

How to handle a Texas-sized drought



PEOPLE DON'T BELIEVE THAT A CITY CAN completely run out of water. But the unprecedented Southwestern drought of 2011-2012 is showing that this comfortable belief is wrong.

The drought has presented enormous challenges to the Texas Division of Emergency Management and to the state. In addition to massive agricultural losses, Texas saw wildfires—including one of the most devastating wildfires in state history, the Bastrop Complex fire—dust storms, buckling infrastructure, disease, endangerment of the state electrical grid, and, most challenging, threats to municipal water supplies.

As of the end of September 2012, the Texas Commission

on Environmental Quality (www.tceq.texas.gov/drinkingwater/trot/droughtw.html) listed four towns with total population of just under 4,000 people that could be completely out of water within 45 days. One town, Spicewood Beach—population about 1,300—has had water trucked to it by the Lower Colorado River Authority. Another 10 communities could be out of water in 90 days or less. And the TCEQ data almost certainly understates the situation—only one in six Texas communities has reported its water supply situation to the state under the state voluntary reporting system.

According to the *Austin American-Statesman* in **January**, “For more than a year, nearly the entire state of Texas has

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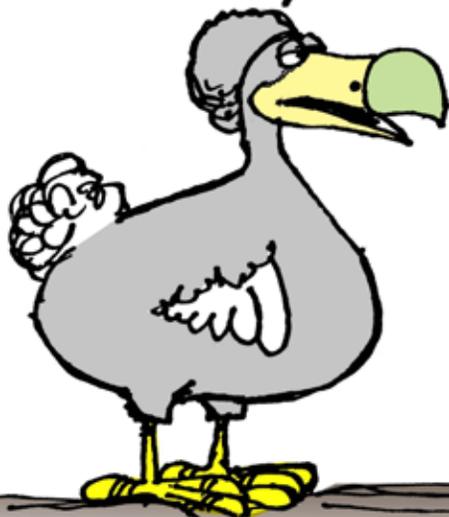
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PERSONALLY,
I DO NOT
RECOMMEND
JOINING MY
CLUB.



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Your classic climate change fish stories

It's rough on the animals—and getting rougher

AS THE OCEANS WARM, fish will get smaller.

Trout will be extinct on the Iberian Peninsula in less than a hundred years.

For the eastern Pacific populations of leatherback turtles, the current century could be their last.

And climate change will “have strong effects on top consumers”—i.e., predators—driving extinction dynamics and biodiversity in complex ways.

These are just the latest species of animals being hounded by climate change. Much of the debate on climate focuses on its impacts on humans, but climate also has a profound impact on the ecosystems and their inhabitants that are poorly understood.

“We were surprised to see such a large decrease in fish size,” said University of British Columbia professor William Cheung in a news release about this research. His study, published in the September 30, 2012, *issue* of *Nature Climate Change*, modeled more than 600 species of fish. They found that, under the current warming regime, body weight of fish in a warmer, less oxygenated ocean can be expected to decline by 14 to 20 percent.

The effects will be seen most dramatically in the tropics, but there will also be affects in temperate regions. This study indicates that the consequences of failing to curtail greenhouse-gas emissions on marine ecosystems are likely to be larger than previously expected,” the study says. And the effects don’t include such other likely human impacts as overfishing.

But overfishing, climate change, pollution, and the extraction of water for irrigation are all likely to doom trout in Spain and Portugal before 2100, according to another *report* in *Global Change Biology* in May, 2012. A team from Complutense University of Madrid found that without changes in current trends the habitat of the common trout will have practically disappeared by 2100.

Trout require cold water. It has “very narrow physiological margins in which it can live.” Between 1975 and 2007, the research team found clear temperature increases in trout habitat water, and a decrease in trout populations. Even in the best case, with only slight additional temperature increases from climate change, “the situation for the trout is disastrous,” said lead author Ana Almodóvar.

The long sad story continues in the tale of the eastern Pacific leatherback turtles. Eggs and hatchlings buried in

hotter drier beaches will be a leading cause of population decline in these animals. The nesting population can decline by 7 percent per decade, or 75 percent by 2100, according to [research](#) published online on July 1, 2012 in *Nature Climate Change*.

Well, few of us have ever seen a leatherback turtle. Maybe fishermen can catch more, smaller fish. And we can survive without eating Spanish trout. But these changes in species mass and composition can have unexpected consequences. "Currently, most models predicting the effects of climate change treat species separately and focus only on climatic and environmental drivers," said Phoebe Zarnetske, a postdoctoral fellow at the Yale School of Forestry and

Environmental Studies and the lead author of a June 22, 2012 [study](#) on predator-prey relationships in *Science*. "But we know that species don't exist in a vacuum. They interact with each other in ways that deeply affect their viability."

Particularly important to these interactions can be the impact on predators or other "top consumers." On Isle Royale in Michigan's Lake Superior, higher winter temperatures and a canine parvovirus resulted in fewer wolves and more moose. Increased browsing by the moose caused a decline in balsam fir. In some environments, these kind of interaction can cause a change in vegetation communities and fire regimes.

They Said It ...

"Call me crazy, I'll be back. I don't want to be nowhere else. If this happened a hundred times, I'm going to move back a hundred times."—**Aleen Barthelemey of Plaquemines Parish, Louisiana, hit hard by both hurricanes Katrina and Isaac, quoted in the September 2, 2012 *New York Times*.**

"We're closer to becoming a Weather-Ready Nation every day. Efforts to improve our service to the nation through these pilot projects along with upgrading our technology and integrating social science research in our warning language are helping us empower people to make life-saving decisions."—**NOAA Administrator Dr. Jane Lubchenco in a NOAA [news release](#).**

"The whole point of this is that we simply don't just sit back and wait for a goddamn crisis to happen. In this country we tend to do that."—**U.S. Secretary of Defense Leon Panetta on preparing for a potentially crippling cyberattack, quoted in *Slate*.**

"The verdict and prison sentences delivered on 22 October in the trial of six Italian scientists and one

government official charged with manslaughter in connection with the L'Aquila earthquake are troubling and could ultimately be harmful to international efforts to understand natural disasters and mitigate associated risk."—**American Geophysical Union [statement](#) on the conviction of scientists and an official for inaccurately predicting the L'Aquila earthquake.**

"I think it's very unfair and very stupid. It reflects a kind of fundamental misunderstanding of what science can and can't do."—**Seth Stein, an earth scientist at Northwestern University in Illinois, quoted in *LiveScience* on the L'Aquila convictions.**

"The idea is ridiculous, to hold scientists responsible for public policy. First, scientists have almost zero ability to predict earthquakes, and second, have no direct responsibility for public policy. Something has gone seriously wrong in the Italian legal system."—**Chris Goldfinger, a professor of geology and geophysics at Oregon State University, on the L'Aquila case, also quoted in *LiveScience*.**

Many reactor sites face tsunami risk

Most at-risk nukes are in Asia

THERE ARE 23 NUCLEAR reactor sites with a total of 74 reactors located on them which are at risk of being hit by tsunamis, according to research by

Joaquin Rodriguez-Vidal of Spain's University of Huelva and colleagues.

Virtually all of the at-risk reactors are located on shorelines in South and Southeast Asia, according to "Civil nuclear power risk of tsunamis," which appeared in the [journal *Natural Hazards*](#) (DOI: 10.1007/s11069-012-0162-0).

Of the 23 total sites, 13, with 29 reactors, are active. Four sites totaling 20 reactors are being expanded with nine new reactors. There are seven new sites with 16 reactors under construction.

"Twenty-seven of the 64 nuclear reactors currently under construction in the world are located in China, giving an indication of the ongoing massive investment in nuclear power in this country. More importantly, 19 (including 2 in Taiwan) of these 27 reactors are being built in the at-

risk areas identified in our study. Rapid expansion of this sensitive technology in at risk shorelines underlines the potential threats posed by a large tsunami hitting any of these locations," the paper says.

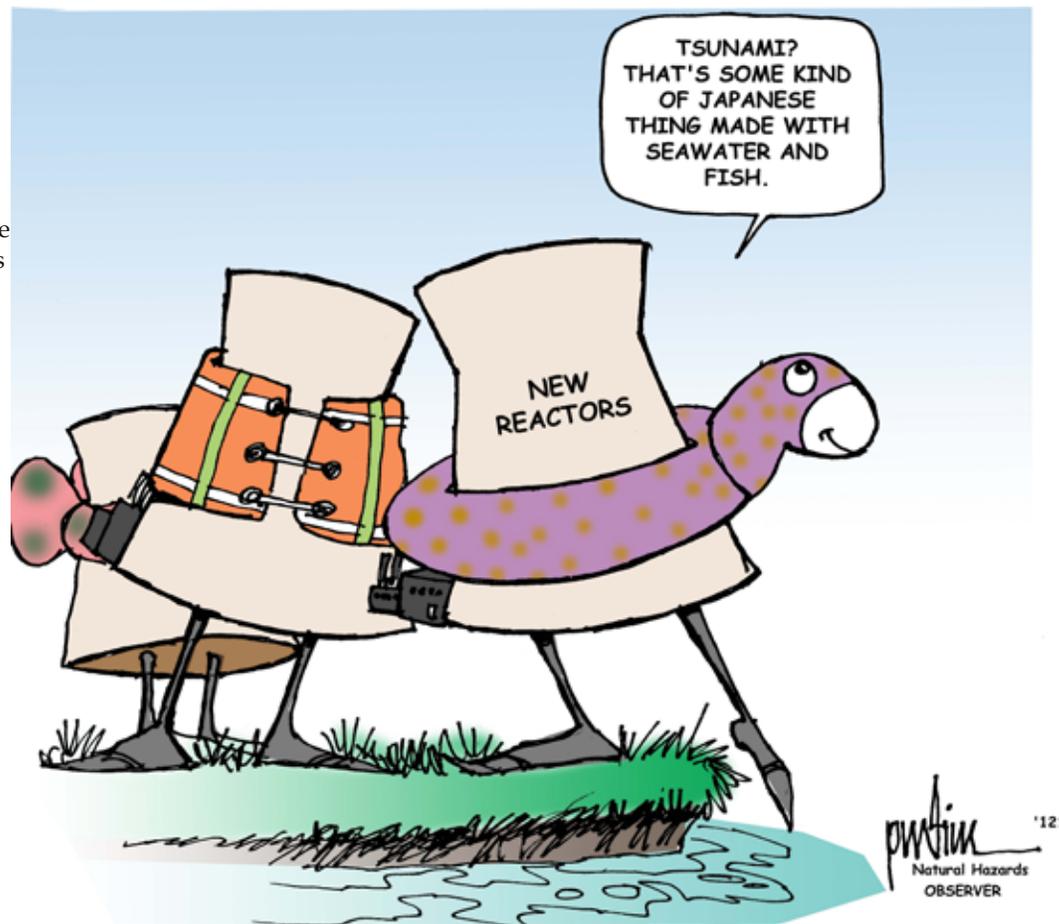
The researchers say that because of the uncertainties surrounding nukes and tsunamis, especially in light of the recent disaster in Japan, "a more conservative approach may be appropriate to achieve sustainable human development." They recommend an all-hazards approach to siting, creation of multi-hazard maps, and consideration of relevant historical and geological evidence.

The Japanese Fukushima disaster happened in a nation with very high levels of technical competence and economic resources. "Should a similar event occur in a country that is less well-equipped to manage the catastrophic consequences of such a coincidence of events, the impact will be far more serious for the world," the authors write.

Radiation can be transported considerable distances after a major accident, posing globally important risks, according to a May 2012 [paper](#) in *Atmospheric Chemistry*

and Physics (doi:10.5194/acp-12-4245-2012). J. Lillieveld and colleagues from the Max Planck Institute for Chemistry found, "In the event of a major reactor accident of any nuclear power plant worldwide, more than 90 percent of emitted ^{137}Cs would be transported beyond 50 kilometers and about 50 percent beyond 1,000 kilometers before being deposited. This corroborates that such accidents have large-scale and transboundary impacts."

The researchers use ^{137}Cs —Cesium 137—as a proxy for radiation dispersal. They did not analyze the fallout patterns from the recent Fukushima accident, but data from other important plant failures like Three Mile Island and Chernobyl.



What is resilience?

National Academies—and others—grapple with definitions

RESILIENCY IN DISASTERS clearly exists, since some people, communities, cultures, and countries recover more quickly from disaster than others. But a standard definition of resilience—what it consists of—is hard to find.

"Disaster resiliency, as it relates to post-disaster community recovery, is a slippery term that can be misunderstood, if not outright abused," wrote Frederick Burkle, Jr., in a 2011 **editorial** in the journal *Disaster Medicine and Public Health Preparedness*. "It is difficult to find a universal definition of resiliency that satisfies all of the disciplines that claim ownership of the term and satisfies the one-definition rule that would measure its impact on individuals, communities, and society."

