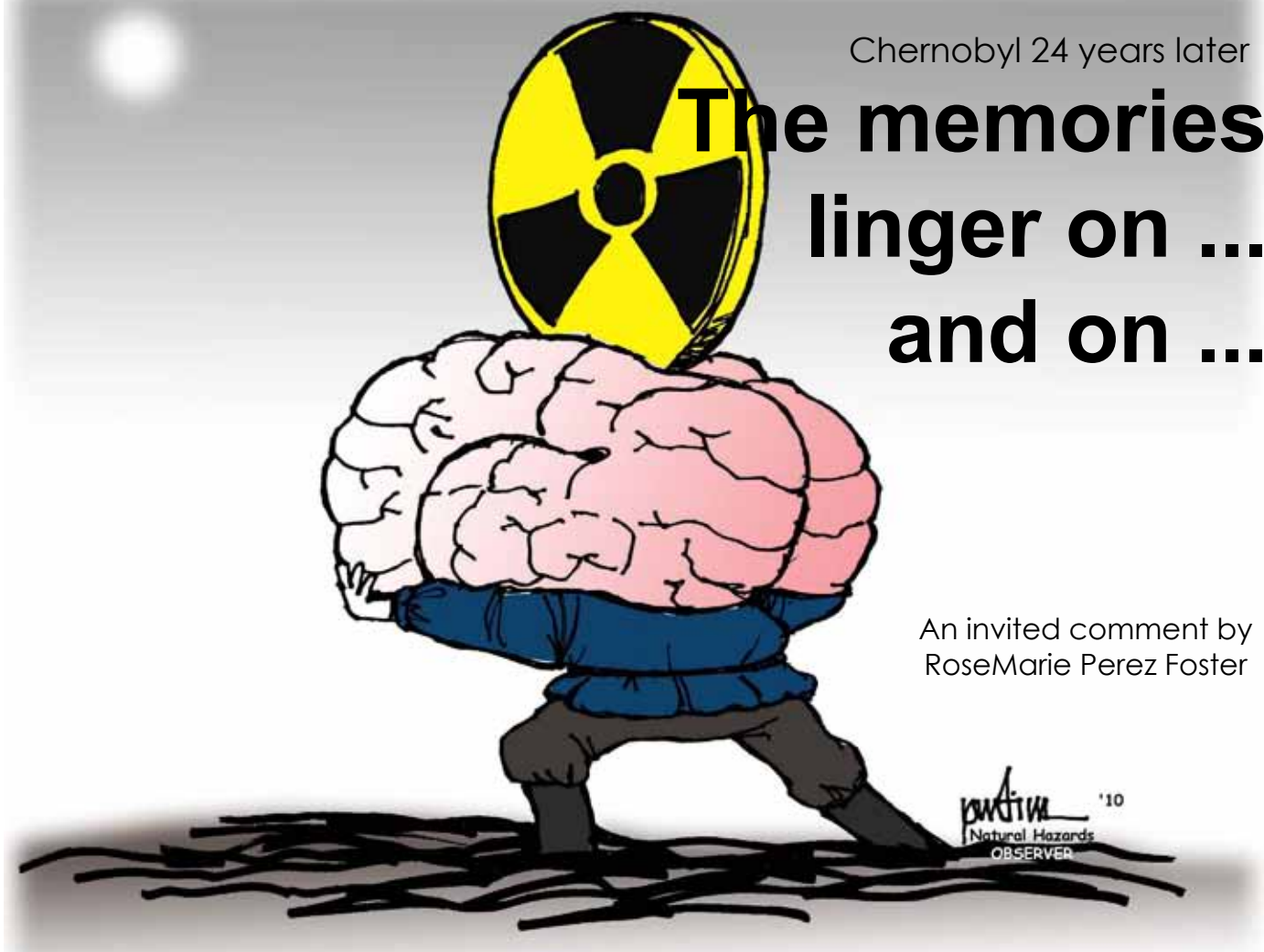


Chernobyl 24 years later

The memories linger on ... and on ...



An invited comment by
RoseMarie Perez Foster

RoseMarie Perez Foster '10
Natural Hazards
OBSERVER

UNLIKE MANY OTHER SUDDEN-ONSET DISASTERS—floods, fires, or vehicle accidents—nuclear incidents carry psychological stressors that affect survivors far into the future. People exposed to a radiation hazard like the 1986 Chernobyl nuclear disaster in the former Soviet Union face long-term uncertainties about their health, their livelihoods, the safety of their food supplies, and many other aspects of their lives. These uncertainties can impact psychological wellbeing longer than for victims of other kinds of disasters—often for a lifetime.

In cooperation with government ministries in the Ukraine, we've been looking at the cognitive, health, men-

tal health, economic, and psychosocial factors in a population sample of 800 residents who were exposed to radiation from the Chernobyl accident. The research has covered two oblasts (counties) 25 years after the accident.

Although the project is not complete, we have analyzed about a third of our data in preparation for a presentation to the National Science Foundation on September 26, 2010.

These preliminary results suggest that the psychological impact of nuclear disasters may be substantially different from most other types of disasters. Depending on the

(Please see "Chernobyl" on page fourteen)

INSIDE ...

Heat and death
in France

Page 10

Drought insurance for
farmers

Page 6

How many die from
malaria?

Page 2

The facts about beetle-
killed trees and fire

Page 3

How many malaria deaths?

Study says many more dying in India than WHO estimates

Lancet says: 205,000 dead

WHO says: Not so fast

THERE ARE 13 TIMES AS many deaths from malaria in India than currently estimated by the World Health Organization, according to a new study published in the British medical journal *Lancet*. WHO estimates 15,000 malaria deaths in the sub-continent, while the new study estimates 205,000 (www.thelancet.com/journals/lancet/article/PIIS0140-6736%2810%2960831-8/abstract).

But WHO officials have “serious doubts about the high estimate of 200,000 malaria deaths in India obtained by [the *Lancet* researchers]. These doubts arise, in part, from the shortcomings of the verbal autopsy approach used in this study,” says Dr. Robert Newman, director of WHO’s Global Malaria Programme.

The vastly higher number of deaths estimated in the *Lancet* study, if correct, could have major implications for the global fight against malaria.

The *Lancet* paper was done by Neeraj Dhingra and nine other collaborators for the Million Death Study, a project of the Centre for Global Health Research which is following the lives and deaths of 1.1 million households throughout India until 2014. The researchers interviewed the families affected by 122,000 deaths between 2001 and 2003 in 6,671 randomly selected areas of India. They used a method they call a verbal autopsy to assess the cause of death from the symptoms described.

The researchers found that 86 percent of the deaths attributed to malaria did not occur in any health care facility. Furthermore, “Malaria accounted for a substantial minority of about one million to three million unattended rural fever deaths attributed to infectious diseases in people younger than 70 years.” The researchers found the minimum number of malaria deaths in India to be 125,000, with a maximum of 277,000 and a midpoint average of about 205,000 annually.

Newman says, however, “WHO estimated 10,000 to 21,000 malaria deaths in India in 2006 based on routine case reports, adjusting for the completeness of malaria surveillance in India, and using information on the proportion of



people with malaria who die of the disease.”

The study’s method of counting malaria deaths is not reliable, he says. “Verbal autopsy is not a trustworthy method for counting malaria deaths, especially in areas where the overall burden of malaria is low, as the symptoms of malaria are shared with many other common causes of acute fever. Consequently, the new study is likely to have overestimated malaria deaths in India, even among those deaths attributed correctly to febrile illnesses. Recent work by WHO and partners in one Indian setting showed that as few as four percent of deaths attributed to malaria by VA [verbal autopsy] were actually caused by malaria.

“The limitations of the new study are exposed when estimates are examined for particular states. The proposed estimate of malaria mortality in Orissa is close to the average estimated for Africa. It suggests, implausibly, that there are 17 million to 50 million *falciparum* malaria cases annually in a population of 40 million.

“In summary, while routine reports of malaria cases and deaths in India are certainly incomplete, the new estimate of 200,000 malaria deaths appears too high. The limitations of VA, and the implausibly high case incidence rates implied by the new malaria mortality estimates, indicate that the findings of this study cannot be accepted without further validation.”

The *Lancet* authors take care not to draw policy recommendations from their conclusions, but the implications are profound. Malaria kills more people worldwide already

than any other infectious disease, even using the lower WHO estimates. WHO says 200 million people are infected annually, and a child dies every 30 seconds from the disease. If it is killing 10 to 15 times more people than WHO counts, then the global control effort would have to be expanded substantially to succeed

Another paper published in early October in the *Lancet* found, "International financing for malaria control has increased by 166 percent (from \$730 million to \$1.9 billion) since 2007 and is broadly consistent with biological needs." Nonetheless, the report says, "Funding for malaria control worldwide is 60 percent lower than the \$4.9 billion needed for comprehensive control in 2010." (www.thelancet.com/

[journals/lancet/article/PIIS0140-6736\(10\)61340-2/abstract](http://journals.lancet/article/PIIS0140-6736(10)61340-2/abstract)).

The global fight against malaria may get more difficult, regardless of which fatality estimate is correct. A paper in the journal *Science* published on October 21, 2010 (www.sciencemag.org/cgi/content/abstract/330/6003/512) found that sub-Saharan Africa's most important malarial mosquito, *Anopheles gambiae*, may be evolving into two species. "These strains, known as M and S, are physically identical. However, the new research shows that their genetic differences are such that they appear to be becoming different species, so efforts to control mosquito populations may be effective against one strain of mosquito but not the other," says an Imperial College of London release on the study.

Beetle-killed trees don't increase wildfire risks

Fires in trees killed by mountain pine beetles are often less intense than those in live forests



SOME AREAS OF THE ROCKY MOUNTAIN WEST have been painted so red by mountain pine beetle-killed trees that NASA satellites can spot them from space. It's been generally believed that these areas are more susceptible to wildfires than green forests. But research now indicates that this may not be the case.

Research conducted in Yellowstone National Park by University of Wisconsin forest ecologists Monica Turner and Phil Townsend and Yellowstone Vegetation Management Specialist Roy Renkin has found that not only do fires not occur more frequently or more intensely in beetle-damaged forests. In fact, they may actually be less likely to burn.

There has been an epidemic of mountain pine beetles in the Rockies over the past couple of decades. That's believed to be a consequence of global warming. Scientists speculate warmer winters in the mountains don't cause beetle populations to die back as they once did.

And it's usually been feared that all the standing dead timber was a wildfire disaster waiting to happen. For in-

stance, when the Fourmile fire near Boulder, Colorado in September, 2010, burned more than 135 homes and 7,000 acres of mountainside, the Web site *Colorado Independent* (coloradoindependent.com/61046/survival-tales-mitigation-questions-linger-as-fourmile-fire-rages) cites Sen. Mark Udall (D-Colo.) that "the fire is a clear indication the full U.S. Senate needs to pass his National Forest Insect and Disease Emergency Act, which would direct federal resources to fire-prone areas ravaged by the mountain pine bark beetle epidemic. 'I will not rest in my efforts to secure additional funding and support to reduce the wildfire threats from dry, dense trees along the Front Range and throughout Colorado — as well as respond to the bark beetle threats,' Udall said in a release."

But apparently it ain't so, Joe. Yellowstone's Renkin says, "I've heard [the tinderbox analogy] ever since I started my professional career in the forestry and fire management business 32 years ago. But having the opportunity to observe such interaction over the years in regards to the Yellowstone natural fire program, I must admit that observations never quite met with the expectation."

According to a NASA release (www.nasa.gov/topics/earth/features/beetles-fire.html), "While green needles on trees appear to be more lush and harder to burn, they contain high levels of very flammable volatile oils. When the needles die, those flammable oils begin to break down. As a result, depending on the weather conditions, dead needles may not be more likely to sustain a fire than live needles.

"Second, when beetles kill a lodgepole pine tree, the needles begin to fall off and decompose on the forest floor relatively quickly. In a sense, the beetles are thinning the forest, and the naked trees left behind are essentially akin to large fire logs. However, just as you can't start a fire in a fireplace with just large logs and no kindling, wildfires are less likely to ignite and carry in a forest of dead tree trunks and low needle litter," the agency says.

These findings are supported by other research into wildfires. In a March, 2010, report *Insects and Roadless Forests: A Scientific Review of Causes, Consequences and Management Alternatives*, four researchers from the National Center for Conservation Science and Policy, in Oregon, found, "Despite the long-standing belief that insect outbreaks lead to increased risk of fire, this assumed link is not well supported by the best available science for most of the forests in

Colorado currently affected by outbreaks. Rather, the best available science indicates that the occurrence of large, severe fires in lodgepole pine and spruce-fir forests is primarily influenced by climatic conditions rather than fuels.”

