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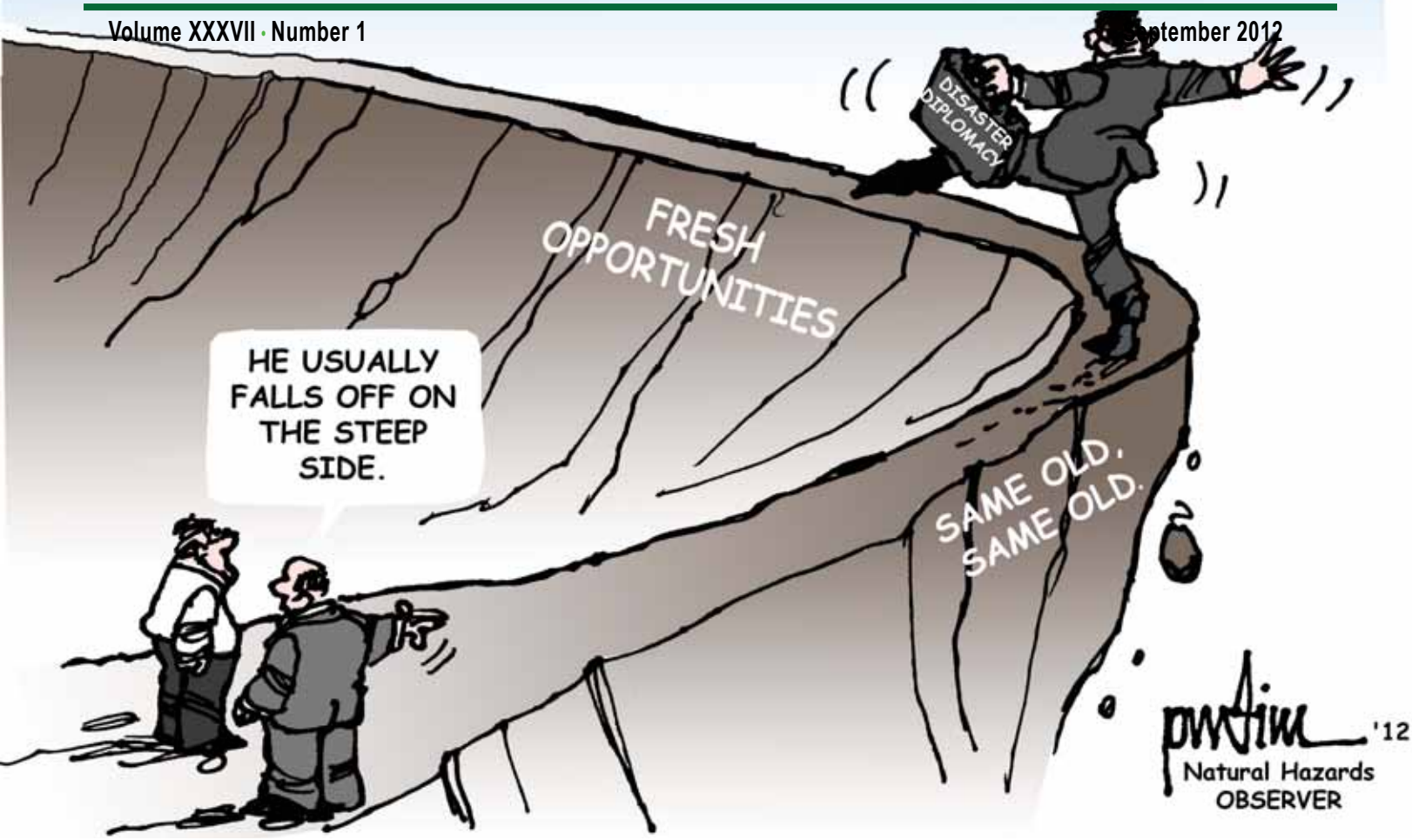


The many failures of disaster diplomacy

An invited comment by Ilan Kelman

Earlier this year, disasters and politics came together in North Korea. The United States, China, and North Korea, with other parties, reached an agreement that North Korea would receive food aid in exchange for progress on nuclear and missile talks. This is a classic case of disaster diplomacy (www.disasterdiplomacy.org), where a disaster is used to move diplomacy forward.

Since about 1995, North Korea has been suffering from floods, droughts, and famines, mainly because of its own agricultural mismanagement rather than problems caused by extreme weather. That has necessitated continual international food aid. North Korea has long tried to avoid international scrutiny regarding its nuclear and military ambitions. Linking humanitarian aid to increased international access to the country meant the Korean food disaster might be used as a fulcrum to address the broad diplomatic interests on all sides.

(Please see "Disaster diplomacy," page twelve)

INSIDE ...

Hot and dry and melting ...

Is climate change to blame?

Climate change signs in on weather patterns

July 2012 was the hottest month on record for the contiguous 48 United States. And drought covered 63 percent of the land area of the Lower 48.

Arctic sea ice extent in August reached a record low by August 27, with a month still left in the usual melt season, according to the National Snow and Ice Data Center.

Vascular plants in the Pyrenees and Sierra Nevada in Spain have migrated nearly nine feet upwards.

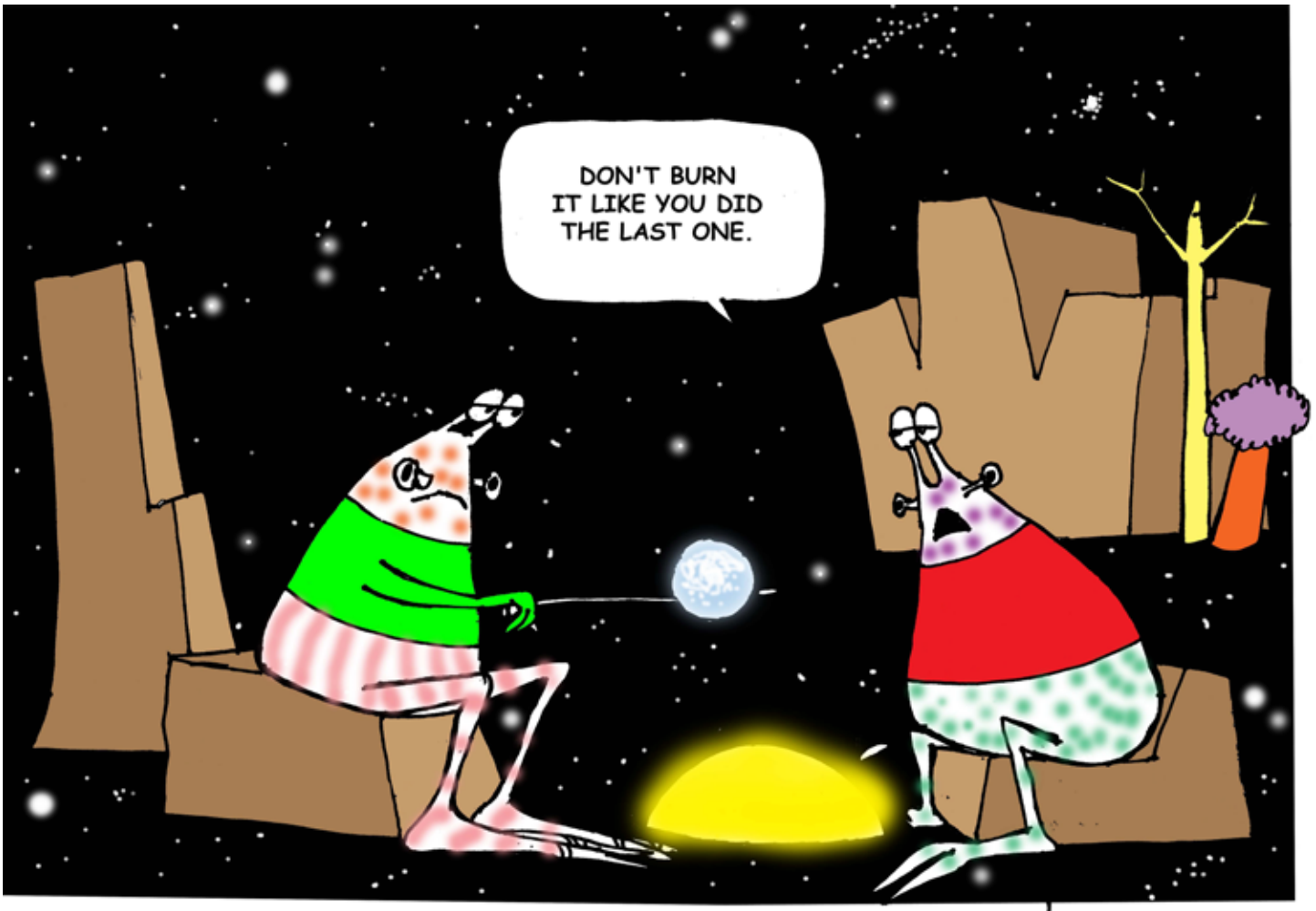
James Ross Island in Antarctica is warmer than it's been in the last millennium.

So … are these at long last the signatures writ large of a changing climate? Several scientists say we're beginning to see the effects of global warming on weather events.

Most prominently, NASA's James Hansen rolled the climate dice and they came up snake eyes in a paper in the August 6, 2012 online version of the *Proceedings of the National Academy of Sciences*, as well as in an oped piece for the *Washington Post*. He and colleagues wrote in the *PNAS* paper, "We can state, with a high degree of confidence, that extreme anomalies, such as those in Texas and Oklahoma in 2011 and Moscow in 2010 were a consequence of global warming because their likelihood in the absence of global warming was extremely small."

Hansen has been studying climate change for longer than nearly anyone. His comments carry a lot of weight. Only six or seven years ago, climate scientists projected that the impacts of global warming were several decades away. Hansen now says that rosy scenario was too optimistic.

In his August 3, 2012, *Post* op-ed, Hansen wrote that, based on observations of events, "The deadly European heat wave of 2003, the fiery Russian heat wave of 2010, and catastrophic droughts in Texas and Oklahoma last year can each be attributed to climate change. And once the data are gathered in a few weeks' time, it's likely that the same will be true



for the extremely hot summer the United States is suffering through right now."

Extremes have become more frequent and more severe. Hansen uses a statistical metaphor of "climate dice." He and his colleagues say in the *PNAS* article, "The most important change of the climate dice is the appearance of a new category of extremely hot summer anomalies, with mean temperature at least three standard deviations greater than climatology." This means that recent extreme events would likely not have occurred in the absence of global warming.

A paper published on November 1, 2011, in *PNAS* by Stefan Rahmsdorf and Dim Coumou also found that record breaking heat events in Russia were probably the result of climate change, though they didn't apply the "three standard deviation" standard that Hansen found.

The *Post*, in a same-day commentary on Hansen's research, concluded bravely, "Patterns emerge." The editors added, "But it's also wrong to blame all extreme events on forces beyond human control." Why the emission of greenhouse gases, the chief anthropogenic cause of warming, is "beyond human control" is an area the *Post* editorial chose not to explore.

The Web site RealClimate weighed in that "Extreme heat waves, like the ones mentioned, are not just 'black swans'—i.e. extremely rare events that happened by 'bad luck.' They might look like rare unexpected events when you just focus on one location, but looking at the whole globe, as Hansen et al. did, reveals an altogether different truth: such events show a large systematic increase over recent decades and are by no means rare any more. At any given time, they now cover about 10 percent of the planet … We have neither long enough nor good enough observational data to have a perfect knowledge of the extremes of heat waves given a steady

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They Said It ...

"The average temperature for the contiguous U.S. during June [2012] was 71.2°F, which is 2.0°F above the 20th century average. Scorching temperatures during the second half of the month led to at least 170 all-time high temperature records broken or tied. The June temperatures contributed to a record warm first half of the year and the warmest 12-month period the nation has experienced since record keeping began in 1895."—**National Oceanic and Atmospheric Administration's State of the Climate** news release.

"This was so extraordinary that at first I questioned the result: was this real or was it due to a data error?"—**NASA Jet Propulsion Laboratory scientist Son Nghiem, when 97 percent of Greenland's surface appeared to have undergone melting on July 12, 2012, in a** NASA release.

"We could kind of see it coming. It's not hard to make these predictions, because the odds are stacked in favor of warming."—**Jason Box, a glaciologist at Ohio State University, on the July 2012 record ice melt in Greenland, quoted in** *Science News*.

"Ice cores from Summit [Station] show that melting events of this type occur about once every 150 years on average. With the last one happening in 1889, this event is right on time. But if we continue to observe melting events like this in upcoming years, it will be worrisome."—**Lora Koenig, a NASA Goddard Space Flight Center glaciologist, on the Greenland melt, quoted in a** NASA release.