The National Academies **report** *Disaster Resilience: A National Imperative*, defines resilience this way: "The ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events." The report goes to say, "Enhanced resilience allows better anticipation of disasters and better planning to reduce disaster losses—rather than waiting for an event to occur and paying for it afterward."

The National Academies report examined many different metrics for looking at resilience that a "national resilience score card be established. "Without some numerical basis for assessing resilience it would be impossible to monitor changes

or show that community resilience improved. At present no consistent basis for such a measurement exists."

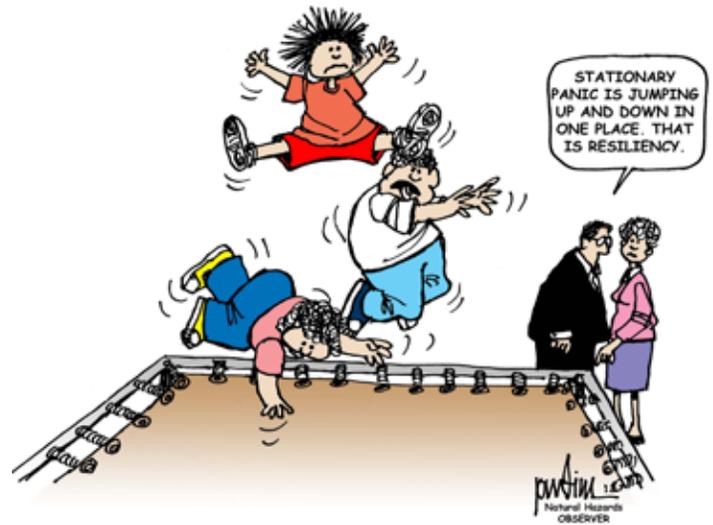
Burkle says, "Disasters have the uncanny ability to immediately reveal and define the status of public health protections and expose community vulnerabilities." But the degree of resilience in a population seems to depend on the kind of disaster that occurs. In the September 11, 2001 terrorist attacks, "Resilience" (defined as 1 or no PTSD [posttraumatic stress disorder] symptoms) was observed in 65 percent of the sample." The frequency of resilience never fell below one-third of those surveyed, even among people who had lost a loved one or actually witnessed the attacks.

Burkle also notes, "The 1991 Bangladesh cyclone, one of the deadliest tropical cyclones ever recorded, killed more than 138,000 people and left tens of millions homeless, yet survivors quickly gathered up corrugated metal sheeting and other remnants of their former homes to reconstruct their lives. Societies that occupy disaster-prone areas incorporate resilience into their cultures, a trait often lacking in more 'fortunate' parts of the world."

But these same people are now facing other, less familiar threats which tend to disrupt that resilient society and pose newer challenges. They are being "driven out of their historical home sites by rising oceans that claim low-lying shoreland and surrounding islands and find themselves externally and internally displaced in unfamiliar and security-poor urban slums facing unprecedented daily challenges to survival."

The approaches to stepping up resilience in everyone's playbook include multidisciplinary approaches: Developing the economy and reducing economic inequities; engaging the local people in the process; fostering international cooperation; propping up existing social support; and planning for the unexpected.

The National Academies report says the key elements of a culture of resilience are: having individuals realize they provide their own first line of defense; providing national leadership in funding and policy by Congress and federal agencies; investing in community-led resilience; providing site specific information on risks; enacting and enforcing local zoning and controls to take advantage of existing natural defenses; encouraging adequate building codes; offering risk based private insurance and financing; developing contingency plans for recovery; and providing redundant infrastructure and regional interdependency.



Investigations subcommittee says ...

Fusion centers coming apart at seams

Units' intelligence is often shoddy, obsolete, taken from public sources

DEPARTMENT OF HOMELAND SECURITY'S FUSION CENTERS have produced little valuable intelligence, becoming instead centers of waste and abuse, according to an investigation by the U.S. Senate Permanent Subcommittee on Investigations of the

Committee on Homeland Security and Government Affairs.

Fusion centers were established after the September 11, 2001 terrorist attacks in an effort to coordinate terrorism-related information among state, local, and federal officials. Instead, though, the subcommittee found that fusion centers "forwarded 'intelligence' of uneven quality—oftentimes shoddy, rarely timely, sometimes endangering citizens civil liberties and Privacy Act protections, occasionally taken from

already published public sources, and more often than not unrelated to terrorism."

The investigation found that DHS exaggerated some contributions, even claiming centers in Wyoming and Philadelphia were functional in DHS materials—but they didn't exist.

Even functional fusion centers provided little useful information. One-third of the reports produced between April 1, 2009 and April 30, 2010 were never published with DHS because they contained no useful information or potentially violated Americans' civil liberties. Many reports were so late they were deemed obsolete by the time they were published. And most reporting "was not about terrorists or possible terrorist plots, but about criminal activity, largely arrest reports pertaining to drug, cash, or human smuggling," the subcommittee report says.

"It's troubling that the very 'fusion' centers that were designed to share information in a post-9/11 world have become part of the problem. Instead of strengthening our counterterrorism efforts, they have too often wasted money and stepped on Americans' civil liberties," said Senator Tom Coburn, the ranking member of the subcommittee, in a [news release](#).

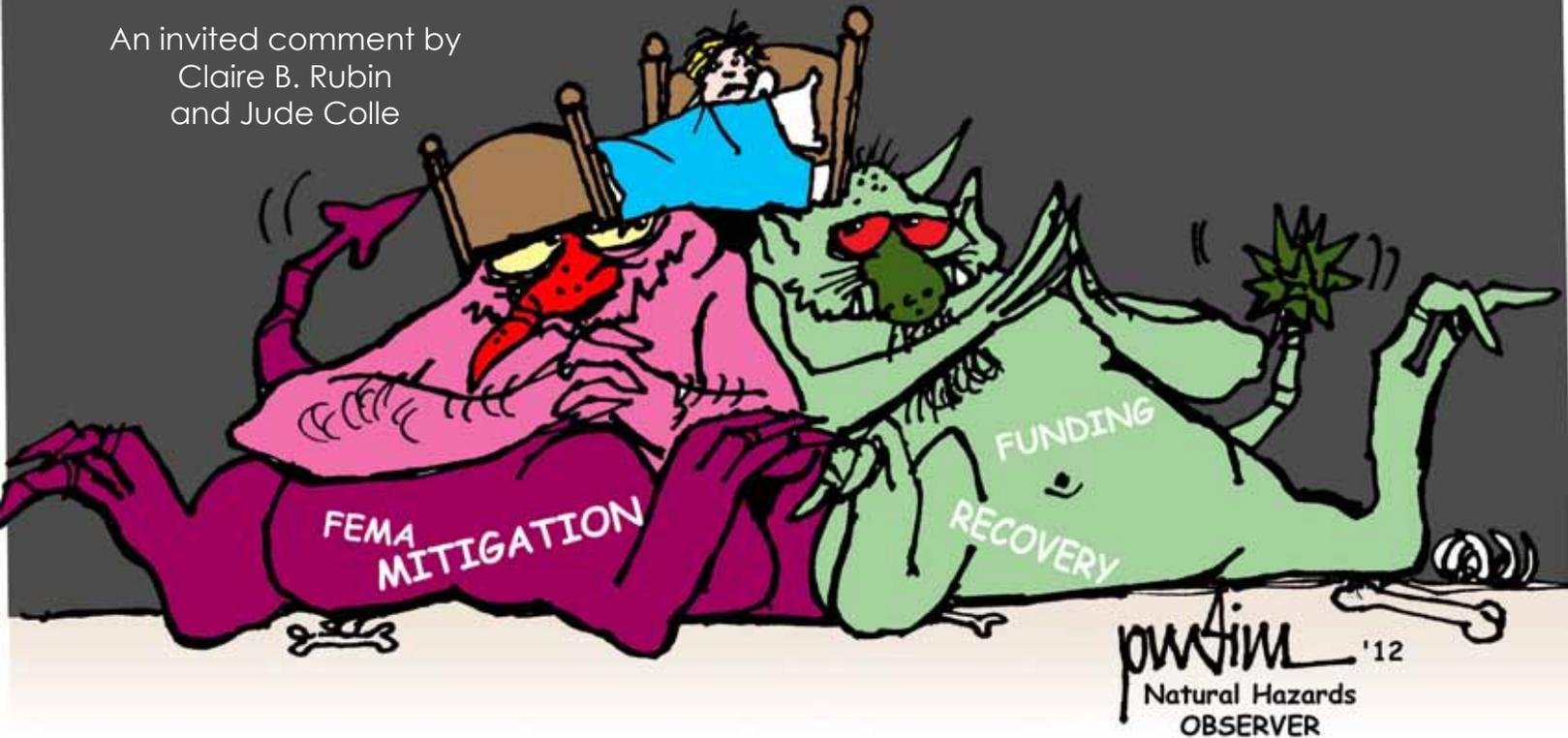
Steven Aftergood of the FAS Project on Government Secrecy wrote, "While it may not be the last word on the subject, the new subcommittee report is a rare example of congressional oversight in the classical mode. It was performed by professional investigators over a two-year period. It encountered and overcame agency resistance and non-cooperation. And it uncovered—and published—significant new information that demands an executive branch response. That's the way the system is supposed to work."

The DHS estimates that it has spent somewhere between \$289 million and \$1.4 billion in public funds on state and local fusion centers since 2003, "broad estimates that differ by over \$1 billion," the subcommittee says.



What keeps me up at night

An invited comment by
Claire B. Rubin
and Jude Colle



On the morning of Tuesday, July 17, 2012, senior researchers gathered in a session of the 2012 Natural Hazards Workshop to discuss “what keeps me up at night,” a look at what has been done and still needs to be accomplished in research and analysis in emergency management in the United States.

The participants in this session totaled several hundred years of work in hazards and disasters. The panelists were Claire Rubin, Dennis Mileti, Larry Larson, and Linda Bourque. The audience participants, who numbered about 70, included Shirley Laska, Jude Colle, Bill Anderson, Bill Hooke, Susan Cutter, Joe Scanlon, Dick Krajewski, Gavin Smith, Terry Jeggle, Louise Comfort, Sam Metlock, Lynn Carter, and Larry Pearce.

The participants were asked to share their nightmares. Though much has been accomplished in the field, that’s not what we gathered to discuss. What we’ve accomplished doesn’t keep us up at night—that job is left for what remains to be done.

Long-term recovery

DESPITE YEARS OF WORK ON THE SUBJECT, the nation still doesn’t have a thorough understanding of the many variables and complexities of recovery. We are not doing an adequate job of documenting, assessing, and compiling a knowledge base about recovery. This includes recovery theory, practices, case studies, outcomes, models, or a recovery research knowledge base.

Public agencies aren’t providing enough technical assistance to localities—especially those that may only experience long-term recovery perhaps once in the political cycle. There is no federal mandate for recovery—no recovery equivalent of the Disaster Mitigation Act of 2000.

What is missing is the kind of money, muscle, and

political will that is needed to address and implement recovery at the national and other levels. No recovery knowledge base has been assembled, so recovery experience is not being analyzed, improved upon, or shared from the 25 years that we’ve been tracking this area.

Federal emergency management workforce

MANY OF US ARE CONCERNED about the quality and competence of the emergency management workforce and its personnel, particularly at the national level. There is a supply of “educated” emergency managers—that is, people who have been in higher education programs who have taken courses and have a year or more of higher education. Many of these programs exist in part because of the 12-year-old

Federal Emergency Management Agency's Higher Education Program, which has encouraged more than 200 institutions to offer degrees and certificates in emergency management and homeland security.

At the June 2012 Higher Education Conference, one of the concerns expressed was that graduates are not finding jobs. Most academics at the conference said they were telling their graduating students to look for jobs in the private sector. They don't know why the public sector isn't hiring them, but that seems to be the case.

While on the one hand we have this educated potential work force. On the other we have the actual federal recruitment and hiring practices. Last year, FEMA had 99 disaster declarations. Assuming that more than 100 places throughout the United States are in the recovery phase of a disaster, it is a tall order for FEMA to send staff and other resources to the states to help these localities recover.

A large part of FEMA's workforce is what's called reservists or Disaster Assistance Employees (DAEs)—full-time but temporary staff who are not regular FEMA personnel. Many of the DAEs do not have an education or a background in emergency management. They may or may not be college graduates. They may or may not know much about emergency management. At best they probably have had some training but no formal education in emergency management.

