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Strengthening resilience through mitigation planning

An invited comment by Kenneth Topping

The Disaster Mitigation Act of 2000 revisited

Before Hurricane Katrina struck the Gulf Coast near New Orleans, hundreds of thousands of acres of wetlands had been disrupted, drained, developed. Even then, the importance of these wetlands as a mitigation tool, especially as a barrier to storm surge, was well understood. But the economic activity, primarily oil and gas development, in the region, subsidence, decreased river sediments, and erosion have all combined to reduce wetlands, making New Orleans more vulnerable to hurricanes, as Katrina demonstrated so dramatically. Since Katrina, the region has sought to rebuild this natural barrier to mitigate future storms.

Following the March 11, 2011, Mw 9.0 Great East Japan Tohoku earthquake and tsunami, 14,843 people were reported dead or missing in Miyagi Prefecture as of May 2011. Yet within the prefecture's largest city of Sendai, population 1,045,903, the number of persons dead or missing was 882—a

(Please see "DMA 2000," page twelve)

INSIDE ...

Looking at the second life of social media

Riots show potential for technology's dark side

A shade or two of the bloom went off the social media rose in August as rioters in Britain demonstrated that flash mobs could be organized to steal big-screen television sets as well as bring down tyrants. In the wake of rioters' use of social media networks to organize their hooliganism, British Prime Minister David Cameron called for Mubarak-like restrictions on services like Facebook, Twitter, and so on.

And it turns out that even the effect of Twitter on tyrants might be a wee bit exaggerated.

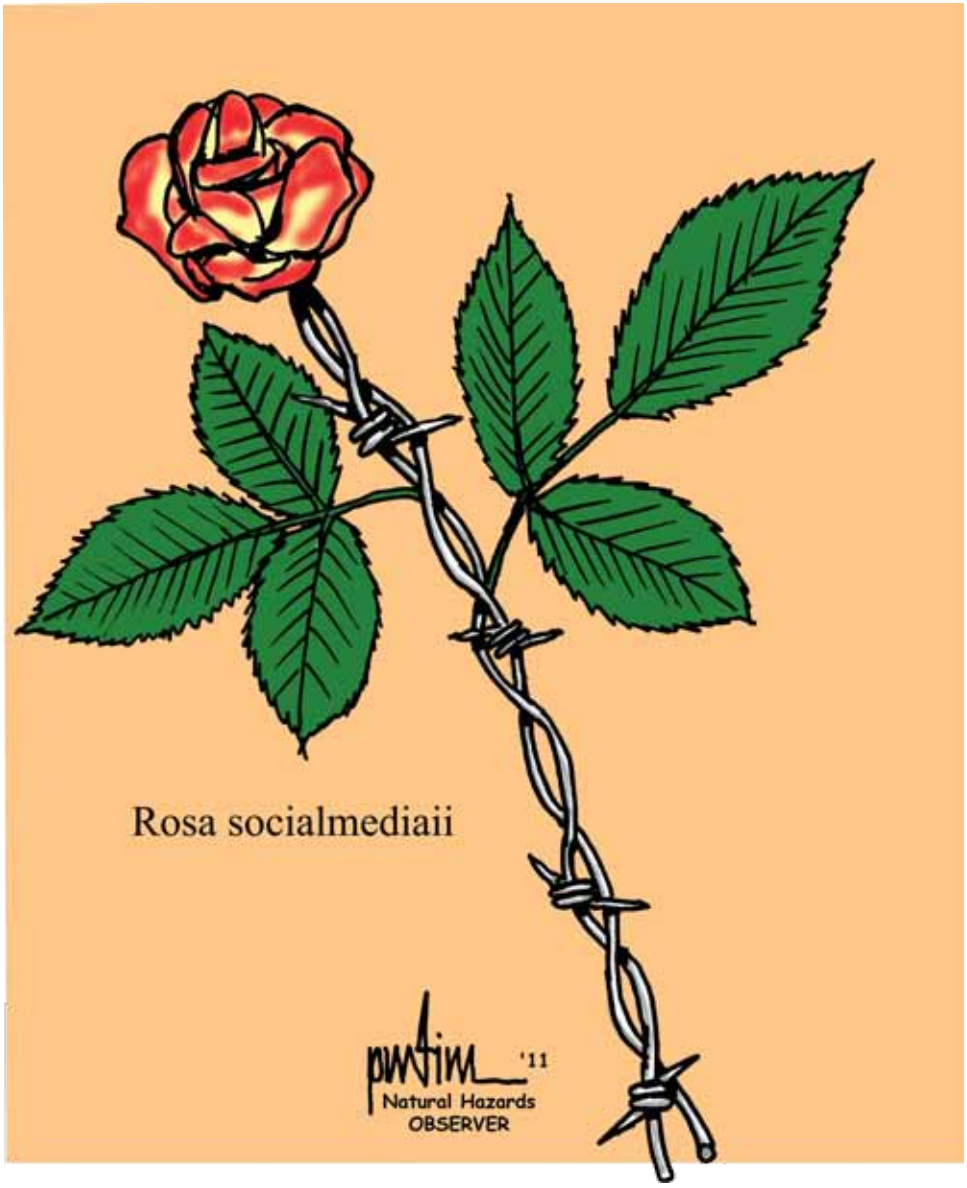
Social media mavens immediately threw cold water on the idea of restrictions, but the British events crystallized issues that have been lingering behind enthusiasm for expansion of new media uses in many arenas, including emergency management, terrorism prevention, adlaw enforcement.

Until the British riots, the dark side of social media was largely theoretical. Experts had warned that it could be used for nefarious purposes, but were hard-pressed to come up specific examples of it.

In the report *Social Media and Disasters: Current Uses, Future Options, and Policy Considerations*, Congressional Research Service analyst Bruce Lindsay wrote, "Malicious use of social media during an incident could range from mischievous pranks to acts of terrorism. One tactic that has been used by terrorists involves the use of a secondary attack after an initial attack to kill and injure first responders. Social media could be used as a tool for such purposes by issuing calls for assistance to an area, or notifying officials of a false hazard or threat that requires a response."

Steven Longmire, the founder of EM Connection, relates an anecdote that immediately prior to the Indian Ocean tsunami some people may have been lured into danger by messages reporting that the water had receded unprecedented distances from the beach and the shell collecting was excellent. The story can't be confirmed, but it's the kind of thing experts worried about.

The first example of success dusted off by social media enthusiasts is the Arab spring uprisings, allegedly fueled by Twitter and text messaging, especially in Egypt, where President Hosni Mubarak shut down Internet access prior to his fall from power. The assertion that it was a "social media revolution" has been challenged on socio-political grounds, but now a researcher has challenged it on social media's own turf, arguing that even during the Egyptian revolution social media turned many people into couch potatoes, not revolutionaries, encouraging caution, delay, and confusion among the "risk-averse majority."



Yale University's Navid Hassanpour, in a paper titled "Media disruption exacerbates revolutionary unrest: Evidence from Mubarak's natural experiment" on the Social Science Research Network, found that by shutting down the Internet, Mubarak actually increased the unrest in the country. After the January 28, 2011, shutdown of internet access, protests spread to parts of the country outside of Cairo. According

to at least one blog, protests became so extensive that even Egypt's ubiquitous police could no longer control them: "There are too many protests in too many places," said the *New York Times'* January 28, 2011, *The Lede Blog.*

Hassanpour wrote in his conclusion, "In the absence of centralized media, crowds' risk-taking behavior becomes independent of the state's intentions. Note that even the most authoritarian regimes prefer not to systematically bomb their own population, they instead use a threat of forceful military action in order to deter. When it is impossible to communicate the possibility of a painful military retaliation, the state is unable to dissuade the crowds. In fact protests proliferate when such threatening measures fail."

Not everyone agrees with this sobering assessment, of course. In a September 13 article for the **MediaShift** section of pbs.org, Tanja Aitamurto argued that social media is keeping the revolution alive by organizing a "digital campaign against military trials for civilians."

The cold water thrown on the social media organizing of revolutions has not, however, much dampened the enthusiasm for it in emergency management. Again citing the Egyptian experience along with the Gulf of Mexico Deepwater Horizon oil spill and several others, Raina Merchant from the University of Pennsylvania's Perelman School of Medicine, says in a **perspective piece** from the July 28, 2011, *New England Journal of Medicine*, "Engaging with and using emerging social media may well place the emergency management community, including medical and public health professionals, in a better position to respond to disasters. The effectiveness of our public health emergency system relies on routine attention to preparedness, agility in responding to daily stresses and catastrophes, and the resilience that promotes rapid recovery. Social media can enhance each of these component efforts."

New research also suggests that technology can help track population movements during disasters, enhancing efforts to deliver aid efficiently. Researchers from the Karolinska Institute in Sweden and New York's Columbia University analyzed position data from 1.9 million SIM cards (subscriber identity modules) from mobile phones in Haiti. They found that estimates of population movement based on SIM card location were more accurate than ad hoc estimates generated immediately after the earthquake there. The results were published on August 30, 2011, in **PLoS Medicine**.

From our far-flung correspondents ...

Japan had two typhoons this past September. We were able to gauge the power of these storms using a new quantitative measure, the Bumbershoot-Umbrella Storm and Typhoon Index (BUSTID). The index was conceived during Typhoon Talas in early September 2011, then experimentally verified during Typhoon Roke later the same month.

BUSTID counts bent, damaged, and destroyed umbrellas left in the street, then stacked for removal after the storm has past. The metric is field based, accurate to the day and time when the refuse crews pick up the umbrella piles. Researchers must account statistically for the number of umbrellas that were blown away before the pile could be secured. The height of umbrella piles can be measured against poles conveniently placed for the purpose (see illustration).

This index is a simple, easy to use metric. It may be relevant in many cities without extensive training of local experts to interpret and sift through the data.

I hope others who experience typhoons can improve on this index. I however, do not wish to do so.

—William Siembieda

Active El Niño, active warfare

Chance of war nearly doubles in El Niño years

In the hotter, drier stress of an active El Niño, warfare becomes likely in the tropics.

During a La Niña phase, which is typically cooler and wetter, the chance of a civil war breaking out somewhere in 90 tropical countries is about three percent. But during the El Niño phase, the chance of warfare rises to six percent, according to a paper that appeared in *Nature* of August 25, 2011.

Kyle Meng of the Columbia University School of International and Public Affairs and one of the authors of the study, said, "An obvious question is why El Niño events lead to this increase in violence … it leads to drier conditions around the tropics. There are larger crop losses. El Niño is correlated with an increased risk in natural disasters like hurricane activity, as well as the spread of infectious diseases." Disasters may contribute to civil unrest in unstable areas, though they are seldom a sole cause for conflict (**Natural Hazards Observer**, March 2009).

There is an increase in violence under the influence of El Niño, but the reasons for it are obscure. There are several competing hypotheses. One is that the events lead to greater income inequality. Another is that it leads to increases in joblessness, which "makes the opportunity to fight a little more attractive," Meng said.

