

Observer

Natural Hazards



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Taking the 'naturalness' out of natural disaster (again)

An invited comment by J.C. Gaillard, Michael Glantz, Ilan Kelman, Ben Wisner, Zenaida Delica-Willison, and Mark Keim



CLIMATE-RELATED DISASTERS ARE RISING WORLDWIDE. The EM-DAT database from the Center for Research on the Epidemiology of Disasters (2013) recorded 879 significant climate disasters between 1981 and 1990; 1,523 between 1991 and 2000; and 2,451 between 2001 and 2010. Forty years ago, scientists and policy makers made similar disturbing observations about the rising losses from natural hazards. At the time, one of the present authors suggested that the causal cascade revealed root causes of people's vulnerability to harm (O'Keefe et al. 1976).

We argue that discussion prioritizing the physical hazard in the case of climate change overshadows and distracts from exposing and confronting the real causes of harm. These root causes remain the many socioeconomic and political processes that push people into vulnerable situations. These

are what prevents those affected to cope with the impacts of a changing climate.

In the case of natural hazards, a series of international initiatives have begun to bring social vulnerability and community-based disaster risk reduction to prominence. Many institutions have focused on communities living with risk. But in the case of climate change, despite talk of adaptation, investments so far do not prioritize communities' strengths and capacities nor deal with the root causes of vulnerability—lack of access to resources, lack of political voice and visibility, poor government outreach, and failure to provide critical infrastructure.

Climate change investment tends to be in Adaptations with a big A, megaprojects governments think will safeguard

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The Natural Hazards Center joins with the rest of the hazards community in mourning the loss of Bill Anderson, a giant in the field of disaster loss reduction. Anderson died on December 29, 2013, while on vacation in Hawai'i.

For over two decades, Bill served as the National Science Foundation program officer for the NHC, providing invaluable guidance and support. Throughout his distinguished career in academia and at the American Sociological Association, NSF, the World Bank, and at the National Academies, Bill was a consummate researcher, mentor, and leader.

A Celebration of Life Service will be held on March 22, 2014 at a location to be determined.

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

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Observer cartoons are drawn by Rob Pudim.

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 **January 31, 2014**.

Letters

DEAR EDITOR,

I was shocked at the publication of Meir Elran's article on Israel in the *Natural Hazards Observer*—mainly because it does not discuss natural hazards at all, but is entirely about security, "resilience," and threats to Israel from terrorism. It is also couched in language that is actively hostile to any means of rapprochement with Palestinians.

The argument for inclusion seems to rest on the notion that "resilience"—itself a slippery concept well on the way to being meaningless like "sustainable"—is similar for threats to security and to natural hazards. That is highly contentious. Compare the way that resources are spent in the United States on "security" as compared with preparedness for natural hazards. It is also dangerously linked to the idea that the same state systems that are supposed to deal with security threats are equally capable of dealing with natural hazards. Causation has gone out of the window in this approach.

Even if we were to accept an argument about "resilience" being generic for Israel, we can question the fact of much of it being militarized resilience. And if all poor countries got as much U.S. aid for military spending as Israel to deal with natural hazards many of their difficulties may be solved.

What is going on? Is the article intended to be deliberately provocative? You can hardly be unaware of the contentiousness of the issues involved. I am not wanting there to be a two-way slinging match over who is wrong or right on this, since we know that it can be very unproductive. But in that sense the inclusion of an unbalanced, irrelevant (to natural hazards) article about Israel as victim is hardly sensible.

There are manifestly many reasons why some Palestinians engage in "terrorism," and a sensible scientific analysis would look at it across the board. It could easily be argued that their behavior is hardly worse (in misguidedly defending their own security) than current American drone attacks in Pakistan, Yemen, and Somalia.

TERRY CANNON
INSTITUTE OF DEVELOPMENT STUDIES
UNITED KINGDOM

H7N9 virus rushes toward the species barrier

Research varies on whether virus can yet jump from animals to humans

THE AVIAN FLU VIRUS H7N9 doesn't yet pose a grave threat to humans, according to research from The Scripps Research Institute. The virus killed several people in China, but it has not yet acquired the characteristics that would allow it easily infect people, the institute's researchers said.

But other research published during the last eight months calls that comforting conclusion into question.

"Luckily, H7N9 viruses just don't yet seem well adapted for binding to human receptors," Ian Wilson, a Scripps researcher, said in a release.

The H7N9 virus infects birds, but apparently causes no symptoms in them. In February of 2013, two areas of eastern China saw several dozen people come down with this strain of influenza. There were 132 confirmed cases, and 37 deaths. The outbreak subsided after about three months.

Most of the cases were linked to poultry exposure, but the question remained whether the virus had "jumped the species barrier," i.e., become able to move easily from birds to people, then spreading from person to person. H7N9 is resistant to antivirals, including Tamiflu, the most widely used medicine.

"Some prominent early studies came to worrisome conclusions," according to the Scripps release. "Most of the H7N9 isolates from the outbreak turned out to have acquired a notorious flu virus mutation that substitutes the amino acid leucine for glutamine in the part of the virus that grabs receptors on host cells. The same mutation, in other influenza virus subtypes, was apparently a key enabler of pandemics that killed an estimated one million people worldwide in 1968-69 (the "Hong Kong flu") and two million during 1957-58 (the 'Asian flu'). Initial studies of the new H7N9 isolates in mice, ferrets and monkeys also suggested that they had at least a limited ability to spread among mammals."

The Scripps tests showed, however, that the virus does not seem to threaten a human pandemic, because the virus binds poorly with human receptor sites. This could change, however, since viruses mutate rapidly.

This encouraging conclusion is counter to results from by a paper in *Eurosurveillance*, in which researchers examined genetic sequences from H7N9 isolates from four of



the pathogen's human victims and from birds found in a Shanghai market. "The human isolates, but not the avian and environmental ones, have a protein mutation that allows for efficient growth in human cells and that also allows them to grow at a temperature that corresponds to the upper respiratory tract of humans, which is lower than you find in birds," says the University of Wisconsin's Yoshihiro Kawaoka, a leading expert on avian influenza.

And research from the *American Journal of Pathology* found "a novel avian-origin H7N9 influenza A virus, which has recently emerged in humans, attaches moderately or abundantly to the epithelium of both the upper and lower respiratory tracts. This pattern has not been observed before for avian influenza A viruses. The report ... suggests that the emerging H7N9 virus has the potential to cause a pandemic, since it may transmit efficiently in humans and cause severe pneumonia." The *AJP* report by Debby van Riel of the Netherlands Viroscience Lab and colleagues was published in October.

Kawaoka's work was published in April of 2013, while the Scripps research is from December 2103.

In May of 2013, University of California-Davis scientists reported that they found H1N1 virus in wild elephant seals on the coast of central California. H1N1 cause a worldwide pandemic in 2009. Researchers at Imperial College of London concluded that about one in five people were infected in that pandemic, with those ages five to 19 most likely to get the virus.

The study of influenza in unusual mammal hosts provides clues to the understanding of how viruses can jump among species.

Any flu outbreak may be discovered more quickly based on a flu forecasting system tested by Columbia University's Mailman School of Public Health. Researchers there were able to predict the timing of the 2012-2013 flu sea-

son about nine months prior to its peak.

The Columbia system adapted techniques used in weather prediction, turning “real-time, Web-based estimates of influenza infection into local forecasts of the seasonal peak by locality,” according to a release. The researchers used a combination of data from Google flu trends, which tracks flu-related internet queries, and regional reports from the Centers for Disease Control on confirmed influenza cases. “The system approach is analogous to weather forecasting, which employs real-time observational data to reduce model forecasts error,” Columbia says.

The modified system was more accurate than Google’s flu tracker, said Jeffrey Shaman, who led the study. Because of the media coverage of the Google system, probably a lot of people made flu-related searches who weren’t infected by a virus—

they were just curious about Google’s system.

The Columbia forecasts did much better than other tracking systems, most of which rely on historical data.

A CDC study says that the total annual economic damage in the United States from influenza is about \$87 billion. Flu kills about 36,000 people a year. This is 10 times the number of people killed by terrorism—which the government spends \$33 billion a year to prevent. The combined budgets for CDC and the National Institutes of Health for flu planning and response is about \$413 million, according to a story in the online magazine *Slate*.

The World Bank says that a global pandemic could result in a worldwide recession. A pandemic like the Spanish flu of 1918-19 could reduce global gross domestic product by four percent, costing about \$3 trillion.

They Said It ...

“You have a very intense event hitting a very susceptible part of the world. It’s that combination of nature and man. If one of those ingredients were missing, you wouldn’t have a disaster.”—**Massachusetts Institute of Technology tropics meteorology professor Kerry Emanuel on Typhoon Haiyan, quoted by the Associated Press on November 11, 2013.**

“There are reports of storm surges from four to seven metres high. People were saying, ‘If I had known it was like a tsunami I would have done something differently.’”—**Jerry Velasquez, head of advocacy and outreach for the United Nations Office for Disaster Risk Reduction, quoted on November 14, 2013 by swissinfo.ch on Typhoon Haiyan.**

“This is not a once in a lifetime event anymore. That means changing where we plan to put people; if we place people in these coastal areas we have to come up with something else, like cyclone shelters, or we have to improve the building standards, or we address poverty.”—**Jerry Velasquez, head of advocacy and outreach for the United Nations Office for Disaster Risk Reduction, quoted on November 14, 2013 by swissinfo.ch on Typhoon Haiyan.**

“This is retribution for a bandit country, they are not worthy of sympathy from Taiwan.”—**Liu Chiao-ju, on**

Twitter, on the lack of charitable response for Filipinos from other East Asian nations after Haiyan, quoted in *Strait Times*.

“Across all our case studies, people told us they are eating less, leaving out meals. Often parents were cutting down their calories so children could eat more. Women would give their share to other family members. Loss and damage is already significant. Some of the impacts on sustainable development may be irreversible.”—**Koko Warner**

of the United Nations University, on flood hazards and losses in Pakistan, quoted by Thomson Reuters Foundation.

“One is tempted to despair, but the minute I despair, then everybody, it cascades down and everybody gets hampered in their efforts.”—**Philippines President Benigno Aquino on the damage from Typhoon Haiyan, quoted by Reuters.**

“It’s very hard to ask a civilian who was just involved in an accident to help us. They had just been involved in a very bad train accident, and now I’m saying, ‘I need your help, I need you to help people who are in worse shape.’ I asked everybody, ‘Listen,

look at the people next to you, and if they need help, help them.’ And they did it.”—**New York Fire Department Captain James Ellson after the December 1 Bronx train derailment, quoted in *The Daily Beast*.**



Haiyan highlights hurricanes' havoc

Philippines hit by more and stronger typhoons since 1983

THE 2013 U.S. HURRICANE SEASON WAS a mild one, according to the National Oceanic and Atmospheric Administration, but don't tell the rest of the world. The devastating Typhoon Haiyan exposed the continued vulnerability of the Philippines, and European researchers say more hurricanes will hit western Europe because of global warming.