"With more yet to come in August, this year's overall melting will fall way above the old records. That's a goliath year—the greatest melt since satellite recording began in 1979."—**Marco Tedesco, assistant professor of earth and atmospheric sciences at The City College of New York, on the record melting of the Greenland ice sheet my mid-August, 2012, quoted in a CCNY news release.**

"We've got the 'storm of the century' every year now."—**Bill Gausman, a senior vice president at the Potomac Electric Power Company, on the June 29 "derecho" knocking out power for 4.3 million people in 10 states and the District of Columbia, in the** New York Times.

"It was so loud, there were people screaming in the water, and metal barrels, and animals. It boiled and boiled, it covered the streets and the yards. It was all you could see."—**Lyudmila Dmitriyevna, on the July Black Sea floods that killed more than 170 people, in the** *New York Times*.

"With this huge outbreak in Texas, the jury is still out on what's going to happen with the rest of the country. But in Chicago, we've already observed high numbers of West Nile virus-infected mosquitoes. This is looking like a large regional event. We don't know if the number of cases is going to drastically increase, but we do expect more cases."— **Dr. Lyle R. Petersen, director of the Center for Disease Control's Division of Vector-Borne Infectious Diseases, quoted in the August 16, 2012** New York Times.

"It's more God and nature's dictates, rather than a man-made event."—**Missouri farmer Kevin Mainord on climate change's effect on Midwestern heat and drought, quoted in the August 15, 2102,** Financial Times.

climate, and so no claim along these lines can ever be for 100 percent causation, but the change is large enough to be classically 'highly significant.'"

In an article in the July 2012 issue of the *Bulletin of the American Meteorological Society—Explaining Extreme Events of 2011 from a Climate Perspective*—editors Thomas Peterson and colleagues concluded that the 2011 floods in Thailand were devastating, but didn't result from an unusual amount of rainfall. Other factors like changes in hydrology were equally likely to cause problems. But droughts in East Africa do seem to be more likely as a result of increased warming from the Indian-Pacific Warm Pool.

One group of scientists in this study looked at one of the events that Hansen concluded was climate change-related, the 2011 Texas drought. They concluded—in a considerably more restrained and less categorical way than Hansen—that "conditions leading to droughts such as the one that occurred in Texas in 2011 are, at least in the case of temperature, distinctly more probable than they were 40-50 years ago." Nonetheless, especially because data records are relatively short, "While we can provide evidence that the risk of of hot and dry conditions has increased, we cannot say that the 2011 Texas drought and heat wave was 'extremely unlikely' … to have occurred before this recent warming."

Peterson and colleagues argue that many of these attribution studies are misinterpreted because of confusion about exactly what questions are being asked.

Meanwhile, European researchers concluded that global warming has driven the habitat of some species of vascular plants to higher elevations—2.7 meters higher, to be precise. "This finding confirms the hypothesis that a rise in temperatures drives Alpine flora to migrate upwards. As a result, rival species are threatened by competitors, which are migrating to higher altitudes. These changes pose a threat to high mountain ecosystems in the long and medium term," the authors said. The paper appeared in the April 20, 2012 issue of *Science*.

But in a *PLoS One* study in February 2012, Texas Tech University researchers found that another earlier study attributing plant elevation changes to climate change was incorrect. The scientists, led by Texas Tech ecologist Dylan Schwilk, "refuted the findings that plants are moving upslope in California because of climate warming." The group looked at desert plants that had been included in the upslope-moving group in the earlier study. "We found that it's actually fire history and self-thinning at play, not global warming," Schwilk said.

Confused yet? While there is little doubt among scientists that the climate is warming as a result of human activity, research on the attribution of individual climate and weather events to climate change is in its infancy, as the AMS report says.

Survey says...

And so … what does your average American—if there is such an animal—think about all this heating/melting/drought and climate change?

He is unconvinced and his doubts are increasing. A June, 2012, *Washington Post*-Stanford University poll found that fully 25 percent of the public thinks the world's temperature has not been going up over the past 100 years. This is the largest percentage of climate skepticism measured since 2006. www.washingtonpost.com/wp-srv/nation/.../global-warming-poll.pdf.

Furthermore, of those saying that global warming is happening, only 30 percent think it's a result of human activity. Sixty-nine percent say it's either natural causes (22 percent) or both humans and nature equally (47 percent).

Lest you think that further scientific research will settle the issue, 73 percent of the respondents said that they trust what scientists say about the environment "not at all" (7 percent), "a little" (28 percent), or "a moderate amount" (38 percent).

In Canada, by contrast, only two percent of the population believes that climate change isn't occurring. www.cbc.ca/news/canada/calgary/story/2012/08/15/calgary-climate-change-web-poll.html.

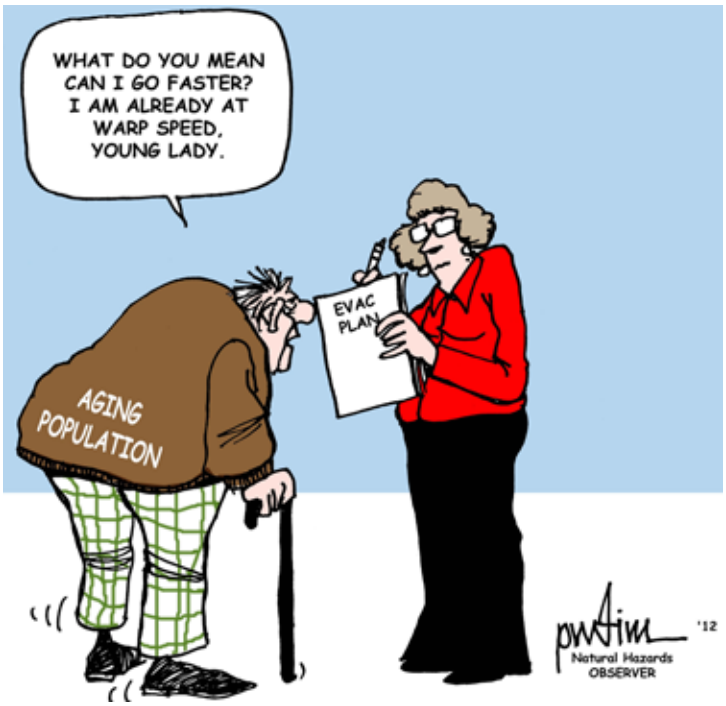
Urban growth, aging populations

A new era in disaster services

FEMA's Kaufman says the challenge is designing resilient systems

The dynamics of the modern world are creating new challenges for delivering services to people in times of crisis, says David Kaufman, director of the Federal Emergency Management Agency's Office of Policy and Program Analysis.

"When we move and look at technology, we see wholesale shifts in the ways in which we access and consume information," Kaufman says, in only one example among many of the changing reality of designing disaster-resilient communities. We place great "reliance upon automated systems that are at the front of our mind and not so at the front of our mind—the fact that in order to get an ATM withdrawal, the [global positioning system] needs to be working."



These new dynamics cut across a wide variety of issues. For the first time in the history of the world, he says, more people live in urban areas than in rural ones. In the United States, 82 percent of the population lives in 11 "megaregions." Population growth is increasing along the coasts, precisely in those areas which are most vulnerable to many natural hazards.

"At the same time, the population of the country is aging," he says. "I find that a particularly astonishing statistic is to look at the growth in the percentage of the population between now and 2025 who are over age 65 and what that means for the kinds of services, the kinds of support systems that are required in times of crisis."

All of this means that disaster experts are facing increased complexity and decreasing predicability. The advent of social media, in particular, has influenced the way that people respond in a disaster. Changes are occurring in whom people turn to for information in disaster situations—who they trust. "Trust is moving away from large institutions, both public and private," Kaufman says. "It is moving to networks. It is becoming increasingly important to understand who the influencers are for different groups of people—who do they turn to for information?"

If, for instance, an evacuation order is given in advance of

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Hazards we hadn't worried about before

That commute is a killer.

Really.

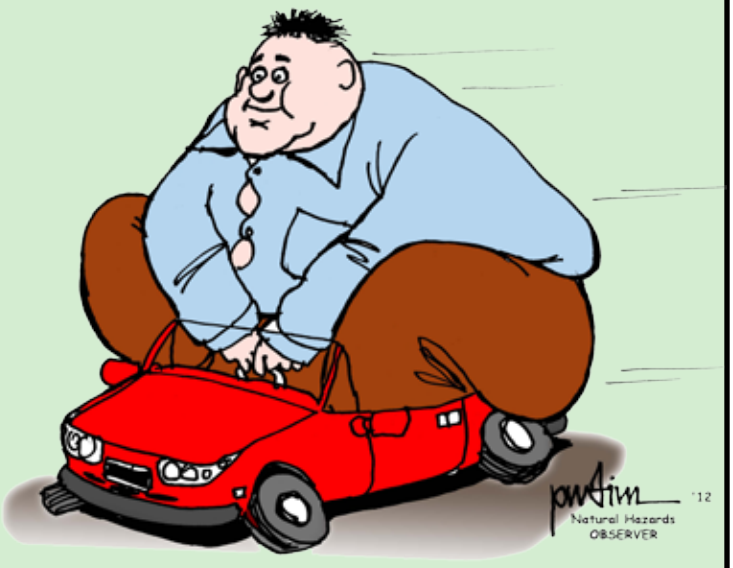
As people move further away from their jobs, the longer commuting times to and from work are making them fatter and decreasing their cardiovascular fitness.

So says research covering nearly 4,300 residents of the Dallas-Ft. Worth and Austin, Texas, metro areas, undertaken by Christine Hoehner of St. Louis's Washington University. People who drove more than 15 miles to work were "less likely to meet recommendations for moderate to vigorous physical activity, and had a higher likelihood of obesity."

A commuting distance of only 10 miles was associated with high blood pressure.

Hoehner says longer commutes may replace participation in physical activity. "At the same time, both BMI and waist circumference were associated with commuting distance even after adjustment of physical activity ... suggesting that a longer commuting distance may lead to a reduction in overall energy expenditure," she says.

The research appeared in the June issue of the *American Journal of Preventive Medicine*.



a hurricane, an average resident is going to check in with four or five other people before deciding whether to obey it. Decision making in a crisis is a social issue, he says.

This social contract has expanded. People have an expectation of input that is "qualitatively different from 20 years ago," Kaufman said. "We are grappling with designing plans and anticipating what people are going to do."

Kaufman says that emergency planners, researchers, and others in the field have to embrace the role that private and nongovernmental organizations are playing in this new paradigm.

Trust is a critical issue, he says. He notes that this applies especially in the field of terrorism. "Terrorism is, as much as anything, an attack on social trust. The object of terrorism is to erode the faith and confidence of a population in its governmental institutions, and to do that with a political objective, is the target of terrorism."

There is a great deal to be gained from the social sciences, he says. There are insights from the behavioral processes on how people behave in ordinary situations that influence the way they will behave under stress. Public citizens are the first responders. But people don't follow the plan in the disasters, so the plans must be flexible and adaptable to respond to the way that people actually behave.

Kaufman spoke on July 15 at the 37th Annual Natural Hazards Research and Applications Workshop held in Broomfield, Colorado.

It's not just how many were lost, but ...

How many were saved?

Media often ignore the benefits from fire safe community planning

As the fire season exploded, especially in the American West, the headlines were full of the number of houses lost, the cost, the human toll. But that doesn't tell the whole story. Programs in place have helped to save many houses and people which would have been lost without these interventions.

Molly Mowery of Firewise Communities at the National Fire Protection Association says, "One of the things we often hear is, 'How many homes were lost?' But when we get to go on the road and talk to people, we hear something different.

"We hear how many homes were saved, how many homes were protected. We heard that already with Colorado Springs"—which was victim of a devastating wildfire in July. "Obviously, it doesn't take away from the loss of life and structures, she says, "but they're already claiming an 81 percent safe rate. We saw that in Texas as well last year." Texas lost about 2,900 structures to fires in 2011. But as a result of different mitigation efforts, 38,581 structures were saved.

The Firewise Communities program is ten years old. It offers a wide variety of tools to help people in the urban-wildland interface to protect themselves and their homes from wildfires.

Keith Worley, also from the National Fire Protection Association, says that one of the major challenges is persuading people to adopt fire mitigation plans in the first place. When he tried to push fire mitigation for home and personal safety, he found strong resistance in the community. "One of the things we found," he said, "is that people don't live there for the wildfires. They live there for the trees."

So Worley, a forester by training, changed his pitch to one of "healthy forests." People accepted this message much more readily than they did the threat of wildfire.

