

Observer

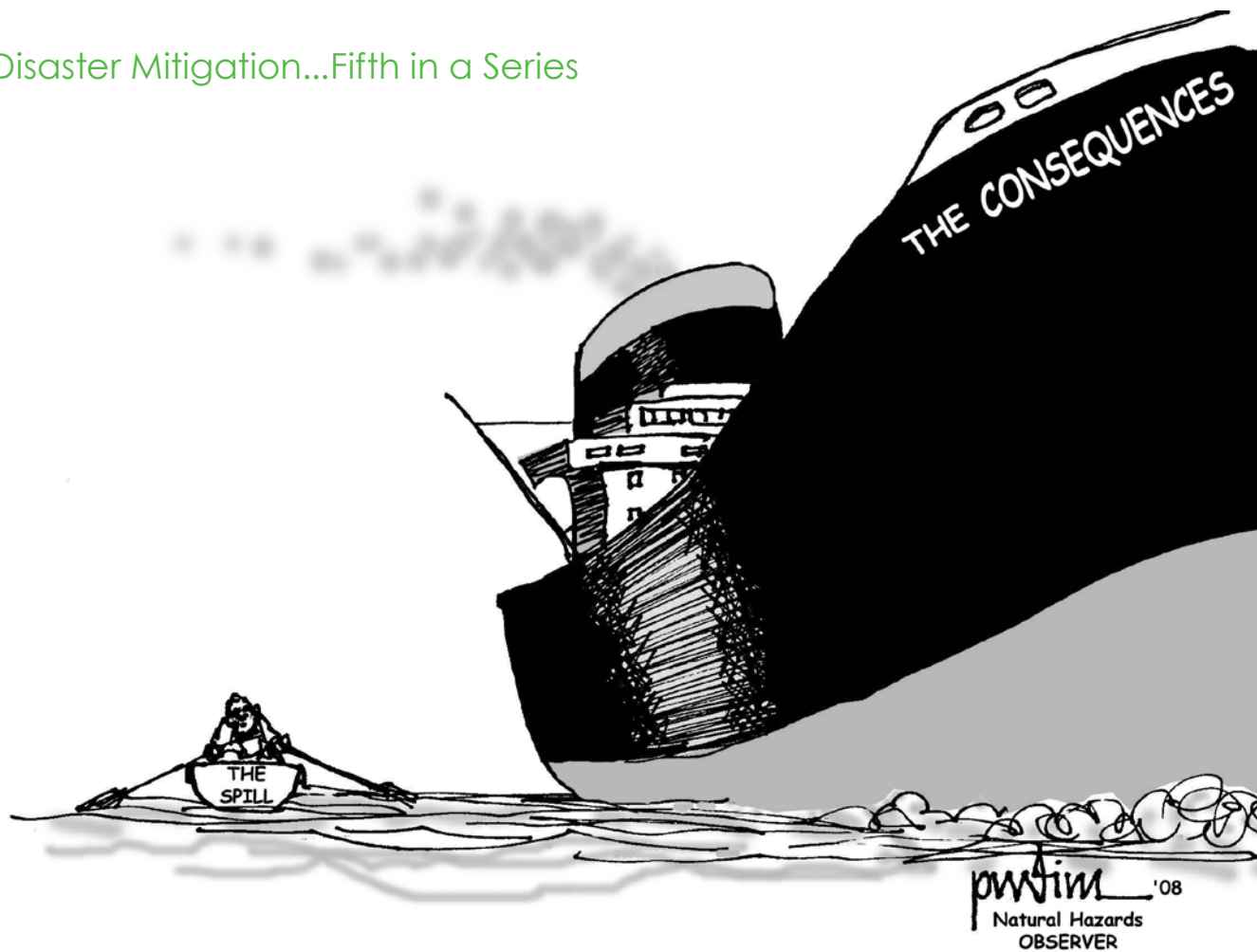
Natural Hazards



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Disaster Mitigation...Fifth in a Series



Exxon Valdez Oil Spill Litigation and Community Resilience

— an invited comment

ON JUNE 25, 2008, THE UNITED STATES SUPREME COURT issued a ruling on the Exxon Valdez oil spill (EVOS) litigation, bringing an end to a chapter of what is arguably America's worst environmental disaster. The disaster struck on March 24, 1989, when the tanker Exxon Valdez ran aground on a well-marked reef in Prince William Sound, Alaska, leaking more than 11 million gallons of Prudhoe Bay crude oil into one of the most pristine ecosystems in the world. Litigation—the primary means of obtaining fair compensation for disaster losses and deterring future negligence—began soon after the spill and languished in the judicial system for years. This article examines the EVOS disaster and considers possible implications of the Supreme Court decision for disaster professionals and society at large.

EVOS Background

IN SEARCHING FOR CAUSES OF THIS DISASTER, there is almost as much blame to spread around as there was oil on Alaska's shoreline. Alyeska Pipeline Service Corporation was responsible for initial spill response and containment but it lacked trained personnel, equipment, supplies, and vessels. The State of Alaska had responsibilities for oversight of Alyeska through the Department of Environmental Conservation. But its most effective inspector had been reassigned because of industry complaints against him. The U.S. Coast Guard had responsibilities for monitoring

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Land Ho!

GLOBAL SEA LEVEL RISE BY THE YEAR 2100 SHOULD NOT EXCEED ABOUT SIX FEET, according to new research. A paper in the September 5, 2008, journal *Science* by Tad Pfeffer of the University of Colorado's Institute of Arctic and Alpine Research and colleagues says, "A total sea level rise of about two meters (six feet) by 2100 could occur under physically possible glaciological conditions but only if all variables are quickly accelerated to extremely high limits." More plausible but still accelerated conditions could lead to a total sea-level rise by 2100 of 0.8 meters (2.6 feet) by 2100, according to the findings.

The Intergovernmental Panel on Climate Change Fourth Assessment Report consensus on sea level rise by 2100 was 0.18 (seven inches) to 0.6 meters (two feet). If the entire Greenland ice sheet melted—an eventuality no one has yet predicted—global sea level would rise about 7 meters (23 feet). At present, most sea level rise—about 88 percent—is accounted for by thermal ocean expansion. As water warms, it takes up more space. Glacier melting is another lesser contributor.

Pfeffer's estimates are the highest year 2100 sea level rise estimates published so far, according to the Web site RealClimate (www.realclimate.org). In September 2008, the Dutch Delta Commission published an estimate for the Netherlands—where rising sea levels are a serious issue—of .65 to 1.3 meters (2.1 to 4.3 feet) regionally.

"Lest readers think this is no big deal, the estimates for the number of people who would be affected by one meter of sea level rise is more than 100 million—mainly in Asia," writes the RealClimate group in a September 4, 2008, posting. "Of some recent relevance is the fact that the storm

“ The estimates for the number of people who would be affected by one meter of sea level rise is more than 100 million—mainly in Asia. ”

surge caused by Gustav in New Orleans was within one foot of the top of the levees. Another three feet caused by global sea level rise would have put a lot more water into the 'bowl.'"

A federal study released in March (climatescience.gov/Library/sap/sap4-7/final-report/) found a sea level rise of 1.22 meters (four feet) over the next 50 to 100 years would permanently flood nearly one-third of the major roadways on the U.S. Gulf Coast. The figure is well within the range Pfeffer's research expects. The results are "a pretty damning tale of what could happen..." former head of the engineering firm Sverdrup Civil Henry Schwartz said in the March



28, 2008, issue of *Science*. "Transportation professionals...by and large haven't looked very seriously at global warming."

The amount of sea level rise expected in this century from climate change is uncertain, but much discussed. NASA scientist James Hansen has proposed a provisional level of five meters (16 feet) in this century. The Pfeffer *et al.* paper concludes this estimate is too high. They also say the contribution from the Greenland ice sheet should be no more than .5 meters (1.6 feet) by 2100.

—Dan Whipple



So When Does It Really Get Hot?

Long-term planners seeking a warm sunny day can look forward to 2095, when temperatures on a hot day could reach 122 degrees Fahrenheit in Australia, India, the Middle East, and equatorial and subtropical South America.

An August 2008 paper by the Royal Netherlands Meteorological Institute's Andreas Sterl and his colleagues examined a 17-ensemble model experiment determining extreme temperatures in a warming climate. The research, published in *Geophysical Research Letters* found that, even

when corrected for today's climate bias, projected temperatures next century point to "dangerously high future temperatures in densely populated areas."

The ensembles showed regularly occurring highs of 104 degrees F in southern Europe and Midwestern United States by 2100.

The Dutch group's findings are consistent with work published in a 2005 issue of the *Journal of Climate* by the British Hadley Centre's Robin Clark and colleagues. They found in some regions changes in extremely hot days were "significantly larger" than changes in mean values.

"The intensity, duration, and frequency of summer heat waves are expected to be substantially greater over all continents," the article says. "The largest changes are found over Europe, North and South America, and East Asia... Even with the most conservative simulations, hot extreme events are still expected to substantially increase in intensity, duration, and frequency."

Evacuation Deportation Apprehension

Federal authorities declared "hurricane amnesty" in the hope that undocumented immigrants in Texas wouldn't try to weather Hurricane Ike in place, according to a September 11 report in the *Christian Science Monitor*. Law enforcement officials said they wouldn't check identification at shelters, monitor roadways, or man checkpoints in an effort to induce illegal immigrants to evacuate safely, according to the paper.

Although police and other agencies distributed flyers informing the estimated 1.6 million undocumented residents that evacuation was safe, many believed previous immigration enforcement efforts would hamper efforts to get those without documentation to leave. In May, a Border Patrol proclamation said those who couldn't prove citizenship would be held in specially designed areas "made to withstand hurricanes" rather than be evacuated.

The *Washington Post* held up the example of Hurricane Dolly. Although Homeland Security Secretary Michael Chertoff said the Border Patrol would not impede a hurricane evacuation during the July hurricane, checkpoints were kept open—and a vanload of illegal immigrants apprehended. Evacuation in that case was not mandatory, according to the *Post*.

Ike hit the Texas Coast on September 13, 2008. About one million people were evacuated, 67 died, and about 300 remain missing.

Biosafety

In an effort to keep up with developments in biological weapons research, the U.S. Senate is considering changes to the biological defense research program. Scientists have complained red tape surrounding bio-agents such as anthrax and botulinum have made research difficult and collaboration with foreign scientists virtually impossible.