As a policy matter, though, the results of the study have important implications. "One of the major accomplishments in the atmospheric sciences is the ability to forecast El Niño events, in some cases up to two years in advance," Meng said. "This ability allows us, we think, to be able to mitigate some

of this violence in terms of the national and international level to help ready parts of the world that are affected by these events when they do occur."

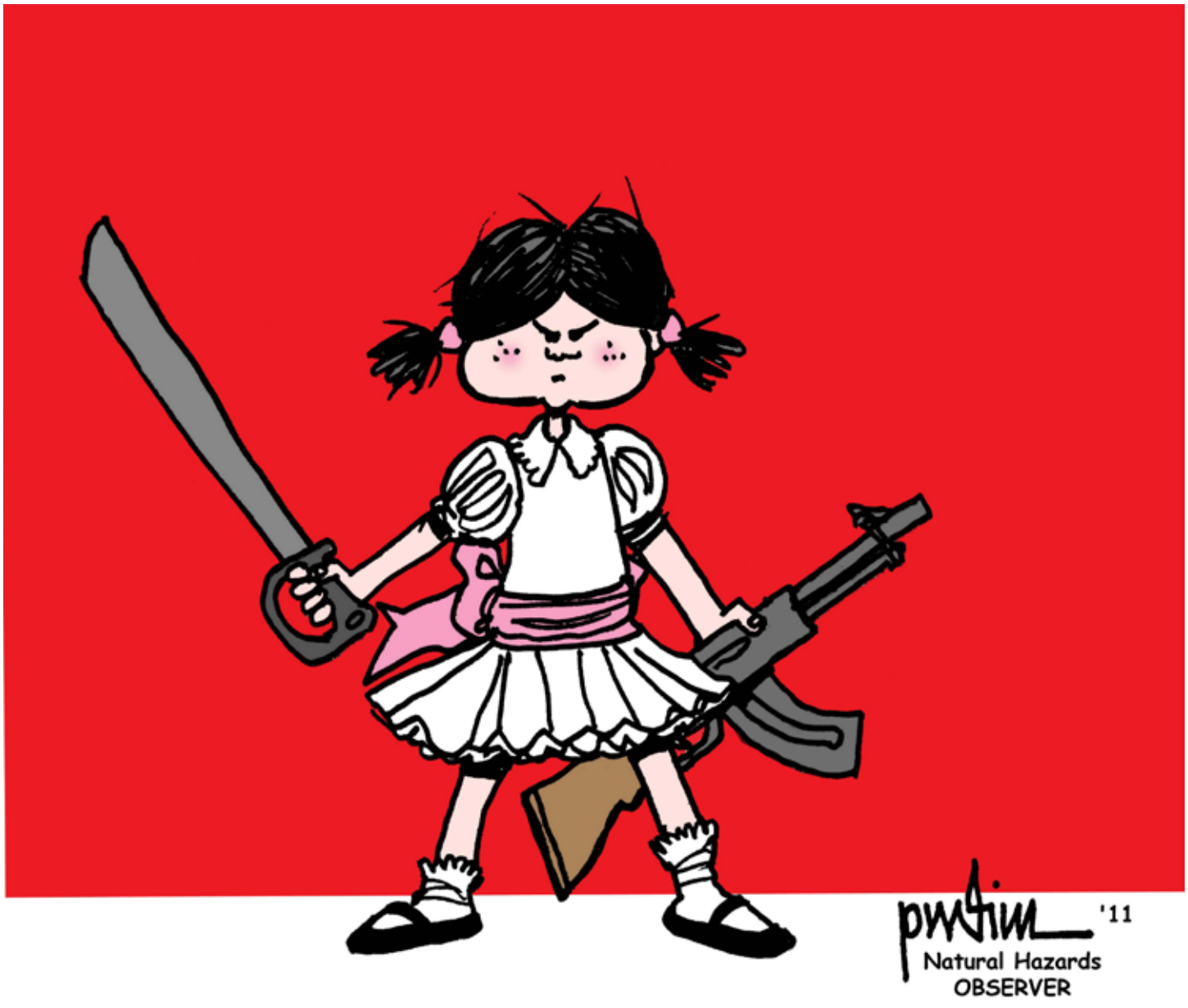
Not everyone is convinced of the climate-violence connection. "The study fails to improve on our understanding of the causes of armed conflicts, as it makes no attempt to explain the reported association between ENSO [El Niño-Southern Oscillation] cycles and conflict risk," said Halvard Buhaug, a political scientist with the Peace Research Institute Oslo who studies the issue. "Correlation without explanation can only lead to speculation."

In a September 21, 2010, paper in the *Proceedings of the National Academy of Sciences*, Buhaug concluded that civil wars in Africa, at least, "can be explained by generic structural and contextual conditions: prevalent ethno-political exclusion, poor national economy, and the collapse of the Cold War system." Climate, he concluded, is a "poor indicator" of the potential for armed conflict.

Another expert, economist Marshall Burke of the University of California, Berkeley, said the *Nature* authors gave "very convincing evidence" of a connection. But, he said, the question of how overall climate change might play out remains. "People may respond differently to short-run shocks than they do to longer-run changes in average temperature and precipitation," he said. He called the study "a useful and illuminating basis for future work."

Another of the *Nature* paper's authors, Mark Cane of Columbia's Lamont-Doherty Earth Observatory, said that their work does not answer the more general question of what will happen under the global warming regime that the earth is currently undergoing. El Niño itself will likely be impacted by a warming climate in unforeseeable ways. The study "can't be said to have any direct implications for long-term anthropogenically induced climate change," Cane says. "But is shows beyond doubt that climate variations have an impact on the propensity of people to fight. It is difficult to see why that won't carry over to a world that is disrupted by global warming."

The paper "Civil conflicts are associated with the global climate" appeared in the August 25, 2011, issue of the journal *Nature*.



They Said It ...

"It's easy for the numbers to dissolve into abstract concepts. But it's essential that, when we talk about 12 million people being affected, we understand that behind each one of those individuals is a story. When I was in Dadaab [a refugee camp in Kenya] in May, I met a woman who had brought her family of five on a three- to four-week trek to reach the camp, just to get food and assistance."—*Nancy Lindborg, head of the Bureau for Democracy, Conflict and Humanitarian Assistance at the U.S. Agency for International Development, quoted in the* ***Washington Post*** *about the drought and food crisis in the Horn of Africa.*

"This means drought is likely to continue in the drought-stricken states of Texas, Oklahoma and New Mexico. La Niña also often brings colder winters to the Pacific Northwest and the Northern Plains, and warmer temperatures to the southern states."—*Mike Halpert, deputy director of the National Oceanic and Atmospheric Administration's Climate Prediction Center on the return of La Niña, quoted in NOAA news release.*

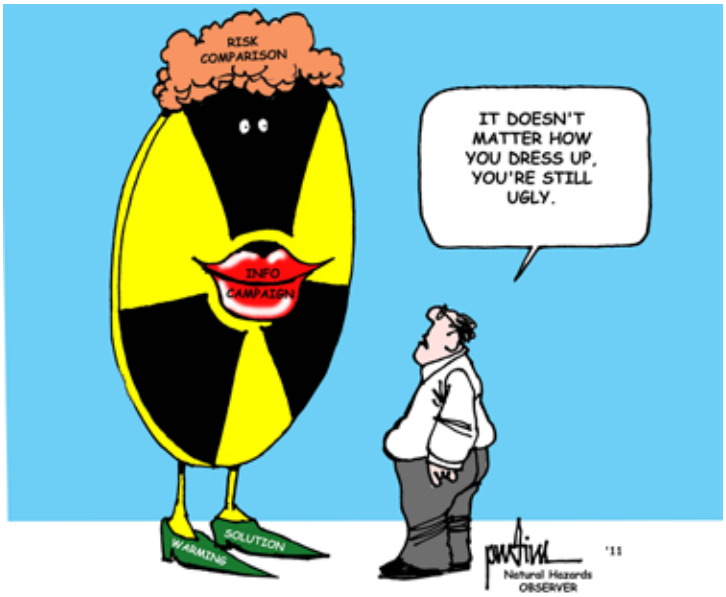
"This shows clearly that H5 [bird flu] can change in a way that allows transmission and still cause severe disease in humans. It's scary."—*Peter Doherty, a 1996 Nobel prizewinner for work in viral immunology, on research demonstrating five mutations in two genes spreads the virus among mammals in the lab, quoted in* New Scientist.

"'Eventually it'll become damned clear that the Earth is warming and the warming is beyond anything we have experienced in millions of years, and people will have to admit…' He stopped and laughed. 'Well, I suppose they could say God is burning us up.'"—*Columbia University geoscientist Wally Broecker, quoted by the* Associated Press.

"I've devoted the past ten years or so to convincing my colleagues that the emphasis in 'emergency manager' should be on the word 'manager.' It's not always an easy sell for a lot of reasons. However, if you can make the paradigm shift, your perspective changes drastically."—*Lucien Canton, emergency management consultant, quoted in Steven Detwiler's Emergency Manager's Weekly Report of September 30, 2011.*

"If you want to sell earthquake preparation in a way that it affects human behavior, you have to sell it like Coca-Cola."—*Dennis Mileti, speaking about the L'Aquila earthquake trial, quoted in the* New York Times.

"If I add up all the phone calls and all the work I've had to do with all the agencies of government, FEMA [Federal Emergency Management Agency] has caused more problems than all the rest put together. And most of the time it's the fact that when FEMA comes in and there's a disaster they interfere with the local people. The local people, the landowners can't do what they want."—*Rep. Ron Paul, R-Tex., on NPR, quoted by* DR—Disaster Research News You Can Use, *Oct. 6, 2001.*



Nukes still losing ground

Report: People are wary after Fukushima

The crisis in Japan with the Fukushima nuclear reactor may accelerate the decline of nuclear power around the world.

In 2010, there more nuclear power plants under construction than in any year since 1988. In an article in the July/August 2011 *Bulletin of the Atomic Scientists*, Mycle Schneider, Antony Froggatt, and Steve Thomas write, "Even before Fukushima, however, status indicators for the international nuclear industry were showing a negative trend. Fewer countries are operating nuclear fission reactors for energy purposes ... Worldwide nuclear production is generally declining, and many new projects are experiencing construction delays."

While the industry worldwide is seeing a slight increase in construction—15 projects broke ground in 2010—the authors argue that this does not constitute the industry's long-awaited "nuclear renaissance." Several more countries have joined the "non-nuclear" ranks, and electricity production from nuclear plans has declined somewhat.

"The main reasons for nuclear's poor global performance are technical problems with the reactor fleets of some of the largest nuclear players; the small producers have remained more or less stable. Between 2008 and 2009, nuclear generation declined in four of the 'big six' countries: France, Germany, South Korea, and the United States. In Japan, the industry had been slowly recovering from the 2007 Kashiwasaki earthquake, and in Russia, production remained stable. These six countries generate ... 73 percent over the past two years of the world's nuclear electricity," the authors say.