"How do we get people interested in this topic? We take a values approach," he said. "We focus on why we live here. The, 'How do we live here smarter?' By being fire adapted. With a fire-adapted forest, a fire-adapted ecosystem, we can work toward a fire adapted community."

Ironically, Worley said, some of the people who are most resistant to fire mitigation around their homes are strong environmentalists. These folks are often resistant to cutting trees down, he said.

Worley and Mowery spoke on July 16 at the 37th Annual Natural Hazards Research and Applications Workshop held in Broomfield, Colorado.

New approaches to the protection of infrastructure

Exploring the 'new normal' by learning from events of the recent past

Protection of infrastructure in the face of disasters requires new approaches and looking at "what is possible, beyond what is probable," says Cornell engineering professor and EERI distinguished lecturer Thomas O'Rourke.

It's necessary to "change the steps to the ecology of your mind," O'Rourke says, "to think of infrastructure in new ways, to think of hazards and the risks that you're bearing in new ways, and not accept standard probability as some sort of a comfort zone. There is infrastructure that is just too big to fail, and we are at some obligation to be able to identify and to do something about it."

Some of this "too big to fail" infrastructure is considered in much disaster work, but some that O'Rourke identified is less familiar. Failure of some could lead to multiple disasters, as when the recent Japanese Tohoku earthquake was followed by a tsunami, followed by catastrophic failures of the Fukushima nuclear power plants.

The infrastructure components that O'Rourke identified include the Southern California water supply, whose tunnels and aqueducts occasionally cross immediately over the San Andreas Fault; the San Francisco fire protection system and auxiliary water supply; the New York City water supply; the New Madrid Zone transportation and liquid fuel lifelines; and the Mississippi Delta flood network.

"The new normal is that it's anything but normal," O'Rourke says. "If we don't come to our senses and change our perceptions after the events of the recent past, particularly with what we've learned combined from Hurricane Katrina, then woe be to us."

O'Rourke says that probability projections are not borne out by reality, especially in the case of nuclear power. "Nuclear power tends to target failure probabilities on the order of at least one times ten to the minus five to one times ten to the minus six per year. However, if we just look at the five major releases from Chernobyl, Three Mile Island, and the three reactors at Fukushima, over the reactor years that those reactors were in operation, it comes to the three times ten to the minus four per year, or about two orders of magnitude off the target for what we've been told is the reliability of those systems.

"These problems of course are compounded … by institutional constraints, politics, lack of perspective, and sometimes just plain dysfunction," he said. "So no normal, except new thinking."

After September 11, the nation operated under the concept of "total protection" for critical infrastructure. But Hurricane Katrina in 2005 changed that perspective, to get people thinking about the resilience of infrastructure, the inability to eliminate all residual risk. Especially after the Tohoku and Christchurch earthquakes, "We need to rethink infrastructure and rethink risk," O'Rourke said.

Thomas O'Rourke spoke on July 16 at the 37th Annual Natural Hazards Research and Applications Workshop held in Broomfield, Colorado.

PERISHIP fellows announced

Seven PhD students will receive a $10,000 grant to support interdisciplinary dissertation work courtesy of the 2012 PERISHIP Dissertation Fellowship Program in Hazards, Risks, and Disasters.

The program assists top scholars in the completion of hazards dissertation work in natural and physical sciences, social sciences, engineering, and in interdisciplinary programs such as environmental studies.

The PERISHIP fellowship is administered by a partnership between the Natural Hazards Center and the Public Entity Risk Institute funded by Swiss Re and the National Science Foundation. For more information on the fellowship, visit the PERISHIP Web site—clas2.ucdenver.edu/periship/Fellows.html. The 2012 PERISHIP Fellows and their dissertations are:

Natalie D. Baker, University of California, Irvine, Department of Planning, Policy, and Design, "Practicing Disaster: Organizational Preparedness for a Catastrophic Earthquake in Southern California."

Gregg Bowser, University of South Carolina Department of Geography, "Determining the Differences in Evacuation Influences and Perceptions within the United States Elderly Population."

Grant Cavanaugh, University of Kentucky Department of Agricultural Economics, "The Prospects for an El Niño Futures Market: Simulating New Disaster Risk Markets Emerging Over Time."

Dana Rose Garfin, University of California, Irvine, Department of Psychology and Social Behavior, "Differential Responses to Natural Disasters: The Impact of the 2010 8.8 Magnitude Chilean Earthquake on Children and Adults Living Near the Epicenter."

Mark Muszynski, University of Illinois at Urbana-Champaign Department of Civil and Environmental Engineering, "Soil Improvement Strategies to Mitigate Impact of Seismic Ground Failures via Novel Integration of Experiment and Simulation."

Lan Nguyen, University of Colorado Boulder Department of Civil, Environmental, and Architectural Engineering, "Theoretical Fundamentals of Confined Masonry for New and Retrofitted Structures."

Jessica Weinkle, University of Colorado Boulder Center for Science and Technology Policy Research, "Characterizing, Creating, and Governing Florida's Hurricane Risk."

Building better flood risk maps: Lessons learned from the electric car

An invited comment by Bob Freitag, Dave Carlton, and Joe Hamman

Engineers have long depended on historic flow information for creating food insurance rate maps (FIRMs), determining the benefits of mitigation projects, and determining design standards for future projects. The longer the period of record, the more comfortable they feel with their projected outcomes.

Flood risk analysis assumes stationarity. For example, it assumes—removing seasonality—there is no long-term trend in the distribution of flooding over time. The 100-year flood in 1970 is the same as the 100-year flood in 2000 is the same as the 100-year flood in 2030.

But the assumption of stationarity is changing under changing climate conditions. "Assumptions on the occurrence of major hydrologic events to analyze extremes are based on the notion of stationarity, yet observational evidence increasingly shows that this assumption is untenable," according to the National Research Council's 2011 report *Global Change and Extreme Hydrology: Testing Conventional Wisdom*.

Using this logic—that the past predicts the future—almost stranded Karl Kim and his electric car.

Karl heads the University of Hawaii Natural Disaster Training Center. His office is in Honolulu, about 10 miles downhill from his Manoa home. Years ago he had installed solar cells on his roof, but with his kids off to college, he found he had extra power. What better way to use this surplus electricity than to charge an electric car? He bought the all-electric Nissan Leaf.

Shortly after he purchased his car, on his way to work, he noticed the car's computer estimated a 50-mile range. With 10 miles to work and 10 miles to return home, he felt confident the trip was well within the car's anticipated range.

The problem was that the car's computer, not unlike the algorithms used to develop Federal Emergency Management Agency flood insurance rate maps, was based on historic information. On the way to work, Karl was going downhill. Driving home uphill, the car's range projection was less than 10 miles. The estimate his car made earlier that day made no sense now.

Karl made it home, but barely.

For future trips, Karl has done what every electric or

hybrid car owner does. He mentally devised alternative forecast scenarios.

One of the authors of this piece, Bob Freitag, also has an electric car. Well, sort of. It's an older Honda Insight hybrid. It can get close to 70 miles per gallon if he devises and sticks to a scenario. Unlike Karl, Bob does have a 67-horsepower, one liter gasoline engine. Although the risks are less dramatic, Bob has the same need to develop scenario-based projections for many trips. Bob's car is not as energy efficient, but he has more choices. He can better deal with changing conditions.

For instance, Bob lives in Seattle. His in-laws live on a ranch in Oregon. The best route to the ranch is over the Cascade Mountains. To make 70 miles per gallon he has to deplete all electrical power reserves when reaching the summit. This requires him to continually reevaluate and adjust his scenario as he ascends. If he depletes his charge before getting to the top, his little car chugs up the mountain with its one liter engine, often averaging less than 20 miles per gallon, and suffering the embarrassment of being passed by 18-wheelers. The risks to Karl are much greater, but so are the opportunities. Karl can make well over a 100 miles per gallon equivalent, but he may not reach his destination if he miscalculates.

Establishing the FIRM

So what does this mean for flood insurance rate maps? It means that we have to stop fooling ourselves into believing that our extensive historical data sets allow us to always provide realistic projections of flood risk today, or in the future. FIRMs, not unlike Karl's trips in his electric car, should be based on scenario-based projections that account for changing environments. The greater the potential for change, the less applicable our historic information.

What could possibly change how water spreads over the historic floodplain? Changes in land cover and climate are the most obvious. But there are many more, including agricultural withdrawals, reservoir operations, and stormwater management. To account for these changes, we should base our projections on scenarios driven by the road ahead and not solely on historic information. These scenarios must be watershed based, considering changes in climate, land cover and land use as well as the communities' capabilities to mitigate these changes.

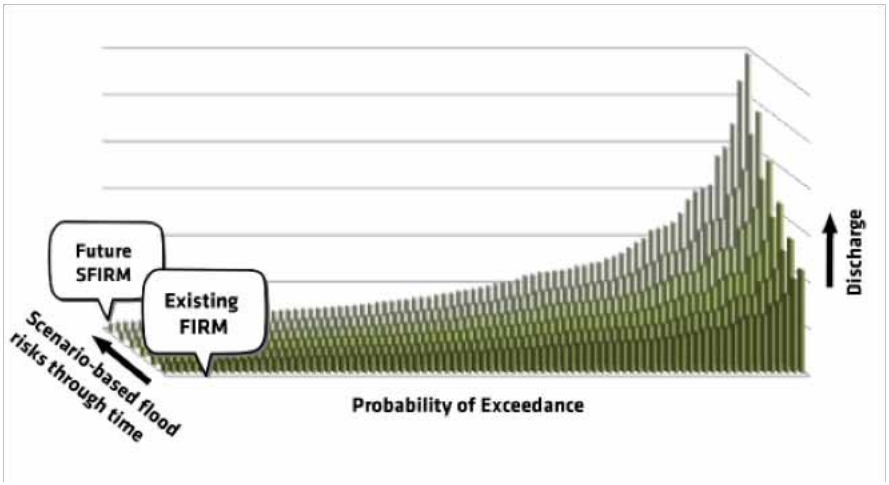


Illustration of varying probability distribution for discharges over time. In this illustration risk is seen to increase through time but that may not always be the case. There are scenarios in which changes in climate, land use, etc.) would reduce flood risk for a given region.

What would scenario-based flood risk maps look like?

Following Karl's lead, we could develop future condition scenario-based flood risk maps (SFRMs) based on an evolving landscape and climate. The SFRM would provide discharge and inundation estimates that could be used for planning, zoning, and building. Many communities have developed and are currently using future conditions maps to guide development and land use decisions.

In the same way that the FIRM is not appropriate to define future risks, the SFRM would not be appropriate to define current risks for setting insurance premiums. However, a SFRM could be used to design one end of a time varying probability distribution for discharges beginning with the current FIRM. (See figure below.)

Using a SFRM as the endpoint, we could develop a distribution of future flood risk beginning with the existing FIRM. The current risk would be determined from the curves illustrating varying discharges beginning with the FIRM and ending with that representing the chosen scenario. The discharge at any point in time for any return frequency could be mapped. This scenario-driven flood insurance rate map (SFIRM) would differ from the current FIRM in that insurance rates would be based on an estimated risk for a given time period. Insurance premiums would change with time as risk estimates change.

Applying existing National Flood Insurance Program (NFIP) principles to the SFIRM would result in structures being built within the SFIRM floodplain, implementing floodplain management construction regulations while not being required to purchase flood insurance at the time of construction. Construction built to be safe from future floods is a key rationale for land use planning. Insurance would still be an incentive by allowing for the purchase of flood insurance at any time.

Leora Waldner, in her 2007 article "Floodplain creep and beyond," suggests an approach for developing a scenario-based risk map. She says the amount of the nation's land considered to be at risk of flooding is growing. So we must reassess how we define floodplains and risk. She mentions four "next generation" issues to be addressed. These represent a starting point for the development of a SFRM. We have added a fifth, climate change:

- expansion of the floodplain resulting from increased impervious surfaces and development;
- the unrestricted development of homes in the 100-year floodplain;
- the possible cumulative riparian effects of widespread cut and fill practices;
- lack of information for prospective homeowners of floodplain-burdened property or property that may be floodplain-burdened in the future; and,
- natural and anthropogenic climate change are influencing flooding patterns in many watersheds.

Waldner's list, with the addition of climate

change, offers a good place to begin our search for how we might create scenario-based risk maps.

Keying off the items offered by Waldner, we can begin defining future flood risk scenarios. With the exception of her "lack of information" variable, which is more of a capability and not easily mapped, we can begin developing scenario-based flood risk maps that incorporate:

- built-out condition along with a continuance of similar patterns of impermeable land use;
- existing patterns of unrestricted development in the floodplain;
- cumulative effects of projected cut and fill practices; and
- climate change impact scenarios, including changes in water storage as ice and snow, sediment mobilization, watershed vegetative succession, and other factors.

