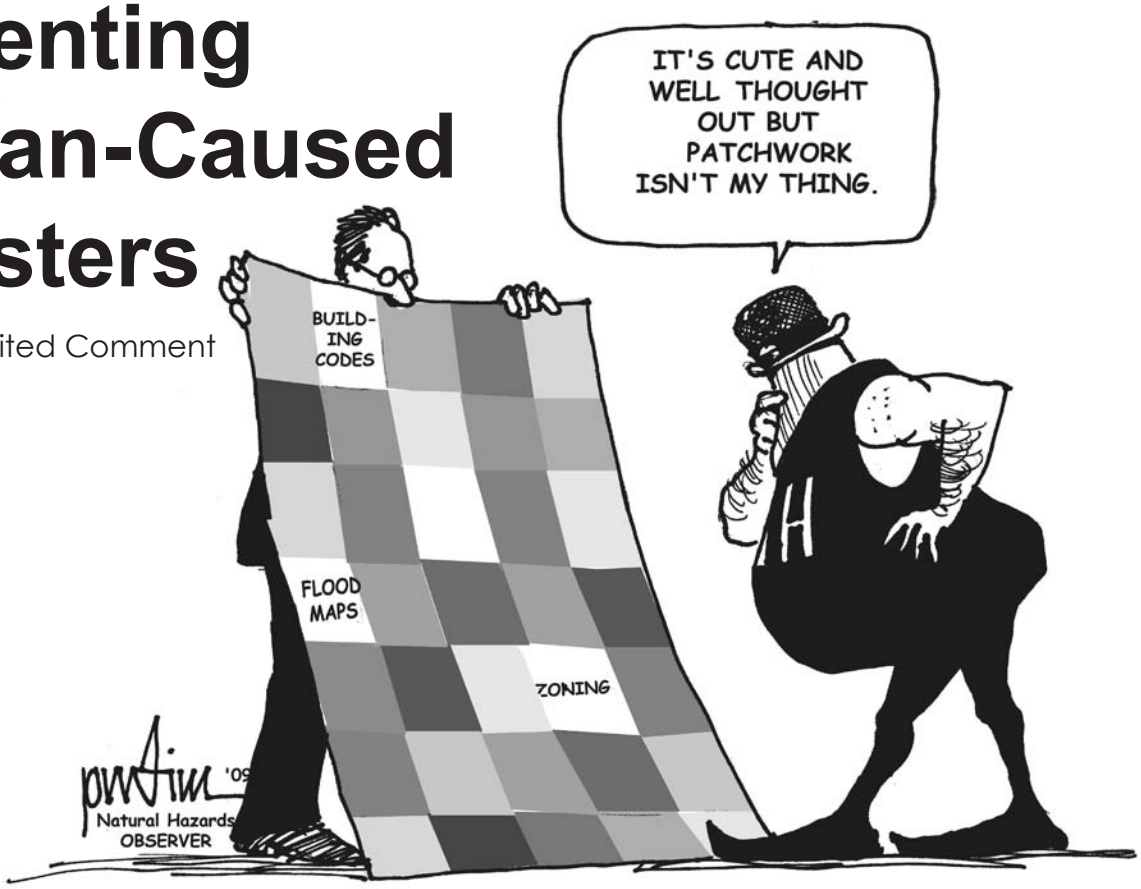
Natural Hazards Observer

NATURAL HAZARDS CENTER

Volume XXXIV · Number 2 November 2009

Preventing Human-Caused Disasters

— Invited Comment



The best disaster response and recovery policy is advance planning, land use, and building codes to prevent a disaster from happening in the first place. Society has the experience and tools at its disposal to prevent many of the devastating impacts disasters have on humans.

There are many programs currently addressing aspects of disaster prevention. Individuals and communities can increase disaster resiliency by piecing together currently available research and programs. Planning in advance of disasters can assure that they impact fewer people and require fewer resources.

Do No Harm

While there is a need for peer-reviewed cost-benefit studies addressing how advance planning affects the impacts of disasters, it is not necessary to wait for additional data. The late Gilbert White famously observed, "Floods are acts of nature; but flood losses are largely acts of man."

Research conducted by Roger Pielke, Jr., presented at the 33rd Annual Natural Hazards Research and Applications Workshop in 2008 confirms that the United States can expect huge increases in disaster costs because of current land use practices, irrespective of any additional toll caused by climate change and attendant sea level rise.

The recently released United Nations 2009 Global Assessment Report on Disaster Risk Reduction urges reducing the damage caused by natural disasters by developing in harmony with natural processes. The report finds that

(Please see Disasters, page seven)

INSIDE THIS ISSUE

Saving Earth from asteroids PAGE 11

Evaluating the Australia fire report PAGE 15

FEMA, Fugate and the future PAGE 18

Does terrorism work? PAGE 3

The Poor Get Poorer

Climate change will be tough on everybody, but its impacts will be felt disproportionately among developing nations. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change concluded in the *Summary for Policy Makers*, "There are sharp differences across regions and those in the weakest economic position are often the most vulnerable to climate change. There is increasing evidence of greater vulnerability of specific groups such as the poor and elderly."

A recent report from researchers at the World Bank and Purdue University published in the August 2009 issue of *Environmental Research Letters* has pinpointed several countries where extreme weather resulting from climate change will have the most profound impact.

"The countries with the highest shares of populations entering poverty in the wake of these extreme events include Bangladesh, Mexico, Mozambique, Malawi, Tanzania, and Zambia," write the World Bank's Syud Ahmed and coauthors.

The researchers looked at how a once-in-30-year climate extreme would affect the level of poverty in 16 countries. "We find that extremes under present climate volatility increase poverty across our developing country sample—particularly in Bangladesh, Mexico, Indonesia, and Africa—with urban wage earners the most vulnerable group. We also find that global warming exacerbates poverty vulnerability in many nations," the authors write.

Hardest hit would be urban labor and rural labor, the paper says. Malawi, for instance, would see an increase of 110 percent in poverty incidence among its urban labor sector, and 91 percent among rural laborers; Mexico, 85.4 percent among urban labor, 52.1 percent rural; and Zambia, 102 percent urban labor, 32.5 percent rural.

This paper looked primarily at declining food production in developing countries resulting from climate change, but there are other possible hazards that may have long-term impacts. The *Stern Review Report on the Economics of Climate Change* found, for instance, "Millions of people will potentially be at risk of climate-driven heat stress, flooding, malnutrition, water-related disease, and vector-borne diseases. For example, dengue transmission in South America may increase two- to five-fold by the 2050s."

The *Stern Review*, released in 2006, continued, "The cost of climate change in India and Southeast Asia could be as high as nine to 13 percent loss in GDP [gross domestic product] by 2100 … Up to an additional 145 million to 220 million people could be living on less than $2 a day."

The paper "Climate volatility deepens poverty vulnerability in developing countries" is available for free download at erl.iop.org. The *Stern Review* is available at www.hm-treasury.gov.uk/stern_review_report.htm.

The Best Plan of Its Kind

The winner in the all-hazards category this month is the University of Florida's zombie attack plan (www.tampabay.com/specials/2009/PDFs/zbsd_exercise.pdf). "The purpose of this exercise is to discern appropriate strategies for responding to a zombie attack and/or infection that might affect the University of Florida campus," the plan says.

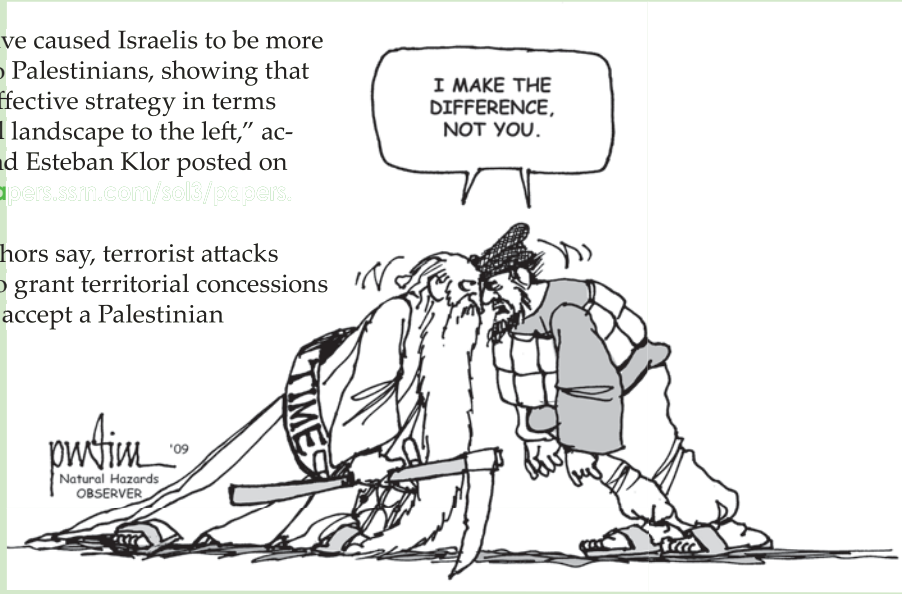
We can safely call it the best plan of its kind. "This exercise consists of a single event: a table-top exercise in which the science (e.g., neurobiology) of 'zombieism,' or zombie behavior spectrum disorder (ZBSD) will be discussed and the stages of an outbreak identified, with follow-on discussion of how an outbreak of zombie attacks might affect maintaining support for the campus course management system."

The plan is carefully footnoted with references to zombie film documentaries like *Night of the Living Dead, Day of the Dead*, and others.

For planners wishing to incorporate zombie attack strategies into their plans, UF recommends the following: "Equip all staff offices with 'blackout curtains' to prevent identifying worker locations to zombies; equip all offices with easily barricaded doors able to withstand prolonged zombie incursion attempts; equip staff with laptops and ensure IPCC software is installed, tested, and working for staff who may find commuting to work to be difficult; equip all staff with long-range (e.g., rifles) and short-range (e.g. handguns) firearms or other weaponry (e.g., chainsaws, baseball bats, LPs) for defense against the infected and to dispatch possibly infected co-workers."

Does Terrorism Work?

Local terror attacks in Israel have caused Israelis to be more willing to offer concessions to Palestinians, showing that "terrorism appears to be an effective strategy in terms of shifting the entire Israeli political landscape to the left," according to a paper by Eric Gould and Esteban Klor posted on the *Social Science Review Network* (papers.ssrn.com/sol3/papers.cfm?abstract_id=1413329).



Between 1984 and 2006, the authors say, terrorist attacks caused Israelis to be more willing to grant territorial concessions to the Palestinians, more willing to accept a Palestinian state, less likely to identify themselves as "right wing," and to have a more favorable opinion of Arabs. "These findings may shed light on the causes underlying the spread of global terrorism in the last few decades."

But Max Abrahms, a postdoctoral fellow at Stanford University, says that his research shows, "Terrorism does not coerce governments into making political concessions." Abrahms says that he has seen the Gould and Klor data, but it doesn't support their claims. "What it shows is terrorism moves the Israeli electorate to the right. They try to reconcile that with the conventional wisdom. The right wing in Israel has become more moderate. That's true. But not because of terrorism."

Gould and Klor, who are economists at the Hebrew University of Jerusalem, used regression analysis to piece out the political attitudes of individual Israelis as a function of terrorist fatalities by location. "We are essentially examining whether changes over time in terror activity within a subdistrict are correlated with the changes over time in political views in that subdistrict, after controlling for the national trend and a rich set of personal characteristics," they write.

"Our results indicate that terror attacks have pushed Israelis leftward in their political opinions towards the Palestinians and made them more likely to support granting concessions. As a result, this paper presents the first comprehensive analysis showing that terrorism can be an effective strategy," Klor and Gould conclude.

The conventional wisdom among political scientists is that groups use terror tactics to achieve political objectives, and that these tactics are used because they're successful. University of Chicago political scientist Robert Pape wrote, "Perhaps the most striking aspect of recent suicide terrorist campaigns is that they are associated with gains for the terrorists' political cause about half the time." Particularly vulnerable targets are democracies, he says.

But Abrahms says the conventional wisdom is based on the study of too few cases and garbles its definitions. Terrorism against civilians has no effect in achieving groups' political goals, he says, while attacks against military targets can be effective. "Terrorism—substate actors attacking civilians— does not coerce governments into making political concessions. When they focus on military targets, say in Iraq, it frequently leads to political concessions."

"I've looked at hundreds of groups," Abrahms says. "The Israeli case is a little bit anomalous. Israel gets a disproportionate amount of pressure on the country to moderate its stance. To attribute this moderation strictly to terrorism when there's another equally viable hypothesis is a little bit irresponsible."

But terrorism is increasing around the globe. According to the START Global Terrorism Database, incidents peaked around 1992, fell until 2002, then rose again. If it doesn't work, why is gaining ground as tactic?

"There are all sorts of benefits to terrorism that don't involve political concessions," Abrahms says, including revenge, social benefits, and prestige.

Meanwhile, research out of Princeton University indicates that if the citizens of one country don't like another country, terrorism may be the result. "An analysis of public opinion polls and terrorist activity in 143 pairs of countries has shown for the first time that when people in one country hold negative views toward the leadership and policies of another, terrorist acts are more likely to be carried out," according to work by Princeton economist Alan Krueger and colleagues.

In a paper in the September 18, 2009, issue of the journal *Science*, Krueger and colleagues write, "Our data do not allow us to infer whether terrorists respond to public opinion per se or whether the political preferences of terrorists respond in the same way as those of the general public to external events. Moreover, it is not possible to draw inferences concerning individual motivations ... Nevertheless, public opinion appears to provide a useful indicator of terrorist activity."

—Dan Whipple

They Said It ...

Via the Natural Hazards Center Twitter feed (and a few other places):

Metaphor rages out of control

"I do have a kind of paternalistic feeling towards DHS. I feel like we've finally given a home to this child we've created, which is finally reaching maturity."—*Sen. Joe Lieberman (I-Conn.), at the groundbreaking for the Department of Homeland Security offices in Washington, D.C.*

"It's always been obvious that total emissions depend on the number of emitters as well as their individual emissions—the carbon tonnage can't shoot down as we want, while the population keeps shooting up."— *Roger Martin, chairman of the Optimum Population Trust, a British nonprofit whose goal is to rein in population growth in the United Kingdom, quoted in the* ***Telegraph*** *of London.*

"I believe because so many people died, someone must take responsibility."—*Liu Chao-shiuan, upon resigning as prime minister of Taiwan because of his government's poor relief response after Typhoon Marakot, quoted in the* ***New York Times****.*

"With the huge number of dams getting older every day, it's becoming a bigger and bigger problem."—*Larry Roth, deputy executive director of the American Society of Civil Engineers, on giving U.S. dams a "D" grade for safety, quoted in* ***Wired****.*

"Nowhere is ready ... there is going to be massive underproduction of vaccines as compared to the needs and demand."—*World Health Organization spokesman Peter Cordingley on H1N1 vaccine distribution in Asia, quoted by Reuters.*

"The United States makes very few vaccines; our facilities are too busy making more profitable drugs that treat pain, various mental disorders, and erectile dysfunction."—*David Dobbs, in* ***Slate****.*

"When it comes to shoring up the financial infrastructure that stands behind homeowners, communities and insurers after catastrophe strikes, we are no better off than we were four years ago. Given the nation's fragile economic condition, we may actually be worse off than we were four years ago."—*James Loy, Protectingamerica.org, in a* ***Miami Herald*** *op-ed.*

"Climate change doesn't just affect the atmosphere and the oceans but the earth's crust as well. The whole earth is an interactive system. In the political community people are almost completely unaware of any geological aspects to climate change."—*Professor Bill McGuire of University College London, quoted by Reuters.*

Burn, Baby, Burn

Wildfires will burn an additional 54 percent of western U.S. lands by the 2050s relative to 2009, with the Rocky Mountains seeing an increase of 175 percent and the Pacific Northwest an increase of 78 percent, according to research in press at the *Journal of Geophysical Research*.