Nuclear power, which is a carbon-free energy source, has been touted as a potential major contributor to greenhouse gas mitigation to slow global warming. A debate continues about whether the positive contribution it could make on that score is worth the technical, proliferation, and waste disposal risks that have plagued the industry since its inception (Natural Hazards Observer, September 2010).

The public has managed to restrain its enthusiasm for expanding nuclear power, even as a partial solution to climate change. M.V. Ramana, also in the *Bulletin*, writes, "Opinion polls show that public support for nuclear power has declined since the Fukushima crisis began, not only in Japan but also in other nations around the world. People oppose nuclear power for a variety of reasons, but the predominant concern is the perception that it is a risky technology."

Conflict or cooperation: A world water saga

Will tomorrow's wars really be about water?

As the world population passes seven billion, global resources are being spread thinner. One of these resources, water, is taking a lead position as a potential source of conflict among nations. But advocate Rupert Watson, a director of the Dispute Resolution Centre in Nairobi, Kenya, says water distribution has great potential as a source of cooperation, not conflict.

In 1995, Ismail Serageldin, chairman of the Consultative Group on International Agricultural Research, made an often-quoted statement: "If the wars of this century were fought over oil, the wars of the next century will be fought over water."

But Watson says, "I'm here to try to persuade you that this is a cliché. I would like to think of water more as something that leads to cooperation more than confrontation." There is a great deal of scaremongering around. "Everybody wants to think there's going to be conflict over water, and there are some local skirmishes over water," he says.

"But the last water war—if we're talking about a war that was between states—was actually 2,500 BCE in Mesopotamia. Since then, there has not been a war exclusively over water." Water is sometimes one component of several involved in sparking a conflict.

A question is whether modern pressures from skyrocketing population, climate change, and rising living standards have changed the water equation. There is still no absolute shortage of fresh water, Watson says. The issue is not one of supply but of distribution.

There are several modern tension points that could conceivably turn into "water wars." Israel and Palestine seem willing to fight about almost anything. Water is a component of the India-Pakistan conflict. Egypt gets 97 percent of its water from outside its boundaries, pri-

marily from the Nile, which has 11 independent nations in its watershed.

One of the potentially most serious water disputes has been the disappearance of Lake Chad, once a vast inland sea covering parts of four nations—Niger, Chad, Nigeria, and Cameroon in West Africa. Between 1963 and 2001, the lake virtually disappeared. There is no longer any part of Lake Chad within the boundaries of Niger or Nigeria. People who lived in those countries along the margins of the lake have often followed its boundaries as it shrank. This kind of mass migration has the potential for serious conflict, though there has been little so far.

"It's been a miracle that there hasn't been a lot more conflict than there has been," Watson says.

As an example of how people in traditional communities have dealt with water conflict, Watson cites how the Fulani people, West African pastoralists, deal with the issue. They move their animals based on the forage available and are very dependent on getting water wherever they go.

They usually find a small well, which can only water a few cows at a time. This limits the amount of stock that can be watered. While the animals are getting water, people sit around and talk, discussing the issues that are important to them, including the distribution of water. In this way, water—even though often in relatively short supply—becomes a source of cooperation among these people.

Sometimes the central government moves in to provide more water, which has a curious cascade of effects. People can water their stock more quickly and can have more of them, which can put pressure on forage. In addition, it often destroys the somewhat leisurely cooperative social environment. Finally, the additional water may make lands that were previously unsuitable for farming attractive for that, driving out the wandering pastoralists.

The history of international uses of water has so far fallen more on the cooperative side of the ledger than the conflict side. But it will be important in the future, Watson says, to think of water management as a series of basins, or watersheds, rather than pieces broken up by international boundaries.

Many Americans feel less safe than ten years ago

Survey says: We're doing better—and worse

Is the disaster preparedness glass half empty or half full? If you ask the public at large, there's been little improvement in emergency preparedness. But if you ask the medical experts, great strides have been made.

A **survey** commissioned by Federal Signal Safety and Security Systems found that ten years after the September 11, 2001 terrorist attacks, 64 percent of Americans don't feel safer in the their day-to-day lives. Fifty percent say "significant improvement is needed" in the public's emergency awareness or communications in their communities, while only 11 percent say no improvement is needed.

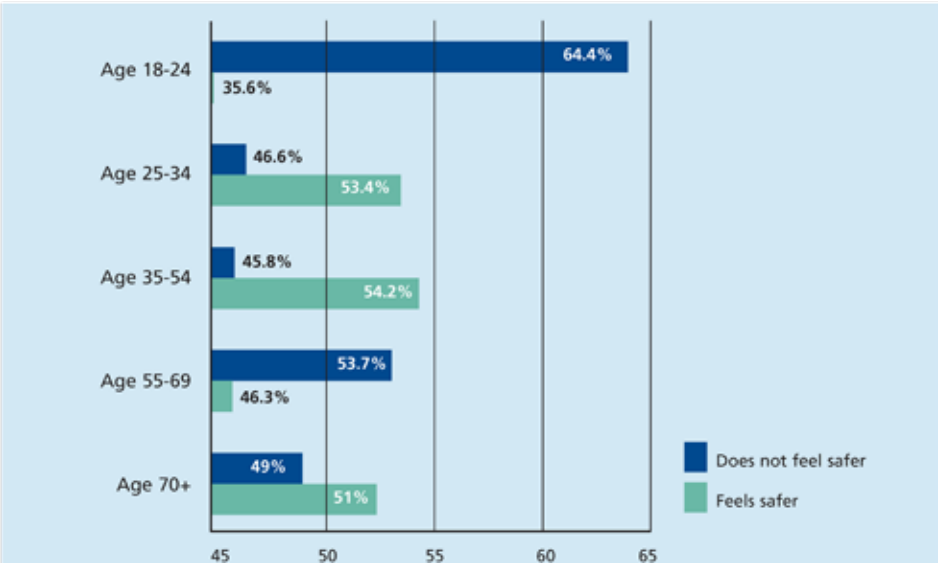
But a **commentary** published online in the September 8, 2011, *Journal of the American Medical Association* argues that "disaster preparedness has improved during the past 10 years," especially in the involvement of the healthcare community. Thomas Inglesby of the Center for Biosecurity at the University of Pittsburgh Medical Center, writes, "Three important developments are worth noting: (1) medical and public health professionals have joined the ranks of the disaster preparedness community; (2) the U.S. federal government has increased its investment in preparedness, resulting in major improvements at the state and local levels; and (3) to an increasing extent, community participants who should be involved in disaster preparedness are getting involved."

In the Federal Signal survey, the youngest age group—ages 18-24—was least likely to feel safer, while older cohorts were in general more likely to feel safer. People living in cities "feel that attention to emergency preparedness has increased more than those that live in the suburbs or a rural area," the survey concluded.

Inglesby didn't consider age breakdowns in his assessment, but he did note that the value of improved preparation efforts in the public health arena "has been repeatedly demonstrated, most recently during Hurricane Irene. Preparedness planning enabled safe and efficient evacuations of more than a million people from many communities on the East Coast. In New York City alone, more than 1,000 patients from five hospitals and 9,000 residents of nursing homes were safely transferred to other facilities. Without active engagement of the medical and public health communities in disaster planning, efforts like these would not have been possible."

The *JAMA* article did say that while smaller-scale disasters are being better addressed, work is still needed to prepare for major catastrophes, like a nuclear detonation or bioterrorist attack. In addition, there have been substantial reductions in investment in some areas recently, such as health preparedness grants from the Centers for Disease Control and Prevention.

Ten years after the 9/11 tragedy, do you feel that public safety and emergency preparedness has improved to the point where you feel safer in your day-to-day life?



From *Diving Deeper into America's Greatest Public Safety Concerns*

Tsunami risk reduction

Small is beautiful

An invited comment by William Siembieda

The tsunami that followed the February 27, 2010, 8.8 Mw earthquake in Chile caused 151 deaths. Most of those who died were visitors to small towns located along Chile's western coast. Permanent town residents were much less likely to be injured than were occasional visitors. The tsunami also destroyed an estimated 300 homes.

Pelluhue is a small coastal town of about 6,500 residents 200 miles southwest of Santiago. When the tsunami hit Pelluhue, the effect was similar to other coastal villages. Visitors died, while most local people evacuated to the nearby foothills. The difference in the type of victim can be explained in part by Chile's system of disaster education, which provides school programs to prepare for the kinds of hazards the local area is likely to experience.

While the death and injury toll among locals was small, this outcome wasn't satisfactory to the community. Pelluhue relies on tourists to drive its economy. Visitor safety is important for both humanitarian and economic reasons. Pelluhue's chief source of revenue is selling fish caught by local fishermen to restaurants and consumers, and from renting cabins to vacationers. If the visitors don't come, the restaurants don't buy the fish. The fishermen don't work.

Pelluhue needed to make itself safer for its short- and long-term visitors, and to instill confidence that it was concerned about the safety of those visitors.

In order to lower risk, we work to reduce or avoid the consequences of an anticipated hazard event. At the national level in the United States, we do this in many ways, with speed limits for one type of hazard, and the national flood insurance program for another type. This practice is repeated down the government scale to the municipal level, to the neighborhood, and sometimes the block level. At national levels there is a tendency to produce a one-size-fits-all approach because of issues of equity, enforcement, and cost. At the local levels, more flexibility is possible. Risk reduction actions can be tailored to specific local and cultural conditions.

Pelluhue made use of its own local experience, terrain, and conditions to develop a local solution to its tsunami warning and evacuation issues.

Pelluhue is physically oriented toward the Pacific Ocean.

Its main streets and buildings run parallel to the coastal edge. A set of low foothills come down close to the main streets, forming a natural barrier to tsunami waves. This forms a sea level zone near the ocean, an intermediate zone at between five and 20 feet above sea level, and a higher zone 21 to 100 feet above sea level into the foothills. These zones form terraces. The sea level zone is the location of highest risk. Risk lessens, naturally, as one moves upward into the higher areas.

The Pelluhue solution

Reducing the risk to the occasional visitor was the key to long-term sustainability in the Pelluhue response. But tourists are difficult to educate and inform about natural hazards in terrain they are unfamiliar with. The solution developed in this town was to employ simple wayfaring symbols, to install them in easy-to-maintain locations, and to locate them where visitors were sure to see them.

The solution has three parts. First, to place the symbols, they used the concrete electric power poles located throughout the municipality. Second, they used simple signs for tsunami danger along with interpretation of those signs. Finally, passive kiosks provide essential services, information, and directions.

Figure 1

For the first part, many of the municipality's concrete power poles carrying electricity overhead were painted red, yellow, or green in a simple color-coded system. If you are on a street with a red pole, you are in a very high tsunami danger zone (see figure 1). In times of tsunami danger, these places should be evacuated uphill, away from the ocean.

On streets with yellow poles, the tsunami danger is moderate. People should evacuate here, but not toward the red zones.

Streets with green poles are safe zones, with little tsunami danger, based on local risk estimates and past experience.