These provide the criteria for developing one or more future conditions scenario-based flood risk maps. These maps would be used for planning a community's built environment.

What can communities do to alter their future conditions scenarios?

These future conditions scenarios do not have to be cast in stone. We are influencing our climate, but we could slow the rate of change or even reverse the trend. Communities could adopt "no adverse impact" measures and reduce discharges. Downstream communities could partner with upstream communities to manage the watershed. Transfer of development rights and increased storage could be options within the watershed.

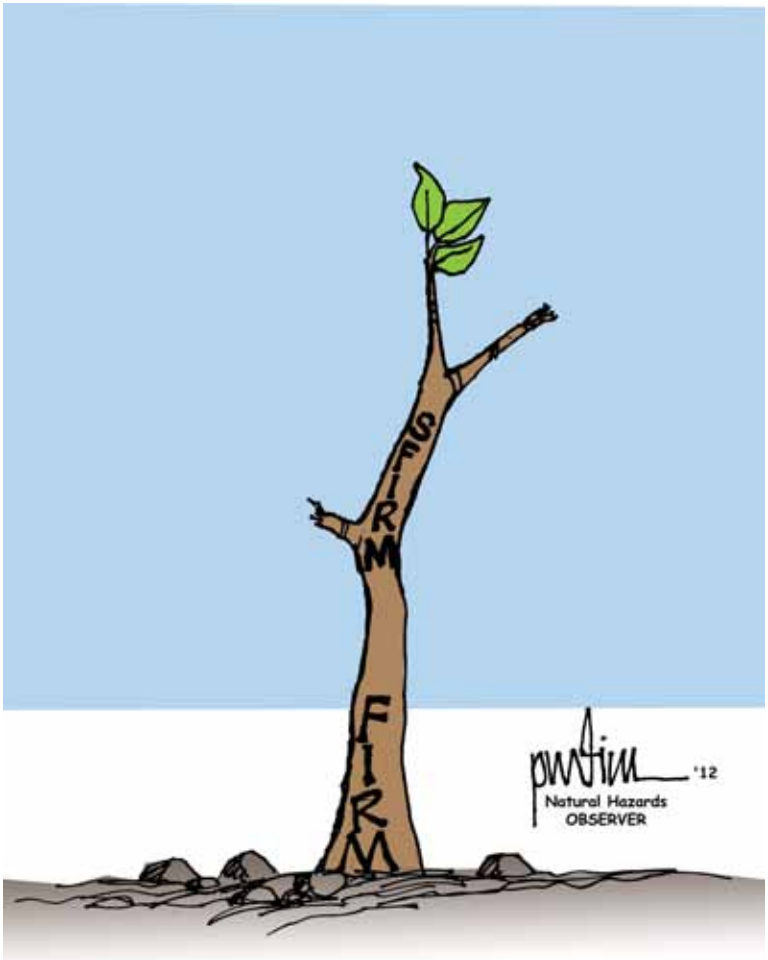
With action, communities can change their risk. Looking at the five variables as examples of a set of opportunities, communities could reduce their risk and their insurance premiums by:

- increasing permeability with low impact development practices, off channel storage, forest land expansion (reduces flood flows);
- restricting development in the floodplain, especially restricting elevating on fill (reduces at risk development);
- expanding riparian areas, increasing storage and connecting floodplains with river corridors (reduces at-risk development and increased flood flows);
- providing actionable information to prospective homeowners of flood-burdened property or property that may be flood-burdened in the future; and
- instituting adaptive climate change measures.

This approach follows the lead of the NFIP Community Rating System. The CRS goals of reducing flood losses and providing better flood hazard management are enhanced when CRS communities adopt the SFIRM approach to mapping their hazard and then developing mitigation strategies. A scenario-based approach to mapping, regulation, and watershed management provides floodplain managers the opportunity to enact flood adaptation and mitigation strategies based on future conditions.

Just as we have the technical knowledge to build an electric car, we can produce flood risk and insurance maps that recognize and help plan for future conditions. In the same vein, it will take a significant shift as we move from flood risk estimation based on the historical record to a more dynamic scenario-based system that takes into account the many non-stationary variables at play in each watershed.

Karl's car and his approach to driving with risk, provides a model for producing better scenario-basd flood risk maps and scenario-based flood insurance rate maps.



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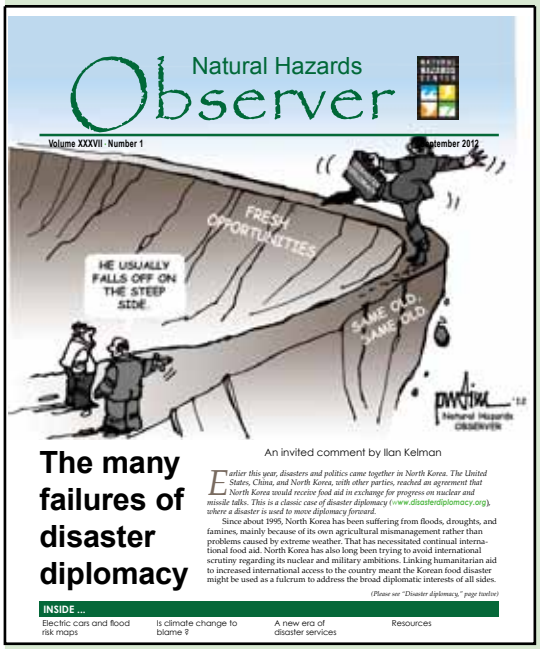

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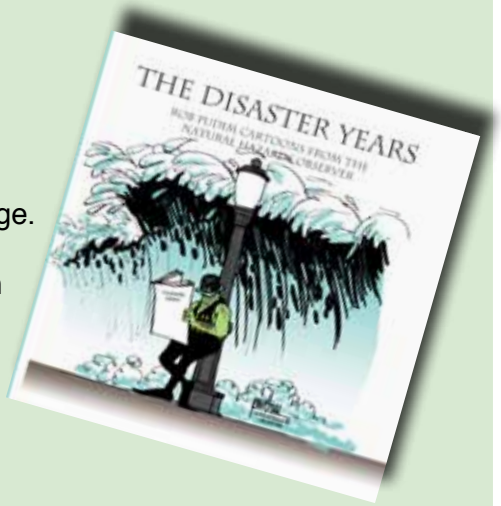

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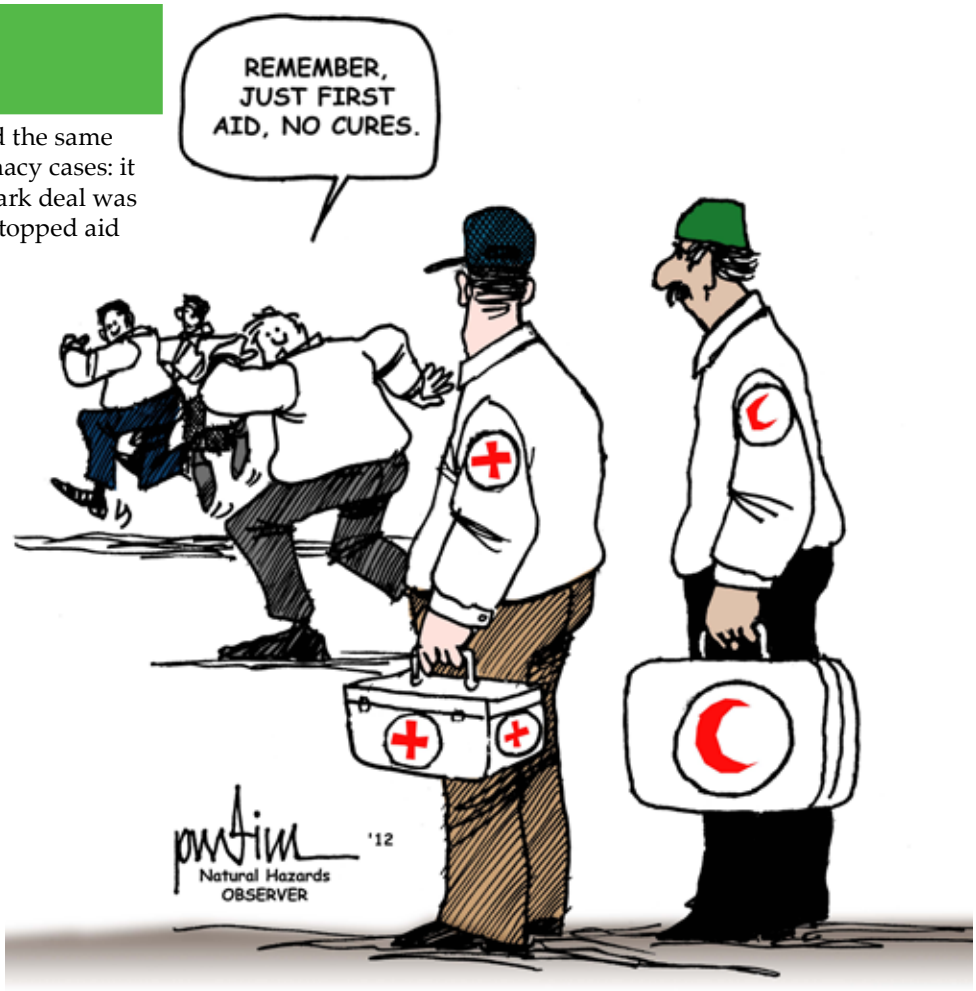
Disaster diplomacy ...

(Continued from page one)

As a case study, these events followed the same pattern as dozens of other disaster diplomacy cases: it was a failure. One month after the landmark deal was hailed in February, the U.S. government stopped aid to North Korea because of a Korean missile test (which also failed). Even China was irate at North Korea's actions.

The situation is not unprecedented. Several times since 1995, North Korea has signed a deal for food aid, even receiving some, in exchange for military and access concessions. Soon afterwards, North Korea reneged on the deal. Aid stopped. North Korea represents a typical disaster diplomacy failure, following the pattern of most published case studies.

Disasters, it seems, do not usually provide a window to address long-term international concerns.



Disaster Diplomacy

The study of disaster diplomacy investigates how and why disaster-related activities do—and do not—influence conflict and cooperation. The key phrase is "disaster-related activities." These cover predisaster efforts including prevention, preparedness, planning, and mitigation. They are also concerned with postdisaster actions, including response, reconstruction, and recovery. Disaster diplomacy case studies are not just about what happens when an volcano erupts in a war zone or about humanitarian aid from enemies. Questions for predisaster diplomacy include whether or not, for instance, warning systems can lead to further cooperation. Or do vaccination programs lead to temporary—but not permanent—cease fires.

All evidence so far suggests that while disaster-related activities do not create fresh diplomatic opportunities, they sometimes catalyze action. Such catalysis occurs only in the short term, not in the long term. In the short term—on the order of weeks and months—disaster-related activities can, but do not always, impact diplomacy. They influence it, they spur it on, as long as a pre-existing basis existed for that influence. The pre-existing basis might be culture or trade links or secret negotiations.

On December 26, 2004, tsunamis raced across the Indian Ocean, with Sri Lanka and the Indonesian province of Aceh the two hardest hit areas. Both locations lost tens of thousands of people. Each had a long-running conflict which had become particularly violent over the previous 30 years. In Aceh, a peace deal was reached a few months after the tsunami. So far it has held. In Sri Lanka, the humanitarian emergency and international aid exacerbated the conflict. Within a few years, Sri Lanka's military won the war.

Did the tsunami create the peace deal in Aceh? No. Secret negotiations had started just two days before the tsunami. Those negotiations formed the basis for the peace deal. Did the tsunami influence the peace deal? Yes. The devastation provided a space in which peace negotiations could be successful, if both parties wanted it. Other factors had to be in play.

In October 2004, Indonesia elected a new president, Susilo Bambang Yudhoyono, whose vice-president, Jusuf Kalla, had held negotiations in Aceh beforehand and who was committed to peace. Meanwhile, the fighters in Aceh were in military difficulty before the tsunami, providing them with an incentive to negotiate. Both parties had non-tsunami reasons for achieving peace. They were able to use the tsunami as one of several excuses to make peace work. The tsunami provided the opportunity. But it was not the cause of the settlement.

The importance of these long-term influences over shorter-term, disaster-related ones is reinforced by the less peaceful results in Sri Lanka. One rebel commander was facing corruption charges, so had an incentive to keep the fighting going. Many Sri Lankans opposed involving the main rebels in humanitarian aid. Months after the tsunami, Sri Lanka elected a pro-war, anti-negotiation president. The main parties involved had non-tsunami reasons for keeping the violent conflict going, so they were able to use the tsunami as one of several excuses to make peace fail.