The authors of a Harvard University study, led by Dominick Spracklen, who is now at the University of Leeds in the United Kingdom, looked at the impact of increasing temperatures on fire extent and the resulting atmospheric aerosol pollution. They found, "Climate change will increase summertime organic carbon aerosol concentrations over the western United States by 40 percent and elemental carbon concentrations by 20 percent from 2000 to 2050."

In terms of the hazard presented by such dramatically increased fire extent, "It depends on where it occurs," says U.S. Forest Service Research Social Scientist Sarah McCaffrey. "It depends on how well we prepare and adjust. There are ways we can mitigate the hazards reasonably effectively, at least in terms of the housing damage. If it takes 50 years to happen, that's a good amount of time to have good planning, good building codes, good zoning. That could have a huge effect on the amount of impact it has."

Co-author Jennifer Logan of the Harvard University School of Engineering and Applied Sciences said in a release that this is the first effort to quantify future wildfires relationship to air quality. "Warmer temperatures can dry out underbrush, leading to a more serious conflagration once a fire is started by lightning or human activity," Logan says. "Because smoke and other particles from fires adversely affect air quality, an increase in wildfires could have large impacts on human health."

The researchers looked at a 25-year record of meteorology and fire extent. Then they applied that within a climate model, using Intergovernmental Panel on Climate Change emissions scenario A1B, which predicts a moderate average global temperature increase of about 1.6 degrees Celsius. They then applied an atmospheric chemistry model to assess the potential changes in air quality. They found "diminished air quality could lead to smoggier skies and adversely affect those suffering from lung and heart conditions such as asthma and chronic bronchitis."

Gabriele Pfister, an atmospheric chemist with the National Center for Atmospheric Research in Boulder, Colorado, says, "The increase in carbon aerosols Spracklen et al. state in their work is very reasonable for the expected change in fires. And that fire intensity and frequency in the western United States most likely will increase in the future has been shown in other studies as well—and on a personal note I might add that the California fire seasons in the past few years as well might be indication of what to await."

But Pfister says there are still many open questions. Emission inventories from current fires still have large uncertainties, and the optical properties of aerosols are poorly understood. "If we make projections into the future we add a whole suite of uncertainties to it. But the Spracklen study is a really important contribution giving us insight into what could happen and what we might have to deal with. The increases they find in aerosols are quite significant."

—Dan Whipple

Influenza Planning

Cooperation and Communication Are Still Central

While the complexity of preparing for a flu pandemic is not lost on anyone, at least two fundamentals of disaster planning have been reinforced at the state, local, and federal levels—communication and cooperation.

A report by the Trust for America's Health (www.healthyamericans.org) released in September, 2009, said, "Overall, the H1N1 outbreak has shown that the investment the country has made in preparing for a potential pandemic flu has significantly improved U.S. capabilities for a large scale infectious disease outbreak, but it has also revealed how quickly the nation's core public health capacity would be overwhelmed if the outbreak were more widespread and more severe."

At the National After Action Workshop on a Federal Public Health Emergency: The Novel Influenza A/H1N1 Epidemic of Spring 2009, hosted in September by the UCLA Center for Public Health and Disasters, public health officials said they were finding it difficult to convey messages from epidemiological studies to the "Joe Black" general public.

Misconceptions such as H1N1 being a "mild" virus, misguided school closings, undeveloped virus exposure reduction strategies, and complicated "layman" guidance documents are but a few examples of the inability to convey the right information. The divide, according to Capt. Stephanie Zaza, of the Coordinating Office for Terrorism Preparedness and Emergency Response at the Centers for Disease Control and Prevention, can partially be explained by difficulties in the communication of guidance in a situation of genuine uncertainty.

The Trust for America's Health report echoed these concerns. "Communication between the public health system and health providers was not well coordinated," the report says. "During the outbreak, many private medical practitioners reported that they did not receive CDC guidance documents in a timely fashion. Other practitioners noted that CDC guidance lacked clinically relevant information and was difficult to translate into practical instructions."

On the ground, communication and cooperation took center stage. In Austin, Texas, an emergency operations center was activated May 1, 2009, and deactivated at the end of that month. This area was one of the first in the United States to be affected by the new influenza strain when it originally crossed over from Mexico. In their after action plan, according to Billy Atkins of Austin's emergency management office, "Some of the areas that worked well during this recent event included the strong relationships that have been established over the years with regional partners. These partnerships have been developed through joint planning efforts as well as exercises.

"Some areas that we will focus on improving include what I'll call for lack of a better word the 'scalability' of the pan flu plan. The plan as currently written assumes a worse case scenario. It assumes that in any pan flu situation there will automatically be a 40 percent absenteeism rate with high morbidity. In the future we'll remember that the primary definition of a pandemic relates to geographic spread and not necessarily severity," Atkins says.

At the UCLA conference, W. Craig Vanderwagon, assistant surgeon general at the U.S. Department of Health and Human Services, agreed there is no "one size fits all solution." But some pointed out that this very idea has created problems with a lack of standard CDC guidance on field data reporting. There is a divide between researchers and policy makers with no field experience and people on the field.

Atkins says, "We learned that what has been preached over and over again really holds true when it comes to communications during a pandemic." Initially, he says, Austin focused almost entirely on external communications, but "We've learned from this event the importance of keeping in touch with your own employees—even when you don't have any new information to share with them.

"The following key points stood out from this recent event: Not all novel strains of a new flu virus are severe … Be prepared for a novel virus to spread quickly. This will create a very fluid situation. During this event information seemed to be changing hourly. Be prepared, and prepare your employees."

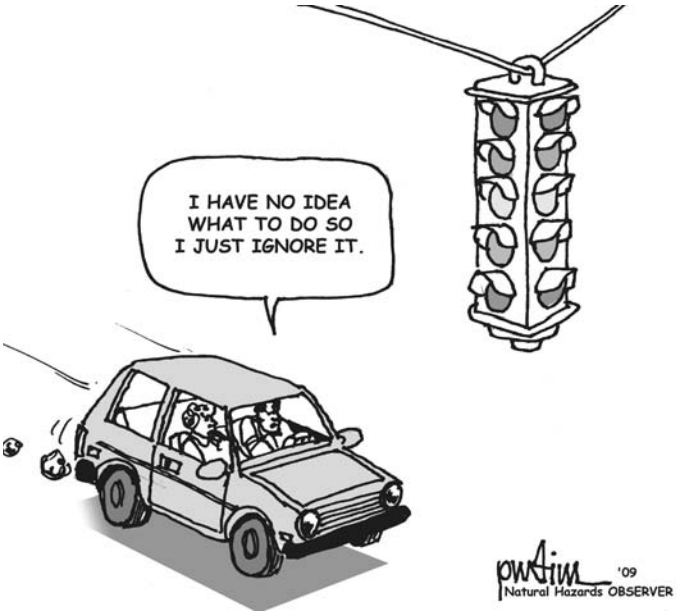
The America's Health report cautions, "Even with a mild outbreak, the health care delivery system was overwhelmed. Even this relatively mild outbreak proved to be a low-level 'stress test' on the health system. It revealed significant problems and lack of preparedness particularly for outpatient settings where there was inadequate personal protective equipment and a limited understanding of infection control measures. At many hospitals, the 'worried well' overwhelmed emergency departments."

Indeed, the *Houston Chronicle* reported in late September, "Parents panicked over whether their sick children might have swine flu are unnecessarily clogging Houston's emergency rooms." One hospital opened an assessment clinic in a tent to handle a 40 percent increase in patients, the paper said.

Austin's Atkins says, "Relationships will be the greatest strength we have to rely on in a severe pandemic event. During the recent H1N1 event, we witnessed first hand the benefit of having close relationships with our partner agencies. Every partner agreed early on to speak and act as one …

"Like the rest of the world we're wondering if this event is just a precursor of something worse to come in the fall. However we do take a great deal of satisfaction from our response to this opening salvo," he says.

—Matthew Beres and Dan Whipple



Stuck on Yellow

Although we're writing this a couple of weeks in advance to make our old-fashioned print publication deadline, we'll go out on a limb to predict that the current National Threat Advisory is yellow (or "elevated"). In the whole history of the alert system, the threat has never been lower than yellow—never "guarded" or, god forbid, "low"—although *The Onion* did report that the threat level was set to green for a total of eight seconds on September 15. (www.theonion.com/content/news_briefs/dhs_sets_security_alert?utm_source=c-section)

The ability of the Homeland Security Advisory System to usefully communicate information to the public is poor, says the Homeland Security Advisory Council. About half of the members of that group think that the color scheme should be abandoned entirely. A report on the national alert system presented to Homeland Security Secretary Janet Napolitano said, "As to the specific question of whether to retain some form of the nation's current color code system, the task force was divided. Though recommending reform of the current system, half of the task force membership believes the concept of color-coded alerts is sufficiently clear, powerful, and easily understood to be retained as one element in the secretary's alerts to the nation.

"By equal number, task force membership believes the color code system has suffered from a lack of credibility and clarity leading to an erosion of public confidence such that it should be abandoned. However, the task force members are unanimous, that if the secretary decides to retain a system of alerts utilizing colors, that substantial reform is required."

The system has eroded public confidence for several reasons, including that it moves up more easily than it moves down, the alerts are overly broad, and they aren't focused on local and regional threats.

Under the recommendations of the task force, the baseline threat level will be "guarded."

"For reasons of public credibility—and public and industry expenditure—the secretary should elevate the threat status only when compelled to do so in the interest of public safety and security. To the extent possible, the nation should be managed at a guarded state," the report says.

We feel safer already.

The report is available at www.dhs.gov/files/committees/editorial_0331.shtm.

Hazards We Hadn't Worried About Before

Ice cream changes how you think. According to new research from the University of Texas Southwestern Medical Center, the fat in ice cream—and, to be fair, in other fatty foods like hamburgers—sabotages your brain's signals that inhibit appetite.

"Normally, our body is primed to say when we've had enough, but that doesn't always happen when we're eating something good," says Dr. Deborah Clegg, assistant professor of internal medicine at UT Southwestern and senior author of the rodent study appearing in the September issue of the *Journal of Clinical Investigation*. One type of fat, palmatic acid, is best at inducing the brain to ignore appetite suppressing signals from molecules that are trying to get you regulate your weight.

"What we've shown in this study is that someone's entire brain chemistry can change in a very short period of time. Our findings suggest that when you eat something high in fat, your brain gets 'hit' with the fatty acids, and you become resistant to insulin and leptin," Dr. Clegg said. "Since you're not being told by the brain to stop eating, you overeat."

Disasters...

(Continued from page one)

worldwide losses from natural disasters are increasing as more people occupy disaster-prone places.

A *New York Times* article on the UN assessment report summarizes these issues: "Education in local communities is needed to overcome a tendency to accept high disaster tolls as a matter of fate, instead of, for example, lax building codes or warning systems."

The solution to this increased toll of human-caused disaster losses should be based on a "do no harm" concept—also known as the "no adverse impact" (NAI) approach advocated by the Association of State Floodplain Managers. According to a description of its principles published in the *Natural Hazards Review* by Larry Larson and Doug Plasencia, "A 'no adverse impact floodplain' is one in which *the action of one property owner or community does not adversely affect the flood risks for other properties or communities as measured by increased flood stages, increased flood velocity, increased flows, or the increased potential for erosion and sedimentation, unless the impact is mitigated as provided for in a community or watershed based plan.*" (Emphasis in original.)

We in the natural hazards community should take the lead. We should expand the NAI principle to all forms of natural disaster, reducing the unnecessary misery we are causing future generations of disaster victims, public officials, taxpayers, and the environment. Acting together, our society can stop disaster damage before it occurs—or at least stop making disaster losses worse. We must reduce or eliminate unnecessary damage caused by human occupancy of hazardous areas. Then we should look at ways to design and engineer disaster relief and recovery as a fair, efficient, and sustainable process.

Adapt to Natural Processes

Once a disaster occurs, we must look for solutions in which humans adapt to natural processes. In one Native American culture, the term *Nania* means "all together." This is a powerful concept when looking for creative, common sense strategies to help individuals and communities cope with the consequences of a flood disaster. For that reason, *Nania* was the name of the 18th annual Association of State Floodplain Managers conference, held in Oklahoma 15 years ago. In our post-Katrina world, this concept has more relevance than ever.

Residents, business owners, community leaders, and taxpayers are all increasingly frustrated with the hardship and costs associated with repeatedly rebuilding structures in areas that year after year suffer natural disasters, espe-

(Please see Disasters, page eight)

Silver Jackets At Work

One example of a "patchwork quilt" is the U.S. Army Corps of Engineers' Silver Jackets Program. Silver Jackets teams are continuously operating, state-led, interagency collaborators working to reduce flood risk. The USACE and the Federal Emergency Management Agency are teaming with state National Flood Insurance Program coordinators, hazard mitigation officers, and other federal, state, and local agencies to provide a unified approach to addressing each state's priorities.

No single agency has the complete solution. Each has one or more pieces, similar to squares in a patchwork quilt. Silver Jackets teams are the quilting bee, the forum where agencies come together to implement a solution.

The primary goals of the Silver Jackets program are to: (1) facilitate strategic life-cycle flood risk reduction; (2) leverage resources and information to solve state-prioritized issues and implement or recommend those solutions; (3) improve processes, identifying gaps and counteractive programs; (4) improve and increase flood risk communication and present a unified interagency message; and (5) establish relationships to facilitate integrated postdisaster recovery solutions.

Pilot teams initiated in Ohio in 2005 and Indiana in 2006 have had success. The Ohio team enabled the town of Marietta to acquire detailed area mapping by tapping into a regional watershed study. By integrating the USACE Planning Assistance to States program and FEMA's Flood Mitigation Assistance program, the town gained eligibility for FEMA flood mitigation funds.

Bringing together multiple agencies, the Indiana team paired technologies not often used together to identify in real time when specific flood areas will be impacted.

The model successfully calibrated against actual river flow data for the White River in Indianapolis. "This cost for setting up this system on a typical gauged stream is relatively low, on the order of less than $10,000 to $15,000 a stream mile," according to USACE Disaster Program Manager Peter Navesky. The city can now see when and where to take protective actions. It can monitor flood progression and be responsible for its own safety.

Disasters...

(Continued from page seven)

cially floods. Modern advances in the sciences of hydrology and hydraulics, coupled with the National Flood Insurance Program's efforts to create maps of all areas of the United States which are especially prone to flooding, make it possible to have a fairly good understanding of the velocity, depth, and future location of floods.