Haiyan was the big news, of course, affecting 11.3 million people in the nine Philippine regions the storm hit. It was a category 5 typhoon, with wind speeds of nearly 150 miles an hour (235 km/hr) and gusts up to 170 mph (275 km/hr), according to the United Nations Office for the Coordination of Humanitarian Affairs. Rainfall was measured at more than an inch per hour, and storm surges of nearly 20 feet (six meters) were registered at Leyte and Samar islands.

The British group [Saferworld](#) says this is a continuation of a recent trend, "The archipelago of over 7,100 islands that make up the Philippines has always been a massively disaster prone area. Yet, trends show that over the past few years, the frequency and intensity of typhoons have actually increased. The Philippines was hit by 56 storms between 1983-1993; 67 between 1993-2003; and 91 in the last 10 years."

The response to Haiyan highlighted many of the differences in approach to disaster relief. Saferworld, for instance, called for distribution of cash to victims to aid the 2.5 million families who lost livelihoods in the disaster. The group says, "\$54 million has already been committed across 23 donors. Yet, aid in terms of materials and personnel will redirect money back to donor locations. Cash transfers, on the other hand, will infuse funds into the local economy, continuing to circulate as assistance over a longer period. It will also give greater choice to beneficiaries. Where materials are to be distributed, local procurement within the country will be more helpful than imports. It must be assumed that skills and resources can be found locally. For markets play a vital for sustainable recovery."

The UN, however, said that the first priority was international help for food, water, and sanitation. The Philippine's government promptly called for international assistance. The UN OCHA said, "In Tacloban City, the government has requested the international community's support in establishing logistics hubs to support the sustainable delivery of aid. Rapid provision of hygienic kits, water purification, debris clearing through cash-for-work and food are also needed."

About two weeks after landfall, recovery and risk reduction processes began to take center stage. UN ISDR said Philippine President Benigno Aquino "declared certain coastlines as 'no-build zones' as reconstruction efforts begin. He directed the Department of Environment and Natural Resources to draw up a comprehensive program of protection against



storm surges, flooding, and landslides.

"The department has also been requested to identify areas, with the help of geohazard mapping, in typhoon-ravaged Leyte Island that are deemed unsafe as potential relocation sites. Mangroves, which will take up to seven years to grow, will be replanted in several areas to act as a natural buffer against storm surges," according to a story published by IRIN. Local officials said that they wanted more resilient infrastructure, especially schools.

Typhoon Haiyan, which struck on November 8, killed more than 5,000 people, mostly on the island of Leyte, displaced 4.29 million people and destroyed more than 552,000 houses. Another 500,000 houses were damaged.

The disaster highlighted geopolitical differences in the region as China and other Asian nations offered relatively little in aid because of diplomatic tensions. China initially offered \$100,000, while the United States sent \$20 million. "I don't think China should actively assist the Philippines," wrote one user of Sina's Weibo microblogging service, [reported](#) by the *Wall Street Journal*. "China needs to help those from Hainan and Guangxi provinces which also suffered from this typhoon."

"As a taxpayer I strongly protest" against aid for the Philippines, wrote another user.

Ilan Kelman, senior research fellow at the Center for International Climate and Environmental Research, said in an email interview, "I would not expect any of the aid to contribute significantly to addressing any of the long-standing disagreements in the region." However, there may be a brief cooperative respite among the various insurgent groups in the Philippines. "There have been numerous cease fires and calls for solidarity amongst armed groups in the Philippines with regards to post-typhoon disaster relief. This is typical in the disaster-prone Philippines. In the past, the conflicts have soon

resumed and, sometimes, opposing groups blame each other for contributing to the disaster,” Kelman says.

The Atlantic hurricane season in the United States, however, was the sixth least active since 1950, according to NOAA. “Thirteen named storms formed in the Atlantic basin this year,” NOAA said. “Two, Ingrid and Humberto, became hurricanes, but neither became major hurricanes. Although the number of named storms was above the average of 12, the numbers of hurricanes and major hurricanes were well below their averages of six and three, respectively. Major hurricanes are categories 3 and above.

“Tropical storm Andrea, the first of the season, was the only named storm to make landfall in the United States this year. Andrea brought tornadoes, heavy rain, and minor flood-

ing to portions of Florida, eastern Georgia and eastern South Carolina, causing one fatality,” the agency said.

Now comes a group of researchers from the Royal Netherlands Meteorological Institute with a climate model showing that because of global warming, a lot of those Atlantic tropical cyclones are going to turn toward Europe. Because of increasing sea surface temperatures, the breeding ground of tropical cyclones will migrate eastward in the Atlantic, “Yielding more frequent and intense hurricanes following pathways directed toward Europe,” the report says.

The report, “More hurricanes to hit western Europe due to global warming,” by Reindert Haarsma and seven colleagues appeared in a recent *Geophysical Research Letters*.

Have scientists ‘substantially underestimated’ sea level rise?



Instrumentation gaps may have led to low estimates of warming

A RECENT STUDY indicates that gaps in the global weather station network, especially in the Arctic has led scientists

to substantially underestimate global temperature rise. The [paper](#), which appeared in the *Quarterly Journal of the Royal Meteorological Society*, estimates that instead of a small warming trend of 0.5 degrees C per decade between 1997 and 2012—sometimes called the “warming pause”—the trend is actually 0.12 degrees C per decade, or no pause at all.

And, oh yeah, the sea level might be rising faster than expected, too.

In a [paper](#) on “Expert assessment of sea-level rise by AD 2100 and AD 2300, Benjamin Horton of Rutgers University and colleagues found that 90 experts from 18 countries expect a 0.4- to 0.6-meter rise in seal level by 2100 if strong mitigation measures are taken, and a 0.7 to 1.2 meters by 2100 if warming continues with out mitigation. Without mitigation, experts expect two to three meters of sea level rise by 2300, “calling into question the future survival of some coastal cities and low-lying island nations.”

These experts generally expect about 65 percent greater sea level rise than suggested by the reports from the Intergovernmental Panel on Climate Change.

Another paper by the Potsdam Institute for Climate Impact Research’s Anders Levermann says that the earth is in for several feet of sea level rise, even if carbon dioxide emissions stopped immediately, because of inertia in the climate system. On the web site *RealClimate*, Levermann wrote, “Within the next few years Miami in Florida will be committed to eventually lie below sea level, while our future actions can still decide on whether we want to one day give up cities such as Virginia Beach, Sacramento, Boston, Jacksonville, or New York City.”

One of the major uncertainties surrounding sea level is how the Greenland and Antarctic ice sheets will respond to higher temperatures. The Antarctic ice sheets—which contain enough water that, if they melted completely could raise global sea level by 70 meters—have been believed to relative stable. But now researchers from Durham University have examined declassified spy satellite imagery of the East Antarctic ice sheet which indicate that “large parts of the ice sheet, which reaches thicknesses of more than four kilometers, could be more susceptible to changes in air temperatures and sea-ice than was originally believed.” This ice sheet is the world’s largest and along contains enough water to raise sea level by 50 meters if it melted entirely.

And in a perspective on sea level rise and the U.S. Mid-Atlantic coast in *Earth’s Future* published by the American Geophysical Union, Rutgers’ University’s Kenneth Miller found, “An analysis of geological and historical sea-level records shows a significant rate of increase in sea-level rise since the nineteenth century. In New Jersey, it is extremely likely that sea-level rise in the twentieth century was faster than during any other century in the last 4,300 years. Accounting for regional and local factors, the authors project sea-level rise in the mid-Atlantic United States most likely about 38-42 inches (96-106 cm) over the twentieth century, but possibly as high as 66–71 inches (168-180 cm).”

A study in Maryland also indicates that sea level along that state’s shores may rise by as much as two feet by 2050.

Advances made in tsunami warnings

Shipboard, GPS, and satellite systems all show promise

THE TSUNAMI DISASTERS in the Indian Ocean and Japan have sparked considerable interest in developing effective tsunami warning systems. Shipboard, GPS, and satellite systems have all been looked at to provide timely warning for tsunamis.

In a 2012 paper in *Geophysical Research Letters*, researchers said a moderate tsunami that hit Chile in 2010 was detected by kinematic global positioning systems from a ship in the open ocean—"the first time shipboard tsunami detection has been achieved."

James Foster of the University of Hawai'i at Manoa and colleagues wrote, "Our results illustrate how the commercial shipping fleet represents a vast infrastructure of potential open ocean GPS platforms on shipping lanes that provide extremely good spatial coverage around most tsunamigenic source regions. Given the affordability of geodetic GPS systems, and ever-improving satellite communications, it would be possible to equip a significant portion of the shipping fleet with real-time-streamed GPS systems and create a cost-effective tsunami monitoring network with denser and more distributed coverage."

They estimated that a shipboard system could have detected the 2004 tsunami in less than an hour.

But in some places, even an hour is too long. Christa von Hillebrandt-Andrade, writing in the August 30, 2013 journal *Science*, said, "In the Caribbean, most tsunami events are very short-fused: The waves can reach the shores within minutes of an earthquake, volcanic eruption, or submarine landslide." Addressing the risks requires effective warning, as well as educating the public about the signs of an impending tsunami, she said.

Today there are 115 seismic stations and 55 sea level sta-



tions in the Caribbean, she writes, offering enhanced warning potential for the region. However, "Unlike the UNESCO regional tsunami warning systems for the Pacific and Indian Oceans and the Northeastern Atlantic and Mediterranean, no Tsunami Warning Center has yet been established in the Caribbean. Nevertheless, forecasts and warnings are being provided on an interim basis by the U.S. National Weather Service Tsunami Warning Centers in Alaska and Hawaii," she wrote.

And the National Aeronautics and Space Administration and group of universities are testing an earthquake warning system using satellite data from GPS that could have allowed warning of the Japan tsunami 10 times faster. "By using GPS to measure ground deformation from large earthquakes, we can reduce the time needed to locate and characterize the damage from large seismic events to several minutes," said Yehuda Bock, director of Scripps Institution of Oceanography's Orbit and Permanent Array Center in La Jolla, Calif., in a NASA release.

Yarnell Hill disaster: Poor planning and communication

New report says agency fire strategy 'indefensible'

A NEW REPORT on the Yarnell Hill fire tragedy says that 19 firefighters died because of poor planning, bad communications, and ill-advised attempts to save structures and pastures that were "indefensible."

The report, prepared by independent consultants to the Arizona Division of Occupational Health and Safety, is a sharp contrast to an earlier report by the Arizona State For-

estry Division, which found "no indication of negligence, reckless actions, or violations of policy or protocol."

The Forestry Division now faces a potential \$559,000 fine. Nineteen firefighters were killed in the Yarnell Hill fire on June 28 of last year. The report says that



even though the forestry division knew “that suppression of extremely active chaparral fuels was ineffective and that wind would push active fire toward non-defensible structures, firefighters working downwind were not promptly removed from exposure to smoke inhalation, burns, and death.”