The catalytic effect of disaster-related activities seems to work only in the short-term. Over the long term, non-disaster factors take over. Examples are a leadership change, distrust, belief that an historical conflict or grievance should take precedence over present-day humanitarian needs, or priorities for action other than conflict resolution and diplomatic dividends.

In 2001, approximately 20,000 people were killed when an earthquake struck Gujarat, India. The de facto leader of Paki-

stan at the time, General Pervez Musharraf, offered aid. The direct consequence was an India-Pakistan summit six months later in New Delhi bringing the leaders of the two countries together to talk peace. The agreement to meet represented successful disaster diplomacy.

But the complete aepisode represented a clear disaster diplomacy failure. A final declaration from the summit could not be agreed upon, so it fell apart, accompanied by public insults. The countries had simply moved too quickly, generating too high expectations which could not be fulfilled. Within a year, India-Pakistan relations were worse than they had been. Commentators feared a regional nuclear war. Then, relations improved, because both parties wanted it, with trade a major factor.

By the time the 2005 earthquake hit the disputed area of Kashmir, killing more than 70,000 people, the two countries had already started cautious cooperation over Kashmir. Both countries then downplayed disaster diplomacy from the Kashmir earthquake. Consequently, the 2005 disaster had limited influence on India-Pakistan relations—because neither side wanted that to happen. Instead, they preferred their slow, cautious, long-term diplomacy. Progress has continued unruffled by short-term events including major terrorist attacks, such as the scores killed during the 11 July 2006 train bombings in Mumbai, despite changes in leadership and ongoing regional geopolitics, in comparison to the 2001 failure.

Some say that film diplomacy, through Bollywood bringing together Indians and Pakistanis, has done more to generate goodwill than anything else. Others point towards the 2010 marriage of Pakistan's former cricket captain Shoaib Malik to India's tennis star Sania Mirza as being the most solid link of India-Pakistan friendship. Sports diplomacy and film diplomacy seem to be more effective than disaster diplomacy.

The overall conclusion from disaster diplomacy research so far is that disaster diplomacy sometimes, but not always, works in the short-term—if the parties involved have non-disaster reasons for collaborating. In the long-term, non-disaster factors supersede the influence of disaster-related activities. This result holds beyond international politics—that is, beyond diplomacy at the bilateral or multilateral level—and also beyond modern instances. Although this article focuses on recent, international cases, there are many local examples and many historical examples where the same conclusions emerge.

Explaining disaster diplomacy's failure

Why does disaster diplomacy fail? Mainly because people make active choices regarding politics leading to active choices against diplomacy or against enacting disaster-related activities, either before or after a disaster. Reconciliation is not necessarily an important objective, despite the potential for joint life-saving actions.

Cuba and the United States face a similar hurricane threat—often the same hurricane. Plenty of scientific and technical cooperation occurs without the politicians knowing about it, such as researching and monitoring hurricanes. When Cuba is hit by a hurricane, the U.S. government frequently offers aid and the Cuban government is impressively clever at finding excuses to avoid accepting it.

When the United States was slammed by Hurricane Katrina in 2005, Cuba's government offered more than 1,000 doctors and several tons of medical supplies. The U.S. government initially did not acknowledge the offer. Nonetheless, led by Fidel Castro, Cuba's parliament held a minute's silence for Hurricane Katrina's victims. Immediately afterwards, they passed a resolution attacking the U.S. government on other topics.

In the case of Cuba and the United States, mutual enmity has bolstered the power base of Cuban leader Fidel Castro. It also bolsters the power base of many U.S. anti-Castro politicians. During the disputed U.S. presidential election of 2000, in which George W. Bush was eventually declared to be the winner, Florida was the deciding state. Florida remains a key swing state and is heavily influenced by Cuban-Americans

who have strong anti-Castro feelings.

Similarly, inertial prejudice, misgivings, and mistrust can overcome disaster diplomacy efforts. On December 26, 2003, an earthquake flattened the World Heritage city of Bam, Iran, killing 25,000 people. Iran categorically stated it would accept aid from any country except for Israel. The disaster could not overcome Iran's bias. American aid, however, was accepted and led to suggestions that Iran-U.S. disaster diplomacy might result.

Media hype and lack of political forethought derailed the good intentions. The U.S. State Department's position vis-à-vis Iran had not actually changed, even though the press presented it as being an opening to rapprochement. The United States then tried to send a high-profile emissary with aid supplies to Iran. But it appears that the Americans did not clear that gambit with the Iranian government beforehand. Iran declined, squashing any hope for a diplomatic success in the wake of the disaster.

Simultaneously, anti-American Iranians in Iran's government were looking towards their elections in February 2004 while the White House, trying hard to demonstrate its strength in national security, was looking towards to U.S. elections in November 2004. Each side could use an "enemy" to bolster their perceived strength with the electorate. Neither side wanted to be seen as giving concessions to the image of the enemy that they had helped to create.

Disaster diplomacy's failure can thus be quite insidious, actually harming attempts to reach a peaceful resolution. Iran's desire to keep disaster diplomacy off the agenda meant high level connections between Iran and the United States faltered. Furthermore, that attitude can make it difficult to deal with the disasters themselves.

With lingering memories of the failed 2003 earthquake diplomacy, Iran declined American aid following the February 2005 earthquake which killed hundreds. Iran said the country could handle the disaster domestically, even though aid was accepted from Algeria, Australia, China, Japan, the United Arab Emirates, and several international organizations. Disaster diplomacy became a specter to avoid at all costs—even at the cost of humanitarian aid.

The fundamental conclusion from disaster diplomacy is that saving lives is not necessarily important for political decision making. That is not an innovative or surprising result.

The fundamental conclusion from disaster diplomacy is that saving lives is not necessarily important for political decision making. That is not an innovative or surprising result. Instead, that is a fundamental basis for politics.

Is there hope for disaster diplomacy?

Given this evidence and analysis, is there any hope for disaster diplomacy? In one ethical system, extensively debated but followed by many humanitarian relief agencies including the International Federation of Red Cross and Red Crescent Societies, disaster-related activities must be conducted neutrally and impartially, irrespective of political distractions such as diplomatic disagreements. Many political systems do not accept that ethical standard, instead wishing to link humanitarian aid and politics.

The debate leads to the question: Should disaster-related activities be deliberately used to induce or force cooperation amongst adversarial states? Those involved offer both possible responses:

- No. Extensive effort occurs to divorce disasters from politics, such as through neutrality and impartiality. New mechanisms for relating disasters and politics are not needed. Instead, encouraging further separation is preferable.
- Yes. Disasters are inherently political and it is naïve to think otherwise. The more positive outcomes from disaster-related activities which could be fostered, the better. Such outcomes should be actively pursued.

Given these disparate opinions converging on the answer "it depends," why does disaster diplomacy enjoy such a high profile, especially in the media after a major catastrophe?

The media and humanitarian organizations tried to push drought diplomacy during the Eritrea-Ethiopia war from 2000-2002. They failed when both governments came up with innovative excuses for why they did not wish to engage in any form of drought diplomacy with their enemy—or even any form of diplomacy. They both wanted the war.

Alternatively, popular desire can overcome high-level diplomatic hesitancy. From the 1950s to the 1990s, Greece and Turkey were not friendly. Within three weeks in 1999, earthquakes hit both Turkey and Greece, leading each country to give extensive support to the other. That led to a media and grassroots frenzy to put aside historical grievances and to join hands across the border and show the world that the phoenix of friendship was rising from the rubble.

The Greek and Turkish governments had actually been moving towards reconciliation since around 1996. The Kosovo war earlier in 1999 had pushed that agenda forward. The diplomats were moving carefully and slowly. They were caught off guard by the populist demands and it nearly derailed the rapprochement process. Fortunately, both countries were able to look beyond disaster diplomacy and to stay together on their slow diplomatic track, which continues to yield dividends.

Nonetheless, events can overtake the desires of diplomats and politicians, as seen by Hurricane Katrina. Judging by the U.S. government's initially contradictory and inadequate response to foreign aid offers, it did not seem to have occurred to American leaders that the United States would ever need external postdisaster assistance or that foreign countries would ever proffer it.

In analyzing Hurricane Katrina disaster diplomacy, no direct malevolence emerged in the State Department's initial refusal to acknowledge offers of assistance from Cuba, Iran, and Venezuela. Instead, it just seemed as if the government did not know how to react. In contrast, New Zealand's post-disaster law the National Civil Defence Emergency Management Plan from 2005 includes a section on receiving postdisaster international aid. Through specific decision making, New Zealand had decided in advance how to deal with such a situation whereas the United States had not.

Is disaster diplomacy a choice?

Such choices provide some level of control over whether or not disaster diplomacy can succeed. Post-tsunami Aceh is

a straightforward example where the parties involved were already seeking a post-conflict Aceh as well. We can never know whether or not peace would have been reached without the tsunami catastrophe.

Both disasters and diplomacy are complex to analyze in research and are complex to deal with in reality. A set of initial disaster and diplomacy conditions does not necessarily prescribe an exact disaster diplomacy trajectory or outcome, especially among the myriad of factors in the minefield of inter-state relations. Aside from trade diplomacy, sports diplomacy, and cultural diplomacy, personal interests can make a difference. When the outgoing Japanese Prime Minister Junichiro Koizumi visited the United States in 2006, he had a wonderful time touring Elvis Presley sites with President George W. Bush—what became known as "Elvis Diplomacy".

Whether in the pursuit of disaster-related objectives or other goals, new diplomacy tends to happen only if it is actively supported, aimed for, or lobbied for by people or organizations, including political leaders, the media, popular will, or non-political heavyweights. Disaster diplomacy and other forms can be either adopted or avoided by choice.

That introduces many unknowns. Individual friendships were forged in Bam, Iran between American rescuers and earthquake-affected Iranians. The people were able to look beyond their countries' political machinations and upcoming elections. If one of those rescuers or survivors (or a relative) becomes a leader or diplomat during times of troubled U.S.-Iran relations, could disaster diplomacy emerge years after the connection was forged? Or would such a leader or diplomat aim for reconciliation anyway, because that is their personality? The earthquake simply becomes an excuse for doing what they would wish to do regarding politics and diplomacy.

Does "public diplomacy" in relation to disaster-related activities have long-term, non-measurable, non-monitorable impacts? Could the longitudinal data that are most needed for testing disaster diplomacy outcomes be uncollectable?

Disaster diplomacy outcomes are never certain. Advocates or opponents of disaster diplomacy may be ignored by power brokers. Leaders attempting disaster diplomacy run the risk of being rebuffed and embarrassed by the other side. Wanting and trying for disaster diplomacy has been a significant factor in its failure by raising expectations which cannot be met immediately, leading to disillusionment, impatience, and ammunition for contrarians. It can also distract from the long-standing root causes of enmity and the long-standing root causes of vulnerability and disaster.

Disaster diplomacy is an attempted quick fix to solve all disaster and diplomacy problems. Quick fixes for fundamental human conditions rarely succeed. Instead, long-term measures are needed.

Nonetheless, a fundamental tenet in research is that "absence of evidence is not evidence of absence." Disaster diplomacy case studies so far yield an absence of evidence for disaster diplomacy's success. That cannot rule out future studies identifying a successful example of new diplomacy based on only disaster-related activities, either from history or in the future.

The option will always exist to actively pursue disaster diplomacy, irrespective of the drawbacks and the chances for failure, rather than passively sitting back and watching. Pathways to disaster diplomacy are often ready and waiting to be actively chosen.

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Resources

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

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

WEATHER

Great British Weather Disasters. By Philip Eden. 2008. ISBN: 978-1-4411-4591-8. 360 pp. $18.62 (softcover). **Continuum Books**. www.continuumbooks.com.

If you follow the polls about people's opinions regarding climate change, you can't help but notice that they closely track the weather. If there's been a protracted heat wave, heavy snow, or thunderous downpours, people tend to ratchet up their conviction that climate change is happening and may be responsible for the anomalous events.

If, on the other hand, the weather is behaving itself, the populace tends to lose interest. They're likely to worry less about global warming.

Philip Eden's exploration of British weather disasters offers an explanation for this phenomenon—short memories. "How much do people remember of past weather events? Not a lot, it seems," he writes. Eden found that people remember a major weather disaster for about 18 months. "Once a weather phenomenon has reached two years old it seems to fall out of the human memory bank. Weather, therefore, has to be truly exceptional before it sticks in the mind."