The fire-and-beetle-kill belief dies hard, though. A June story in the *Denver Post* (www.denverpost.com/news/ci_9556664#ixzz103s3Jhiq) said, “Wildfires burning among trees killed by pine bark beetles could be so dangerous to fire crews, some blazes in those forests may be allowed to burn this season. Rather than sending out lines of firefighters to contain a blaze, agencies will consider ‘giving up some acreage’ in order to keep crews safe,” according to

U.S. Forest Service officials.

Wildland fire blogger Bill Gabbert writes on his website *Wildfire Today* (wildfiretoday.com/2010/09/08/firefighters-should-calm-down-about-beetle-killed-forests), “The dirty little secret that some firefighters and land managers either don’t know or will not admit to knowing, is that forests that have been affected by mountain pine beetles are less likely to burn as intensely as green forests. When the needles on a pine tree die, the volatile oils that cause a green, healthy pine tree to torch and support a crown fire, break down. And a tree with no needles is not a good candidate for a crown fire either—less so than a green tree.”

They Said It ...

“The IPCC [Intergovernmental Panel on Climate Change] has already identified the influence of climate change in these disasters. That’s clear. But the main trend we need to look at is increasing vulnerability, the fact we have more people living in the wrong places, doing the wrong things.”—**Sálvano Briceño** of the *UN International Strategy for Disaster Reduction*, quoted by the *Associated Press*.

“My brother tells me from our village near the town of Sharda in the Neelum Valley that the house we finished building just two years ago, after our old one was destroyed in the 2005 quake, has been badly damaged by the rains and torrents coming down from the hills.”—**Rafiq Muhammad**, a Pakistani who runs a tea kiosk in Islamabad, on the impact of the floods there, quoted by *IRIN*.

“Tragically, we will see more deaths due to sickness. People are in a miserable state. In some places conditions are even worse than after the 2005 Kashmir quake,

the aftermath of which I saw, and the lack of existing infrastructure to meet basic needs aggravates matters.”—**Unidentified French aid worker**, on the Pakistani floods, quoted in *IRIN*.

“Earthquake cycles last two orders of magnitude longer than election cycles.”—**Brian Atwater**, **U.S. Geological Survey seismologist**, at the meeting of the *Association of State Dam Safety Officials*.

“Climate change, economic development and land subsidence risks could cost communities along the U.S. Gulf Coast over \$350 billion in cumulative economic losses over the next 20 years.”— *Study released October 20, 2010*, by **Swiss Re**, commissioned by *Entergy Corporation*.

“The response from the international community as a whole, however, I have to say, bluntly, has just been lamentable. It’s been absolutely pitiful.”—**United Kingdom Deputy Prime Minister Nick Clegg**, on the Pakistani flooding, quoted at *Bloomberg.com*.

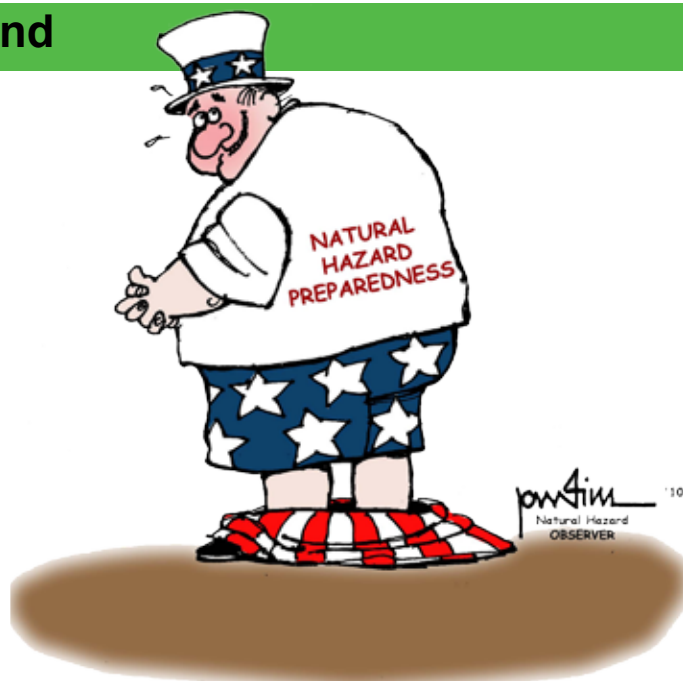
Katrina and the American mind

Survey says ...

HURRICANE KATRINA IS going to haunt the American psyche for some time to come. Despite the barrels of ink and money spilled over the hurricane that flooded New Orleans, 57 percent of Americans say that the nation is no better prepared for natural disasters than it was in 2005 when Katrina made landfall.

A survey by the Pew Research Center for People and the Press completed at the end of August found “broad skepticism about the nation’s preparedness to deal with hurricanes and other natural disasters.” But at least the two major political parties can agree on something: 57 percent of Democrats and 54 percent of Republicans “say the nation is not better prepared for such disasters than it was when Katrina devastated the Gulf Coast.”

What lessons the public takes from Katrina and other disasters—like the Deepwater Horizon oil spill—isn’t very clear. A study conducted in California about the safety of offshore oil and gas drilling seems to show that scientific



findings about an issue have only a limited impact on public opinion. People are most likely to accept a scientific claim if it supports their already existing views.

Researchers from several California universities asked people in that state about their perceptions of the safety of offshore drilling. They found that people tended to accept information—regardless of its source—that reinforced their previously held opinions. “Liberals have overwhelming confidence in the claim that offshore oil drilling is riskier than previously thought, irrespective of the source,” write the authors, “and conservatives place more faith in the message that oil drilling is safer.”

The paper, which appeared in the journal *Public Understanding of Science* (pus.sagepub.com), said, “If these findings hold up when replicated in other policy areas, they do not bode well for the influence of science on public policy debates. If people are inclined to discount news reports that are inconsistent with their preexisting beliefs, regardless of the source, then scientists will have a tough job educating the public about issues such as climate change and energy policy. This is not a conclusion that is likely to bring joy to the hearts of the scientific community.”

Curiously, the paper had some good news for environmental groups, however. The results showed that environmentalists hold a substantial credibility advantage—at least in California. People there are generally predisposed

Phase out nukes?

The answer depends on where you live

Another
survey
says ...

FORTY-SEVEN PERCENT OF SCIENTIFICALLY literate readers answering an online poll think nuclear power should be phased out, replaced with other clean energy sources.

The magazines *Scientific American* and *Nature* conducted a self-selecting poll of 21,000 of their readers about trust in scientists. Perhaps unsurprisingly, given the audience polled, scientists were most trusted to provide accurate information about important public issues. Religious authorities and elected officials were least trusted.

The poll asked a couple of questions about nuclear power. Although nearly half thought nukes should be replaced with alternative energy sources, there were substantial differences between European and American respondents.

Among Europeans responding to the poll, 66 percent said they were not comfortable with the risks associated with nuclear power. Only 18 percent of U.S. respondents were uncomfortable with the technology's risks. Only five percent of Europeans claimed to be “totally comfortable” with nuke risks, while 24 percent of Americans were.

The poll also found growing acceptance of human-caused climate change. Despite the recent Climate-gate e-mail controversy, people around the world have become more certain that humans are altering the climate. About 80 percent of those polled agreed “humans are significantly changing global climate.”

These results, while interesting, were not done in a statistically rigorous manner. There were about 4,800 responses from the United States, for instance, and only 269 from China. “The respondents were self-selected, so some

to believe that oil and gas drilling is risky, and it is environmentalists who warn about these risks. “So if other claims by environmentalists are regarded with similar confidence, environmental groups have a strong hand in political disputes over public policy,” the paper says.

Whether people will trust an “expert opinion” depends very much on the cultural values that they bring to the table, say other researchers. Dan Kahan, a law professor at Yale University, and colleagues published a study in mid-September in the *Journal of Risk Research*, finding that people were more likely to accept a scientific finding if the position matched the person's already established cultural values.

Kahan said, “People tend to keep a biased score of what experts believe, counting a scientist as an ‘expert’ only when that scientist agrees with the position they find culturally congenial.” This bias was not confined to one side of the political spectrum, either. People didn't want their positions on nuclear weapons, climate change, or gun control challenged by “experts.”

“It is a mistake to think ‘scientific consensus,’ of its own force, will dispel cultural polarization on issues that admit scientific investigation,” said Kahan. “The same psychological dynamics that incline people to form a particular position on climate change, nuclear power and gun control also shape their perceptions of what ‘scientific consensus’ is.”

subsets of readers may simply have bypassed the questionnaire. And cultural differences may have influenced how people from different countries responded to identical questions,” says a story in *Nature*.

Hazards we hadn't worried about before



Television shows can make you sick. (Well, duh.)

VIEWERS WHO watch all those sick people on television worry more about their personal health and have reduced satisfaction with life, according

to a University of Rhode Island communications professor.

The study, which appeared in the September issue of the journal *Mass Communication and Society*, found that viewing television shows with high medical content—like *Grey's Anatomy*, *House*, and *E.R.*—leads people to “believe they have a greater likelihood of being victimized by health-risks as well as a strong belief in the severity of those risks.”

URI's Yinjiao Ye surveyed students ranging in age from 18 to 31, a youthful group associated with good health and vitality. “While this surveyed group shows dissatisfaction, I suspect that if I surveyed a more general population the dissatisfaction would be even higher,” she said in a release.

Old Pacific NW dams vulnerable to likely earthquakes

Data: magnitude 9.0 quakes more frequent than earlier believed

several experts. Newly developed data on the Pacific Northwest shows that the region has historically seen magnitude 9.0 quakes, and most of these dams were not built to withstand so powerful a shaking, according to Ivan Wong, the manager of the Seismic Hazards Group.

Data indicate that there have been about 20 large quakes—magnitude 9.0 or larger—affecting the region in the last 10,000 years. They don't appear to be evenly spaced, but come in clusters with long periods of dormancy. The chief geological threat in the region is the subduction zone where the Juan de Fuca continental plate is sliding beneath the North American plate in the Cascadia Subduction Zone.

U.S. Geological Survey geologist David Atwater told the Association of Dam Safety Officials on September 20, "We have a history of magnitude 9.0 quakes in the Pacific Northwest," although the last quake that large occurred around 1700. The area at risk from a quake in this region includes Seattle and Portland, and all of the coastal area of Washington, Oregon, and Northern California.

Much more information about historical seismic activity in the Northwest has been discovered over the last two decades. Scientists think the region is on a par with the better known earthquake hazards in California. Atwater said, "Most scientists now consider Cascadia to be a region of moderate to high hazards, similar to California. This obviously poses a challenge to dam owners and regulators

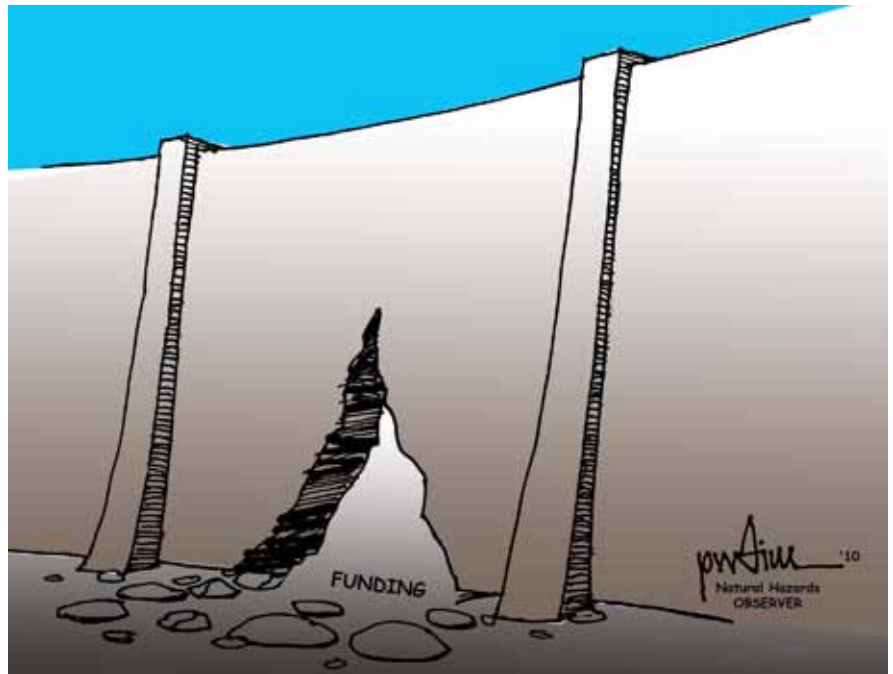
MOST DAMS IN THE PACIFIC Northwest are more than 20 years old—built before the explosion in geologic information about the region's earthquake potential, according to

whose responsibility it is ensure the safety of dams."