Large numbers of reservists are being employed to work in the field and for the regional offices. They are being augmented by an inexpensive additional cadre from AmeriCorps composed of energetic and well-meaning recent college graduates—who have no education in emergency management. So there is a supply of well-trained, well-educated people who are not finding jobs, while there are a lot of people without an education or background in emergency management being given work. There seems to be a mismatch in the supply and demand for the EM workforce.

Dealing with minority communities—like example from Hurricane Katrina—is another workforce composition concern. While minority communities are at the greatest risk from disasters, minorities are still not represented well in either the practitioner or researcher workforce. We need more Latino and African-American researchers, for example, because they will probably ask questions that others may overlook. Those practitioners may develop approaches that are different from those in the mainstream.

Finally, emergency agencies don't seem to realize that a lot of actions is undertaken by ordinary people who step in to lend a hand. We still encounter public officials, especially at the local level, who say, "We must prevent any involvement by civilians."

Knowledge base

THE LATE CHARLIE FRITZ FIRST BROACHED THE IDEA OF AN emergency management "information clearinghouse" many years ago. This complex field needs a central knowledge base, a place that encourages the creation, gathering, maintenance, and sharing of the wealth of material gathered on the subject.

Traditionally, books, articles, and media materials have been the main repository of knowledge. However, libraries today have fewer acquisitions. In fact, you're lucky if your organization even has a library. FEMA no longer has a headquarters library; neither does the Environmental Protection Agency. The mantra is: "We're in a digital age, an internet age. We have alternate ways via technology for

storing, ranking and using knowledge." But we know of only one digital effort in emergency management maintained by the federal government, www.llis.gov. Few people know of it, and it is not very user friendly.

Some historical research is archived at the Natural Hazards Center and the Disaster Research Center. But it's held in costly journals and databases, or it's in paper only—not digitized and no longer in catalogues. People aren't familiar with research from past decades, so they do things that run counter to what we know works. An information clearinghouse or "knowledge commons" would be a useful way to centralize all of the knowledge that we have accumulated and make it available now, and to future generations.

We must effectively translate knowledge to practice. When Natural Hazards Research and Applications Information Center was put together, its mission was to take the knowledge produced by the research community, warehouse it, and transfer it to the practitioner, to integrate the knowledge, and bridge the gap between the researchers and practitioners. We don't effectively integrate knowledge across disciplines and get it from the research community into the hands of the practitioner community. The mission is bigger than this Center could ever accomplish.

We have the capacity in the digital age to build this knowledge commons. The late Eleanor Ostrom recognized that the capacity must be facilitated through the technologies currently available. We need a creative approach to design this knowledge commons, an approach that is interdisciplinary, inter-jurisdictional, and inter-organizational. The technical capacity exists. We must combine the creative capacity of our younger researchers plus the experience of our older researchers and practitioners.

Lack of respect for knowledge

THERE IS PRESENTLY AN ANTI-SCIENCE FERVOR in the United States. It has affected kids in K-through-12. We see poor analytical skills even in entering college freshmen. They can't separate good information from bad information. They don't understand numeracy. This problem perpetuated at all levels. What does that mean about our culture in terms of its ability to respond to this growing devastation of environmental impacts (and the effects on disasters) that we're going to have from here on? We have to explore this because we're losing an opportunity to benefit from people who have this knowledge.

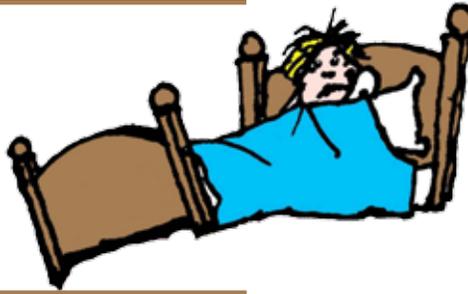
Lessons "learned"

THE PHRASE "LESSONS LEARNED" is being used to create freedom from responsibility for putting knowledge into practice. It is a cop-out to allege in a post-disaster setting—for example after 9/11—we learned the lesson that "different agencies did not have the ability to communicate with each other." And then spend billions of dollars creating a technological solution to that problem.

Many years ago Henry Quarentelli pointed out that you can't solve that problem with just technology. Police and fire departments that don't communicate routinely, won't communicate during or after a disaster. There are social elements involved in communications as well as technical.

We are troubled by the use of the idea. Not that lessons aren't learned—engineers go to earthquakes to investigate "best practices." But the term is often used by people who did not take the time to do their homework—people who did not

Not that lessons aren't learned ... But the term is often used by people who did not take the time to do their homework—people who did not perform a literature review, but are approaching the problem as if no prior knowledge exists.



do not accomplish mitigation from the top down. You have to do it from the bottom up.” And that is what Project Impact was all about. The only similar project today is the Army Corps of Engineers “Silver Jackets” program.

perform a literature review, but are approaching the problem as if no prior knowledge exists.

Mitigation: Solve the causes of disasters

SMART DEVELOPMENT IN DUMB PLACES IS NOT SUSTAINABLE.

We do not seem to have learned yet what Gilbert White told us in 1940. Despite everything all of us—and everyone before us—has ever done, the problem continues to get worse. In other words, maybe what we are doing to solve the problem is not the right thing. And if it is the right thing, it is not having much of an effect. Yet we continue to expect a different outcome. The idea is “disasters are created by human beings.” Nature creates the hazard— human beings create the disaster.

How can we be successful if we are not addressing the causes of disasters but only continue to service the symptoms? So where do we address the causes? The answer is mitigation—project mitigation and process mitigation. Mitigation is successful when it occurs at the local community level. That’s where disasters happen. That’s where losses occur.

The incentives and disincentives in the current process are problematic. There are many ways for decision makers to externalize costs if there are programs that permit such decisions. There is the Disaster Relief Act, National Flood Insurance, and others that reward good decisions at the local level. But under the guise of humanitarian relief, we are rewarding bad behavior. The problem is to strike a balance—at least a slight cost share might be better. “Yes, you will get relief, but you will get less relief if you’re doing dumb things.” We are not rewarding those who do well. We are penalizing them by making them help pay for those who make the bad decisions.

Our nation was once on the right course. One example is Project Impact, introduced in 1997 in an effort to “protect families, businesses, and communities by reducing the impact of natural disasters,” according to FEMA. We developed public-private partnerships where we started pulling people in to the decision-making process. We started talking to folks in other cities. We had to look around and ask “how do we do this differently?” because it was not working. We had roundtables and everybody came and we worked through it. We had no solutions to offer people. We weren’t acting parental. We weren’t telling people what to do. But what you can do is ask people questions and they can generate their own answers. And you can provide information that helps them select informed answers.

People in the country who make daily decisions affecting future disaster losses must sit at the same table and decide the issues. That was Project Impact. And we turned our back on it—this process. We turned our back therefore on the root causes of disaster at the only available level to solve the problem—the local level.

The other basic concept of Project Impact was, “You

Funding for terrorism, not natural hazards

IN THE 1990s, WALLACE STICKNEY INTRODUCED the “all-hazards approach” to disasters. We are having a discussion now at the national level that brings back the discussions of ten years ago about terrorism versus all hazards—especially natural hazards. For example, within the FEMA grant programs and the hazards planning community, there is a movement to replace the basic equation for risk. How we defined risk was: $\text{risk} = \text{probability} \times \text{consequences}$ —a scientific approach. However, the proposed definition is: $\text{risk} = \text{threat} \times \text{consequences}$. We do not know how you put a probability on threat, but now we are expected to do planning in that context in an effort to say, “How do you relate your flood, and wind, and fire problems with your terrorist problems?”

The inability to assign a scientific probability to risk concerns us. Right now, if you throw that into the grant mix—which FEMA attempted to do and Congress rejected—it will keep coming back. Eventually if you combine what gets funded and the cloak and dagger crowd figures out that you can make terrorist numbers higher than the others, we are going to see some problems. In fact if you talk to the Department of Homeland Security grants people now, they are saying, “well, if we throw all the grants together and compete, natural hazards cannot get funded because it is subject to the 9/11 Act¹ which says that if there is no terrorism link it does not get funded.” There has to be a balance in that process.

Decreasing impact on policy and decision making

WE ARE DISMAYED AT THE EXTENT to which the disaster community—engineers, seismologists, social scientists, psychologists, anthropologists, planners, and managers—seems to have lost the ability to influence policy at all levels of government. We talk a lot about the need to educate folks around hazards and transferring knowledge to practitioners. How do we transfer knowledge to the folks at the national and federal levels that are making all of these decisions in ways that are not risk-informed or responsible?

The attitude after Hurricane Katrina and the September 11, 2001 terrorist attacks was “nothing like this had even happened before.” This was simply wrong. It ignored—or actively opposed—the disaster community and the history of research supporting them. There are a lot of people then who pointed out that we already have a lot of information that was relevant to 9/11 and then later, to Hurricane Katrina. Why did our governments and other groups ignore the fact that there is relevant research going back decades to usefully inform policy and decision making?

Some people think that if we give communities the right

¹ Implementing the 9/11 Commission Act.

tools, they'll make the right decisions. But just because the long- and short-term risk and reward scenarios are laid out, they may not do the right thing. They often don't consider all the elements—especially the long-term ones. There are many ways that decisions benefit those who make them, while the consequences are externalized to others—just look at development on the coast of Florida over the past 50 years.

Conclusion

THERE'S BEEN A CULTURAL SHIFT IN THIS COUNTRY over the last 50 years. We have moved away from caring and sharing in communities. The attitude is, "It's all about me. I don't care what is going on with my neighbor— what I can get, and what I have, and you are not going to get it." Until we reverse this "culture of me" into one of "share and care," we are not likely to make much progress on many of the things that keep us up at night.

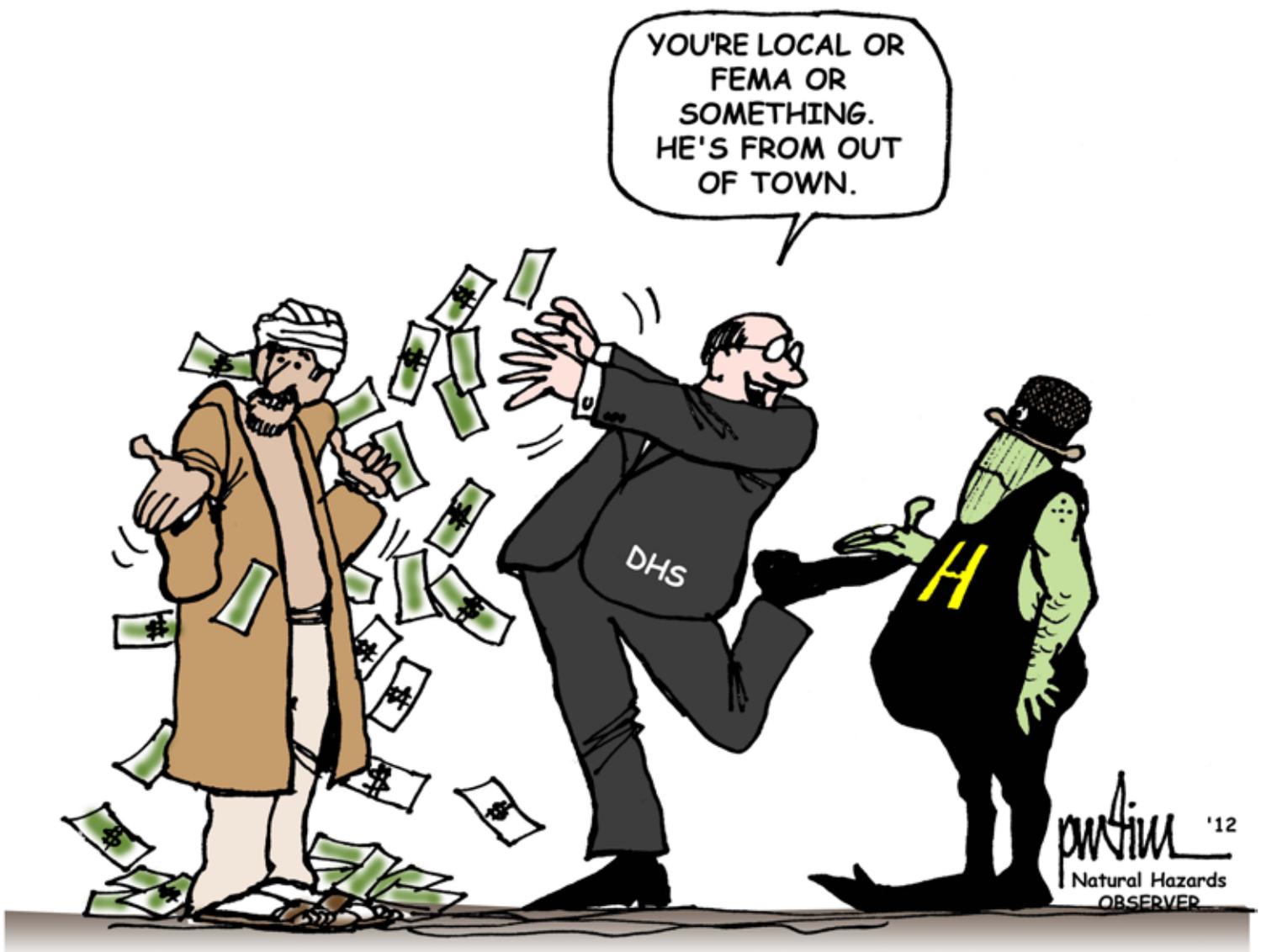
FEMA's Whole Community approach—their program engage communities at every level—seems like just more rhetoric. It does not address necessary solutions. It is not making that foundational change in communities because it's a top-down initiative to something that requires a bottom-

up approach. And the way we are going to get it is through education, through community social ties. And right now, they don't care and they don't share.