Early in the book, Eden cites a study that asked 50 Brits whether they remembered 12 significant weather events—two of them bogus (i.e., they never occurred). As many as 10 percent remembered events which never occurred, a phenomenon perhaps best passed over without comment. Maybe it's

the cuisine.

But only 13 percent of those questioned remembered a genuine disaster, the 1990 Burns Day storm. Violent gales with winds in excess of 100 miles per hour swept all of England and Wales, killing 48 people. The total remembering this storm is only slightly higher than those remembering a storm that never happened. Eden calls it "the great forgotten disaster of recent decades."

People's inability to retain memories of these weather phenomenon—perhaps simply because they are so commonplace—might explain fluctuating public opinions about global warming.

Eden, the weather correspondent of Britain's *Daily Telegraph* and *Sunday Telegraph*, has produced an entertaining, well-researched, and well-written account of weather anomalies on the scepter'd isle. For the Sherlock Holmes fans among us, chapter five explaining the deadly fog and smog in London history is worth the purchase price.

CLIMATE

The Great Global Warming Blunder: How Mother Nature Fooled the World's Top Climate Scientists. By Roy W. Spencer. 2010. ISBN: 978-1-59403-373-5. 180 pp., $23.95 (hardcover). **Encounter Books**. www.encounterbooks.com.

In 2009 surveys, 82 percent of scientists polled answered "yes" when asked whether "human activity has been a significant factor in changing global mean temperatures." Roy Spencer, a research scientist at the University of Alabama at Huntsville and an expert in remote satellite sensing, is among the 18 percent who answered "no." A long-time skeptic of the seriousness of climate change, Spencer's book fires another volley into the climate science fortress.

In the early 2000s, Spencer and colleagues at UAH could provide virtually the only scientific evidence in opposition to the emerging global warming consensus. Based on their work with satellite remote temperature sensing, they found that parts of the atmosphere were not warming at the rates expected by climate models and were significantly out of sync with land-based temperature measurements. While many climate scientists at the time tried to minimize Spencer's findings, it was a serious hole in the global warming argument.

In the middle of the decade, however, adjustments to the data set eventually brought the UAH data into line with the consensus. Now the satellites also show the atmosphere warming in lockstep with the ground-based measurements. The last serious scientific objection to the warming hypothesis was overcome.

One would think this would convince the "climate skeptics." But no, the counter-arguments shifted to other grounds: global warming might be good for you; it's a natural cycle; the sun did it; and so on.

If global warming is good for you, then there is no need to change the way we use fossil fuels. The crux of the issue—or one crux of the issue at least—is whether you believe the disruption from developing new energy systems will be worse than the disruption from the altered climate. If you're an oil company, the answer is pretty clearly, "Yes." For the rest of us though, the issue is not cut and dried.

Either way, the world's poor are likely to feel the most impact. Poor countries have contributed almost nothing to global carbon dioxide emissions, but are expected to shoulder much of the burden of the changing climate. Spencer argues that the reverse is the case as well. Changing the energy mix will hurt the poor, he says. "While relatively wealthy and environmentally conscious Westerners can deal with the higher food prices that result from diverting some of our food supply into liquid fuels, green energy policies will push many of the world's poor who are already malnourished into starvation. Many Westerners are able to absorb the extra costs of CO_2 regulation that must inevitably be passed on to the consumer, but the war on global warming will increasingly become a war on the poor."

Spencer's scientific arguments against global climate change are now centered on the role of clouds as the culprit in climate change. This is a very complex issue, which climate scientists have been attempting to incorporate into their models for decades, without too much success. As Spencer himself says, "To be fair, the IPCC's failure to investigate natural, internal mechanisms of climate change more thoroughly is partly the result of not having very much data to investigate. To actually prove that Mother Nature has caused global warming, one would need many decades of highly accurate satellite measurements of the entire Earth."

Clouds probably contribute to both warming the planet—by trapping heat between the surface and the cloud layer, a little like a blanket—and cooling it by reflecting sunlight back into space. Whether the net effect is cooling or warming, no one can say yet. Nor can anyone say whether the pattern and volume of cloud formation has changed.

The evidence for human-induced global climate change has become overwhelming. Spencer's book is surely not the last word from climate change skeptics, but the arguments repeated here sound lamer and lamer as time goes on.

Adapting to a Changing Environment: Confronting the Consequences of Climate Change. By Tim R. McClanahan and Joshua E. Cinner. 2011. ISBN: 978-0-19-975448-9. 208 pp., (hardcover). **Oxford University Press**. ukcatalogue.oup.com.

While this book has the magic words "climate change" in its subtitle, many of the issues it addresses would be critical even if global temperatures were static or cooling. McClanahan and Cinner focus "on the local and regional impacts of climate change to coastal ecosystems and societies." But many questions they tackle—overfishing, poverty, the environmental impacts of aquaculture—would remain even if global warming was removed from the equation.

Their concern and thorough research of these issues is the strength of their book. The global market for fish and fish products has increased 55 percent between 2000 and 2006 to $86.4 billion, which is larger than any other "renewable export commodity." Coffee, for instance, has a total export value of about one-seventh that of fisheries.

"The majority of this growth in the seafood trade is coming from fisheries in developing countries, and Africa is becoming increasingly central in this growth trend," they write. "Fisheries play a huge role in employment, trade, and economics. It is estimated that 120 million people are dependent on fisheries for some part of their household incomes, with 35 million of these people in Africa.

The book spends a chapter exploring the vulnerability of coastal communities in the western Indian Ocean to climate disturbances and fishery management options. "Of the 15 countries with the highest vulnerability of fisheries to climate change," they write, "13 or 14 were in Africa, depending on the severity of the climate change scenario used."

"Examining key components of social vulnerability to

changes in the flow of goods and services revealed that there is considerable spatial variability in how [western Indian Ocean] societies will be affected by, cope, or take advantage of opportunities provided by climate change," they write.

Adapting to a Changing Environment also has a thorough primer on international agreements and customs that govern fisheries management. The book explores the impacts of the globalization of the industry.

The Rising Sea. By Orrin Pilkey and Rob Young. 2011. ISBN: 978-1-610-91004-0. 272 pp., $22.95 (softcover). **Island Press**. islandpress.org.

The world's glaciers are retreating. The Greenland ice sheet is melting. The oceans are expanding in the heat. Sea level is rising to swamp the low-lying coasts. Maybe someone should make a movie.

Oh, wait, someone already did. *The Day After Tomorrow*, released in 2004, gave a sci-fi view of the worst possible results of climate change and sea-level rise.

Pilkey and Young don't sink to cinematic levels, of course. Theirs is a sober and scientific look at the issue. Sea-level rise is a gradual phenomenon, but one which seems to be coming on faster than most people had thought likely. Only a few years ago, no one thought the Greenland ice cap was at risk. But recent developments have called that assumption into question. NASA found that by July 12, 2012, 97 percent of the surface ice sheet in Greenland had melted. In a typical July, only about 40 percent of the sheet undergoes thawing at or near the surface. "Researchers have not yet determined whether this extensive melt event will affect the overall volume of ice loss this summer and contribute to sea level rise," NASA said in a **release** (www.nasa.gov/topics/earth/features/greenland-melt.html).

Son Nghiem of NASA's Jet Propulsion Laboratory in Pasadena, Calif., was analyzing radar data from the Indian Space Research Organisation's Oceansat-2 satellite when he noticed that most of Greenland appeared to have undergone surface melting on July 12. Nghiem said, "This was so extraordinary that at first I questioned the result: was this real or was it due to a data error?"

NASA reports, "Melt maps … showed that on July 8, about 40 percent of the ice sheet's surface had melted. By July 12, 97 percent had melted."

The Rising Sea tackles the issues head on. It offers the hard choices that will reduce the ultimate impacts of the climate-induced disaster—uprooting citizens, changing where building occurs, coordinating response, and so on. The history of global floodplain management does not inspire a lot of optimism that these measures will actually be instituted, but this book provides a strong case for them.

WATER

Water and the City: Risk, Resilience and Planning for a Sustainable Future. By Iain White. 2010. ISBN: 978-0-415-55333-9. 210 pp., $53.95 (softcover). **Routledge**. www.routledge.com.

Water is a complex topic. "In developed nations," writes White early in this book, "it is easy to forget how vital the effective management of water is to humanity's survival; we both need continual availability and protection from its potentially devastating impacts."

Part of this book is dedicated to the changing attitude toward technological solutions to flood control. The reluctance to rely too heavily on engineering solutions to floods has been a rapidly evolving phenomenon, primarily since Hurricane Katrina, at least in the United States. In Great Britain, the changing ethos has been recognized "in the pragmatic tenor of recent policy documents' titles whereby … the message is that we should 'learn to live with rivers,' 'live with the risk,' and 'make space for water.'"

The non-engineering solutions, White writes, depend on planning. He cites a 2007 UN-Habitat report: "Land use planning is perhaps the most fundamental tool for mainstreaming disaster risk reduction into urban development processes."

White travels a long road through water management history, use, consumption, planning, and technology. He concentrates mostly on Europe and North America. One of the strong points of his book is that he does not feel it necessary to look too far into the future to achieve benefits from the effective management of water resources in the context of cities.

"The problem is not necessarily a classical environmental trade-off between the welfare of present or future generations, as the climate change or sustainability arguments are frequently posited. Rather, the issue is about improving the well-being and success of people now, those relying on the success of the city in ten years time, and those in the more distant future."

Climate Change and its Effects on Water Resources. Alper Baba, et al. eds. 2011. ISBN: 978-94-007-1142-6. 318 pp., $210.30 (hardcover). **Springer**. www.springer.com.

This book focuses on the water management, quality, and supply issues of Eastern Europe and the eastern and southern Mediterranean, though it's lessons might be relevant to many emerging nations. The early chapters focus on resilience, especially on mathematical definitions of that state. The authors admit, however, "Currently the mathematics of resilience thinking is at its infancy."

The authors find—along with many other books on this topic—that absolute water availability is not the problem. Rather it is the distribution of water resources, especially as it is entangled with the other problems of poverty and development. Concluding that a water supply of less than 500 cubic meters annually constitutes "absolute scarcity," the authors find that only six countries fall into this category—Kuwait (30 m^3/person); United Arab Emirates (174 m^3/person); Libya (275 m^3/person); Saudi Arabia (325 m^3/person); Jordan (381 m^3/person); and Singapore (471 m^3/person).

This book can be described as largely descriptive rather than prescriptive. Given the uncertain nature of the impacts of climate change, this is a prudent, if conservative, approach. *Climate Change and its Effects on Water Resources* is a volume in the series Issues of National and Global Security from the NATO Science for Peace and Security Series C—Environmental Security.

FOR KIDS

Safari's Encounter with Coastal and Marine Hazards. Karen Coetzee, editor. 24 pp., free. **UNISDR Africa Educational Series**. www.unisdr.org/we/inform/publications/26439.

A kid-friendly explanation of tsunamis, drought, and disaster in general, the story is told through the eyes of a family living on Kenya's coast. The vocabulary in the book can be technical, appropriate for older children. It includes a quiz at the end to test the reader. There are clear and informative illustrations of the chief weather patterns that affect Africa.

Contracts and Grants

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

I-Corps: An Advanced Methodology for Evaluating Fire Suppression System Performance. National Science Foundation grant #1249267. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1249267. Five months. $50,000 to principal investigator Andre Marshall, University of Maryland College Park, awmarsh@umd.edu.

Cutting edge spray characterization research conducted at the University of Maryland has deepened the current state of understanding of fire sprinkler spray generation. This research and insight has been extended to the fire sprinkler system design process resulting in a potentially disruptive design tool. The design tool is based on advanced measurements of sprinkler sprays developed over the past ten years of research in this area. This fire sprinkler spray research has demonstrated that laser based Shadowgraphy/PTV measurement techniques paired with a basis function data compression approach effectively characterizes the complex stochastic behavior of sprinkler sprays. This efficient approach provides a compact, computationally inexpensive, physics-based representation of the sprinkler spray not before possible. This high-fidelity sprinkler spray description is well suited for use in the proposed computer based simulation. A device database for commercially available fire sprinklers will be created using this methodology and included into the software package allowing the user to conveniently assess various types of sprinklers for the modern fire suppression system design challenge of interest without needing to know the details of the complex spray physics.

The proposed approach combines innovative laser-based diagnostics; analytical methods; modern software tools; and novel engineering practices all bundled into a cutting-edge engineering design product. This fire sprinkler performance based design tool offers an innovative computational approach, which addresses the shortcomings of the prescriptive design method. The design tool provides a powerful and convenient design loop facilitating unprecedented system optimization. The visual representation of the sprinkler wetting performance allows users to evaluate the performance of sprinkler systems in protecting standard and unconventional spaces, within the context of NFPA code compliance.