The Select Agent Program and Biosafety Improvement Act of 2008 would ease some of those issues by setting minimum standards for research and training and outlining an anonymous incident reporting system. The bipartisan legislation would reauthorize the research of 325 organizations and thousands of individuals that have worked with bio-agents under government approval since 2002.

EVOS...

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tanker traffic in and out of the area but funds for state-of-the-art radar equipment had not been authorized by the federal government as promised in legislation authorizing the Trans-Alaska Pipeline. Oil companies in the 1980s were in an economic downturn that led to cost-cutting measures such as reducing the number of tanker crew members, extending working hours, and encouraging more risk taking in an effort to reduce travel time from terminal to refinery and back. In retrospect, a complacent culture characterized oil transportation in this area.

Against that backdrop, the primary responsible parties for the EVOS were Exxon and the tanker's captain. Court records said, "The accident occurred after the tanker's

captain, Joseph Hazelwood—who had a history of alcohol abuse and whose blood still had a high alcohol level 11 hours after the spill—inexplicably exited the bridge, leaving a tricky course correction to unlicensed subordinates."

Records further showed

Exxon knew of the captain's alcohol issues but failed to supervise or reassign him. Other documents suggested the tanker had faulty radar equipment that had been in need of repair for almost a year. In working order, this system might have averted the accident. Once the tanker grounded on Bligh Reef, an environmental (or "technological") disaster ensued that continues to this day.

The ecological devastation caused by the EVOS was immense. The spill contaminated 44,000 square kilometers (17,000 square miles), including more than 1,900 kilometers (1,200 miles) of rugged Alaskan coastline. Controversial clean-up methods, including the use of pressurized hot water on the beaches and shorelines, contributed to the damage by destroying microorganisms and plankton that form the ecosystem's foundation. The spill occurred at the beginning of the region's most biologically active season and killed an estimated 250,000 seabirds, 144 bald eagles, 4,400 sea otters, 300 seals, and 20 whales, as well as destroying billions of salmon and herring eggs. Ecosystem impacts were so severe that, 18 years later, only 10 out of 26 species have recovered from oil spill damages (see www.evostc.state.ak.us/).

The EVOS had disastrous impacts on local communities, particularly those with strong economic and cultural ties to renewable natural resources. Alaska Native villages such as Tatitlek and Chenega Bay are traditional subsistence communities whose culture and lifestyle are intimately tied to the environment. Commercial fishing communities such as Cordova, Alaska, have strong economic and lifestyle ties to the renewable natural resources that were damaged by the spill. Initial impacts within these types of communities included high levels of collective trauma, social disruption, economic uncertainty, community strain, and psychological stress. As key commercial and subsistence resources such as herring and pink salmon failed to recover, many local residents, particularly those most closely tied to the resources (e.g., Alaska Natives and

commercial fishermen), experienced chronic psychological stress, social disruption, and collective trauma that persist to this day. Ironically and sadly, a significant portion of these chronic impacts were a result of litigation, the very mechanism used to obtain disaster relief, reduce vulnerability, and enhance resiliency in this type of disaster.

EVOS Litigation

LITIGATION HAS BEEN A SIGNIFICANT FEATURE of the *Exxon Valdez* disaster. Two noteworthy legal cases involved the government versus Exxon and class action litigation against Exxon. In 1991, the State of Alaska and U.S. government collaborated to negotiate a settlement with Exxon for approximately \$900 million in criminal and civil fines. The agreement established the *Exxon Valdez* Oil Spill Trustee

Council (EVOSTC) to administer the funds and monitor recovery of resources damaged by the spill. Paid out over a 10-year period, these funds were used in recovery and restoration efforts in coastal areas heavily impacted by the spill.

The numerous civil cases filed against Exxon in the wake of the oil spill were eventually consolidated into a "class" consisting of almost 33,000 plaintiffs. The class included Alaska natives, commercial fishermen, deckhands, cannery workers, business owners, landowners, local governments, and others financially harmed by the spill. A 1994 jury trial in U.S. District Court in Anchorage, with the Honorable H. Russel Holland presiding, found Exxon reckless and liable for \$287 million in compensatory damages and \$5 billion in punitive damages. Exxon waited until 1997 to appeal the verdict and the amount of punitive damages became a major point of contention.

Class action EVOS litigation took a series of unanticipated twists and turns that delayed resolution for almost 14 years. First, the case languished in the U.S. Ninth Circuit Court of Appeals for more than four years until a 2001 decision ruled against Exxon on all points except the amount of punitive damages, which was deemed excessive. The case was returned to Federal District Court where Judge Holland reduced the award to \$4 billion in 2002. Exxon appealed and in 2003 the appeals court sent the case back to district court with guidelines for reducing punitive damages. Judge Holland revised the punitive award to \$4.5 billion in 2004 and Exxon appealed again. The Ninth Circuit cut the award to \$2.5 billion in 2006, prompting another appeal by Exxon—this time to the U.S. Supreme Court.

While the legal saga unfolded, communities and groups closely tied to the resources experienced disastrous losses. Commercial fishing recovered slowly. The national economic boom of the 1990s skipped these communities and instead, bankruptcies, business closings, out-migration, and low tax revenues became the norm. Uncertainty over recovery of ecosystem resources and delayed justice from prolonged litigation contributed to a chronic social-psychological malaise that drained communities of social capital—people and groups were increasingly "tapped out." Each appeal and court delay seemed to deflate many disaster

“Records indicated Exxon knew of the captain's alcohol issues but failed to supervise or reassign him. Other documents suggested the tanker had faulty radar equipment that had been in need of repair for almost a year.”



survivors a little bit more. Moreover, almost 20 percent of the plaintiffs passed away during this time.

Exxon Shipping Co. v. Baker: The Supreme Court Decision

THE SUPREME COURT HEARD ORAL ARGUMENTS in the EVOS case on February 27, 2008. Exxon argued that punitive damages were not permitted under maritime law and the Clean Water Act. The corporation also contended that punitive damages were unnecessary because it had already spent more than \$3.4 billion in cleanup costs, compensatory damages, criminal and civil fines, and other expenses. The plaintiffs argued that corporations like Exxon must be held accountable for reckless actions and punitive damages served to deter similar actions and wrongs. They also argued the spill caused extensive damage to the environment and the lives of area residents, much of which occurred after compensatory damages were awarded in 1994 and for which no compensation has been provided. For example, the commercial herring fishery, which earned most fishermen about a third of their annual income, collapsed in 1994 and has not recovered.

On June 25, 2008, the Supreme Court issued a ruling that upheld the plaintiff's assertion that Exxon was responsible for the spill and punitive damages were allowed in this case. However, the Court voted 5-3 to reduce the \$2.5 billion punitive damage award to \$507 million—a one-to-one ratio of punitive damages to actual damages. Justices Anthony Kennedy, Antonin Scalia, David Souter, Clarence Thomas, and Chief Justice John Roberts were in the majority and Justices Ruth Bader Ginsberg, John Paul Stevens, and Stephen Breyer dissented.

Writing for the majority, Justice Souter ruled that the punitive damage award was excessive, noting that, "American punitive damages have been the target of audible criticism in recent decades," particularly regarding "the stark unpredictability of punitive awards." He wrote, "In many instances a high ratio of punitive to compensatory damages is greater than necessary to punish or deter." In establishing a one-to-one ratio of punitive to compensatory damages, Justice Souter acknowledged that the decision could strike some as the Court doing too much policymaking but deemed the decision justifiable in the narrow context of maritime law.

In dissent, Justice Stevens wrote, "In light of Exxon's decision to permit a lapsed alcoholic to command a supertanker carrying tens of millions of gallons of crude oil through the treacherous waters of Prince William Sound, thereby endangering all of the individuals who depend upon the sound for their livelihoods, the jury could reasonably have given expression to its moral condemnation of Exxon's conduct in the form of this award." Justice Ginsberg's dissent took issue with the Court setting the one-to-one ratio on a matter where "Congress is the better equipped decision maker." Further, she wrote, "I question whether there is an urgent need in maritime law to break away from the 'traditional common-law approach' under which punitive damages are determined by a properly instructed jury, followed by trial-court, and then appellate-court review, to ensure that the award is reasonable." Justice Breyer noted, "The jury thought the facts here justified punitive damages of \$5 billion ... based

in large part on the fact that Exxon's conduct was highly reprehensible."

As expected, reactions to the Supreme Court's decision were mixed. Pro-business organizations hailed the decision for helping bring punitive damage awards under control. The U.S. Chamber of Commerce released the following statement: "For years, the chamber has argued that punitive damages are too unpredictable and unfair, and today the Court agreed." A spokesperson for the National Chamber Litigation Center said, "Limiting punitive damages to no more than the amount of a compensatory award will go a long way in containing unpredictable punitive damages." Exxon Mobil CEO Rex W. Tillerson said, "The Valdez oil spill was a tragic accident and one which the corporation deeply regrets. We have worked hard over many years to address the impacts of the spill and to prevent such accidents from happening in our company again."

A joint statement by Alaska's senators and congressman read, "Today's ruling adds insult to injury to the fishermen, communities and Alaska Natives who have been waiting nearly 20 years for proper compensation following the worst environmental disaster in our nation's history." Governor Sarah Palin said, "While the decision brings some degree of closure to Alaskans suffering from 19 years of litigation and delay, the Court gutted the jury's decision on punitive damages."

Some criticized the ruling as judicial activism by a pro-business Court primarily appointed by presidents Ronald Reagan, George H.W. Bush, and George W. Bush. As described in an editorial in *Mother Jones*, "Exxon was able to drag on the appeal long enough for President Bush to stack the Court with two new business-friendly justices who are fairly hostile to the notion that regular people sitting on juries ought to be able to hit big companies where it hurts—in the pocketbook—for reprehensible conduct." Others characterized the judgment as a travesty because survivors were forced to wait too long for justice. In the end, they were not fairly compensated for their losses and Exxon was not adequately punished. An editorial in the *Daily Astorian* said, "Any legal system that permits a corporation to wiggle off the hook of real responsibility by dragging out a legal battle for 19 long years is in serious need of overhaul."

Future potential influence

SOME LEGAL EXPERTS CONTEND the decision will influence state courts grappling with problems of excessive punitive damage awards in other cases. Although the ruling applies to maritime law, it sets a precedent that will influence current and future cases involving punitive damages. The Court laid out a well-reasoned, deliberative argument for curtailing punitive damages that could be used as a

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EVOS...

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standard beyond maritime law. It is a matter of time before these standards are applied to other civil cases.