There was some hopeful data resulting from the recent Mw 9.2 quake in Chile. The quake struck over a large area—an equivalent length along the coast of the distance between Los Angeles and San Francisco. But retaining walls and dams performed well, with only one earthen dam showing minor distress, according to David Frost, an engineer at Georgia Tech.

The significance of the Chile results to the United States is that prior to the quake, Chile had adopted seismic codes similar to those in use in the United States. "Part of the reason it's relevant to the United States is that it tested the codes we use," Frost said.

One tailings dam at a closed-down gold mine did fail. Up to 100,000 cubic meters of tailings flowed about a half a kilometer (0.3 miles) and killed four people. Soil at the dam liquefied at the site during the main quake and aftershocks.



Drought protection for Africa's small farmers

Weather-based crop insurance attracts a crowd

11,000 farmers sign up in first year

first year of its existence.

Kilimo Salama (Swahili for "safe agriculture") has brought in 11,000 subscribers to its weather-based insurance plan during its first year of operation.

The Kenya operation (kilimosalama.wordpress.com), funded by a partnership of Syngenta Foundation for Sustainable Agriculture, UAP Insurance, and Safaricom, provides crop coverage for weather-related crop loss. Farmers pay five percent extra on the seed and other products they, then they are reimbursed up to 50 percent of their input costs. It's assumed that the rest can be recovered from salvage harvests of the crop.

ACROP INSURANCE PLAN for Kenyan farmers has attracted nearly 1,000 participants a month during the

The insurance plan paid out its first claims at the end of September when 100 farmers received payments because of low rainfall in Embu in central Kenya.

Kilimo Salama has installed 27 solar-powered weather stations in its rural Kenya regions to monitor rainfall in the area. Farmers aren't covered for losses from pests, floods, or poor management. The group provides training by agricultural experts on best practices for each climatic region.

There are many microinsurance products, not just for agriculture. In South Africa, for instance, most people have funeral insurance. But agricultural microinsurance schemes have been expanding in Africa and elsewhere around the globe over the past few years (*Natural Hazards Observer*, May 2009). According to an International Labor Organization Microinsurance Innovation Facility report (www.ilo.org/public/english/employment/mifacility/publ/brnotes.htm), southern

and eastern Africa are leading the way, with agricultural insurance programs in Malawi, Kenya, South Africa, Namibia, Ethiopia, and Zimbabwe. In Asia, India is the only nation in the world with a commercial insurer handling the programs. There ICICILombard sells 40,000 to 50,000 policies annually.

Syngenta says that while the early tests have been successful, agricultural insurance is still in the laboratory stage and isn't ready for mass marketing. "Firstly," the

foundation says in a fact sheet on the program, "insurance products need to be affordable for farmers, without reverting to subsidies. Secondly, distribution channels relevant to smallholder farmers need to be identified and developed. Thirdly, investment in renovating automated weather stations that can monitor the local weather patterns and the related insurance contracts is needed."

A conversation with Rose Goslinga

Helping the 'naturally risk averse' avoid risk

*Small- and medium-sized farms in the developing world are especially vulnerable to weather events, putting them at increased risk as the climate changes. The Syngenta Foundation, a Swiss nonprofit, has developed an index-based, microinsurance program in Kenya called **Kilimo Salama** (Swahili for "safe agriculture") to insure the agricultural inputs of farmers in that country, to help them ride out weather-related problems (see related story, above). Syngenta Foundation's Agricultural Insurance Initiative Coordinator **Rose Goslinga** spoke with the **Natural Hazards Observer** about their program.*

Natural Hazards Observer: How did the program get started?

Goslinga: We started working in insurance two years ago, with the background of really trying to solve a problem that we were creating ourselves. When you try and advise farmers about how to become more productive, how to intensify, that you need to invest in good seeds, apply fertilizer, that you have to mechanize your farms—basically by doing that you're making farmers take more risk, you're making them spend more money.

Now if they're actually good farmers—and most farmers are hardworking people—they will spend that money, maybe take out a loan even. And if it doesn't rain, or if it rains too much, or if the weather overall is against them, then your advice has actually taken them backwards rather than forwards.

Farmers are very aware that the weather is a factor that affects them. Therefore they invest less in any case. They're naturally risk averse. They'll do a lot of things, like plant different varieties of maize on their land, which is essentially as if you diversify an investment portfolio, but to an extremely low level. If you have one acre, on that one acre you might have six different crops being grown.

Now what we're trying to do is to help them become better farmers through insurance. What we developed was based on index-based insurance. Index-based insurance, I should explain, is a different type of insurance. Rather than assessing losses by a human being going and visiting the farm and assessing the yields, we use a weather station, a fully automated



weather station that measures the rainfall in a location, and essentially that weather station would act as a proxy for the experience of the farmers.

There are no farm visits necessary. The weather station will measure the rainfall, too much or too little of it. If it's too little to sustain a crop, or if it's too much so that the crop rots, particularly at harvesting, then the measurements of the weather station trigger a payout—not what happens on the farm.

This is what they call "index-based insurance." There was a pilot of index-based insurance in Malawi, which proved the concept that you can actually do this (*Natural Hazards Observer*, May 2009).

We looked at this and said, "Look, in the end, it's about how does it get to the farmer." The concept of the weather station, it's very interesting, and you can downscale, but how do you take this product to the farm.

So we started developing an idea around insuring farmers using weather stations as part of the technology, but also using mobile phone applications. We developed a mobile phone application to register insurance.

NHO: What were some of the early issues you dealt with?

Goslinga: What we also realized is that to actually sell insurance in Kenya—and frankly even in the developed world—insurance is not the same as credit. With credit, the bank has to trust you. With insurance, you have to trust the insurer—and particularly in Kenya. I remember in our first pilot, two insurance companies went bankrupt during those three months. The insurance industry has a very bad reputation. To be called an insurance broker is an insult in Kenya.

You have build trust. You have to build trust that this product that you're selling is actually real. This product that you're selling is a promise. To be able to make that promise, people have to trust you. You have to build trust.

You have to have a channel of distribution that has that trust to some extent already. So you can't use normal insurance agents. What we did is we started using agri-dealers and farmer networks as the distribution partner.

Agri-dealers would sell a bag of seed, and farmers could choose to pay a bit more and insure that bag of seed. We basically developed a mobile application that allowed agri-dealers to do that.

NHO: What does the application do?

Goslinga: An agri-dealer will have a mobile phone—just an ordinary mobile phone, nothing special. The only thing special about it is that it has a camera.

It runs a program, *Kilimo Salama*. The first thing it will be asking the farmer is, "Where are you? Where is the weather station that you want to be represented by?"

The next thing it will ask is, "What do you want to insure?" Do you want to insure fertilizer, seeds, chemicals? Then what it does, the stockist will have a piece of paper with bar codes on it for each insurable product. The camera will scan it and when you press "add," you'll be able to add any quantity.

It will show you the basket you want to insure. Then it will calculate a premium for you. Then it will ask for your mobile number. Then you receive an SMS on your phone.

We currently insure up to 12,000 farmers through this system. On the spot, the farmer gets a confirmation, the stockist collects the premium. If there's a payout, they get the payout to their phone again.

Two days ago, we had a payout ceremony in Embu, where we paid out to 135 farmers. There was a 15 percent payout. There was a very minor drought in that area.

In our first year, in 2009, we had an 80 percent and a 30 percent payout. That was the year where it was very dry.

NHO: And how many farmers got those?

Goslinga: That was our first pilot year. We had 200 farmers then. All of them got a payout. Currently, if I'd had a drought in certain areas this year, I could have had three or four thousand people getting a payout.

NHO: 12,000 farmers signed up in a year seem like an awful lot. It seems like you've gotten an enthusiastic

response. Is that your take on it, too?

Goslinga: We get individual farmers as well as groups. And the larger part of the 12,000 farmers we have now are through groups, basically an organization that wanted to insure drought for its farmers. In sales language, they're a key account.

We're looking for more of those people. We have about 3,500 to 4,000 walk-in customers.

I think we're doing good. I think we're doing okay. Obviously, the individuals are more expensive for us to acquire because we have to train them, organize field days and so on, whereas the groups are cheaper for us.

In terms of where we want to go, of course we want more groups and we want more individuals—basically, we want all Kenyan farmers to be insured.

NHO: What do you have to do expand the program? Is the program ready to be scaled up?

Goslinga: It depends on how you do it. There are expensive ways of doing it and cost-effective ways of doing it. Working through groups and farmer organizations is definitely a cost-effective way. Actually going out and convincing each farmer one by one is a less cost-effective way of doing it, and I don't think that will be very scalable.

So we are actively looking toward working with farmer groups, with banks, with other organizations that could serve as aggregators as well as the agri-dealers that we currently work with, which are a good walk-in channel.

We see two main obstacles for us to scale. First, we need financial education, we need to train farmers on what is insurance. I don't train farmers on "what is crop insurance?" I train farmers on "what is insurance?"

A lot of their first experience in insurance is coming from this product. That means they have to try it. If you buy a new product, you don't insure everything. You insure a small thing, which means the costs outweigh the income in the beginning. So you have reach scale quite quickly, and you have to make sure that people start insuring more, so that in the first year they insure their seeds, in the second year they insure their fertilizer as well. That's how I measure success, essentially, because that starts to make things scalable and financially sustainable.

Apart from the distrust and the lack of knowledge about insurance, the second point is weather stations, and weather data infrastructure. We currently operate about 30 fully automated weather stations. They measure rainfall, wind speed, solar radiation, and are powered by solar cells. Kenya allows us to expand to a lot of areas because there is historical weather data, but we do need an investment in new weather stations to enable us to expand to other areas.

NHO: What is the level of enthusiasm among insurers for this kind of product?

Goslinga: I must say, UAP (a Kenya-based insurance company), our partner, we chose them because they had already started doing agriculture insurance for many large-scale farmers, and they had agricultural know-how within their organization. So

they were already open to looking at agriculture.

I would say, every day when getting an insurer to look downmarket, which is what you're doing with microinsurance, it's always a struggle, because you have to convince them to do something they haven't been doing before. And there was a reason they weren't doing it before.

But they're very keen, particularly because the mobile technology really brings down the transaction costs. There are no forms, there's no claims procedure. The transaction cost per farmer and per policy is really, really low. That is one of the reasons why they're enthusiastic.

NHO: Is it suitable for other countries in Africa or elsewhere around the world?

Goslinga: The reason why we're in Kenya is because we know there are a number of reasons why it can work here. A number of things come together really nicely.

We have weather data, which means we can assess the risk. All the risks are reinsured on the international reinsurance market, which makes it easier for UAP to also go into this market.

You have weather data, so you can assess the risk. That is not the case in many African countries. As soon as you have a civil war somewhere, the first things to go

are observations and weather data.

Manual weather stations have been there for a long time. They're generally kept at churches, farms, research organizations, and meteorological departments. So they're there. But if you have civil unrest, that goes. It takes a long time for them to start up again, in my experience. So you have a large gap and that doesn't help much in Africa.

I think Kenya is to some extent an exception because they have very good weather data. There are other countries that have good data. Tanzania has reasonable data. I was working in Rwanda before. They have good weather data up until 1990, after that it's not much. Uganda, not very good either. Malawi has good weather data. Zambia has reasonable weather data. It really depends.

The second thing you have to look at is: are the farmers interested in insurance. Do they have a risk that I can actually cover? We get a lot of demand from farmers who farm tomatoes. They say they want insurance. I ask them, "What do you want to be insured against?" They say, "Well, you know, I get this disease." Or farmers say, "I want to be insured against hail." And I'm thinking, "How can that weather station of mine measure hail? Or measure that disease?"

We're really trying with some diseases, which we think are weather-related. We're experimenting in that.

The insurance industry grapples with climate risk

While we're on the subject of insurance ...

THE INSURANCE INDUSTRY is looking hard at adaptation to climate change. This examination is usually couched in terms of a "com-

mon interest" among all stakeholders for "sustainable growth," but there's a lot of cash involved—a lot of risk that can not currently be quantified.

And not everyone is convinced that insurance will provide much long-term protection against the impacts of climate change—at least not in underdeveloped countries.