Subduction Zone Coupling and Strain Partitioning in the Philippine Plate Boundary Zone. National Science Foundation grant #1215658. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1215658. Two years. $99,872 to principal investigators Michael Hamburg, and Kaj Johnson, Indiana University, hamburg@indiana.edu.

This pilot research project seeks to examine active tectonic processes in a complex, subduction-dominated plate boundary zone in the Philippines island arc through analysis of the surface deformation field using high-precision GPS measurements. The project takes advantage of a newly available suite of data from a 240-station network of continuous and campaign GPS sites in the Philippine plate boundary zone, collected by the Philippine Institute of Volcanology and Seismology (PHIVOLCS), together with international collaborators. The project builds on a successful research collaboration between Indiana University, PHIVOLCS, and two research institutes in Taiwan. The work will focus on: (1) improvement of regional plate motion and intraplate deformation models for the Philippine island arc; (2) evaluation of strain partitioning between subduction-related compression and intra-arc shear deformation in Luzon, including assessment of post-seismic transient effects associated with the 1990 Luzon earthquake; and (3) assessment of spatially variable subduction zone coupling along the Manila and Philippine trenches and its impact on earthquake potential.

Tasks include: (1) extending kinematic modeling of elastic block interaction to include the entire Philippine archipelago; (2) developing 3-D deforming block models of fault-related deformation at the Philippine Fault and interaction with subduction boundaries; and (3) examining spatially variable coupling along the Manila and Philippine subduction zones through dynamic modeling of subduction-zone creeping and locked segments. The expected models of plate boundary earthquake potential can be used as input for ground-motion and tsunami-generation models.

Deciphering the Tectonic History of the Transantarctic Mountains and the Wilkes Subglacial Basin. National Science Foundation grant #1148982. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1148982. Five years. $714,584 to principal investigator Samantha Hansen, University of Alabama Tuscaloosa, shansen@geo.ua.edu.

To understand Antarctica's geodynamic development, the origin of the Transantarctic Mountains (TAMs) and the Wilkes Subglacial Basin (WSB) must be determined. Current constraints on the crustal thickness and seismic velocity structure beneath the TAMs and the WSB are limited, leading to uncertainties over competing geologic models that have been suggested to explain their formation.

This project broadens the investigation of this region with a new seismic deployment, the Transantarctic Mountains Northern Network (TAMNNET), a 15-station array across the northern TAMs and the WSB that will fill a major gap in seismic coverage. Data from TAMNNET will be combined with that from other previous and ongoing seismic initiatives and will be analyzed using proven modeling techniques to generate a detailed image of the seismic structure beneath the TAMs and the WSB.

The data will test three fundamental hypotheses: the TAMs are underlain by thickened crust; the WSB is characterized by thin crust and thick sedimentary layers; and slow seismic velocities are prevalent along strike beneath the TAMs.

Results will provide new information about the nature and formation of the Antarctic continent and will help to advance our understanding of important global processes, such as mountain building and basin formation.

ABR: Multiscale Dynamics in Explosive Volcanic Eruptions. National Science Foundation grants #1144585

and 1144198. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1144585. Three years. Two grants. $65,006 to principal investigator Josef Dufek, Georgia Tech Research Corporation, dufek@gatech.edu, and $179,998 to principal investigator Michael Manga, University of California-Berkeley, manga@seismo.berkeley.edu.

Explosive volcanic eruptions are some of the most energetic granular flows on the planet, the largest of which can have global impact. Even the more common, smaller, events encompass scales of several kilometers. However, mass and energy transfer in these flows are fundamentally controlled by processes at much smaller spatial and temporal scales, where individual particles interact with each other, with gas, or with the surface over which the flows travel.

Our past work on steam explosions, ash production, and heat transfer have shown that subgrid models developed from experiments can be coupled to large-scale numerical simulations. These subgrid relations are critical for predicting the dynamics reflected in volcanic deposits and in ash dispersal patterns; models that neglect subgrid processes can fail to produce the energy transfer manifest in volcanic deposits by several orders of magnitude.

The investigators will examine a suite of particle-scale mass and energy transfer mechanisms in the laboratory with the aim of understanding the physics of these processes and to incorporate them into large-scale simulations of explosive volcanic eruptions.

This project will support an ongoing effort in predictive computational volcanology. Specifically they team will focus on: (1) heat transfer between particles and gas at high Reynolds numbers and using clast cooling proxies to examine entrainment in pyroclastic density currents; (2) particle deposition and resuspension, including the role of particle impacts in generating depositional features; (3) large-scale experiments of gas-particle density driven flows; and (4) and the production of fine ash particles in the conduit and in pyroclastic density currents.

Temporal Variations in the Seismogenic Zone, Cook Inlet, Alaska. National Science Foundation grant #1215933. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1215933. Three years. $102,026 to principal investigator Jeffrey Freymueller, University of Alaska Fairbanks Campus, jeff@giseis.alaska.edu.

Over the last decade we have observed a variety of transient slow slip events, episodes of slip on a fault that are very slow compared to the slip that generates earthquakes, but significantly faster than tectonic plate motions and steady fault creep. Recently, the investigators of this study have detected a transient event that appears to be the opposite of a slow slip event: a "locking event" in which a section of a fault that had been creeping stopped for a few years, and then began creeping again. Or perhaps it represented the end of one slow event and the start of another.

It appears that the behavior of the down-dip end of the seismogenic zone at subduction zones is more dynamic and subject to change than previously thought. The researchers will determine more precisely what part of the subduction plate interface changed its behavior, or whether some other explanation is required to explain the observations. We will then determine whether these changes were led by, accompanied by, or followed by changes in tectonic tremor or seismicity patterns, and evaluate the stress changes acting on and caused by slip on the subduction megathrust. Specifically, we will measure the extent and magnitude of velocity changes, by augmenting the PBO data with repeat surveys of campaign GPS sites surveyed from the 1990s to mid-2000s, construct source models to relate the observed changes to changes in the slip distribution on the plate interface, evaluate stress and stressing changes and seismicity rate changes, to evaluate possible causes and effects of the changes, and explore the implications of this discovery for earthquake hazard assessments.

Most of the largest earthquakes occur at subduction zones, where one of Earth's tectonic plates is being thrust beneath another. Earthquakes occur in the shallow part of the interface between the plates, extending from the surface (usually the seafloor) to about 30 to 40 kilometers (18 to 25 miles) depth. The hazard from great earthquakes and tsunamis makes it critical to understand better what controls the extent of these earthquake ruptures. The pattern of deformation of the Earth, which can be measured very accurately with high precision GPS measurements, can be used to make such assessments. Between earthquakes, the region landward of the deep-sea trench of the subduction zone contracts, which reflects the storage of energy within the earth to be released in future earthquakes.

Analysis of AIDA (Aftershock Imaging with Dense Arrays) Data from the 2011 Mw5.8 Virginia Earthquake. National Science Foundation grants #1215789 and 1215839. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1215739. Two years. Two grants. $154,411 to principal investigator Larry Brown, Cornell University, ldb7@cornell.edu, and $75,223 to principal investigators, John Hole, and Martin Chapman, Virginia Polytechnic Institute and State University, hole@vt.edu.

The August 23, 2011, Mw 5.8 earthquake in Louisa County, Virginia, provided an opportunity to test a novel type of high-density aftershock deployment utilizing EarthScope Flexible Array instruments.

Beginning August 27, AIDA deployed 201 stations in three phases, including lines with a 200-meter station spacing above the aftershock zone and a 60-kilometer long regional profile. The survey was designed to record wavefields at sufficiently dense spacing to minimize spatial aliasing and lower the event detection threshold.

Preliminary work has focused on joint tomography for seismic velocity and hypocenter locations, synthesizing high resolution seismic reflection profiles from Vertical Seismic Profile processing of earthquake records and body wave and surface wave imaging using ambient noise techniques. In addition, this unique data set will allow the investigators to test seismic interferometric methods for synthesizing virtual seismograph records at the physical location of the earthquake sources.

Ongoing work includes locating more of the >1000 events with high signal-to-noise, event imaging using reverse-time waveform migration, and using seismic interferometer stacking to produce high quality images of earth structure in 3D. The resulting high-resolution subsurface images and aftershock characterization will not only constrain key geologic relationships at depth for this important, intraplate hypocentral region but should provide a template any future aftershock deployments (e.g., 1000+ channels).

Developing a Link between Dynamic Friction and Fracture Mechanics Models of Earthquake Rupture using a new Dynamic Double-Direct Shear Apparatus. National Science Foundation grants #1214765 and 1215669. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1215765. Three years. Two grants. $105,008 to principal investigator Vikas Prakash, Case Western Reserve University, Vikas.Prakash@case.edu, and $159,649 to principal investigator W. Ashley Griffith, University of Akron, wag8@uakron.edu.

There is broad agreement amongst researchers in the geophysics community that similar rocks may undergo very different weakening processes in different normal stress and/or slip velocity regimes. Consequently, inference of weakening behavior of fault rocks in situ from laboratory experiments at interfacial conditions of relevance to earthquake physics cannot be done simply by scaling exercises, and relatively small changes in normal stress and/or the slip speed can result in changes in the slip weakening distance of an order of magnitude.

The investigators will advance the current state of understanding regarding the frictional constitutive behavior of earthquake faults using two principal approaches: (1) implementing a new dynamic shear friction testing apparatus by synergistically combining the split-Hopkinson pressure bar and the double-direct shear friction apparatus to the study of dynamic friction in both intact and granular geo-materials; and (2) developing a methodology for testing the efficacy of parameters extracted from dynamic friction experiments in dynamic rupture models.

The intellectual merit of this proposal is strengthened by the fact that it addresses some of the outstanding problems in earthquake physics, including the influence of slip and slip velocity on fault strength during a typical fault rupture event. No laboratory experiments to date combine the large displacement, high slip rates, and normal stresses that are understood to characterize dynamic earthquake slip at natural fault interfaces.

The research will contribute toward our understanding of earthquakes in several ways. To construct theoretical models of the earthquake process, we must understand how frictional resistance on faults changes during an earthquake. In particular, the weakening mechanisms that we propose to study have profound implications for the magnitude of stress-drops during earthquakes and consequently for the magnitude of strong ground shaking. The manner in which fault strength varies with displacement and rupture velocity, as well as the rate at which healing occurs as the slip velocity decreases behind the rupture tip, can control the mode of rupture propagation, i.e., as a crack or a pulse. Thus, understanding dynamic friction is important not only for practical matters related to predicting strong ground motions and resulting damage, but also for answering major scientific questions receiving considerable attention, e.g., the strength of the San Andreas fault/the heat-flow paradox.

Improving Resolution of Finite Fault Inversions with Increasing Bandwidth. National Science Foundation grant #1215769. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1215769. Two years. $359,859 to principal investigator Ralph Archuleta, University of California-Santa Barbara, Ralph@eri.ucsb.edu.

Because the process of an earthquake cannot be directly observed, we must infer the process by determining source parameters that describe the relative motion between the two sides of the fault, i.e., the kinematics of the rupture. At each point on the fault the source parameters are: (1) the slip-rate time function, characterized by a functional form and generally specified with a few parameters; (2) the rupture time—a time relative to the origin time of the earthquake at which the slip rate function starts; and (3) the final slip, a vector with one component along strike and the other up-dip (i.e., perpendicular to the strike component), that gives the relative displacement of one side of the fault with respect to the other.

The investigators assume a priori the velocity and attenuation structure of the medium in which the fault is embedded as well as the geometry of the fault and the hypocenter of the earthquake. With this information we can compute the ground motion at any point in space, in particular, at the locations of the seismic and geodetic instruments that recorded the earthquake. To find the source parameters they will solve an inversion problem in which they continuously adjust the source parameters. With each adjustment they will compute ground motion time histories (synthetics) at the recording sites and compare the synthetic time histories with the recorded time histories. At the same time they compute the static displacements for comparison with the geodetic measurements, GPS or InSAR. Using a predetermined cost function that measures the misfit between data and synthetics, we continue the procedure of adjusting the source parameters until we have an acceptable level of misfit.

Until relatively recently the emphasis has been on reducing the misfit between the data and the synthetics. However, that is now being recognized as not the issue because any number of different kinematic descriptions can fit the data. The number of free parameters (i.e., source parameters) is often far greater than the number of independent data making it possible to find nearly perfect agreement between synthetics and data. This raises two questions to be addressed in the proposal: (1) Is there additional data, not yet used, to constrain the source parameters? (2) Rather than measure the misfit between synthetics and data, how can we determine the difference between models? That is, how can we decide if one source description is better than another?