While this system is subject to errors related to wave height, elevation, barriers, and so on, it is simple and direct. It's easy to understand, easy to maintain, and easy to install. In fact, the system was installed not by the municipal authorities, but by a local nongovernmental organization called Techo para Chile, a Catholic Church-supported enterprise predominantly engaged in providing low-cost housing for poor families. On a single weekend, local volunteers painted the poles from the beach to the center of town. See figure 2 (next page) where all the pole colors are shown.

Figure 2

The second part of the warning and evacuation system is the use of simple symbols for tsunami danger, along with instruction about how to interpret those symbols. The electric posts use a local set of danger and evacuation tsunami symbols (see figure 3). These symbols are officially supported by the municipality. They are posted near the beaches and public buildings. Easy to understand, they employ the red, yellow, and green danger levels.

Figure 3

The third and final component consists of signs with directions to basic services and essential phones numbers. These are located at the transition zones between the beach and the town. (See figure 4). A local public health doctor developed this project. The doctor's patients, and a local artist, made the signs on the kiosk poles as a public service. Again, the focus is the occasional visitor.

Figure 4 with the author

Discussion

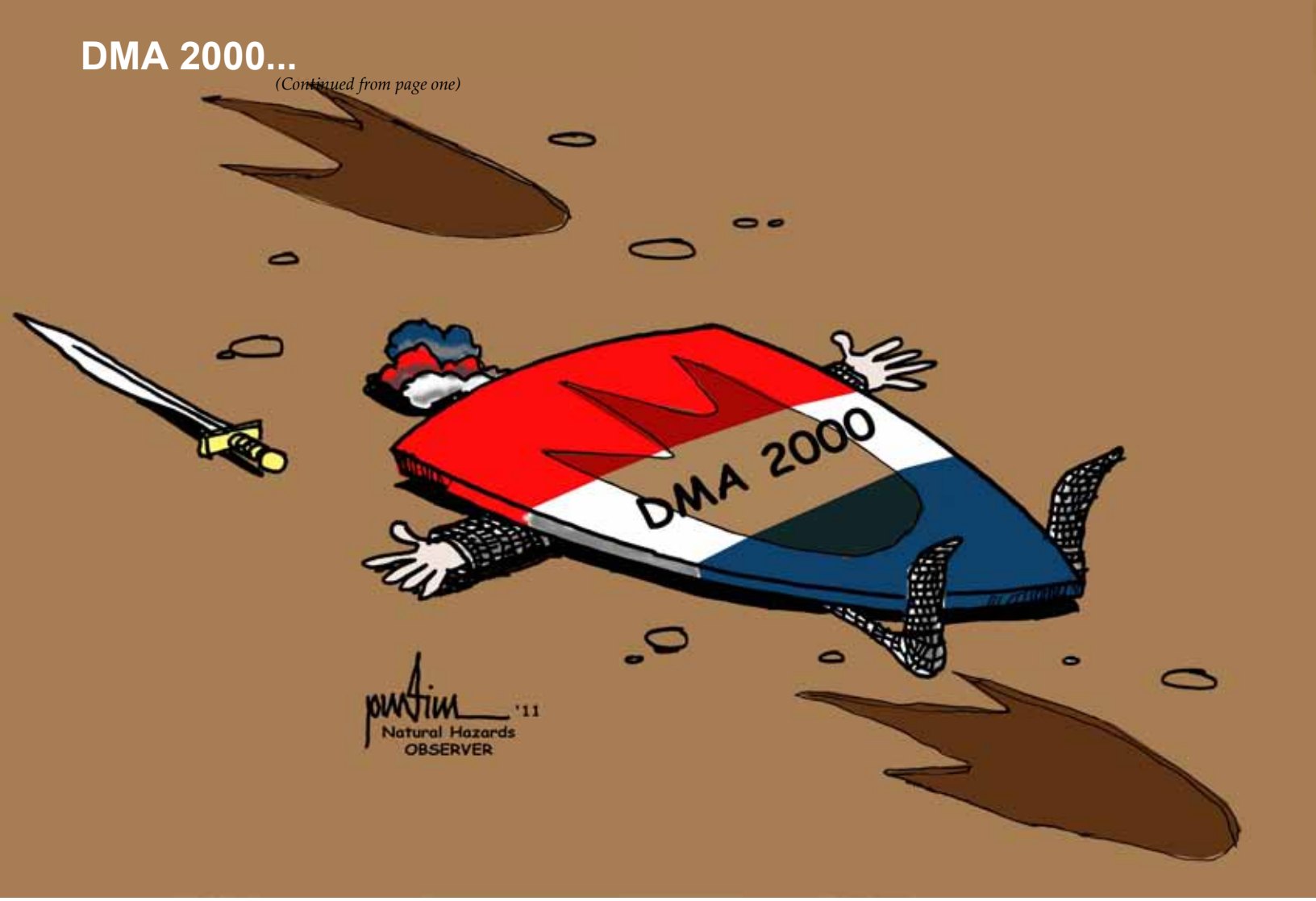
While effective and to the point, these actions are not based on an in-depth study of the best engineering information, projected modeling, and peer review. They are subject to some error. They may cause some people to think twice about where to build their second home, or where to rent a cottage. This is normal. As a system of risk reduction however, they are focused on appropriate needs, and represent a sound response to those needs.

This solution is also inexpensive to implement, can be easily adjusted, and requires no new legal procedures. It also provides the occasional visitor with a sense of what to do, based on where they are, when a tsunami event occurs. We will not know until the next tsunami if this system is effective in saving lives and preventing injury. But on the a whole, it is as a step in the right direction toward risk awareness and risk reduction.

William Siembieda conducted field assessment in Chile in March 2010 with the Earthquake Engineering Research Institute, and in May 2011 as a Fulbright Specialist assisting the Catholic University of Chile coastal recovery planning effort. He has written about the Chilean case in the ***Journal of Disaster Research****, and* ***Earthquake Spectra****. He can be reached at wsiembie@calpoly.edu.*

DMA 2000...

(Continued from page one)



remarkably low figure for a large city struck by a great earthquake. This attests to the importance of Japan's strict national building codes in saving lives.

Over a decade ago, the U.S.Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) as an amendment to the Stafford Act. DMA 2000 required local governments to prepare local natural hazard mitigation plans before receiving federal grants to mitigate community hazards, risks, and vulnerability. The law is designed to aid mitigation, preventing failures like those seen on the Gulf Coast.

DMA 2000 was initiated as an effort to learn from disasters—to avoid throwing good money after bad. The local hazard mitigation plans were intended to build long-term resilience in communities by identifying hazards and mitigation actions to permanently minimize associated risk and vulnerability.

Eleven years after its passage, there are over 19,000 federally approved local mitigation plans representing 22 percent of all U.S. cities, counties, special districts, school districts, and tribal jurisdictions. Recent disasters like tornadoes in the Southeast, floods in the Midwest and Northeast, a Mw 5.8 earthquake near Washington, D.C., and wildfires in Texas suggest the need to evaluate DMA 2000 progress.

As Louisiana State University's Brian Gerber suggested in a 2007 issue of Policy Studies Journal *(Gerber 2007), "Mitigation is simply the idea that certain policies and practices can minimize the adverse effects of a disaster event … For the most part, mitigation is a regulatory problem. Historically, mitigation has not been a major emphasis of disaster management and it is only in the last several decades that its importance has grown."*

Changing this emphasis is a driving force behind DMA 2000. But implementation suffers from several problems, characterized by confusion of mitigation with preparedness, adoption of local mitigation plans as separate stand-alone documents unconnected to local land use and infrastructure plans, and insufficient stakeholder and decision maker engagement. In the face of growing budgetary constraints, there is a need for streamlining of local plan content and state-federal review processes.

This article asks how DMA 2000 implementation can become more effective, arguing for local hazard mitigation plans which: (1) emphasize mitigation; (2) correspond with other local plans; (3) increase stakeholder and decision maker engagement; and (4) streamline plan content and reviews.

Basic provisions

An aim of DMA 2000 was to reduce repetitive disaster costs by building local government capacity to undertake effective mitigation. A growing volume of losses from natural disasters over preceding decades had underscored the need for such a law—federally declared disasters had increased from 237 in the 1980s to 460 during the 1990s (FEMA 2011).

This interest was paralleled by the growing realization that hazard mitigation was a good investment. A study by the Multihazard Mitigation Council of projects completed between 1993 and 2003 revealed an average of four dollars in disaster losses were avoided for every dollar invested in mitigation.

DMA 2000 amended the Stafford Act to require state, lo-

cal, or tribal governments to prepare hazard mitigation plans as a precondition for receipt of mitigation project grant funds. The language of the law was simple, calling for: (1) identification of natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government; (2) actions to mitigate those hazards, and (3) a strategy to implement the actions.

The concept was straightforward. Planning would improve the quality of hazard mitigation projects submitted by local governments for Federal Emergency Management Agency approval. The reward for good local planning performance would be improved opportunities for grant approval. The overall benefit would be improved grant project outcomes and safer communities.

Understanding mitigation

Mitigation is one of four elements of disaster management. The others are preparedness, response, and recovery. Preparedness, response, and recovery are sequential, whereas mitigation can be done at any time, preferably before a disaster strikes. Waiting to mitigate until after a disaster leads to avoidable losses, complicates response, and increases recovery costs.

Mitigation is defined by FEMA as "sustained action to reduce or eliminate long-term risk to human life and prop-

Mitigation vs. preparedness

Mitigation is only one pillar of disaster management. **Preparedness** addresses actions taken to minimize impacts of hazard events under unaltered risk and vulnerability circumstances, absent mitigation. These can include preparations for what to do in a disaster, what food and supplies to have on hand, how to evacuate, where to go, who to contact, and where to seek emergency shelter. Familiar preparedness examples include pre-earthquake "drop-cover-hold" exercises, distribution of sandbags to deflect flooding, and planning evacuation routes. None of these alter the severity of hazard impacts.

Response includes actions taken to respond to the actual disaster, such as rescuing survivors, conducting mass evacuation, feeding and sheltering victims, and restoring communications.

Recovery includes restoring housing, transportation, public services, and restarting economic activity, as well as creating new opportunities for the future through community improvement.

erty from natural and human-caused hazards." An American Planning Association study clarifies this definition by describing the nature of "sustained action" as "a loss prevention function characterized by *planned, long-term alteration of the built environment* to ensure resilience against natural and human-caused hazards."

Mitigation can be simple and sensible. In newly developing areas, commonly deployed mitigation practices include the adoption of modern building codes, avoiding flood and landslide zones in subdivision design, minimizing residential densities in the wildland-urban interface, and requiring two entrances and exits for new developments to assure adequate emergency vehicle access should one of them happen to be blocked.

In the wildland-urban interface, fire losses can be reduced by modifying flammable vegetation in the areas immediately around homes and by following safe construction practices. According to a study by researchers at Texas Tech University and the Institute for Business and Home Safety, in the 2007 Southern California Witch Creek fire not a single home burned in three study communities that followed "shelter-in-place" wildfire mitigation guidelines, including vegetation modification and building code provisions. In contrast, two similar communities that did not follow best mitigation practices had 145 homes burn in the same fire.

