entire surface of the ice sheet to the melting point each summer—as it did in 2012.



New data on Chernobyl leukemia cases

Low-level radiation risk takes center stage

Workers who cleaned up at the 1986 Chernobyl nuclear power plant accident had a significantly higher risk of developing leukemia than the unexposed population, according to new research.

The health risks included a greater-than-expected number of cases of chronic lymphocytic leukemia, which in the past scientist did not believe was a consequence of radiation exposure.

The paper, "Radiation and the risk of chronic lymphocytic and other leukemias among Chernobyl cleanup workers" by University of California-San Francisco researcher Lydia Zablotska and colleagues, appeared in the November 8, 2012 online version of *Environmental Health Perspectives*.

The researchers found 137 cases of leukemia among the 111,000 workers in the study, with 16 percent attributable to radiation from Chernobyl. According to a UCSF release on the paper, "The results may help scientists better define cancer risk associated with low doses of radiation from medical diagnostic radiation procedures such as computed tomography scans and other sources."

Leukemia isn't the only risk from low-level radiation. The National Research Council of the National Academies also released a report on the first phase of its plan assessing cancer risks for people who live near nuclear facilities.

The research is being done in two phases. This first report identifies "scientifically sound approaches for carrying out an assessment of cancer risks associated with living near a nuclear facility." As with all things nuclear, the NRC found that the issue is not straightforward.

Challenges include the fact that there is little solid data available on cancer mortality at levels lower than a county. There is also little data about nuclear effluent releases. Finally, people move and it is hard to track them down.

The NRC looks at several study designs, each of which has strengths and weaknesses. They consider risk-projection models, ecologic studies, cohort studies, and case-control studies. NRC says, "Case-control studies can involve contacting subjects to collect residential history and lifestyle information through interviews and questionnaires. Such studies would need to be limited to recently diagnosed cancer cases ... and would likely be subject to additional selection and information biases. There are added difficulties in obtaining appropriate approvals from the cancer registries before subjects could be contacted. However, such studies can also be carried out without subject contacts by using information from birth and other administrative records."

Finally, they say, radiation dosage estimates can be ob-



tained from data on effluent releases, direct exposure and meteorology.

Given the difficulties, the NRC recommends cautiously proceeding with ecologic and case control studies. However it cautions, "The statistical power of epidemiologic studies of cancer risks in populations near nuclear facilities is likely to be low based on currently reported effluent releases from those facilities. Moreover, the magnitude of the variation of other risk factors that may not be measurable such as smoking or exposure to medical radiation may surpass the expected effect from the releases of the nuclear facilities and therefore overwhelm the actual effect attributed to the releases."

They Said It ...

"Perhaps the most troubling problem ... is that only a tiny share of enrolled properties accounts for a giant share of the overall claims, as the properties are repeatedly flooded and rebuilt in low coastal regions and in hurricane flight paths. One Biloxi, Miss., property valued at \$183,000 flooded 15 times over a decade, costing the program \$1.47 million, according to federal data provided by the agency to a member of Congress. Another in Humble, Tex., has resulted in over \$2 million in flood payouts even though it was worth just \$116,000."—the *New York Times*, November 12, 2012, on the underfunded federal flood insurance program after Hurricane Sandy.



The way forward

Overcoming barriers to disaster risk reduction

An invited comment by Justin Moresco and Lori Peek

ONE MYTH OF DISASTER RISK REDUCTION is that knowledge alone leads to action. The thinking goes something like this: an agency publishes an updated hazard map—Web-based, multicolored, and interactive—expecting it to dissuade people from living in dangerous areas. Or, a consultant offers an impassioned presentation on personal preparedness, anticipating the talk will spur the audience to race home to assemble disaster survival kits. Or, a team of academics releases its latest study, assuming the findings on expected losses, death, and suffering will shock politicians into action.

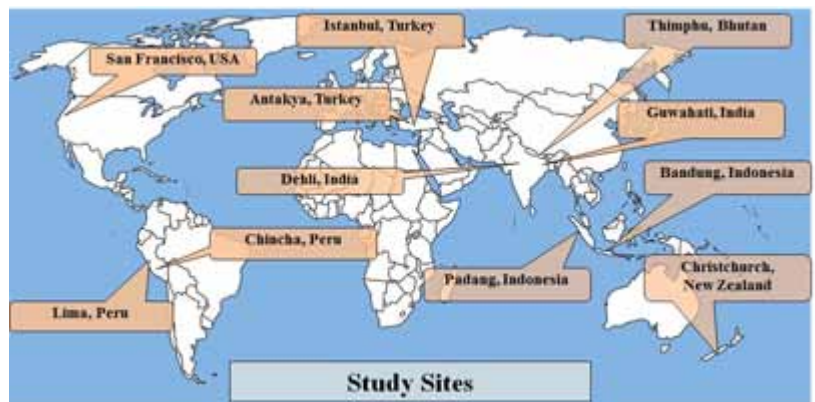
If only it were that simple. The road from knowledge to action is a long, rocky path. Even when qualified individuals have the information and tools at hand for making themselves and their communities safer from natural hazards, many obstacles can hinder progress.

Today, we have more accessible data, more technology, and more research on hazards and social and physical vulnerabilities than ever before. But in many parts of the world, disaster losses continue to rise. It's not a simple "lack of understanding" or "dearth of knowledge" that holds otherwise sensible people back from preparing for catastrophic events. Other obstacles are in the way. Understanding these barriers to action will equip the natural hazards community to design more effective interventions.

Barriers revealed

THIS PAST SUMMER, GEOHAZARDS INTERNATIONAL and Colorado State University's Center for Disaster and Risk Analysis completed an 18-month study commissioned by the Global Earthquake Model Foundation that investigated, among other things, the barriers practitioners encounter in promoting and implementing earthquake preparedness and mitigation measures. Team members traveled to 11 cities in seven coun-

tries, including: Antakya and Istanbul, Turkey; Bandung and Padang, Indonesia; Chinchá and Lima, Peru; Christchurch, New Zealand; Delhi and Guwahati, India; San Francisco; and Thimphu, Bhutan.



By the close of the study, team members had interviewed and surveyed 133 practitioners working in five sectors: government, business, health care, education, and grassroots organizations. The research team focused on these because each plays a crucial role in promoting a culture of safety. The interview and survey participants held diverse positions, with job titles and responsibilities that included, among others: government hazard analysts, identifying hazards within cities or districts to inform land use policies; emergency planners, implementing preparedness measures in school districts or hospitals; and program coordinators, leading nonprofits' efforts to help vulnerable populations reduce earthquake risk in their homes and local communities.

Delhi, India, one of the cities that our team visited, is home to 16.7 million people. Government officials there esti-

mate that nine out of every 10 buildings in the city are at risk of moderate to severe quake damage. Make no mistake: city leaders know that they are living in a seismically active location, which could suffer widespread destruction in a quake.

Yet M.P. Sanjani, a retired government official in Delhi, was representative of many of the study's respondents in describing how difficult it is to move from awareness into action. He said:

"If you will allow me to be brutally frank, we are very good at planning, but when it comes to implementation, we tend to be lethargic. The main problem is that immediately when the government took office, and we prepared a national road map, I advised the states to prepare state road maps [for earthquake risk reduction]. But not much attention is paid to these aspects unless you are also hit by a major disaster. And that is true when you go down to the community level also, because when you hold different types of programs at the community level, it is not taken with that much seriousness, for the simple reason that the other problems of immediate nature, like poverty, unemployment, health issues, they are staring at them. Therefore, they look at a possible earthquake or cyclone, which will come once in 10 years or 20 years or may even not come in their lifetime, that gets relegated in importance."

As our team traveled from city to city, talking to preparedness and mitigation experts across a range of geographic and social contexts, we heard them outline a complex array of technological, social, political, historical, and economic barriers to action. These barriers, which were frequently described as tightly interconnected, often delayed or completely derailed preparedness and mitigation efforts. Although it was overwhelming to consider the numerous challenges facing these cities at risk, it was valuable to learn more about the barriers. It explained why even informed individuals or well-funded organizations may be unable to adopt practices to make them safer from looming threats.

Hakan Uslu, civil engineer and owner of Sigma Construction Test Laboratory in Antakya, Turkey, knows firsthand that knowledge does not necessarily lead to action. In 2002, Uslu opened the first construction materials testing lab in Antakya, an ancient Mediterranean city of more than 200,000 people located in a region with a history of strong earthquakes. When he started his business, Uslu discovered that nearly half of the concrete and steel that he tested did not meet the country's minimum strength standards. Government officials were not taking steps to improve the situation.

Uslu himself pushed for change. He documented his find-

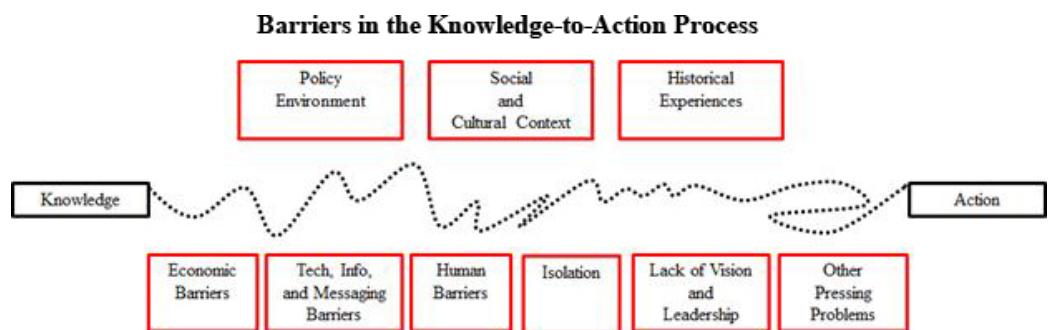
ings, sending report after report to the government enforcement agency. He published brochures describing the shortcomings of poor materials. He passed these out to construction workers, engineers, and building owners. After several years of his effort, the government began its own testing, demanding that building owners submit material testing reports before it would issue building occupancy permits. Today, Uslu says, 97 percent of the concrete and steel he tests meets Turkey's minimum standards.