A report by the World Wildlife Fund and Allianz, a global financial service provider, found enormous exposure for insurers from only a single hazard resulting from the changing climate—sea level rise. "A global sea level rise of 0.5 meters by 2050 is estimated to increase the value of assets exposed in all 136 port megacities worldwide by a total of \$25,158 billion to \$28,213 billion in 2050," according to *Major Tipping Points in the Earth's Climate System and Consequences for the Insurance Sector* (knowledge.allianz.com/climate_tipping_points_en.html).

A hurricane hitting New York could result in costs of \$1 trillion today and as much as \$5 trillion by 2050. Drought, shifting monsoon and rainfall patterns, and other problems are also all growing risks in the insurance field.

And in a "Global Insurance Industry Statement on Adapting to Climate Change in Developing Countries," several companies and nongovernmental organizations called on nations to "develop a holistic risk management culture, facilitating community, regional and state level loss reduction activities, climate-proofing existing infrastructure investments and putting in place appropriate zoning

and building codes and enforcing these—all of which will contribute tangibly to managing risks and loss potential."

They also called for policies that would allow a suitable environment for risk management, including insurance, to get financial services to all levels of society.

The statement cited the Caribbean Catastrophe Risk Insurance Facility (CCRIF), a public-private partnership to limit the impact of hurricanes and earthquakes for 16 Caribbean governments. But another report, this one by the NGO Christian Aid, cited CCRIF as an example of the limitations of insurance in developing countries. While insurance can be useful, it has to be put in a holistic framework.

"At present, CCRIF appears unresponsive to community needs and a poor fit between investment and return," the report said. "Countries paying premiums for hurricane coverage can experience severe and repeated floods, storm surges and wind damage without qualifying for a CCRIF payout."

Nonetheless, several agricultural insurance programs in Africa and Asia have shown promise. Microinsurance in Malawi has proven effective in partially protecting about 1,000 farmers from weather-related crop loss. And a similar initiative in India attracted about 700,000 farmers.

A USAID fact sheet says, "Agriculture is perhaps the most disaster-sensitive sector. Communities that are dependent on agriculture are increasingly vulnerable to harvest losses, destroyed plantations, salinization, and loss of livestock due to disaster and disease. As a sector that is heavily dependent on natural phenomena, largely uninsured and (in India) not technology driven, agriculture can derive great benefit from even minimal investment in disaster preparedness."



An invited comment
by Richard C. Keller

pm
Natural Hazards OBSERVER

The social ecology of catastrophe

Heat and death in France

IN A CEMETERY ON THE SOUTHERN OUTSKIRTS OF PARIS lie the bodies of a hundred Parisians, people whom many have called the “forgotten” victims of the deadliest natural disaster in French history, the devastating heat wave that struck France in August 2003, leaving 15,000 dead in its wake. They died alone in Paris and its suburbs, buried at public expense when no families claimed their bodies. They died (and to a great extent lived) unnoticed by their neighbors. It was sometimes weeks after their deaths before their bodies were discovered.

And as with the victims of Hurricane Katrina, they became symbols of the disaster for a nation wringing its hands over the mismanagement of the heat wave and the social and political dysfunctions it revealed. I have spent the past several years researching the social histories of these most marginalized of victims, beginning with their undignified end.

The devastating heat wave that swept through Western and Central Europe in August 2003 was by every measure an extreme event. It hit France particularly hard. Daytime highs in Paris reached 40 degrees Celsius (104 degrees Fahrenheit) for days on end. Evening minimum temperatures only dipped to the low 20s (about 72 degrees F), giving people little nighttime respite from the heat. Ozone pollution levels compounded the heat’s effects. The high temperatures lasted unbroken for two weeks, making the climate insufferable. The heat wave’s human toll was staggering: roughly 70,000 lives lost to the heat in Europe—15,000 in

France alone.

My project tells the stories of some of these victims by investigating the multiple narratives of disaster: the official story of the crisis as it unfolded and its aftermath as presented by the media and the state; the anecdotal lives and deaths of its victims and the ways in which they illuminate and challenge typical representations of the disaster; and the scientific understandings of catastrophe and its management. It is at once a social history of risk and vulnerability in the urban landscape, as well as an ethnographic account of the complexities of the disaster.

The heat wave of 2003 more closely resembled an epidemic than a sudden-onset natural disaster. Where tsunamis, floods, and earthquakes strike with dramatic force, the European heat wave was a creeping catastrophe marked at first by a death here, two deaths there. Only well after its inception was there a sudden explosion in mortality. Unlike hurricanes or tornadoes, heat waves appear at first primarily as nuisances. People will travel into a heat wave on vacation, but not into a flood zone or an earthquake epicenter. Work and leisure go on as planned. A heat wave takes days to kill its victims, as their bodies slowly deplete their stores of water and sufficient heat accumulates to raise the core temperature to deadly levels.

The social origins of heat waves’ victims also distinguish them from other disasters. Where most catastrophes prey on the most socially vulnerable—those who live in flood zones, or in substandard housing that poorly resists

extreme weather or seismic events—heat waves prey on particularly marginalized populations. The addicted, the elderly, the sick, and the desperately poor are at especially high risk during heat waves for a range of biological and social reasons. Death among these populations produces little shock, as it is already so prevalent. Where a healthy cocker spaniel or a small child who dies while locked in an overheated car is clearly a victim of hyperthermia, who is to say whether a 94-year-old woman or a malnourished, HIV-positive, cross-addicted homeless man died from the heat or from some other cause—old age or Alzheimer’s, overdose or AIDS—even if the weather is stifling?

The death of Bodo M. drew little attention. He was an elderly German man who had lived in Paris for decades before his death on August 2, 2003. Combined with its western-exposed windows, his Left Bank apartment’s situation under the building’s zinc roof made it sweltering. Another neighbor who lived down the hall saw M.’s door ajar. When he tried to push it open to check on his neighbor, M.’s lifeless body blocked the door.

Nor did anyone pay much attention a few days later, when a desk clerk in a rundown hotel in a decaying neighborhood in Paris’s eighteenth *arrondissement* went to check on Patricia P., a tenant who had lived in the building for months, but whom he had not seen in days. She too lay dead against the door. Like M., she was apparently trying to open the door when she collapsed. No one noticed the death of Françoise V., a 43-year-old heroin addict and alcoholic, in a squat in an abandoned ramshackle building in Paris’s twentieth *arrondissement*, where she lay dead for over a day until others found her. The same went for Claude N., a homeless 53-year-old man, who ironically died in the street directly in front of one of Paris’s coolest environments, a frozen-food outlet.

People with much in common

ALTHOUGH DIFFERENT IN LOCATION, AGE, and social origins, these people had much in common. They are representatives of the stark inequalities and pervasive alienation of modern urban life. They remain the public face of the heat wave and its mismanagement. They had few family ties: Bodo M. had a half-brother whom he had only met once; Patricia P., apparently mentally ill, had left her family years before, vanishing without a trace; Françoise V. had once been married, but lived primarily with her addictions. Their neighbors recognized them, knew a bit about them, but that didn’t save them. The city’s and the nation’s famed social safety nets did little to stop their fall. The media were initially unaware of these anonymous deaths in their midst, if only because of their very ordinariness.

It is only when these deaths appear en masse that they demand attention. Overwhelmed by the bodies of the dying and the dead, funeral directors and emergency room personnel finally drew media and government attention to a crisis that had been brewing since the arrival of the weather system.

Journalists, government officials, and epidemiologists began to tell a story of extremity and exception. Yet despite efforts to write off the heat wave as a “natural” disaster—one that was as unmanageable as it was unpredictable, and therefore out of the state’s hands—the social components of the catastrophe immediately generated a political crisis



in France unmatched elsewhere in Europe. The fact that these deaths occurred during the first two weeks of August focused critical attention on the culture of the August vacation. As the young and well-heeled headed south for holidays at Mediterranean beaches, they left their poor, isolated grandmothers to die horrid deaths from heat stroke and dehydration in their apartments in Paris and Lyon—deaths that a phone call or a visit might have prevented.

Or so went a typical media narrative—an urban myth, for the most part.

The realization that so many bodies lay unclaimed in France’s cities reinforced this notion. While deaths in isolation are a fact of modern life, the sheer numbers of these unclaimed bodies emphasized the gravity of the catastrophe. The idea that abandonment on such a scale was possible in the historical birthplace of the notion of universal human rights underscored central story lines of shame and selfishness, entitlement and inequality, indulgence at the expense of solidarity.

The story of these bodies is a complex one, far more difficult to grasp than the select keywords of isolation, abandonment, alienation, and death might suggest. To learn more about them, I spent months collecting their stories.

I began from their grave sites, compiling lists of their names and birth dates. I then worked from 2003 telephone directories to find addresses for a handful of the victims, and wrote to the officials in Paris’s twenty official administrative districts, or *arrondissements*, in an attempt to obtain death notices for as many as possible. This range of strategies enabled me to obtain the addresses of nearly 100 of the victims, which I visited by bicycle, metro, and on foot. Interviews with building custodians, neighbors, and shopkeepers helped me to piece together the disparate fragments of the public record for many of these victims.

What I learned from researching their backgrounds told me less about the victims themselves than about their social and physical surroundings, and less about the heat wave than about social memory of the disaster. I became fascinated by the ways in which their stories intersected with the larger narratives of the catastrophe, and how they opened a window on the tragedy’s multiple social dimensions.

All in all, I visited the residences of 93 victims. Fifty-one were men, 42 women. Among women, three-quarters were over 75 years old; among men, four-fifths were under

75. These figures are important because of their contrast with the nationwide mortality. Of France's 15,000 victims, four-fifths were over 75, and two-thirds were women. Among these most marginalized of the heat wave's victims, younger men were significantly over-represented when compared to the general mortality pattern. When examining the characteristics of vulnerability among a group already likely to live in conditions of overwhelming isolation, what factors might indicate these departures from the general portrait of risk established during the crisis?

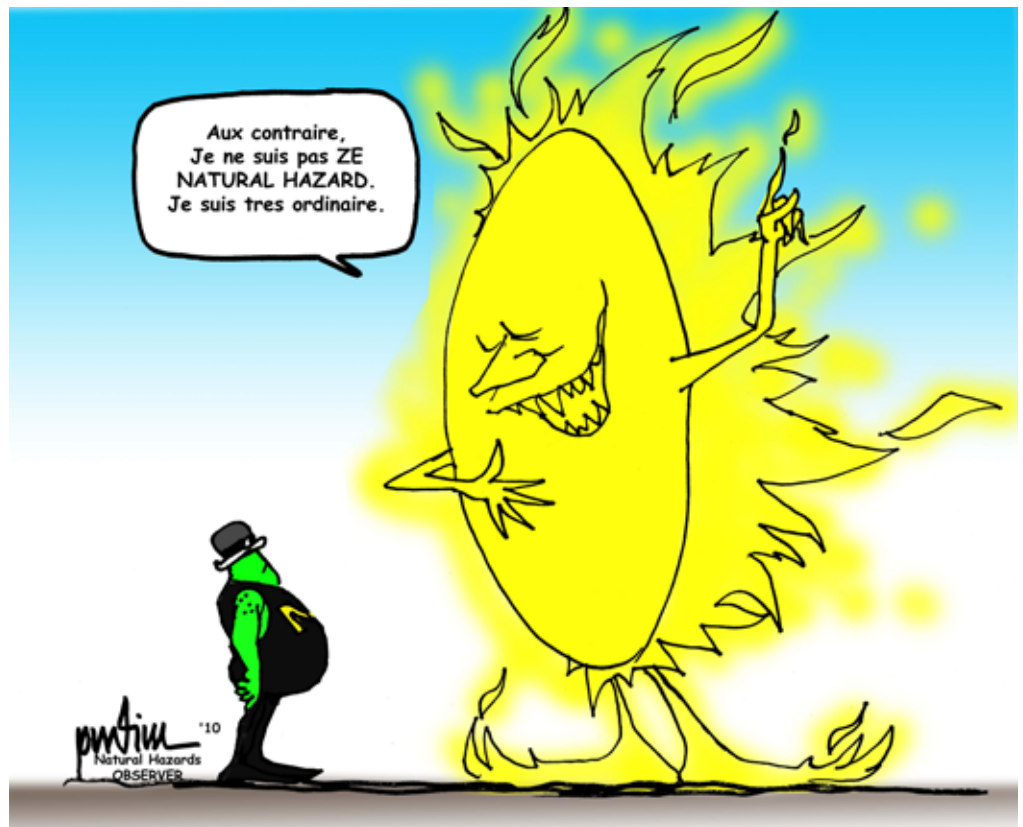
The cases were distributed across a broad range of age groups and were evenly distributed throughout Paris, from luxurious buildings in the heart of the city to decaying residential hotels in the most marginalized neighborhoods. They included an 89-year-old woman, born during the opening salvos of the Great War, who had been a foundling; she literally was born and died in utter isolation.