Although the Court ruled in favor of the plaintiffs, holding Exxon liable, many considered the decision to dramatically reduce the punitive damage award to favor the oil company. Reaction to the decision in Cordova and other fishing communities showed feelings of betrayal, shock, injustice, anger, depression, resignation, defeat, sadness, and hurt. Many expressed a lost faith in the justice system. They felt helpless, invisible, and insignificant compared to corporations. One fisherman stated, "It kind of sends the message that big corporations that have the right money and political power can throw safety and responsibility to the wind." Another characterized the Court as being "part of owned-and-operated corporate America." A Cordova fisherman observed, "It gives big business the formula they need to calculate the cost of their actions when they destroy the environment. This gives them the formula to calculate their risks." Another quipped, "I found out what the true meaning of punitive damages is: puny." A Kodiak fisherman summed up the decision: "It's amazing how money can purchase justice in this country. A jury of your peers apparently doesn't stand for much because they can change it whenever they want."

Just when it appeared the EVOS litigation was concluded, it took a new twist. The 1994 decision included an interest penalty on damage awards not paid within four years of the verdict. Applying interest to the reduced punitive damage award would almost double the amount, but the Supreme Court did not rule on the interest issue. Instead, the issue was remanded to the Ninth Circuit Court and attorneys predict it could take two more years to resolve this issue.

The legal chapter of the disaster may be coming to a close, but the environment and several key resources have not fully recovered. Oil can still be found along the western shores of Prince William Sound. Some survivors may obtain closure with the final decision, but for others, the disaster continues.

Implications for Disaster Professionals

THE EXXON VALDEZ DISASTER and the subsequent Supreme Court decision regarding punitive damages in this case have important implications for disaster professionals. One issue concerns how communities affected by environmental disasters seek redress for such events. In the case of hurricanes, floods, earthquakes, and the like, communities, groups, and individuals often receive support from government and relief organizations such as the Red Cross. In some cases, survivors can obtain low interest loans to rebuild damaged homes and businesses. There are active programs to assist recovery efforts and help communities improve preparedness and enhance resiliency. These forms of support are relatively absent in environmental disasters. Efforts to improve community capacity to effectively deal with these types of disasters are lagging. Instead, litigation has been the standard means of recovery. The EVOS case demonstrates litigation is inadequate and may, in fact, create additional stress and disruption. This lesson is not lost on those facing similar situations. Interviews with Dutch

Harbor, Alaska, fishermen after the 2005 Selendang Ayu shipwreck and oil spill revealed an aversion to using litigation because of the EVOS litigation saga.

Another issue concerns the general context in which disaster-related research in the U.S. is being conducted. One motivation for individuals to participate as "subjects" in such studies is the notion that data they provide may help to develop preparedness or recovery programs or assist other communities facing a disaster. Witnessing the protracted EVOS litigation and its ultimate outcome may send a message to victims and survivors of disasters that there is little they can do to influence their fate or assist others against corporations with deep pockets. Another irony is the fact that \$507 million in punitive damages will likely do nothing to deter Exxon's behavior or that of other large corporations.

Punitive damages are related to basic issues of vulnerability and resilience. Broadly, punitive damages are intended to help reduce vulnerability by punishing egregious behavior and serving as a deterrent to future negligent or reckless behavior. If punitive damages can be calculated as simply a cost of doing business, communities and individuals are at a greater risk and are more vulnerable to actions that might lead to disastrous consequences. In the Exxon case, the \$507 million punitive damage judgment pales in comparison to the \$40.6 billion in profits the company made in 2007.

Similarly, the Court decision is related to issues of resiliency. Among the foundations of resiliency are sustainability and a healthy social-ecological system. The precedent established by *Exxon v. Baker* comes at a time when we should be strengthening our protection of the natural environment rather than weakening it through a judicial activism. Weakened deterrence, particularly in an era of increasingly scarce natural resources and economic crisis, invites risk behaviors that will inevitably result in more environmental disasters. Given the current Supreme Court's stance, legislation is the best way to restore deterrence through the judicial system.

Researchers, policy makers, and other professionals can advance the disaster field by developing alternative approaches to deal with environmental disasters. These disasters have response, recovery, and preparedness issues that do not necessarily follow established patterns and programs. Alternatives to litigation need to be examined more closely and further developed. In particular, they need to account for the kinds of long-term damage caused by environmental disasters like the EVOS. Communities like Cordova, that continue to deal with damages to renewable natural resources and associated economic, social, and psychological problems, need more community help programs like those developed by the Prince William Sound Regional Citizens' Advisory Committee (www.pwsrcc.org/projects/OSRplan/coping.html).

Small punitive damages will not discourage corporate recklessness, but may discourage victims from trying to recover their losses and hurt post-disaster mitigation efforts across a wide spectrum of technological hazards.

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Social Media and the Democratic Convention

What happens when Web 2.0 meets the “official version?”

THE WORLD HAS GONE A-TWITTER. AND A-FLICKR. And you-Tube’n.

Micromedia, new social media, Web 2.0 – call it what you like. Peer-to-peer information and communication technologies are changing the way information is shared in a disaster. These new technologies, both online and mobile, include such things as social networks like Facebook and MySpace, photo sharing through Flickr, video sharing through YouTube, and microblogging with Twitter. In this article, we discuss how new social media have been used in recent crises and disasters, and the ways that public information officers monitored information online during the Democratic National Convention in Denver.

Social media are a new phenomenon, but their growth has been extraordinary. Twitter (twitter.com), for instance, was founded in March 2006, emerging in only a couple of years to become one of the most popular sites on the Internet (the number of Twitter users isn’t published officially, but could be as high as 15 million). Facebook (www.facebook.com) was founded in February 2004 as a network for college students, but has grown into a favorite online destination of multigenerational Web surfers. It has 110 million users, making it the fourth most-trafficked Web site in the world. Other sites such as YouTube, Flickr, and MySpace, have entered the daily vocabulary of the Web-savvy entertainment seeker, news hound, and office-bound procrastinator.

The relevance of these new media to emergency management is their ability to support real-time reporting of events happening on the ground. Recent research on the uses of peer-to-peer communication in disaster has revealed striking patterns of collective behavior that are becoming important for the practice of emergency management, especially the functions of intelligence gathering, retrieval and dissemination of risk information, and situational awareness.

THE SCHOOL SHOOTING AT VIRGINIA TECH IN APRIL 2007 was a community-wide tragedy that provoked international interest. As members of the public converged online to offer their prayers and condolences, the students used their trusted online social networks on Facebook to conduct health and welfare checks. Within days of the disaster, researchers began to collect data on the channels and flow of information during the event, revealing examples of concentrated and earnest collective intelligence enabled by new social media. For example, students and other volun-

“Verizon Wireless reported a 16-fold increase in wireless calls, text messages, picture and video messages, Internet connections, and other wireless traffic on cell sites serving the Denver area on the night Barack Obama accepted his party’s presidential nomination.”



teers participated in a coordinated online effort using Facebook to correctly identify the names of all of the deceased victims before the university released that information (Palen *et al.* 2007).

Investigation into the sources and uses of information and communication technology during the 2007 Southern California Wildfires also revealed important patterns of public involvement. Individuals with local knowledge monitored news activity online, often providing corrections to misinformation (Sutton *et al.* 2008). During this same disaster, one local news and information website, rimoftheworld.net (www.rimoftheworld.net),

became the go-to source of information for local residents, as well as emergency responders and local public officials. Rimoftheworld founder Scott Straley says that the site went from an average of 300,000 page views a week to nine million during the week-long evacuation of the area

affected by the fires.

Using a small staff of employees and many volunteers, they monitored back-channel communications such as scanners and “word-of-mouth” social networks. Combined with their pre-established online presence, rimoftheworld.net was able to keep people up to date about the fires (Shklovski *et al.*, 2008). “We developed a system that could keep residents informed in near-real-time with the progress of the fire fight,” says Straley.

Unfortunately, even as peer-to-peer communication technology enables information exchange in times of disaster, back-channel communications are suspect in the eyes of emergency managers. To some, information sharing through online social networks and other social media is viewed as uncontrolled and uncoordinated. For those

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Social media...

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reasons, some emergency managers believe that some unconfirmed information is likely to be rumor-driven and rife with inaccuracies. Misinformation could lead to misunderstandings about the situation, confusion about official orders for public protection, misdirected resources, and in the direst circumstances, may exacerbate the situation and lead to loss of life or property.

EMPIRICAL STUDIES ON PEER-TO-PEER COMMUNICATIONS in disaster, such as those cited above, show that these concerns, while valid, may be overstated. For instance, during the Virginia Tech tragedy, communication between members of Facebook groups was found to be extremely well coordinated. Individuals took turns monitoring and verifying one another's postings. Not one name posted by this distributed group was inaccurate. (Vieweg *et al.* 2008). During the 2007 Southern California wildfires, many of the people who participated in back-channel communications did so because of a perceived dearth of information from official sources; information which was necessary for making key life-safety decisions. They also contributed their local knowledge to correct the misinformation disseminated by public officials and network news (Sutton *et al.*, 2008). Instead of generating rumor and misinformation, these online volunteers, enabled by technology, offer a viable fact-checking service that can be harnessed in future events to strengthen situational awareness.

Some emergency managers are eager to learn more about the potential applications of new social media in disaster and crisis situations and are working with local policy makers and information technology departments to remove the filters from some social media Web sites that are traditionally blocked to government employees. Just this past August, in preparation for the Democratic National Convention, the Office of Emergency Management for the City of Denver recognized the potential benefits that might come from accessing new social media and put into place plans to monitor public sentiment online. Public information officers (PIO), served as the test case for using Web 2.0 technologies.

Stationed in a newly remodeled Joint Information Center (JIC), PIOs developed a consistent message across all agencies, answered media inquiries, and investigated and corrected instances of information inaccuracies. This third task largely consisted of online monitoring of news and commentary about protest groups, public demonstrations, police activity, arrests, and the activities of city officials. PIOs engaged in regular communications with their counterparts in the Emergency Operations Center, various city departments, and federal officials located at the Multi-Agency Communication Center nearby.