The Federal Emergency Management Agency is expanding and continuing the major effort our nation has made over the past five years to digitize, update, and revise our nations flood insurance rate maps. This expanded effort is known as RiskMAP (Risk Mapping, Assessment, and Planning). The effort will increase our understanding of which areas are most susceptible to flooding, helping us determine how to live in harmony with the processes of nature. RiskMAP will also provide increased risk modeling and more comprehensive mapping, particularly in high priority areas such as coastal and urban environments, and emphasize results-oriented success in reducing losses from all natural hazards through efforts by state, local, and regional stakeholders.

Cost of Disasters—Not Just Money

Floods are the nation's most frequent and costly natural disaster. People living in hazardous areas know only too well the high cost and emotional trauma associated with rebuilding, only to face another devastating flood or other hazard.

The costs of rebuilding from repeated disasters go well beyond enormous human suffering and the cost of repairing individual structures. There are costs to local governments responding to crisis situations and repairing roads, bridges, and infrastructure. There are also costs to volunteer agencies, private organizations, and insurance companies and their customers.

Damage to fragile riverine and coastal ecosystems cannot be fully quantified, but it affects not only critical habitat for wildlife, but the natural flood protection capacity and capability of these ecosystems to protect against the next severe weather event. This is particularly true of disasters so large that the president declares them to be "major disasters" under the Stafford Act. Just think of the misery caused by the 1993 and 2008 Midwest floods, hurricanes Andrew, Charlie, Hugo, Ivan, Ike, Katrina, or Rita, the devastating effects of tornados, damage from earthquakes during the last quarter of the twentieth century, and the annual devastation of wildfires. The future promises even larger disasters that will have even greater strategic significance.

Americans are generous in disasters. Time and again we see outpourings of support and donations to people hit by catastrophe. Communities come together. People help their neighbors. Despite this empathy for the plight of victims, the question is often raised, "Why must taxpayers' money subsidize people who live along coastal or river areas that flood again and again and again?"

Many real economic concerns for, state, and regional government agencies intertwine with concerns about constitutionally protected property rights to discourage solutions. In addition, most levels of government have limited financial and human resources. Local officials often express

Floods are the nation's most frequent and costly natural disaster. People living in hazardous areas know only too well the high costs and emotional trauma associated with rebuilding, only to face another devastating flood or other hazard.

frustration with the number of plans they are requested to write and the regulations they are requested to implement.

Just Say 'No'

As a government, we do not ordinarily dictate where people can live, own property, or operate their businesses. We can, however, use sound zoning regulations and natural hazards management programs along with appropriate building codes and practices to ensure that people are encouraged to avoid especially hazardous locations. This sort of planning is strongly encouraged by the Disaster Mitigation Act of 2000, which essentially mandated improved local and state planning for disaster mitigation as a condition of many forms of disaster assistance. This planning can mitigate potential harm to those who choose to remain in areas Mother Nature predictably visits with wildfires, storms, and floods, if proper guidelines are followed.

As Paul Farmer, the executive director of the American Planning Association, said in the July 2009 edition of the APA magazine *Planning*:

> Where one builds is just as important as what one builds and how one builds. Planning is the only profession that integrates these three issues, and it's time now for planners to boldly take the lead in community and professional debates on their interrelationships. They should point out that good buildings simply should not be built in bad locations—something that those enamored of environmental rating systems for individual structures would do well to remember.
>
> Sometimes the response is easy: Just say no to new buildings on barrier islands or in wildfire-prone canyons. Sometimes it's not so simple: Planners confront very real moral, ethical, and public policy dilemmas in places like New Orleans, the Sacramento-San Joaquin River Delta, or known high-hazard zones of Florida.
>
> The fact is that existing hazard mitigation and disaster policies are woefully inadequate at a time when new climate change data and other new realities redefine our future.

Accomplishing the "no adverse impact" objective—particularly in a postdisaster situation—is not simple. No single agency or program exists that effectively addresses all the diverse needs in areas impacted by repeated floods and other natural disasters. The menu of assistance programs is vast and difficult to understand in the aftermath of a disaster. But if all of us work together to develop creative strategies, we can turn a NAI vision into reality.

Often it is after a disaster that the mobilization to mitigate and improve disaster resiliency is the strongest. A quote from Confucius illustrates the point: "By three

methods we may learn wisdom: first, by reflection which is noblest; second, by imitation, which is the easiest; and third, by experience, which is the bitterest."

Lessons learned by experience are "the bitterest." They also offer a strong motivation. There are enough examples of disaster impacts and successful mitigation efforts that only a little reflection is needed for individuals and communities to set the goal of improving safety and saving lives.

A disaster's impact is influenced by the number and location of residents, environment, architecture, infrastructure, emergency preparedness and response, and numerous other factors. Since impacts have numerous sources, strategies to mitigate must also draw on numerous sources. This is where "The Patchwork Quilt" concept is helpful. This concept is based on the American idea that scraps of "this and that" can be turned into a useful, warm, valuable object by people who possess a vision of the final product. A variety of grants, technical assistance, training programs, and other resources may be sewn together from different agencies to create The Patchwork Quilt that improves the ability of individuals and communities to mitigate and recovery from disaster.

The Quilt

The Patchwork Quilt—A Creative Strategy for Safe and Long Term Post-Disaster Rebuilding is a paper and accompanying workshop elaborating on this concept of piecework and cooperation. It provides descriptions of numerous agencies and programs that can contribute to individual or community mitigation and recovery strategies. The paper guides readers through principles that will assist in the success of their strategies; the importance of posterity, collaboration, and persistence are emphasized as common sense principles leading to success. The steps in creating a patchwork quilt include identifying leaders—or quilters—to champion the process, gaining technical assistance to create a strong pattern, writing a hazard mitigation plan, using a variety of programs when selecting fabric, and sewing it all together to take action.

The Patchwork Quilt paper and workshop are frequently updated to reflect new and newly discovered programs. It's based on a concept Ed Thomas developed while serving as the president's federal coordinating officer in Iowa following the Great Midwest Floods of 1993. In 1994, Thomas authored an article with Barbara Yagerman of the Federal Emergency Management Agency that was published by the Association of State Floodplain Managers. In 2008, Thomas and Sarah Bowen completed a comprehensive update of the article with financial assistance from the Michael Baker Corporation.

Since the 2008 update, the paper and workshop have been presented at numerous conferences and events including. The paper and an accompanying PowerPoint workshop presentation are available on line at **www.floods.org/PDF/Patchwork_Quilt/Patchwork_Quilt_Floodproofing_Conference_10908.pdf**

Successful safe development and redevelopment requires the cooperation of everyone affected. It can be as simple as landscaping, elevation, or wet or dry floodproofing, or as complex as relocation, demolition/reconstruction, acquisition/relocation, or some sort of selective voluntary buy-out program for a neighborhood or even an entire community.

Conclusion

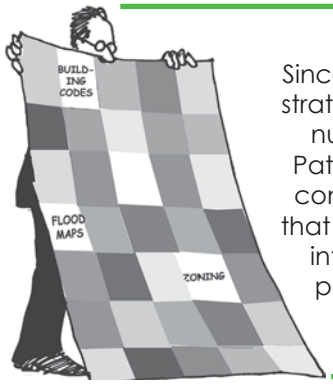
The nation has come a long way in its understanding of how best to deal with the damage we humans cause to each other, the environment, and the taxpayer by improper building and rebuilding in hazardous locations. We no longer require the insane concept of "rebuild to pre-disaster conditions." Instead we can adopt a Patchwork Quilt system of assistance with which local and regional governments can encourage—and even require—safe and sustainable development.

We know the best possible mitigation is properly and safely designing and building in a "No Adverse Impact" manner. Some FEMA-sponsored studies are available which support this notion, yet there is an opportunity for additional research and documentation in this area.

Sarah Bowen, sbowen@mbakercorp.com, Michael Baker Jr., Inc.
Edward A. Thomas, ethomas@mbakercorp.com, Michael Baker Jr., Inc.
With contributions from **Jennifer K. Dunn**, jennifer.k.dunn@usace.army.mil, U.S. Army Corps of Engineers

This article sets forth the personal views of the authors, and does not necessarily represent the views of any agency, company or organization. The affiliation of the authors is indicated for identification purposes only.

(Please also see "Planners Meet 'No Adverse Impact,'" page ten)



Since impacts have numerous sources, strategies to mitigate must also draw on numerous sources. This is where 'The Patchwork Quilt' concept is helpful. This concept is based on the American idea that scraps of 'this and that' can be turned into a useful, warm, valuable object by people who possess a vision of the final product.

The introduction goes well ...

Planners Meet 'No Adverse Impact'

Against a background of flooding in Georgia that claimed at least nine lives, Tom McDonald, vice-chair for the Georgia Association of Floodplain Management (GAFM), and I debuted "No Adverse Impact—the Do No Harm Principle" to a large audience of planners at the Georgia Planning Association's Fall Conference in Athens, Georgia, on September 30, 2009.

"No adverse impact" ensures the action of any community or property owner, public or private, does not adversely impact the property and rights of others. NAI changes the focus from building within the environment to "do no harm." It encourages local decision makers to see that future development impacts will be identified, considered on a watershed-wide basis, and mitigated (or at least accounted for) within a community-based plan. It is a comprehensive strategy for reducing flood losses.

In the June 2009 issue of *Planning*, American Planning Association Executive Director Paul Farmer talked about sustainable initiatives in which "planners should lead the way." In relation to hazards, he said planners must prepare "a plan for recovery based on the philosophy of better, but not necessarily bigger." He reminded the organization, "Health and safety were the bedrock beginnings of planning."

Since many of these safety decisions must be made in the face of objections from powerful interests, he also charged planners who were burdened with political pressures or fear of loss of employment over their decisions to "get out of the way and let someone take over who will provide the leadership our communities deserve."

Since many of these safety decisions must be made in the face of objections from powerful interests, Farmer also charged planners who were burdened with political pressures or fear of loss of employment over their decisions to 'get out of the way and let someone take over who will provide the leadership our communities deserve.'

NAI incorporates these bedrock principles and enables planners and managers to apply them in a concrete way. The approach encourages a "good neighbor policy," offering benefits such as reduction in future flood damages and related suffering. It protects the community's natural resources and amenities and provides for improved quality of life. NAI improves water quality and results in reductions in nonpoint source pollution impacts. It provides for green corridors, which also serve as additional areas for floodwater storage. No adverse impact provides for more sustainable growth within the community and may even increase property values near these green areas.

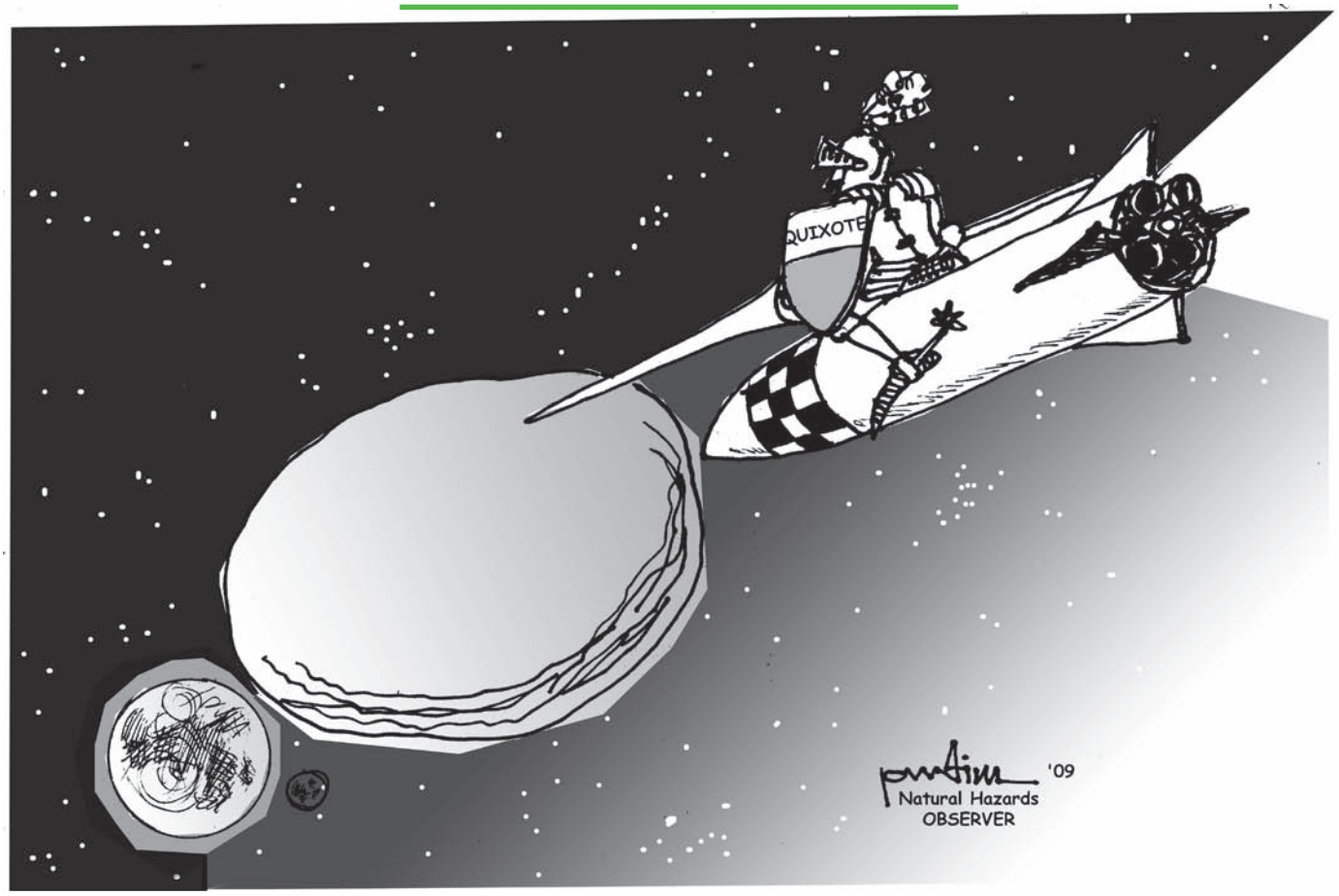
APA's Farmer embraced the philosophy when he wrote in the July 2009 issue of *Planning*, "Where one builds is just as important as what one builds and how one builds. It's time now for planners to boldly take the lead … they should point out the good buildings simply should not be built in bad locations."

As Ed Thomas and coauthors write in this issue of the *Observer*, "Once a disaster occurs, we must look for solutions in which humans adapt to natural processes." McDonald and I emphasized NAI planning strategies to reduce flood losses. Legal research by the Association of State Floodplain Managers found communities were most apt to have to pay in a court action when development they permitted caused damage to others—not when they denied a permit because it might cause damage to others. Flood damage is much easier to predict today than it was a number of years ago because of advancements in hydraulic and hydrologic technologies.

We also discussed how tougher regulatory standards could be incorporated into current ordinances. Finally, the legality of those tougher standards was presented, along with the fact that the courts have broadly and consistently upheld performance-oriented floodplain regulations. Yet, according to APA's Farmer, "Planners confront very real moral, ethical, and public policy dilemmas … and local governments are generally unprepared to protect their citizens."

After Georgia's catastrophic flooding in September, ask the folks around Atlanta if we need to change how we are regulating development. As the floodwaters have finally receded, I'm pretty sure you'd hear a resounding "Yes!"