Mitigation can include such measures as structural retrofits to reduce earthquake damage, construction requirements minimizing structural ignitions in the wildland-urban interface, elevation of structures above the base flood elevation, or prohibiting development in landslide hazard areas.

In existing built-out communities, mitigation can include a variety of measures creating safer conditions. Examples include retrofitting brick structures against earthquake damage, elevating homes above the base flood elevation, and strengthening infrastructure to minimize disaster losses and damage.

In San Luis Obispo, California, population 45,000, over 100 old brick buildings have been partially or fully strengthened in recent years. These actions were stimulated by life and building losses in neighboring Paso Robles in the December 23, 2003, Mw 6.5 San Simeon Earthquake. San Luis Obispo has enlisted the cooperation of building and business owners in a seismic upgrading program which will protect the city against loss of life in future earthquakes. An important additional motivation has been the desire of the downtown business community to assure continued operation when future earthquakes strike.

Unreinforced masonry seismic retrofit programs have been successfully conducted on a much larger scale elsewhere in California. Los Angeles seismically retrofitted about 8,900 old brick buildings during the 1980s and early 1990s, which helped materially in avoiding unnecessary building losses during the January 17, 1994, Mw 6.8 Northridge Earthquake.

DMA 2000 implementation

DMA 2000 implementing regulations (44 C.F.R. 201) were issued several years after the law's passage to provide specific guidance for state and local hazard mitigation planning. Local mitigation planning could be undertaken on a single- or multi-jurisdiction basis.

In contrast with the language of the parent legislation, the regulations were highly detailed and addressed implementation of mitigation planning under both DMA 2000 and the Flood Insurance Act. Local governments were required to have FEMA-approved local hazard management plans in order to receive mitigation project grants under the Stafford Act's Hazard Mitigation Grant and Pre-Disaster Mitigation programs, and the National Flood Insurance Act's Flood Mitigation Assistance and Severe Repetitive Loss programs.

Key themes focused on creating systematic hazard, risk, and vulnerability evaluation methods as well as prioritized mitigation action at the local level. To promote this approach, FEMA issued a series of general how-to manuals, which can be found online. These were supplemented by a set of guidelines known as the *Blue Book*, which elaborate on DMA 2000 regulations and provide examples of best practices for fulfilling regulatory requirements inlocal mitigation plans. Also issued was a compliance checklist known as the *Crosswalk* by which local mitigation plans could be reviewed for adequacy in relation to specific regulatory requirements when under review by state emergency managers or FEMA staff.

DMA 2000 at the crossroads

Implementing regulations called for updating of local hazard management plans every five years. Although some

Financial incentives for planning

Because the United States is so large and decentralized, the federal government often uses financial incentives to secure state and local government cooperation in meeting national objectives. Grants enable states and localities to pursue projects for which money is otherwise unavailable.

An example was creation of the National Highway System after World War II. Money was made available to states and localities in return for cooperation in the development of interstate highways.

The approach was extended to hazard mitigation through the National Flood Insurance Program, authorized by the 1968 National Flood Insurance Act. Federally backed flood insurance was provided to home and business owners throughout the country. Rates could be lowered in localities providing higher levels of flood hazard mitigation—as much as 45 percent in communities with the best mitigation performance.

The Stafford Act in 1988 extended financial incentives to the mitigation of other hazards by offering grants to states and local governments for post-disaster mitigation projects under the Section 404 Hazard Mitigation Grant Program for the purpose of reducing future losses. Additionally, grants were extended to localities under the Stafford Act's Section 406 Public Assistance Program to cover incidental costs of hazard mitigation while restoring disaster-damaged infrastructure.

Amendments to the National Flood Insurance Act in 1994 required preparation of local flood hazard mitigation plans as a condition for flood mitigation grants under the Flood Mitigation Assistance Program. The Stafford Act was meanwhile amended to require states to prepare mitigation plans to qualify for grant funds.

Glossary

The **Disaster Mitigation Act of 2000** amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act "to authorize a program for predisaster mitigation, to streamline the administration of disaster relief, to control the federal costs of disaster assistance, and for other purposes," according to a summary of the law prepared by the Congressional Research Service. DMA 2000 required local governments to prepare local natural hazard mitigation plans before receiving federal grants to mitigate community hazards, risks, and vulnerability. The legislation passed the U.S. House of Representatives on March 4, 1999, by a vote of 415-2. The Senate approved the law by unanimous consent on July 19, 2000.

Local Hazard Mitigation Plans are the DMA 2000-required mitigation plans developed at the local level. FEMA says, "It has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs." DMA 2000 requires that local plans include comprehensive risk and capability assessments, and participation of "a wide range of stakeholders."

Pre-Disaster Mitigation Grant Program provides funds to all levels of government and to universities for hazard mitigation planning and the implementation of mitigation efforts before an event strikes.

Wildland-urban interface refers to communities which mingle with undeveloped wild vegetation—trees, grasslands, shrubs, and so on. These areas are often at risk from wildfire.

Flood Mitigation Assistance Program is a part of the National Flood Insurance Program that attempts to "reduce or eliminate the long-term risk of flood damage to buildings, homes, and other structures covered by NFIP," according to FEMA's website.

The **Severe Repetitive Loss Program** provides funding to reduce or eliminate long-term flood damage risk to residential properties that have been subject to multiple disaster claims under the NFIP.

The ***Blue Book*** is a, ahem, book with a blue cover issued by FEMA to help states and other jurisdictions understand the mitigation planning regulations. It is also intended to help them develop new mitigation plans or modify existing ones in accordance with the DMA 2000 rules.

Crosswalk is a tool FEMA uses to review the adequacy of plans submitted under DMA 2000. It is essentially a checklist covering a wide range of criteria that must be included in the local mitigation plan, scoring them either "needs improvement" or "satisfactory."

plans were prepared before DMA 2000, most were prepared during the first five-year cycle from 2004 to 2009. By July 2005, there were 5,763 FEMA-approved plans. By January 2009, an additional 13,019 had been approved.

Now, a new five-year update cycle has begun. Many local governments which participated in the first five-year cycle are expected to update their plans to maintain grant eligibility. During the next five-year cycle, more local governments may prepare hazard management plans for the first time and the total number of plans submitted to FEMA is likely to grow as governments seek grant funding.

A nationwide evaluation of DMA 2000 mitigation plan outcomes has not yet been undertaken. Research attention has been directed to plan quality among certain states. Such studies indicate substantial variation at the state and local level.

A University of North Carolina review of 30 state hazard mitigation plans indicated an improvement in state plan quality in the past decade. Using both FEMA and other plan quality criteria based on prior studies at UNC, it concluded that there is considerable room for improvement. The study observed that most plans had not effectively integrated hazard mitigation planning with land use planning.

A separate analysis of local hazard mitigation plan participation using January 2009 statistics indicated widely varying levels of local government participation. Variations in participation levels found between FEMA regions were posited to result from geography, urbanization, disaster incidence, and local government structure, but were not systematically identified.

A study of FEMA-approved local plans adopted by over 500 local California jurisdictions from 2005-2007 revealed they generally complied with FEMA *Blue Book* and other guidance. Local government participation was substantial. The plan content reviews found many positive aspects of local California mitigation plans.

Although all FEMA-approved plans met minimum FEMA plan compliance criteria in the California study, considerable variation in plan quality was observed. Plans having higher compliance levels had substantial stakeholder engagement, were prepared for communities with higher socioeconomic status, tended to be financially supported with federal predisaster mitigation funds, and were prepared with consultant assistance.

Plans with lower compliance levels barely met minimum citizen participation criteria and were for communities with lower socioeconomic status indicators. Also, single-jurisdiction plans generally had higher levels of compliance than multi-jurisdiction plans. Perhaps this was because the multi-jurisdiction plans provided fewer incentives to individual localities to measure up to detailed *Blue Book* criteria.

Based on such studies as well as the sheer number of FEMA-approved local mitigation plans, it can be reasonably argued that substantial mitigation planning progress has been made to date. However, several key areas of concern deserve attention. These include: (1) the need to more firmly distinguish mitigation from preparedness, (2) better integration of local hazard mitigation plans with land use and other local plans, (3) increased stakeholder and decision maker engagement, and (4) streamlining of plan content and reviews.

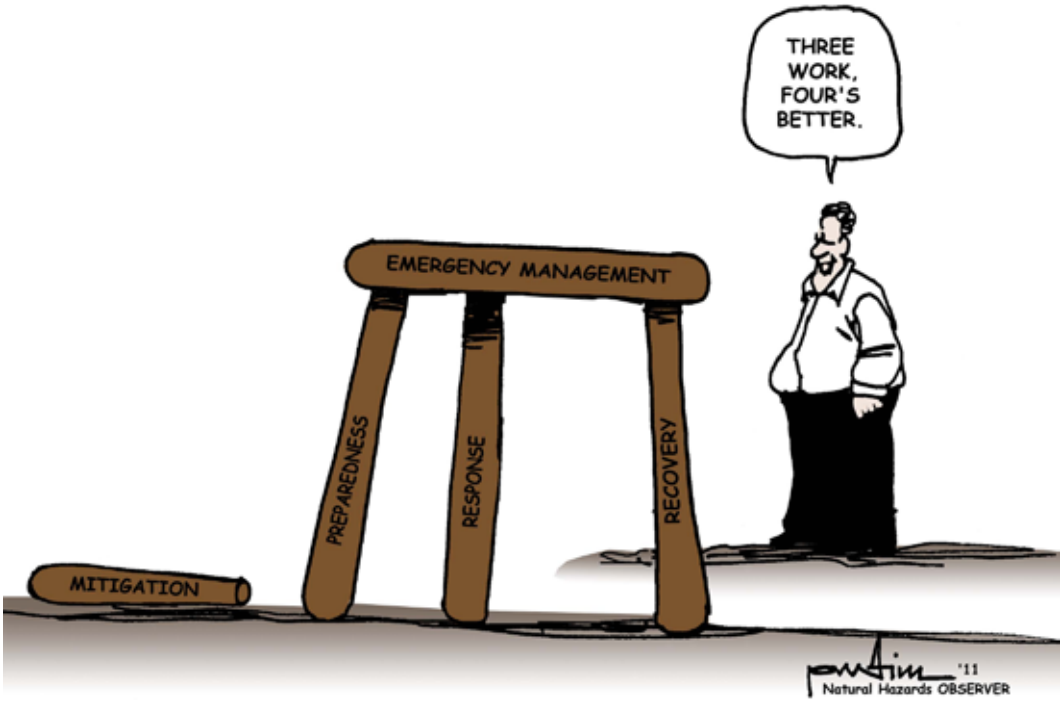
Mitigation on the ground

Mitigation is distinguished from preparedness by its emphasis on creating long-term resilience through perma-

nent modification of physical and other circumstances which create risk and vulnerability. Yet mitigation is widely misunderstood, often confused with preparedness—and not just by news media and the general public.

For example, the previously mentioned California study noted that many plans included action items which could be clearly characterized as preparedness, such as acquisition of fire trucks and emergency generators. The study found proposed preparedness activities dominated these plans, moving the focus away from mitigation.