Marshall Krotenberg, safety compliance supervisor for

Pacific Northwest quake could trigger giant landslides

Problem would be ‘greater than previously thought,’ based on new analysis

THE SEATTLE AREA hasn’t experienced a major earthquake in along time—since about 900 A.D. The Space Needle hadn’t

been built then, and fewer people lived in the area.

That quake triggered giant landslides along Lake Washington, pushing entire blocks of forest into the lake. A recent study suggests “the next big quake on the Seattle fault may cause devastating damage from landslides, greater than previously thought and beyond the areas currently defined as prone to landslides,” according to a release about the study.

The study, published in the December 2013 *Bulletin of the Seismological Society of America*, found that a Mw 7.0 earthquake in Seattle would trigger landslides what “will be extensive and potentially devastating, causing direct losses and impeding recovery.”

the state’s division of the Occupational Safety and Health Administration, said the absence of safety officers “increased the risk of firefighter exposure to hazards,” according to the *New York Times*. The State Forestry Division declined comment on the findings and on the proposed fines.

The study says the southern portion of the city would be hardest hit, with several hundred to thousands of buildings affected citywide. “The analysis suggests landslides could also affect some inland slopes, threatening key transit routes and impeding recovery efforts. For saturated soil conditions, it is an order of magnitude worse, with 8,000 buildings within all hazard zones, 5,000 of those within the two highest hazard zones. These numbers only reflect the number of buildings in high-risk areas, not the number of buildings that would necessarily suffer damage.”

Although the Pacific Northwest has been long quiet seismically, it is attracting the attention of researchers. At the Natural Hazards Workshop this past July, Evelyn Roeloffs of the U.S. Geological Survey said the Cascadia subduction zone is capable of a magnitude 9.0 earthquake. “There’s geologic data that shows there have been a number of these at intervals of 230 to over 600 years.” Over the last 6,500 years, the average recurrence interval is about 500 years. The last one was 314 years ago. This means that either we are due for a large quake or we still have 200 years to the next one, depending on how you read the statistics.”

Past seismic history in the region gives reason for concern. A study on the tsunami history of the region also from the *Bulletin of the Seismological Society of America* found that local tsunamis occurred every 390 years, while the Cascadia Plate ruptured in a large quake about every 500 years. The authors write, “The A.D. 1700 earthquake may be the first of a new cluster of plate-boundary earthquakes and accompanying tsunamis.”

The U.S. Congress faces “an ongoing challenge in determining the most effective federal approach to the increasing the nation’s resilience to low-probability but high-impact major earthquakes,” says energy and natural resources specialist Peter Folger in a July 2013 Congressional Research Service report. Folger cites Washington, California, Oregon, Alaska, and Hawaii as being especially vulnerable to large quakes, with California especially at risk because of its large population and high infrastructure value.

“The United States faces the possibility of large economic losses from earthquake-damaged buildings and infrastructure,” Folger writes. “The Federal Emergency Management Agency has estimated that earthquakes cost the United States, on average, over \$5 billion per year. California, Oregon, and Washington account for nearly \$4.1 billion (77 percent) of the U.S. total estimated average annualized loss. California alone accounts for most of the estimated annualized earthquake losses for the nation.”

The unpredictability of quakes is well known. However, Folger says, “As more accurate seismic hazard maps evolve, and as understanding of the relationship between ground motion and building safety improves, trends denoting the effectiveness of mitigation strategies and earthquake research and other activities may emerge more clearly.”



Look out below!

The earth in peril (again) from space

Chelyabinsk meteor highlights perils of near earth objects. And, oh yeah, you probably didn't notice the massive solar storm.

AFTER CENTURIES OF WARNINGS, the sky is finally falling.

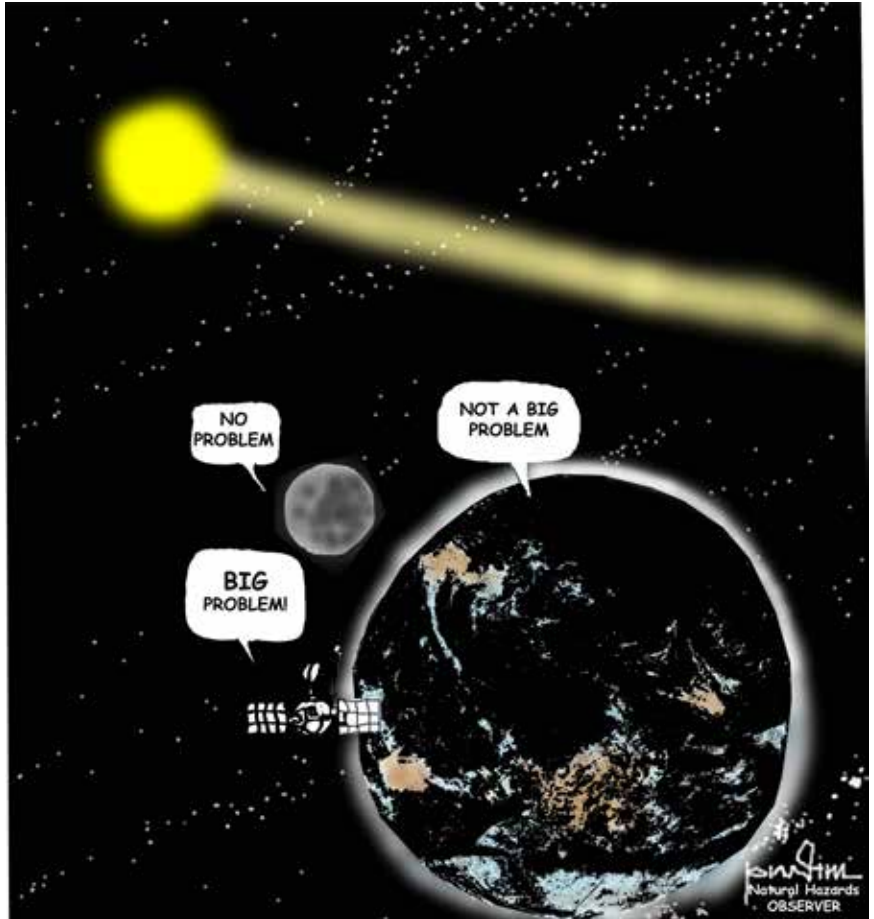
The asteroid impact near Chelyabinsk, Russia, on February 15, 2013 gave a small taste of the potential damage from near earth objects that could hit the planet. A large group of scientists, led by Olga Popova of the Russian Academy of Sciences reported in *Science Express* in early November that 50 villages experienced damage from the impact, which “was the largest airburst on Earth since the 1908 Tunguska event.” Most of the damage consisted of broken glass. The air burst hit with the equivalent of about 470 kilotons of TNT.

Most of the actual damage from the Chelyabinsk impact was broken glass. About 50 villages had damage. In Chelyabinsk alone, 3,613 apartment buildings—44 percent of them—had shattered glass. “Directly below the fireballs, path, the shock wave was strong enough to blow people off their feet,” the authors wrote.

The Chelyabinsk event was notable because it was so well documented by modern electronics, including some celebrated automobile dashboard camera footage and field sensors.

Which brings us to another threat from outer space—one that’s largely ignored—the potential for a massive solar storm disrupting electronic communications. A July 2012 coronal mass ejection—or CME—narrowly missed the earth at seven million miles per hour. Baker presented his findings at the American Geophysical Union’s annual fall meeting in San Francisco in December.

According to University of Colorado solar scientist Daniel Baker, the event was “likely more powerful than the famous Carrington storm of 1859, when the sun blasted Earth’s atmosphere hard enough twice to light up the sky from the North Pole to Central America and allowed New Englanders to read their newspapers at night by aurora light ... Had it hit Earth, the July 2012 event likely would have created a technological disaster by short-circuiting satellites, power grids, ground communication equipment and even



threatening the health of astronauts and aircraft crews.”

Typically, CMEs take a few days to reach Earth but this one arrived in only 18 hours. Fortunately, the point on the sun where the CME occurred had rotated away from Earth, missing us by about a week.

Space weather events can have serious consequences. A 1989 storm caused the collapse of Quebec’s electrical transmission system. The National Oceanic and Atmospheric Administration classifies geomagnetic storms on a scale from 1 to 5, with category 5 the most serious.

On the positive side, the chances of newly discovered asteroid 2013TV135 hitting Earth have dropped to zero. It was spotted in October, and the first few observations predicted that it might come close to Earth in 2032. Analysis of additional data concluded, however, that it would miss us.

Phew. That was close.



Killing them softly—with the Spanish flu

An invited comment by Joe Scanlon and Brenna Lester

*Over there, over there,
Send the word,
Send the word over there
That the Yanks are coming, the Yanks are coming
The drums rum tumming everywhere
So prepare, say a prayer
Send the word, send the word to beware
We'll be over, we're coming over
And we won't come back till it's over over there*

AMERICANS WHO HAVE ANY KNOWLEDGE of the World War I probably know George M. Cohan's song, which portrays the U.S. Army—with minimal losses—coming to the rescue of the beleaguered Allies.

To a considerable extent, it's true. Certainly the American losses of a little more than 100,000 are insignificant to France's 1.4 million and Britain's 900,000 and Germany's appalling 2 million plus.

But a story that is often forgotten is how the Americans died.

ON SEPTEMBER 25, 1918—as the United States built up for the final stages of the First World War—the Acting Surgeon General of the Army Brigadier General Charles Richard recommended that troop movements in the United States and troop shipments overseas be halted because so many soldiers were coming down with the flu—an outbreak of pandemic in-

fluenza that became known as the "Spanish flu." The disease was called the Spanish flu because Spain, a neutral, admitted the seriousness of the outbreak while other countries—concerned about its impact on morale—concealed the extent of their losses.

"Influenza is now epidemic in many camps on the Atlantic seaboard, including camps Devens [in Massachusetts], Upton [New York], Dix [New Jersey], and Lee [Virginia]," General Richard reported. "A few cases have appeared at camps Mills [New York], Merritt [New Jersey], and Stuart [Virginia]. If movements of troops overseas continue without interruption, influenza may be expected to break out on our troop ships, which under present conditions of overcrowding may be expected to result in thousands of cases of the disease, with many deaths.

"It is recommended," his memo continued, "if the situation will permit ... that organizations known to be infected, or recently exposed to the disease, be not permitted to embark for overseas service until the disease has run its course within the organization, or until it is considered comparatively safe from danger of infection."

Despite compelling evidence that continued troop movements to Europe would mean many U.S. soldiers would die of the flu en route to France, the Army kept moving troops to East Coast ports and sending them overseas. President Woodrow Wilson expressly consented to this.

Most British, French, German and other soldiers died

in combat or from war wounds. But among U.S. troops in WWI, 53 per cent died of the flu. That was in sharp contrast to neighboring Canada, where flu killed only 13 per cent of Canadian army personnel.