Another was a 48-year-old alcoholic whose wife had thrown him out of the house a few weeks before the heat wave. He died in a tiny room in a boarding house where a friend let him sleep. Another was a man in his seventies who was allegedly a millionaire, but who was by all appearances schizophrenic. Others included a couple (ages 102 and 75) found in bed together in a coal-heated apartment, and who now lie in adjoining tombs; a Vietnamese immigrant who committed suicide at the peak of the heat wave; and a 77-year-old Serbian man who was found in bed wrapped in a sweater, a robe, several blankets, and a comforter. In the last case, the building custodian found him so dehydrated that his skin was hard to the touch.

Despite the diversity of these cases, with careful analysis a number of common factors emerge:

- **Disenfranchisement and vulnerability.** By definition, these stories don't have happy endings. But my research also revealed precious few happy beginnings. Most of the subjects of the study came from poor or desperately poor backgrounds. Just a handful owned their apartments, and many lived in decaying public housing projects. A few had state pensions, but most had lived in a precarious state of bare survival for years preceding the disaster—some for their entire lifetimes. Many, especially the younger victims, had extensive health problems, and physical or mental disabilities that prevented them from holding a larger stake in society.

- **Social citizenship and health.** As a corollary to the above, the victims in my study were vested citizens only in the narrowest of terms. While virtually all of them were French nationals, that nominal link to the



state represented their only capital of citizenship. They had at least theoretical access to the entitlements of the state, but none had anything like the real social citizenship that is an essential component of health in a liberal democracy. None was woven into the social fabric of the community. In some cases, this social marginalization may have exacerbated their health conditions. In others—particularly in the cases of victims with severe mental illnesses and other disabilities—it likely shaped that marginalization. This nearly reciprocal relationship between health and citizenship suggests powerful ways in which the precariousness of life is as dependent on social and political factors as it is on biological ones.

- **Vertical geographies of vulnerability.** Although the overall death rate in Paris during the heat wave varied widely by neighborhood, the spatial distribution of the deaths of the abandoned was surprisingly even, with few obvious concentrations. Yet there is a clear concentration that emerges through the analysis of a different geography: the spaces of the abandoned. Most lived on the top floors of their buildings, sites of greater vulnerability for several reasons. Higher floors increase risk first simply by being hotter: heat rises. The highest floors of these buildings brought even greater risk, since many nineteenth- and early twentieth-century buildings have thin, uninsulated zinc roofs, providing little shelter from the baking sun. Living on higher floors—particularly in walk-up buildings—is a sign of poverty in French cities. A typical top-floor, one-room apartment will have less than 100 square feet, no bath facilities, one small window, and perhaps a common water source down the hall. For the elderly or disabled, the difficulty of descending and re-ascending six or seven flights of stairs makes such apartments virtual prisons.



While deaths in isolation are a fact of modern life, the sheer numbers of these unclaimed bodies emphasized the gravity of the catastrophe. The idea that abandonment on such a scale was possible in the historical birthplace of the notion of universal human rights underscored central story lines of shame and selfishness, entitlement and inequality, indulgence at the expense of solidarity.

• **Aging, isolation, and aggregate risk.** Given the distribution of mortality in 2003, preventive campaigns have focused on old age as the critical risk factor for elevated morbidity and mortality during heat waves. This makes statistical sense: if 80 percent of the heat wave's victims were the very elderly, then the allocation of limited resources should aim at that population. Yet the other 20 percent constitute 3,000 victims—two Hurricane Katrinas' worth of mortality. A focus on the elderly is unavoidable in a rapidly aging society like France, but it is the isolation that often correlates closely with aging—as well as a range of other social conditions—that appears to be the critical threat. In a disaster of this scale, the outliers constitute a staggering excess mortality. An analysis of an isolated population reveals aging as merely one risk factor, albeit a critical one.

• **Disaster and memory.** A qualitative study such as this one, which relies on ethnographic methodology and the reconstruction of social history from the starting point of the victims' deaths, has complications. One of these is that neighbors, building custodians, and shopkeepers told me the victims' stories from the perspective of their deaths, often in ways that reduced their own potential culpability. One concierge told me of her attempts to look in on an elderly woman in her building. She was screamed at for her trouble. Another discussed a victim's greed as the principal reason for her falling out with her family. Others described victims as paranoid, insane, scheming, or irascible, resisting all attempts to link them into a social network. They gave me marginalizing memories organized in a narrative that emphasized the victim's role in his or her death, minimizing the role of the community. Such a perspective has the potential to reduce sympathy for disaster victims, potentially reducing the effectiveness of campaigns to reach out to the homeless, the elderly, or the otherwise vulnerable.

• **Risk profiling and memory.** Another intriguing tendency that emerged in field interviews was equally problematic. When I discussed the cases of relatively young victims with neighbors, they uniformly denied that those deaths were caused by the heat wave. They would discuss the victim's compromised health status—a heart condition, HIV infection, addiction, obesity, or mental illness—and would ascribe the death to that condition. They would note that “the heat didn't do him any favors,” but would invariably consider the heat, at

most, a lesser contributing factor. With elderly victims, the opposite was true. Informants said things like, “Of course she died during the heat wave. She was old. That's how it happens.” Even given the staggering excess mortality during the period, informants were reluctant to consider heat the cause of death for those who did not fit the typical risk profile advanced by epidemiologists and the media: that of the very elderly poor. They failed to consider that heat might be a principal cause of death, exacerbated by poor underlying health conditions. Instead, they considered the opposite to be true: for victims under age 65, the heat was the exacerbating factor.

Although it is too early to offer any real conclusions based on the study, these general observations are troubling. They indicate just how difficult it will be to institute preventive measures for France's most disenfranchised citizens. While policies established after 2003 have proved modestly successful in successive hot summers (2006 and 2010 in particular), they have been aimed primarily at the elderly. They involve public awareness campaigns encouraging French citizens to look after their elderly neighbors, telephone surveillance networks through which city officials make contact with the elderly to ascertain their safety when the temperature goes above 25 degrees C, and the establishment of cooling centers in nursing homes. But it remains to be seen what effect they will have in the next summer that rivals 2003 in its intensity. The challenge is all the more difficult when community members do not see that the very poor, the addicted, the homeless, and those in poor general health are threatened at least as much during heat waves as the elderly. A focus on aging as the critical site of vulnerability makes good statistical sense, but it overlooks populations at equal risk by virtue of similar factors—social isolation, poverty, and disabilities—which often make these populations extremely difficult to reach.

The individual stories of the forgotten constitute elaborate narratives of social marginalization, offering a fascinating lens through which to examine the disaster, but also the larger phenomenon of anonymous death and life in an urban landscape. The stories of Marie F., Pedro S., Marcelle C., Paulette M., Minh T., and many others cast a powerful spotlight on the all-too-easy possibility of falling through the safety nets of an extensive welfare state. They provide a means of interrogating the conditions of poverty in a society marked by tremendous wealth, and of marginalization in a republican polity. Perhaps most important, they call into question what it means to assess risk, to promote resilience, and to count the dead.

*Richard C. Keller is a professor in the Department of Medical History and Bioethics at the University of Wisconsin-Madison. His research was conducted under a National Science Foundation Science and Society Scholar's Award: **Heat and Death in France: Social Ecology and the Making of the Paris Heat Wave Disaster.***

Chernobyl...

(Continued from page one)

quality and degree of loss, people usually recover psychologically from disaster as the immediate trauma fades with time. But our interim findings suggest that after Chernobyl the perception of radiation risk to both self and family in the Ukrainian population has not decreased since the immediate postdisaster period.

The population has experienced a sustained and protracted concern about radiation-related disease for all 23 years of the post-disaster period.

This is true even though epidemiological and medical research show there has been little demonstrable increase in radiation-caused diseases in this population since the Chernobyl incident's immediate aftermath. The death of workers from radiation poisoning immediately after the accident and an increase in thyroid cancers among individuals exposed before the age of two years are the only distinct clinical effects that have been directly related to radiation exposure from the Chernobyl accident fallout. Other long-term health impacts are unclear (UNSCEAR 2002).

People affected by Chernobyl are acutely aware of their situation—of what they don't know and essentially can't know about their health prognoses as they age. There is something unique, we believe, about radiation and other toxic disasters and their cognitive, affective, and communal impact on a population. Because in most cases the long-term effects on health and welfare are unknown, people face continued stress. They in turn practice continued vigilance.

Our findings also show a relationship in our study population between the perception of risk and actual radiation exposure. We conjecture that the exposed population was well attuned to regional information disseminated on radiation fallout in their area. They are concerned ac-

cordingly. The radiation levels for the particular areas we studied were too low to carry any known biomedical risk. But this lay population of survivors appears to be logically interpreting higher dose exposure with greater odds for acquiring radiation-related disease.

We examined the general mental health functioning—depression, anxiety disorder, post-traumatic stress disorder, psychoticism, and so on—of the population with some high-powered diagnostic instruments. We found no relationship between perception of radiation risk and compromised mental health. We believe that these are resilient, functioning, sound-thinking folks, who have simply remained aware of their environmental risks and exposures since the accident. This has left them appropriately vigilant concerning about their own and their families' health.

There is something unique, we believe, about radiation and other toxic disasters and their cognitive, affective, and communal impact on a population. Because in most cases the long-term effects on health and welfare are unknown, people face continued stress.



There was a joke popular in the Ukraine not long after the accident: Two men from the same town meet in heaven after their deaths. One asks, "Comrade, what caused your demise?" The other answers, "I died from exposure to Chernobyl radiation. And what did you die of?" The first man responds, "I died from information."

(Please see next page)

The plants and the plant

The 1986 accident at Chernobyl in the Ukraine was the most serious in nuclear plant history—but apparently it wasn't so bad in green plant history.

Surprisingly, while the area around the nuclear facility remains heavily contaminated with long-lived isotopes, the ecosystem has adapted to the conditions pretty well, according to a paper published in August in the journal *Environmental Science and Technology*.

"If you visit the area, you'd never think anything bad had happened there," said Martin Hajduch, one of the study's authors and a plant geneticist at the Slovak Academy of Scienc-

es in Slovakia, told the *New York Times*. "Somehow plants were able to adapt to the radioactivity; we wanted to understand what kind of molecule changes were going on."

What they found is that "the proteome of seeds from plants grown in radiocontaminated soil display minor adjustments to multiple signaling pathways." This means that the flax plants studied altered their protein makeup to create a kind of shield for themselves.

Although the plants themselves are healthy, they aren't ready to be put

in the salad yet. "Now I don't think anybody wants to eat this," Hajduch told the *Times*. "But one day, it may be cultivated and used for agricultural purposes."



Chernobyl and its aftermath

Chernobyl is as synonymous with the hazards of nuclear power as the *Titanic* is with the hazards of icebergs. Coming online in 1983, the Chernobyl nuclear power station near Pripyat in the Ukraine, about 100 kilometers north of Kiev, provided four gigawatts of power—about ten percent of the electric power used in Ukraine. Just before 1:30 a.m. on April 26, 1986, during a safety test on reactor number four at the plant, a power surge caused an explosion. Core temperatures reached more than 2000 degrees Celsius, melting the fuel rods and releasing a cloud of radiation into the atmosphere.

“In Chernobyl, the quantities of released fission products were significant,” according to a 2003 paper in *Applied Energy* (Strupczewski 2003). “The doses in the early phase after the accident were high. In the rescue team, 28 men died in consequence of exposure to radiation and several more of those who were treated for radiation sickness died from illnesses that may have been associated with their exposure.”

Problems remain for survivors

THE EXACT CAUSES OF THE MELTDOWN are still unclear. It was a serious failure, the sort of thing that wasn't supposed to happen. According to the 2000 Report of the United Nations Scientific Committee on the Effects of Atomic Radiation to the General Assembly, “The accident at the Chernobyl nuclear power plant was the most serious accident involving radiation exposure. It caused the deaths, within a few days or weeks, of 30 workers and radiation injuries to over a hundred others. It also brought about the immediate evacuation, in 1986, of about 116,000 people from areas surrounding the reactor and the permanent relocation, after 1986, of about 220,000 people from Belarus, the Russian Federation and Ukraine.”