Uslu's story illustrates that the knowledge-to-action process often entails multiple steps over a long period. Problems must be identified. Information must be gathered. Funds must be allocated. Sometimes new tools must be developed. Government officials and others must be convinced of the value of change. Potential users must be persuaded to adopt vital technologies, and to change entrenched behaviors.

Barrier upon barrier

OUR PROJECT TEAM ASKED TWO OPEN-ENDED QUESTIONS ABOUT barriers during the interviews in each of the eleven cities: (1) What barriers have emerged in the course of designing and implementing your earthquake program? (2) Have you changed anything about the program itself or your overall strategy to try to address these barriers? These questions were followed by a series of open-ended questions meant to draw out more detailed responses.

Every respondent discussed barriers in his or her interview, referring in total to 49 barriers to achieving earthquake risk reduction. The project team categorized these 49 barriers into nine "meta-themes"—for example, economic barriers, historical experiences, and policy environment—which emerged from analysis of the interview data. The meta-themes are shown in the graphic below. Only six of the 49 total identified barriers directly relate to technical or specialized knowledge. The remaining 41 barriers—which range from limited funding to weak leadership, from a lack of dedicated mitigation champions to an emphasis on profit over long-term safety—are largely or entirely created by conditions unrelated to technical know-how.



In addition to collecting data through qualitative interviews, our team administered a brief survey to assess respondents' perceptions of barriers to earthquake risk reduction. We developed a list of potential barrier items based on a review of the research literature about obstacles to effective disaster preparedness and mitigation. The survey asked participants to specify whether the listed barrier item was a "minor barrier," "major barrier," or "not a barrier" in their professional risk reduction activities.

The table below shows a lack of money was most commonly cited as a major barrier to earthquake risk reduction

action. More than half (53 percent) of the respondents in our study indicated this was an obstacle. Additional common major barriers included: other pressing social and economic problems that divert attention from preparedness and mitigation (50 percent indicated that this was a major barrier); a lack of available personnel to work on such projects (47 percent); and lack of technical expertise (46 percent).

The least common problem was a lack of interest among colleagues. Slightly more than a quarter of respondents (27 percent) cited this as an impediment to action. Perhaps most important, more than half of all respondents indicated that all nine items on our survey list were either minor or major barriers.

Our team found respondents in lower-income countries reported a greater number and intensity of barriers than did respondents in higher-income countries.

What does it all mean?

NO EXISTING RESERVE OF INTELLIGENCE, POWER, OR WEALTH could remove all of the barriers that impede preparedness and mitigation action in the cities our project team visited. But does that mean that we should throw up our hands in despair? Absolutely not.

Change is possible. Along with the disheartening stories that the team heard about disaster risk reduction challenges and setbacks, we listened to inspiring reports of small successes, incremental movement, and in some cases, tremendous leaps forward in earthquake preparedness and mitigation.

So what did we learn about overcoming barriers to disaster risk reduction?

- **Acknowledge the presence of barriers to risk reduction.** Seek to understand how they affect action (or inaction) in your organization or community.
- **Don't try to do everything at once.** Barriers are most likely to be overcome through focused action and incremental change.
- **Understand that disasters are focusing events.** The most important factor driving risk reduction programs was the occurrence of a disaster in or nearby the respondent's home community. Practitioners should strategize about how to use events in other cities, re-

gions, or countries as motivation to overcome barriers within their own organizations or communities, then push to implement those strategies when focusing events occur.

- **Be inclusive.** Engage stakeholders across sectors like government, business, education, health care, grassroots groups, and beyond. If you are working within an organization, then collaborate with representatives from different groups or departments. If you are working at the city level, reach out to civic groups, trade associations, organizations with technical expertise, and government agencies. Listen to differing opinions, appeal to different values and interests, and gain support—and overcome pockets of resistance—by including stakeholders in your efforts to reduce earthquake risk.

- **Make risk reduction activities—or at least, a consideration of the existing natural hazards risks—part of normal operating procedures of an organization or city government.** This is easier said than done, but risk reduction advocates have a better chance of overcoming barriers when they have a formal, recognized channel through which to advocate for change.

A final vignette

SAN FRANCISCO, HOME TO MORE THAN 800,000 PEOPLE, has embarked upon an ambitious, long-term plan to make its residents and visitors safer from earthquakes. Many factors contributed to make risk reduction a priority. The city has a widely recognized high seismic hazard and a relatively recent history of large, destructive earthquakes. At the same time, San Francisco has local experts in science, engineering, and policy making; highly capable and dedicated mitigation champions in the public and private sectors and in local nonprofits; nearby universities conducting cutting-edge research related to earthquakes; and a tax base that any mayor could love.

Yet San Francisco's residents and thousands of daily commuters and visitors are still living at risk, mostly because of older, vulnerable buildings constructed before modern seismic codes were in place. A study published in 2010 and carried out by the Applied Technology Council for San Francisco estimates that 27,000 buildings, or about 17 percent of the city's total stock, would be unsafe to occupy after a magnitude 7.2 earthquake offshore along the San Andreas Fault. Between 200 and 300 people would die. About 7,000 would be seriously injured. The cost for owners to repair or replace their damaged buildings, excluding damage to contents, could exceed \$30 billion. One would think, given these estimates, that city leaders would act swiftly, pushing through whatever measures are necessary to make San Francisco more resilient.

Even in San Francisco, though, many barriers to action exist. Laurence Kornfield, San Francisco's former chief building inspector and one of the city's key figures advocating for earthquake risk reduction, explains: "Of course the main barrier from the city's point of view is competing priorities. The earthquake could be in five, ten, or twenty years. We've got potholes to deal with today. Come back next year, and we'll think about it. That's a huge barrier."

To overcome this and other barriers, the Community Action Plan for Seismic Safety project—which produced the study previously cited and a policy road map to reduce earthquake risk in San Francisco, among other noteworthy

Major Barriers to Earthquake Risk Reduction

Barrier Item	Rank
Money	1
Other social/economic problems	2
Lack of available personnel	3
Lack of technical expertise	4
Lack of interest among the public	5
Lack of earthquake information	6
Other serious hazards	7
Time	8
Lack of interest among colleagues	9

Note: 1 = most common barrier, 9 = least common barrier.



results—spent almost 12 years convening diverse stakeholders on a monthly basis to air grievances, talk through differences, and arrive at a consensus on how to move forward. With agreement finally reached, San Francisco has turned to action on the recommendations and has developed a 30-year work plan, which Mayor Ed Lee considers a priority for the city. San Francisco aims to complete these measures by 2042.

Kornfield says, “Of course the one everybody says is, ‘I can’t afford it.’ I say, ‘What can you afford?’ They say, ‘Whatever it is, I can’t afford it.’... I kind of think about this as a herd of antelope in the African savanna. There [are] always a couple of antelopes lagging, and they’re the ones who are going to get taken first. So we want to do that. We want to break it down into small enough bites, so the herd will accept the [costs].”

Kornfield, and the many other risk reduction experts and champions whom we interviewed, taught us so much about the need for focus, expertise, dedicated resources, and perseverance in the face of potentially devastating losses.

Justin Moresco is a project manager for GeoHazards International, a California-based nonprofit with offices in Delhi, India, and Thimphu, Bhutan. He can be reached at moresco@geohaz.org.

Lori Peek is an associate professor of sociology and co-director of the Center for Disaster and Risk Analysis at Colorado State University. She can be reached at lori.peek@colostate.edu.

The study on which this article is based is available free from www.globalquakemodel.org/needs-drr-practitioners.

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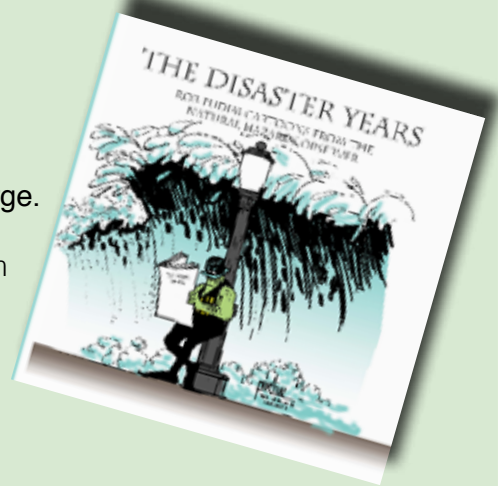
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So what do we really learn from experience?

An invited comment by Joe Scanlon



WHEN CARLETON UNIVERSITY's Emergency Communications Research Unit received funding for quick response research in the early 1970's—at the time the unit was studying how rumors spread in the wake of a dramatic incident—it began by visiting a number of smaller cities in Atlantic Canada and northern Ontario. Unsure of how their student researchers would be received, ECRU's directors decided it was sensible to explain how they would operate should something untoward happen in those communities.

One community was North Bay, Ontario. Within a year two incidents—the murder of a police officer and a building explosion—occurred there. ECRU responded to both as well as to a devastating wind storm in Sydney, Nova Scotia. When ECRU shared its wind storm report with the chief of police in North Bay, Bill Wotherspoon, he noted that one problem in Sydney had been that few gasoline pumps were connected to generators. North Bay was building a new police station. After reading the Sydney study, Chief Wotherspoon ordered a change in plans. Gas pumps were to be hooked up to the emergency generator.

Sydney had also learned from its experience. In the wake of the wind storm, power crews had trouble responding because of downed trees. Work crews had trouble clearing the trees because they were entangled with downed power lines. They were uncertain if it was safe to proceed. Sydney decided that in future, whenever there was a wind storm warning, power and works vehicles would share each others garages so they could operate together.