INCREDIBLE AS IT MAY SEEM, 57,260 U.S. soldiers in WWI died of the flu. This number exceeded the 50,280 who were killed in combat or died as a result of combat injuries. In contrast, just 8,637 Canadian soldiers died of the flu compared to 56,639 killed in action or died from wounds.

And the flu's impact on Americans wasn't limited to soldiers. The death rate among Army nurses was nine times higher than the death rate among nurses and volunteers serving with the Canadian Army Medical Corp.

There is no question the Army knew exactly what would happen if troop movements continued. In another memorandum that same day—September 25—General Richard made clear that the situation was extremely serious in some military camps, especially Camp Devens, Massachusetts. In that camp alone, he reported:

"ONE HUNDRED AND FORTY-TWO DEATHS have occurred since September 19, the greatest number in any one day being 63 on September 23 ... Hospital facilities are entirely inadequate,

and many barracks have been turned over for extemporized hospitals ... Additional medical officers and nurses and supplies have been sent so far as available, but the situation remains grave and many more fatalities are expected before the epidemic has run its course.

"During the continuance of this epidemic new men should not be sent to Camp Devens nor should men be sent away from that camp. New men will almost surely contract the disease and add to the already heavy burden of the camp in caring for them. In transferring men from Camp Devens at present a virulent form of the disease will almost surely be conveyed to other stations."

DAY AFTER DAY, Richard and others in the medical corps filed reports showing the situation was steadily getting worse. Soldiers were dying in camps. Soldiers were dying en route to Europe. Soldiers were dying in Europe.

"American troops joining A.E.F. [American Expeditionary Force] through French ports thoroughly infected with influenza and large percentage of these cases develop pneumonia. Influenza severe type epidemic throughout France and in A.E.F.... Two vessels entered port September 24 with 425 hospital cases, of which approximately 170 were pneumonia."

Doctor Roy writes about the flu

ON SEPTEMBER 29, 1918, A DOCTOR who signed his name only as "Roy" wrote a letter to a physician friend from Camp Devens. He wrote, "This epidemic started about four weeks ago, and has developed so rapidly that the camp is demoralized and all ordinary work is held up till it has passed. All assemblages of soldiers taboo."

Camp Devens was established in September 1917 as a temporary facility for training soldiers. It was named in honor of Brevet Major General Charles Devens, a Massachusetts native who served in the American Civil War and was later attorney general in the Grant administration. The letter was featured on the PBS program *The American Experience*.

Dr. Roy continued, "These men start with what appears to be an attack of *la grippe* or influenza,

and when brought to the hospital they very rapidly develop the most viscous type of pneumonia that has ever been seen. Two hours after admission they have the mahogany spots over the cheek bones, and a few hours later you can begin to see the cyanosis extending from their ears and spreading all over the face, until it is hard to distinguish the coloured men from the white.

"It is only a matter of a few hours then until death comes, and it is simply a struggle for air until they suffocate. It is horrible. One can stand it to see one, two or twenty men die, but to see these poor devils dropping like flies sort of gets on your nerves. We have been averaging about 100 deaths per day, and still keeping it up.

"There is no doubt in my mind that there is a new mixed infection here, but what I don't know. My total time is taken up hunting rales, rales dry or moist, sibilant or crepitant or any other of the hundred things that one may find in the chest, they all mean but one thing here — pneumonia — and that means in about all cases death."

Dr. Roy was overworked, with 168 beds in his ward, and lots of paperwork. There were four day nurses and five night nurses.

"I don't wish you any hard luck Old Man," he wrote toward the end, "but do wish you were here for a while at least. It's more comfortable when one has a friend about. The men here are all good fellows, but I get so damned sick o' pneumonia that when I eat I want to find some fellow who will not 'talk shop' but there ain't none, no how. We eat it, sleep it, and dream it, to say nothing of breathing it 16 hours a day."



SEPTEMBER 26: "Camp Devens, with a strength of approximately 45,000 men, has reported over 12,000 cases of influenza. The first cases were reported on September 12. The number of new cases increased each day up to September 20 when 1,543 new cases were reported, and the disease curve reached its highest point, since which date a daily decline in the number of new cases has occurred, 271 new cases being reported on September 25. Twelve hundred and ninety cases of pneumonia have been reported since September 19, with 287 deaths at this camp alone since September 19 up to and including September 25. The greatest number of deaths in any one day was 83 on September 25."

OCTOBER 9: "Investigation by inspector general of condition on Louisville, recently arrived at Brest, shows cause of epidemic of influenza pneumonia to have been overcrowding, poor ventilation, filth, and insufficient covering, each man having but one blanket.. There were 500 cases of influenza on the Louisville, 32 deaths on the voyage and 18 after arrival.

"Report of inspector general on the Vale shows spread of epidemic was due to overcrowding and lack of covering, each man having but one blanket. Bunk capacity of transport is 1,600, and there were 2,600 on board. There were 500 cases of influenza on the Vale, 80 of which developed into pneumonia; 31 deaths on the voyage and 14 after arrival."

OCTOBER 18: "Influenza is now prevailing in all camps and cantonments in the United States. This disease will probably continue for several months."

Further, though General Richard didn't say so, the disease was spreading from the Army to the civilian population.

CAMP MACARTHUR, TEX., OCTOBER 27, 1918: "Throughout the entire influenza epidemic the troops were not quarantined against the outside communities, nor were those outside quarantined against the troops. Also no orders were issued preventing the congregation of troops in mess halls, exchanges,

theaters, etc., inside the camp. Both of the above measures were recommended by the camp surgeon, but not followed by the camp commander."

IT WAS CLEAR FROM THESE MEMOS that if the United States continued drafting new personnel and sending them to military camps they would get the flu. If the Army continued sending troops to Europe many would die of the flu en route. It seemed as if there was only one solution—recruitment, troop movements and troop shipments to Europe had to be stopped.

That was done—but only briefly—and that occurred when the disease was confined mainly to camps on the east coast.

Alfred Crosby, author of *Epidemic and Peace 1918: America's Forgotten Pandemic*, told the PBS television program *American Experience* in 1997, "The first reaction of the authorities was, for many of the most important ones, just flat-out denial. This was simply too large an event for them to deal with, not only in policy, but to even to think about constructively. So, the chief health officer of New York, a man named Royal Copeland, denied it when it became undeniable. He said it wasn't any great danger. He talked a good game throughout the entire, epidemic and there were other people like him right across the United States."

AS THE SITUATION WORSENEd and the flu spread—and more and more troops became ill—the U.S. Army Chief of Staff Peyton March ordered troops to be screened before departure—but sent overseas unless they were ill—a procedure which had little impact. A soldier might appear perfectly healthy one day, but be dead from the flu a few days later. Because influenza spreads through the air, from breath, it took just one sick soldier to infect a troop ship. There were, for example, 600 sick soldiers on the *Nestor* when she stopped in Sydney, Nova Scotia. All had appeared healthy when the *Nestor* sailed from Hoboken, New Jersey, three days earlier.

The flu deaths and the decision to keep troops moving overseas despite the flu worried the President Wilson. He left the White House to visit Peyton March, telling him he was being advised by physicians that troop movements ought to be stopped.

March told him that if U.S. troop movements were halted, it would boost enemy morale. March is quoted as saying, "Every such soldier who has died (from influenza) has just as surely played his part as his comrades who have died in France. The shipment of troops should not be stopped for any cause."

Wilson accepted that argument, approved March's decision and the troop movements continued. Inevitably, many soldiers became ill and died on board ship and others spread the flu after arrival in France.

ALTHOUGH ALL THIS OCCURRED IN THE AUTUMN OF 1918, the flu actually started earlier that year in Kansas. It apparently began on a farm, then spread to an Army base. At first, the disease was relatively mild. Many were sick, but there were comparatively few deaths. But as it was carried across the country and then exported to Europe, it developed into a more virulent strain. That strain was brought back to the states on returning troop ships. It quickly spread from east to west as well as to Canada, then back to Europe again, this time in its new, more deadly form.



This strain reached Canada aboard U.S. ships like the *Nestor*, which stopped at Canadian ports before crossing the Atlantic and from U.S. troops which passed through Detroit and neighboring Windsor by train en route to East Coast ports.

Just as in the United States, the flu was carried across Canada from east to west at least partly by soldiers, including conscripts who were en route to Victoria and Vladivostok where they were to join an Allied force being sent to fight the Red Army. (The joint force included Americans and was under command of a Japanese admiral.) As their train moved from east to west, sick soldiers were taken off at almost every major railway center. That inevitably spread the flu in those communities. The Canadian Army, in short, like the Americans, kept moving soldiers in accord with its war priorities, with little regard for civilians.

SO WHY WAS THE FLU WAS SO MUCH MORE DEADLY for U.S. soldiers and nurses than it was for Canadians?

There were two main reasons.

First even though Canada was at war much longer than the United States, more American than Canadian soldiers were involved in the war.

SECOND, CANADA ENTERED WORLD WAR 1 on August 5, 1914. The United States entered the war 32 months later—April 6, 1917. By the time the flu struck in 1918, most Canadians of military age were already in Europe. Major troop movements had stopped. The Canadians who were overseas had already been exposed to the first wave of the flu. The United States, however, was still recruiting new soldiers, training them and shipping them overseas.

As for the difference in nursing deaths, by 1918 Canadian Army nurses and volunteers were well integrated into the medical system. They had earned the respect of physicians and worked with them as a team. The United States—new to the war—was still working out the bugs (Scanlon, McMahon, Hurrell 2009).

Some American authors put it bluntly: "...when pandemic-related epidemics hit with full force in the fall of 1918, many U.S. Army nurses were new not only to the military and their current assignments—but new to the practice of nursing ... The situation ... sharply contrasted with that in the British armies [which included the Canadians]. In 1918, after four years of continuous fighting in Europe, British nursing and medical officers were part of a well-established and relatively stable organization."

By the time the U.S. physicians and nurses reached the front they were better prepared to deal with injury, death and disease. That helps explain why the death rate among American nurses was twice as high in the states as it was in Europe.

WHAT LESSONS—IF ANY—CAN BE LEARNED from what happened?

A U.S. review of the situation suggested that the decision to keep shipping soldiers to Europe made little difference. "It may be said in passing," the review concluded, "that the severe outbreaks of influenza and pneumonia and the heavy mortality therefrom on troop ships were not due, except in part, to their sanitary conditions per se. This was generally good, save for overcrowding. Yet overcrowding and lack of sufficient hospital space, medical personnel, and supplies undoubtedly increased the percentage of pneumonia complica-

tions, and also the case mortality from that disease.

The review concluded (*italics mine*): "But it should be emphasized that the epidemic would have appeared among these troops had they remained in camps in the United States, and it is safe to say the fatality would have been nearly the same as occurred aboard transports."