These are some—but not all—of the many thoughtful points made during the session. The authors selected those topics that received the most attention, in terms of frequency of related comments from panelists and the audience participants. We thought they would be of interest to the broader audience of the *Natural Hazards Observer*.

Your comments and observations are invited. The authors plan to continue this discussion.

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Texas drought ...

(Continued from page one)

been in some stage of severe or exceptional drought. Groesbeck, near Waco, bought water from a rock quarry and built a seven-mile pipeline through a state park to get it (see sidebar, page 13). Some communities on Lake Travis moved their intake pipes into deeper water. When Lake Houston ran too low, the city of Houston started getting water from an alternative reservoir farther away."

Neither established drought doctrine nor standard emergency management practices are designed to deal with a municipal water crisis. Current drought measurements and policies are designed primarily to deal with agricultural drought, not municipal water supply problems. Underlying this situation is the difficulty of performing some of the vital work of consequence management—gaining situational awareness, forecasting, planning, and establishing a clear command element.

The least explored aspect of drought disasters is the possibility of cities running out of water. Emergency management is designed to deal with hurricanes and, to a lesser extent, earthquakes and wildfires, but not the challenges that the state of Texas and local jurisdictions have faced during the last two years.

There is no emergency plan anywhere to address a city running out of water completely. Yet this is precisely the situation that Texas is facing.

Background

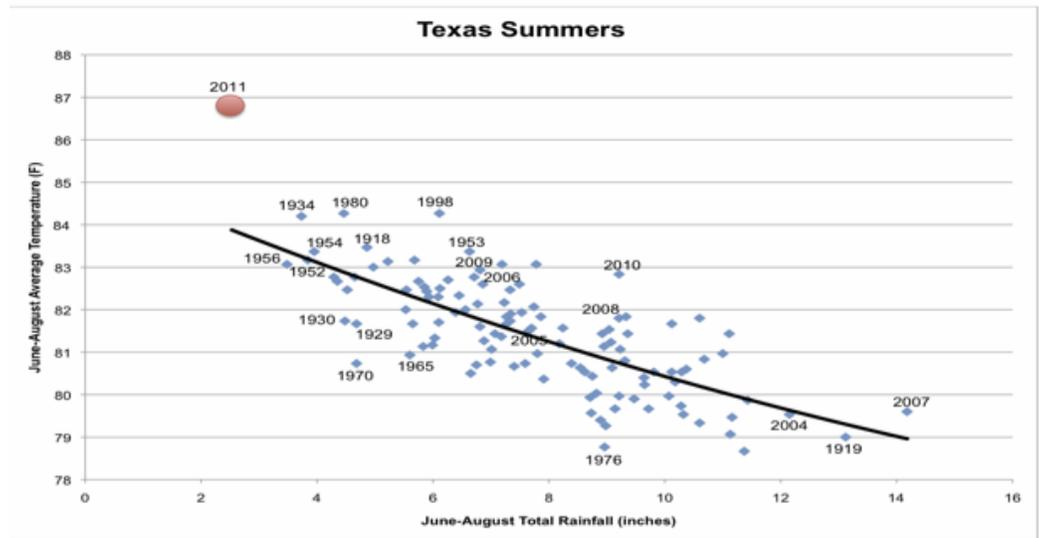
IN TEXAS, RESPONSIBILITY FOR DEALING WITH DROUGHT rests with the Texas Drought Preparedness Council. Created after a drought in 1998, the council is composed of several state agencies. The chairman of the council, and the designated drought manager for the state of Texas, is the chief of TDEM. The drought preparedness council is facilitated by the Plans Unit in the preparedness section. The Plans Unit is responsible for the Texas Drought Preparedness Plan and the Emergency Drinking Water Plan.

Gaining situational awareness

THE FIRST GOAL OF EMERGENCY OR CONSEQUENCE management is to get an overall assessment of the problem. Several factors make this difficult in Texas. Texas is a home rule state, meaning the state government can't dictate to local officials. In a drought, local officials don't have to report the condition of their municipal water supplies to state agencies. They can volunteer the information, but there's no mandatory reporting requirement. Of the more than 6,000 water systems in Texas, only 1,000 have notified the Texas Commission on Environmental Quality—the state agency that manages most of

the surface water in the state—that they have enacted water restrictions.

Local jurisdictions have a limited ability to determine exactly how much water they have or how long it will last. The Texas Emergency Drinking Water Plan sets 180 days of water remaining as the criteria to declare that water systems' surface reservoirs have reached a critical condition. Making this determination is, at best, guesswork. There is no effective



Courtesy of Dr. John Nielsen-Gammons, Texas A&M University

modeling to develop the information. Predicting water supplies is especially difficult when dealing with groundwater resources, on which most Texas water systems are dependent.

The emergency management system in the United States is not built to deal with private companies. It is designed to provide and coordinate aid to local and state governments. Most of the critical infrastructure in the country is privately owned. Gathering information from these entities is limited to information mandated by regulations. For instance, a private water system may be required to have a drought contingency plan, but there is no way to dictate the plan's contents. The state can't even require that the private entity use the plan. There is certainly no requirement to notify the state about their water supply status or their plans for dealing with a potential water shortage.

Forecasting

IN ORDER TO MANAGE A DROUGHT EMERGENCY, you must be able to forecast events. It is far more important to determine the direction the incident is heading than to look at current conditions. This ability doesn't exist when it comes to drought. During the summer of 2011, there was an unheard of combination of heat and lack of precipitation in Texas, a state familiar with both, as exhibited in the graph.

The event last summer could not have been predicted. Incidents like the 2010 Russian heat wave, which took 15,000 lives, and the recent Australian floods seem to explode from nowhere. Nonetheless, the ability to predict these rare weather extremes is vital if communities are to prepare. But as Nobel laureate Niels Bohr once said, "Prediction is very difficult, especially about the future." When Texas rolled into another La Niña in the fall of 2011, the Climate Prediction Center is-

(Please see "Texas drought," page twelve)

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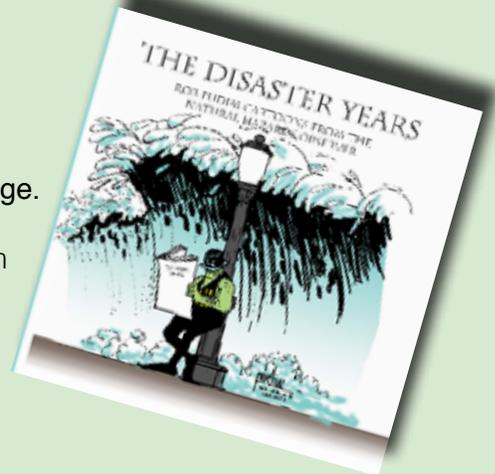
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Texas drought ...

(Continued from page ten)

sued a forecast for the state of a drier-than-normal winter. Yet, the exact opposite situation occurred. Texas, in particular north and east Texas, experienced one of the wettest winters ever. The cause of this anomaly isn't known. Key decision makers and elected officials rely heavily on these forecasts. But they are unaware of the range of forecast variability, which can lead to inadequate contingency planning.

In consequence management, the ability to quantify the severity of a situation is fundamental to resource allocation. The basic question is, "How bad is bad?" Every situation is dire to the people experiencing it, but in the scope of the entire incident, it may not be as serious as another situation.

Recently, we asked the question, "Is the drought better or worse?" The answer depends on how you measure drought. If you were to look at the current drought monitor for West Texas, it might give the appearance that the drought is better because the entire area is not glowing red. But this conclusion is incorrect if you examine the levels of the reservoirs in that region. Many are completely dry. Those that aren't have lost 50 percent of their already diminished capacity in the last 12 months. So ... is the drought better or worse?

Even if the seriousness of the situation can be quantified, this does not relieve the need to forecast the trajectory of events. The next question for consequence managers, "If it's bad, is it going to get worse? If so, how much worse?" The ability to answer these questions, as they relate to drought, doesn't exist.

Planning

EMERGENCY PLANNING IS HIGHLY PROBLEMATIC. Once a plan is written and finalized, it begins to degrade almost immediately. Changes in personnel, organizational responsibilities, technology, and procedures work against it. Plans must be updated regularly. It is one thing to plan for a known hazard. But it's quite another to have a plan for an eventuality many do not consider possible—such as a city completely running out of water. There is no drought plan for the contingency of a city running out of water—anywhere.

All drought plans are similar in the way they deal with drought. They limit outdoor watering. The typical progression is to allow outdoor watering several days a week, then two days, then one day a week, then one day every other week, then no outside water use at all. This is the point where the vast majority of drought plans stop. Beyond this, there is a smattering of plans that talk about rationing, generally a percentage of historical use for some indexed period of time.



The least explored aspect of drought disasters is the possibility of cities running out of water. Emergency management is designed to deal with hurricanes and, to a lesser extent, earthquakes and wildfires, but not the challenges that the state of Texas and local jurisdictions have faced during the last two years.

Beyond that, there is no evidence that there has been planning work done, by any entity anywhere in the world, that has dealt with this problem. As far as we can determine, the first contingency planning session to deal with a city literally running out of water was conducted by the Texas Division Emergency of Management in March 2012.

There is ample reason for the lack of planning—it is an extraordinarily complex problem. Dealing with this particular emergency has spurred changes to Texas' drought planning, particularly the Emergency Drinking Water Plan. In its original form, the plan assembled an interagency team of Drought Council agencies to try to solve the problem after a city had run out of water. The plan was probably adequate in years past, but it failed in our current situation.

The current approach completely changes traditional focus of emergency management, preventing this eventuality. The Emergency Drinking Water Task Force, composed of representatives from TDEM, the Texas Commission on Environmental Quality, the Texas Water Development Board, and the Texas Department of Agriculture has been meeting weekly to deal with water systems that have self-reported they have an estimated 180 days of water reserves remaining. TCEQ is the lead agency, although TDEM retains the chairmanship of the committee. The goal of the committee is to provide technical expertise, identify funding opportunities, work to waive or speed up regulatory processes, and facilitate regional solutions, all in an effort to keep the unimaginable from happening.

Clear command element

EMERGENCY MANAGEMENT AND OUR FEDERAL SYSTEM OF government delineate very clearly who is responsible for emergency management activities. At the local level, the chief elected official in Texas—either the mayor of the city or the county judge—are in charge. The state cannot intervene in their emergency unless requested to do so.