During the week of the Convention, a team of researchers led by the Natural Hazards Center was embedded

in the JIC to observe the information retrieval and sharing activities of PIOs. A second team of researchers from the University of Colorado Department of Computer Science observed patterns of user traffic on a number of online sites.¹

Throughout the event, there was a significant increase in traffic through mobile communication devices and online. For instance, Verizon Wireless reported a 16-fold increase in wireless calls, text messages, picture and video messages, Internet connections, and other wireless traffic on cell sites serving the Denver area on the night Barack Obama accepted his party's presidential nomination. In addition, thousands of videos and photos were posted to YouTube and Flickr, and there was an increase in activity on Twitter and Facebook during the week of the DNC. In spite of this, researchers observed a lack of focused attention to new social media in the JIC during the week-long event. While PIOs were regularly engaged in online searches for

news reports about the convention and the city's involvement in public safety activities, they mainly did so by viewing official online news sites produced by local news stations and some political blogs; other social media were rarely accessed.²

“Given the efforts required to enable access to traditionally restricted sites, such as those designed for social networking or video and picture exchange, one might consider the JIC media-monitoring activities to have been too narrowly focused.”

Given the efforts required to enable access to traditionally restricted sites, such as those designed for social networking or video and picture exchange, one might consider the JIC media-monitoring activities to have been too narrowly focused. The city plans for the external affairs function during the DNC detailed the PIO tasks for information retrieval and dissemination with little instruction on how to utilize new social media beyond the most basic activities, such as scanning for event-related information on the more widely read official news sites. Providing access to these new resources does not necessarily mean that those responsible for public safety will monitor or use it as part of their daily operations.

Many questions remain, however, about how PIOs could have routinely engaged in Twitter monitoring, Facebook browsing, or citizen blog reading during their downtime in the JIC. For instance, how might PIOs have sorted through the overwhelming amount of information available to them on the Internet? How would they have determined what was useful in the midst of chatter and “static?” Once potentially valuable information was recognized, how would they have verified its accuracy and where would the information have been channeled within the coordinated efforts of the emergency Operations Center? And in the end, would members of the public who engaged in discussions on Facebook groups, posted videos, or produced Twitter streams argue that government monitoring was an invasion of their privacy? These are questions

¹ These projects are ongoing. Full reports will be made available at the conclusion of the research.

² FEMA external affairs officers conducted their own media monitoring and provided twice daily updates to the JIC. The sources and content of these updates are not known at the time of this writing.

yet to be answered as government officials ponder the use of social media for disaster response and recovery.

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More than 10,000 military personnel were stationed in Austin in 1918. About half contracted the Spanish Flu. At least 27 died.

Lessons of History

Austin and the Spanish Influenza of 1918

ON OCTOBER 2, 1918, AN ARTICLE in the Austin, Texas, *Statesman*, one of the city's two daily newspapers, appeared with the headline, "Spanish Influenza Discussed in Intelligent Manner by Leading Austin Physician." Curiously, the article didn't anywhere mention this "leading physician" by name.

The unnamed doctor assured readers the "present widespread, and you might say pandemic disease called Spanish influenza, is the same old disease commonly known to everyone as *la grippe* ... or influenza." The medical community has been aware of the disease since 1655, he said, and "repeated outbreaks have occurred throughout the world." The disease is only "moderately contagious." The best way to prevent it was to "avoid drafts or taking cold and crowded assemblies." The article added:

"There is absolutely nothing new or different in the present epidemic than what we have had in Austin every year for the past twenty or twenty-five years and there is no just cause for alarm."

It was perhaps fortunate for this "leading Austin physician" that he wasn't named. Almost everything he said would be proven wrong over the next

30 days. But it's likely there was no Austin physician at all. The article was probably distributed by the Committee on Public Information. The CPI—or Creel Committee—was an independent agency created by Executive Order 2594, charged with keeping up American morale during the First World War.

On Saturday, October 5, Texas State Health Officer Dr. W.B. Collins, and Assistant State Health Officer Dr. Oscar Davis, returned from meetings in Washington, D.C., reporting, "Federal health authorities are exerting every effort possible to completely stamp out Spanish influenza."

Austin on the Brink

IN 1918, AUSTIN HAD A POPULATION of about 34,000 people spread over 16 square miles. It was then as now a major center of learning, home to the largest university in the South, the 2,500-student University of Texas. Other schools in the area included St. Edwards College, Austin Presbyterian Theological Seminary, the State Deaf and Dumb Institute, the State Blind Institute, Tillotson College and

Sam Huston College for Colored Children (Huston-Tillotson University today).

There were also several military facilities in or near

The Statesman, October 2, 1918

**Spanish Influenza Discussed
In Intelligent Manner by
Leading Austin Physician**

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Austin, including Camp Mabry, the largest of them. The Students Army Training Corps, the School of Military Aeronautics, and the Air Service School for Radio Operators were all near town or associated with the university. The School of Automobile Mechanics was located at Camp Mabry, which was then well outside the city limits.

Officials at Austin's military installations reported that they "do not look for any serious results from the epidemic."

The Spanish influenza was disinclined to heed these optimistic scenarios. The disease—first observed at Fort Riley, Kansas, in March of 1918—rapidly became a global epidemic. Infection rates were as high as 50 percent of the populations exposed. Estimates vary still, but it probably killed between 40 million and 50 million people worldwide.

With the modern threat of a global influenza pandemic threat possibly arising from the H5N1 strain of bird flu (*Natural Hazards Observer*, September 2008), the Austin Office of Emergency Management is developing a pandemic response plan for modern-day Austin, now with a metropolitan population of 1.6 million and a single university larger than the entire city 90 years ago.

As we worked on our plan, we thought an understanding of the historical impact of the Spanish flu pandemic on our community would help our effort. We had plenty of information about the 1918 influenza in other cities—in the Northeast, for instance—but we wanted to know what happened in Austin, about the way our community responded.

An unintended, yet happy, consequence of our historical research was a renewed interest in planning for a pandemic event. That is, we defeated some of the "pandemic planning fatigue" we were beginning to experience as we

considered real-life impacts on the local level using names, places, and landmarks everyone knew well.

Austin Takes Action

AUSTIN IN 1918 WAS HOME TO A NUMBER of institutions conducive to the spread of influenza with people congregating at close quarters. One of these was Camp Mabry. On September 27, 1918, the first case of influenza appeared there. By October 4, only a week later, 900 cases were reported at the camp. Twenty-five cases were also reported at the Students Army Training Corps on October 4. By October 8, the Deaf and Dumb Institute reported 79 cases of influenza.

By Monday, October 7, civilian authorities began to respond to the growing emergency, most likely spurred by actions taken elsewhere in the United States, and as a result of the growing number of cases in the military facilities. The first institution to move was the University of Texas. The faculty executive committee issued an order suspending classes for three days. While the suspension was originally intended to be lifted on Friday, October 11, "a second statement announced that school would be dismissed until further notice."

The order also encouraged students at the university "to remain quietly in their homes and boarding houses, and to abandon all social gatherings and assemblies of all other sorts during this period." But "a large number of young men and women left Austin for their homes on the night trains." This may have resulted in the further spread of influenza.

After the university issued its order, a group of Austin physicians and the superintendent of schools met with Mayor Alexander Penn Wooldridge in his home on Monday evening. As a result of that meeting, another one was



scheduled for the next morning in the mayor's office "to determine whether we shall order the closing of schools, churches, moving picture shows and all other places of public assembly pending the epidemic." The second meeting also included UT President R.E. Vinson, schools superintendent A.N. McCallum, and Camp Mabry commander Maj. Walter Channing.

Wooldridge told the group the city did not "like to undertake the necessary steps to prevent the spread of influenza which necessarily would be drastic, without informing all." Based on the "general assent to such drastic action," Mayor Wooldridge called a meeting of the city council for later in the afternoon to consider an ordinance banning all public gatherings in Austin.

At the special meeting on Tuesday afternoon, October 8, an ordinance closing all public places was unanimously adopted by Mayor Wooldridge and Councilmen W.B. Anthony, Eugene C. Bartholomew, Harry L. Haynes, and Pinkney W. Powell. The ordinance said that the "preservation of the public health of Austin, Texas" was "seriously threatened by the presence here and the rapid spread of Spanish influenza and pneumonia." The ordinance also provided for the imposition of "a fine of not less than \$25 nor more than \$200" for violations.

Confusing Reports and Mixed Messages

ON THE SAME DAY THAT AUSTIN ADOPTED its ordinance banning all public gatherings and declaring that the city was "seriously threatened," one of the city's newspapers reported, "the situation is not serious." Conflicting newspaper reports and limited information lead to some public skepticism regarding the impact of this disease and the public authority's efforts to combat it. On Saturday, October 5, the *Statesman* reported a "big improvement" and that the "outlook is very encouraging" at Camp Mabry.

Far from improving, the first deaths from the influenza occurred at Camp Mabry the morning of Monday, October 7, only two days after the *Statesman* called the situation "encouraging."

Following the adoption of the ordinance banning public gatherings, the local newspapers published a "reassuring statement" by local physicians intended to educate the public about the nature of the disease, methods of preventing its spread, and explaining the need for a ban of public gatherings.

The statement read, in part:

1. The influenza situation is progressing satisfactorily. There have been about eight deaths from pneumonia in Austin, four of whom were soldiers. (It is not known if the eight people who died were satisfied with the progress of the disease or not.)

2. While the situation is reassuring, the character of the disease is such that it spreads rapidly, especially through crowding. (Again, it's not known what is so reassuring about a disease that spreads rapidly.)

3. Every possible effort is being made to check the course of the epidemic and to prevent further infection.

4. As a precautionary measure we have advised the city council of Austin to close all public meeting places...to give the physicians of Austin time in which to combat the disease and prevent further spread.

By Tuesday, October 8, city physician Dr. O.H. Radkey estimated there were 1,000 cases of influenza in the civilian population. He also said the disease was "rapidly on the increase." With the military camps and the university included, the number of cases of Spanish influenza in Austin was about 2,175.

One key resource desperately needed to respond to the Spanish influenza cases in Austin was nurses. The American Red Cross of Austin appointed Mrs. J.A. Jackson as chairman of volunteer nurses. In that capacity, Mrs. Jackson organized 50 "prominent and capable women of Austin" as volunteers. Many of these same women were active in the wartime fundraising efforts. In addition to actually caring for the ill, many of the women also responded to requests for supplies of all types. Volunteers were busy "running full tilt" sewing pajamas and surgical dressings.