It is true that the flu was so virulent that it proved almost impossible to prevent its spread. As far as is known, there were only two places each in Canada and the United States where quarantines were successful. One was the agricultural University of Saskatchewan where students remained on campus and escaped the flu. The second was the volunteer fire department in Kenora in Northern Ontario where fire-fighters isolated themselves before the flu hit. The third was a U.S. military camp where 2,000 newly arrived black soldiers were isolated and "not a single case of the flu developed." The fourth was in Booneville, Arkansas, where the State Tuberculosis Sanatorium blocked all outside contact and escaped 'flu free (Marion and Scanlon 2011).

But it is not surprising that many persons in the health field blame the flu deaths on the decision to ship soldiers overseas on crowded troop ships, knowing this was the perfect environment for the flu to spread.

What happened in 1918 raises a number of implications for the future.

One is that a repeat of the Spanish flu—as noted elsewhere—would hit the young and seemingly healthiest elements of the population. Another is that if the flu could move so quickly back and forth between the United States and Europe and across North America in 1918, it would move even faster today. A third is that in times of war military priorities may once again override civilian concerns.

But perhaps the most important implication is that in a pandemic the civilian population could not expect assistance from the military. The military would be having difficulty dealing with its own problems. There is a long tradition in Canada—though somewhat less so in the United States—of the military providing assistance in the wake of natural events. In Canada, for example, they have responded to floods, ice storms, mudslides, snow emergencies, air crashes, and hurricanes. In the United States, to give just one example, they played a major role in the response to Katrina. This assistance would be unavailable during a pandemic.

Joe Scanlon is professor emeritus and director of the Emergency Communications Research Unit at Carleton University in Ottawa, Canada. He and his researchers have written two earlier articles as aspects of the flu. Brenna Lester is a fourth year history student at Carleton.

Scanlon, Joseph, T. McMahon, and C. Hurrell. 2009. Al-most only women: Canadian volunteer response to the 1918-20 pandemic. *American Journal of Disaster Medicine* Vol. 4 No. 6 (November-December): 331-344

Marion, Nicole, and J. Scanlon. 2011. Mass death and mass illness in an isolated Canadian town: coping with pandemic influenza in Kenora, Ontario, in 1918–1921. *Mortality* Vol. 16 No. 4: 325-342

Climate ...

Continued from page one

their states from climate change (big dams, large acreages sown with biofuels, large-scale urban drainage, and so on). On close analysis, many of these Adaptations with a big A block the ability of small farmers, pastoralists, fishers, local craftspeople, tradespeople, and business owners to engage in adaptation with a little “a” (Chia et al. 2013; Tall et al. 2013; Wisner et al. 2012; World Commission on Dams 2000). By adaptation—with a lower case “a”—we mean iterative planning and implementation of resource management and other changes at the local and regional scale based on both local knowledge and outside specialist knowledge (Wisner 2010). Such local community members know about climate change and have been adjusting to it for decades on their own. But if people are displaced by a megaproject, then their attempts at adaptation are doomed to failure (Wangui et al. 2012).

Going up—climate disasters

The 60 percent increase in the number of climate-related disasters over the last decade is due partly to more comprehensive reporting. But without doubt there is evidence

of increased vulnerability. In fact, alongside highly visible large-scale disasters, an even larger number of small-scale crises have had not only a lingering adverse impact on livelihoods and sustainability around the world but also a cumulative impact (Lewis 1984; UNISDR 2009; Wisner and Gaillard 2009). These recurring events often are not acknowledged by the media or policy makers.

Colombia provides a poignant example. EM-DAT lists 82 climate and hydrological events affecting people in Colombia between 1981 and 2010. An alternative database, Desinventar, which draws on sub-national sources such as local newspapers and civil society reports, catalogues 11,819 climate-related disasters for the same time period in the same country (Corporacion Osso and La Red de Estudios Sociales en Prevencion de Desastres en America Latina 2013). The cumulative impact of these invisible disasters is higher than that of large-scale events. The 2009 and 2011 United Nations’ global assessment reports on disaster risk reduction call these small and medium disasters the result of actualized “extensive risk” (UNISDR 2009; 2011).

Despite stark evidence that harm from extreme events is foreshadowed in daily life, the dominant paradigm still ignores these underlying societal risk factors. Despite ample field evidence (Glantz 1977; Hewitt 1983; Wisner et al. 2004, 2012), many continue to consider climate-related disasters as exogenous and extraordinary events to which people



Who pays for disasters?

Typhoon Haiyan not only devastated the Philippines but has ruptured the fragile bonds among the rich and poor nations over **who pays** for climate change. The *New York Times* reported in mid-November from Warsaw that “a routine international climate change conference here turned into an emotional forum, with developing countries demanding compensation from the worst polluting countries for damage they say they are already suffering.”

That poor countries contribute little to the causes of climate change while taking on most of the impact burdens has long been accepted policy wisdom. But now that the effects of global warming are being felt on the ground—from sea level rise, stronger storms, higher storm surges, and the like—there appears to be a growing restlessness among developing nations about the costs.

A recent study by Germanwatch assessed “to

what extent countries have been affected by the impacts of weather-related loss events.” They found that in 2011—the most recent year for which complete were available—the most affected nations were Thailand, Cambodia, Pakistan, El Salvador and the Philippines. For the 20 years between 1992 and 2011, Honduras, Myanmar, and Nicaragua were the hardest hit. All of these are developing nations that produce little climate impact.

“We are at these climate conferences essentially moving chess figures across the board without ever being able to bring these negotiations to a conclusion,” Achim Steiner, executive director of the United Nations Environment Program, told the Times.

John Kioli, chairman of the Kenya's Climate Change Working Group, said, “If developed countries are reasonable enough, they are able to understand that they have some responsibility.”

have to “adapt.” They do not understand that disastrous consequences are co-produced by the interplay of the social fabric and the extreme climatic event.

In fairness, some attempt has been made to introduce social vulnerability into the perspective of so-called climate science and to balance its tendency to identify extreme climatic events with their disastrous outcomes—but no place for intervening social processes. For example, social vulnerability was introduced into the recent Intergovernmental Panel on Climate Change AR5 report on climate extremes and disaster (IPCC 2012). However, that report remains firmly anchored in physical science and does not cite wide swathes of disaster and vulnerability literature. The social and the physical are there in the report side by side, not fully integrated.

Going down—focus on root causes

Such a hazard-focused—as opposed to vulnerability-focused—view has produced policies for reducing the risk of climate-related disasters that resemble war strategy (Gilbert 1995; Alexander 2002). The implication is that risk reduction should be handled by military or civil protection institutions, relying on rigid chains of command and treating climate hazards as enemies to fight against, because people need “protection.” Indeed, strategic evacuation and permanent relocation of populations have been suggested in the face of increased flood disaster incidence in some parts of Africa, drought in East Africa and the Horn, some coastal areas and islands threatened by sea level rise, cyclones, and diminishing fresh water (APA 2013; Gaillard 2012; Mwape 2009). The results are technocratic, command-and-control measures including a good deal of Adaptation with an upper case A, involving large engineering structures. Such a suite of measures also includes technology-based warning systems with the people added in afterwards. Land use planning and risk awareness campaigns are based on hazard rather than vulnerability (Hewitt 1983).

Those who suffer most from climate-related disasters are the marginalized segments of society (Wisner et al. 2004; Gaillard 2010). They do not choose to place themselves at risk. Instead, they are often forced to live in hazardous places

because less hazardous places are not available to them. These marginalized segments of society include people who suffer discrimination due to religion, gender, age, physical ability and ethnicity. They are usually poor. The political and economic systems under which they live do not permit them to make their own livelihood choices. Ultimately, their voice is disregarded by those with political and financial power (Chambers 1983; Blaikie and Brookfield 1987).

The emphasis given to the physical side of climate change in scientific and policy discourse distracts attention from addressing the root causes of vulnerability to climate change (Kelman and Gaillard 2010). Climate change may serve as a perfect scapegoat for disaster occurrence. Invoking the role of climate change as a phenomenon of global scale and diffused responsibility enables governments and other players to evade their own responsibility.

Addressing such root causes of social vulnerability means good governance must be characterized not just by elections but also by a free press, free speech, and participation in decision making by all those affected. It is about the ideologies, values, and behaviors imposed by the authorities on the people; the distribution of power within society; and the priority given to vulnerability in the context of DRR and climate change adaptation and, in turn, the place and priority of these issues within wider development contexts (Hewitt 2007; Gaillard 2010).

Ben Wisner discovered natural hazards in 1966 while living in a Tanzanian village affected by flood, drought, pest attacks on stored grain and residential fire spreading rapidly from thatched roof to thatched roof.

J.C. Gaillard is an associate professor at the School of Environment of The University of Auckland.

Michael Glantz is now researching “lessons learned about lessons learned” about hydro-meteorological disaster risk reduction.

Ilan Kelman is a reader in risk, resilience and global health at University College London.

After surviving a severe tornado that destroyed his home and community in 1982, Mark Keim now serves as an associate director of science, leading the U.S. Centers for Disease Control's efforts for disaster risk reduction as it applies to health.

Zenaida Delica-Willison is an independent consultant in the Philippines and winner of the Mary Fran Myers Award for work on gender and disaster.

References

Alexander, D. 2002. From civil defense to civil protection and back again. *Disaster Prevention and Management* 11(3): 209-213.

African Press Agency. 2013. Mozambique begins compulsory evacuation of people in flood-risk areas. *StarAfrica.com*. <http://en.starafrika.com/news/mozambique-begins-compulsory-evacuation-of-people-in-flood-risk-areas.html>.

Blaikie, P. and H. Brookfield. 1987. *Land Degradation and Society*. London: Methuen.

Center for Research on the Epidemiology of Disasters. 2013. EM-DAT: The OFDA/CRED International Disaster Database. Louvain: Université Catholique de Louvain. <http://www.cred.be/emdat>.

Chambers, R. 1983. *Rural Development: Putting the Last First*. London: Longmans.

Chia, L, A. Olufunso, D. Somorin, D. Sonwa, and A. Tiani. 2013. Local vulnerability, forest communities and forest carbon conservation: Case of southern Cameroon. *International Journal of Biodiversity and Conservation* 5(8): 498-507.

Corporación Osso and La Red de Estudios Sociales en Prevención de Desastres en América Latina. 2013. *DesInventar Online: Sistema de Inventario de Efectos de Desastres*. Cali: OSSO/La Red de Estudios Sociales en Prevención de Desastres en América Latina. <http://online.desinventar.org/>.

Gaillard, J. C. 2010. Vulnerability, capacity, and resilience: Perspectives for climate and development policy. *Journal of International Development* 22: 218-232.

Gaillard, J. C. 2012. The climate gap. *Climate and Development* 4(4): 261-264.

Gilbert, C. 1995. Studying disaster: A review of the main conceptual tools. *International Journal of Mass Emergencies and Disasters* 13: 231-240.

Glantz, M. 1977. Nine fallacies of natural disasters: the case of the Sahel. *Climatic Change* 1: 69-84.