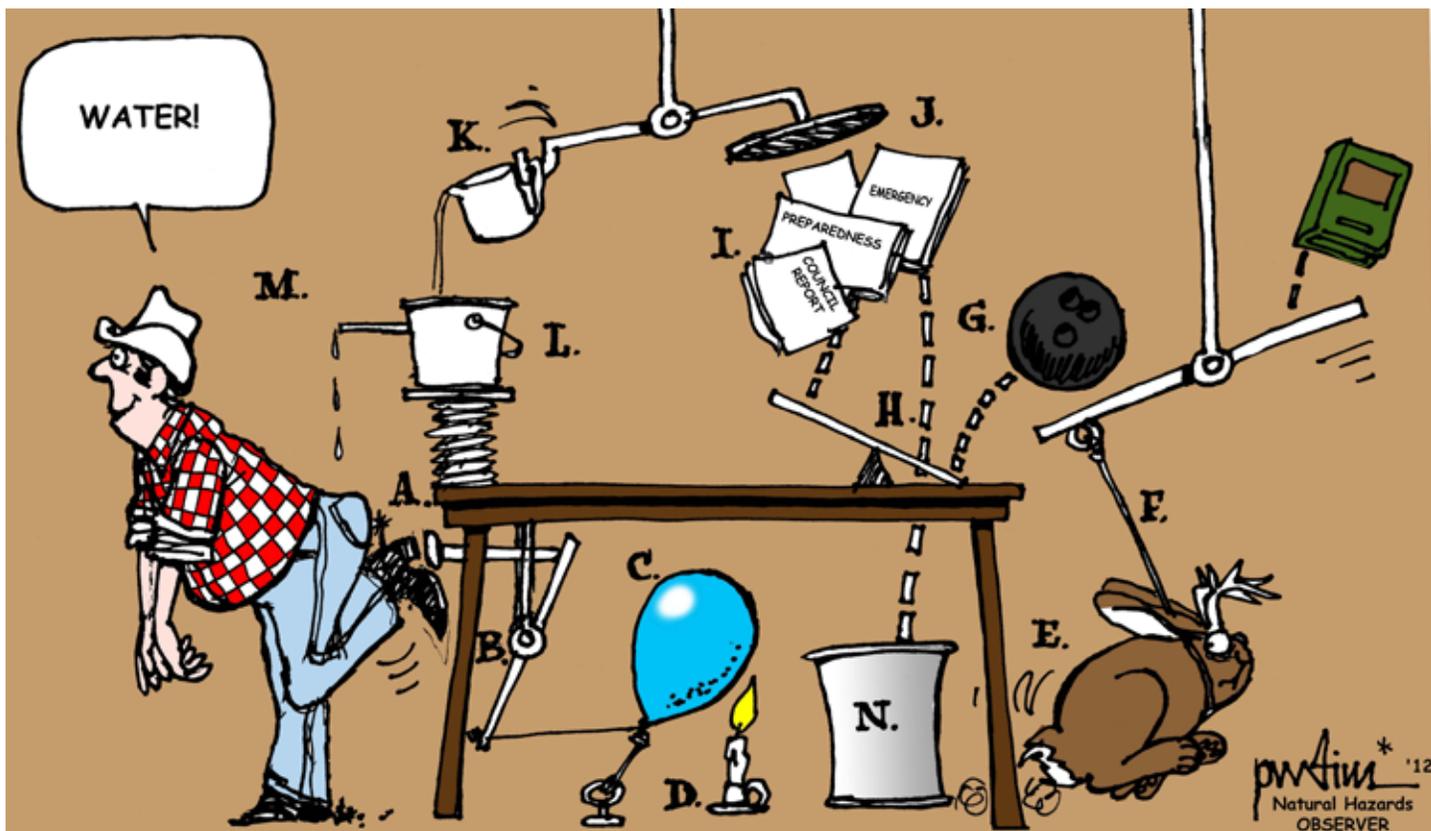
At the state level, the governor is in charge of emergency response. The federal government cannot intervene except at the request of the governor. There is, however, no single point of coordination for water. The management of water is dispersed through numerous federal agencies including the Bureau of Land Management, Bureau of Reclamation, Corps of Engineers, Environmental Protection Agency, U.S. Fish and Wildlife Service, and the National Park Service.

At the state level, management of water is conducted by the TCEQ, various river authorities, and approximately 100 groundwater districts. In addition, there are thousands of privately owned water utilities that cannot be forced to take any action unless they are in violation of a regulatory requirement. Compounding all this is the fact that there are different laws for surface and groundwater. There is no water any-

where that someone does not own or have a right to in the state.

The experience of the Emergency Drinking Water Task in the last year and a half is that every community or water system that needs help requires a solution to be crafted specifically for their situation. Each situation is unique in some way. The running of a temporary pipeline through a state park,

(Please see "Texas drought," page fourteen)



Groesbeck, Texas

* Apologies to Rube Goldberg

In the summer of 2011, Groesbeck, Texas, emerged as the public face of drought. The town of 5,000, located 75 miles from Waco, Texas, is entirely dependent on the Navasota River.

The upper arm of the Navasota river flows into Fort Parker Lake, located in a state park, then over a small dam to the lower arm of the Navasota River where the intake for Groesbeck is located. Fort Parker Lake is a very shallow lake that was not designed as a reservoir. The town is upstream of the nearest reservoir. It has no groundwater resources. The level of the river was declining. It was in danger of dropping below the intakes. Fort Parker Lake levels had dropped so low that the city was no longer able to pump water over the dam as it had been doing for months.

Groesbeck tried several approaches to increase its water supply. First, the city bought water from an abandoned quarry located several miles away. While this didn't provide continuous flow, it was estimated to provide an additional five months of water.

The question remained how to get the water to the intake? The city devised a plan to pump the water out of the quarry into Jack's creek, then to the upper Navasota. Just before the river runs into the lake, there is a natural deep spot where the water would then be pumped out of the river, into a water line laid above ground. The water would travel five miles through Fort Parker State Park, around the dam and back into the lower Navasota. All of these activities had to be completed rapidly, since the town had only two or three weeks of water at the time.

The project required numerous waivers from a number of state agencies, such as the Texas Parks

and Wildlife Department, the Texas Commission on Environmental Quality, and the Texas Department of Transportation. The Drought Preparedness Council and the Emergency Drinking Water Task Force coordinated procedural issues to avoid red tape delays.

The challenge faced by Groesbeck also revealed the limits of our current governmental systems. Although Groesbeck had devised a solution, they had no way to fund it. The city had an extra pump that had not been used in years, but lacked the second required pump. There was no funding available to rent the five miles of temporary piping, estimated at \$25,000 a month. Traditional funding available to the city through established mechanisms for water system development or mitigation funding from the Federal Emergency Management Agency does not recognize "temporary" solutions.

Emergency funds available through FEMA are not designated to be dispersed until after the damage has been done. In this case, the cost of hauling drinking water to support Groesbeck if their water was allowed to be depleted was conservatively estimated at \$66,000 per day. As it turned out, a second pump was borrowed from another municipality, the city took a signature loan out from a bank, the pipe was laid, and the system tested proved successful.

Fortunately, just as the system was completed, unanticipated La Niña winter rains arrived and refilled the river. All of the equipment was disassembled and returned. But serious questions remain about how long Groesbeck would be able to sustain themselves this way.

Texas drought ...

(Continued from page twelve)

for example, may require the involvement of up to a half dozen state agencies working closely together. Texas has enjoyed an unprecedented level of cooperation and success among the various state agencies.

Systemic challenges: What makes the 2011-2012 Texas drought a crisis

WE HAVE MADE NUMEROUS PRESENTATIONS on the drought during the last 18 months. We now use the word “crisis” rather than “emergency” in describing the nature of the problem. There is no established methodology to deal with this particular aspect of drought. There are well-established programs for agriculture to help producers survive, but the needs of water systems are not addressed in them.

On the emergency management side, the Federal Emergency Management Agency has little experience dealing with drought. Funding for water projects are considered capital improvement projects. The time between the application for funds and the beginning of construction is measured in years. Additionally, there is no funding for “temporary” solutions such as laying a pipeline aboveground to reach a new water source. The management of a crisis requires three things: (1) the recognition on the part of an organization that business as usual will not suffice; (2) the organization must adapt and change to meet the new reality; and (3) the development of ad-hoc organizations to deal specifically with the crisis, in other words a crisis management team.

The Emergency Drinking Water Task Force is the representative that the state of Texas has established—at least the framework—to manage the crisis. The TCEQ has altered or waived many of its established requirements in order to facilitate the implementation of individual solutions. TDEM realized it cannot wait for the disaster to happen and has changed its focus from managing the emergency to preventing the situation from occurring.

The ability to determine when help is needed is a critical part of emergency management. In the United States, emergency emergencies or disasters are local. It is only when the local jurisdiction has exhausted their resources that the request for aid is sent to the state government and, if resources are still inadequate, to the federal government. The key to the system is that the local jurisdiction must acknowledge they are in fact in a water crisis.

While people readily envision a catastrophe such as a tornado or wildfire, many find it difficult to envision running out of water. A study conducted in Australia about residents’ attitudes towards drought found that, even in the country that has most directly confronted drought, citizens were unable to imagine running out of water. (Dolnicar and Hurlimann 2011) It has rained before, they think. It will rain again. This delays the necessary notification and contingency planning vital to consequence management. There is also a tremendous

reluctance on the part of local leaders to announce they anticipate a critical water shortage. This announcement might discourage investment. Local leaders are placed in difficult circumstances.

Conclusions

Drought is insidious. It doesn’t announce its arrival. It creeps up. Drought gives no indication of its potential severity. Drought tells no one how long it is staying.

Drought attacks the single most important commodity on earth, fresh water. The nature of drought and the complexity of water laws, water management, and jurisdictional boundaries make the management of urban water shortages extraordinarily difficult.

There are some keys to dealing with such a crisis. First, the organizations involved must realize that the situation is happening and must be dealt with. Second, standard regulatory and emergency management practices are not sufficient to deal with the crisis. Organizations must evolve and adapt. Finally, interagency, ad hoc structures must be developed to address cross jurisdictional and regulatory boundaries at all levels of government. Time will only tell if the 2011-2012 Texas drought is a statistical outlier, or a chilling harbinger of the future for the western United States.

There is no evidence that there has been planning work done, by any entity anywhere in the world, that has dealt with this problem.

As far as we can determine, the first contingency planning session to deal with a city literally running out of water was conducted by the Texas Division of Emergency Management in March 2012.



Mike Bewley is the supervisor of the Local Plans Unit in the Texas Department of Public Safety. Gabriela Stermolle and Mario Chapa are planners with same organization. Bewley can be reached at Mike.Bewley@dps.texas.gov.

References

Dolnicar, S. and A. Hurlimann. 2011. Voluntary relocation—An exploration of Australian attitudes in the context of drought, recycled and desalinated water. *Global Environmental Change*, Vol. 21, 3:1084-1094.

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.

FEMA fine-tuning hazard mitigation planning

An invited comment by Ann Patton and Edward A. Thomas

The Federal Emergency Management Agency says it is making changes in its hazard mitigation planning program in response to a recent Inspector General analysis that highlights some remarkable progress in planning to reduce disaster losses in the United States.

More than 19,000 local jurisdictions are now represented by FEMA-approved hazard mitigation plans, covering 70 percent of the nation's population, according to the recent report by the Department of Homeland Security's Inspector General.

Since 2000, when the planning program was launched, more than 26,000 jurisdictions have developed their own plans, covering approximately 90 percent of the nation's population, according to the FEMA response to the [report](#), *Survey of Mitigation Planning* (OIG-12-109), released in August.¹

Hazard mitigation includes actions to reduce long-term risk to people and property from hazards such as fire, flood, earthquake, and wind. Hazard mitigation measures can include installing hurricane clips to hold on a roof, moving a flooded home to higher ground, reinforcing a quake-prone bridge, and other structural projects. Effective hazard mitigation also includes non-structural techniques including natural resource protection and hazard avoidance through local land use planning and development regulations.

FEMA "has made progress in the hazard mitigation planning program since the passage of the Disaster Mitigation Act of 2000, as amended," the report says. The voluntary program encourages state, tribal, and local jurisdictions to identify their hazards and risks and to implement policies or projects that will reduce disaster losses. FEMA-approved hazard mitigation plans are required to receive certain types of non-emergency Federal disaster assistance, including grants for hazard mitigation projects. Every \$1 spent on hazard mitigation saves society \$3 to \$4 in losses avoided, according to recent cost-benefit analyses.²

The IG said no further audit is needed for hazard mitigation planning at this time. But the program would be more effective with a couple of internal changes, the IG said.

The analysis recommends requiring states to update their



plans every five years, less frequently than the current requirement of every three years. The report said states believe the three-year updates waste time and money on updating plans when few changes have occurred. FEMA agrees with that change, the report said.

The report also recommends changes in FEMA's record keeping. "At the time of our fieldwork, FEMA did not track mitigation projects but was developing a tool to track mitigation actions identified and implemented by grant recipients," the report says. "The tool is expected to be in use sometime in 2012. We encourage FEMA to continue with its plans to implement a mitigation project tracking tool."

FEMA granted more than \$100 million to encourage state and local mitigation planning between 2007 and 2011, the report says. That money for planning is a small slice—6 percent—of the \$1.7 billion FEMA granted for hazard mitigation

¹ It should be noted that some local plans have lapsed, and many are involved in current updates.

² *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities* - Multihazard Mitigation Council, 2005.

work in those four years. Another 6 percent went for management, and the remaining 88 percent for a wide variety of projects to provide long-term loss mitigation for public or private properties that experience repeated disaster damage.

Unfortunately, the report did not attempt to qualify the extensive benefits of what is undoubtedly the most cost beneficial form of hazard mitigation—building safely and properly at the beginning of development. Nor did the report quantify the benefits provided by the numerous forms of federal, state, local, and non-government expenditures that provide protection against damage, disruption, injury and death in repetitive floods, earthquakes, tornadoes, and other disasters. Perhaps future national accounting of the expenditures can also aggregate estimated benefits, to demonstrate the wisdom of reducing disaster losses before they occur.