While not necessarily representative of the whole, observations such as these are sufficiently common among mitigation practitioners to validate this concern. How could such confusion still be evident so long after DMA 2000 passed? Researchers surmised that one reason may have been the rush by FEMA to move a very large number of plans through the approval process, leading to compromises of *Blue Book* criteria.



An additional reason is the nature of the subject matter—local hazard mitigation plans are difficult for many stakeholders to understand, not only because of their inherently technical nature, but also because they may not be coincident with their individual interests. Preparedness is easier to address because it consists of discrete actions which can be taken on an individual basis, like acquiring sand bags and evacuation kits, storing food and water, and planning evacuation.

Mitigation projects are complex, require large financial commitments, and can involve many people. Though it might be reasonable to include preparedness, response, or recovery action items germane to risk reduction, mitigation actions should predominate.

The fundamental reason for the confusion may be that emergency managers are the facilitators for DMA 2000 mitigation planning. Communications about mitigation plans are distributed through a widespread network of state and local emergency managers, led by designated state hazard mitigation officers. Local building, planning, and engineering departments tend to be included secondarily in mitigation planning.

Relationship with other plans

A specific interest expressed in the DMA 2000 implementing regulations was creation of an interface between mitigation plans and other local plans, such as comprehensive general plans for land use and capital improvement plans for infrastructure finance. Regulations for conducting vulnerability analyses in required risk assessments emphasize the types and numbers of existing and future buildings and critical facilities in identified hazard areas, potential dollar losses to structures, and descriptions of land use and development trends.

The most compelling reasons for integration of local mitigation plans with land use and infrastructure plans are straightforward. They include: (1) avoidance of conflicting outcomes; (2) better mitigation performance; (3) improved external funding opportunities for state and local governments; and, (4) building partnerships among mitigation stakeholders.

The California study found, however, that only 17 percent of the local plans adequately identified future land use and development trends and their relation to hazards and risks. It further found only 15 percent of jurisdictions had adopted their local plans as part of their comprehensive general plan safety elements required under California law.

In recent years FEMA has begun to strongly encourage state and local governments to emphasize integration of hazard mitigation planning with land use planning. The May 2010 joint study **Hazard Mitigation: Integrating Best Practices into Planning** published by FEMA and the American Planning Association provides a useful start in this direction (Schwab et al. 2010). It articulates important points of connection between hazard mitigation plans with land use and other local plans. Its purpose is to educate local governments in the benefits of integrating local hazard mitigation planning with comprehensive planning. Particularly useful are case studies of successful local implementation of DMA 2000 within a comprehensive planning approach.

Stakeholder and decision maker engagement

DMA 2000 implementing regulations call for an open public involvement process in preparation of the local hazard mitigation plan. The proceeding must be documented, along with a formal record of plan adoption by the local governing body, including each jurisdiction participating in a multi-jurisdictional plan. While many communities have complied with stakeholder and decision maker engagement requirements, some only give them lip service.

Preparation of these plans is usually a low visibility process, often undertaken by out-of-town consultants. They draw little media attention. Unless the media identifies controversial issues, there is a tendency to leave the technical subject matter to specialists. For elected officials, approval of a thick, technical document to qualify the jurisdiction for grant funds is easily lost among more pressing agenda items. If buried in a consent calendar, the plan may never rise to the decision mak-

ers' attention.

Part of the problem lies in the need for definitive direction from FEMA regarding how much stakeholder and decision maker engagement is required. Though detailed in other respects, DMA 2000 regulations are surprisingly open-ended in this regard, requiring only "an opportunity for the public to comment on the plan during the drafting state and prior to plan approval…[and]…for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, other private and non-profit interests to be involved in the planning process."

Missing is any indication of how the "opportunity" for comments can be assured. For example, local governments commonly use communications techniques, like Internet posting, newspaper publication, mailed notices, neighborhood workshops—to provide interested parties information about the planning process in time to participate. Such common practices often include how much lead time should be allowed before formal action is taken, such as 14 days.

Streamlining local plan content and review

During the second five-year update cycle, opportunities exist to encourage improvements in local hazard mitigation plan quality. However, continued growth of the program is hindered by funding shortages related to the stagnant economy. As early as 2007, the California review found that many plans were prepared either directly at local expense or with very limited grant support, and that funding for projects was uncertain. Forty-seven percent of the jurisdictions didn't know how they would fund identified mitigation measures. The review also found that communities choosing not to prepare an plan tended to be smaller and had higher percentages of households below the poverty line than mitigation-savvy communities.

A 2010 update of the California review showed a smaller number of new and updated plans approved by FEMA during the period 2007-2009 than for the period 2005-2007. It also showed a continuing trend of lower participation by poorer communities (Cal EMA 2010).

Costs of preparation for the average small- or medium-sized community can exceed $50,000, and for larger cities may range to $200,000. For very large cities and urban counties, costs can be much higher. This presents a "Catch-22" dilemma—communities without means to prepare a local plan are trapped within a cycle of hazard, risk, and vulnerability that they seek to correct through grant requests. Financing for the Pre-Disaster Mitigation Program, intended to provide pre-event planning and project funds on a competitive basis, has meanwhile been shrinking.

Cost is directly related to the technical complexity of the planning documents, driven in turn by highly detailed and complex *Crosswalk* compliance checklists. Although reviews result in a pass or a fail depending upon level of compliance, the *Crosswalk* process fosters addition of repetitive content so that each checklist item is covered in a demonstrable manner. A difficulty for both preparers and reviewers is that no fundamental distinctions are made between higher vs. lower priority content. As someone has already said, "When everything is important nothing is important."

Strengthening DMA 2000

Needed now is the identification of high priority local hazard mitigation plan compliance criteria, coupled with streamlined reviews. Several criteria merit high priority status.

Emphasize mitigation. Taking a page from its joint publication with APA on plan integration, FEMA should expand its definition of hazard mitigation beyond "sustained action to reduce or eliminate long-term risk to human life and property from natural and human-caused hazards," to include the concept of mitigation as a loss prevention function characterized by planned, long-term alteration of the built environment to ensure resilience against natural and human-caused hazards. An interim definition of such scope should be used by FEMA and included in the next formal revision to 44 C.F.R. Part 102. A more lasting remedy might be to amend DMA 2000 along such lines. But that's unlikely in the current political climate.

Link mitigation plans with land use and infrastructure plans. Although FEMA requires reference to related plans, greater attention is needed to key points of connection or conflict between local hazard mitigation plans and comprehensive general plans, capital improvement plans, and other local plans dealing with land use. This issue of integrating hazard mitigation planning with land use planning remains a substantial challenge to effective deployment of DMA 2000. It is especially important in the vast number of existing communities created with insufficient attention to hazard mitigation, as well as the communities experiencing growth and development in hazardous areas. Keeping people and public facilities out of harm's way is an essential responsibility of local governments under DMA 2000, particularly with regard to housing, hospitals, nursing facilities, and critical infrastructure like emergency operations centers, water supply facilities, and wastewater treatment plants.

Engage stakeholders. FEMA should put substance into stakeholder engagement requirements, replacing the current vague language referring to an "opportunity" for public com-

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ment with minimum performance thresholds. Requirements should include communication techniques used by local governments, such as neighborhood workshops, Internet posting, newspaper publication, mailed notices, and other methods of providing people information with enough lead time to participate in the process. The rules should also specify minimum lead times for notice before formal action by the governing body is taken. Plan adoption should be strengthened to include minimum procedures by which decision makers can be made aware of local plan content, such as a publicly advertised hearing. Placement of plans on consent calendars should be flatly prohibited.

Streamline the review process. In the second five-year cycle of plan updates, FEMA has an opportunity to streamline required plan content and reviews in light of fiscal austerity brought on by the recession, and to improve overall quality. Lessons learned during the first cycle should be applied in the second. Perhaps the most important lesson is that the highly detailed requirements in 44 C.F.R Part 201, the *Blue Book*, and the *Crosswalk* make it difficult to clearly distinguish the plan quality factors that count the most. There is a need to substantially simplify and streamline the *Crosswalk* tool to help reduce plan redundancies and bulk, and hence, plan costs. Most particularly, the *Crosswalk* procedures must place of value on compliance with key, high priority requirements, and lesse emphasis on the uniformity of compliance across all criteria.

With diminishing budgets at the federal, state, and local levels, emphasis on core content and process issues must be emphasized, including: (1) more complete definitions of mitigation; (2) clearer linkages between mitigation and land use planning; (3) stronger stakeholder and decision maker engagement; and (4) within a streamlined review process, program integrity and continuity.

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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

ALL HAZARD

Managing Spontaneous Community Volunteers in Disasters: A Field Manual. By Lisa Orloff. 2011. ISBN: 978-1-4398-1833-6. 323 pp. $80 (hardcover). CRC Press. www.crcpress.com.

It's a given that in most disasters the first responders are those already on the scene who have survived the initial onslaught. And it's also a given that people come out to volunteer spontaneously for a considerable time, not just immediately following the first shock. Lisa Orloff writes, "After the 1995 earthquake in Kobe, Japan, when communication lines were down and backup facilities lost, massive spontaneous aid emerged in the form of an estimated 630,000 to 1.3 million volunteers."

But all this manpower is not of a uniform benefit. It has to be managed carefully. For instance, speaking at the 2011 Natural Hazards Workshop in July, Claude de Ville de Goyet of the World Health Organization said after the 2010 Haiti earthquake, some teams and field hospitals that arrived to assist were not meeting minimal professional or ethical standards. Small underequipped and underfunded teams were a major burden for the coordination system. Foreign individuals who offered their medical services were a particular burden, de Ville said.

"You had everything from the highest quality to the charlatan," he said. "You have a lot of volunteers come in with nothing to offer but good will." People with few skills and no knowledge of the language were a major burden for the recovery. "They were useless," he said.

This book is a process-oriented manual for dealing with volunteers. Chapter six, for instance, discusses setting up a walk-in volunteer reception center to "incorporate all types of volunteers into disaster response initiatives." Orloff outlines it in detail, from the main entrance and the floor plan to the copy machine.

There's also the obligatory chapter on social media in disasters, and its use in organizing volunteers. Finally there are also several short case studies in a chapter toward the end of the book. In the case study on Haiti, Orloff also finds disappointments, although they are different from the ones de Ville found. "It became clear that the standards and expectations of local leaders by the international humanitarian sector did not take their needs and constraints into consideration," Orloff writes. "The agency in charge of the meeting only said a few words of warning about security and informed the group of community leaders that they would have to devise logistics

plans to distribute food in a safe and fair manner. Most local leaders left the meeting very discouraged, as little to no training was given, nor was there a blueprint for how to proceed, and they had no prior experience with mass food distribution before the earthquake."

Fostering Community Resilience: Homeland Security and Hurricane Katrina. By Tom Lansford, Jack Covarrubias, Brain Carriere, and Justin Miller. 2010. ISBN: 978-1-4094-0249-7. 184 pp. $87.66 (hardcover). Ashgate Publishing. www.ashgate.com.