*—**Terri Turner,** chair, Georgia Association of Floodplain Management*



The Catastrophe We Can Prevent

Saving the Earth, One Asteroid at a Time

— Invited Comment

A near earth object is a comet or asteroid whose orbit brings it within potentially hazardous proximity to Earth. As of the middle of 2009, 6,292 NEOs had been discovered, according to the National Aeronautics and Space Administration's Jet Propulsion Laboratory (neo.jpl.nasa.gov/stats/).

Collisions of these large objects with earth are rare, but they do occur, sometimes with devastating consequences. Past collisions have played significant roles in shaping the planet's geological and biological history. The best-known is the impact event on the Yucatan Peninsula at the Cretaceous-Tertiary geological time boundary 65 million years ago when a 10-kilometer-diameter asteroid wiped out between 70 percent and 80 percent of all species—most famously the dinosaurs (Alvarez 1997).

In 1908, an asteroid fragment just 30 or 40 meters (98 to 130 feet) wide struck in Tunguska in Siberia, flattening 2,100 square kilometers (810 square miles) of forest (Chapman *in press*).

NASA's JPL says, "The most dangerous asteroids, capable of a global disaster, are extremely rare. The threshold size is believed to be 0.5 to one kilometer (in diameter). These bodies impact the Earth only once every 1,000 centuries on average. Comets in this size range are thought to impact even less frequently, perhaps once every 5,000 centuries or so."

Tunguska-like events may occur about every 300 years (Jones 2008). The NEO population includes some "potentially hazardous asteroids" which closely approach Earth and may pose a future collision hazard. One well-known asteroid hazard is Apophis, which is a little bigger than Yankee Stadium:

> For a few days around Christmas 2004, this 250- to 300-meter near-Earth asteroid was given an official probability… of about three percent of impacting Earth on April 13, 2029. The places on Earth that were at risk of being struck were central Europe, the Middle East, and populous regions in Asia such as the Ganges River valley. About a month later, radar echoes received by the Arecibo radar refined knowledge of Apophis' position and removed any chance of collision in 2029, although Apophis will still pass below the geosynchronous artificial satellites and will be visible to the unaided eye…. (There remains a 1-in-45,000 chance that Apophis will pass through a resonant-return "keyhole" in 2029, so that it impacts Earth on April 13, 2036.) (Chapman, forthcoming)

A "resonance keyhole" is a small region in space—in the case of Apophis about 600 meters (2,000 feet) across—in which gravity could alter the course of the asteroid to put it

(Please see NEO, page twelve)

NEO...

(Continued from page eleven)

on a collision course with Earth.

Such impacts will certainly happen in the future unless we prevent them. A cosmic impact will cause tsunamis, volcanic eruptions, and earthquakes, dramatically and quickly change the weather, and have many other effects, foreseeable and unforeseeable. The issue is not *if,* it's *when.* At the moment our detection capabilities are limited. Thus, an NEO that we aren't aware of could blindside us. As Apollo 9 astronaut Rusty Schweickart says, "We're driving around the solar system uninsured."

Not So Fast

If we are to do anything about this problem, detection must improve. So it will. Pan-STARRS (Panoramic Survey Telescope and Rapid Response System), on Mount Haleakala on Maui, saw first light in August 2007. It will usher in a new era in observational astronomy (Irion 2006). Some 300 scientists are lined up to take advantage of this new technology. Some will map the Milky Way and others will look for asteroids. The LSST (Large Synoptic Survey Telescope) will have 24 times more survey power than Pan-STARRS. Like its Hawaiian rival, this expensive project has broad scientific objectives, asteroid detection among them. Construction of LSST is expected to begin at Cerro Pachon, Chile, in 2011 and be operational by 2014. When completed, LSST will cover the entire available sky every four nights with a 3.2 billion pixel camera (Stone 2008).

In 2000, more than 1,272 NEOs had been identified. By 2007, the number had grown to 5,083. And after ten years of operation, LSST should have plotted rough orbits for 82 percent of the 20,000 NEOs larger than 140 meters in diameter. In 2005, the U.S. Congress ordered NASA to expand its search to detect 90 percent of these objects of at least 140 meters in diameter by 2020. A by-product of this activity will be the discovery of a large number of NEOs, some with the worrisome probability of striking Earth.

An open question is what astronomers, engineers, and politicians will do when several of these smaller NEOs pose an apparent collision threat. It's estimated that several NEOs per year will have a non-zero collision probability. As former astronaut and planetary scientist Tom Jones writes, "The effects of a one-kilometer asteroid strike on

Worst sci-fi movie ever?

How They Do It in Hollywood

The nuclear weapon option is probably the only asteroid deflection technique known to most people because of the 1998 movie *Armageddon,* starring Bruce Willis, Billy Bob Thornton, Ben Affleck, Liv Tyler and several other notables.

Scientists found a lot to dislike about the film, especially some scenes that treated the laws of physics as mere suggestions. Astronomer and science fiction writer Mike Brotherton called it the "worst science fiction movie ever!" (www.sfnovelists.com/2008/02/08/the-worst-science-fiction-movie-ever) because "There's not a minute of this movie that isn't an affront to science or common sense."

Nonetheless, the movie reached number one at the box office. If you were to ask the person-on-the-street what steps should be taken if an asteroid was aimed at the Earth, the response would almost certainly be, "Send Bruce Willis to nuke it."

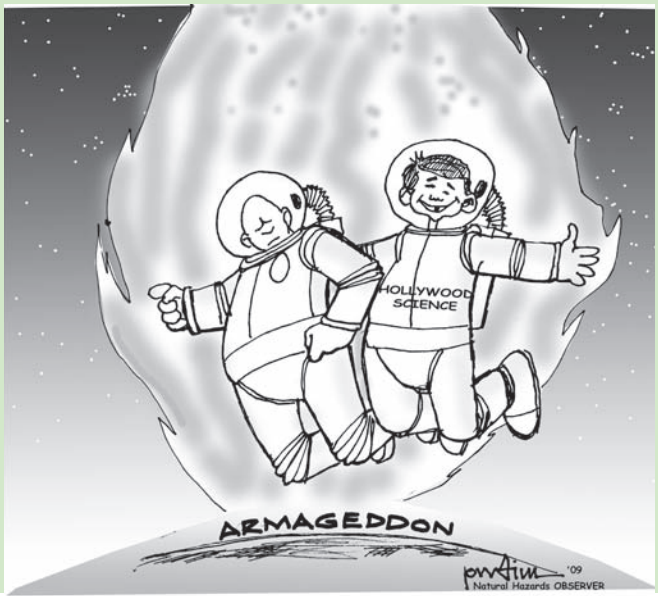
But nuclear weapons aren't the preferred method for dealing with a potential impact. In fact, because of the uncertainties involved—the asteroid might simply break into several smaller but still dangerous pieces—"I'd say forget that," Keith A. Holsapple, a professor at the University of Washington who studies the effects of simulated nuclear explosions, told the *New York Times* in 2003.

Quite a lot of creative thinking has gone into the problem, though none of the potential solutions have reached the operations stage.

For instance, a 1,000 kilometer-long (600 mile) tether could be attached to an asteroid, changing its center of mass, thus altering its course. This plan, devised by North Carolina State University aerospace engineer David French, would use Kevlar carbon nanotubes to construct the tether. But the problem of lifting so much material into space is unresolved.

Another suggestion is to paint one side of the threatening asteroid black. Under this hypothesis, the object would absorb photons on one side and emit them on the other. This heat radiation would force a change in direction over the long term. Getting so much paint into space might not be much simpler than a thousand kilometers of carbon nanotubes, however.

Other suggestions have included a "magnetically powered conveyor belt" that would hurl rock and dirt from the asteroid surface. Or small solar powered rockets attached on one side to gradually push the asteroid onto a new path.



today's fragile, interconnected human society would probably cause global climatic disruptions, widespread crop failures, and world famine" (Jones 2008).

The Only Preventable Natural Disaster

Unlike tsunamis, earthquakes, volcanic eruptions, hurricanes, and so on, we have the technology to prevent an asteroid strike. Several tools are available for deflection. The objective is to change the asteroid's speed so it arrives too early or too late to hit Earth.

How do we do this? The first step is to use a transponder-equipped spacecraft to determine the object's future orbit precisely, eliminating the uncertainty that surrounds impact calculations. If deflection is necessary, it is possible to use a "gravity tractor" spacecraft to hover near the asteroid and slightly change its velocity, if the required velocity change is small. Alternatively, if the required velocity change is large, it is possible to ram an incoming object with a high-speed projectile, transferring momentum and altering the object's velocity. A third solution, considered a last resort, is to use a nuclear explosion to vaporize the top layer of the NEO's bedrock, resulting in debris and gas nudging the asteroid off course. The first two solutions require years of planning and deployment. The third solution is unlikely to be needed except in cases of very late discovery of a large NEO. It is the only solution available if warning time is short.

The European Space Agency is looking at one part of the deflection problem. Its project, Don Quijote, is a mission concept addressing the projectile proposal. A non-threatening asteroid would be identified. A spacecraft would fly out to observe the asteroid for some period of time. A second spacecraft would then fly out and ram the asteroid while the first spacecraft continued to measure changes in the asteroid's trajectory. This program is as yet unfunded.

ESA's Don Quijote: A non-threatening asteroid would be identified. A spacecraft would fly out to observe the asteroid for some period of time. A second spacecraft would then fly out and ram the asteroid while the first spacecraft continued to measure changes in the asteroid's trajectory.

Compared to many other of the planet's pressing problems—like world peace, world hunger, or global climate change—the solution to the NEO problem is clear and relatively inexpensive. The fact that it seems not to be high on the world's radar screen is surprising, since it has the potential to collapse civilizations or cause severe disruptions to society.

Some Barriers to a Solution

There are a number of significant barriers. The first and possibly the largest is that no national or international agency has been charged with preparing for asteroid deflection or with mitigating the effects of an asteroid Earth strike. And no local or national emergency response plan or training includes any planning about near earth objects.

If an international agency were charged with attending to this problem, the myriad decisions to be made are mind boggling. The large economic and behavioral science literature on decision making attests to the fact that we really don't know how such decisions can or should be made. Rational models suggest one approach, behavioral models another, garbage can models yet another, and naturalistic approaches still another.

Assuming an international agency is charged with addressing both the deflection and mitigation issues, it must necessarily farm part of the problem out to agencies in many nations. To address deflection, manufacturers of launch vehicles, gravity tractors, and so on would have to work together. They will have to work in turn with space experts. Space experts will have to work with local and international political figures. In the mitigation area, emergency service planners and trainers will have to work across nations and cultures. As an example of the near impossibility of this, today in the wildland fire arena in Europe, NATO wants cross-national responsibilities to be taken over by the European Community. It's difficult to imagine France working with Germany—much less Greece—on this, a more immediate, less complex issue than asteroid collisions.

Predicting an NEO impact site is another barrier. The orbit of an NEO with a probability of striking Earth is imperfectly known due to tracking limitations. The set of possible impact points appears on Earth's surface as a corridor which is only a few miles wide, but passes over many countries. We may not know the actual impact point with precision until long after a decision to deflect must be made.

Any deflection attempt must necessarily take one or more countries out of the risk corridor while simultaneously exposing other countries. It's difficult to imagine countries agreeing to be placed in the risk zone without some international process for making that decision.

Existing space law also provides challenges to problem solution. That body of law speaks more generally to the peaceful uses of outer space than it does specifically to such issues as the legal dimensions of detecting operations, the peaceful uses of nuclear explosion, and the issue of liability for damages. For example, the United Nations General Assembly Resolution of December 13, 1963 says, "The Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space demand that the exploration and use of outer space be carried on for the benefit and interest of all mankind "(Lichem 2009). Such broad provisions contain no guidelines for how NEO deflection activities might be approved or executed.

Challenges also occur at the level of the individual. One issue is our well-known inability to think and act for the long term. It is unlikely that world or local leaders will prefer the solution of a low-probability, long-term problem to a high-probability, short-term one. Citizen support depends on how well leaders can fix imminent problems before the next election or the next uprising. Closely associated with this problem is the fact that we think probabilistically rather than possibilistically (Clarke 2006). The probability of an asteroid strike is low but it is possible. Its consequences would be far worse than the normal hu-

(Please see NEO, page fourteen)

NEO...

(Continued from page thirteen)

man understanding of disaster. If we think possibilistically we will come up with different solutions than if we think probabilistically.

In an interesting paper on the asteroid impact problem, Paul Slovic (2007) reminds us that the possibility of natural disasters elicits far less concern from people than the possibility of human-caused disasters. Perceptions are heightened, then quickly drop after the occurrence of a disaster. Slovic doubts that any meaningful progress can be made toward understanding perceptions of risk from an asteroid impact in the absence of a credible imminent threat. A more achievable objective, he thinks, is to create realistic appraisals of risk. We are susceptible, Slovic notes, to bounded rationality and the availability heuristic. That is, we never have all the information we need to make decisions, and frequent or more visible events are easier to recall than infrequent or less visible events.

Some Contributors to a Solution

What if a credible international agency combined with national space agencies convinced the world's governments and populations of the necessity to think about and act upon this issue—even while we think it is still not imminent? What if possibilistic thinking worked? The only international agency one could appeal to is the United Nations. The United Nations or its appointees would then have to work in conjunction with national space agencies. This problem is tractable because there are only 13 spacefaring nations (not including those able to launch suborbital flights) and only three of those are capable of manned space flight. Spacefarers themselves are rather an international lot (see, for instance, **www.space-explorers.org**). Many of them know each other and they probably have a good deal of cultural similarity.

The risk of asteroid impact on Earth is demonstrable, and the potential consequences are catastrophic. The probability of impact is small but not trivial.

Another contributor to a solution is that asteroids can potentially contribute to the global economy. Sonter (1988) reports that mining and metallurgical options exist that are robust and sound. Further, he says, asteroid mining is very close to technical and economic feasibility. Potentially commercial products from asteroids include nickel, iron, silicates, platinum group metals, water, bituminous hydrocarbons, and trapped or frozen gases. Andres Galvez with European Space Agency's Strategic Studies and Institutional Matters Office says one reason the ESA is interested in the asteroid problem is because of the economic potential of asteroid exploration and exploitation. Some near earth asteroids may be defunct comets with high water content that could eventually be economical to harvest.

Finally, at a more individual level, the risk of asteroid impact on Earth is demonstrable, and the potential consequences are catastrophic. The robability of impact is small but not trivial. Chapman estimates the odds of an individual dying in an NEO impact are about the same as dying in a plane crash. Under these circumstances thinking in possibilistic terms may get us further than thinking in probabilistic terms. Unless action is taken the risks will be uncontrolled.

Is There Any Progress?

Yes. In 2005, the Association of Space Explorers, an international professional and educational organization whose members are space farers from 33 nations, approved an open letter asking the world to take action to prevent future asteroid and comet collisions with Earth. ASE formed a committee to further this activity. In 2007, the organization appointed an international committee of diplomats, scientists, engineers, and legal experts, called the Panel on Asteroid Threat Mitigation. The panel convened to study the scope of the NEO hazard and to make recommendations on processes for moving forward. In 2008, the panel finalized and adopted its document, which ASE submitted it to the United Nations (Schweickart et al. 2008).