Second, the report is also limited by its focus on only FEMA's Section 404 mitigation for federally funded projects in the Hazard Mitigation Grant Program (which granted \$1.3 billion in 2007-2011), Pre-Disaster Mitigation (\$270 million), and Flood Mitigation Assistance (\$120 million). Section 404 is only a portion of the hazard mitigation universe.

There are other aspects of mitigation that should also be explored, such as FEMA's Section 406 mitigation authorization for post-disaster Public Assistance, which can dramatically reduce repetitive losses and improve public safety in the repair or replacement of public facilities and infrastructure damaged or destroyed by hazards. Many local communities have been successful in securing non-federal financial assistance to implement their plans, and some have integrated hazard mitigation into their own funding mechanisms such as local capital improvement programs. Education and awareness can also greatly impact public and private adoption of mitigation and preparedness measures.

It would be more difficult but nonetheless important to estimate the savings from higher land use and building code

standards, a most cost-effective form of hazard mitigation. Also noteworthy are techniques for low-impact development, safe development/No Adverse Impact, and other options in the patchwork quilt of government and nongovernment programs.³

Third, the IG report does not discuss the quality of these hazard mitigation plans. Research has shown that the both state plans and local plans vary greatly in quality and effectiveness and often do not include effective land use measures; some research questions whether states are effectively encouraging local jurisdictions to include land use management in their plans.⁴

The Natural Hazard Mitigation Association commends FEMA, the states, and leaders of 26,000 local jurisdictions for noteworthy progress in planning for hazard mitigation. And we encourage them to improve the quality of these plans and take steps to document the many benefits of hazard mitigation planning. NHMA's Hazard Mitigation Planning Committee is preparing recommendations to strengthen this important endeavor, in a report to be released shortly. We have come a long way, but we have a long way to go.

Ed Thomas is president of the Natural Hazard Mitigation Association. Ann Patton is NHMA's 2nd vice president. NHMA's Darin Punchard and Gavin Smith also contributed to this review. The Natural Hazard Mitigation Association links together practitioners and supporters of loss reduction by mitigation before, during, or after a disaster. See [NHMA.info](#) for more information.

³ "The Benefits of Safe and Proper Construction," Edward A. Thomas, 2012.

⁴ <http://www.ie.unc.edu/cscd/projects/dma.cfm>.

DISEASE

Avian Influenza: Science, Policy and Politics. Ian Scoones, editor. 2010. ISBN: 978-1-84971-096-1. 288 pp., \$125 (hardcover). [Earthscan](#). www.earthscan.co.uk.

The global response to the avian influenza threat is important not only in its own right, but also a "dress rehearsal" for the response to other potential pandemics, like swine flu, SARS, ebola, or any of a number of other diseases, says Ian Scoones in the first chapter of this volume. The recent confirmed outbreak of ebola in Uganda—38 cases resulting in 16 deaths as of July 31, 2012—makes this warning ring a little louder.

"The avian influenza response thus offers some important perspectives on some of the big issues of the moment. These include, for example, how to respond to uncertain threats which have transnational implications; how to cut across the emergency—development divide, making sure crises result in longer-term responses as well as dealing with immediate needs; how to balance interests and priorities between assuring health and safety as well as sustainable livelihoods; how to operate effectively in a complex multilateral system, within and beyond the UN; what a commitment to 'security' in health and livelihoods really means in practice and much, much more," he writes.

Avian influenza has most affected Asia, and most of this book is devoted to the response in the most-affected nations—

Cambodia, Vietnam, Indonesia, and Thailand. The authors list ten lessons from these nations' response, ranging from focusing on livelihoods to more diversified professional response—most of the response has been from veterinary medicine. "There is a need for a shift from a focus on outbreaks to a consideration of long-term disease dynamics and ecology," they write in the conclusion.

ALL HAZARDS

Recovery News. A blog from the American Planning Association. blogs.planning.org/postdisaster.

APA is providing an important resource for disaster recovery and research. Topics covered since the launch include disasters and historic preservation, tracking resident participation in hazard planning, the transitions made in Christchurch, New Zealand, following the quake there, and many others. The blog is updated about every two weeks.

Disaster Psychiatry: Readiness, Evaluation, and Treatment. Frederick J. Stoddard, Jr., Anand Pandya, and Craig L. Katz, eds. 2011. ISBN: 978-0-87318-217-1. 418 pp., \$69 (softcover). [American Psychiatric Publishing, Inc.](#) <http://www.appi.org/searchcenter/pages/SearchDetail.aspx?ItemId=7217>

More than 800 psychiatrists responded to assist after the September 11 attacks, according to the promo material for this book. But the traditional expectations of psychiatrists have to

be left behind if they are to be most effective in disasters.

Disaster Psychiatry is kind of a how-to manual for psychiatrists as first responders. And while the skills of the profession can be very important in the event, doctors will usually find that they don't practice them as they would in a traditional setting.

"Often, disaster survivors do not reach the threshold of diagnostic definition yet still require a supportive and connective approach for engagement, assessment, and psychosocial interventions," the authors write in the first chapter. "Consequently, the roles that a psychiatrist volunteer may be asked to fulfill are numerous and highly unpredictable. It is not uncommon for clinicians to step into other roles that include administrative, consultative, educational, and general medical duties. For example handing out water and other resources can be useful activities with the potential to facilitate contact with mental health personnel in a less threatening manner than direct referral. This can allow for early intervention, assessment, and triage for those most affected and in need of more formal mental health services."

The book cautions that many victims, while potentially traumatized by events, are experiencing normal reactions to abnormal circumstances. The survivors aren't "patients." While they may need psychological support, they don't require long-term clinical interventions.

A fine primer for psychiatrists who want to volunteer their services in a crisis, this book covers all the issues they'll need to address.

Women Confronting Natural Disaster: From Vulnerability to Resilience. By Elaine Enarson. 2012. ISBN: 978-1-58826-831-0. 245 pp. \$58.50 (hardcover). **Lynne Rienner Publishers.** <https://www.rienner.com>.

This is a wide-ranging investigation of the influence of gender in disasters, an attempt to overcome the neglect this subject has received in much research. "A conspicuous silence around gender has been maintained," Enarson writes, "a looking away, perhaps a calculated blindness ... The Psychological effects of disasters on women are measured without examining the larger context of gender relations, and disaster-related interpersonal violence is conspicuously underexamined, whether against women or men, boys or girls."

On this latter point of interpersonal violence, Enarson looks at case study data tracking violence against women in disasters. The 1989 *Exxon Valdez* oil spill saw an "increase in domestic violence." After the Loma Prieta earthquake that same year, the local battered women's shelter "coped with a 50 percent increase in requests for temporary restraining orders, while the district attorney's office reported a 'very heavy' workload the first week after the quake and filed its first reported gang rape case."

In an interesting part of a chapter on housing, Enarson takes up the issue of evacuation: Who decides? Researchers found that "gender exerted the strongest and most consistent influence on individual evacuation response." During Hurricane Katrina, men were consistently more likely to remain in a threatened city than women—though they may have later regretted the decision.

Enarson promises a path from "vulnerability to resilience" in the title, but like all the books on the hot topic of resilience, the best she can offer is "more analysis and research are needed." Until—if ever—the stones of "resilience" are assembled into a complete structure, this is likely the best any-

one will be able to do.

Enarson's major accomplishment here is a laser-like focus on gender and the disparities that arise from gender differences under the stress of a disaster.

TERRORISM

Emergency Response to Domestic Terrorism: How Bureaucracies Reacted to the 1995 Oklahoma City Bombing. By Alethia Cook. 2010. ISBN: 978-0-82643-073-1. 136 pp., \$24.30 (softcover). **Continuum.** www.continuumbooks.com.

Natural disasters and terrorism share the characteristics of low probability and large consequences. And people are as unlikely to prepare for a low probability event "when there are 15 tasks that have to be accomplished by Friday." So much is *Disaster Studies 101*.

The 1995 bombing of the Murrah Building in Oklahoma City seems a long time ago now. Both terrorism and natural disasters seem to have escalated their assault since then—the September 11, 2001 attacks, Hurricane Katrina, the tsunamis in the Indian Ocean and Japan. This book is written on the premise that "Improving emergency response preparedness to acts of terrorism would have the added benefit of increasing capabilities to respond to natural disasters. Hurricane Katrina demonstrated that the country's emergency response preparations continue to be lacking ... The Katrina response was plagued with significant difficulties including a failure in communications technologies, a lack of adequate supplies, the need to shelter large numbers of citizens, insufficient government coordination at each level of government and across the levels of government, and a large number of injured and dead. These characteristics would also be likely to be present in a major terrorist attack."

But Cook also says that responding to a terrorist attack is "arguably more complex" because the area is also a crime scene.

An important lesson from the response to the OKC bombing is that a lot of lessons are not being learned. This, too, might be *Disaster Studies 101*. Cook cites Erik Auf der Heide, who says communities not only don't learn from each others' experiences but they don't even learn much from their own experiences, or correct the failures of the previous responses very well.

Cook's research determined that both top-down and bottom-up "conceptualizations of bureaucracy" are found in emergency response. She also reaches the uncontroversial conclusion that "training helps to form an organizational culture within the response bureaucracies." Nonetheless, even with training it is still difficult to overcome some organizations' cultures. The police, for instance, may view it more important to preserve a crime scene, even at the expense of some immediacy. The fire department's priority will probably be to respond as rapidly as possible to initiate rescues. "Responders from many participating agencies will see the problems of response differently," she writes.

Contracts and Grants

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

Plate Boundary Evolution and Physics at an Oceanic Transform Fault System – The Blanco Transform OBS Experiment. National Science Foundation grant #1031858. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1031858>. Three years. \$129,089 to principal investigator, John Nabelek, Oregon State University, nabelek@coas.oregonstate.edu.

Most earthquakes occur along the boundaries of rocky plates that make up the Earth's surface. Most great earthquakes occur where plates converge, as in Indonesia, Japan and Cascadia. Other damaging events are associated with transform faults, where the plates slide past each other, in places such as Turkey and along the San Andreas Fault in California. Oceanic Transform Faults (OTFs) in the seafloor are geologically simpler than those onshore, and thus offer a natural laboratory for studying their seismicity.

This study will deploy a dense array of 55 Ocean Bottom Seismographs (OBSs) off the coast of Oregon for one year to study the Blanco Transform fault. This deployment of OBSs will also be an important adjunct to the Cascadia Initiative (CI), an ongoing onshore/offshore seismic and geodetic experiment that includes an array of seismometers on the seafloor to complement an array of stations onshore.

A primary aim of the Cascadia Initiative is to gain a better understanding seismicity associated with subduction along the Pacific margin of Washington, Oregon and northern California, where the risk of a megathrust earthquake is high.

Interactions Among Forest Defoliator Outbreaks, Wildfires, Climatic Variability, and Nitrogen Availability in the Interior Pacific Northwest. National Science Foundation grant #1233278. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1233278>. Two years. \$15,961 to principal investigators Daniel Gavin and Aquila Flower, University of Oregon, dgavin@uoregon.edu.

Logging, grazing, and the suppression of wildfires have led to widespread changes in forest structure and disturbance regimes in the interior Pacific Northwest, and these ecosystem-wide changes have altered nitrogen cycling dynamics. In spite of the crucial role of nitrogen in determining ecosystem health and productivity, the mechanisms controlling nitrogen availability are not fully understood. In particular, the impact of altered disturbance regimes on nitrogen availability remains uncertain.

This project will use a combination of tree-ring records and statistical methods to reconstruct multi-century records of disturbance events, forest demographics, climatic variability, and nitrogen availability. Tree rings provide high resolution records of growth rates, nitrogen isotopic composition, disturbance impacts, and forest stand dynamics. Sampling will be conducted at two sites in mixed-conifer forests in Idaho and Montana. The research will answer the following questions: (1) What changes in disturbance regimes and forest composition have occurred over the last three centuries? (2) How does climatic variability influence forest composition and disturbance dynamics? (3) What are the relationship

among nitrogen availability and climatic variability, fires, and outbreaks of the western spruce budworm? (4) What long-term impacts on nitrogen availability have resulted from changes in disturbance regimes and forest composition?

This project will help to answer fundamental questions regarding the impacts of climatic variability, disturbances, and human activities on nutrient cycling dynamics. Reconstructing nitrogen availability from the isotopic composition of tree rings is a fairly new field of inquiry, and the results of this project will help to advance this emerging field. This project will provide new knowledge about the impacts of insect defoliation on nitrogen availability in coniferous western forests and about defoliation-nitrogen dynamics.