Furthermore, the UNSCEAR report said, “It caused serious social and psychological disruption in the lives of those affected and vast economic losses over the entire region. Large areas ... were contaminated, and deposition of released radionuclides was measurable in all countries of the northern hemisphere. There have been about 1,800 cases of thyroid cancer in children who were exposed at the time of the accident, and if the current trend continues, there may be more cases during the next decades.”

But the report concluded, “Apart from this increase, there is no evidence of a major public health impact attributable to radiation exposure 14 years after the accident. There is no scientific evidence of increases in overall cancer incidence or mortality or in non-malignant disorders that could be related to radiation exposure ... the great majority of the population are not likely to experience serious health consequences as a result of radiation from the Chernobyl accident.”

Nonetheless, as our research indicates, problems remain for the survivors. Most of them believe that their health has been compromised by their exposure. The 2005 World Health Organization Chernobyl Forum report “estimates that some 4,000 people could eventually die from radiation exposure caused by the 1986 accident in the then-Soviet Union, far fewer than previously assumed. To date only 56 deaths have been directly attributed to the disaster.”

Havenaar and his research group (2003) found sig-

nificantly greater medical service visits by populations in Chernobyl-exposed areas compared to those from non-exposed areas. Working in conjunction with the Ukraine Ministry of Health, our group is tracking the study population's medical service visits, medical diagnoses since the accident, self-reported illnesses, and the key factor: cognitively perceived levels of radiation health risk. This is data that will hopefully illuminate the human experiential and economic burdens generated by a population that deeply fears the long-term risks of its radiation exposure.

“The health and environmental effects ... have been relatively, and surprisingly, minor,” said Kalman Mizsei, UN Assistant Secretary-General and United Nations Development Program regional director for Europe and the Commonwealth of Independent States.

“The psychological impact is now considered to be Chernobyl's biggest health consequence,” UNDP's Louisa Vinton told the *Chicago Tribune* in 2006, “People have been led to think of themselves as victims over the years, and are therefore more apt to take a passive approach toward their future rather than developing a system of self-sufficiency.

“There's a sense of waiting for rescue from a rescuer that never comes,” Vinton said. “It's a real impediment to people being able to take charge of their lives again (Rodriguez 2006).”

These are controversial statements for the survivors of Chernobyl. Our studies are beginning to show that while they are firm in their belief that their health is at risk, these concerns have not impacted their functioning at work, their family lives, or their current general mental health. In other words, this population may have substantial health concerns, but it is also forging forward with their general functioning (Perez Foster, et al. 2010). What is emerging is a resilient population simultaneously aware of the risks and taking charge of their own lives. We look forward to completing our data collection and acquiring a fuller understanding of these complex dynamics.

As the *Applied Energy Paper*, says, “Much greater damage to health has been caused by well meaning but misguided attempts to protect and help people living near Chernobyl at the time of the accident. The evacuation of hundreds of thousands of them is now seen as an overreaction, which in many cases did more harm than good. The first reaction was to move people out. Only later, was it realized that many of them had not needed to be moved. The relocation of people destroyed communities, broke up families, and led to unemployment, depression, hypochondria and stress-related illnesses. Among the relocated populations, there has been a massive increase in stress-related illnesses, such as heart disease and obesity, unrelated to radiation (Strupczewski 2003).”

As with most issues related to nuclear power, however, not everyone agrees with these relatively optimistic health assessments. The environmental group Greenpeace says that 93,000 people may eventually die from Chernobyl-induced disease. They called the UN reports a “whitewash.”

Features of toxic events

UNLIKE OTHER DISASTERS, TOXIC EVENTS are often marked by lethal agents unperceived by the senses. Technological disasters such as chemical or radiation emissions hold the threat of disease, malignant illness, and genetic damage. But the tangible aspects of these destructive agents are of-

Our current research is still preliminary, but we've found so far that health fears about radiation-related illness for self and family has not decreased for the Ukrainian population that remains in the oblasts near Chernobyl.



ten absent, as are predictable courses of their future impact on those exposed.

Biological and infectious disasters arouse contagion fears and primitive concerns within communities about destruction by powerful external forces that cannot be controlled. For exposed communities, the risk potential of toxic agents comprise amorphous physical and psychological threats that have no clearly defined beginning, middle, or end. Several investigators have conjectured that upon physical exposure to a toxic agent, the perception of risk remains active in the cognition of impacted communities, functioning as a chronic stressor across time.

Aside from their immediate impact on physical mortality and morbidity, research indicates that toxic disasters may stimulate a unique spectrum of long-term mental health effects that compromise community functioning, postdisaster recovery, health behavior, and utilization of medical services. There is evidence that perceptions of event-related toxic risk can reverberate far into a community's future, as exposed populations contemplate long-ranging health effects (Havenaar, Cwikel, and Bromet 2002).

The methodical study of the direct and mediating influences of post toxic disaster containment procedures is still in the early stages. This is striking, since the literature shows a linear relationship between disaster-related mental health symptoms and the additive effects of evacuation, physical isolation, body decontamination, and clinical examination, compounded by human loss, personal and familial injury, and property loss (Norris et al. 2006). Knowledge about the effectiveness of public health information dissemination and education related to toxic exposures is also still not highly developed.

A news release on the Chernobyl Forum report (WHO 2005) reflects this—and gives a little more bite to the information joke related earlier— when it concludes, “Alongside radiation-induced deaths and diseases, the report labels the mental health impact of Chernobyl as ‘the largest public health problem created by the accident’ and partially attributes this damaging psychological impact to a lack of accurate information. These problems manifest as negative self-assessments of health, belief in a shortened life expectancy, lack of initiative, and dependency on assistance from the state.”

In previous research, we studied Chernobyl survivors who emigrated to the United States (Perez Foster, Branovan, and Ukrainsky 2003). We found that while the physical exposure may not be manifest for a number of years, psychic anxiety over their eventual realization is chronically active among many Chernobyl survivors. “For example,” we wrote at the time, “some of those who are still deeply affected believe that radiation has forever changed the way their minds work; or that their sexual impotence is caused

by irradiated sperm. Still others await the dreaded diagnosis of malignant cancer, or interpret every arthritic ache or bronchial cough as having a basis in the Chernobyl disaster.

“More subtle reactions can be found in mothers who quietly fear thyroid cancer from a child’s cough or sore throat, or homemakers who even after migration will not keep floor carpets because radioactive particles are believed to collect on dusty surfaces.”

Our current research is still preliminary, but we’ve found so far that health fears about radiation-related illness for self and family has not decreased for the Ukrainian population that remains in the *oblasts* near Chernobyl. While our interim data indicates that this anxiety is subclinical, it nevertheless shows a persistent reaction in a community faced with a lifetime of uncertainty about their exposures to Chernobyl radiation.

But people remain wary, concerned about their environment’s effect on them. While this keeps anxiety levels high, it is a rational response to the uncertainties they face.

A broader issue

THE LAST DECADES HAVE WITNESSED a proliferation of large-scale toxic events that have exposed multiple international communities to high levels of radiation, hazardous materials, and infectious biological agents. Chernobyl is the poster child for these issues, but there are others. The Union Carbide accident in Bhopal, India that deployed lethal levels of methyl isocyanate and other chemicals, caused over 1,000 deaths. And there are the recent pandemic threats of SARS and H1N1 in Hong Kong, Canada, China, Ukraine, United Kingdom and the United States, as well as the recent large toxic discharge in Hungary..

The psychiatric morbidity outcomes for toxic disaster events are an understudied phenomenon that accompanies these hazards. Their eventual mitigation lies in a complex understanding of how individuals manage the threat of toxic exposure with successful titration of health-related anxiety, such that they can go on with their lives. Our research team aims to learn from the 1986 Ukrainian Chernobyl disaster experience, as we study a population that appears to be both *impacted by* and *emergent from* the radiation disaster experience of 1986.

RoseMarie Perez Foster is a senior research associate at the University of Colorado’s Natural Hazards Center and an honored professor in the Department of Applied Psychology Academy of Labor and Social Relations, Federation of Trade Unions of Ukraine.

Natural Hazards Observer editor Dan Whipple contributed to this article.

REFERENCES

Havenaar, J.M., J.G. Cwikel, and E.J. Bromet. 2002. *Toxic Turmoil: Psychological and Societal Consequences of Toxic Disasters*. New York: Kluwer/Academic.

Norris, F.H., M.J. Friedman, P.J. Watson, C.M. Byrne, E. Diaz, and K. Kaniasty. 2002. 60,00 disaster victims speak: Part I, An empirical review of the empirical literature, 1981-2001. *Psychiatry* 65: 207-239.

Perez Foster, R. 2002. The long-term mental health effects of nuclear trauma in recent Russian immigrants to the United States. *American Journal of Orthopsychiatry* 72: 492-504.

Perez Foster, R., D.I. Branovan, and G. Ukrainsky. 2003. *Surviving Chernobyl in America*. Media Luna Ltd: New York.

Perez Foster, R., R.A. Yaffee, and T. Borak. 2010. "DRU: Modeling Human Nuclear Disaster Risk: The Effects Of Perceived Radiation And Cumulative External Radiation Exposure To Caesium-137 On Post-Chernobyl Psychosocial And Health Behavior Outcomes In Ukrainian Residents." in *Proceedings of the National Science Foundation, Human and Social Dynamics Awardees Conference*. Arlington, VA, Sept. 26-27, 2010. (Forthcoming.)

Rodriguez, A. 2006. Chernobyl still poisons bodies and minds. *Chicago Tribune*. April 23, 2006. www.ukemonde.com/chernobyl/index.html.

Strupczewski, A. 2003. Accident risks in nuclear-power plants. *Applied Energy* 75: 79-86.

UNSCEAR. 2000. Sources and Effects of Ionizing Radiation. Report of the United Nations Scientific Committee on the Effects of Atomic Radiation to the General Assembly. Vol. II. www.unscear.org/unscear/en/publications/2000_2.html.

WHO (World Health Organization). 2005. *Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts*. www.who.int/mediacentre/news/releases/2005/pr38/en/index.html.



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

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

ALL HAZARDS

School Emergency and Disaster Preparedness: Guidance Notes. By UNISDR One Million Safe Schools and Hospitals Campaign. 2010. 30 pp. Free download. www.unisdr.org/europe/publications/v.php?id=15655.

This is an international guide to help schools prepare for emergencies and disasters from natural hazards. It takes administrators through creating an emergency committee, designing a disaster plan, knowing who can help and how, and conducting emergency drills. The guidance is clear, thorough, and on point. It also provides a list of references for further planning and first aid.

Hazard Mitigation: Integrating Best Practices into Planning. James C. Schwab, editor. 2010. ISBN: 978-1-932364-84-2. 146 pp. \$60 (softcover). American Planning Association. www.planning.org.

I'm the sort of person who, when the check engine light goes on in the car, I think, "I'll wait. Maybe it'll fix itself." This book has harsh words for me. Under its heading "What Does Not Work," the first item is "Procrastination."

This book explores the role of planners in dealing with emergencies. It discusses planning procedures, public involvement, assessing mitigation efforts before a disaster, and many other aspects of planning that affect how disasters can be avoided or ameliorated if they do occur.

The importance of planning in disaster management is becoming more critical, more widely recognized, and at the same time more controversial. To take only the most obvi-

ous example, preventing or limiting development in floodplains is almost certain to send developers and homeowners into paroxysms of protest.

Hazard Mitigation provides case studies of large, intermediate, and small jurisdictions. Clearly written and effectively organized, it should be on the bookshelf of every planner and emergency manager.

School Disaster Response Drills: Models and Templates. By Risk RED for Earthquake Country Alliance. 2009. 40 pp. Free download. www.riskred.org/schools.html.

This publication delivers what it promises: templates for schools to prepare for disasters. It offers checklists for staff expertise, emergency contacts, assessment and planning, response capacity and all the other details needed in a school during an emergency. It emphasizes earthquake drills, but offers guidance for other situations as well.

CLIMATE CHANGE

Weathering Climate Change: Insurance Solutions for More Resilient Communities. By Swiss Re. 2010. 16 pp. Free download. www.swissre.com/rethinking/climate/Weathering_climate_change.html.

"More than 3.4 billion people worldwide are already threatened by natural hazards, most of them in the developing world," the opening of *Weathering Climate Change* says in large, cheerful, yellow type. "Climate change could make matters even worse." Innovative insurance efforts can help cushion the blows that seem sure to fall on these folks,

Swiss Re says.

But the report looks at a detailed risk and adaptation analysis that paints a brighter picture. This analysis “tells another, more encouraging story about the challenges of climate adaptation. In the countries studied, anywhere between 40 and 68 percent—and in one instance close to all—of the average annual expected losses can be prevented cost-effectively through known and readily available adaptation measures. These include improved drainage and irrigation systems, sea barriers and enhanced building codes, vegetation buffers and disaster awareness campaigns, among many others.”