There was a similar learning experience in Hamilton, Ontario, when the various agencies assembled to review emergency planning and, while doing so, discussed the problems

of dealing with a snow emergency. They decided one aspect of their response would be to place a police car, an ambulance, and a snow plow at every fire station. The plow could keep clearing the roads in that area and could lead the other vehicles to any nearby emergency.

Change is hard

BUT SIMILAR EXAMPLES OF LESSONS LEARNED are hard to find. When David Etkin and Niru Nirupama of York University in Toronto surveyed emergency managers in Ontario in 2009, they were told there was need for a "lessons learned library." Those same emergency managers were critical of the federal and provincial governments "for not implementing into policy 'lessons learned' nor collecting and disseminating lessons learned from communities' disasters."

When Bill Anderson recorded his findings for his Ph.D. from the 1964 Alaska earthquake, he did find some changes based on experience, but they were of very short duration. He said that, given the magnitude of the earthquake, "It is somewhat surprising to note the limited extent of actual long-term changes associated with it."

Published research suggests Anderson would reach similar conclusions today. One of the rare publications on this subject, by Amy Donahue and Robert Tuohy, was titled, "Lessons we don't learn: A study of the lessons of disasters, why we repeat them." I said almost exactly the same thing in a chapter for an online book on Canadian emergency planning. "The Canadian disaster story is one of lessons learned and lessons promptly forgotten," I wrote. "We have ... noted the lessons that it should teach us. But we have put aside or forgotten what we have learned."

In fact—except for the examples quoted above—I could only find one other case when a government seized upon an incident and used it to force major changes. That was in Australia when a newly-elected prime minister, in the wake of a massacre at the former prison colony of Port Arthur, persuaded the states to tighten their gun laws.

Of course there is one aspect to “learning” that can lead to an inappropriate response. That is when what Bill Anderson called a “disaster subculture” develops. That means persons who have to deal with periodic threats respond to the next threat on the assumption their previous behavior will again be appropriate. Unfortunately one flood or one hurricane is not necessarily like a previous one. A well-developed subculture can lead to tragedy.

The problem is not that communities always stick to inappropriate plans when emergencies occur. In fact the opposite is often true. On September 9, 2001, four Newfoundland communities—St. John’s, Gander, Stephenville, and Goose Bay—faced the same emergency at the same time—scores of diverted flights. All had similar plans. But each operated differently, in line with local resources and local conditions.

In January, 1998, the Regional Municipality of Ottawa-Carleton discovered there were gaps in its emergency plan when it had to cope with enormous power outages and other problems caused by a seemingly never-ending ice storm. The municipality quickly adjusted its plan and filled those gaps. I am sure a review of the U.S. experience would reveal many similar situations.

Nor is the problem that communities don’t share their experience so others can learn. It is common in the wake of a major incident for those involved to tell others about their experience. After a November, 1979, train derailment and toxic spill in Mississauga, Ontario, which led to 217,000 people being evacuated, Peel Regional Police officers Chris Silverberg

and Barry King found themselves devoting a great deal of their time sharing Peel’s experience. Both later became police chiefs partly, perhaps, because of their excellent performances in explaining how Peel managed the evacuation. There are many similar examples.

The problem is that we don’t know whether Peel’s experience—even though it was widely shared—led to Peel and others changing their plans. The town’s officers for example stressed that Peel had been very open with the media. They also reported that during the evacuation crime was not a problem. Crime rates actually fell. Did this lead other police forces to be more open with the media and to reduce their concentration in emergencies on anti-social behavior such as looting? Probably not.

Is there learning from experience? The fact is, we don’t know. No one has gone back to communities to see if lessons learned have been applied. And the problem is not just a local one. When Kathleen Tierney testified before the U.S. Congress she said, “It is astonishing that so much has been invested and so many initiatives have been launched in the area of emergency management without systematic research on program effectiveness.”

She was discussing the American experience since 9/11, but her comments have equal validity to Canada and, in my opinion, every other country.

When I contacted others asking where I could find studies that documented that lessons aren’t learned, they could not provide references. It appears very few researchers have gone into a community during an untoward incident to document lessons learned and then returned, perhaps six months to a year later, to see if those lessons learned were incorporated into training, education and planning. Perhaps lessons are being learned and we’re simply unaware of it—though I doubt it.



What sort of lessons need learning?

FOR THE MOST PART THEY ARE THE BASIC LESSONS that Henry Quarantelli and Russell Dynes and their students have been finding for more than half a century: people don’t panic when they hear warnings; survivors are not dazed, confused, and in shock, but help others; that looting does occur but it is rare; and so on.

Knowledgeable people usually find it disturbing to read misguided reports about looting. These were reported after Hurricane Katrina, for instance, though most were corrected later. Other reports also leave a false impression. For example, in the wake of Katrina, investigations turned up hundreds of cases of fraud. Most were successfully prosecuted. There was fraud and many fraudsters were convicted, but the reports left the impression that victims were cheating the system. One of my researchers reviewed every case we could find. We found only two cases where a



Is there learning from experience? The fact is, we don't know. No one has gone back to communities to see if lessons learned have been applied.

victim actually tried to cheat the system. All the others were about people who were not victims but saw a criminal opportunity. Some of those who sought and got benefits were in jail and others were in California when the storm struck.

There is also the continually troubling discovery that most plans assume an emergency will occur at a single location or site, that response will proceed in a predictable manner. The site will be immediately controlled by police. Firefighters will deal with fires, spills, and heavy rescue. Ambulance personnel will triage the injured, getting them to hospitals in appropriate proportions. As anyone who has studied a tornado or hurricane or earthquake knows, this is not what happens.

There is also the important finding that the initial response to widespread destructive events is done by ordinary people, by survivors (including injured survivors) and by passersby. These people are the true first responders. What they do affects the response by others. Hospitals for example need to recognize that the first injured to arrive at emergency will be the least injured. These victims will be brought there by ordinary citizens, sometimes on foot, sometimes in private vehicles. In Tokyo after the sarin gas attack a television crew stopped shooting visuals and transported victims to hospital.

This fact—that ordinary people play a significant role in emergency response—is not just ignored but resisted. I was

appalled when I was asked to comment on the emergency plan for an American city only to discover that the plan stressed that ordinary citizens must be prevented from taking part in the response. It was reassuring therefore to discover that Amsterdam with leadership from the fire department is not only stressing that plans must include the role of ordinary citizens but is even doing emergency exercises in which the first responders are not police, fire, or ambulance but whoever happens to be around when the staged incident occurs.

Bill Anderson's writings about the 1964 Alaska earthquake documented the role of ordinary citizens in the response. "The [hospital] disaster plan was also changed to permit the use of some patients as volunteers during emergencies under the direction of hospital personnel," He wrote. "This change also reflected the earthquake experience in the patients proved to be a valuable resource at that time. "They performed as messengers, stretcher bearers, janitors, elevator operators, dietary helpers, and general straightener-uppers."

A book by historian Scott Knowles, *The Disaster Experts*, examines the failure of research to create conditions which reduce losses from disasters. In his conclusions, Knowles wrote: "Research into disasters matters, it has real human and economic repercussions and when the research is productive but cannot influence disaster policy ... then we have failed to live up to our obligations as social scientists."

I believe he is correct: the failure to get social science findings accepted and adopted into planning is a failure by all of us who do disaster research. The challenge today is not so much to establish what happens in various types of emergencies – we know a lot about that. It is to convince those who plan for and respond to emergencies that this research is relevant and that they should pay attention to it when doing planning and when responding.

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Sandy ...

(Continued from page one)

Hurricane Sandy and its subsequent damage cannot be definitively tied to global warming. Scientists are reluctant to attribute a single event—even one as dramatic as Sandy—to climate change. But it is indisputable that one of the most powerful manifestations of a changing climate is the effect a warming world has on the occurrence and severity of natural hazards. Key changes include increases in high precipitation events, increases in extreme heat and drought, rising sea levels, and possibly more intense hurricanes. Our coastal communities represent the front line of the disaster management/climate change adaptation challenge. A large proportion of our human settlements are located along the coast, but their design reflects the climate of the past.

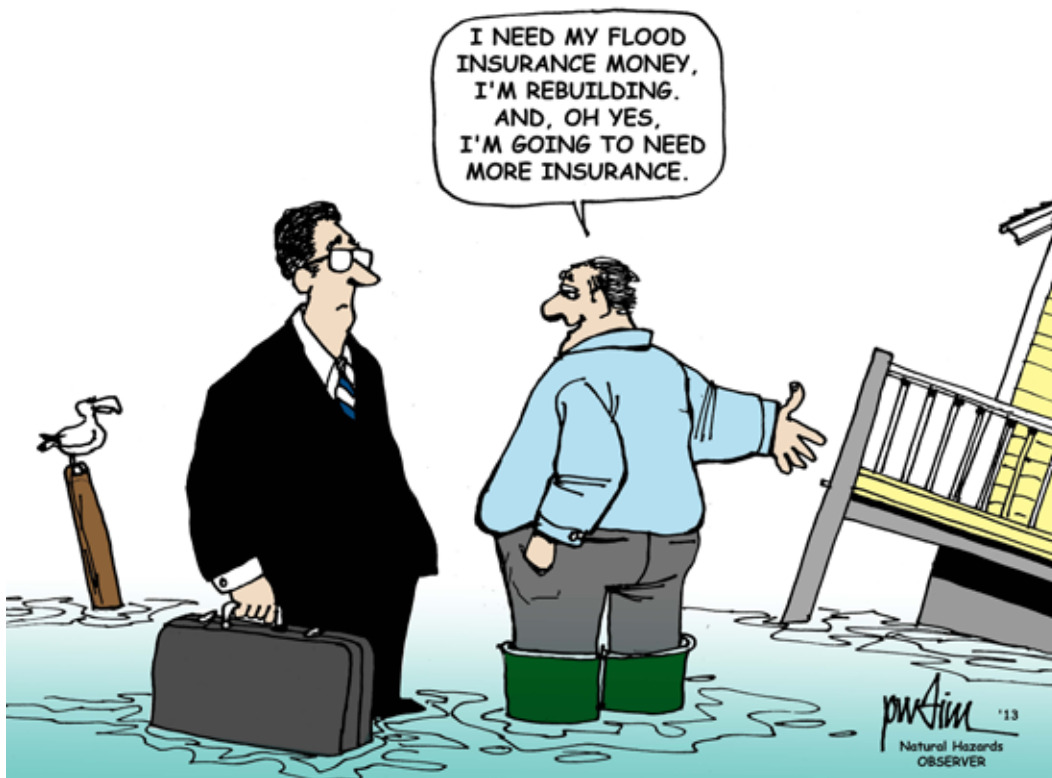
The good news is that coastal communities across the United States have disaster management policies and plans in place that can be used to reduce their vulnerability to both episodic extreme events like hurricanes, as well as slow on-set disasters like sea level rise. Important challenges remain,

however, as an evaluation of the policies and plans that are intended to reduce natural hazard vulnerability and inform the rebuilding of communities in the aftermath of disasters are inadequate. Nor do these policies and plans effectively address climate change.