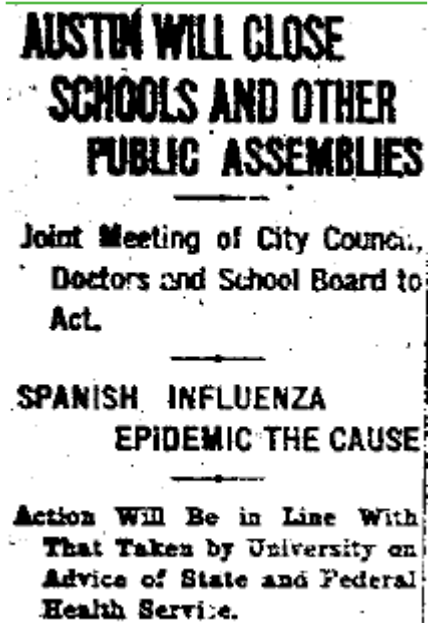
Medical facilities in 1918 Austin included the Seton Infirmary, a hospital with over 100 beds, managed by the Daughters of Charity. The Seton Infirmary cared primarily for military patients during the epidemic. At one point, Seton had so many patients that a "tented hospital" named Camp O'Reilly was located on the "well-kept Seton lawn."

The care and treatment of the ill, especially patients from the various military camps, wasn't limited to established hospital or other medical facilities. In the spirit of community care "several of Austin's loveliest homes" were "offered as convalescent homes to the military authorities."

Austin Adapts

SHORTLY AFTER THE CITY COUNCIL IMPOSED the ban on public gatherings, many Austin businesses and organizations began to adjust their operations. The Austin Street Railway Company limited ridership to the seating capacity of cars. The company also experienced high absenteeism from the flu, with 19 employees off duty from illness.

The Achilles-Alford grocery store reported that one of the owners and six clerks were "taken with the grippe." The merchant asked his customers to "co-operate with him until the store is able to take care of their wants as usual,



Austin American, October 8, 1918

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by coming to the store and carrying home the goods they buy."

On October 10 a short article in the *Statesman* reported that "a noticeable decrease in travel" attributed to the influenza had been noted by railroad officials. On October 12, hotels were nearly empty: "People stopping at hotels are very few in number, showing plainly that only those are leaving home who have pressing business that can not be well postponed."

The *Austin American* reported troubles of its own, with "men sick in every section." Every route carrier they had was ill. Twenty-nine percent of Austin's 28-man police force was out sick, including the chief.

On October 10, city physician Radkey delivered a report to the city council that was "especially interesting." Radkey said that during September, 1918, there had been no deaths in Austin from influenza or pneumonia. But by October 10, he had counted 6,000 cases of influenza in the city and local military camps, and there had been 11 deaths since the first of October attributable to the Spanish flu. In the next 24 hours there would be three more deaths at Camp Mabry and one more civilian death. By October 14, a total of 27 deaths were reported in military camps. This particular report was issued to "allay the rumors that have been circulating that more deaths have occurred than have been reported."

The October 12, 1918, *American* reported that "the influenza had made such inroads on the working forces" of some state offices "it will require a day's extra work to catch up." By October 22, the State Comptroller of Public Accounts announced half of the workforce in his office was "afflicted with influenza" and it was "impossible to dispatch the state's business with any degree of rapidity." Comptroller H.B. Terrell reported his office had received "hundreds of letters and telegrams" from state employees requesting their pay warrants be issued.

The Situation Is Reviewed

By THURSDAY, OCTOBER 17, 1918, THE CITY BAN ON public gatherings had been in place for over a week. The city council met to review the situation and to decide when the ban could be lifted.

Major F.A. Johnson of the School of Military Aeronautics said a "large percentage" of his 6,000 cadets were down with the flu. Fifty percent of the 1,700 students in the School of Radio Operators had contracted the disease. Fifteen hundred of the 3,000 students in the School of Auto Mechanics had it. Seventy-one percent of the students at the Deaf and Dumb Institute were sick. There were a reported 300 cases among the students still at UT.

Most of those addressing the council recommended that the ban on public gatherings remain in place. In fact, Bishop W.N. Ainsworth suggested closing all businesses, except for drug stores, in the evening hours, prohibiting

crowds from congregating on the streets, and that "handshaking, especially of the promiscuous kind, be stopped."

The Community Responds

THE BAN ON PUBLIC GATHERINGS REMAINED IN PLACE. The city's attention then focused on caring for the ill. While those stationed at the various military camps in Austin had access to medical care, nurses, and hospitals, the broader civilian population did not enjoy those same benefits.

On Sunday, October 20, another call was issued for

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nurses to care for the sick in Austin. This request for nurses was specifically aimed at helping the civilian population.

Especially in need of help was Austin's African American population.

“Dr. W.A. Crawford, colored physician of Austin, stated Saturday night that

practically every family among the colored people was suffering with influenza,” the *American* reported.

Since Dr. Crawford had no trained nurses to assist him he had to be “nurse, cook, delivery man, and in some cases, housecleaner.” Among the African American population of the city there had been five deaths on Wednesday the 16th, six deaths on Thursday and seven on Saturday, Crawford reported.

On Thursday, October 24, the city council was addressed by a committee comprised of physicians and Red Cross volunteers who “appealed for relief for the sick destitute of the city.” The city pledged to supply nurses, medicine, and physicians for the care of the needy. To carry out this relief effort, the city was divided into seven districts with Red Cross volunteer nurses assigned as chairman of each district. Anyone needing a nurse, broth, food, fuel or medicine was encouraged to call the city physician, Dr. Radkey, who would turn the request over to the appropriate district chairman.

Austin Convalesces

ON SATURDAY, OCTOBER 26, THE MAYOR and a number of local physicians met informally to discuss “the influenza and pneumonia situation as it applies to Austin...from all angles.” Published reports emphasized the decision to raise the embargo would not be made by the mayor but would be made based “on the advice he is given from the physicians who are officially in charge of handling the present epidemic.”

At this meeting those physicians reported that “unless there is a further outbreak of the epidemic it would be safe to open the schools and the picture shows” on November 3. While influenza was “on the wane in Austin,” Dr. Smartt said the epidemic was either increasing or at a standstill in the county, depending on the locality

On October 31, the city council lifted the ban on public gatherings, effective November 3 at 6 a.m. so that “all could go to church.” Austinites ventured out to services in “large crowds” that morning. The *American* reported, “The reopening after the epidemic was tinged with a shade of sadness as there were a number of vacant pews where members had been accustomed to sit for years and in still

more, the family groups were broken by the absence of one or more, who had fallen victims to the influenza.”

In November, Austin began the process of determining just what the effect of the influenza had been. Among the “Whites and Mexicans” it was reported that there had been 143 deaths in October and another 24 deaths were reported between November 1 and November 5. A total of 110 deaths among African Americans in Austin and Travis County were reported.

While no official documents have been found, estimates from newspaper articles put Austin and Travis County mortality total from the 1918 Spanish Influenza at approximately 277. This is a significant increase from the total of 47 deaths reported for the month of September.

The relevance to Today

IN RESEARCHING THE IMPACT OF THE 1918 FLU in Austin, we learned some unexpected lessons that we could apply to our own planning

At one time or another, our planning efforts all face the “it-can’t-happen-here” syndrome, usually in conjunction with the “if-it-didn’t-happen-here-it-didn’t-happen-at-all” disease. Even with an epidemic as severe as the 1918 Spanish flu, these responses are only heightened because it happened a long time ago. But researching the 1918 history brought home the fact that it can happen here. It did happen here. By discussing the event in terms of our own community, we could transcend the years. Our planning took on a new immediacy.

The revitalized planning partners were suddenly discussing locations, institutions, and organizations that are relevant to them 90 years later. Planning efforts weren’t discussed in terms of what occurred in Philadelphia, Boston or New York, but things that actually happened in Austin. We discussed what happened at the University of Texas, the Capitol, and Seton Hospital. This event that had originally seemed so unimaginable was now something real that had severely impacted our city.

Any modern emergency planner would have to give the Austin city fathers, and the citizens of Austin, some fairly high marks for their response to the 1918 Spanish influenza. There are some differences in how the city would respond today, especially the amount of prior planning that goes into a response to a catastrophic disease epidemic.

Today the City of Austin commits a significant amount of resources to just this type of planning. It includes not just the city’s response but also a public health component, a community care component, and an ongoing employee and public education component.

But there are several specific instances where the 1918 Austin response to the 1918 could be considered progressive for its day and would still be followed, albeit with some adjustments. First, the implementation of social distancing measures would be enacted sooner. In 1918 containment measures were enacted well after the disease had emerged. Today, plans call for implementation of initial containment measures upon the first reported sustained human-to-human transmission anywhere around the globe.

Second, disease surveillance would begin immediately. In 1918, surveillance wasn’t implemented by the state until October 22, weeks after the disease had begun to ravage Austin and the state.

Third, Austin in 1918 made effective use of donated facilities in order to increase its hospital capabilities. Today we continue to work with area hospitals to continually improve and increase our surge capabilities.

Next, Austin in 1918 was carefully districted in order to provide home health care to those most in need. Today Austin continually revises its plans to assist its most vulnerable populations.

Finally, plans today call for a detailed recording of the event for future evaluation. In Austin, there was limited primary source documentation for conducting research on the earlier epidemic. Even the state in 1918 was unable to “give [an] opinion on status here in Austin” because of poor record keeping and reporting processes.

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Office of Homeland Security and Emergency
Management
Austin, Texas

References

There are remarkably few official records of the Spanish flu epidemic in Austin. This article was written using primarily information from the local newspapers of the day, the *American* and the *Statesman*. All the quoted material is taken from stories in one or the other of those papers.

504 CONGRESS AVENUE

SNAMAN'S

WOMEN'S APPAREL AND MILLINERY

\$50,000 STOCK OF Women's Apparel and Millinery

Goes on Sale at Greatly Reduced Prices

On account of the prevalent epidemic business has been practically at a standstill for the past month. October is usually the month in which most women purchase their Winter Apparel and Millinery, but owing to the existing conditions many have not done this and consequently we find our stock much too heavy for this time of the year. The purpose of this sale is to reduce it to its usual size in normal times, and in order to accomplish this as quickly as possible we have made many price concessions.

Austin American, November 3, 1918

Contracts and Grants

Below are descriptions of recently awarded contracts and grants related to hazards and disasters. An inventory of awards from 1995 to the present is available at www.colorado.edu/hazards/resources/grants/

Florida Center of Excellence: Center of Excellence for Hurricane Mitigation and Product Development. Funding Organization: State of Florida. \$10,006,995. Four years. Principal Investigator: Dr. Stephen P. Leatherman, Florida International University, (305) 348-8364. leatherma@fiu.edu

The State of Florida has sustained hurricane losses in recent years totaling over \$60 billion. Hurricane Wilma alone, barely a Category 2 hurricane in 2005, resulted in \$16 billion in damages in South Florida. These losses have resulted in unprecedented insurance payouts, causing companies to leave the state, or greatly increasing insurance rates. The answer to Florida's hurricane crisis is to strengthen homes through retrofitting and improve new construction. This requires a better understanding of hurricane-induced wind-rain effects on structures through full-scale destructive building testing.