Project results will include a long time series of high-resolution nitrogen availability records for the western United States. The multi-century tree-ring records produced through this research will facilitate a detailed assessment of the relationships among forest management policies, climatic conditions, disturbance events, forest composition, and nutrient cycling, and it will provide insights into the long-term effects of forest management practices on forest health.

Spatial and Temporal Variability of Post-Fire Conifer Regeneration in Lower Treeline Forests of the U.S. Rocky Mountains. National Science Foundation grant #1232997. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1232997>. Two years. \$15,993 to principal investigators Thomas Veblen and Monica Rother, University of Colorado at Boulder, Thomas.Veblen@colorado.edu.

Sharp increases in wildfire activity since the early 1980s in forest ecosystems in many parts of the world have been linked to warming trends. Questions have arisen about whether post-fire recovery will be to the same type of forest or to a different, possibly non-forested vegetation type.

Preliminary observations of lower treeline forests in the Colorado Front Range that burned during the past approximately 25 years have led to the hypothesis that under a warmer climate there is less post-fire tree regeneration in comparison with fire events that occurred in the late-19th to mid-20th centuries. Although numerous retrospective studies document the general success of tree regeneration following fires in the late-19th to mid-20th centuries, such studies are ambiguous about the actual timing and abundance of tree regeneration and potential relationships to annual-scale climate variability.

Few studies have examined how climate change may alter forest resiliency to future climate-related disturbances such as fire, and this research addresses the unanswered question of how lower treeline Rocky Mountain forests may be less resilient to wildfire given warmer, drier conditions. The research objectives are to: (1) quantify post-fire conifer establishment and survival by examining the density of conifer juveniles across a range of lower treeline sites that have burned since the mid-1980s; (2) examine the spatial variability of juvenile conifer densities in relation to site factors such as fire severity (as indicated by percent tree mortality), competition with

herbaceous and woody species, distance to seed source, and topographic variables including elevation and slope aspect; (3) analyze relationships between post-fire conifer regeneration and annual climate variability to determine if certain climate conditions limit or favor establishment and survival; and (4) experimentally manipulate microclimate to determine effects on conifer seedling survival and growth by increasing air temperature and examining both the direct effects of warmer temperatures and the secondary effects of changes in relative humidity and soil moisture.

Geospatial Modeling for Pro-active Flood Mitigation in the Rural Midwest. National Science Foundation grants #1234226, 1234390, and 1235317. <http://www.nsf.gov/award-search/showAward.do?AwardNumber=1234226>. Two years. Three grants. \$70,246 to principal investigator Heather McIlvaine-Newsad, Western Illinois University, newsad@wiu.edu, and \$60,313 to principal investigator, David Casagrande, Lehigh University, dac511@lehigh.edu, and \$164,732 to principal investigator, Nicholas Pinter, Southern Illinois University at Carbondale, npinter@geo.siu.edu.

Repetitive flooding severely affects rural communities in the Midwest and nationwide. "The crucial point about understanding why disasters happen is that it is not only natural events that cause them. They are also the product of social, political, and economic environments." This project will evaluate relationships between: (1) flood risk; (2) local attitudes towards mitigation; (3) responses of local leadership; and (4) institutional regulations and policies in order to create an integrated physical-social GIS model of vulnerability to catastrophic flooding and use it to select 30 rural communities suitable for large-scale flood risk mitigation such as through community relocation. We will survey residents in the 30 communities and use the data to answer questions about rural communities' attitudes towards living with catastrophic flood risk and mechanisms for promoting community-driven reductions in flood risk. We will also map institutional, regulatory, and legal policies that local leaders must navigate to implement proactive mitigation.

We will conduct a controlled experiment in 10 communities, assigned in equal number to experimental intervention or to a control group. Intervention in the five communities will consist of engaging leaders and residents in multifaceted discussion of the obstacles, opportunities, and incentives for reducing exposure to catastrophic flood damage. Ethnographic analysis of the interventions will allow us to qualitatively test how local leaders negotiate potential conflicts between community attitudes, flood risk, and governmental structures and programs. These results will be used to further refine the GIS model and shape it as a tool for flood mitigation and mitigation research.

The goal is to analyze the physical, hydrological, economic, social and institutional landscape of rural floodplains of the Mississippi, Ohio, and Illinois Rivers to identify—and begin implementing strategies—for increasing rural community resilience. The practical goals of this project are to assess the vulnerability of rural floodplain communities, their capacity to recover from catastrophic flooding, and local attitudes that present both opportunities and challenges to meaningful mitigation of flood hazard. Many U.S. floodplain residents live in a virtual state of denial regarding the long-term risk of flooding, and many vociferously resist buyouts and other mitigation measures that could meaningfully reduce future

flood damages.

Many obstacles to effective risk reduction could be dramatically reduced by: (1) proactive planning ahead of major disasters; and (2) community-scale mitigation projects, rather than piecemeal removal of structures and slow erosion of affected communities. This project seeks to create a socio-hydrological framework and practical foundation to reenergize flood mitigation efforts on rural U.S. floodplains.

Flood-Related Pathogen Risk Models Appropriate for Low Resource Settings. National Science Foundation grant #1249250. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1249250>. Three years. \$50,000 to principal investigator, Justin Remais, Emory University, justin.remais@emory.edu.

Recent severe flooding in southern China has affected millions of people in Hunan province and has raised the threat of waterborne infectious diseases. Pathogens can be mobilized by flood conditions as urban sewerage systems and rural latrines overflow, and manure from agricultural animals is washed into rivers and streams. This project will improve our understanding of, and our ability to predict, the microbiological risks that follow a major flood event.

Emergency responders are faced with the significant challenge of estimating the scale in time and space of microbiological risk following a flooding event, especially where environmental data are limited. At the same time, questions arise as to when elevated microbiological risks return to normal—that is, when is it safe to return to flooded areas?

The researchers will collaborate closely with colleagues in Hunan and neighboring provinces to develop models capable of estimating the risk of *Cryptosporidium* exposure in drinking water following the flood. *Cryptosporidium* is an important organism to study because it is a high priority pathogen for the United States and Chinese risk managers, it is a documented cause of acute diarrhea during floods, it persists in the environment under harsh conditions, and it is highly resistant to disinfectants used to treat drinking water.

Even under non-flood conditions, the pathogen threatens delivery of safe water in China, the United States, and in drinking water systems throughout the world. The emergency situation in Hunan provides a narrow window of data availability in which environmental monitoring data can be obtained at key locations throughout the flood zone. The risk of *Cryptosporidium* oocyst ingestion through drinking water will be calculated under flood conditions and compared to nominal flow conditions to assess the role of the flood in elevating or lowering risk.

Researchers will examine the role of specific landscapes in attenuating or intensifying risk under flood conditions. Finally, the models will be used to isolate the role of specific processes (like dilution of pathogens under heavy flows) that drive flood-related risks, and the time required for *Cryptosporidium* oocyst concentration to return to pre-flood will be examined in relation to the location of sources of contamination and factors that affect *Cryptosporidium* survival in the water column.

Results from the project will be highly relevant to devising strategies to moderate future flood risks in flood-prone regions. The researchers will develop new tools for the modeling and prediction of flood-related microbiological risks that will improve our understanding of how extreme events can alter microbiological water quality.

Institutional Responses to a Changing Environment: Flooding and Natural Resource Access in the Okavango Delta, Botswana. National Science Foundation grant #1234018. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1234018>. Two years. \$13,579 to principal investigators Brian King and Jamie Shinn, Pennsylvania State University, bhk2@psu.edu.

This project examines how social institutions that mediate access to natural resources respond to changing environments and the implications such responses have for people dependent on natural resource-based livelihoods. As the consequences of climate change increasingly impact communities across the globe, the local institutions that mediate access to natural resources will be critical in shaping effective adaptation practices.

The project will focus on institutional responses to environmental changes in the globally significant ecosystem of the Okavango Delta in Botswana. Seasonal floods are an integral part of life for the residents of the Okavango Delta, where rural livelihoods depend on the floodwaters for important natural resources. In recent years, however, increased flooding levels have displaced residents from their homes and disrupted livelihood systems. The project will examine how social institutions that affect the rules of use that determine access to natural resources are responding to these increases in flooding.

The qualitative study will use household-level semi-structured interviews and a structured survey to address three specific and interlinked questions: (1) What are the institutions that govern access to wetland resources in the Okavango Delta? (2) How are these institutions responding to increasing levels of flooding? (3) How do these responses impact the ability of residents to access resources and sustain livelihoods?

A Multi-Platform Kinematic and Thermodynamic Study of Tornado Genesis, Structure, and Evolution. National Science Foundation grant #1211132. <http://www.nsf.gov/award-search/showAward.do?AwardNumber=1211132>. Three years. \$1,421,820 to principal investigators Joshua Wurman, Curtis Alexander, Wen-Chau Lee, and Karen Kosiba, The Center for Severe Weather Research, jwurman@cswr.org.

The need for improved understanding and development of more reliable means to identify and provide advance warning of tornado formation are key motivations behind the joint NSF-NOAA sponsored VORTEX2 (Verification of the Origins of Rotation in Tornadoes) project. Field operations during VORTEX2 encompassed multi-platform field activities providing a wealth of radar and in-situ thermodynamic data within severe thunderstorms, tornadoes, and their supporting environments. Following on a successful two-year multi-investigator data collection campaign, this research effort will focus on advanced physical understanding in three separate yet interrelated topical areas: (1) Specification of mechanisms contributing to the genesis, intensification and evolution of tornadoes; (2) more comprehensive description of near-surface winds in tornadoes and their relationship to built-structure damage; and (3) improved climatological description of tornado characteristics utilizing a growing suite of close-up, high-resolution observations gathered via specially-tailored mobile platforms. In the course of these studies, researchers will seek to increase robustness of prior indications of typical tornado behavior, including what may be a preferred scale and inten-

sity for tornadoes, a suggested negative correlation between vortex core size and intensity, and an apparent lack of correlation between the strength of tornadic vortices vis-à-vis overlying in-cloud circulation within parent mesocyclones.

Mineral reactions during seismic slip and earthquake instability. National Science Foundation grant #1248103 and 1247951. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1248103>. Two grants. One year. \$66,848 to principal investigator, Ze'ev Reches, University of Oklahoma Norman Campus, reches@ou.edu, and \$70,616 to principal investigators, Harry Green, Nicholas Beeler, and David Lockner, University of California-Riverside, harry.green@ucr.edu.

Although a great deal is known about the location of earthquakes and their danger to society, our knowledge of the underlying physics of how they nucleate and, especially, the physical processes operating as the slipped area on the fault expands during an earthquake is still poorly understood. Greater knowledge of these processes is necessary to better predict seismic shaking danger and, it is hoped, to one day enable prediction of major earthquakes. This project will use experimental studies and high-resolution electron microscopy to test a new hypothesis of how the slip on continental earthquakes occurs.

Earthquakes are understood to initiate by two distinctly different processes: In the cold, low-pressure, environment of the upper few tens of km within the Earth, earthquakes generally begin by overcoming static friction on pre-existing faults. However, earthquakes also occur continuously to depths approaching 700 km in subducting oceanic lithosphere where the pressure is too high to allow brittle failure. Experiments show that shear failure (faulting) at high pressure requires a mineral reaction that yields a small amount of 'fluid' for their initiation and expansion; the 'fluid' can be either a true fluid (eg. H₂O or CO₂) or a nanocrystalline solid exhibiting an extremely low viscosity in the solid state.

The project will test the hypothesis that the process of mineral-reaction-induced shearing instability, the mechanism of faulting at high pressure, can also operate in shallow earthquakes where it is activated by the frictional heating/straining that occurs during initiation of earthquake slip. The team envisions two main ways in which this may occur: (1) Breakdown of clay minerals or carbonates in the fault zone releasing a fluid (water or CO₂, respectively) that results in a large drop of the resistance to sliding on the fault; (2) generation of extremely small particles during initiation of sliding that form a nanocrystalline solid that can flow by grain-boundary sliding at seismogenic speeds, as has already been demonstrated for high-pressure faulting. Models of earthquake slip, experiments, and examination of fault zones in the field strongly suggest that shear-heating-induced devolatilization occurs in some earthquakes. The high-pressure experimental observations that such reactions lead to shearing instabilities further suggest that similar processes could enhance shallow earthquakes. Similarly, recent laboratory work in at least two laboratories concludes that powder-lubrication may be a critical part of fault propagation and lubrication. The key question we will test experimentally is whether such shear-heating-induced mineral reactions can lead to rapid drop in friction and/or enhancement of slip under shallow crust conditions.