The Swiss Re report provides several pages of case study on the Caribbean Catastrophe Risk Insurance Facility which “provides 16 Caribbean governments with short-term liquidity in the event of hurricanes and earthquakes.” When the devastating earthquake hit Haiti earlier this year, the fund paid out \$8 million. “Measured against the loss of life and devastation on the island,” the report admits, “the \$8 million payout was not a major sum of money. It did, however, provide much needed liquidity to get the wheels of government turning again. In addition, the Haitian catastrophe has highlighted the potential of parametric insurance to help countries plan for and pre-finance natural disasters as part of a comprehensive disaster risk management strategy.”

But not everyone is so enamored of the CCRIF. The group Christian Aid (www.christianaid.org.uk) issued a report on insurance’s role in climate adaptation. They found, “At present, CCRIF appears unresponsive to community needs and a poor fit between investment and return. Coun-

tries paying premiums for hurricane coverage can experience severe and repeated floods, storm surges and wind damage without qualifying for a CCRIF payout.

“This view is supported by the experience of two of the research countries, Haiti and Jamaica, which suffered significant damage during 2007 and 2008 when they were hit by hurricanes. They were unable to claim any CCRIF payouts despite suffering considerable damage, including loss of life, displacement and destroyed livelihoods.”

Adapting to Climate Change: A Planning Guide for State Coastal Managers. National Oceanic and Atmospheric Administration Office of Ocean and Coastal Resource Management. 138 pp. Free download. coastalmanagement.noaa.gov/climate/adaptation.html.

For most people involved in coastal planning, this guide will start at chapter three where the authors start in on the planning process. The first 20 pages or so lay out the potential impacts of climate change. It is essential to include this, of course, but it seems unlikely that any coastal planners are only now awakening Rip van Winkle-like to the perils facing the coasts.

So that’s the why. But the rest of the project is the “how.” The book moves logically from planning and goal setting through vulnerability assessment, adaptation, and plan implement and maintenance. The book also cites a wide variety of publications, training, and resources to achieve the goals set out.

NOAA was a little slow to acknowledge the whole climate change thing, but this guide is an admirable practical effort in catching up.

6 Emergency Supplies and Items to Stockpile

Prepare necessary emergency supplies by considering your family’s situation. Make a “Family Emergency Supply List” and regularly check it. Put your supplies into a bag and leave the bag in a place where you can easily get to it. Separate these emergency supplies from stockpiled items that you will take out later.

1) Emergency Supply Checklist (Example)
-Put your Emergency Supplies into a bag and leave it in a convenient location.

- portable radio
- flashlight
- spare batteries
- helmet/protective hood
- emergency rations (3-day supply)
- drinking water
- lighter/matches
- tissues/toilet paper
- knife/can opener
- spoons/chopsticks/cups
- underwear/socks
- emergency medical supplies/first aid kit
- money (including both coins and paper money)
- towels
- gloves
- writing supplies/notepads
- raingear/umbrellas
- blankets/sleeping bags
- plastic bags
- backpack
- tampons/sanitary pads

2) Stockpile Item Checklist (Example)

- drinking water
- rations
- clothes
- gas cooking stove (and gas canister)
- rope
- duct tape
- plastic sheet (can be used as a rain shelter)
- small portable toilet

at least 9 liters of water per person
7-day supply-include a 3-day supply of ready-to-eat foods
include clothes appropriate to the season

Even while you are sleeping...
Put a flashlight, radio, and shoes or slippers near your bed. (If you are barefoot, you can cut your feet on broken glass)

For families with babies...
Include milk, baby bottles, baby food, spoons, diapers, sterile cotton, baby carrier, bath towel or baby blanket, and gauze or a handkerchief.

EARTHQUAKES

Earthquake Disaster Prevention Guidebook. By Shizuoka Prefecture. 2010. 15 pp. Free download. www.earthquakes.pref.shizuoka.jp/english/contents.html.

There hasn’t been an earthquake in the Tokai area in the Pacific Ocean off the coast of Japan’s Shizuoka Prefecture since 1854. But historically, they’ve occurred every 100 to 150 years. This guidebook warns, “A massive earthquake is expected to occur in Shizuoka in the near future.”

The prefecture’s guidebook provides a very accessible preparation manual for getting ready for this quake. It could also be used as a more general guide to earthquake preparation—you don’t have to live in Japan to appreciate its lessons. It tells you what kind of shaking you can expect from a magnitude 8.0 quake. It has clever and clear cartoon illustrations describing the actions to take. These illustrations extend to thorough emergency checklists.

Japan has considerable experience in dealing with evacuations of, the elderly, and others with mobility issues. That experience is also reflected in this guide. (And yes, it’s available in English.)

Dam Safety and Earthquakes. By the International Commission on Large Dams Committee on Seismic Aspects of Dam Design. 2010. Three pages. Free download. www.preventionweb.net/english/professional/publications/v.php?id=15259.

This brief publication reviews the design of large storage dams to resist earthquake shaking. “The main concerns are related to the existing dams, which either have not been designed against earthquakes—this applies mainly to small

and old dams—and dams built using design criteria and methods of analyses which are considered as outdated today,” the report says. “Therefore, it is not clear if these dams satisfy today’s seismic safety criteria. There is a need that the seismic safety of existing dams be checked and modern methods of seismic hazard assessment be used.”

The paper provides further resources in the form of a list of bulletins that can guide quake planning for large dams.

TSUNAMI

Tsunami: To Survive From Tsunami. By Susumu Murata, Fumihoko Imamura, Kazumasa Katoh, Yoshiaki Kawata, Shigeo Takahashi, and Tomotsuka Takayama. 2010. ISBN: 978-981-4277-47-1. 302 pp. \$68 (hardcover). World Scientific Publishing. www.worldscientific.com.

This book begins with an exploration of the Great Indian Ocean Tsunami of December 2004, then moves to damages from tsunamis generally, using many case studies. The bulk of the book is devoted to calculation of the damage that can be expected from these hazards, depending on wave heights and other factors.

This is a technical book, very thorough, especially enlightening about engineering in tsunami zones.

EPIDEMICS AND DISEASE

Inside the Outbreaks: The Elite Medical Detectives of the Epidemic Intelligence Service. By Mark Pendergast. 2010. ISBN: 978-0-15-101120-9. 432 pp. \$28.00 (hardcover). Houghton Mifflin Harcourt. www.hmhco.com.

If you have this book lying on your desk, people walking past will pick it up and say, “That looks interesting.” This reaction is a function of the cover, which is graced with Roy Lichtenstein-style comic book pop art showing the “elite medical detectives” of the title in super-hero poses.

This clever come-on is carried through with an entertaining history of the Epidemic Intelligence Service. EIS is two-year service and training program started in 1951, now under the Centers for Disease Control and Prevention.

Author Mark Pendergast calls EIS “the most important and effective government agency of which you have never heard.” A Cold War-inspired medical investigative service, EIS officers started the first poison control program in the United States, learned that even unbroken eggs can carry salmonella, pioneered some disaster relief techniques, identified Legionnaires’ disease, and did much else.

Who’s In Charge? Leadership During Epidemics, Bio-terror Attacks, and Other Public Health Crises. By Laura H. Kahn. 2009. ISBN: 978-0-275-99485-3. 235 pp. \$49.95 (hardcover). Praeger Security International. www.abc-clio.com.

It can be hard to figure out who’s in charge even in placid times. This interesting, readable book goes through a brief history of epidemics and their impact on public health policies, then looks at political and bureaucratic leadership during health crises in several cities in the United States, United Kingdom, and Canada.

“Who is in charge during a crisis can have an enormous impact on how many lives are saved or lost,” writes Kahn. “Leaders must make decisions and communicate them effectively to many different groups. Understanding how this process works, and how it can go wrong, should help future political leaders, public and animal health leaders, media professionals, and the public better prepare for the disease crises they may face.”

So how does leadership evolve in these situations? Kahn finds that engaged, informed elected officials with strong communications skills are essential. Second, when scientific data are lacking, officials have to use their common sense to make decisions. Thirds, elected officials and bureaucratic leaders must communicate effectively with the media. And, finally, legal frameworks have to be established within nations and states that reduce confusion over who is in charge.

TERRORISM

Terrorism, Risk and the Global City: Towards Urban Resilience. By Jon Coaffee. 2009. ISBN: 978-0-7546-7428-3. 361 pp. \$114.95 (hardcover). Ashgate Publishing. www.ashgate.com.

Places matter. And the way places are aligned matter to the safety of their residents. This book examines the way defensive city layout help protect citizens, distribute risk, and enable recovery from terrorist attacks.

The book emphasizes the safety of individuals in cities. It also demonstrates that the safety structures are often established by economic elites, who can establish areas like “Fortress Los Angeles” to protect themselves from crime, actual and feared. It doesn’t, however, get into another kind of risk—the possible trade-off of liberty for safety in this era of heightened terrorist threats.



Conferences and Training

November 30-December 2, 2010
**Canada-United States Northern Oil and Gas
Research Forum**
Indian and Northern Affairs Canada
Calgary, Canada

Cost and Registration: \$400

This conference will examine the direction of future oil and gas development in the Beaufort and Chukchi seas off the coast of Alaska, as well as its North Slope and Mackenzie Delta. Topics include arctic oil spill prevention and management, the impact of oil and gas on coastal habitats, and offshore platform safety.

www.ainc-inac.gc.ca/nth/og/sci/forum-eng.asp

December 1-3, 2010
**Third Asian Conference on Earthquake
Engineering**

Asian Institute of Technology, Tokyo Institute of Technology,
and others
Bangkok, Thailand

Cost and Registration: \$350, open until filled

This conference will address how building safer environments can reduce disaster risk, with the aim of promoting new ways of thinking about seismology, earthquake engineering, seismic risk, and disaster mitigation. Topics include enhancing community-based disaster risk reduction, promoting safe environments, and understanding and mitigating earthquake hazards.

acee2010.com

December 5-8, 2010
**30th Annual Meeting of the Society for Risk
Analysis**

Society for Risk Analysis
Salt Lake City, Utah

Cost and Registration: \$490, open until filled

This conference will discuss methods for effective risk analysis and the use of risk analysis in decision making. Session topics include trust and uncertainty in the theoretical constructs of risk, evolving risk communication technology, risk governance and climate change, and response to natural disaster.

www.sra.org/events_2010_meeting.php

December 6-10, 2010
**Fifth Caribbean Conference on Comprehensive
Disaster Management**

Caribbean Disaster Management Agency
Montego Bay, Jamaica

Cost and Registration: \$360, open until filled

This conference will examine Caribbean disaster issues, measure regional progress, and promote disaster management best practices. Session topics include disaster mitigation in engineering and geology, emergency response operations, and integrating climate change and disaster risk reduction into national planning.

www.cdema.org/joomla2/index.php?option=com_content&view=article&id=50&Itemid=58

December 13-16, 2010
Shared Strategies for Homeland Security
Denver Urban Area Security Initiative
Denver, Colorado

Cost and Registration: \$350, open until filled

This conference addresses disaster preparedness, prevention, response, and recovery from multiple viewpoints. Topics include managing mass casualties, integrating citizens in preparedness and response, protecting infrastructure, and responding to hazardous materials.

www.denveruasipresents.com

December 13-17, 2010
Extreme Environmental Events
European Science Foundation
Cambridge, United Kingdom

Cost and Registration: \$943 before November 30

This conference will assess current understanding of the frequency and magnitude of extreme environmental events, the uncertainty associated with such events, and how those uncertainties affect climate prediction. Conference sessions include statistical methodology, modeling extreme events, and the impact of extreme events on the environment.

www.esf.org/index.php?id=7048

December 18-20, 2010
**11th International Symposium on Structural
Engineering**
Guangzhou, Shenzhen, and Hong Kong Polytechnic
Universities

Guangzhou, China

Cost and Registration: \$264, open until filled

This symposium will present recent structural engineering research and development; offer information on structural analysis, design, and hazard mitigation; and discuss new tools for creating safe and sustainable infrastructure. Topics include disaster prevention and hazard mitigation for infrastructure, wind engineering and observation, and structural damage detection.

www.isse-11.org/?trees=:0:37:

January 17-20, 2011
Climate and River Basin Management Symposium
Waterpraxis
Oulu, Finland

Cost and Registration: \$193, open until filled

This symposium will examine European Union water policies with an emphasis on the multiple impacts caused by climate change. Topics include the effects of climate change on hydrology and water availability, land use and groundwater-dependent ecosystems, and socioeconomic analysis for assessing climate change adaptation.

www.waterpraxis.net/de/climate-rivers-symposium-2011.html

January 10-13, 2011

Fifth International Conference on Earthquake

Geotechnical Engineering

International Society of Soil Mechanics and Geotechnical Engineering and the Chilean Geotechnical Society
Santiago, Chile

Cost and Registration: \$650 before November 10, open until filled

This conference will cover a wide range of earthquake-related geotechnical problems, including engineering challenges, soil dynamics, structure vulnerability, and slope failure. Session topics include earthquake-induced landslides, defending monuments against seismic threats, and lifeline engineering in earthquakes.

www.5icege.cl

January 26-28, 2011

12th East Asia-Pacific Conference on Structural Engineering and Construction

City University of Hong Kong
Hong Kong

Cost and Registration: \$550, open until filled

This conference will examine recent progress in structural engineering and the practical applications of recently developed tools and technology. Conference topics include earthquake engineering, forensic engineering, building safety and reliability, fire resistant design, and disaster prevention.

bccw.cityu.edu.hk/easec12/wp_home.asp

Contracts and Grants

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

Caltech gets \$10 million for natural hazards studies

Foster and Coco Stanback of Irvine, California, have given \$6.7 million to the California Institute of Technology—accompanied by a \$3.35 million matching grant from the Gordon and Betty Moore matching program—for “an effort to find ways to minimize the damage caused by natural hazards,” according to a Caltech release.