Because we cannot directly observe an earthquake, we invert the seismic, geodetic and geologic data created by the earthquake to infer the relative motion between the two blocks of earth. The kinematic source parameters describe how the rupture evolves in time and space, i.e., the time when a point on the fault starts to slip (controlled by the rupture velocity) and the growth of the slip at each point on the fault (controlled by the stress relaxation of the medium). Conceptually the inverting the data is similar to finding the parameters (slope and intercept) of the best fitting line to a group of points.

Mechanical Erosion of Frictionally Locked Fault Patches Due to Creep: Observational Evidence and Modeling. National Science Foundation grant #1214900. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1214900. Two years. $96,751 to principal investigators Allan Rubin and Maximilian Werner, Princeton University, arubin@princeton.edu.

This study will increase our understanding of how earthquakes nucleate on frictionally locked fault patches that are loaded by the growing stress concentrations at their boundaries due to aseismic creep. We will begin with an analysis of observed seismicity patterns at locations where creep-mediat-

ed mechanical erosion is likely to be occurring—on streaks of microearthquakes on partially creeping faults, and at the base of the seismogenic zone of major strike-slip faults.

Streaks are near-horizontal ribbons of tightly clustered small earthquakes, first observed in large numbers on Northern California's creeping faults, that neighbor apparently aseismic holes that might be frictionally locked or aseismically creeping. We will analyze the seismicity patterns on streaks to search for changes that might betray the gradual mechanical erosion of neighboring locked patches.

By correlating seismicity patterns on the streaks with whether or not neighboring holes have hosted moderate earthquakes (i.e., are probably locked), locked holes might be (statistically) identifiable. Mechanical erosion of locked patches has previously been invoked to explain accelerating seismicity and increases in maximum earthquake magnitude on a strike-slip streak in Kilauea's east rift, and might also play a role in the loading of major locked strike-slip faults by creep from below the seismogenic zone. The search will therefore be extended to promising regions at the base of crustal-scale strike-slip faults in Southern California.

How earthquakes nucleate remains a major unsolved problem in seismology. Given the uncertainty in the current equations that are presumed to describe friction on faults, it is essential that numerical models of earthquake nucleation be continually confronted by observations. A standard conceptual model is that many earthquakes are caused by slow, aseismic sliding of the surrounding fault area, which progressively loads fault regions that are frictionally stuck until eventually a large earthquake occurs.

Simple mechanical models predict that, because of the growing stresses at the transition between the stuck and aseismically sliding regions, micro-seismicity should mirror the progressive loading by becoming stronger over time (e.g., rates increase, magnitudes grow), until a large earthquake releases the built-up energy. The goal is to search for observations that might support this model and its predictions, while at the same time confronting numerical simulations of earthquake cycles based on current laws of friction with the observations.

Surface Rupture Earthquakes and the Mechanics of Earthquake Faulting. National Science Foundation grant #1213768. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1213768. Two years. $168,902 to principal investigators Steven Wesnousky and Glenn Biasi, University of Nevada Reno, stevew@seismo.unr.edu.

This work will develop new observations and data from historical ground rupturing earthquakes to improve understanding of the earthquake rupture process. Prior observations have worked to define the role of fault geometry in rupture propagation, addressed and discounted self-similarity in the description of surface rupture slip distributions, shown clearly that fault rupture is not consistently uni- or bilateral, that earthquakes do not consistently initiate on the section of fault ultimately recording maximum slip, and that the relationship between average coseismic slip and rupture length for large strike-slip earthquakes appears to require coseismic slip at progressively greater depths below the seismogenic layer as a function of rupture length. Previous work was been limited by time and funding to a set of about three dozen large continental earthquakes which shared the characteristics that there existed: (1) maps of the surface rupture trace; (2) maps of the nearby active faults that did not rupture; and (3) measurements of coseismic offset at many points along the strike of the rupture to define the surface slip distribution. The resulting compilation has already become a heavily cited and widely used resource for the larger earthquake physics community.

Airborne Response to the High Park Fire. National Science Foundation grant #1250576. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1250576. One year. $55,659 to principal investigator Thomas Kampe, National Ecological Observatory Network, tkampe@neoninc.org.

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

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

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

Pre/Post Earthquake Damage Assessment for Infilled RC Frame Buildings. National Science Foundation grant #1235496. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1235496. Three years. $349,940 to principal investigators Andreas Stavridis and Babek Moaveni, University of Texas at Arlington, stavridis@uta.edu.

This project will dynamically test in the field an existing two-story reinforced concrete frame building infilled with unreinforced masonry walls. The building, located in El Centro, CA, was built in the 1920s and it is typical of the construction practice in California in that era. Buildings with similar characteristics are located in regions with high seismicity such as Los Angeles, San Francisco, the Mediterranean region, and Latin America. Such buildings often have historical significance but they have proved vulnerable to earthquakes. Understanding and improving their behavior has been a challenging task for engineers.

The building selected in this study has sustained damage during earthquakes of 1940, 1979, and 1987 and 2010 which have been recorded in close proximity. The building was repaired and retrofitted after the first three earthquakes; however, the damage induced during the 2010 event cannot be repaired cost-effectively considering the economy in the area. Hence, the structure is scheduled to be demolished. This provides a unique opportunity to test a real-life building using mobile shakers. The testing will be incremental and it is expected to bring the building on the verge of collapse.

Conferences and Training

September 7-9, 2012
From Surprise to Rationality: Managing Unprecedented Large-Scale Disasters
International Society for Integrated Disaster Risk Management
Beijing, China
Cost: $400

This conference will discuss scientific, technical, economic, financial, and educational aspects of large-scale disasters. Topics include theory and methodology in disaster risk science, recovery and reconstruction, economic impacts and financial management of large-scale disasters, managing unprecedented extreme events, and risk assessment modeling.

idrim2012.adrem.org.cn/home.htm

September 12-13, 2012
Disaster Risk Reduction
Disaster Management Institute of Southern Africa
Limpopo, South Africa
Cost: $617

This conference will discuss natural hazard mitigation and response strategies. Topics include dealing with refugees and internally displaced persons, reducing the risk of fires in vulnerable settlements, addressing the effects of climate change, protecting communities from hazardous materials, educating communities about flood risk reduction and response, and providing humanitarian relief in Somalia and Sudan.

www.disaster.co.za/

September 16-21, 2012
Dam Safety 2012
Association of State Dam Safety Officials
Denver, Colorado
Cost: $750

This conference will discuss emergency planning for dam safety and geotechnical, structural, seismological, and hydraulic threats to dam security. Topics include emergency action planning, hydraulic dam failure analysis, safety evaluations of existing dams, plant and animal impacts on embankment dams, earthquake engineering for dam safety, and stability analysis of concrete dams.

damsafety.org

October 15-19, 2012
Storm Warning: Water, Energy, and Climate Security in a Changing World
University of British Columbia
Banff, Alberta, Canada
Cost: Not listed

This conference will address six sources of uncertainty affecting water, energy, and climate security. These include unknowns about water availability; downscaling climate modeling to local and regional areas; the costs of adaptation to climate change; and other topics. The conference is by invitation only, so interested parties should complete an application on the Web site.

www.stormwarning2012.ca/StormWarning2012_Temp_Brochure.pdf

September 20-21, 2012
International Conference on Hazards and Disasters
International Center for Research and Development
Colombo, Sri Lanka
Cost and Registration: $375

This conference will present a broad range of research, promote networking opportunities, and generate new ideas about hazard risk reduction. Session themes include risk management, the economic impact of disasters, environmental and ecological risks, critical infrastructure, emergency medicine, climate change and natural disasters, transportation systems, technological disasters, and traditional knowledge about risk reduction.

www.globaldisasters.org

September 19-21, 2012
Eighth International Conference on Risk Analysis and Hazard Mitigation
Wessex Institute of Technology
Island of Brac, Croatia
Cost: $1,739

This conference will discuss new methods for estimating the effects of potential natural and human-caused disasters. Topics include risk mapping, natural hazards and climate change, security and public safety, financial risk assessment, political instability and economic vulnerability, health risk, early warning systems, hazard prevention, and the design and simulation of evacuation procedures.

www.wessex.ac.uk/12-conferences/risk-analysis-2012.html

September 23-27, 2012
Emergency Preparedness and Hazmat Response Conference
City of Baltimore Local Emergency Planning Committee
Baltimore, Maryland
Cost: $275 before August 10, open until filled

This conference offers training and certification for emergency managers, first responders, and local emergency planners. Topics include community preparedness, criminal and anti-terrorism video surveillance, railroad safety and response, radiation awareness, disaster debris management, the Hazardous Materials Emergency Preparedness grant program, and chlorine safety and emergency response.

2011conference.net

September 24-25, 2012
Barrier Based Risk Management Network Event
CGE Risk Management Solutions
Amsterdam, The Netherlands
Cost: $304

This conference will discuss emergency incident management for a wide range of businesses and allow for cross-industry networking. Topics include effective incident investigation, resilience analysis, organizational culture and safety management, qualitative risk assessments in a financial context, and a beginner's introduction to incident analysis.

www.cgerisk.com/networkevent

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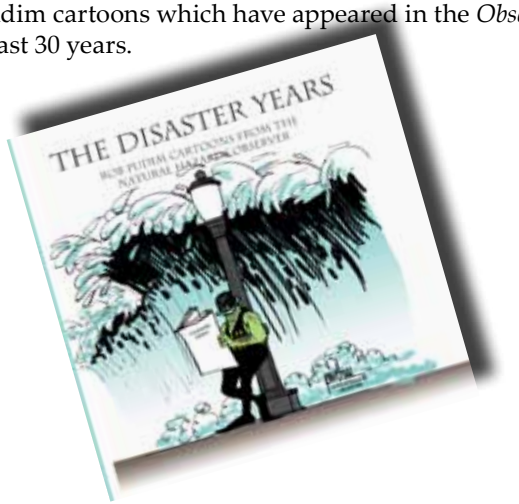

September 24-28, 2012
15th World Conference on Earthquake Engineering
International Association of Earthquake Engineering and the Portuguese Association of Earthquake Engineering
Lisbon, Portugal
Cost: $810

This conference will discuss seismology research, structural engineering, seismic risk assessments, and the social and economic issues surrounding earthquakes worldwide. Topics include seismic vulnerability and risk analysis, a global earthquake model, protecting cultural and historic buildings, political aspects of earthquake risk reduction, the role of architecture and urban planning in earthquake resilience, and the seismic safety of existing nuclear power plants.

15wcee.org

October 1-2, 2012
Third Annual Pacific Northwest Climate Science Conference
Pacific Northwest Climate Science Conference
Boise, Idaho
Cost: $125

This conference will discuss expected climate impacts for the Pacific Northwest and research needed on adaptation and mitigation strategies. Topics include adaptation strategies for the Columbia River basin; climate change impacts on regional agriculture, food security, human health, and natural resources; hydrological effects of regional climate change; climate change communication strategies; and vulnerability assessments.

pnwclimateconference.org

October 5-7, 2012
Disaster Response Challenge
British Red Cross
London England
Cost: $80

This two-day hypothetical disaster will provide first-hand knowledge of the issues and decisions experienced by Red Cross units when responding to a major incident. Each team will act as an independent emergency response unit and develop their own disaster response plan as the scenario unfolds in real time. Specific modules dealing with logistics, communications, first aid evacuation, and security will be included.

www.redcross.org.uk/Get-involved/Events/Challenge-and-social-events/Adrenaline/Disaster-response-challenge

October 6-11, 2012
National Weather Association Annual Meeting
National Weather Association
Madison, Wisconsin
Cost: $530

This conference will look at technologies that improve weather forecasting and communication with the general public. Topics include numerical weather prediction, remote sensing with current and future environmental satellites, development of a winter impact index for the Twin Cities, wildland fire forecasting, probabilistic forecasting of severe convection, and severe weather simulations.

www.nwas.org/meetings

October 10-12, 2012
First Biennial Conference for Risk Reduction
African Center for Disaster Studies at North-West University
Potchefstroom, South Africa
Cost: $510

This conference will celebrate the 10-year anniversary of the African Center for Disaster Studies with presentations that address academic and professional approaches to disaster risk reduction. Topics include building resilience to disasters using gender mainstreaming in Botswana, contingency planning for disaster preparedness and response in southern Africa, integrating disaster risk reduction into South African municipal development, and the magnitude and frequency of flash floods in northern Nigeria.

acds.co.za/index.php?page=conf2012

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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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Observer cartoons are drawn by Rob Pudim.

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