The report makes five major recommendations:

- It declares international preparations—not unilateral action by a single spacefaring country—as the only way society can counter impact threats.
- It says a global, coordinated response to NEO threats includes the execution of three functions: information gathering, analysis, and warning; mission planning and operations; and executive oversight.
- It calls for the international community to create and recognize an NEO information, analysis, and warning network. The network is to include a web of ground- or space-based telescopes for detecting and tracking NEOs. The network should then analyze NEO orbits to identify potential impacts. And the network should establish criteria for issuing public NEO impact warnings.
- It calls for a mission planning and operations group to draw from the expertise of the world's spacefaring nations to determine the best means of mounting a successful deflection campaign.
- It calls on the United Nations to oversee these functions through an intergovernmental Mission Authorization and Oversight Group. MOAG would execute any deflection campaign.

The ASE report was formally submitted to both the UN Scientific and Technical Subcommittee and the full committee of the Peaceful Uses of Outer Space committee of the UN at their 2009 sessions. It is currently being integrated into formal UN documents as part of a three-year work plan in anticipation of being transmitted to the UN General Assembly. Astronaut Tom Jones reports that at least five years of work lie ahead, and that the ASE continues to use its members' international influence to advise the United Nations and policy makers of the necessity of creating a practical decision making framework.

We know the NEO hazard is a potentially lethal but

solvable problem. Failure to address it seems criminal in light of the degree of potential catastrophe and the solution's relatively modest cost. A deflection mission might cost less than $500 million, while it is estimated that an impact by an NEO such as Apophis would result in more than $400 billion in damage. As we know from other catastrophes, the cost of prevention is always lower than the cost of cleanup. Then, too, as someone said, "Gee, if we could solve this problem we might have a template for addressing world hunger, the H1N1 flu, and world peace."

Karlene H. Roberts, karlene@haas.berkeley.edu
Haas School of Business
University of California, Berkeley

I want to thank astronauts Russell Schweickart and Thomas D. Jones who contributed much to this piece.

References

Alvarez, W. 1997. *T. Rex and the Crater of Doom*. Princeton: Princeton University Press.

Chapman, C.R. Forthcoming. Meteroids, meteors, and near-Earth objects. *Earth, Moon, and Planets.*

Clarke, L. 2006. *Worst Cases*. Chicago: University of Chicago Press.

Irion, R. 2006. A Hawaiian upstart prepares to monitor the starry heavens. *Science* 312: 840-841.

Jones, T. 2008. Asteroid deflection: Planning for the inevitable. *Aerospace America* October: 14-17.

Lichem, W.A. 2009. International legal and institutional implications of asteroid threat mitigation operations. Paper presented at the Conference on Near-Earth Objects: Risks, Responsibilities and Opportunities—Legal Aspects, College of Law, University of Nebraska, Lincoln, April 23-24.

Schweickart, R., T. Jones, F. von der Dunk, and S. Camaro-Lara. 2008. *Asteroid Threats: A Call for Global Response*. Association of Space Explorers.

Slovic, P. 2007. Perception of risk and asteroid impact. In *Comet Impacts and Human Society*. ed. P.T. Bobrowsky and H. Rickman. 369-381. New York: Springer.

Sonter, M. 1998. The technical feasibility of mining the near-Earth asteroids. Presentation to the 49th IAF Congress, Melbourne, Australia, Sept. 28-Oct. 2.

Stone, R. 2008. Preparing for doomsday. *Science* 319: 1326-1329.

Extreme Heat — Invited Comment

Australian Fire Policy May Emphasize 'Go' Over 'Stay-and-Defend'

When the Royal Commission of Enquiry was established following the Australian state of Victoria's bushfire disaster of February 7 this year, it was instructed to deliver an interim report in time for the next fire season. The 2009 Victorian Bushfires Royal Commission—Interim Report *was delivered on Monday, August 17, 2009. The looming fire season—predicted to be as bad or worse than the last—gave it an increased urgency.*

State Initiative, National Implications

Although the enquiry is a Victorian initiative with no authority elsewhere in Australia, it has become imbued with national significance.

A piece in the May 2009 *Natural Hazards Observer* describes the fire and immediate impacts. Saturday, February 7, 2009, was the worst fire day in Victoria's history. The conditions had been predicted, but were significantly worse than expected with record high temperatures, very strong winds, and low humidity. This came on top of the state's hottest and longest drought, a record dry spell, and the most severe heat wave on record the week before. The fires left 173 dead and destroyed well over 2000 homes and businesses. The points from the *Interim Report* should be read with these extreme weather conditions in mind.

As the Royal Commission's hearings had been conducted in public with much analysis and commentary in mainstream media and by commentators with varying expertise, the contents were generally anticipated. Early on, the legal team assisting the commission made it clear that they would scrutinize the "Stay-or-Go" approach and the information and warnings needed to make it effective. (There were some recommendations on operational matters as well. See www.royalcommission.vic.gov.au). Post-fire research

(Please see Fires, page sixteen)

Fires...

(Continued from page thirteen)

shows many people did not receive warnings or—while conscious that there was a fire risk—were unaware of the threat to themselves. While some were prepared to defend their properties, many had made only limited preparations regardless of whether they intended to stay or leave early. Some had simply not thought about it, focusing instead on coping with the extreme heat.

The commission states the assumptions underlying its recommendations for warnings:

> The community expects and depends on detailed and high quality information prior to, during, and after bushfires. The community is also entitled to receive timely and accurate bushfire warnings whenever possible.

The report finds that on February 7 warnings were "often delayed, which meant that many people were not warned at all" or did not have enough time to respond. Also, in an understatement, the report finds that "the sources of information … did not cope well with the level of demand." There was also difficulty getting onto the relevant Web sites and about 80 per cent of the calls to the Victorian Bushfire Information Line were unanswered. The great majority of 000 calls (911 in the United States) also went unanswered.

Not surprisingly, the report recommends that public information and warnings be improved, essentially through a combination of best practice in message design and the use of a variety of locally appropriate media (e.g., sirens) along with the implementation of a national telephone-based automatic warning system, among other things. The commission found that warnings could be improved by more locally relevant material on timing, location, and severity and that they should be clear about the risk to life. These recommendations highlight the potential tensions between locally specific messages, as indicated by best practice risk communication, and pressures for national consistency. In Australia, fire risk predictions are predicated on a fire danger rating index based on predicted weather conditions. This index proved to be inadequate. Improvements were recommended. Critics should bear in mind, however, that the index was not originally designed for public warnings.

Warning Uncertainties

Some fire agency staff argue that with hundreds of incidents—as occurred on Saturday, February 7—they cannot provide precise detail for all fires. In any case, it's often impossible to predict fire travel and arrival times, especially with massive spotting of up to 30 kilometers (18 miles) ahead of the fire front, and major local topography and wind effects. They also point out that they do not have a legal responsibility for this task—something the commission suggests should be rectified. There is also an argument about whether encouraging people to rely on warnings—given these uncertainties—would increase the risk rather than increase safety. There is agreement that fires are very difficult to predict, but critics point to other issues: the apparently low priority given to public warnings on Saturday, February 7; the deliberate blocking of warnings in one area; internal communication problems resulting in delays, which meant key fire prediction information was not used; issues with Web site overload and currency; and so on.

The emphasis with 'Stay-or-Go' has shifted from staying to leaving early, with more emphasis on defendable space and having appropriate equipment. Those planning to stay will be encouraged to be prepared both physically and emotionally.

In the debate over "Stay-or-Go," it has generally been overlooked that many people successfully defended their homes during the fires even in the worst areas—although in the worst areas defense was very difficult. But many people died inside houses as well and this has led to a re-examination of the policy. This will go on for some time because the fatality data remains in the hands of the police while their investigations continue.

The commission found no support for compulsory mass evacuation (not permitted under current Victorian law). However it said:

> Unquestionably the safest course is always to leave early. To stay may still be an appropriate option for some, particularly in less dangerous bushfires … To stay requires considerable effort to prepare a property and make it defendable. But some properties … will not be defendable in extremely dangerous bushfires. To defend a property successfully requires considerable physical effort and emotional strain … It is a task for those who are physically fit and mentally strong. It is not a place for children, older people, or the infirm.
>
> For those who choose to stay and defend, the risks should be spelt out more plainly, including the risk of death … [and] that not all houses are defendable … and contingencies need to be considered in case the plan to stay and defend fails.

Clear advice should be provided to individual households.

Stay-or-Go

The emphasis with "Stay-or-Go" has shifted from staying to leaving early, with more emphasis on defendable space and having appropriate equipment. Those planning to stay will be encouraged to be prepared both physically and emotionally. Official advice is to be connected with a new fire danger index. At the highest fire danger level, the advice will be to leave.

Fire agencies argue many of these recommendations restate what they have been trying to do. In Australia, concern over legal liability has limited the advice provided to individual householders and has meant that community level rehearsals do not occur. There is a potential problem

with leaving if that leads to many people leaving late and risking being caught out in the open as the fire front passes. It is historic evidence about the dangers of departure that has helped underpin the "stay" advice.

There has been public support for "fire refuges" and the commission wants the concept of fire refuges to receive more attention, including "the use of existing venues (including car parks, amenities blocks, and dam walls) and open spaces." This would be in the context of township protection plans—an existing system. The state government has endorsed this approach, but fire agencies remain unconvinced.

It may seem surprising, but there was "no state-wide policy requiring government schools to evacuate, close, or use a fire refuge in event of fire." But many local volunteer fire brigades had worked on procedures for school safety. In any case, there is no general agreement that children will be safer away from schools and other child care facilities, since these are relatively easy to plan for and to protect.

The formal legal process of the official enquiry and its report have dominated the media and captured political attention. However, there is also much activity elsewhere. As with most major disasters in Australia, there is a high level of political involvement. Agencies with fire-related responsibilities have also individually and collectively been examining their approaches. Political involvement may be frustrating and can undermine evidence-based policy. But in the present case there is political recognition that changes are needed and a readiness to embrace at least some of that change. This can also result in knee-jerk reactions that do not actually translate into risk reduction.

The most severe category—'extreme'—occupied half the scale from 50 to 100. Given that the February 7 fires occurred with much more severe fire weather of around 170 on the index, it had clearly become inadequate.

Fire Danger Index

Under the leadership of AFAC (Australian Fire and Emergency Services Council), fire agencies across Australia have been involved in revisiting their approach to warnings and the associated community safety messages. This has resulted in rapid and significant national improvement—in the context of awareness of what was likely to be recommended and of the political desire for action. For example, the AFAC process has resulted in agreement on additional fire weather severity categories in the Fire Danger Index (or rating scale). This scale went from one to 100 with five categories, from low fire danger to extreme fire danger.

The most severe category—"extreme"—occupied half the scale from 50 to 100. Given that the February 7 fires occurred with much more severe fire weather of around 170 on the index (with many days following the fires rating even higher), the index had clearly become inadequate. The old category of "extreme" has now been replaced with two categories, with a new category for conditions of 100-plus. Nationally consistent warning messages linked to these categories have been developed and will be tested this fire season.

The new messages will state that the safest option is to leave when the index is over 100. This reflects recent experience and the reality that the new national bushfire related building standard does not consider conditions over 100.

The Australian position may be moving toward one where more emphasis is given to leaving than staying.

There has been much criticism by some arguing that the Royal Commission has not taken evidence from those affected, has not made recommendations on fuel reduction burning, land-use planning, or a raft of other issues. But the critics ignore the fact that the report is an interim one, and that the commission had very limited time to establish itself, conduct hearings, and write its report. Before writing the *Interim Report*, it held 26 community meetings attended by over 1,000 people, received some 1,200 written submissions and held weeks of public hearings—all within a few months. The Royal Commission is now conducting a new series of hearings in the fire affected areas and will deal with fuel management, planning, and so on in its final report due mid-2010.

John Handmer, john.handmer@rmit.edu.au, Bushfire CRC, RMIT University, Melbourne

Quick Response Grant Deadline Looms

2010 Quick Response Research Program grant proposals are due to the Natural Hazards Center by November 15, 2009. Please go to www.colorado.edu/hazards/research/qr/guidelines.html for application information.

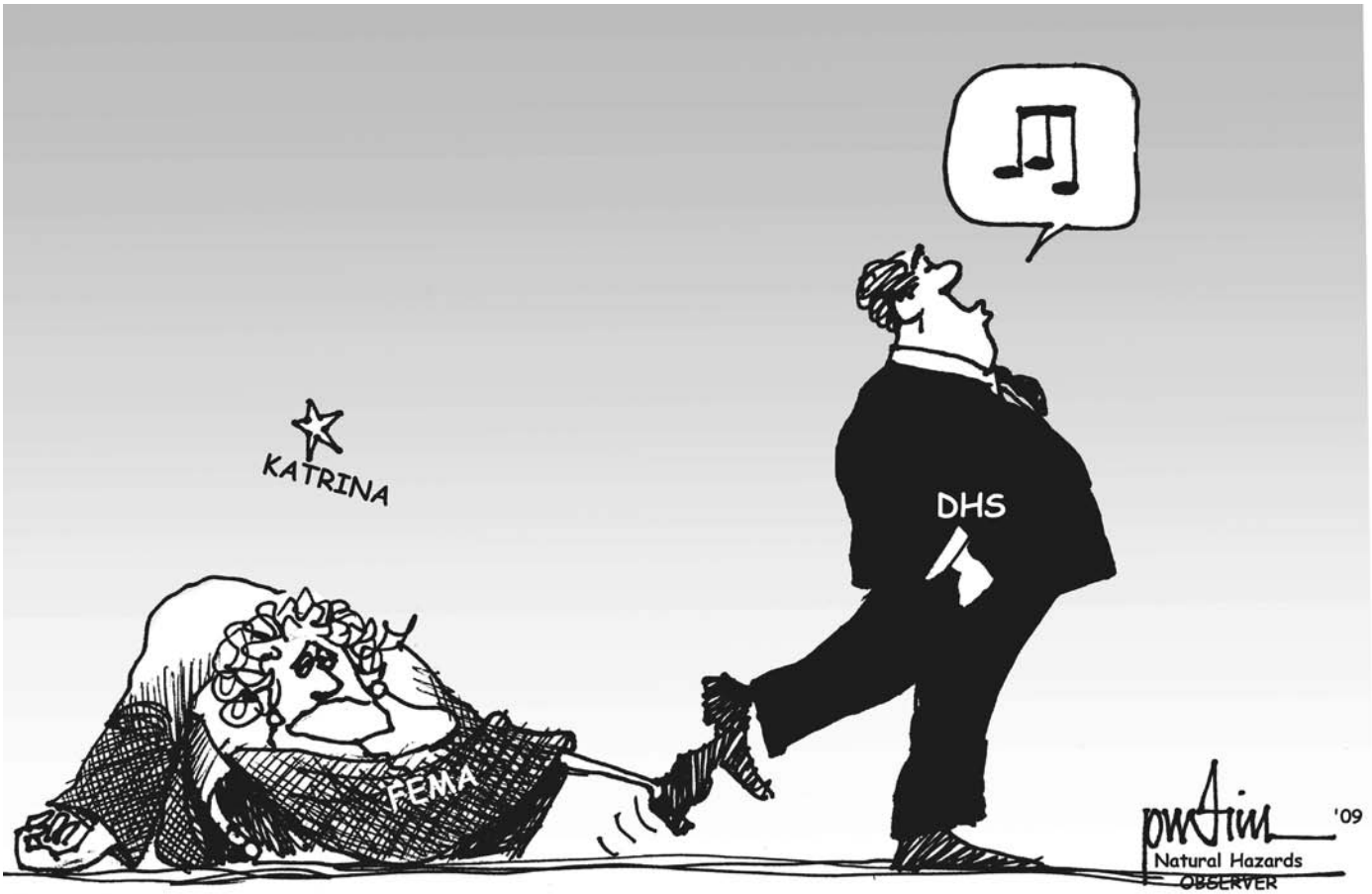
2010 Preferred Topics

Although all proposals will be considered, the Natural Hazards Center has identified areas where it would like to see the literature developed. For the 2010 Quick Response year, proposals that engage one or more of the following topics or classes of disasters will be given extra weight:

- Legal process, especially in relation to response, access, and civil and human rights;
- Journalistic practices and their impacts;
- Disadvantaged populations, minorities, or children;
- Vital, cultural, and historic record preservation;
- Mandatory evacuations, including compliance and repopulation;
- Interagency and intergovernmental coordination, especially in relation to preexisting disaster plans;
- Mass mortality;
- Primary public health incidents, e.g., epidemics, large-scale environmental contamination, etc.;
- Hospital and health system response;
- Disruptions to food production and producing communities;
- Application of or conflicts between ethical standards or frameworks; and
- Debris removal and disposal.