Hazard mitigation plans

In order to alter the long-standing trend of increased disaster losses, we need to improve state and local pre-event planning and policy making to reduce future hazard vulnerability. We must do a better job of utilizing post-disaster funding when extreme events occur. One of the most promising vehicles to achieve this objective is the hazard mitigation plan. Following the passage of the Disaster Mitigation Act of 2000, states and local governments were required to develop hazard mitigation plans in order to remain eligible for most types of post-disaster federal assistance. The Act also created the Pre-Disaster Hazard Mitigation fund to help states and communities implement the risk reduction measures identified in these plans.

In a national study analyzing the quality of these plans in coastal states, funded by the Department of Homeland Security



ty's Science and Technology Directorate, we identified several problems. They include: (1) a poor connection between the results of risk assessment and the adoption of specific policies or projects designed to address identified threats; (2) the limited utilization of land use techniques to reduce development in known high hazard areas before a disaster or to encourage redevelopment in less risky locations afterwards; and (3) few plans that made the link between natural hazards risk reduction and climate change adaptation (for more information on this national study, including journal articles, research summaries, plan quality evaluation tools and reports see <http://hazardscenter.unc.edu/mitigation-planning/> and at <http://www.ie.unc.edu/cscd/projects/dma.cfm>).

Recently, the funds allocated to the Pre-Disaster Mitigation Program were assimilated into the National Preparedness Grant Program (NPGP), which represents an amalgamation of several emergency management grants. While the intent of this effort is to streamline Federal Emergency Management Agency-sponsored grants, many have expressed concern that the PDM program as it currently exists is slated for elimination and that future hazard mitigation grant applications sought through the NPGP may be harder to obtain, since they would compete with other disaster response-oriented applications. This policy shift has the effect of further hindering the implementation of state and local hazard mitigation plans.

Disaster recovery plans

IMPROVING POST-DISASTER RECOVERY PLANNING and policy making, including its connection to risk reduction and climate change adaptation, benefits from a brief review of three programs. These include the National Disaster Recovery Framework (initiated following Hurricane Katrina when Congress realized that the United States did not have a robust disaster recovery policy in place), FEMA's Public Assistance program and the Hazard Mitigation Grant Program.

The National Disaster Recovery Framework (NDRF) encourages states and local governments to develop pre-disaster

recovery plans. In a review of the quality of state disaster recovery plans (developed prior to the passage of the NDRF), researchers in our center found that most state plans did not articulate a vision of recovery or define associated goals. Most notably, we found that the recovery plans were largely devoid of policies designed to balance competing interests, guide the coordinated actions of those involved in recovery, or serve as a larger decision-making tool before and after a disaster. Nor did plans have a strong implementation component.

At the local level, most communities do not have a pre-disaster recovery plan in place, instead relying on a disjointed reactionary approach following extreme events. As such, it should not be surprising to see many communities struggle with the monumental challenge

of coordinating the large influx of post-disaster resources, including federal grants that may not adequately meet local needs or assist communities achieve a more disaster resilient future (for more information on the disaster recovery planning research conducted, including reports and journal articles see <http://hazardscenter.unc.edu>. In order to obtain a copy of the recently completed *State Disaster Recovery Planning Guide* see http://coastalhazardscenter.org/dev/wp-content/uploads/2012/05/State-Disaster-Recovery-Planning-Guide_2012.pdf).

A powerful case in point is FEMA's Public Assistance funds, which are used to pay for the costs of state and local emergency services, picking up debris, and repairing damaged infrastructure. The costs to repair damaged infrastructure are typically the largest federal outlay following a presidentially declared disaster. The vast majority of these funds are used to rebuild infrastructure to its pre-event condition, even though there is a provision in the program that allows for the incorporation of risk reduction measures. The problem is that the incorporation of hazard mitigation measures into the repair or reconstruction of damaged infrastructure takes more time to implement. It requires an assessment of cost-effectiveness and technical feasibility. These additional tasks often result in the underutilization of this important post-disaster program in order to avoid slowing down recovery efforts. The development of good pre-event hazard mitigation plans that identifies at-risk infrastructure and conducts eligibility determinations can help counteract this all too common outcome. Unfortunately, few state hazard mitigation plans have emphasized training local officials in the skills needed to accomplish this objective while local plans often fail to identify at-risk infrastructure and develop pre-disaster grant applications in anticipation of future extreme events and the funding that follows.

The Hazard Mitigation Grant Program provides funds to states and local governments after a Presidentially-declared

disaster to reduce future losses. In large disasters like Sandy, totals often exceed hundreds of millions of dollars. Governor Cuomo of New York, for instance, has publicly stated that the state will need an estimated 9 billion dollars in hazard mitigation funding (The Hazard Mitigation Grant Program funding allocated to states is based on a percentage of total disaster costs and the status of the State Hazard Mitigation Plan). Specific projects funded under this program can include the relocation of flood-prone homes, the strengthening of public facilities, and the flood-proofing of at-risk infrastructure.

Yet the projects eligible under this program, which could serve as a critical part of efforts to adapt to a changing climate, do not explicitly account for changing levels of exposure associated with climate-change influenced hazards such as sea level rise, extreme rainfall events and the likelihood of more intense hurricanes. While FEMA has recently released a policy memo noting the importance of their role in climate change activities, grant programs like the Public Assistance Program and the Hazard Mitigation Grant Program as well as hazard mitigation and disaster recovery plans have yet to be amended to address climate change-related effects.

Hurricane Sandy dialogue: A call to action

HURRICANE SANDY HAS SERVED to foster a much needed national dialogue about the connection between disaster

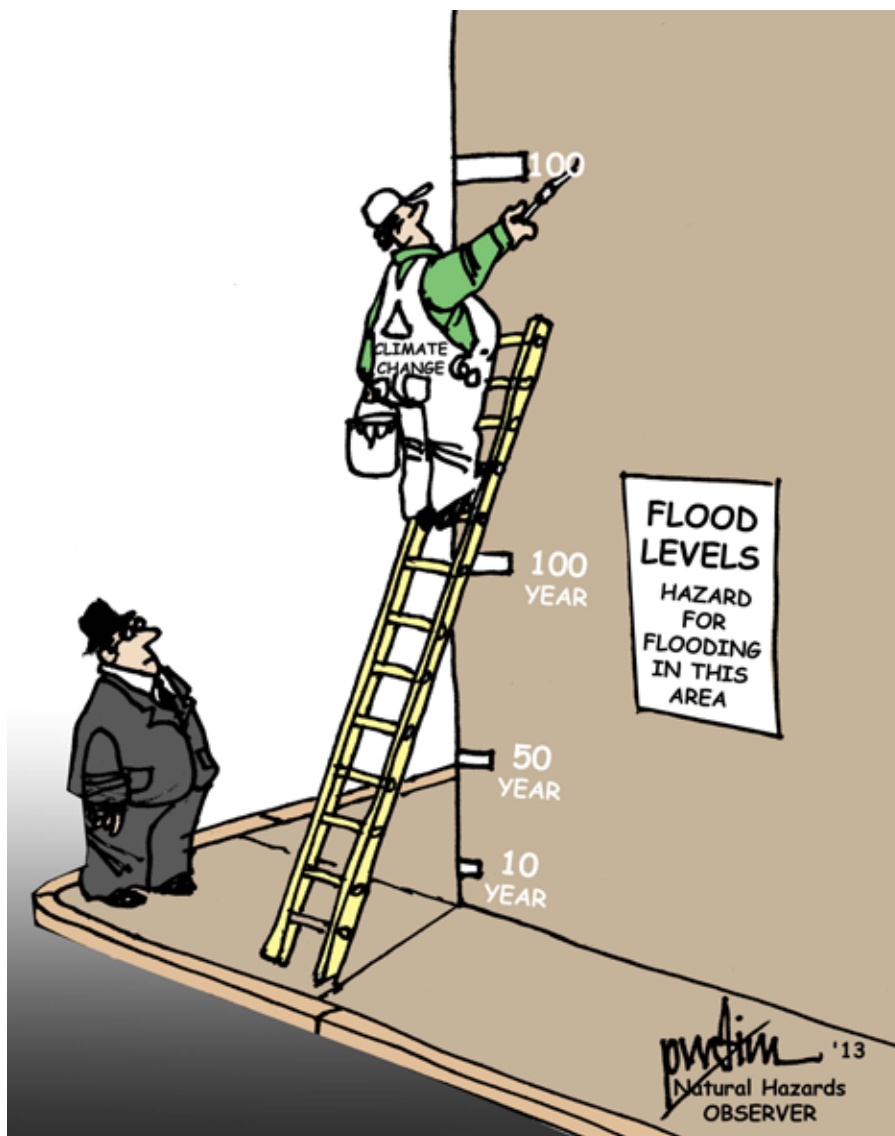
management and climate change adaptation. Now is the time for those involved in the study and practice of disaster management and climate change adaptation to advocate for a coherent and actionable national climate change adaptation strategy that includes modifying existing policies and plans to account for our changing climate and reducing risks tied to episodically occurring extreme events.