Presently, the nation lacks the necessary testing and product development capability. The Center of Excellence for Hurricane Damage Mitigation and Product Development (HDMPD) will become the leader in educating, researching, and commercializing hurricane mitigation technologies essential to the economic health of the Florida and the nation.

The HDMPD will enable development of full-scale structural testing to determine inherent weaknesses of structures when subjected to Categories 1 to 5 hurricane-force winds and rain. This first-of-its-kind testing facility will revolutionize building construction and retrofitting practices, leading to new technologies, designs, and products. While existing wind tunnel testing of scaled house models has provided useful information, the wind engineering research team at the International Hurricane Research Center (IHRC) has already conducted full-scale testing with the Wall of Wind (WoW) hurricane simulator.

The portable, first-generation, two-fan WoW produces 120 mph (Category 3) winds and includes a water-injection system to simulate horizontally flowing rainfall under hurricane conditions. The second-generation Renaissance six-fan WoW produces 130 mph winds and includes water-injection and debris-propulsion systems. Both systems will be housed in an 8,000-square foot laboratory. However, the Center of Excellence funding will permit complete development of a full-scale, national research facility, including an electric 10-fan system, providing key infrastructure to advance and expedite technology development, transfer, and much-needed commercial products and industry.

IHRC also is developing a computer model that can predict the benefit of structural mitigation measures and retrofits to reduce hurricane damage.

Communicating Forecast Information to Optimize Evacuation Behavior. Funding Organization: National Science Foundation. \$391,145. One year. Principal Investigator: Pallab Mozumder, Florida International University. mozumder@fiu.edu.

This project will model the difference between an optimal evacuation and what's observed in practice. A

wide variety of factors affect evacuation behavior—forecast uncertainty, forecast transmission method, risk perception, available transportation, and an acceptable destination, among others. Modeling these factors to predict how people will react is complex. The investigators attempt to answer some basic questions in a unified research framework such as (1) what is the link between objective hurricane forecast information and subjective risk perception, (2) how subjective risk perception and its interactions with other relevant factors affect evacuation behavior, and (3) how observed (and intended) evacuation behavior deviates from optimal evacuation behavior.

Built on interdisciplinary knowledge from sociology, economics, meteorology, and media research on hurricane risk communication, the investigators propose to combine both descriptive (the way people actually behave) and prescriptive (the way people should behave) approaches.

Assessing and Managing Cascading Failure Vulnerabilities of Complex, Interdependent, Interactive, Adaptive Human-Based Infrastructure Systems. Funding Organization: National Science Foundation. \$1,939,748. Three years. Principal Investigator: Robert Bea, University of California-Berkeley. bea@ce.berkeley.edu

This award is an outcome of the competition as part of the Emerging Frontiers in Research and Innovation (NSF 07-579) solicitation under the subtopic Resilient and Sustainable Infrastructures (RESIN). The research project is a collaborative interdisciplinary study to create, validate, and apply new risk assessment and management methods to assess and improve the design, operation, and maintenance of interdependent complex infrastructure systems (ICIS).

The recent failures of ICIS for the Greater New Orleans area due to Hurricane Katrina demonstrate unequivocally that human, organizational, social, cultural, and political considerations are major factors in assuring the reliability and performance of ICIS. To understand and improve the behavior of ICIS, it is necessary to integrate the physical/environmental sciences (technology) with the social sciences (human and organizational factors). The research team will study the California Sacramento-San Joaquin Delta flood protection, water distribution, and power supply systems. These systems are embedded in a complex and sensitive ecosystem.

Like ICIS in other parts of the United States, their effectiveness and performance have eroded over time due to age, deferred maintenance, increasing societal demands, and natural hazards. The ultimate goal of this research is to learn how to improve the resiliency and sustainability of ICIS, while maintaining other vital performance characteristics such as serviceability, safety, durability, and compatibility.

The research builds on more than two decades of collaborative interdisciplinary research during which more than 600 major accidents and disasters involving ICIS were studied. Past research resulted in the formulation and testing of engineering RAM methods for ICIS. This research

addresses two vital components in the development of next generation RAM methods: (1) the probability of failure, P[F], of ICIS, and (2) the consequences of failures, C[F]. In turn, P[F] incorporates two different types of uncertainties: (1) intrinsic (natural and analytical), P[I], and (2) extrinsic (human and organizational), P[E]. The goals of the research are to achieve more realistic assessments of P[F] and C[F], to identify new means for mitigating and controlling P[F] and C[F], and to improve how risk information is delivered to policy and decision makers.

Cone-Forming Explosive Eruptions of Basalt Magma: Etna, Kilauea, Stromboli. Funding Organization: National Science Foundation. \$97,785. Continuing grant. Principal Investigator: Bruce Houghton, University of Hawaii. bhought@soest.hawaii.edu

Kilauea on Hawaii's Big Island has produced eruptions with high-fountaining (>400m) activity in 1959, 1960, 1969(-1974) and 1983-1986(-2007), as well as other summit (1971, 1974, 1982) and flank eruptions characterized by low-fountaining activity. This study considers the eruption dynamics and products of the best-documented examples of these eruptive episodes. The immediate goal is to develop integrated models for the full range of styles and intensities of Hawaiian explosive volcanism, making it possible to compare activity there with other well-documented Strombolian and basaltic subplinian eruptions and to create a new self-consistent classification for their pyroclastic products

The research will expand understanding of how basaltic systems erupt in Hawaiian and Strombolian fashion, enhancing classifications of these types of explosive events by using the best documented recent examples from the volcano.

Kilauea is the site of large and growing volcano-tourism operations. There is a public need both for better knowledge of the volcano's behavior and improved forecasting of the likely course of future eruptions. Results will be widely disseminated via the Internet using linked Web sites hosted by Hawaiian Volcano Observatory and University of Hawaii.

Turning the Civil and Mechanical Infrastructures into a "Smart" Structures and Systems Through the Adoption of Bio-inspired Sensing and Actuation Technologies. Funding Organization: National Science Foundation. \$15,000. One year. Principal Investigator: Ming-Liang Wang, Northeastern University. mi.wang@neu.edu.

The award will fund a workshop to develop a road map for planning a comprehensive, bilateral, U.S.-Taiwan team- and center-based research and implementation plan for realizing significant advances in civil and mechanical infrastructure based on "smart structures and systems through the adaptation of bio-inspired sensing and actuation technologies." Taiwan is situated in a highly seismic region with devastating earthquakes occurring almost every decade. It is also on the primary path of Northwestern Pacific tropical cyclones that occur almost yearly.

In this workshop, we proposed significant improvements in multiple natural hazard mitigation approaches are possible and can be achieved through adopting transformative technologies such as bio-inspired sensing and actuation concepts.

The Interactions of Climate Change, Land Management Policies, and Forest Succession on Fire Hazard and Ecosystem Trajectories in the Wildland-Urban Interface. Funding Organization: National Science Foundation. Two grants. \$306,848. Four years. Principal investigators: John Bolte, Oregon State University, and Bart Johnson, University of Oregon. boltej@engr.orst.edu and bartj@uoregon.edu.

This project will identify ways to reduce wildfire hazard and the loss of imperiled ecosystems by exploring the joint effects of climate and land use changes in western Oregon's Willamette Valley eco-region. Three hypotheses will be tested: climate change will increase fuel loads and wildfire hazard; land development will increase the area of wildland-urban interface and alter vegetation in ways that increase the risk of wildfire and loss of imperiled ecosystems; and some management options will be more robust than others in mitigating fire risk and sustaining imperiled ecosystems across a range of future climate scenarios.

The work will employ a biophysical model of fine spatial scales at which human land use and management decisions are made, then scaling back up to represent the landscape-scale effects of human actions on vegetation and fire hazard. The biophysical model will be coupled with an agent-based model in which decision makers on individual land parcels respond to climate, land use regulation and incentives, land markets, perceived fire hazard, land management costs, and aesthetics. This research will advance knowledge of how to bridge key theoretical and practical issues related to multiple types of system uncertainties, different spatial and temporal scales, and complex interactions and feedback among coupled natural and human systems.

This research will produce a transferable methodology for modeling such systems that is tractable, spatially explicit, and directly linked to policy-based decision-making.

Evaluation of Seismic Levee Deformation Potential by Destructive Cyclic Field Testing. Funding Organization: National Science Foundation. \$375,000. Three years. Principal investigator: Scott Brandenburg, UCLA. sjbrandenberg@ucla.edu

The Sacramento-San Joaquin Delta levees are critical components of California's water distribution system. The Delta supplies fresh water to 22 million people in southern and central California as well as eastern portions of the San Francisco Bay area and directly supports \$400 billion of economic activity in California yearly. The "islands" circumscribed by the network of levees are commonly three to five meters below sea level and are protected by only about one meter to 1.5 meters of freeboard at high tide. A breach in a levee causes water from the channel to flow into the island, thereby inundating farmland and wildlife habitat and drawing saline water from San Francisco Bay into the Delta.

This award will support full-scale testing of an existing earth embankment to investigate the *in situ* deformation potential of peaty organic foundation soils under realistic stresses and boundary conditions. The test conditions and instrumentation will be designed to measure the deformation mechanisms that can result in a critical loss of freeboard leading to a breach. Data of this sort is essential for the development of more rational analysis tools for assessing the seismic vulnerability of levees. Field testing will be supplemented by an extensive laboratory testing program

to further investigate key material response characteristics such as soil strength loss and volume reduction caused by shaking. The improved knowledge of levee seismic vulnerability will be broadly applicable wherever these earth structures are founded on organic soils.

The most important societal impact of this research will be improvement of seismic risk assessment in the Delta, which in turn will result in better-informed retrofit and construction decisions and a water delivery system more likely to maintain functionality during and following earthquake shaking.

This award will also support development of education modules that leverage Network for Earthquake Engineering Simulation resources to contribute to the broader NEES goals for education, outreach and training. Included with the modules will be a study guide containing suggestions regarding implementation of the modules at different levels (i.e., undergraduates and K-12).