Advancing FEMA in the Post-9/11 World

— Invited Comment



It's been eight years since the September 11 attacks, and four years since Hurricane Katrina struck the Gulf Coast. Both of these disasters generated so-called "lessons learned." The September 11 attacks taught us that "homeland security," broadly defined, should be combined into a single federal department. The creation of this agency has done little to enhance public safety, but its creation did eviscerate the Federal Emergency Management Agency, quickly reducing the agency from one of the best in the federal government to one of the most maligned (Morris 2006).

While some of the "lessons" of September 11 and Katrina are either incorrect or unlearned, we can say that Katrina did teach one important thing: the evisceration of FEMA and hasty post-September 11 policy changes made the nation less prepared to address any catastrophe, natural or not. The homeland security system—the color coded "threat advisory system," the voluminous National Response Plan, the "security theater" of airport screenings, and the unwieldy chain of command in the Department of Homeland Security—was found wanting during and after Katrina. All these elements are under scrutiny in the new administration.

The response to and the recovery from Hurricane Katrina has been slow. It is worthwhile to step back and ask where we are, how we got to this point, and where post-Katrina reforms. The appointment of Craig Fugate to lead FEMA will take disaster policy in the future.

After September 11

Let's start with this simple premise: there was nothing about the September 11 attacks suggesting there was anything significantly wrong with FEMA and the system of response available on that day. Local, state, and federal responders by all accounts did remarkable work under very trying circumstances. The most notable problem—communications systems that were not interoperable—had been known since at least the 1993 World Trade Center bombing. In any case, the issues were operational, not broad policy problems.

This leads us to another premise: one can connect the September 11 attacks, the creation of the Department of Homeland Security, and the decline of FEMA directly to the federal failures in Hurricane Katrina (Sylves 2006). September 11 greatly altered federal attitudes toward emergency management. State and local emergency managers and academic researchers across many disciplines were ignored in favor of the untested "expertise" of federal law enforcement officials, military officers, and contractors, many of whom have little experience in disaster or emergency management.

What's more troubling is the idea that the policies enacted after September 11 were designed to respond to a catastrophic event at Katrina's scale (Cooper and Block 2006). These systems failed in large part because of poor decision making between September 11 and Katrina. At the same time, the creation of DHS did not bring together the agencies most responsible for counterterrorism. The CIA, the FBI, and the various intelligence agencies in the Department of Defense all remained organizationally autonomous (Harris 2003), as subject to turf conflicts and information hoarding as they were before September 11. When DHS met its first real test—Hurricane Katrina—it failed (Glasser and Grunwald 2005).

The civil defense and quasi-military tone of post 9/11 emergency management discourse was dominated by rhetoric and behaviors similar to those of the Cold War-era military industrial complex (Monahan and Beaumont 2006). Lip service was given to "all hazards" but, as feared by many long-serving emergency managers, the tenor of the conversation revealed that terrorism was the most important threat, starting with the act that created DHS itself (Morris 2006).

Fugate has said we need to change our vocabulary in emergency management. People who are alive after a disaster are not 'victims,' they are 'survivors,' with the ability and resources to respond to and recover from disasters.

The Lessons of Katrina and Policy Changes

What we learned from Katrina is that the overall system for managing catastrophic disasters, to the extent such a system existed, failed badly. It is difficult to claim that a system really did exist—the post-9/11 National Response Plan was months old when Katrina hit, and, in any case, implementation would be difficult because of the lack of capacity at FEMA, as well as considerable confusion among federal, state, and local actors. What was most surprising to many observers was the fact that the system performed as poorly as it did despite the fact that much of the emergency management bureaucracy created after September 11 was designed for catastrophes (Cooper and Block 2006).

The many failures in Hurricane Katrina triggered a number of policy changes. Congress enacted the Post-Katrina Emergency Management Reform Act of 2006, which required that the administrator of FEMA be a professional emergency manager. No longer would the FEMA director be the Under Secretary of Homeland Security for Emergency Preparedness and Response, a title which suggested much more responsibility for preparedness than FEMA really had. The focus on response once again placed FEMA in the position of being a federal first responder, even though FEMA was never designed for this role.

The Post-Katrina Act also made it clear the FEMA administrator could provide Congress with information about emergency management after notifying the DHS Secretary. The FEMA administrator would not need permission to speak to Congress or the President. FEMA will remain in DHS, but FEMA's location may matter less than the restoration of most of its autonomy. FEMA is again free to build its brand the way that James Lee Witt successfully did in the 1990s. This is not to say that all of FEMA's actions were universally successful. But by the late '90s, FEMA's reputation and its autonomy were one of its most important assets (Roberts 2006).

Enter Craig Fugate

Into this challenging environment stepped FEMA Administrator Craig Fugate, the former emergency management chief in Florida. He was praised for his management of the 2004 Florida hurricane season, which saw four storms cross the state. Fugate's appointment was particularly well received by the research and practice community. Fugate has frequently shared his vision and goals for FEMA. Many of these will be familiar, as they are the very things that we have advocated in our own research and practice. The new FEMA administrator appears to understand the importance of these ideas at the outset.

Fugate has said we need to change our vocabulary in emergency management. People who are alive after a disaster are not "victims," they are "survivors," with the ability and resources to respond to and recover from disasters. Acknowledging the findings of many sociologists, Fugate noted we must harness the power of "spontaneous volunteers" and emergent groups in disaster response and recovery (see also Rodriguez, Trainor, and Quarantelli 2006).

Fugate has embraced social media and the value of citizen-created information, a change from attitudes in DHS and in FEMA that suggested that the public were liabilities to be managed, not assets to draw upon in disasters. Along these lines, Fugate noted that emergency managers should communicate with the public in plain English. And while Fugate notes the importance of the public in helping to prepare for and respond to disasters, he also notes that the public, through its decisions, often creates risk, such as by supporting development in hazardous flood plains and coastal areas (see also Burby 2006) .

Improve Mitigation

Like James Lee Witt before him, Fugate supports improved mitigation—indeed, Fugate said that mitigation may be the most important aspect of FEMA's work. Mitigation appears set to reemerge on FEMA's agenda after many years of inattention. Fugate said in his remarks at the 2009 Annual Hazards Workshop in Broomfield, Colorado, that much mitigation is "nickel and dime" activity that has limited effectiveness, and that it does not affect building codes, which can codify serious mitigation techniques. Fugate was very clear that the assessment process for public assistance and hazard mitigation funding for local governments should be streamlined so that public assistance funding can yield mitigation benefits. Projects shouldn't be reviewed by FEMA twice—once for public assistance funding and then again for mitigation funding. Hurricane Katrina, in particular, has illustrated the wastefulness of the current approach.

At his confirmation hearing, Fugate said, "We also have a responsibility as a government to make sure that our plans for response and recovery, to the extent possible, address the needs of the most vulnerable residents," including

(Please see FEMA, page twenty)

FEMA...

(Continued from page nineteen)

the elderly, the poor, and children. Taking up this theme, Fugate argued that FEMA can do better by encouraging the public sector to get up and running soon after a disaster so goods are available as soon as possible. This would relieve FEMA from having to create supply chains. It would also free up resources to help the most isolated survivors.

Finally, Fugate seems to have accepted the political and organizational environment in which FEMA is located. He appears to believe he can work with it. He did not support removing FEMA from DHS, although his answer to Senate Homeland Security Committee Chairman Sen. Joseph Lieberman's (I-Conn.) question at his confirmation hearing was both politically savvy and pragmatic—no nominee was likely to cross Senator Lieberman on this issue. Fugate said, "I believe that the next confirmed administrator of FEMA needs to be focused on the next disaster. And being focused on that means that debate, as far as I am concerned, is over."

Disasters Are Political Events

Now that Fugate has taken the reins of a more autonomous FEMA, can he achieve managerial and policy goals in this structure? I believe he can, but this will depend on several factors. First, we cannot ignore the fact that disasters are by their nature political events—they trigger intense discussions over "who gets what" from government. We know that disasters are an opportunity for distributive spending, or what we generally call "pork" (see also Platt 1999; May and Williams 1986).

While spending on aid may be inevitable, there are better ways to allocate mitigation and other grant funds. Achieving Fugate's goals will depend on the extent to which the DHS leadership takes seriously its statutory requirement under the Post-Katrina Act to respect FEMA's autonomy. Secretary Napolitano's statements so far suggest that DHS is not particularly interested in usurping FEMA's statutory role.

FEMA must perform well in the next highly visible natural disaster, both to solidify its autonomy and to restore its reputation. This does not mean that FEMA must be the cavalry. Rather than command-and-control, Fugate has said FEMA is part of a team, not at the top of an organizational chart.

In the end, the homeland security structure created after September 11 has, from the emergency management perspective, been substantially corrected by the Post-Katrina Act. But the new FEMA administrator still needs to work in a challenging policy environment, in which disaster relief, when needed, is quick in coming, where serious mitigation efforts are often resisted by developers, and where members of Congress use disasters as opportunities for gathering federal largess. Unfortunately, the system will not be tested until we experience another major—or catastrophic—terrorist attack or natural disaster, at which point Fugate will need to ponder new "lessons" and new ways of responding to these lessons. His job is made more challenging by the confusion created by the September 11 attacks and the widespread failure after Hurricane Katrina.

Thomas A. Birkland, tom.birkland@gmail.com
North Carolina State University

References

Burby, Raymond J. 2006. Hurricane Katrina and the paradoxes of government disaster policy: Bringing about wise governmental decisions for hazardous areas. *The Annals of the American Academy of Political and Social Science* 604 (1): 171-191.

Cooper, Christopher, and Robert Block. 2006. *Disaster: Hurricane Katrina and the failure of Homeland Security.* New York: Times Books.

Glasser, Susan B., and Michael Grunwald. 2005. Department's mission was undermined from start. *Washington Post*, December 22, A1. www.washingtonpost.com/wp-dyn/content/article/2005/12/21/AR2005122102327.html.

Harris, Shane. 2003. Homeland security cedes intelligence role, *Government Executive*, February 26. www.govexec.com/story_page_pf.cfm?articleid=24997&printerfriendlyvers=1.

May, Peter J., and Walter Williams. 1986. *Disaster Policy Implementation : Managing Programs Under Shared Governance.* New York: Plenum Press.

Morris, John C. 2006. Whither FEMA? Hurricane Katrina and FEMA's response to the Gulf Coast. *Public Works Management Policy* 10 (4): 284-294.

Monahan, Rachel, and Elena Herrero Beaumont. 2006. Big time security. Forbes.com, August 3. www.forbes.com/business/2006/08/02/homeland-security-contracts-cx_rm_0803homeland.html.

Platt, Rutherford H. 1999. *Disasters and Democracy.* Washington, D.C.: Island Press.

Roberts, Patrick. 2006. FEMA and the prospects for reputation-based autonomy. *Studies in American Political Development* 20 (1): 57-87.

Rodriguez, Havidán, Joseph Trainor, and Enrico L. Quarantelli. 2006. Rising to the challenges of a catastrophe: The emergent and prosocial behavior following Hurricane Katrina. *Annals of the American Academy of Political and Social Science* 604 (1): 82-101.

Sylves, Richard T. 2006. President Bush and Hurricane Katrina: A presidential leadership study. *Annals of the American Academy of Political and Social Science 604 (1): 26-56.*

FEMA must perform well in the next highly visible natural disaster, both to solidify its autonomy and to restore its reputation. This does not mean that FEMA must be the cavalry.

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

A Guide to Enhance Grassroots Risk Communication Among Low-Income Populations. By Randy Rowell, Payam Sheikhattari, Tanyka M. Barber and Myrtle Evans-Holland. 2009. Morgan State University School Of Public Health And Policy. 42 pp. Free download at www.diversitypreparedness.org/Topic/Subtopic/Record-Detail/18/resourceId__18423.

Low income and minority populations often don't have as many tools as wealthier residents to deal with hazards. The *Guide to Enhance Grassroots Risk Communication Among Low-Income Populations* says, "These groups most often have fewer resources, lower literacy levels, and less communication with response groups before and during a disaster. Current risk communication materials may be written at a literacy level above that for many low-income people, thus it may be difficult for some of them to understand. Poverty, as the root cause of numerous other problems, may influence the low-income populations' perception of the risk, trust in the system, and personal motivation to obtain information."

The authors offer a system for developing a grassroots disaster communications program, which they define as enabling "public health and emergency preparedness practitioners to involve grassroots organizations such as faith-based, community-based, and business organizations serving low-income populations, in risk communication activities during imminent danger (warning), response, and recovery phases of disaster." Like most disaster preparedness efforts, it isn't something that can be done at the last minute, but must be undertaken as a priority by emergency response organizations.

This groundwork is often not done. The guide offers, for instance, these discouraging statistics: "In a study of low-income African Americans in Maryland, when asked if the system would do a good job in protecting the public's health, 50 percent of respondents reported that they were 'not too confident' or 'not at all confident' and 32 percent were 'very confident' … Consistent with these findings was a study of low-income Spanish-speaking Latinos in Baltimore, Maryland where 53 percent were 'not too confident' or 'not at all confident' and 32 percent were 'confident' of fair treatment."

Grassroots communication efforts attempt to overcome this lack of trust by going through faith- and community-based organizations early in the planning process. The guide includes a "Swine Flu Scenario" showing how this can be done.

Filling the Ark: Animal Welfare in Disasters. By Leslie Irvine. 2009. ISBN: 978-1-59213-834-0. 166 pp. $24.50 (hardcover). Temple University Press. www.temple.edu/tempress.

If we're faced with an oncoming disaster—like the landfall of Hurricane Katrina, to take a not-very-random example—nearly all of us will want to save our pets. The Katrina experience taught that this may not be a simple matter. Leslie Irvine reports, among many others, the story of Carlos and Dale Menendez, who stayed home with their German Shepherd Lily. Eventually they were flooded and had to evacuate. They ended up with Lily at the Convention Center, but when that facility was evacuated, the National Guard refused to take Lily. The dog was released to run, alone and confused, while her critically ill owners were evacuated. Many dogs and cats were killed. About 33 were shot execution style at P.G.T. Beauregard Middle School.