The grant establishes the Terrestrial Hazard Observation and Reporting Center (THOR) to bring “under one program innovative efforts to reduce the risks and costs associate with natural hazards,” the release says.

THOR will bring together two of Caltech’s divisions, Geological and Planetary Sciences and Engineering and Applied Science.

“The interdisciplinary and interactive nature of engineering at Caltech allows us to translate scientific knowledge and discovery into applications with direct societal impact,” says Ares Rosakis, the von Kármán Professor of Aeronautics, professor of mechanical engineering, and chair of Engineering and Applied Science. “One of the areas of pioneering research and innovation made possible by THOR is seismo-engineering. The boundaries of seismo-engineering are fuzzy ones and lie exactly in the interface between seismology and earthquake engineering. We are delighted to have the opportunity to explore these boundaries.”

A workshop on the theory of disaster recovery. National Science Foundation grant #1049312. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1049312. One year. \$39,998. Principal investigator Gerard Hoetmer, Public Entity Risk Institute, ghoetmer@riskinstitute.org.

This is a two-and-a-half day workshop on the theory of disaster recovery. Little has been done to pull research together into an overall theory to shape and prioritize future research, or to help those who can use it in communities affected by disasters. The workshop will ask the leading researchers in disaster recovery to help shape such a theory and develop a five-year research plan for further disaster recovery research.

Recovery is the least understood aspect of emergency management. Researchers do not fully understand the roles of all the different types of organizations and interest groups that are involved in recovery. They also do not understand how these many different groups interact with each other or if the people who are more vulnerable—elderly, the infirm, minorities and the poor—can be properly taken care of by the government or the community. Most local governments do not plan for disaster recovery. There is no state or federal government policy to help frame and to coordinate the disaster recovery process.

Recovery is also not understood by practitioners working in all levels of government. Hurricane Katrina illus-

trated how dangerous it is when we fail to understand the recovery needs of a community, a region, and a state. Although Katrina struck almost five years ago, many communities still struggle with the hardships of rebuilding homes, businesses, and infrastructure, as well as a sense of community. Since Hurricane Katrina many scholars have started looking at disaster recovery again so that the knowledge of how communities can recover best can be improved. These same scholars also now need to look at the overall results of this latest research and to see if there are common themes and ideas that can be drawn from these research efforts. They will then be able to determine if there are gaps in the knowledge.

Responsive oil spill outreach based in science. National Science Foundation grant #1048433. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1048433. One year. \$186,078. Principal investigator Jessica Kastler, University of Southern Mississippi, jessica.kastler@usm.edu.

This RAPID award provides funding that will allow the University of Southern Mississippi, Mississippi State University, and Mississippi Public Broadcasting to provide scientific information to the public in response to the BP Oil Spill via the following productions:

1. Three one-hour television programs. These moderated, roundtable discussions among scientists, journalists and educators will be a regular, timely, high-profile venue for linking the public to what science can tell us regarding the oil spill. They will be broadcast on MPB at one-month intervals. Each topic will be introduced by a short video package and discussed by panelists using broad questions to focus their comments. Dr. Bob Thomas, from the Center for Environmental Communications, Loyola University New Orleans, has agreed to moderate each of these discussions.

2. Thematic news-style video packages. Videos will provide scripted content lasting three to five minutes on timely topics that require careful explanation (e.g., oil genesis and production in the Gulf, dispersant use, potential berm placement on Louisiana beaches). The videos will lead and focus roundtable discussion in broadcast programs. Likewise, videos will be archived on the companion Web page.

3. Companion Web portal. An interactive Web portal will provide an online address for the broadcast audience and others. Although work to develop and populate it will begin immediately upon receipt of funding, the investigators regard this as the focus of long-term oil spill education efforts to be continued after the well is capped and news providers go home. The moderator will work regularly to update the site and respond to user feedback regarding content, which will include: (1) an invitation to ask the questions addressed during broadcast programs; (2) video packages and unaired footage from broadcasts; (3) "frequently asked questions" with answers; (4) an annotated selection of resources related to the oil spill; (5) interviews with experts regarding specific issues; and (6) a weekly blog written by scientists. Investigators will collaborate closely on all components to ensure the unique benefits each type of media provides will work together as a coherent resource representing the science of the oil spill.

From earthquake physics to testable forecasts. National Science Foundation grants #0944218 and 0944202. www.nsf.gov/awardsearch/showAward.do?AwardNumber=0944218.

One year. Two grants. \$95,489 to Principal investigator David Jackson, University of California-Los Angeles, djackson@ucla.edu, and \$97,756 to principal investigator Danijel Schorlemmer, University of Southern California, ds@usc.edu.

Models that attempt to incorporate earthquake physics play an increasingly important role in seismology and are prevalent in seismic hazard assessment.

Most often, the physical ideas that inform these models are heuristically motivated and based on expert opinion. The Uniform California Earthquake Rupture Forecast employs several such models. To increase the testability of the upcoming UCERF3, we propose to investigate the characteristic earthquake hypothesis, the relation of maximum magnitude to fault length, and the Coulomb Stress hypothesis.

For many faults, seismologists identified so-called characteristic earthquakes and include them as expected target earthquakes in hazard assessment. The most prominent and best-studied example is the sequence of Mw 6.0 events at Parkfield, California. Studies have shown that this phenomenon possibly could be explained by low sample size from the upper magnitude ranges of the frequency-magnitude distribution. The relation of maximum magnitude to fault length plays a major role in hazard assessment as it is used to estimate the size of future large events at particular faults.

This relation is based purely on a posteriori observations and has not been tested using a priori predictions. The most complicated of the selected models is the Coulomb Stress model. It shows great descriptive capabilities but is also relies on a posteriori observations through fitting of the free parameters. Its uncertainty range remains relatively unexplored. Common to all of these conceptual models is the fact that they were never rigorously tested for their predictive power, owing in some part to the difficulty in formulating them as testable hypotheses. We propose to explore the uncertainty ranges of these hypotheses and to translate them into testable hypotheses to be tested rigorously in the framework of the Collaboratory for the Study of Earthquake Predictability.

Response to the increased seismic activity along the San Jacinto fault zone following the April 4, 2010 Mw 7.2 El Major-Cucaph earthquake. National Science Foundation grant #1057842. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1057842. One year. \$49,851. Principal investigator Frank Vernon, University of California-San Diego Scripps Institute of Oceanography, flvernon@ucsd.edu.

On Easter Sunday, April 4, 2010, the Mw 7.2 El Major-Cucaph earthquake occurred with rupture initiating in Baja California at the southern end of the Cucaph mountains, propagating to the northwest and terminating where the aftershocks concentrated just north of the California border. Since the earthquake, there has been a migration of seismicity to the north that has included the recent July 7, 2010, Mw 5.4 Collins Valley earthquake. This RAPID award will accelerate the instrument deployment for the existing NSF funded project entitled "Collaborative Research: Structural architecture and evolutionary plate-boundary processes along the San Jacinto fault zone." The funds are solely for the shallow borehole drilling. The RAPID funding will allow for seven installations.

Natural Hazards Observer

ISSN 0737-5425

Printed in the USA.

Published bimonthly. Reproduction with acknowledgment is permitted and encouraged.

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, *DR-Disaster News You Can Use*, can be downloaded free from the Center's Web site:

www.colorado.edu/hazards/

Improving communication of oil spill research. National Science Foundation grant #1055381. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1055381. One year. \$199,909. Principal investigator Sunshine Menezes, University of Rhode Island, sunshine@gso.uri.edu.

The Metcalf Institute for Marine and Environmental Reporting at the University of Rhode Island Graduate School of Oceanography is implementing a three-stage sequence of workshops that will bring together science journalists, communications professionals, informal science education professionals, and NSF-funded research scientists who are studying the Deepwater Horizon oil rig failure and its impact on the Gulf of Mexico. During this period of focused interest by the public, the three stages will allow for an iterative process of capacity-building by journalists and informal science educators that will result in a set of experiences and resources to improve the public understanding of the oil spill's impacts and the specific scientific techniques used to assess the impacts.

The three stages are: (1) three sessions at the October 2010 conference of the Society of Environmental Journalists; (2) an April 2011 two-and-a-half-day seminar in Louisiana cohosted by Louisiana State University and Louisiana Universities Marine Consortium; and (3) a June 2011 week-long "science immersion workshop" including laboratory and field experience on a URI research vessel and five associated public lectures at the Metcalf Institute, including a live Web cast.

Seamless marine-wetlands-coastal soils database to support urgent decision-making against the Deepwater Horizon coastal oiling. National Science Foundation grants # 1047776 and #1047673. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1047776. One year. Two grants. \$84,968 to principal investigator Christopher Jenkins, University of Colorado at Boulder, chris.jenkins@colorado.edu, and \$35,032 to principal investigator Martin O'Connell, University of New Orleans, moconnel@uno.edu.

For several years, the principal investigators have been developing a data system which can represent the soils of the coastal fringe. They have been devising solutions to these problems over the last several years by: (1) extending a large marine soils database to onshore landscapes in the

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: _____

Australian outback; (2) researching the geologic/ecologic changes in the Mississippi delta region; (3) innovating in making numerical and linguistic data co-mappable (the heterogeneous data problem). The coastal zone is heavily populated and invested in worldwide.

This project will open the way to a better depiction and understanding of the geomaterial and environmental patterns over large expanses of the zone. In particular, better availability of data will improve planning and numerical model performance based on improved inputs and extended opportunities for validations. In regard to the Deepwater Horizon disaster, this project will immediately provide better information focused on and supporting the cleanup and remediation efforts. The project will strengthen the cleanup decision support systems and numerical models, and will provide a new source of data to work with the associated research-side scientific mapping and experimental work.

Socio-legal studies and disaster: Cross-national and cross-disciplinary conversations. National Science Foundation grant #1051408. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1051408. One year. \$42,013. Principal investigator Susan Sterett, University of Denver, ssterett@du.edu.

This workshop will bring together cross-disciplinary, international scholars from two currently separate fields of study—socio-legal studies and disaster studies—to develop a more sophisticated research agenda drawing from the intersection of these two areas. Scholars will develop the basis for new intellectual directions in the impact of natural and man-made disasters on the attribution of risk and blame; the application of existing rules; the introduction of new norms and rules; the development of new governmental institutions; and the reconstitution of the social understanding of identity, responsibility, rights and the role of law. Consistent with the goal of expanding international collaboration in these fields, the site for the proposed workshop is the Onati International Institute for the Sociology of Law in Onati, Spain.



Natural Hazards Center
 Institute of Behavioral Science
 University of Colorado at Boulder
 483 UCB
 Boulder, Colorado 80309-0483
 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 *DR* e-newsletter, Annual Workshop, library, and the *Natural Hazards Observer*.

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

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

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

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

Jolie Breeden.....Program Associate
 Nnena Campbell.....Research Assistant
 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
 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, 483 UCB, Boulder, CO 80309-0483; (303) 492-6818, (303) 492-2151 (fax); hazctr@colorado.edu. The deadline for the next *Observer* is **November 30, 2010**.