Mitigating the Risk of Coastal Infrastructure Through Understanding Tsunami-Structure Interaction and Modeling. Funding Organization: National Science Foundation. \$374,996. Three years. Principal Investigator: Daniel Cox, Oregon State University. dan.cox@oregonstate.edu.

The current tsunami evacuation strategy in the United States puts large populations at high risk because it requires everyone to evacuate the flooded areas and does not consider the possibility of using tall buildings for shelter. Part of the unwillingness to adopt vertical evacuation strategies stems from an inability to estimate the damage level in the flooded area for a range of building types, including reinforced concrete (e.g., modern hotel), unreinforced concrete masonry units (e.g., older motel, light commercial) and light-frame wood (mostly residential and some light commercial) structures. The goal of this project is to model building damage by studying water flow and debris hazard of collapsed buildings in the flooded areas. This will help create an understanding of the expected damage to cities and towns and to design buildings to withstand these forces.

As a first step of this new approach, we will focus on residential (light-frame wood) buildings, which make up 90 percent of the building stock in the United States and are where people spend approximately half of their day.

The goals of this NEESR-II project are to (1) develop a methodology to assess the risk of residential structures to tsunami inundation and wave forces through a systematic experimental study coupled with a numerical probability of failure analysis; (2) enable the development of innovative retrofit products by developing a structural testing protocol that is representative of hydraulic impact/forces during a tsunami; and (3) refine the current hydraulic force equation in ASCE 7 based on a series of wave basin tests to account for building density and other variables.

To accomplish the project objectives, several large-scale tests will be conducted over three years at the NEES Tsunami Facility at Oregon State University using both the Large Wave Flume and Tsunami Wave Basin Facilities. The tests will mark the first time that large-scale tsunami tests will be conducted for U.S. residential structures.

This project develops a collaboration with the Port and Airport Research Institute (PARI), Japan's premier research center for coastal infrastructure. Currently, the Tsunami

and Storm Surge division of PARI is developing a series of nested numerical models that can model tsunami propagation and inundation over a wide range of spatial scales, including tsunami forces on buildings.

This project will have an important educational aspect by training two graduate students, one at Oregon State and the other at Colorado State, and one undergraduate research student per year from Texas A&M University-Kingsville, a minority serving institution. This research will permeate to basic undergraduate and graduate engineering courses at OSU, CSU, and TAMU-Kingsville to increase awareness of the engineer's role and responsibility in the design of houses and buildings exposed to the forces of nature.

Outreach aspects focus on a hands-on design project related to tsunami-structure interaction for first-year engineering students at universities outside the NEES@OSU site. In addition to this activity, the project as a whole will reach the general public through collaborations with museums of science and industry in Portland, Oregon, and the other in Chicago, Illinois. The project team will help the Chicago museum develop tsunami content for Science Storms, a high-visibility marquee exhibit at the museum, which welcomes over 1.5 million visitors, students, parents and teachers each year. Data from this project will be made available through the NEES data repository at www.nees.org.

IBORC—Interaction Between Building and Occupant Responses During Collapse. Funding Organization: National Science Foundation. Two grants: \$345,000 and \$405,000. Three years. Principal investigators: Benigno Aguirre, University of Delaware, and Sherif El-Tawil, University of Michigan. aguirre@UDEL.edu and eltawil@umich.edu.

The objective of this project is to conduct a multidisciplinary investigation—at the intersection of structural engineering, social science, and computer science—of how building occupants respond to signals issued by a building during and immediately after an event that threatens its integrity. Other secondary objectives are to investigate: (1) how the response of victims is modulated by their social conditions at the time of the incident; and (2) the influence of a building's structural system on building collapse response and occupant survival rates.

Computational simulation models will be developed to represent building collapse and agent-based models will be used to model human response within the building models. Existing information will be sought to formulate basic rules governing human response during times of extreme danger. The developed models will be calibrated and validated by comparisons to well-documented events that involved building collapse. The developed models will then be used to clarify how building occupants respond during emergencies through extensive parametric simulations. The models will also be used to investigate how buildings collapse and to identify means to mitigate building failure and its effects.

The project, furthermore, will contribute to hazards research by developing knowledge that could form the basis of public education and awareness programs to help building occupants, their rescuers, and city officials respond appropriately during extreme events.

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. Direct Web links are provided for items that are available free online. Other materials can be purchased through the publisher and/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 Change

Extreme Weather, Rapid Warming, and Public Water Systems

ADAPTING TO EXTREME WEATHER will be one of the biggest challenges humans face as the climate warms. Although, most climate models predict increased intensity in these events, a study by the University of Miami and the University of Reading in the United Kingdom shows observational evidence confirming a link between warmer climate and more powerful rainstorms.

Richard Allan of Reading and Brian Soden of Miami looked at how tropical precipitation varied with temperature using satellite observations and model simulations. Their findings have been published in *ScienceXpress*, the pre-print version of *Science* online. Observations revealed “a distinct link between rainfall extremes and temperature, with heavy rain events increasing during warm periods and decreasing during cold periods.” Amplification of rainfall extremes was also found to be larger than predicted by models, implying projections of future rainfall extremes contributable to human-caused global warming could be underestimated, according to the research.

Another study in the July 2008 issue of *Geophysical Research Letters* by University of Miami’s David Nolan and Eric Rappin found that under conditions of global warming there might be fewer, stronger Atlantic hurricanes. The scientists, both of UM’s Rosenstiel School of Marine and Atmospheric Science, found as water temperature increased, so did wind shear—the lateral crosscutting of hurricanes that, if strong enough, causes them to “topple over.”

“We designed the computer simulations to show that as the ocean temperature increased, hurricanes would form more rapidly and easily, even in the presence of wind shear,” says Nolan. “Instead we got exactly the opposite result. As water temperature increased, the effectiveness of the wind shear in suppressing hurricane formation actually became greater.”

Heat from ocean water is the “engine” of hurricanes, so while fewer Atlantic storms may form, the researchers say those that do could be more powerful.

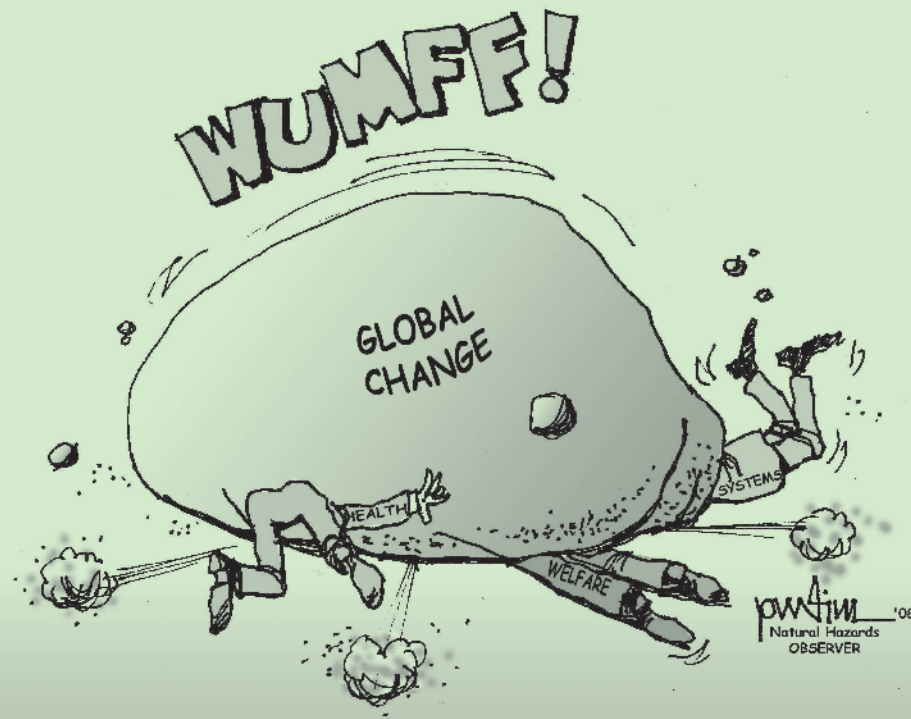
THE ISSUE OF HURRICANE DAMAGE and frequency from global warming has been a controversial issue. The University of Miami study is unlikely to be the last word on the subject. The matter could be resolved soon, though, according to research in the August 1, 2008, *Science* that found “rapid climate change” may occur in as little as one to three years.

The authors, lead by Jorgen Peder Steffensen of Denmark’s University of Copenhagen, studied Greenland ice cores containing records back about 120,000 years ago.

Looking at three climatic shifts—the Bolling-Allerod warm period (around 14,600 years ago) and the onset and termination (about 12,850 and 11,700 years ago, respectively) of the Younger Dryas cold period—they found that a deuterium excess (a proxy for moisture) switched modes within one to three years.

“The data reported by Steffensen, *et al.*, underscore the fact that atmospheric circulation may shift from one state to another with just one year,” wrote Swiss scientist Jacqueline Fluckiger in a perspective for the magazine. “With ongoing global warming, the climate system might therefore hold some surprises.”

THE U.S. CLIMATE CHANGE SCIENCE Program and the Subcommittee on Global Change Research released its final report, *Analyses of the Ef-*



(Continued on page eighteen)

fects of Global Change on Human Health and Welfare and Human Systems (www.climatescience.gov/Library/sap/sap4-6/default.php), which says:

“The United States is a highly developed country with a wide range of climates. While there may be fewer cases of illness and death associated with climate change in the United States than in the developing world, we nevertheless anticipate increased costs to human health and well-being. Greater wealth and a more developed public health system and infrastructure (e.g., water treatment plants, sewers, and drinking water systems; roads, rails and bridges; flood control structures) will continue to enhance our capacity to respond to climate change. Similarly, governments’ capacities for disaster planning and emergency response are key assets that should allow the United States to adapt to many of the health effects associated with climate change.”

The greatest danger to human health is “during heat waves, on days with higher-than-average temperatures, and in places where summer temperatures vary more” and from the likelihood of increased air pollution, according to the report

And the people most likely to suffer from these hazards are the same ones who are most vulnerable to society’s other ills. The report says:

“Groups particularly vulnerable to heat-related mortality include the elderly, very young, city-dwellers, those with less education, people on medications such as diuretics, the socially isolated, the mentally ill, those lacking access to air conditioning, and outdoor laborers. A sociological analysis of the 1995 Chicago heat wave found that people living in neighborhoods without public gathering places and active street life were at higher risk, highlighting the important role that community and societal characteristics can play in determining vulnerability.”