In the United States, the category of "homeland security" includes preparation for, mitigation of, recovery from—and so on—natural disasters as well as the prevention and reaction to acts of terrorism. There has been an ongoing debate about whether these missions are compatible. One can find, for instance, strong and reasonable arguments on both sides of the question of whether the Federal Emergency Management Agency should be housed within the Department of Homeland Security.

Lansford et al. use the lens of Hurricane Katrina to look at the history of the homeland security debate. In a reading of history that may be controversial, they write, "It was not until after the devastation of Hurricane Katrina that U.S. homeland security policy as a whole shifted focus to prevent both natural and man-made disasters."

They examine whether this change of emphasis has improved the resilience of American communities. "The history of homeland security in the United States," they write, "elucidates the finding that comprehensive or national resilience cannot be an endeavor belonging primarily to the state and federal government … Ultimately, if a community is thoroughly and sufficiently informed of its distinctions it is able to become resilient."

Encyclopedia of Weather and Climate Change: A Complete Visual Guide. By Juliane L. Fry, Hans Graf, Richard Grotjahn, Marilyn Raphael, and Clive Saunders. 2010. ISBN: 978-0-5202-6101-3. 512 pp. $39.95 (hardcover). University of California Press. www.ucpress.edu.

This encyclopedia presents a comprehensive look at the world's weather. However, what makes this book really stand out is its use of stunning photographs, detailed charts, diagrams, maps, and graphics.

The text not only explains what weather is and how it has shaped the world's landscapes and human existence, but it shows it, using clear and beautiful photos and informational graphics. A complete section is devoted to weather extremes, providing separate chapters for thunderstorms, tornadoes, hurricanes, frontal systems, drought, heat, floods, and where to find record-breaking weather. Some chapters provide information about notable global disasters.

The authors also address the study and tracking of weather through history. The last half of the book is dedicated entirely to climate change. Here, the text explains climate, then looks at each of the world's climate zones. Human environmental impact and its effect on climate, and the future of climate are also assessed. The book concludes with tips on how we can slow climate change through decreasing our carbon emissions, planning more efficient urban areas, and using alternative fuels to power our homes and industries.

—Wanda Headley

Connections: The EERI Oral History Series—William A. Anderson. Robert Reitherman, interviewer. 2011. ISBN: 978-1-9328845-50-0. 132 pp. $15 (softcover). Earthquake Engineering Research Institute. www.eeri.org/site/publications-etc/oral-history.

This is the 19th volume in EERI's delightful oral history series about prominent figures in the field of earthquake engineering. William Anderson is an African-American sociologist who has been a lifelong advocate of interdisciplinary research in the hazards and disasters field. Skillfully interviewed by Robert Reitherman, who has produced several other volumes in the series, Anderson tells of growing up in Ohio in what he calls "a mixture of segregated and integrated circumstances in the 1940s and 1950s."

Anderson talks about the influences in his early life and in his professional career, giving generous credit to those who helped and influenced him. This makes a worthy addition to what is already an important and interesting series.

Lawyers, Swamps, and Money: U.S. Wetland Law, Policy, and Politics. By Royal C. Gardner. 2011. ISBN: 978-1-59726-814-1. 304 pp. $70 (hardcover). Island Press. www.islandpress.org.

Wetlands came to the forefront of the hazards world in two recent disasters, the Banda Aceh earthquake and tsunami and Hurricane Katrina. The loss of wetlands before both of those incidents was credited with making things worse, since healthy wetlands can reduce storm surge and provide some protection against disaster.

Royal Gardner says in his introduction, "Wetlands pay the bills." This book is an exploration of the legal life of these extremely important ecological features. Once derided as pestilent swamps, wetlands are now recognized—by scientists, at least, if not by land developers—as critical water-purifying filters, as refuges for wildlife, and as the aforementioned buffer against disaster. Gardner takes the reader through the laws, lawsuits, and agency rulings that have created the thicket of conflicting priorities and uses of modern wetlands.

For a legal lesson, the book is surprisingly readable. Gardner sprinkles it with swamp humor and insights—from Shakespeare to Gary Larson. In conclusion, Gardner comes across as an optimist, proposing a laundry list of reforms to lead regulators and administrators out of the, er, swamp of wetlands management. "To implement this wish list, we would need the support of many different players," he writes. "Obviously, many of these actions would require substantial funds, and Congress would need to be willing to provide an appropriate level of appropriations to the [U.S. Army] Corps [of Engineers] and the [Environmental Protection Agency]. Executive branch officials would also need to modify policies and priorities to emphasize watershed planning, monitoring, enforcement, and transparency. But even then, the individual regulator in the field will still retain administrative discretion. It will be up to interested stakeholders to participate in the agency decision-making process—at all levels—to channel that discretion for the protection of wetlands."

CLIMATE

Global Warming and Political Intimidation: How Politicians Cracked Down on Scientists as the Earth Heated Up. By Raymond S. Bradley. 2011. ISBN: 978-1-55849-869-3. 168 pp. $19.95 (softcover). University of Massachusetts Press. www.umass.edu/umpress/spr_11/bradley.htm.

There is an ancient Chinese curse: "May you live in interesting times." At a hearing in 2000 before the Senate Commit-

tee on Commerce, Science, and Transportation, geoscientist and Director of the Climate System Research Center at the University of Massachusetts Amherst Raymond Bradley told the committee, "We are living in unusual times. The climate of the twentieth century was dominated by universal warming; almost all parts of the earth had temperatures at the end of the century that were higher than when it began. At the same time, the concentration of greenhouse gases in the atmosphere increased to levels that were higher than at any time in at least the last 420,000 years. These observations are incontrovertible."

Strong stuff. It's interesting to note that this testimony was given in 2000, when to most people global warming was a vague rumor. Not long after this hearing, Sen. John McCain, R-Ariz., became a leading advocate for dealing with climate change. It is a measure of the nation's progress on the issue that McCain—and virtually all other Republicans—have abandoned climate change mitigation and adaptation as an issue. The stance—and let's not be too hard on the Republicans, because the Democrats have done little when they've had the chance—seems to be that climate change either isn't happening, or isn't that big a deal if it is.

The well-funded wave of "climate skepticism" seems to have swept the political tide before it.

Bradley's book describes how scientists who attempt to understand global climate dynamics have been intimidated and harassed by the denial machine. Bradley is one of the authors of the famous "hockey stick," a graph in the Intergovernmental Panel on Climate Change reports that clearly shows the sudden uptick in global average temperatures beginning in the twentieth century. Because the graph is so clear and dramatic, it has been the subject of sustained and arcane attacks by the climate denial machine. Bradley's book provides an enlightening look at this controversy, which turned obscure technical details like principal component analysis and archived Gaspé tree ring data into the stuff of high drama.

It is hard to believe congressional committees have enough time available to address this kind of thing. But it is also true that willful ignorance about scientific methods and conclusions may have a severe negative impact on the world's policies affecting climate and related environmental issues. Bradley discusses the hockey stick controversy, the "doubt merchants" and much else in this short book about the perils of climate science and policy.

Contracts and Grants

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

Real-time investigations of the Tohoku and Darfield earthquake sequences. National Science Foundation grant #1136469. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1136469. One year. $144,875. Principal investigator Thomas Jordan, University of Southern California, tjordan@usc.edu.

The earthquake sequences excited by 2010 Darfield, New Zealand, and 2011 Tohoku, Japan, are natural experiments being conducted in two distinctive and well-instrumented tectonic laboratories. This project supports U.S. scientists participating in these experiments collaborating with their Japanese and New Zealand colleagues.

The project will improve the physical and statistical foundations for time-dependent earthquake forecasting. New forecasting models incorporating seismic, geodetic, and other data are being developed and evaluated using the existing infrastructure of the Collaboratory for the Study of Earthquake Predictability. The research is focused in two areas: (1) the retrospective calibration and prospective testing of physics-based forecasting models, including those based on rate/state-dependent friction, the Coulomb stress function, and observations of slow slip event; and, (2) the evaluation of hypotheses critical to forecasting large earthquakes, including the characteristic earthquake hypothesis, the seismic gap hypothesis, and the maximum-magnitude hypothesis.

The basic research sponsored by this project is elucidating critical scientific issues related to temporal changes in primary and secondary seismic hazards. The results will help the Working Group on California Earthquake Probabilities formulate an improved time-dependent Uniform California Earthquake Rupture Forecast, and they will also aid the U.S. Geological Survey and the National Oceanic and Atmospheric Administration in improving procedures for time-dependent forecasting of earthquake and tsunami hazards off the Cascadia coast.

The effects of pre-disaster recovery plans on post-disaster recovery among socially vulnerable populations. National Science Foundation grant #1066310. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1066310. One year. $147,770. Principal investigator Jennifer Horney, University of North Carolina at Chapel Hill, jen.horney@unc.edu.

This study will document the prevalence, type, and quality of recovery plans in coastal counties throughout the southeastern United States, examining the effectiveness of recovery plans in reducing vulnerability to disasters. Socially vulnerable groups, including women, racial and ethnic minorities, the elderly, poor, and persons living with disabilities may suffer disproportionately from disasters. This may be in part because these groups do not participate in the disaster planning process or because their unique needs are not typically addressed in disaster plans.

An inclusive planning process that includes public participation and engagement of socially vulnerable groups will lead to higher quality recovery plans. Higher quality plans will, in turn, lead to more disaster resilient communities. A resilient community faces future disasters with reduced vulnerability, fewer inequities and a more sustainable future.

SDCI Net: A wireless ad hoc and sensor network cyberinfrastructure for emergency response. National Science Foundation grant #1127449. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1127449. Three years. $300,000. Principal investigator Radu Stoleru, Texas Engineering

Experiment Station, stoleru@cse.tamu.edu.

Given the complexity and seriousness of the disaster response environment, there is an urgent need for a wireless ad hoc and sensor network cyberinfrastructure integrating responders and supporting networks. The cyberinfrastructure must enhance robustness and efficiency of the integrated networks and provide mechanisms to dynamically modify network behavior in response to changing conditions. Similar efforts have made contributions in surveillance, tracking, and healthcare but fail to address the scale, complexity and robustness required by disaster response.

This project develops a cyberinfrastructure consisting of a set of new protocols, software components, and analysis to support disaster response. It is designed for the alternately congested and sparse environments typical of disasters where conventional infrastructure is unavailable. A spectrum-aware, multi-channel MAC protocol improves energy efficiency of compressed sensing applications, by minimizing congestion through intelligent use of multiple channels. On-demand routing provides end-to-end delay guarantees at optimal data rates. Adaptive tuning improves performance and minimizes negative interactions. The architecture provides a robust, energy-efficient framework tailored to disaster response operations.

The project will provide the first cyberinfrastructure for emergency response, integrating wireless sensor networks, and ad hoc networks deployed in a realistic environment.

Minimizing the spread of false rumors in social media during a disaster. National Science Foundation grant #1138658. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1138658. One year. $49,979. Principal investigator Yasuaki Sakamoto, Stevens Institute of Technology, ysakamot@stevens.edu.