This means reassessing how we define flood hazard risk (the old 100-year flood typology is in need of change to reflect rising seas and more frequent intense rainfall events), remapping our floodplains (including those subject to coastal storm surge) to account for sea level rise and more intense hurricanes, and charging actuarially sound flood insurance rates that account for expected rises in sea levels. It requires strengthening hazard mitigation plans to include the adoption of forward-looking, scenario-based actions that emphasize land use approaches. Scenario-based plans must recognize that the policies they contain are subject to updates over time as we gather increasingly better data tied to climate-influenced disasters. It requires the adoption of enhanced building codes in coastal communities that address sea level rise and more intense storms. It requires the incorporation of risk reduction measures that reflect future sea level rise projections into the repair and reconstruction of damaged infrastructure following extreme events rather than rebuilding what amounts to the backbone of urban settlements in a manner that sets the stage for the next disaster.

There is no doubt that these suggestions face opposition from many living in high hazard areas, and entrenched development interests. We can't afford to subsidize risky development through pre- and post-disaster assistance programs that encourage rather than discourage sound disaster management and climate change adaptation practices. Nor can we look the other way as important pre-disaster hazard mitigation programs are in essence eliminated and the plans intended to guide the development of comprehensive risk reduction strategies and post-disaster recovery are weak and do not account for climate change.

Current estimates suggest that Hurricane Sandy resulted in over \$70 billion in losses, making it the second most costly disaster in the United States after Hurricane Katrina. We are living in the age of climate change. It is already occurring. Isn't it time we recognize that things are getting worse and start planning for this eventuality? This means using the limited resources we possess—both before and after disasters—in a manner that is focused on reducing our long-term vulnerability to a changing climate. We can't afford to do otherwise.

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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.

HURRICANES

Resilience and Opportunity: Lessons from the U.S. Gulf Coast after Katrina and Rita. Amy Liu, Roland V. Anglin, Richard M. Mizelle, Jr., and Allison Plyer, eds. 2011. ISBN: 978-0-8157-2149-9. 220 pp., \$22.95 (softcover). [The Brookings Institution](http://www.brookings.edu). www.brookings.edu.

It must be written on stone tablets somewhere: “Katrina you shall have always with you.” The editors’ first sentence in this volume acknowledges, “Policy analysts, historians, and social commentators will analyze the impact of the 2005 storms on the Gulf region for years to come.” And with all that analysis going on, one has to wonder whether there is anything new to say.

But this volume takes a stab at it. Resilience remains an elusive concept in the world of hazards. The series of papers presented in *Resilience and Opportunity* first attempts to define it, then illustrate its application in several arenas, including criminal justice, ethics, health care, and other .

In the ethics arena, at least, the book offers some optimism. New Orleans had a home rule charter revision in 1994-95 directed at ethical reforms. However, nothing substantive was done for ten years. But, David Marcello writes, “We must credit Katrina as the catalyst that led to implementation of the ERB [Ethics Review Board], OIG [Office of Inspector General] and professional service procurement in a post-Katrina New Orleans ... Post-Katrina political upheavals created an opportunity for systematic change, but systematic change is no guarantee of reform. Systematic change can have either positive or negative effects, and even well-designed changes can be well or poorly implemented.”

The book’s authors also find that resilience resides in part in self-reliance and community involvement. “Progress was fastest and most effective among communities that refused to wait for somebody else to help ... They mobilized their most valuable resource, their community members; they followed the most effective strategy, working with each other; and they took the view that government is not the problem: it belongs to citizens, and it can and must act as a partner to citizens.”

CLIMATE

Climate Change Denial: Heads in the Sand. By Haydn Washington and John Cook. 2011. ISBN: 978-1-84971-336-8. 192 pp., \$23.80 (softcover). [Earthscan](http://Earthscan.com). www.routledge.com/books/details/9781849713368.

Pity the ostrich. This noble bird has been saddled with the canard that it sticks its head in the sand to avoid unpleasantness, considering itself invisible. It’s been well-established that ostriches don’t do this. Golden retrievers do it.

Nonetheless, it’s an ostrich—not a golden retriever—with its head in the sand gracing the cover of *Climate Change Denial: Heads in the Sand*. Climate change denial in the United States has progressed past the point of skepticism to become a

kind of pathology. Washington and Cook note that scientists should retain a healthy skepticism, but that it’s different from denial. “Refusing to accept the overwhelming ‘preponderance of evidence’ is not skepticism, it is *denial* and should be called by its true name.” (Emphasis in the original.)

The late U.S. Sen. Daniel Patrick Moynihan has been attributed with the saying, “Everyone is entitled to his own opinion, but not his own facts.” As the recent election cycle demonstrated, many Americans are immune to or indifferent to facts, especially if they don’t confirm previously held beliefs. As many as 20 percent of Americans believe that the moon landings are a hoax. Twenty-five percent of Democrats believe that George W. Bush had a hand the September 11 attacks. Twenty-five percent of Republicans believe that Barack Obama was born in Kenya. Facts to the contrary in all cases has little effect on these opinions. People do seem to feel entitled to their own facts.

In books, article, websites, congressional hearings, conferences, lord-only-know where else, climate scientists have long been fighting a rearguard action on the climate skeptic/contrarian/denial issues. It would take a book to list all of the deceptive non-arguments that have been put forth. Oh, wait, that’s what we have here. Citing numerous experts, Cook and Washington find: trend skeptics who deny the trend to natural causes; impact skeptics who say the results will be beneficial; outright deniers who argue the whole thing is a fraud; combative confrontationalists who automatically deny any general consensus; professional controversialists who are seeking recognition; conflicted naysayers; conspiracy theorists; cherry pickers; false experts ... and so on. Phew.

It’s a long slog to gin up a scientific argument to answer each objection lofted like water balloons by these various objectors. There is no persuading them. Washington and Cook make a yeoman’s effort though, working from the scientific consensus to the kinds of objections and so on.

Denial in its various forms “is a siren song of delusion and represents a real risk to the to the human psyche,” the authors write. “Today it is not just a personal risk, however, but a delusion that has become a pathology. It is a pathology that threatens the stable climate in which our civilization evolved. It is a pathology that threatens the web of life with which we evolved, our brother and sister species who share this Earth ... Anything that attacks the ecosystems we rely on is ultimately an attack on ourselves and our children. Climate change—which we are the cause of—is such an attack.”

The flaw in this book—not just this book, but in all of the dialectics with the denialists—is that the authors take their subject too seriously. Many of the objections the skeptics offer are simply silly. A little more humor applied to the topic would be not only refreshing but more persuasive to the general audience. The contrarians are just golden retrievers

with their heads bent under the front porch steps, pretending the rest of the world isn't out there.

Debating Climate Change: Pathways Through Argument to Agreement. By Elizabeth L. Malone. 2009. ISBN: 978-1-84407-829-5. 176 pp., \$39.70 (softcover). [Earthscan](http://Earthscan.routledge.com/books/details/9781844078295). www.routledge.com/books/details/9781844078295.

Debating Climate Change doesn't exactly bring a sense of humor to the topic of global warming, but it does offer a lighter touch than many books. It's a social scientist's look at fighting fair in the arguments about what ought to be done. Malone gives a quick history of the scientific findings on climate as well as the environmental and economic issues it raises.

The book discusses in digestible capsules most of the essential sociological issues that are bandied about the debate. Is it possible, for instance, to have economic growth and a clean environment. This depends on whether you think that goods which have been obtained for free by companies so far—the right to dirty the air, for instance, or exploit minerals cheaply—can be priced for their environmental values. “In fact, goes one argument, industries need free natural resources so much that, if companies had to pay for environmental resources, they couldn't do business,” Malone writes.

A counterargument is, Malone writes, “Ecological economics and ecological modernization advocate setting prices on natural resources and seeking to develop technologies that will be less polluting, less environmentally degrading, more efficient and so on. Ecological modernization posits the potential for controlled, sustainable growth that can yield both economic prosperity and no environmental damage.”

These are only a taste of the convolutions available. “Globalization” is major meme here. She concludes that climate change, while related to globalization, is more than that. She offers a tidy discussion of the essential arguments about the issue, from “it's not a problem” to a “rift with nature.”

Malone argues that there are many bases for debate, and many bases for agreement in the climate change discussions.

Climate Change: Evidence, Impacts and Choices. By the National Research Council of the National Academies. 2012. No ISBN. 41 pp. Free download. [NationalAcademies](http://NationalAcademies.dels.nas.edu/basc). dels.nas.edu/basc.

As can be deduced from the previous two entries, the holiday season brought a bounty of climate change rebuttals to the *Observer* inbox. One of the clearest and crispest of these offerings is this one from the National Academies, which is sub-subtitled “answers to common questions about the science of climate change” (all lower case).

One of the conundrums facing publishers in the modern techno world is how to deliver your message. These two brief pamphlets do it every which way—web, video, print. You can take in the information via DVD, web [video](http://nas-sites.org/americasclimatechoices/) (<http://nas-sites.org/americasclimatechoices/>), print, or online.

So ... what are the “common questions” about climate science. Even asking this question is a step into controversy. Skeptics have made so many challenges to climate science—nearly all of them based on false premises, misinformation, or misunderstandings—that it can be hard to say which are “most common.” The web site [Skeptical Science](http://www.SkepticalScience) (<http://www.SkepticalScience>)

(www.SkepticalScience.com/argument.php) lists 173 objections raised by climate denialists at one time or another. Anyone who wants to rebut all 173 has too much time on his hands. Which ones can be called “most common?”