The team will investigate the role of 'fluid'-producing reactions in fault mechanics. They will activate shear-induced devolatilization in laboratory experiments at the University

of Oklahoma by high-speed sliding under a range of normal stresses. They will characterize the microstructure of gouge and sliding surface produced in these experiments, comparing those microstructures with the 'superplastic' fault-filling materials produced in high-pressure faulting experiments.

Instrumentation and Modeling of Seismic Isolation in Aftershocks. National Science Foundation grant #1258466. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1258466>. Two years. \$169,910 to principal investigator Henri Gavin, Duke University, henri.gavin@duke.edu.

The project objective is to measure the long-term seismic responses of the base-isolated Christchurch Women's Hospital, located in Christchurch, New Zealand, and to use these measurements, along with computational models, to assess the relative effects of soil-foundation-structure interactions with liquefying soil, for interactions between adjacent buildings, and for interactions across the isolation interface.

Nine networked triaxial accelerometers and three displacement sensors, installed at three levels within the structure, will allow for remote monitoring of aftershock responses and rapid data processing. The database of high fidelity measurements from this building will be combined with detailed computer simulations of the structure, isolation system, foundation, and supporting soft soil.

The project team, including researchers in structural and geotechnical engineering at the University of Canterbury, Christchurch, New Zealand, engineers from firms in New Zealand conducting geotechnical field investigations at the building site, and hospital staff, will collaborate on the deployment and remote monitoring of the instrumentation, the development and application of modern system identification techniques to the data, and the development of nonlinear numerical models to examine the processes governing the response of this structure.

Vibration measurements obtained in situ from buildings during actual earthquakes are invaluable in assessing and improving the performance of earthquake protection systems. Following the large earthquakes of 2010 and 2011, Christchurch has experienced, and continues to withstand, hundreds of earthquake aftershocks per year. This project seizes the unique opportunity to capture perishable data from the seismically-isolated Christchurch Women's Hospital, a building designed to be particularly earthquake-resistant. While this facility is providing uninterrupted service throughout this sequence of earthquakes, some aspects of the dynamic response of this structure are unanticipated. By combining measurement and analysis, researchers will identify the aspects of this structure leading to the measured and observed motions.

Seismic Investigation of Geysers at El Tatio. National Science Foundation grant #1256397. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1256397>. One year. \$32,849 to principal investigator Jesse Lawrence, Stanford University, jfl77@stanford.edu.

This project will collect a new data set to will support geyser eruption research currently funded by the National Science Foundation. The goal of this proposal is to create a short-term seismic array that will monitor and characterize the seismic behavior of the shall subsurface at El Tatio Geyser Fields. This is the third largest geyser field in the world. Due to the more relaxed stance on marginally invasive scientific

investigations, El Tatio is an ideal location to deploy such a network. The data will be unique in sensor density and duration. Results will likely surpass those for any other geyser field. The goal is to characterize subsurface processes resulting in seismic vibrations and correlate these sources with surface eruption characteristics. The concurrent measurements of temperature, discharge rate, eruption height, eruption duration, and recurrence time make this data set unique.

As the world's third largest geyser field, El Tatio is a key geotourism location. Better understanding of the subsurface processes for such locations will eventually help education the broader public. Geyser eruptions are also key for understanding volcanic eruption processes as well as constraining important properties for geothermal energy generation.

The Feasibility of Simulating of Weak Volcanic Shockwaves with Analog Modeling. National Science Foundation grant #1250153. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1250153>. One year. \$100,482 to principal investigators, Gregory Waite, and Jeffrey Allen, Michigan Technological University, gpwaite@mtu.edu.

Information about conditions at a volcano vent can be extracted from observations of atmospheric shock waves. An improved understanding of the burst phenomena that generate shock waves and the dependence upon volcano shape and eruption properties may lead to new methods to access information on the eruption intensity as well as generate the initial conditions required in a buoyancy predictive models of the gas/ash plume dispersion. This is a one-year feasibility study that will investigate experimental simulation of a volcanic explosion using a unique shock tube apparatus.

Use of atmospheric shock propagation to gauge explosive power and eruption temperature is new and untested. If successful, atmospheric shock propagation has the potential to radically improve the accuracy of measuring explosive power. At the conclusion of the project we anticipate being able to definitively address concerns regarding the feasibility of a shock tube experiment to scale volcanic explosions. The theory developed will enable more precise prediction of explosive power derived from atmospheric shock wave propagation.

Documenting the Spatial Pattern of Drought in Western North America During the Holocene. National Science Foundation grant #1252874. <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1252874>. One year. \$54,126 to principal investigator, Mark Abbot, University of Pittsburgh, mabbott1@pitt.edu.

Drought in western North America impacts the environment and economy by limiting water for municipalities, agriculture, forestry, hydropower, fisheries and recreational uses. The problem of limited water resources will be compounded by rapid population growth in the western U.S. and the loss of alpine snowpack and glaciers. This problem will be especially difficult in the southern reaches of this region, where alpine snowpack currently buffers stream flow during the summer dry season. Documenting the timing, magnitude, duration and geographic pattern of past wet and dry cycles is an important step toward understanding the causes of droughts. This research will help scientists understand the frequency, duration and magnitude of wet and dry cycles, help place the current drought impacting the region in perspective, and aid policy makers so that they can make better-informed plans regarding water resources.



Conferences and Training

October 30 to November 12, 2012

SARMA Annual Conference

Security Analysis and Risk Management Association

Arlington, Virginia

Cost: \$595

This conference will focus on the challenges and needs of the security risk management community as it strives to professionalize the field. Topics include standards and training, applying security management risk principles, creating innovations in security risk, cybersecurity, and emerging issues.

sarma.org/news/homepageboxes/6thannualconferenc/

November 2-3, 2012

Children's Disaster Services Volunteer Workshop

Church of the Brethren

Denver, Colorado

Cost: \$45

This workshop will teach ways to comfort, relieve stress, and calm the fears of young children during disaster and other traumatic situations. Topics include a shelter simulation, the needs of children after disaster, the role of play in the recovery process, and how to set up and operate a children's disaster services center.

www.brethren.org/cds/training/

November 5-11, 2012

Fourth International Symposium on Fire Economics, Planning and Policy

Mexico National Forestry Commission, U.S. Forest Service, International Wildland Fire Association, and Others

Mexico City, Mexico

Cost: \$400

This conference will look at increased costs of wildfire management and the futility of fighting fires in environments without fuel management strategies. Topics include the consequences of differing management strategies, real and perceived influences of climate change, sustainable forest management, hazardous fuel treatment, and research solutions to current wildland fire challenges.

www.fumeproject.eu/?q=node/796

November 6, 2012

High-Rise Aerial Firefighting and Rescue

Tangent Link

Dubai, United Arab Emirates

Cost: \$140

This conference will examine the feasibility of fighting high-rise fires using helicopters. Topics include case studies of helicopter use in urban Moscow firefighting, how to form helicopter firefighting and rescue teams, and standard operating procedures for high-rise fire and rescue operations.

www.tangentlink.com/high-rise-aerial-firefighting--rescue--dubai-uae--6th-november-2012--.html?page=1

November 7-8, 2012

Fourth International Conference on Geo-Information Technology for Natural Disaster Management

Geoinformatics Center of the Asian Institute of Technology

Colombo, Sri Lanka

Cost: \$300

This conference will present technological advancements for understanding natural hazards and their impacts. Topics include climate impacts on Himalayan glacier dynamics and water resources, intelligent evacuation route identification systems, a preliminary study on intraplate earthquakes in the Indian Ocean, a conceptual model for landslide prediction in Sri Lanka, cloud computing as an approach to natural disaster management, drought monitoring using GIS and remote sensing in Rajasthan, India, and the effects of coastal land use on tsunami inundation along the South Indian Coast.

e-geoinfo.net/git4ndm2012/

November 7-9, 2012

Risk Assessment in the Context of Global Climate Change

UN Office for Outer Space Affairs and the China Ministry of Civil Affairs

Beijing, China

Cost: Free

This conference will discuss how to enhance long-term risk reduction efforts by obtaining space-based climate change data from international and regional organizations. Topics include national climate change-related risk reduction efforts, the increasing availability of open source data, applying space technology to disaster risk assessment and mapping, and activities supported by the UN Platform for Space-Based Information for Disaster Management and Emergency Response (UN-SPIDER).

www.un-spider.org/risk-assessment-climate-change

November 12-15, 2012

Fourth International Conference on Drylands, Deserts, and Desertification

Ben-Gurion University of the Negev

Beersheba, Israel

Cost: \$430

This conference will discuss challenges of living sustainably in arid environments and offer possible solutions. Topics include water resource management tools, architecture and urban planning to make arid environments livable, intergovernmental management of water resources, dryland ecosystem benefits, agricultural productivity using minimal irrigation, and remote sensing tools in drylands.

in.bgu.ac.il/en/desertification/Pages/default.aspx

November 13, 2012

Emergency Management: Themes in Emergency Planning, Response, and Recovery

Nottingham Trent University

Nottingham, England

Cost and Registration: \$219, open until filled

This conference will discuss the theoretical and empirical foundations of emergency management and new research implications for policy and practice. Topics include major incident response and crisis management, emerging trends in emergency response and disaster

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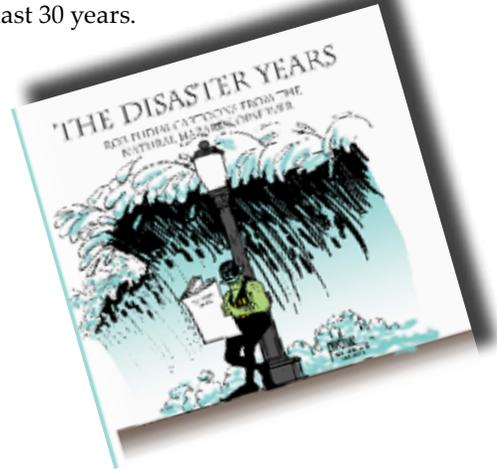
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management, business continuity planning and disaster recovery, and community resilience and recovery.

www.ntu.ac.uk/soc/news_events/conferences/emergency_conference.html

**November 13-14, 2012
Texas Dam Safety and Field Technician
Training Workshop**

**National Hydrologic Warning Council
Austin, Texas**

Cost: \$175

This workshop will examine issues of dam safety in Texas, with emphasis on challenges, regulations, and the impact the drought has on dam safety and maintenance. In addition to the workshop, extensive training for hydrologic field technicians will also be offered.

www.hydrologicwarning.org/content.aspx?page_id=22&club_id=617218&module_id=123459

**November 15-16, 2012
Rebuilding Sustainable Communities after Disasters
in China**

**Center for Rebuilding Sustainable Communities after Disasters
and the China Program Center
Boston, Massachusetts**

Cost: \$300

This conference will examine best practices and lessons learned in reducing the socioeconomic impact of disasters on vulnerable communities in China with a focus on how such lessons can be improved and applied internationally. Topics include sustainable land use planning, traditional and public policy practices in managing floods, strategies for integrating disaster risk reduction into business planning, culture-based disaster support for the poor, the role of media in disaster, urban reconstruction policies, and the role of women, children, the elderly, and the disabled in postdisaster reconstruction.

www.umb.edu/crscad/events/china_2012/

**November 20-22, 2012
Second European Conference on Flood Risk
Management**

**Deltares, HR Wallingford, Samui, and Flood Control 2015
Rotterdam, The Netherlands**

Cost: \$939

This conference will examine the trend that is moving from flood protection to comprehensive flood risk management, including advances and innovations in risk analysis. Topics include flood hazard analysis and probabilities, vulnerability and societal resilience, damage assessments, flood defense and nonstructural flood control, risk communication, disaster risk reduction, and policy, zoning, and regulation.

www.floodrisk2012.net/

**December 3-7, 2012
Fifth International Fire Ecology and Management
Congress**

**Association for Fire Ecology
Portland, Oregon**

Cost: \$445

This workshop will examine wildland fire issues in a global context, study advances in science and technology, and get a perspective on wildland fire worldwide. Topics include assessing fire with geospatial technology, implementing fire policy, the National Cohesive Wildland Fire Management Strategy, climate drivers of historical fires, native species management, and mitigating human risk from wildfire.

afefirecongress.org/

**December 11-14, 2012
Extreme Natural Hazards and Their Impacts
Union Commission on Geophysical Risk and Sustainability
Orange, California**

Cost: \$400

This conference will present scientific knowledge about extreme natural hazards from around the world. Topics include recent earthquakes, tsunamis, and volcanic eruptions, the connection between climate extremes and natural hazards, early warning, satellite sensor monitoring, and disaster management in developing countries.

www1.chapman.edu/~rsingh/GeoRisk2012/



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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.

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