This project focuses on understanding the spread of false information during responses to natural disasters and on the development of new techniques to prevent the spread of false information in social media. For example, after the March 11, 2011 major earthquake in Japan, social media such as Twitter played an important role in sharing information and coordinating disaster response. However, social media were also used by some people to spread false information about radiation and supplies, potentially creating widespread panic. The goals of this project are to better understand how false information is spread via Twitter after an emergency and to develop and evaluate new techniques to prevent the spread of false information.

The investigators will build a visualization tool to measure the effectiveness of counteracting tweets that question the accuracy of false tweets and conduct experiments with university students in Japan and the United States in which subjects' familiarity with and likelihood of spreading different types of false and counteracting tweets are measured.

The project will provide new insights into the factors that determine the spread of false information, as well a set of recommendations for reducing this spread. The project will also contribute new methods for analyzing the spread of information in social media.

The insights and tools provided by the project will benefit future disaster response efforts by allowing emergency personnel to detect when false information is being spread and intervene to counteract the effects of false information before negative societal effects such as panic occur.

Near collapse performance of existing reinforced concrete frame buildings. National Science Foundation grant #1135005. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1135005. Two years. $539,995. Principal investigator Mehrdad Sasani, Northeastern University, sasani@neu.edu.

Column shear-axial failure in existing vulnerable reinforced concrete frame buildings constructed before the mid-1970s is a major seismic risk. The challenges associated with spatial response and system load redistribution capability at the onset of collapse has not been resolved yet. The acceptance criteria in current seismic rehabilitation provisions are defined at the element level with no due consideration for the system robustness. Four sets of three-dimensional, geographically distributed hybrid simulations will be conducted using the George E. Brown, Jr. Network for Earthquake Engineering Simulation facility at the University of Illinois at Urbana-Champaign to obtain the response up to collapse of a representative three-dimensional structural system subjected to one-directional and tri-axial seismic ground motions.

This research will investigate, characterize, model, and derive practical procedures for the consequences of column shear-axial failure on the collapse of existing vulnerable reinforced concrete structures. The project will develop system-level acceptance criteria and analytical tools for near collapse seismic performance of existing non-ductile RC frame structures. Data from this project will be archived and made available to the public through the NEES Project Warehouse/data repository at www.nees.org.

If successful, this research project will shift the philosophy of structural assessment of vulnerable buildings from component-level to system-level evaluation. The application of system-level evaluation methods developed in this project can lead to more efficient and cost-effective rehabilitation methods for existing non-ductile RC buildings against collapse by identifying and prioritizing buildings susceptible to partial/total collapse.

New Zealand as a natural laboratory to investigate earthquake stress variation. National Science Foundation grants #1113593 and #1113703. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1113593. Two years. Two grants. $140,364 to principal investigator Rachel Abercrombie, Boston University, rea@bu.edu and $142,824 to principal investigator Diane Doser, University of Texas at El Paso, doser@utep.edu.

Global studies of earthquake source parameters have suggested that high stress drop events are more likely to occur in intraplate regions, along strike-slip faults, and at deeper depths. These studies combine stress drops determined from a variety of methods whose uncertainties are poorly known. The PIs will investigate the validity of these general observations by using a single analysis technique on moderate-sized earthquakes recorded by the modern broadband New Zealand network that has been operating for over seven years.

This research has three aims: (1) determine factors controlling the earthquake rupture process in four distinct tectonic regimes of New Zealand; (2) examine uncertainties in estimating stress drops obtained using the empirical Green's function technique; and (3) a preliminary examination of spatial variations in earthquake parameters along the Hikurangi Margin, North Island, New Zealand. The initial

focus will be to investigate four distinct tectonic regimes where large earthquakes with prolific aftershock sequences or swarm sequences provide us with numerous moderate magnitude events. These regions include strongly coupled subduction (Dusky Sound 2009), weakly coupled/aseismic subduction (Gisborne 2007), strike-slip crustal (Darfield 2010 and Christchurch 2011), and back-arc spreading (Matata 2005-2010). The results will be useful to scientists who study subduction zone processes or the dynamics of the earthquake rupture process.

The research will focus on a preliminary study of earthquakes along the margin of the North Island of New Zealand where the Pacific plate is being subducted (pushed) beneath the island. This margin has large, along-strike variations in geology and structure that affect how parts of the Pacific plate stick or creep as the plate descends. The results will also be relevant to studies of SSE and seismic hazards in other subduction zones such as Cascadia and Alaska. Since many urban regions of the world are located along these types of plate margins, the results will be useful to scientists who study geologic and tectonic processes at these margins, as well as to improving earthquake hazards models and building codes for these highly urbanized areas.

Pervasive computing for disaster response. National Science Foundation grants #1143705 and #1143666. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1143705. Two years. Two grants. $140,000 to principal investigator Nalini Venkatasubramanian, University of California-Irvine, nalini@ics.uci.edu and $159,998 to principal investigator Julian Bunn, California Institute of Technology, julian@cacr.caltech.edu.

This research will develop key components of community-based pervasive systems to allow citizens to respond to disasters. The systems will make use of inexpensive networked sensors and communication devices distributed among families and communities. The devices will enable the collection of situational information and the dissemination of alerts, by use of fault and delay-tolerant networks, and through the use of cloud computing and crowd sourcing techniques.

Sensor-based detection technologies will be studied to help identify events, e.g. abnormal ground motion, and fault-tolerant networks will be designed to connect the sensor systems together and to a resource-rich cloud infrastructure. Methods for performing sensing analysis and data fusion in the cloud will be incorporated to address tradeoffs among rates of false positive alarms, false negative alarms, and time to detection. The existing infrastructure will be used to design systems for delivering actionable information to responders and communities using multiple networks. The community-based sensing and alerting techniques developed will be evaluated in campus testbeds at UCI and Caltech.

Observations of near-Earth asteroids. National Science Foundation grant #1109940. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1109940. One year. $216,102. Principal investigator David Tholen, University of Hawaii, tholen@ifa.hawaii.edu.

This project will continue an ongoing program of astrometric (positional) observations of near-Earth asteroids. Astrometric follow-up of new observations is essential in order to determine orbits and recover the objects at future observing opportunities.

Over 60 percent of NEAs newly discovered in 2008 and 2009 were subsequently lost due to the lack of adequate follow-up. This project will measure using the University of Hawaii 2.24-meter telescope and other telescopes on Mauna Kea.

The telescopes and specialized techniques used enable the team to observe fainter objects, with greater positional accuracy, and with better access to the south celestial hemisphere than other groups. They will adapt the newest and most accurate astrometric reference catalog, the PPMXL catalog, for use in NEA astrometry and provide this customized catalog to the community.

The group will plan and carry out measurements of physical characteristics, including shapes, albedos and colors, of selected objects that are candidates for human exploration.

Conferences and Training

November 11-17, 2011
IAEM Annual Conference
International Association of Emergency Managers
Las Vegas, Nevada
Cost: $595

This conference discusses current trends in emergency management and homeland security. Topics include mutual aid agreements under the Federal Emergency Management Agency's Public Assistance Program, public engagement in emergency preparedness, the role of amateur radio in emergency management, and emergency sheltering for people with functional needs. Optional Emergency Management Accreditation Program training is available after the conference.

www.iaem.com/events/annual/intro.htm

November 14-17, 2011
Exploring the Mega-Fire Reality 2011
Elsevier
Tallahassee, Florida
Cost: $700

This conference discusses the growing number and intensity of wildfires and how those changes affect fire protection strategies. Topics include ecosystems at risk, changing fire patterns in the boreal forest, predictions and preparations, and managing ecological recovery.

www.megafirereality.com

November 15-16, 2011
Public Health and Medical Disaster Response in Action
The Center for Preparedness Education
Omaha, Nebraska
Cost and Registration: $150, closes November 8

This conference will showcase the experiences and lessons learned by medical and public health personnel when

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Copies of the *Observer* and the Natural Hazard Center's electronic newsletter, *DR—Disaster Research News You Can Use*, can be downloaded free from the Center's Web site:

www.colorado.edu/hazards/

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a tornado hit Joplin, Missouri, this May. Session topics include emergency medical services response team experiences, impacts to Mercy St. John's Hospital, security and safety at Freeman Health, and impacts to home health care agencies.

www.preped.org/Training/2011-JoplinConf.html

November 22-24, 2011
Sumatra Tsunami Disaster and Recovery 2011 and South China Sea Tsunami Workshop
Tsunami and Disaster Mitigation Research Center
Banda Aceh, Indonesia
Cost: $100

These workshops will present new research and practices in earthquake and tsunami disaster management. Topics include numerical simulations and tsunami models, risk mapping and evacuation routes, city planning and restoration after earthquakes and tsunamis, community-based disaster risk management, and disasters and food security

www.aiwest-dr.org

November 23-26, 2011
Cities in Transition
Cisco Systems, Inc.
Porto Alegre, Brazil
Cost and Registration: $545, open until filled

This conference looks at cities becoming more resilient in the face of climate change. Local movements that mitigate future disasters will be highlighted. Topics include food access, redefining metropolitan governance and leadership, peri-urban agriculture and renewable energies, and urban growth and planning.

portoalegrecongress2011.metropolis.org

December 6-9, 2011
Rivers 2011
River Engineering and Urban Drainage Research Centre
Penang, Malaysia
Cost: $500

This conference will examine the effect of climate change on the world's rivers and attempt to formulate sustainable solutions for flooding and water scarcity. Topics include innovations in urban drainage, floodplain and river rehabilitation, land use planning for watersheds, water-related hazards and disasters, and flood forecasting.

rivers2011.eng.usm.my

December 14-15, 2011
International Conference on Climate Change and Social Issues
Toulouse Business School and Institute of Human Development and Training
Colombo, Sri Lanka
Cost: $182

This conference will look at the social issues of climate change, including gender inequality, social justice, ethics, and human rights. Attendees will participate in group discussions, debate the global impacts of climate change, and form working groups to implement ongoing mitigation and adaptation strategies.

www.ihdt.org/Conference.html

January 10-12, 2011
Eighth International Conference on Environment, Cultural, Economic and Social Sustainability
University of British Columbia
Vancouver, Canada
Cost: $550

Held in different venues around the world each year, the meeting will address fundamental issues of sustainability in a holistic manner. The conference is divided into streams of environmental, cultural, economic and social sustainability research and presentations.

onsustainability.com/Conference-2012

January 17-19, 2012
International Disaster Conference
International Disaster Conference and Expo
New Orleans, Louisiana
Cost: $200

This conference presents public- and private-sector best practices in emergency management, homeland security, and disaster preparation, response, recovery, and mitigation. Session topics include business continuity planning, national security, global emergency preparedness, and private sector emergency management resources. Independent training courses in business continuity and emergency management will also be offered.

www.internationaldisasterconference.com

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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.

To find out more about these and other opportunities for giving, visit:
www.colorado.edu/hazards/about/contribute.html

Or contact Ezekiel Peters at ezekiel.peters@colorado.edu or (303) 492-2149 to discuss making a gift.

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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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Observer cartoons are drawn by Rob Pudim.

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