The NRC boldly goes where so many have gone before and lays out 18: seven questions about evidence for anthropogenic climate change; seven about expected impacts in the 21st century and beyond; and four about the choices facing society. Strictly speaking, these last four are more about climate policy than climate science, although one can hope that science will inform that policy. One can hope ...

The information in these two publications is presented in clear and interesting text and graphics. It is basic climate science, unlikely to be news to anyone who follows the issue, but it's an excellent overview of the state of knowledge.

The only objection one can raise to this is that it's time to move beyond the repetitive arguments about the validity of the science and on to what the world is going to do about it. Many nations have taken more aggressive action than the United States in this arena, which is still standing like a golden retriever with its head under the porch—though the National Academies kindly refrain from saying so in these publications.

Climate Refugees. By Collectif Argos. 2010. ISBN: 978-0-26251-439-2. 350 pp., \$29.95 (softcover). [MIT Press](http://MITPress.mitpress.mit.edu/books/climate-refugees). mitpress.mit.edu/books/climate-refugees.

Experts disagree—as experts occasionally will—about whether there are currently any refugees whose plight is the result of the changing climate. But the United Nations estimates there might be 150 million people displaced by global warming by 2050.

This book shows several places in which this next great migration might begin. The Shishmaref community in Alaska, for instance, voted to relocate their village by 2015. “The future of the Shishmaref community has yet to be determined,” the authors, a French journalism collective, write, “but two possible solutions have emerged. The first involves moving it to small towns around Nome and Kotzebue, 200 miles to the south and east, respectively, to take advantage of their urban infrastructure. With an estimated cost of \$100 million, this is the less expensive alternative and the one favored by the state of Alaska and federal funding agencies. The second alternative, estimated to cost \$200 million, would involve relocating the village to the mainland.”

The authors have numerous examples, but not all can be definitively linked to climate change. Lake Chad, for instance, is shrinking, but most researchers attribute it to overgrazing and human water use, not the changing climate. Lake Chad borders four African countries—Chad, Nigeria, Niger and Cameroon—so its potential as a source of conflict over water is only too obvious. It's potential for disaster is unquestioned, but so far it's not a “climate disaster.”

This book has many very fine pictures and is told in an engaging journalistic style. It doesn't demonstrate that there are any climate refugees quite yet, but it does show how large the risk is.

Migration and Climate Change. Étienne Piguet, Antoine Pécoud, and Paul de Guchteneire. 2011. ISBN: 978-1-107-01485-5. 464 pp. \$101.60 (hardcover). [Cambridge University Press](http://CambridgeUniversityPress). www.cambridge.org/9781107014855.

Studies of migration in the mid- to late-20th century

focused on political and conflict migration. Before that, say the editors of *Migration and Climate Change*, environmental factors were often included in serious discussions of the issue. "The American geographer Ellen Churchill Semple ... wrote that 'the search for better land, milder climate and easier conditions of living starts many a movement of people which, in view of their purpose, necessarily leads them into an environment sharply contrasted to their original habitat,'" they write.

The authors applaud the recent trend to consider climate change and other environmental factors in discussion of the causes of mass migration.

They list the usual suspects as likely causes of movement—drought, sea level rise, increasing power of cyclones, and so on. If you've read even a short article on climate hazards, you've seen them mentioned.

But the distinction of "environmental refugees"—as differentiated from political ones—has a serious point. Under most current international legal regimes, political refugees

have rights and are protected, but environmental migrants do not. The book has several chapters that explore this legal limbo.

The question of mass migration in the face of climate change has become one of the many political issues of the climate debate. In his concluding paper in this volume, Stephen Castles writes, "The disciplinary divide is between environmentalists, who see global warming-induced climate change as a powerful new force in population displacement, and migration scholars who regard environmental factors as just one part of a wider constellation of economic, social and political relationships that motivate people to move."

He adds, "In future, then, migration will continue to be the result of multiple factors in both origin and destination areas, but the climate change component is likely to become increasingly significant. Migration is not an inevitable result of climate change, but one possible adaptation strategy of many."

Contracts and Grants

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

Dynamic Decision Support for Emergency Managers.

National Science Foundation grant #1260970. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1260970>. Six months. \$50,000 to principal investigator, Louise Comfort, University of Pittsburg, comfort@gspia.pitt.edu.

The decision support software developed through this project represents a new tool to aid decision makers in making informed, efficient decisions. The software tool builds on earlier research that explored interactions among technical systems, organizational processes, and physical and social conditions that affect information flow in managing risk and uncertainty. The design approach develops practical decision models using Bayesian networks and influence diagrams to assess uncertain conditions, based on systematic identification of interdependencies among the component technical, organizational, and knowledge systems that characterize urgent operating environments. It integrates technical skills in computer programming and simulation design, grasp of business dynamics and marketing, and understanding of context, policies, and constraints of emergency management. This decision support module identifies options available for action, given actual constraints and near-real time information from multiple sources, and calculates the probability of success of each option, based on the collective judgment of experienced emergency managers. This decision support tool addresses problems of scalability and simultaneity in information flow processes that have hindered inter-organizational decision making in large-scale, regional disasters. Modeling potential outcomes can systematically enable managers to compare a broader range of options.

If successfully developed, this dynamic decision support tool may have a transformative effect on how communities manage risk. As the number, type, and severity of disasters increase in a global society that depends increasingly on large-scale systems in transportation, power generation, communication, and gas, water and wastewater distribution, the

cost and consequences of failure in these socio-technical systems escalate exponentially. Managers may need improved tools to monitor these interdependent operating systems simultaneously, and adjust and adapt the balance between demand and resources available to manage sudden surges in demand from extreme events. This technology has the potential to benefit communities through helping local governments, nonprofit organizations, and small businesses increase their capacity to manage their continuing exposure to risk, but reduce losses by more informed, effective decision making.

Deep Shear Wave Velocity Profiling for Seismic Characterization of Christchurch, New Zealand—Reliability Merging Large Active-Source and Passive-Wavefield Surface Wave Methods.

National Science Foundation grant #1303595. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1303595>. One year. \$197,683 to principal investigator, Brady Cox, University of Texas at Austin, brcox@utexas.edu.

In 2010-2011, the city of Christchurch, New Zealand was devastated by a series of powerful earthquakes, the most destructive being the 22 February 2011 Mw6.2 Christchurch Earthquake. During this event, the seismic demands imposed on the built environment at many locations in the city were higher than engineering design levels, causing severe structural damage and collapse, especially within the central business district (CBD). Ultimately, the Christchurch Earthquake resulted in 181 casualties, thousands of injuries, and widespread soil liquefaction that caused billions of dollars in damage to buildings, homes and infrastructure. The entire CBD was cordoned-off following this event and remained closed to the public in October 2012, while an estimated 1000 structures are being demolished. A network of 19 seismic recording stations in the greater Christchurch area captured an extensive and unique set of ground motions (GM) during the 2010-2011 earthquakes. Potentially, these GM can be used for back-

analyses aimed at understanding the spatial variability of the ground shaking (particularly site and basin effects), followed by accurate forward-estimates aimed at quantifying the amplitude and frequency content of future design GM. However, detailed GM analyses cannot presently be conducted because no information exists on the shear wave velocity (Vs) structure of the greater-than-400-m deep interlayered sand and gravel deposits that underlie Christchurch.

The thrust of this Rapid Response Research (RAPID) grant is to conduct deep (>400 m) Vs profiling at 12-15 key sites in Christchurch, New Zealand to aid in important seismic GM response analyses. This information is needed rapidly, as plans for reconstruction of the CBD are proceeding quickly and the proposed testing will be significantly complicated (if not prohibited) once reconstruction begins in earnest in early-to-mid 2013. The only way to economically and rapidly obtain Vs estimates to these great depths is through non-intrusive surface wave testing. However, there is currently a great deal of uncertainty involved in the passive-wavefield techniques most commonly utilized for deep Vs profiling. Therefore, a unique study will be conducted to compare and merge data from large active-source and passive-wavefield surface wave methods over an extended frequency/wavelength range, which will allow robust determination of data uncertainty and relative bias. The active-source surface wave measurements will be conducted using one of the large and unique NEES@UTexas mobile, servo-hydraulic shakers and up to 48, 1-Hz geophones, while passive-wavefield data will be collected using intermediate- and large-diameter circular sensor arrays composed of 10 broadband seismometers.

This research will triple the available comparisons between large active-source and passive-wavefield surface wave methods utilized for deep Vs profiling. These comparisons are needed before confidence in utilizing passive-wavefield methods independently can be achieved. Therefore, the intellectual merits of this work include: (1) the collection and interpretation of a one-of-a-kind dataset that can be used for evaluating the reliability involved with merging large active-source and passive-wavefield surface wave methods for deep Vs profiling, and (2) the advancement in accurate ground motion prediction for deep sedimentary basins made possible by these deep Vs profiles through analysis of a unique set of damaging GM records from multiple seismic events. Progress made on both of these issues will directly impact earthquake engineering studies in the US, New Zealand, and throughout the world.

Hurricane Isaac Storm Surge Sedimentation. National Science Foundation #1263492. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1263492>. One year. \$18,781 to principal investigator, Harry Williams, University of North Texas, HarryF.Williams@unt.edu.

Sediment deposited during hurricanes is a little-studied but potentially important contributor to long-term coastal marsh aggradation. Studies of modern hurricane storm surge deposits are needed to quantify the impact of hurricanes on long-term marsh sedimentation rates, and to inform interpretations of prehistoric hurricane deposits. This Rapid Response project will make use of recent storm surge deposits associated with Hurricane Isaac, a Category 1 storm that hit the U.S. Gulf Coast in August 2012. Sampling transects will be established at sites of storm surge sedimentation that vary in distance from the hurricane landfall location. Excavation pits along transects will be stratigraphically described and

sampled to determine the magnitude, distribution, and characteristics of the storm surge deposits. To place the deposits in the context of long-term marsh sedimentation rates, underlying sediments will be dated in increments using Cesium-137. Transects will be revisited after a year to characterize the incorporation of the deposits into the marsh.