Hewitt, K. 1983. The idea of calamity in a technocratic age. In Hewitt, K. (ed.) *Interpretation of Calamities*. Boston: Allen & Unwin Inc, 3-32.

Hewitt, K. 2007. Preventable disasters: Addressing social vulnerability, institutional risk, and civil ethics. *Geographische Rundschau International Edition* 3: 43-52.

International Panel on Climate Change (IPCC). 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report of the IPCC*. Cambridge: Cambridge University Press.

Kelman I., and J.C. Gaillard. 2010. Embedding climate

change adaptation within disaster risk reduction. In Shaw, R., J. Pulhin, and J. Pereira (eds.) *Climate Change Adaptation and Disaster Risk Reduction*. Bradford: Emerald, 23-46.

Lewis, J. 1984. Environmental interpretations of natural disaster mitigation: The crucial need. *The Environmentalist* 4: 177-180.

Mwape, Y. 2009. Impact of Floods on the Socio-economic Livelihoods of People: A Case study of Sikauzwe community in Kazungula district of Zambia. MA thesis, University of the Free State, Faculty of Natural and Agricultural Sciences, Disaster Risk Management Training and Education Centre for Africa (DiMTEC), Republic of South Africa.

O'Keefe, P., K. Westgate, and B. Wisner. 1976. Taking the naturalness out of natural disasters. *Nature* 260: 566-567.

Tall, A., A. Patt, and S. Fritz. 2013. Reducing vulnerability to hydro-meteorological extremes in Africa – A qualitative assessment of national climate disaster management policies: Accounting for heterogeneity. *Weather and Climate Extremes* 1: 4-16.

United Nations International Strategy for Disaster Reduction (UNISDR). 2009. *2009 Global Assessment Report on Disaster Risk Reduction*. Geneva: UNISDR.

United Nations International Strategy for Disaster Reduction (UNISDR). 2011. *2011 Global Assessment Report on Disaster Risk Reduction*. Geneva: UNISDR.

Wangui, E., T. Smucker, B. Wisner, E. Lovell, A. Mascarenhas, M. Solomon, D. Weiner, A. Munna, Sinha, C. Bwenge, H. Meena, and P. Munishi. 2012. Integrated development, risk management and community-based climate change adaptation in a mountain-plains system in Northern Tanzania. *Journal of Alpine Research* 100(1): <http://rga.revues.org/1701>.

Wisner, B. 2010. Climate change and cultural diversity. *International Social Science Journal* 61: 131-140.

Wisner, B., P. Blaikie, T. Cannon and I. Davis. 2004. *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. London: Routledge.

Wisner, B. and J.C. Gaillard. 2009. An introduction to neglected disasters. *Jambá: Journal of Disaster Risk Studies* 2: 151-158.

Wisner, B., J.C. Gaillard, and I. Kelman. 2012. *Handbook of Hazards and Disaster Risk Reduction*. Abingdon: Routledge.

Wisner, B., A. Mascarenhas, C. Bwenge, T. Smucker, E. Wargui, D. Weiner and P. Munishi. 2012. *Let Them Eat (Maize) Cake: Climate Change Discourse, Misinformation and Land Grabbing in Tanzania. Contested Global Landscapes*. A Multidisciplinary Initiative of the Cornell Institute for the Social Sciences. Ithaca, NY: Cornell University.

World Commission on Dams. 2000. *Dams and Development: A New Framework for Decision-Making*. London: Earthscan.



Resources

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

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

CLIMATE

Regulating Disasters, Climate Change and Environmental Harm. Michael Faure and Andri Wibisana, eds. 2013. ISBN: 978-1-78100-248-3. 498 pp. \$166 (hardcover). Edward Elgar Publishing. <http://bit.ly/1cqLbj1>.

The challenges of the 21st century for emerging poor nations include creating a legal and regulatory system to deal with them. This book examines the experience of Indonesia, one of Asia's poor nations, in preparing a legal and regulatory structure for disasters and climate change.

Climate, environmental protection, and rapid globalization are all intertwined. The editors write in the last chapter, "A developing country like Indonesia is, inter alia, as a result of globalization, increasingly vulnerable to environmental degradation. This can easily be noticed on ... Bali: economic development grows strong inter alia thanks to the tourism industry, but on the other hand tourism also poses considerable threats to both food safety and to environmental degradation."

The book is wide ranging in its discussions, from wildlife law to nuclear power plant construction, from deforestation to environmental compensation. It is a legal study, though, so there is lots of tortuous prose and many footnotes. But there are lessons to be learned from the experiences here that can be applied to good governance initiatives in other emerging markets.

Living in a Dangerous Climate: Climate Change and Human Evolution. By Renée Hetherington. 2012. ISBN: 978-1-107-69473-6. 256 pp., \$29.99 (softcover). Cambridge University Press. www.cambridge.org/9781107694736.

It's not enough we have to worry about economic, social, spiritual, and personal responses to climate change. Now we have to worry about the survival and adaptability of the entire human race. "Throughout Earth's history, the inevitable response of species to catastrophic climate change has initially been for the number of species in the affected area to drop," this book says. "Typically, the number of previously dominant species falls. In worst cases, species face extinction because their genes cannot adapt quickly enough to respond to a rapid change in climate, and they do not have enough behavioral or physiological adaptability or flexibility to adjust."

The world has endured relative climatic stability over the last 13,000 years or so—since the widespread adoption of agriculture in the Fertile Crescent and its spread around the globe. But now the Earth is being subjected to levels of carbon dioxide in the atmosphere that are unique in the history of homo sapiens. Atmospheric physics dictates that this increase in greenhouse gases will result in increased global average temperatures. This will put humanity outside the climate envelope that has enabled our emergence as a the earth's domi-

nant species (well, except maybe for ants). Many skeptics of the dangers of climate change assume that this doesn't matter much to human survival. But the consequences are so severe, that this approach seems cavalier.

Living in a Dangerous Climate is a very informative and readable tour through the history of humankind and its relations to the climates that the species homo and its antecedents have adapted to in the 3.85 million years since *Australopithecus afarensis* emerged in the area that is now Tanzania. *H. sapiens* is the only one of several lineages that remains. This can be a cause for celebration—"We're number one!"—or for caution. At least six closely related species have shown themselves vulnerable to extinction, one as recently as 17,000 years ago.

Late in this book, Renée Hetherington relates a personal anecdote—familiar to many of us—about attending a conference in which her hotel was across the street from the conference facility "an easy three minute walk in a safe neighborhood ... Even so, I noticed that many people were not walking ... but were climbing into their rental cars driving across the street, and parking in the conference center's parking lot ...

"During one of the conference seminars a group of us were discussing the capacity of modern humans to respond to changes in our environment ... One of the fellows engaged in this discussion suggested that we were far more capable of adapting to climate change than our ancestors were. As we sat in our freezing cold, air-conditioned meeting room on this warm late summer afternoon, I glanced across the table at his relatively young, hunched overweight body slumped over his laptop computer and was perplexed. When the meeting concluded, he used his cell phone to call for a vehicle to take him to his hotel."

Hetherington cites this anecdote as an example of our dependence on fossil fuels. But it also shines a light on the chasm of meaning in the modern world of "adaptability." Harnessing technology is clearly a useful adaptation. Many people point to past technological breakthroughs that have averted impending disasters. The widespread adoption of the automobile, for instance, prevented many cities from being buried in horse manure. And many are expecting technology to save us from climate change. Witness the current enthusiasm in some circles for geoengineering.

The trouble is we're already "geoengineering" the planet—pouring millions of tons of CO₂ and other greenhouse gases into the atmosphere. That experiment hasn't gone so well, so far.

ALL HAZARD

Calculating Catastrophe. By Gordon Woo. 2011. ISBN: 978-1-84816-739-1. 355 pp., \$31 (softcover). Imperial College Press. www.icpress.co.uk.

In America, every pithy quote is attributed either to Yogi

Berra or Mark Twain. No one else has ever said anything memorable. Even when someone else does say something clever, the subsequent quoter won't cite the original person. Instead they'll credit Yogi. But even Yogi once said, "I didn't really say all the things I said." Or something like that.

This book starts off with a quote that, miraculously, is from neither Yogi nor Twain. It is from the German genius Wolfgang von Goethe, who said, "Mathematicians are like Frenchmen: Whatever you say to them, they translate into their own language and forthwith it is something entirely different."

Calculating Catastrophe applies mathematics to natural disasters to show readers the parameters of predicting them, estimating the potential damage, and being aware of the uncertainty of them. Gordon Woo has written a very user-friendly book here, but it helps if you're not afraid of a few equations.

Woo deals with the likelihood of every conceivable natural disaster, from avalanches to Zipf's law. This is in service of realistically preparing for and warning about natural disasters and terrorist attacks. He is careful with the unknown risks and uncertainties as well—the error bars. Because, as Danish physicist Niels Bohr once said, "Prediction is very difficult, especially about the future." Or something like that.

Disasters Without Borders. By John Hannigan. 2012. ISBN: 978-0-7456-5069-2. 195 pp., \$24.95 (softcover). Polity. www.politybooks.com.

This book looks at disasters "through the lens of international politics." Disasters may be local, but their impacts often spread far beyond the immediate vicinity. In the introduction, Hannigan cites the 1783 eruption of Iceland's Laki volcano which, he says, "killed an estimated six million people worldwide" over the subsequent two years.

One interesting subject Hannigan tackles in the sixth chapter is disaster politics as "game playing." Domestic political considerations come into play when a nation has to decide whether to accept international aid in a disaster. One notorious example of this was when the Myanmar regime declined aid after Cyclone Nargis. Hannigan says that about 25 percent of the time, a nation will decline aid.

It's relatively little known that the United States rejected most of the 151 offers of help that were forthcoming from other nations after Hurricane Katrina in 2005. India offered \$5

million and medical assistance. China offered \$5 million and rescue workers. Venezuela, Cuba, and Iran offered assistance, though their offers had contingencies that seemed mostly intended to embarrass the United States rather than genuinely assist.

In his final chapter, Hannigan discusses "emergent institutionalism," in which the response to a novel disaster can demand an emergent response based on incomplete or faulty information. But once a configuration of people and institutions has emerged to deal with the issue, it is very difficult to change the "sense making" of the disaster, even if new information reveals that the original assumptions were wrong. "This can lead to a poor fit between emergent problems and emergent institutions," he writes, "especially where new information becomes available making an early interpretation of a problem wrong or inadequate."

Disasters Without Borders offers a satisfying merger of disasters with the international politics that influences how well or poorly they are addressed. It should remind disaster professionals how important the issues of good governance and politics are, especially in disaster response and recovery.

EARTHQUAKE

Active Faults of the World. By Robert Yeats. 2012. ISBN: 978-0-521-19085-5. 621 pp. \$85 (hardcover). Cambridge University Press. <http://bit.ly/1833080>

No surprises here. The book delivers exactly what it promises in its brief title—a catalog of the world's active earthquake faults. After a description of each discipline that goes into the geological study of active faults—plate tectonics, seismology, geodesy, and so on—Yeats plunges into the details of the world's faults.