But the fate of companion animals in disasters is only a small part of a large story that Irvine examines. Millions of farm animals, trapped in cages or otherwise unable to escape, die in disaster. "Although we have the closest bonds with companion animals, they constitute only about two percent of the animals living in the United States," Irvine writes. "The other 98 percent are the cattle sheep, hogs, and poultry raised for food."

Irvine uses natural disasters as a springboard for discussion of the ethics of our relationships with animals. Most people probably call themselves "animal lovers" and, when it comes to our companion animals, we certainly are. But, Irvine writes, "As rescuers roamed the streets of New Orleans, breaking into homes to rescue dogs, cats, birds, and other companion animals, millions of farm animals died because of Katrina. Most were chickens. Those who did not starve or die of thirst and exposure were bulldozed alive into dumpsters. Over eight million birds died in just one producer's facility. The media reports these, and the deaths of other animals used for food, as 'losses' for the producers. Their lives are not noted."

This is a deeply felt and carefully thought out book, which will be of interest to anyone interested in animals and disasters, either together or separately.

Personal Preparedness in America: Findings from the Citizens Corps Survey of Four Urban Areas. By the Federal Emergency Management Agency. 2009. 69 pp. Free download at www.citizencorps.gov/news/press/2009/personal_preparedness_research_jun09.shtm.

The Lord, it is rumored, helps those who help themselves. But He hasn't been very busy if the data from this FEMA survey of New York, San Francisco, Houston, and Indianapolis is to be relied upon. People in those cities don't think that disasters of any type are likely to occur there, so they have taken few steps to prepare for them. "Residents in the four surveyed urban areas who perceived they were more vulnerable to a natural disaster were more likely to have disaster supplies set aside in their homes than respondents nationwide, but the specific supplies were still inadequate."

(Continued on page twenty-two)

Resources...

(Continued from page twenty-one)

FEMA director Craig Fugate has said, "You can't look at the public as a liability, you have to look at them as a resource. The survivors are the ones we have to empower." This report indicates there is still a way to go in empowering the public as "first responders" in a disaster.

Older Persons in Emergencies: An Active Ageing Perspective. By the World Health Organization. 2008. ISBN: 978-92-4-156364-2. 43 pp. $15 (softcover). apps.who.int/bookorders.

By 2050, the number of people over the age of 60 will comprise 22 percent of the worldwide population—about two billion older folk—up from 11 percent in 2006. The population of people aged 80 and older is growing especially fast. This report looks at case studies of recent disasters and their impact on the older population—71 percent of the deaths in Hurricane Katrina were people over 60 years old; 50 percent of the casualties in the 1995 Kobe earthquake were older people.

But older people were not just victims of these disasters, they were also among first responders. In the British Columbia wildfires, for instance, older persons "formed the 'backbone' of community emergency response," this report says.

So while older people may need special consideration in emergencies, they are also a resource to be counted on. "Older people should be integrated into mainstream services and equity of service provision should be ensured in all sectors, including provision of basic necessities, health and psychological care, protection, and economic rehabilitation," the report says.

Disaster Policy and Politics. By Richard Sylves. 2008. ISBN:978-0-87289-460-0. 285 pp. $54.95 (softcover). CQ Press. www.cqpress.com

Sylves, a professor of political science at the University of Delaware, puts disaster management in a broad political and policy framework. He examines, for instance, the different expectations and effects of Jeffersonian versus Hamiltonian management styles—democrats versus technocrats, to oversimplify a complex and edifying discussion.

Disaster Policy and Politics is a textbook-style presentation that benefits from a readable and accessible format. Key terms and concepts of the homeland security and emergency management worlds are clearly laid out, defined, and discussed.

Managing Crises: Responses to Large-Scale Emergencies. Arnold M. Howitt and Herman B. Leonard, editors. 2009. ISBN: 978-0-87289-570-6. 646 pp. $49.95 (softcover). CQ Press. www.cqpress.com.

This book offers a case-based examination of emergency management, attempting to provide "detailed cases about specific emergency events in the context of discussions about concepts, terminology, hypotheses, and theories about emergency management."

It's designed as a university-level teaching tool. The chapters start out with discussion questions. It covers a wide variety of hazards, from the 1992 Los Angeles riots to the 2001 World Trade Center attacks to Hurricane Katrina to the 2004 Democratic Convention.

Disaster Recovery. By Brenda D. Phillips. 2009. ISBN: 978-1-4200-7420-8. 521 pp. $69.95 (hardcover). CRC Press. www.crcpress.com.

This textbook covers disaster recovery from theory to debris cleanup to economic recovery and financing. The book takes both an overview and case study approach to the issues, covering natural disaster, terrorism, environmental recovery, and many other topics. Each chapter concludes with a study guide, discussion questions, and a list of key terms.

Communicating Emergency Preparedness: Strategies for Creating a Disaster Resilient Public. By Damon Coppola and Erin Maloney. 2009. ISBN: 978-1-4200-6510-7. 266 pp. $69.95 (hardcover). CRC Press. www.crcpress.com.

Intended as both an academic resource and a "how-to" guide, this book explores all the angles of informing the public about disaster preparedness. It is dedicated to helping the public be prepared to help itself through education.

But the authors emphasize that "education" is not just one thing. It requires a comprehensive understanding of the target audience. They take the reader through four steps: early planning; developing a campaign strategy; implementation and evaluation; and program support.

"Although there is no single recipe by which all public education campaigns are developed," the authors write, "there do exist ingredients without which success will range from difficult to nearly impossible. Perhaps the most obvious requirement is that of trust in the communicator. Recipients of risk information are unlikely to heed any instructions they hear or read if they cannot lend any credibility to the source of those instructions," they write.

Disaster and Recovery Planning: A Guide for Facility Managers. By Joseph F. Gustin. 2007. ISBN: 978-1-4200-5146-9. 422 pp. Price unavailable (hardcover). The Fairmont Press, Inc. www.fairmontpress.com.

The fourth edition of this handbook deals with the nuts and bolts building managers need to master as a result of hazards, natural and un-. For disaster planning, Gustin says, there are three major areas: occupant issues, building issues, and business issues. Mitigation requires planners to: Identify and organize resources; conduct a risk assessment; develop a mitigation plan; and implement the actions.

The book is well-organized, liberally sprinkled with bold-faced and bulleted headers, rapidly moving the reader from the general and theoretical to the specific.

Building Trust in Diverse Teams: The Toolkit for Emergency Response. By the Emergency Capacity Building Project. 2007. ISBN: 978-0-85598-615-5. 135 pp. $24.65 (softcover). OxfamGB. www.oxfam.org.uk/publications.

This is, as advertised by the title, a step-by-step guide for assessing and improving the trust among team members during a disaster cycle. If nothing else, this book will give the reader a deeper appreciation of what trust is, and how it is built. It discusses "swift trust," which can be developed quickly based on perceptions of competence, integrity, sharing of information, and reciprocity. Over time team members can develop "deeper trust," based on compatibility, goodwill, predictability, well-being, inclusion, and accessibility.

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

Scholarly publishing

Public Money, Public Access?

A consortium of 57 liberal arts colleges is calling for passage of the Federal Research Public Access Act, which would require scientific journals to make the results of publicly funded research available free online at some reasonable time after publication.

The letter says, "The Federal Research Public Access Act would be a major step forward in ensuring equitable online access to research literature that is paid for by taxpayers. The federal government funds over $60 billion in research annually. Research supported by the National Institutes of Health, which accounts for approximately one-third of federally funded research, produces an estimated 80,000 peer-reviewed journal articles each year.

"Given the scope of research literature that would become available online, it is clear that adoption of the bill would have significant benefits for the progress of science and the advancement of knowledge."

The group behind the effort, the Alliance for Taxpayer Access (www.taxpayeraccess.org), says, "Access to scholarly journals has lagged behind the wide reach of the Internet into U.S. homes and institutions. Subscription barriers limit U.S. taxpayer access to research that has been paid for with public funds."

Needless to say, not everyone is thrilled with the idea. The Association of American Publishers says, "Professional and scholarly publishers have expressed strong opposition" to the bill. It "would create unnecessary costs for taxpayers, place an unwarranted burden on research investigators, and expropriate the value-added investments made by scientific publishers—many of them not-for-profit associations who depend on publishing income to support pursuit of their scholarly missions, including education and outreach for the next generation of U.S. scientists," according to AAP's Professional and Scholarly Publishing Division Chairman Brian Crawford.

In an op-ed in the *Boston Globe*, AAP President and former Colorado Congresswoman Patricia Schroeder wrote, "Is public access a problem? Not with Google indexing copies of articles that authors often post on personal or institutional websites. Is patients' access to medical literature a concern? Most publishers will provide free or modestly priced copies of individual studies."

In related news on the publications front, five major research universities— MIT, Cornell, Dartmouth, Harvard and the University of California, Berkeley—plan to develop a system in which they pay fees to open access journals for the articles published by the institutions' scholars. They've set aside $100,000, and are inviting other institutions to join them.

But problems seem to be cropping up everywhere in the world of scientific publishing. A report on social science journal publishing (www.nhalliance.org/bm~doc/hssreport.pdf) funded by the Andrew W. Mellon Foundation found, "Analysis of the journal costs provided for this study confirm that a shift to an entirely new funding model in the pure form of open access in which the costs of publishing research articles in journals are paid for by authors or by a funding agency, and readers have access to these publications for free, is not feasible for this group of journals."

The study quotes a February 2007 statement by the American Association of University Presses urging caution in the push to open access: "Bypassing this laboratory stage of experimentation and development and plunging straight into pure open access, as attractive as it may sound in theory, runs the serious risk of destabilizing scholarly communications in ways that would disrupt the progress of scholarship and the advancement of knowledge."

The Mellon report looked at eight journals in the social sciences.

Meanwhile, the Nature Publishing Group will launch its first open access journal, *Nature Communications*, in 2010. They'll charge authors an article processing charge, still to be announced. An NPG spokesman told *The Scientist*, "Scholarly publishing is on the cusp of yet more radical change with increasing commitment by research funders to cover the costs of open access making experimentation with new business models more viable."

The Federal Research Public Access Act will probably not be acted on until health care legislation is resolved.

(More contracts and grants, page twenty-four)

Contracts and Grants ...

(Continued from page twenty-three)

Collaborative Research: The M8.0 Pisco Peru Earthquake—A Benchmark Ground Failure Event for Remote Sensing and Data Archiving. National Science Foundation awards #0928737, #0928526 and #0928439. 18 months. Three grants. $119,297 to principal investigator Joseph Wartman, Drexel University, joseph.wartman@drexel.edu; $117, 064 to principal investigator Brady Cox, University of Arkansas, brcox@uark.edu; and $28,817 to principal investigator Adrian Rodriguez-Marek, Washington State University, adrian@wsu.edu.

This research will use remote sensing, geotechnical investigations, and traditional "boots-on-the-ground" reconnaissance information to collect, process, interpret, and digitally archive ground failure events from a large portion of the mesoseismal region of the 2007 M8.0 Pisco, Peru Earthquake. The research plan is guided by the vision of using state-of-the-art remote sensing and data management tools to establish the Pisco Earthquake as a fully documented "benchmark" ground failure event that will be permanently archived in a searchable, professionally curated NEES central data repository. Several factors make the Pisco Earthquake well suited for use as a benchmark ground failure event: (1) its effects were documented by a ground-based Geo-engineering Extreme Events Reconnaissance (GEER) team immediately after the earthquake, (2) the mesoseismal region spans a variety of land uses and geomorphic settings ranging from coastal plains to steep mountainous terrain more than 4,500 meters (14,800 feet) in elevation, and (3) a rich and varied "living laboratory" of earthquake effects ranging from severe soil liquefaction to massive rock avalanches occurred.

7th International Conference on Urban Earthquake Engineering and the 5th International Conference on Earthquake Engineering, Tokyo, Japan, March 3-5, 2010. National Science Foundation award #0958198. One Year. $33,759. Principal investigator Amr Elnashai, University of Illinois at Urbana-Champaign, aelnash@uiuc.edu.

This project will support the travel of 11 U.S. scientists and engineers to participate in the joint conference of the 7th Conference on Urban Earthquake Engineering and the 5th International Conference on Earthquake Engineering Conference to be held in Tokyo, Japan on March 3-5, 2010. The combined conference is organized on four major themes: (1) vulnerability of mega-cities to seismic hazards; (2) multi-hazard mitigation solutions; (3) adoption of new sensors, actuation and control technologies within future mitigation strategies; and (4) education initiatives aimed toward cultivating interdisciplinary and cross-cultural earthquake engineering curricula.

Commuter Risk Perceptions after the Washington, D.C. Metrorail Collision. National Science Foundation award #0958144. One year. $34,857. Principal investigator Pamela Murray-Tuite, Virginia Polytechnic Institute and State University, murraytu@vt.edu.

This grant funds the collection of important, perishable data on how risk perceptions after a vivid event that received widespread media coverage: (1) influence travelers' selection of transportation mode in the near, medium, and long term; (2) change the trade-offs transit users are willing to make among safety, speed, frequency of service, cost, and reliability after such an incident; and (3) attenuate or sharpen over time and geographic distance from the accident. This grant allows a small team to collect shifting traveler perception and decision data through three waves of a survey of Metrorail and Park-and-Ride bus commuters. Our hypotheses are that in the aftermath of the accident, changes in risk perceptions over time and space—the amount of time since the June 22nd accident and the distance of commuters from both the accident site and the line on which it occurred—influence mode and route choices, as well as preferences for different characteristics of transit. We will administer a set of choice experiments in each wave to test these hypotheses. The data will allow: (1) consideration of safety in mode choice models; and (2) systematic examination of the attenuation of intense feelings resulting from the crash over space and time and their role in decision making.

Structure of Contact Networks and the Spread of Flu-like Infectious Diseases: Implications for Dynamics and Control. National Science Foundation award #0947132. 18 months. $103,133. Principal investigator James Holland Jones, Stanford University, jhj1@stanford.edu.

The researchers will use wireless sensor network technology to identify the temporal network dynamics during typical days in a school setting. Understanding the structure of freely forming groups and how that relates to the overall social structure remains a major social science challenge.

Participants will have small wireless sensors attached to them; these sensors send and receive radio signals to and from other sensors nearby. The data will model disease and epidemic dynamics on real-world contact networks, which has never been done before due to the lack of appropriate data. Such dynamic modeling will make it possible to test different control scenarios to prevent the spread of flu-like diseases in schools.

Tsunami Generation by Landslides: Integrating Laboratory Scale Experiments, Numerical Models and Natural Scale Applications. National Science Foundation award #0936603. Three years. $804,923. Principal investigator Hermann Fritz, Georgia Institute of Technology, hermann.fritz@gtsav.gatech.edu.

This project's long-term goal is to transform assessment and mitigation of the landslide tsunami hazard through hybrid modeling of landslide tsunami evolution in real world scenarios, where the generation, propagation, and runup stages overlap. Rare field measurements are mostly limited to landslide scarp, deposit, tsunami runup, and eyewitness accounts, while critically important data related to the landslide motion and tsunami evolution is lacking. The goal of the research is to compensate for missing data by combined physical and numerical modeling of fully three-dimensional landslide tsunami scenarios.