Results of this research will aid interpretations of hurricane deposits in the sedimentary record, which contribute significantly to assessments of hurricane recurrence intervals, long-term trends in hurricane activity, and associated risk to coastal inhabitants.

Enhancing the Viability of Emergency Alerting over Social Media via a Collaborative Computer-Aided System for Handling Incoming Citizen Messages. National Science Foundation grant #1248867. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1248867>. Six months. \$150,000 to principal investigator, Hisham Kassab, MobiLaps, hkassab@mobilaps.com.

The innovation is a software engine that empowers emergency managers to analyze and process the high volume of incoming citizen messages (e.g., inquiries, calls for help, etc.) on the emergency manager's social media sites (e.g., Facebook, Twitter), typically experienced after an emergency alert is issued over one or more social media sites. The core of the Internet-connected software engine consists of two algorithms: a multivariate matching algorithm and a natural language processing algorithm. The matching algorithm optimally selects, based on a number of parameters, other emergency managers who can collaborate with the affected jurisdiction's emergency manager on handling the incoming messages. The natural language processing algorithm is employed to reorder incoming messages based on an intelligent keyword-driven prioritization method. The reprioritization is necessary since certain messages warrant more immediate attention than others.

The broader impact of the innovation will be the societal benefit of enhancing the nation's emergency notification capability and effectiveness, which in turn bolsters the nation's emergency preparedness and response efforts, potentially saving lives during life-threatening emergencies.

Emergency managers currently using social media for emergency alerting will attest to its power as an alerting tool in terms of reaching targeted citizens quickly, inexpensively, and with detailed information; while immediately establishing two-way communication with citizens for the purpose of receiving requests for assistance as well as eyewitness and first-hand accounts of situational developments.

The same emergency managers warn that the already large number of incoming messages is growing as more citizens join their social media accounts, which will eventually make it unsustainable for emergency managers to manually process all the incoming messages, especially during period after the alert is issued, when their efforts are focused on responding to the emergency incident.

Morphological Change Near Katama Inlet During Hurricane Sandy. National Science Foundation grant #1310876. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1310876. \$25,686 to principal investigator, Steve Elgar, Woods Hole Oceanographic Institute, elgar@whoi.edu.

Hurricane Sandy produced 11 meter high waves in 66 m water depth on the continental shelf south of Cape Cod and five m high waves in 12 m depth two kilometers offshore of

the southern shore of Martha's Vineyard, Massachusetts. The large waves combined with strong tidal- and wave-driven currents can transport tremendous amounts of sediment along the shoreline, and into the inlet during flood tides.

Visual inspection of Katama Bay and Inlet after Hurricane Sandy suggest there were large changes to the ebb shoal, shoreline, inlet, and back bay.

When combined with the pre-Sandy survey and observations of tides, waves, and currents that were collected by the investigators before, during, and after Hurricane Sandy, the proposed post-hurricane observations will allow the data and numerical models to be used for addressing the following hypotheses: (1) the timing of storms relative to ebb and flood flows is important to the morphological evolution; and (2) accretion inside the bay is caused by sand carried alongshore from the west and subsequently transported into the inlet during flood flows. An additional hypothesis is that wave radiation stresses drive water into the inlet, producing stronger flood and weaker ebb flows, further enhancing the transport of sediment into the inlet during storms.

The project investigators have been providing the local harbormaster, boating organizations, and shell fishermen with updated bathymetric maps to help them with their operations. Improved understanding of, and numerical models for, the processes affecting the morphology would help them with future management decisions as the inlet evolves.

Impact of Disturbance from Hurricane Sandy on Methane Emission and Carbon Sequestration Rates in New Jersey Coastal Wetlands. National Science Foundation grants #1311713, 1311796, and 1311547. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1311713. \$40,000 to principal investigator, Peter Jaffe, Princeton University, jaffe@princeton.edu, and \$81,941 to principal investigator, Karina Schafer, Rutgers University Newark, karinavr@andromeda.rutgers.edu, and \$70,200 to principal investigators, Gil Bohrer, and Alpher Yilmaz, Ohio State University, bohrer.17@osu.edu.

This study will evaluate the consequences on greenhouse gas fluxes of superstorm Sandy in a temperate urban coastal wetland in New Jersey. Ongoing experiments have already been providing baseline data for more than a year of intensive measurements of carbon dioxide and methane fluxes with the eddy covariance technique, methane fluxes with the chamber technique and below ground porewater measurements. With this baseline data, it is possible to characterize the impact Sandy had and will continue to have on the processes governing methane release and carbon dioxide emission and uptake.

Advanced remote sensing analysis will be conducted to map the storm disturbance to wetland vegetation at very high resolution, and additional chamber measurements will target locations where specific types of disturbances occurred (uprooting, wind damage, flood-sediment cover). The production, emission and uptake of methane and CO₂ from the wetland as a whole will be determined using eddy-covariance measurements, and the relative rates of carbon and methane cycling in specific microsites will be quantified, along a gradient of disturbance and among different vegetation types, including native and invasive vegetation. The effects of the storm, in terms of greenhouse gas budget of the wetland and its microsites from a few days to a year following the storm, will be determined.

The insight from this study will inform the scientific and land-management communities about the role of wetlands,

and the vulnerability of their ecosystem service, in terms of GHG, to storms and future climate that may include stronger and more frequent storm events.

Geologic Evidence of Tsunamis Originating from the Japan Trench's Southern Segment. National Science Foundation grant #1303881. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1303881. \$31,970 to principal investigator, Benjamin Horton, University of Pennsylvania, bphorton@sas.upenn.edu.

In the wake of the 2011 Tohoku tsunami, studies modeling rupture scenarios for the Japan Trench have identified areas of uncertainty, particularly along the southern segment. The accuracy of these seismic models and the understanding of fault movement along the southern Japan Trench can be greatly improved by locating and mapping prehistoric tsunami deposits. Records of tsunamis developed from the sedimentary deposits they leave behind, improve our understanding by expanding the age range of events available for study. This EAGER research project, carried out by scientists from the University of Pennsylvania and the Geological Survey of Japan, aims to locate geologic evidence of past tsunamis originating from the southern segment of the Japan Trench, which to date remains undocumented. The study will investigate the beach ridges and coastal ponds of Chiba region of Japan using the state-of-the-art litho-, bio-, and chronostratigraphical techniques. The research is highly exploratory in nature since, as of yet, geologic evidence of paleo-tsunamis in this region has been found.

The importance of understanding the timing and magnitude of tsunamis originating from the Japan Trench was highlighted by the unexpected Mw 9.0 Tohoku-oki event in 2011. Despite generating the largest instrumental record of an earthquake, very little is known about the Japan Trench, particularly its southern segment near Tokyo. The establishment of a recurrence interval for tsunami generating earthquakes improve assessments of natural hazards to the Greater Tokyo Area, the largest metropolitan area in the world.

Full Accounting of Pyrogenic-C Dynamics at the Watershed Scale: A Unique Opportunity Offered by the High Park Fire. National Science Foundation grant #1261383. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1261383. \$197,363 to principal investigators, Francesca Cotrufo, Keith Paustian, and Mazdak Arabi, Colorado State University, francesca.cotrufo@colostate.edu.

Carbon is the main building block of all vegetation, as well as the organic component of soils. In order to predict the effects of wildfires on forest carbon storage in a future where more fires are expected to occur, a better understanding of the cycling of carbon is therefore critical. This project focuses on pyrogenic, or black carbon and its related fluxes, a component that has been largely ignored in earlier studies. During fire a fraction of the burned carbon, perhaps up to ten percent of the total, is converted to black carbon and deposited in the soil, where it may runoff in water or remain stored. In many fire-prone ecosystems, black carbon comprises more than 20 percent of soil organic matter. The High Park Fire burned more than 35,000 hectares in June 2012 along the Cache la Poudre River in Northern Colorado and, in the process, created a unique opportunity to conduct a full initial accounting of black carbon dynamics, from production to deposition, storage, and runoff.

This project will determine the rate of production of black carbon from the High Park Fire, its rate of loss in erosion compared to its accumulation deeper in soil, its export by water runoff through an intensive water monitoring effort, and deposition along river banks and in stream bed sediments. Stored samples of sediments and water from before and after the fire will be used along with new samples taken over the following year. State of the art methods will be used to accurately quantify black carbon in all soil, sediment and water samples.

After the many fires of 2012, the general public is more than ever interested in their causes and consequences. An open panel on fires, pyrogenic carbon, and their impacts on water resources and climate change will be organized locally.

Reorganization of Stresses Beneath Greater Tokyo After the 2011 TohokuM9 Earthquake. National Science Foundation grants #1215757 and 1215358. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1215757> Two grants. Three years. \$177,000 to principal investigators, David Okaya, and Thorsten Becker, University of Southern California, okaya@usc.edu, and \$148,000 to principal investigator, Andrew Freed, Purdue University, freed@purdue.edu.

The March 11, 2011, Tohoku earthquake at Mw 9.0 was the largest event in Japan's 1400+ years of recorded history. The impact of the earthquake and resulting tsunami on the people of Japan was severe, with approximately 20,000 fatalities and an estimated \$120 billion of economic loss.

Recent Japan government studies estimate that a shallow megathrust earthquake similar to the 1923 Mw 7.9 Great Kanto earthquake would result in 11,000 fatalities and up to \$3 trillion in economic damage. Concern for a worsening of seismic hazards in Tokyo region is warranted based on recent advances in earthquake science that indicate (1) that an earthquake that relieves stress in one area will build up stress in adjacent areas, and (2) while stress changes occur rapidly during the earthquake, postseismic processes will lead to the redistribution of crustal stresses for years to many decades after a large earthquake.