The text descriptions are illustrated by easy-to-grasp maps of the areas under discussion. This is an essential reference work for anyone interested in earthquakes and their accompanying hazards.

Contracts and Grants

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

Hikurangi ocean bottom investigation of tremor and slow slip (HOBITSS). National Science Foundation grants #1333311, 1333025, 1334654, and 1332875. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1333311. Three years. Four grants. \$137,060 to principal investigator Spahr Webb, scw@ldeo.columbia.edu, Columbia University; \$231,715 to principal investigator Laura Wallace, llwallace@ig.utexas.edu, University of Texas at Austin; \$12,311 to principal investigator Anne Sheehan, Anne.Sheehan@colorado.edu, University of Colorado Boulder; and \$31,006 to principal investigator Susan Schwartz, susan@es.ucsc.edu, University of California-Santa

Cruz.

Deployment of a network of pressure gauges and seismometers on the Hikurangi portion of the subduction zone off North Island New Zealand is designed to record a slow-slip event expected to occur on the plate boundary fault in the 2014-2015 time frame. Slow-slip events occur about every 18 months in this region, so documenting the deformation associated with it and comparing that activity with ongoing microseismicity should illustrate the evolution of forces and associated hazards in this region. Twenty American seafloor instruments will be combined

with a similar number of Japanese instruments for about 12 months. The data will be evaluated together with data from onshore geodetic and seismic stations in this international collaboration. Results will inform planning for possible future seafloor drilling and subsequent in-situ measurements.

Due to the shallow dip of the subducting plate, the Hikurangi site offers a unique opportunity to document the small signals associated with SSE, for which motion is too minor for human perception. Insights into this newly recognized mode of plate interaction, are expected to be applicable to other convergent margins. How far up-dip the slip extends, whether all the way to the seafloor near the subduction trench or not, is a key unknown in current estimates of earthquake shaking and tsunami hazard. The extent of slow slip can indicate how much stress on the plate boundary fault is relieved versus building up toward an eventual megathrust earthquake.

Refining the climate role of tropical cyclones:

Key constituents of the Hadley Cell. National Science Foundation grant #1331260. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1331260. Two years. \$86,000 to principal investigator Benjamin Schenkel, bschenkel@albany.edu, University of Albany.

Recent research on the relationship between tropical cyclones and climate suggests that years with enhanced tropical cyclone activity may lead to decreased atmospheric poleward heat transports during the following winter, possibly due to significant atmospheric poleward heat transports. Supporting this hypothesis are several studies showing that TCs are responsible for significant short-term reductions in hemispheric zonal available potential energy due to poleward moist static energy transports. Past research has also shown that Western North Pacific tropical cyclones are responsible for significant cross-hemispheric transports of dry static energy into the Southern Hemisphere.

This project will undertake a comprehensive quantification of meridional energy transports by TCs to serve as a foundation for establishing the climate role of TCs. Research will test the hypothesis that Northern Hemisphere TCs constitute a significant portion of global atmospheric dry static energy (DSE) transports from the Northern Hemisphere to the Southern Hemisphere during boreal summer and fall due to the upper tropospheric equatorward outflow jets associated with the TCs. Analyzing the composited meridional DSE transports by TCs within the Eastern North Pacific, North Atlantic, and West Pacific, the PI will determine whether the mean response is significant within each basin.

The study will quantify zonally integrated cross-hemispheric DSE transports at the equator by each Best-Track TC from reanalysis to determine the significance of aggregate dry static energy transports relative to the total atmosphere on time scales ranging from weeks to years. Finally the project will examine Coupled Model Intercomparison Project simulations to compare results from reanalysis to determine the fidelity of the role of TCs as evidenced in general circulation models.

The 2013 Rim Fire: Survey of potential water quality impacts on the Hetch Hetchy reservoir system. National Science Foundation grant #1361454. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1361454. One year. \$49,799 to principal investigator Terri Hogue, thogue@mines.edu,

Colorado School of Mines.

Wildfires have a direct impact on physical and chemical processes in watersheds, including acute loss of vegetation and soil organic matter, decreased soil cohesion, enhanced soil water repellency, ash layer deposition, decreased infiltration, and increased runoff. These changes greatly impact the magnitude and timing of post-fire peak flows. Water quality is also impacted by fires often resulting in increases in nutrients and suspended sediment. This research will collect immediate, essential field observations of hydro-geochemical behavior within pristine mountain reservoir systems following a catastrophic wildfire. The work will address a significant gap in knowledge of the coupling of hydrologic flux and water quality in subalpine, snow-dominated, post-fire systems, especially with regards to trace metal behavior after a catastrophic wildfire.

The Rim Fire, which has burned 255,858 acres, is the third largest fire in California history. Post-fire processes threaten water supplies to the city of San Francisco and 29 other wholesale buyers. Water supply from the Hetch Hetchy reservoir system (three lakes in total) is unfiltered and therefore especially vulnerable to increased turbidity and sediment loads as a consequence of the Rim Fire. Collected data will ultimately be used to develop models and predictive tools to quantify short and long-term impacts on water quantity, sediment flux and contaminant loads into Hetch Hetchy and other regional lakes which encompass a nearly singular input to the San Francisco water supply system.

Characterizing sediment mobilization and landscape response to the combined effects of wildfire and extreme flooding along Fourmile Canyon, Front Range Colorado.

National Science Foundation grant #1401260. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1401260. One year. \$15,054 to principal investigator William Ouimet, william.ouimet@uconn.edu, University of Connecticut.

This project focuses on the impacts of flooding and erosion on Fourmile Canyon in the Colorado Front Range following the exceptional September 2013 rainfall event. The catchment is still responding to a 25 square kilometer wildfire in 2010. The team will test the hypothesis that the 2013 flood reworked and deposited sediments initially mobilized by the earlier fires. The team will study the 2013 flood deposits, eroded slopes, tributary and gully deposits, and deposits freshly exposed beneath terraces along the canyon. They will revisit locations that have been part of an ongoing post-fire study, and will use short-lived fallout radionuclides in these deposits to help identify remobilized fire sediments.

In addition, researchers will analyze the geochemistry and stratigraphy of valley deposits and compare measures of short-term wildfire and flooding-related erosion with ongoing studies documenting erosion rates and hill slope processes over the past 10,000 to 30,000 years. These new exposures greatly increase the ability to analyze and date Holocene slope and valley stratigraphy.

Assessing sentinel responses of lake ecosystems to the Rim Wildfire. National Science Foundation grant #1360066. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1360066. One year. \$140,000 to principal investigator Craig Williamson, craig.williamson@miamiOH.edu, Miami University.

Wildfires transform and transport large amounts of organic carbon across landscapes at regional to continental

and even global scales. The burning of vegetation and soil organic matter, followed by increased runoff of water and erosion, can have big effects on lakes. In addition, smoke plumes from wildfires may even influence lakes much farther away indirectly through what are called teleconnections. The 2013 Rim Fire was the third largest fire ever in California and presents an opportunity to examine these different types of movements of carbon and their impacts on lakes.

This project will apply advanced optical and acoustic technology in order to examine the responses of lakes in the Sierra Nevada Mountains to changes in the quality and quantity of dissolved organic carbon and the consequences for the biology of the lakes. Two main questions are: What characteristics of lakes respond to changes in organic matter due to fires within their watersheds, and; Can such responses also be detected in lakes in distant watersheds through teleconnections?

To address these questions, eight larger lakes and a suite of smaller lakes will be sampled over one year. The watersheds of two of the larger lakes have been extensively burned and influenced by smoke plumes from the Rim Fire. Three other larger and several smaller lakes are located about 150 miles north of the Rim Fire itself, but were still under the smoke plume from the fire. Finally, three lakes are outside of both the smoke and burn areas and will serve as control sites. Intensive sampling of the lakes themselves, data from satellite remote sensing, and detailed chemical analyses will be used to determine the exposure of all the lakes to either fire in the watersheds or just the smoke, as well as the effects on lake ecology.

Immediate behavioral response to flash-floods in Uttarakhand, India. National Science Foundation grant #1361323. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1361323. One year. \$39,887 to principal investigator Sudha Arlikatti, Sudha.Arlkatti@unt.edu, University of North Texas.

This project will better understand people's immediate response to the June 16-17, 2013 flash floods in the hilly state of Uttarakhand in northern India. This event has claimed over 1,000 lives with over 5,700 still reported missing and presumed dead. Data will be collected through field observations and semi-structured interviews of over 300 flash flood survivors from six affected villages. The interviews with survivors will examine their traditional knowledge about floods and landslides and actions they take, their understanding of how the environment changes, number of floods they have experienced, their sources of warning, the actions they took prior to evacuating, their emotional state at the time of the flash floods, and their responses related to protecting themselves, their family and friends.

The project activities will advance the state of knowledge about people's response to flash floods and provide a foundation for cross-cultural comparisons of flash flood response. There are few studies of flood response and virtually none on flash flood response in developing countries. Adopting questionnaire items from previous surveys used will provide a basis for comparing responses to the Uttarakhand flash floods with responses to other rapid onset hazards.

Software for emergency preparedness for dam or levee failure. National Science Foundation grant #1400850. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1400850. Six

months. \$50,000 to principal investigator M. Chaudhry, chaudhry@sc.edu, University of South Carolina at Columbia.

Researchers propose to develop software for determining the extent of flooding following dam or levee failure. In current models and software, flows are assumed to be one-dimensional flows, which is not valid for natural channels (especially those with flood plains). The dam is assumed to fail instantaneously, which is not the case in real life. Therefore, the results computed may not be accurate and the resulting plans are unreliable.

The research team has developed numerical procedures for two-dimensional dam-break flows and compared the computed and experimental results. Small- and large-scale laboratory tests on gradual failure of dams are being conducted. The proposed software will be user friendly, utilize state-of-the-art numerical procedures, allow interactive data input, and provide options for graphical output which can be used by authorities and consulting engineering firms to develop emergency preparedness plans for possible dam and levee failures.

Following the Teton Dam Failure in 1976, all the owners of high dams were required to prepare emergency plans for possible dam failure. The proposed software can be used to simulate flooding resulting from accidental dam and levee failures and planned levee breach to mitigate flood hazards. The proposed model can be used to prepare emergency plans for a catastrophic flooding event and save a significant amount of money and lives and mitigate adverse environmental impacts. An extended version of the model will be suitable for simulating flood flows from rainstorm and snowmelt, failure of other hydraulic structures, avalanches and mud flows, and simulation of possible geomorphic environmental impacts.

Inputs of polycyclic aromatic hydrocarbon to drinking water sources from the Yosemite wildfire. National Science Foundation grant #1361678. http://www.nsf.gov/awardsearch/showAward?AWD_ID=1361678. One year. \$49,770 to principal investigator Alex Chow, achow@clemson.edu, Clemson University.