Determining the Added Hazard Potential of Tsunamis by Interaction with Ocean Swell and Wind Waves. National Science Foundation award #0936579. One year. $100,000. Principal investigator James Kaihatu, Texas Engineering Experiment Station, jkaihatu@civil.tamu.edu.

For all their differences in destructive power, size, and generation, tsunamis and swell waves (which are always present on the ocean surface) are both gravity waves, and follow many of the same physical laws. Additionally, gravity waves of different frequencies exchange energy, which affects the shape of the front face of the wave and, in turn, the destructive power, travel time, and damage potential (structural damage and erosion) of the tsunami.

Experiments will be conducted in the NEES Tsunami Wave Basin during summer 2010 to investigate this interaction. Both tsunamis and swell-band waves will be generated, in isolation and in combination, and their interaction determined by analysis of the measured velocities and free surface heights. Both standard (Fourier-based) and advanced (Hilbert-Huang transforms) methods will be used to determine the degree of the tsunami-swell interaction and the resulting changes on the evolution of the front face of the tsunami wave. These data will be used to determine the change in the tsunami front-face characteristics due to the interaction with swell waves and further deduce the effect to its destructiveness.

Topographic Effects in Strong Ground Motion—From Physical and Numerical Modeling to Design. National Science Foundation award #0936543. Three years. $1,132,593. Principal investigator Adrian Rodriguez-Marek, Washington State University, adrian@wsu.edu.

Although it is widely recognized that topographic amplification can elevate seismic risk, there is currently no consensus on how to reliably quantify its effects, leaving an important factor contributing to seismic hazard unaccounted for in routine design. Until now, a major impediment towards understanding and realistically modeling topographic effects has been the lack of a statistically significant number of seismic recordings from densely instrumented sites with topographic features. Moreover, while existing theoretical models are generally capable of qualitatively predicting the effects of irregular topographic features on seismic ground motion, there is still significant quantitative disagreement between predictions and observations. This research addresses this problem with a study of topographic amplification of ground motion that will include a comprehensive and integrated program of experimental simulations, field measurements, empirical data analysis, and numerical modeling. This new understanding will in turn permit the development of data- and analysis-driven guidelines to account for these effects in engineering design, building code provisions, and seismic risk and microzonation studies.

Full-Scale Structural and Nonstructural Building System Performance During Earthquakes. National Science Foundation award #0936505. Three years. $1,200,000. Principal investigator Tara Hutchinson, University of California-San Diego, tara@ucsd.edu.

Nonstructural components and systems (NCS) are those elements within a building that do not contribute to the building's load bearing system. NCSs are generally categorized as being either an architectural, mechanical, plumbing, or builing contents. Since these elements generally represent more than 80 percent of the total investment of a building, even minor damage can translate to significant financial losses. Of the handful of full-scale building experiments conducted in the United States, none have specifically focused on evaluating the response of nonstructural component and systems during earthquake shaking. This project involves a landmark test of a full-scale, five-story building completely furnished with NCSs, including a functioning passenger elevator, partition walls, cladding and glazing systems, piping, HVAC, ceiling, sprinklers, and other building contents, as well as passive and active fire systems. The NEES-UCSD and NEES-UCLA equipment combines to realize this unique opportunity to advance understanding of the full-scale dynamic response and kinematic interaction of complex structural and nonstructural components and systems. While most NCSs in these experiments will be designed to the latest state-of-the-art building code seismic provisions, non-seismic detailed designs widely used in low-seismic regions of the United States will also be included. Furthermore, this research will investigate the potential for protecting critical systems using, for example, damping or isolation methods. Data from these experiments will be used to compare earthquake performance predictions determined using available commercial and research computational modeling platforms.

'Smart Rocks' for Debris-Flow Landslide Research. National Science Foundation award #0927496. One year. $86,136. Principal investigator Pedro de Alba, University of New Hampshire, pedro.dealba@unh.edu.

Debris flows are a particularly destructive class of landslide, in that large volumes of wet soil and rock can move as liquefied masses at very high velocity and with little warning. Debris flows may be triggered by earthquakes, volcanic eruptions, or rising groundwater. Because of their rapid motion, they can result in a large number of fatalities; an extreme example is the destruction of San Salvador's suburb of Santa Tecla by an earthquake-triggered debris flow in 2001, resulting in over 700 deaths. This project will develop two sizes of instrumented "smart rocks" using recently developed instrumentation: a "smart pebble" of golf-ball size to measure how the interior particles vibrate and how water pressure develops and dissipate in the liquefied interior of the sliding mass; and a "smart cobble" of softball size, more heavily instrumented, so as to also be capable of tracking how coarser particles move towards the landslide snout during sliding.

Science, Policy, and the Community: A Symposium in Post-Katrina New Orleans. National Science Foundation award #0924792. One year. $25,000. Principal investigator Amy Lesen, Dillard University, alesen@dillard.edu.

This project supports a symposium that investigates communication among stakeholders, scientists, and publics into policy decisions in post-Katrina New Orleans. The symposium takes place in mid-November 2010, which coincides closely with the fifth anniversary of Hurricane Katrina. The two objectives for the symposium are: (1) to examine and improve the interaction among scientists, engineers, other academic scholars, policy makers, and the public in the New Orleans region, to improve mechanisms for public input into research and policy decisions, and to scrutinize the role scientists and scholars play in community affairs; and (2) to bring together scholars from diverse fields who do not normally interact, to stimulate

Contracts and Grants ...

(Continued from page twenty-five)

innovative, interdisciplinary research addressing ecological and social dynamics in the region, research that can improve regional resilience.

Effects of Environmental Cues and Informal and Official Warnings on Protective Action Decision Making: A Case Study for Earthquakes and Tsunamis in the Indian Ocean. National Science Foundation award #0900622. Two years. $279,954. Principal investigator Christopher Gregg, East Tennessee State University, gregg@etsu.edu.

Very few social science studies had investigated human response to tsunamis' environmental cues and informal and official warnings before the 2004 Indian Ocean Tsunami, but the largest and most comprehensive earlier study was conducted in Thailand in the months afterward. It showed that the high death toll from the 2004 tsunami was not due to a lack of warning, but to people's inability to accurately interpret and act on information that was available to them before the tsunami impacted the shore. For example, environmental cues and informal warnings provided enough forewarning for most people to survive in 2004, as some 74 percent of tsunami survivors in Thailand noticed the shoreline recession or unusual waves and currents up to 15 minutes before the first wave crest hit the shore. However, these cues did not trigger appropriate behavior, as 65 percent saw many people in the danger zone, watching the sea, when the first crest arrived. Similar behavior was recorded in nearly every tsunami-affected country. This project will study the current situation in Thailand and aspects of the 2004 and 2005 events there. First, the respondents will be re-interviewed to test whether the Protective Action Decision Model can predict response to environmental cues and warnings in 2010. A separate but parallel study focuses on understanding aspects of disaster memory in this population.

Developing and Testing Algorithms for Generating Leading Tsunami Waves. National Science Foundation award #0960512. One year. $50,020. Principal investigator Philip Liu, Cornell University, pll3@cornell.edu.

This research will use the newly installed wave makers with long strokes at Cornell University and the NEES tsunami facility at Oregon State University to test the hypothesis that the leading tsunami wave does not have sufficient time and distance to evolve into a solitary form, therefore challenging the currently used modeling approach for wave runup and other physical quantities based on the solitary wave. Since both wave makers are new, investments need to be made to develop algorithms for generating properly scaled leading tsunami waves.

Cause and Duration of Extensive Rejuvenated Volcanism on Savai'i, Samoa. National Science Foundation award #0946752. One year. $18,389. Principal investigator Jasper Konter, University of Texas at El Paso, jgkonter@utep.edu.

A 20th century Savai'i eruption displaced an entire village, and understanding the timing and evolution of this volcanism is of social importance for the local islanders. Savai'i was essentially repaved with large volumes of rejuvenated volcanism, in contrast to other ocean islands (e.g., Hawaii, the Canary Islands, and Mauritius). Eruption of Samoan rejuvenated volcanism is limited to the western three islands, and their close proximity (about 150 kilometers) to the northern terminus of the Tonga trench suggest that Samoan rejuvenated volcanism may have a different origin than in other hotspots. In the last five million years the distance between Savai'i and the trench has decreased due to plate motion and slab rollback. Thus, trench-related stresses and materials may be responsible for the volume, duration, and unusual enriched compositions of Samoan rejuvenated lavas. The rejuvenated stage may be completely exposed in a 500 meter deep gorge on the south side of Savai'i that covers a two million year history.

Acquisition of Imaging Equipment to Understand the Dynamics of Explosive Volcanic Flows through Laboratory Experiments and Field Observations. National Science Foundation award #0930703. One year. $175,590. Principal investigator Amanda Clarke, Arizona State University, amanda.clarke@asu.edu.

Funds will support acquisition of a planar laser-induced fluorescence imaging system and shock wave tube to study the dynamics of simulated volcanic eruptions in laboratory experiments. Laser-based multi-phase fluid dynamic diagnostic capabilities will enable simulation of a range of particle laden nonsteady flows including subaerial volcanic eruptions and hydrothermal black smokers. Researchers will focus on experimental simulation and quantitative observation of the fluid dynamics of Vulcanian eruptions, base surges, lateral blasts, and shock-generating explosions. Laboratory results will be compared with field observations and numerical eruption models to improve volcanic hazards predictions.

Spatial and Temporal Patterns of Drought in Western North America during the Holocene. National Science Foundation awards #0902753 and #0902200. Two years. $235,416 to principal investigator Joseph Ortiz, Kent State University, jortiz@kent.edu; and $208,397 to principal investigator Mark Abbott, University of Pittsburgh, mabbott1@pitt.edu.

This grant produces paleoclimate datasets recording the timing, duration, frequency and magnitude of aridity cycles on a network of paired open and closed micritic basins along the western cordillera of North America from the Pacific Northwest to the Canadian Arctic. The project employs hydrologic and stable isotope mass balance models to provide quantitative estimates of precipitation and relative humidity changes. The project explores how the temporal-geographic patterns of aridity changed during the Holocene and uses advanced data processing techniques to test hypotheses concerning the periodicities in the paleoclimate archives. The project tests hypotheses concerning the causes and magnitude of climate variability during the Holocene. The work is relevant to western North America where populations are rapidly expanding and water resources are stressed.

Natural Hazards Observer
ISSN 0737-5425
Printed in the USA.
Published bimonthly.

The *Observer* is free to subscribers within the United States. Subscriptions outside the United States cost $24.00 per year. Back issues of the *Observer* are available for $4.00 each, plus shipping and handling. Orders must be prepaid. Checks should be payable to the University of Colorado. Visa, MasterCard, and American Express cards are also accepted.

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

www.colorado.edu/hazards/

Please:

- ☐ Add my name to the *Observer* mailing list
- ☐ Delete my name*
- ☐ Change my address*

*Return this form (with address label on reverse)

Name: _____

Mailing Address: _____

_____

Phone: _____

Fax: _____

E-mail: _____

Affiliation: _____

Conferences and Training

November 10-13, 2009
Glacier Hazard Workshop 2009
University of Natural Resources and Applied Life Science
Vienna, Austria
Cost and Registration: $444, open until filled

This workshop will review glacial and permafrost hazard assessment methods, identify research gaps, outline existing and future climate change impacts, and encourage the exchange of ideas between the scientific community and policy makers.

www.baunat.boku.ac.at/workshop09.html

November 15-18, 2009
Emergency Preparedness and Prevention and Hazmat Spills Conference
U.S. Environmental Protection Agency, Region III
Baltimore, Maryland
Cost and Registration: $250, open until filled

This conference provides an opportunity to meet emergency management and prevention officials, attend training, and view exhibits. Sessions will cover a range of hazard-related education.

www.2009conference.org

November 24-27, 2009
Sixth Canadian Risk and Hazards Network Symposium
Canadian Risk and Hazards Network
Edmonton, Canada
Cost and Registration: Not posted

This symposium identifies lessons, systems, and modules to improve communication and broader collaboration on Canadian disaster resiliency efforts. Sessions include public awareness and Web-based applications; interdisciplinary, interjurisdictional, and intercultural dialogue; and emergency preparedness exercises in secondary schools.

December 5-6, 2009
International Conference on Corporate Social Responsibility and Industrial Disasters
National Law Institute and the National Institute of Disaster Management
Bhopal, India
Cost and Registration: $300, open until filled

This conference examines issues of corporate social responsibility and industrial disasters. Session topics will include law and the Bhopal disaster, disaster management policy and legislation, human rights, and the impact of industrial disasters on human health.

December 7-10, 2009
2009 Annual Meeting, National Institute of Building Sciences
Washington, D.C.
Cost and Registration: $495, open until filled

This conference addresses new ideas for improving the built environment through sustainable practices, smart buildings, and high-performance building design. Session topics include disaster resilience in sustainable design.

www.nibs.org/AnnualMeeting

Natural Hazards Center Says Farewell to Longtime Researcher

The Natural Hazards Center will soon bid a fond farewell to Research Associate Jeannette Sutton. Sutton has spent nearly a decade at the center, beginning her career as a graduate research assistant in 2000. After completing her sociology PhD in 2004, she continued as a member of the center's professional research staff. Sutton's PhD dissertation examined therapeutic religion in the aftermath of the World Trade Center attack. Her recent work has focused on the use of social media in disaster, an area she will continue to explore as an independent researcher (www.jeannettesutton.com/Home_Page.html) and blogger (www.emergencymgmt.com/emergency-blogs/disaster-sociologist). Good luck, Jeannette!

Natural Hazards Center
Institute of Behavioral Science
University of Colorado at Boulder
482 UCB
Boulder, Colorado 80309-0482

Change Service Requested

Non-Profit Org.
U.S. Postage
PAID
Boulder, CO 80309
Permit No. 156

Printed on recycled paper

Support the Natural Hazards Center

The success of the Natural Hazards Center relies on the ongoing support and engagement of the entire hazards and disasters community. The Center welcomes and greatly appreciates all financial contributions. There are several ways you can help:

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

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

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

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

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

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

A U.S.-based organization, the Natural Hazards Center is a nonprofit, tax-exempt corporation under Section 501(c)(3) of the Internal Revenue Code.

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

Staff

Christine Bevc.....Research Assistant
Jolie Breeden.....Program Associate
RoseMarie Perez Foster.....Senior Research Associate
Brandi Gilbert.....Research Assistant
Wanda Headley.....Library Manager
Alexandra Jordan.....Research Assistant
Wee Kiat Lim.....Research Assistant
Ezekiel Peters.....Asst. Director for Programs & Outreach
Liesel A. Ritchie.....Asst. Director for Research
Diane Smith.....Office Manager
Kathleen Tierney.....Director
Dan Whipple.....Editor

Research Affiliates

Dennis S. Mileti.....Rancho Mirage, CA
Leysia Palen.....University of Colorado at Boulder
Lori Peek.....Colorado State University
Deborah Thomas.....University of Colorado at Denver

Observer cartoons are drawn by Rob Pudim.

Send items of interest to the Natural Hazards Center, University of Colorado at Boulder, 482 UCB, Boulder, CO 80309-0482; (303) 492-6818, (303) 492-2151 (fax); hazctr@colorado.edu. The deadline for the next *Observer* is **November 25, 2009**.