Understanding the ongoing time-evolution of stress buildup in the Tokyo region adjacent to the 2011 Tohoku-Oki rupture, and its influence on active faults in that region is the primary objective of this NSF-supported project. This project is a collaboration with Japanese scientists who seek improved estimates of seismic hazards in the Tokyo region both currently and for decades to come. This project will provide research training to U.S. students, as well as international research experience, and also seeks to help our Japanese colleagues improve their ability to conduct this type of seismic hazard research.

This project seeks to understand the evolution of crustal stresses and associated seismic hazards in the Tokyo region in the years and decades to following the Tohoku earthquake. Stress changes will occur due to two primary postseismic processes, afterslip and viscoelastic relaxation. The former is associated with aseismic slip along the North America/Pacific plate interface within and below the region of coseismic slip, while the latter involves the relaxation of hot weak mantle beneath the converging plates.

Both processes will cause a time-dependent transfer of stress to the seismogenic upper crust. It is our goal to understand this process of stress transfer and how it works to load active faults in the Tokyo region. This will be achieved by de-

veloping an observationally constrained finite element model that can accurately calculate stress changes due to afterslip and viscoelastic relaxation. Observational constraints will consider seismological data describing tectonic geometry and elastic structure of the region, and geodetic constraints that will enable a determination of the rheology (viscous strength) of the region. The model should enable us to separate the relative contributions of afterslip and viscous relaxation to post-seismic geodetic data. This is not only required for an accurate calculation of stress changes, but will provide invaluable insights about the nature of these two processes that will benefit our understanding of subduction zone tectonics.

Combined Spectroscopic/Lidar Response to the High Park Fire, Larimer County, Colorado. National Science Foundation grant #1264433. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1264433>. One year. \$54,645 to principal investigator, Thomas Kampe, National Ecological Observatory Network, tkampe@neoninc.org.

The High Park in Northern Colorado burned over 35,000 hectares, a worst-case scenario fire due to the extent, severity, and duration of the fire. This study documents the impact of the High Park fire on the forests, soils and geomorphology of the burned area using NEON's Airborne Observatory remotely sensed data (visible-to-shortwave infrared imaging spectrometer, small footprint waveform lidar, and high resolution digital camera) over the area disturbed by the fire and adjacent unburned areas.

The remote sensing data acquisition will be coordinated with a targeted field campaign to collect baseline information on forest composition, structure and three-dimensional distribution, soil biota, and rates of erosion and sedimentation.

We focus is on essential data collection to characterize post-fire conditions, but data collection efforts are designed in the context of two broad categories of science questions for future research: (1) How did conditions prior to the fire affect fire behavior and impacts? and (2) How does fire severity and pattern affect post-fire trajectories?

We will gather data in response to this natural disaster; its urgency derives from the high probability that conditions on the ground will change rapidly after the fire. Summer rains will initiate post-fire erosion and sedimentation; management activities will alter the landscape characteristics, and vegetation will begin to regenerate.

Combining the field and remote sensing datasets will allow an unprecedented assessment of the impact of the fire, provide data products useful to the scientific and management communities, and support future research on post-fire trajectories.



Conferences and Training

January 6-10, 2013

American Meteorological Society Annual Meeting
American Meteorological Society

Austin, Texas

Cost: \$325

This conference will focus on expanding weather forecasting and projections beyond current capabilities. Topics include Fukushima contaminant diffusion, climate variability and change, weather modification, aviation and aerospace meteorology, space weather, coastal environments, hydrology, and satellite systems.

<http://annual.ametsoc.org/2013/>

January 7-11, 2013

Building Innovation
National Institute of Building Sciences
Washington, D.C.

Cost: \$400

This conference will highlight building innovations that increase resilience and reduce risk. Topics include integrating risk and performance in resilient design, mitigation and planning for multi-hazard situations, security and disaster preparedness, and sustainability of the built environment.

<http://www.nibs.org/>

January 8-10, 2012

International Disaster Conference
International Disaster Conference and Expo
New Orleans, Louisiana

Cost: \$300

This conference will discuss emergency management policy and successful mitigation practices. Perspectives from homeland security, emergency response, disaster recovery, business continuity, and global security will be presented. Topics include the differences in responding to natural versus man-made disasters, the Mississippi Alternative Housing Pilot Program, human resilience and logistics in supply chain management, emergency responder decision support tools, resilience to terrorism, portable water storage and distribution, and technologies for managing high volumes of insurance claims.

<http://www.internationaldisasterconference.com/>

January 15-17, 2013

13th National Conference on Science, Policy, and the Environment

National Council for Science and the Environment
Washington, D.C.

Cost: \$395

This conference will examine the connectedness of six themes in a series of symposia, keynote addresses, plenary sessions, and breakout workshops. Themes include: cascading disasters, the intersection of the built and natural environments, disasters as mechanisms of ecosystem change, rethinking recovery and expanding the vision of mitigation, human behavior and its consequences, and "no regrets" resilience.

<http://www.environmentaldisasters.net/>

January 21-23, 2013

New Chief Leadership Symposium
International Association of Fire Chiefs

Phoenix, Arizona

Cost: \$950

This symposium is designed to provide newly appointed fire chiefs with the skills and information needed to effectively manage their departments. Topics include critical thinking and decision making, budget management, political understanding, technology and social media, and work-life balance.

<http://www.iafc.org/newChief>

January 23-24, 2013

Coastal Futures
Communications and Management for Sustainability
London, England

Cost: \$234

This conference will examine the challenges facing coastal sustainability, environmental changes, and trends in coastal management from a multidisciplinary perspective. Topics include coastal economy, offshore wind industry impacts, hydro-environmental impact studies, marine debris, marine spatial planning, and ecosystem management.

<http://www.coastms.co.uk/conferences/468>

January 31-February 1, 2013

Coastal Hazards Summit 2013
University of Florida
St. Augustine, Florida

Cost and Registration \$175

This conference will examine coastal hazards such as hurricanes, storm surge, and man-made environmental damage to determine upcoming research needs and share advances in coastal disaster management. Topics include coastal hazard policies, forecasting systems, climate change and sea level rise, coastal restoration options, and collaboration to prepare for coastal disasters.

<http://conferences.dce.ufl.edu/>

February 1, 2013

Earthquakes: Mean Business
Parks College of Engineering, Aviation and Technology
Saint Louis, Missouri

Cost: \$105

This conference will raise earthquake awareness and teach preparedness in a business context. Topics will include infrastructure engineering, business continuity and risk, earthquake policy, building code issues, and the St. Louis Area Earthquake Mapping Project.

<http://bit.ly/SmUirb>

February 8-9, 2013

Disasters, Displacement, and Human Rights: Framing the Field

University of Tennessee Department of Anthropology
Knoxville, Tennessee

Cost: \$40

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This conference will explore questions related to disasters, development, and conflict with the aim of creating a new approach to understanding the human impacts of natural and man-made hazards. Topics to be discussed include holistic approaches to studying DDHR, culturally specific ideas and human rights, triggers of modern disaster, and common denominators of disasters.

<http://web.utk.edu/~anthrop/ddhrs.html>

February 19-24, 2013
12th World Congress on Stress, Trauma, and Coping
International Critical Incident Stress Foundation
Baltimore, Maryland
Cost: \$570

This conference will focus on helping crisis intervention and disaster mental health personnel navigate the next era of disaster response with lessons learned, innovations, and evidence-based applications. Topics include transportation disasters, resilience in healthcare, critical incident stress management in aviation, children and trauma, post-action staff support, and ethics-based leadership.

<http://www.icisf.org/world-congress-articles/672-12th-world-congress>

March 12, 2013
Second Annual Forum for Disaster Victim Identification
The Royal College of Pathologists
London, UK
Cost: \$273

This conference will discuss techniques and legislation related to the identification of disaster victims. Topics include the importance of culture in victim identification, roles and duties of coroners in disaster, academic programs for disaster victim identification, and age estimation from developing teeth.

<http://lifescienceevents.com/>

March 13-15, 2013
Asia Water Week
Asian Development Bank
Manila, Philippines
Cost: free

This conference will look at ways to strengthen and reform Asia's water sector in ways that will result in sustainability, private sector investment, and increased expertise. Topics include climate change; the intersection of water, food, and energy; disaster management; water supply and sanitation; water resources and environment; and agriculture and irrigation.

<http://www.adb.org/news/events/asia-water-week-2013>

March 19-21, 2013
Wildland Urban Interface
International Association of Fire Chiefs
Reno, Nevada
Cost: \$375

This conference will discuss solutions to wildland-urban interface fire suppression, prevention, and mitigation challenges. Topics include creating fire-adapted communities, assessing wildfire hazards, preventing accidental or intentional wildfires, and reducing wildfire risk while protecting environmental interests.

<http://www.iafc.org/wui>

March 25-28, 2013
National Hurricane Conference
National Hurricane Conference
Orlando, Florida
Cost: \$350

This conference is focused on strengthening hurricane preparedness and response in the United States and Caribbean by exploring new ideas and lessons learned, as well as the basics. Topics include evacuation decision making, amateur radio communication, healthcare accessibility, fostering resilient communities, debris management, and utility damage assessments.

<http://hurricanemeeting.com/>



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Support Center Operations—Provide support for core Center activities such as the *DR* e-newsletter, Annual Workshop, library, and the *Natural Hazards Observer*.

Build the Center Endowment—Leave a charitable legacy for future generations.

Help the Gilbert F. White Endowed Graduate Research Fellowship in Hazards Mitigation—Ensure that mitigation remains a central concern of academic scholarship.

Boost the Mary Fran Myers Scholarship Fund—Enable representatives from all sectors of the hazards community to attend the Center's Annual Workshop.

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