The Yosemite Rim fire, the third largest fire in California history, burned 257,314 acres (402 square miles) adjacent to a major source of drinking water for 2.6 million people. This fire burned for nearly 10 weeks, finally contained on October 26, 2013.

One of the big questions is how did this fire affect the water quality of the reservoirs in and around Yosemite National Park and what might be the impact subsequently on drinking water quality. The research team has already collected the first set of samples which are post-fire and pre-rain. The next sampling will be post-rain as close to initial runoff as possible.

The burning will likely increase the concentration of chemicals controlled under the Safe Drinking Water Act, namely polynuclear aromatic hydrocarbons. However, little is known about the formation of black carbon—soot to most of us—and its impact on water quality or drinking water quality. Another unknown is the impact of the fire on natural organic matter from the forest floor. This “leaf litter” is normally transported to streams, rivers, and lakes by rain. It may lead to the formation of disinfection by-products during water treatment.

Conferences and Training

January 16-17, 2014

Northridge Earthquake Symposium
Pacific Earthquake Engineering Research Center
Los Angeles, California

Cost: \$50

This symposium examines impacts and progress resulting from the Northridge Earthquake and the use of new technology and building standards to create resilient communities. Topics include transportation systems in disaster, resilient building materials, ground motion hazards, earthquake effects on utility infrastructure, and financial, business, and insurance implications.

<http://www.northridge20.org/>

January 29-30, 2014

Symposium on Earthquake and Landslide Risk in Central Asia

European Commission FP7 Project
Bishekek, Kyrgyz Republic

Cost: \$41

This symposium will focus on developments in landslide and earthquake assessments with an emphasis on remote sensing, geospatial information, and case studies. Topics include monitoring post-event recovery, remote sensing technology, geospatial data management, disaster prediction and prevention, geosensing and infrastructure development, and the role of policymakers.

<http://bit.ly/1kPh6Z3>

January 30-31, 2014

Baltic Earth Workshop on Natural Hazards and Extreme Events in the Baltic Sea Region

Baltic Earth
Helsinki, Finland

Cost: Free

Baltic earth is the earth system science program for the Baltic Sea region. This workshop will review current understanding of extreme events. Then it will establish links among research groups, identify gaps in knowledge, review modeling capabilities, and so on. The conference will help to plan future research in the region.

<http://www.baltic-earth.eu/hazards/>

February 8-13, 2014

67th Society for Range Management Annual International Meeting, Technical Training and Trade Show

Dow AgroSciences and Society for Range Management
Orlando, Florida

Cost: \$365

The theme for the meeting is "From Dusty Trails to Waning Wetlands" to bring drought and water management to the forefront. Topics include the history of grasslands in the south, the history of drought, and managing drought on rangelands. The meeting will include a variety of technical sessions, workshops and symposia on topics ranging from wildlife to wildfire ecology.

<http://rangelands.org/orlando2014/>

February 11-13, 2014

Business Continuity and Emergency Response Forum
Fleming Gulf

Abu Dhabi, United Arab Emirates

Cost: \$3,199

This forum will address business continuity standards for disasters and crisis management strategies to develop emergency plans and disaster recovery goals. Topics include business continuity standards, cyberthreats, engaging senior management in business continuity implementation, applying the National Response Framework to business continuity practices, and assessing the status of emerging diseases.

<http://security.fleminggulf.com/business-continuity-emergency-response-forum>

February 13-16, 2014

Second World Congress on Disaster Management
World Congress on Disaster Management

Hyderabad, India

Cost: \$250

This conference will examine global disasters with a focus on the environmental, social, technological, and economic risks related to geological, hydro-meteorological, mining, health, and infrastructure disasters. Topics include earthquake risk, early warnings, drought, tsunamis, oil spills, forest fires, women and children in disaster, urban sewage risk mitigation, indigenous disaster approaches, and the role of IT and communications in disaster management.

<http://wcdm.info/index.html>

February 17-19, 2014

International LiDAR Mapping Forum

SPAR Point Group
Denver, Colorado

Cost: \$550

This conference will discuss how advancements in mapping in transport, coastal zones, GIS applications and urban modeling have improved mapping for customers in a wide range of disciplines and industries. Topics include ocean mapping, cultural heritage documentation, remote sensing data collection, use of laser scanners, extracting information from data to improve disaster response, and the use of maps post disaster to aid in recovery.

<http://www.lidarmap.org/international>

February 19, 2014

Advances in Extratropical Cyclone Understanding and Prediction

National Oceanic and Atmospheric Agency Center for Weather and Climate Prediction

College Park, Maryland

Cost: Free

This colloquium will use the 35th anniversary of the 1979 President's Day snowstorm in Washington, D.C. to examine the changes in prediction techniques and current and future challenges in predicting extra-tropical cyclones. Topics include prediction technology and systems, lessons from the storm, early detection and monitoring,

and acknowledgement of those who contributed to the advancements of the last 35 years. Remote attendance options are also available.

<http://www.opc.ncep.noaa.gov/35th.php>

February 24-26, 2014

Climate Leadership Conference

Center for Climate and Energy Solutions, Association of Climate Change Officers, and others

San Diego, California

Cost: \$525

This conference will discuss how policy, business, societal, and technological innovations can affect climate change and ways to create a sustainable future through climate mitigation. Topics include understanding water risk and dependency, building resilience against catastrophic storms, climate risk in supply chains, making businesses greener, and carbon emission reduction strategies.

<http://www.climateleadershipconference.org/about.html>

March 13-14, 2014

2014 Annual Land Use Conference

Rocky Mountain Land Use Institute

Denver, Colorado

Cost: \$525

Interior Secretary Ken Salazar will deliver the keynote address at the meeting. The gathering will focus on growth issues as the nation emerges from the recent recession. Topics covered will include retrofitting existing neighborhoods while ensuring access to transportation, schools and recreation; ensuring that financing is available; and many others.

<http://www.law.du.edu/index.php/rmlui/rmlui-practice/rmlui-annual-conference/program>

March 14-18, 2014

3rd World Conference on Disaster Risk Reduction UNISDR

Sendai City, Japan

Cost: Not posted

This conference is the major venue for international disaster risk reduction to complete the assessment and review of the implementation of the Hyogo Framework for Action and to review the experience obtained in regional and national programs. The conference will adopt a post-2015 disaster risk reduction framework.

<http://www.preventionweb.net/wcdr/>

March 19-20, 2014

2014 Aerial Fire Fighting Conference

California Department of Forestry and Fire Protection

Sacramento, California

Cost: \$1400

This conference will examine the impact of budgetary restraints on agriculture, forestry, and firefighting department procedures and infrastructure in relation to recent large-scale wildfires. Topics include investing in future pilots and equipment, navigation technologies, fire suppression, rescue equipment, and emergency response methods.

<http://tangentlink.com/event/aerial-firefighting-sacramento-2014/>

May 5-8, 2014

5th Africa Regional Platform for Disaster Risk Reduction

United Nations Office for Disaster Risk Reduction-Regional Office for Africa

Abuja, Nigeria

Cost: Not specified

The meeting brings together stakeholders ranging from nongovernmental organizations to the private sector to share their common commitment to building resilience to disaster risk and climate change in African communities.

<http://www.unisdr.org/africa>

March 20-21, 2014

ASIS Region 1D Conference: Critical Infrastructure Protection

American Society for Industrial Security

San Diego, California

Cost: \$175

This conference will discuss the relationship between facility operations, emergency management, and security personnel to better prepare for disasters. Topics include innovative security practices, providing security in the face of budget restraints, infrastructure technology, emergency management implementation, and new security developments and regulations.

<http://www.sdasis.org/>

May 5-7, 2014

Design for Urban Disaster

Harvard University

Cambridge, Massachusetts

Cost: \$75

The conference is for humanitarian aid practitioners, government experts and physical space designers “to explore ways to improve actions before and after disasters. A release about the meeting says, “Urban disasters are on the increase, with rapid urbanization causing more people to live in place vulnerable to hazards such as flood, earthquake, and fire.”

<http://www.designforurbandisaster.com/>

May 12-15, 2014

2nd International Conference: Climate Change—The Environmental and Socio-Economic Response in the Southern Baltic Region

Baltic Sea Experiment and Szczecin University

Szczecin, Poland

Cost: Not available

Progress has been made in the understanding of the climate system on the global scale. But understanding of regional scales is still needed. This conference will highlight: climate proxies and models; natural dynamics of climate and coastal areas; changing Baltic sea coasts; and adaptation of energy politics to climate change.

<http://www.baltex-research.eu/SZC2014/index.html>

May 19-21, 2014

Local Solutions: Northeast Climate Change Preparedness Conference

Antioch University, U.S. Environmental Protection Agency

Manchester, New Hampshire

Cost: \$240

The *Observer* is available free online. A print subscription to the *Observer* is \$15 a year to subscribers within the United States. 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.

Subscribe to the *Observer* and the Natural Hazard Center's electronic newsletter, *DR-Disaster Research News You Can Use*, at:

<http://ibs.colorado.edu/hazards/subscribe>

The conference will be an educator's summit, facilitating networking with public and private stakeholders for training in climate preparedness. The conference will present "how-to" knowledge about the tools available to communities to deal with the changing climate. "Attendees will also learn how to craft effective communications and engagement approaches, and how to forge public-private and school-community partnerships that leverage resources. Above all, key decision-makers and other individuals will meet in an accessible setting to discover synergies and teach each other about how to protect what we all invest so much of our professional and personal lives in: safe, healthy, and thriving—resilient—communities," according to the website.

<http://www.antiochne.edu/innovation/climate-change-preparedness/>

June 11-12, 2014

16th Futures Conference: Sustainable Futures in a Changing Climate

Turku University, Finland Futures Research Centre

Helsinki, Finland

Cost: \$475

This conference brings together experts from the field of futures studies to look at sustainable development under the modern regime of changing climate. The conference will "present current academic research and give new viewpoints and novel ideas to decision-makers to assist them towards more feasible decisions for sustainable development."

<http://www.futuresconference.fi/2014/>

June 16-18, 2014

23rd SRA-E Conference

Society for Risk Analysis

Istanbul, Turkey

Cost: \$750

The theme of this European-oriented conference will be "Analysis of Governance and Risks Beyond Boundaries." This means that risk is not constrained by the boundaries of nations, but can travel across regions. The conference will "promote recent scientific novelties in risk reduction and to enhance inter-disciplinary approaches to develop new strategies in both evaluating and coping with well-known and less-known risks."

<http://srae2014.itu.edu.tr/>

June 16-20, 2014

34th EARSeL Symposium

University of Warsaw

Warsaw, Poland

Cost: \$538

EARSeL is a scientific network of European remote sensing laboratories, both academic and private. The conference will cover a wide variety of topics, including natural and cultural heritage; remote sensing for archaeology; hydrological applications and many others.

<http://www.earsel.org/symposia/2014-symposium-Warsaw/index.php>



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

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

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

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

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