“The extent to which mortality increases will depend on the effective implementation of a range of adaptation options, including heat wave early warning systems, urban design to reduce heat loads, and enhanced services during heat waves,” the report’s authors wrote.

The report pointed to advantages and disadvantages in climate impact on American human settlements. For instance, higher temperatures in urban areas are related to higher levels of ozone, which cause respiratory and cardiovascular problems. Changes in precipitation can lead to changes in water use, cost, and availability. Energy demands for cooling could increase.

But climate change could also reduce winter weather costs and stress, increase attention to long-term sustainability and make less severely impacted communities more competitive.

The report also examined strategies to adapt to—not mitigate—climate change. In the parlance of climate policy, it’s more than a matter of semantics. Mitigation refers generally to efforts to lessen greenhouse gas output, while adaptation refers to a location’s ability to cope with changes as they occur—what many in the hazards world would call resilience.

These community adaptations include moving people or activities to another location; changing the spatial arrangement of a location; making technological improvements that reduce sensitivity to the changes; making institutional changes; and creating low net cost policy initiatives that add resilience.

THE U.S. ENVIRONMENTAL PROTECTION AGENCY is trying to address climate change threats to the nation’s water systems. EPA has issued the **National Water Program Strategy: Response to Climate Change** (www.epa.gov/water/climatechange). The strategy focuses on 40 actions the national water program can take to respond to climate change.

Among the water supply and quality impacts the EPA foresees are warming air and water, changes in the location and amount of precipitation, increased storm intensity, rising seas, and other changes in ocean characteristics.

Each present a challenge to water supplies, the report says. For instance, warmer temperatures will mean warmer water. In turn, warmer water “holds less dissolved oxygen making instances of low oxygen levels and ‘hypoxia’ more likely and foster[s] harmful algal blooms and change[s] the toxicity of some pollutants.”

More extreme weather events will increase flood risk and high-flow water velocity, which will increase erosion. “These changes will have adverse effects on water quality and aquatic system health,” the report states.

The EPA proposes dealing with these and other water supply issues by developing data to adapt to climate change, planning for extreme water events, increasing watershed sustainability and resilience, developing analytical tools for water managers, and strengthening partnerships.

SEEING THE RAPID PACE at which knowledge of climate change’s human and scientific dimensions develops, it’s an act of courage to attempt to issue a work that is, well, encyclopedic on the topic. But that’s what has been done in the **Encyclopedia of Global Warming and Climate Change** (S. George Philander, general editor. 2008. ISBN: 978-1-4129-5878-3. Three volumes. \$375. Sage Publications, Inc. www.sagepub.com).

“The purpose of this encyclopedia is to help the reader learn about the intricate processes that make ours the only planet known to be inhabitable,” Princeton geosciences professor Philander writes in the introduction.

The encyclopedia provides an accessible background to what is known about climate science, the contributions from and impacts on individual nations, forcings, feedbacks, and all the other fundamentals of the subject. About 180 U.S. and international scholars contributed to the three volumes.

All Hazards

Producing Emergency Plans: A Guide for All-Hazard Emergency Operations Planning for State, Territorial, Local, and Tribal Governments. Federal Emergency Management Agency Interim Version 1.0. July 11, 2008. Free download. www.fema.gov/pdf/about/divisions/mpd/cpg_101_interim.pdf

The FEMA guide is intended to help beginning and experienced planners navigate the stormy waters and rocky slopes of all-hazards planning. The current version incorporates lessons learned from Hurricanes Andrew, Hugo, Rita, and Katrina; the Loma Prieta earthquake; and flooding in the Midwest. This effort provides methods for emergency planners to:

- Develop and train planners;
- Identify resource demands and operation options;
- Link planning, preparedness, and resource and asset management in a virtual environment;
- Prioritize planning efforts;
- Provide concurrent planning through all levels; and
- Quickly produce plans on demand.

Disaster Preparedness in Urban Immigrant Communities. By Ann Bessie Mathew and Kimiko Kelly. A Tomas Rivera Policy Institute and Asian Pacific American Legal Center Report. June 2008. 36 pp. Free download. www.trpi.org or www.apalc.org.

This report, subtitled *Lessons Learned from Recent Catastrophic Events and Their Relevance to Latino and Asian Communities in Southern California*, found language barriers hinder emergency and disaster response, education, awareness, and training efforts and not enough is being done to translate to what the authors have termed “Limited English Proficient” immigrants. The report used qualitative research conducted in areas with large immigrant Latino, Chinese, and Vietnamese populations, a literature review, and case studies to formulate recommendations.

The key findings were:

- Government and nonprofit relief agencies don’t provide culturally sensitive disaster preparedness education in appropriate languages;
- There are no tools to offer immediate translation of emergency information to immigrant populations in Southern California;
- First responders rely on bilingual family members, often children, to provide translations;
- Latino, Chinese, and Vietnamese immigrants turn first to native language radio stations for emergency information; and
- First response agencies don’t consider immigration status in providing services, but they don’t reassure the public that immigration status is not an issue, either.

Fire

Year of the Fires: The Story of the Great Fires of 1910. By Stephen J. Pyne. 2008. ISBN 978-0-87842-544-0. 325 pp. \$16.00 (paper). Mountain Press Publishing Co. (406) 728-1900. www.mountain-press.com.

Fire reigned in 1910, burning more than 3 million acres nationwide and taking many lives, but the events of that year helped form the fire-suppression consensus that has ruled much of the western forest landscape since. Stephen Pyne, a professor of life sciences at Arizona State University

who has written widely and well about the effects of fire, brings his historian’s eye to the events of the year. Among the stories he tells is that of forester Ed Pulaski, who led his men to relative safety in a mining tunnel during a blowup.

As John Maclean notes in his foreword to the book, “The social compact in support of fire suppression broke up toward the end of the twentieth century chiefly because suppressing fire in a fire-dependent ecosystem does not work.” Pyne’s book helps explain this philosophical and practical transition.



Introduction to Fire in California. By David Carle. 2008. ISBN: 978-0-520-25577-7. 216 pp. \$50 (cloth). \$18.95 (paper). University of California Press. www.ucpress.edu

Introduction to Fire in California is a primer not only for Californians, but for anyone interested in wildland fire hazards. What’s actually burning when something burns? How do the physics of fire work? How do forest, grass, and chaparral fires behave differently?

Carle answers these questions and more thoroughly and entertainingly, adding awe-inspiring examples from the latest fire-modeling technologies.

“Computer programs have been developed to estimate fire behavior in different vegetation types under different conditions of fuel moisture, terrain, and wind speed,” he writes. “In Sonoma County, for example, assuming flat terrain with 20-mile-per-hour wind and typical late-summer fuel moisture levels, four-foot flame lengths would be expected at the head of a fire in grassland, six-foot flames in oak savanna, seven-foot flames in coastal scrub, nine-foot flames in dense conifer forests, and 18-foot flames in chaparral. Southern California’s denser chaparral can generate 47-foot flame lengths! Crown fires in forests (or in shrublands during extreme winds) might have 100-foot flame lengths.”

In addition to his technical subjects, Carle addresses how homeowners can reduce the risk of fire in their neighborhoods.

Living With Fire: Fire Ecology and Policy for the Twenty-First Century. By Sara E. Jensen and Guy R. McPherson. 2008. ISBN: 978-0-520-25589-0. 180 pp. \$29.95 (hardcover). University of California Press. www.ucpress.edu.

The importance of fire in the California landscape can be testified to in the flow of books on the topic from the University of California. This volume looks at the intersection of fire policy, science, and management. Although the authors note the general consensus is that decades of fire

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Web Sites of Interest

In Case of Emergency

incaseofemergencyblog.com/

Those with any kind of interest in emergency preparedness won't want to wait to break the glass on this useful aggregation that includes education resources, legislative news, advice from experts, a video series on what the public should know and much more. The blog, subtitled *A Citizen's Eye View of Emergency Preparedness*, began as a way for creator John Solomon to discuss, disperse, and develop research he gathered for his upcoming book, *In Case of Emergency, Read Book: Simple Steps To Prepare You and Your Family For Terrorism, Natural Disasters and Other 21st Century Crises*.

Oikos Risk Management Game

www.e-oikos.net/gmap/oikos.htm

This interactive, online game aims to raise public awareness of disaster risk and preparedness issues. As mayor of Oikos city, players learn about disaster impacts and how simple preventative measures and sustainable development can save lives. The fun begins when players develop a city district facing six hazards, while addressing development, financial, and social issues. Be sure to read the game guide before getting started or you might miss out on the game's more sophisticated elements.

Animal Disaster Preparedness

www.hsus.org/hsus_field/hsus_disaster_center/

When it comes to disaster preparedness, pets don't plan—and neither do many of their owners. That's why the Humane Society of the United States has put together a series of disaster plans, evacuation tips, and information for preparing household pets, horses, and livestock for a disaster. These useful guides let people know what steps to take in emergencies to keep animals safe.

Wireless Foundation VITA Advisories

www.wirelessfoundation.org/VITAAdvisories/index.cfm

VITA advisories can turn an everyday cell phone into a tool that saves lives. VITA—Latin for life—is part of the Wireless Foundation responsible for wireless AMBER Alerts and Text 2HELP. VITA advisories provide information about how to effectively use your cell phone in an emergency. Tips range from knowing your cell phone's many features to knowing how to communicate after disasters. (For more information about the best uses for cell phone technology in a disaster, check out Corey Reynolds' story in the September, 2008 *Observer*.)

National Child Traumatic Stress Network

www.ncstnef.org/nccts/nav.do?pid=hom_main

Disasters are stressful for all involved, but children are especially vulnerable to the psychological trauma of large-scale events. The National Child Traumatic Stress network has aggregated a wealth of information in various languages for helping kids who fall victim to terrorist

threats and natural disasters, including earthquakes, fires, tsunamis, floods, and others. A handy compilation of hurricane resources on the home page makes timely advice easy to access.

Climate Resilient Cities

www.worldbank.org/eap/climatecities

This World Bank Web site is one-stop shopping for anyone on the city level interested in planning for and mitigating the effects of climate change. Targeted toward East Asian cities, the site has tools, resources, and reports applicable to all cities. Among its offerings are an assessment tool to help determine vulnerability and impact potential; resilience profiles of cities ranging from Albuquerque to Rome; a climate-proofing blog; and the text of *Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Climate Change Impacts and Strengthening Disaster Risk Management in East Asian Cities*.

Green Groove: A Phased Withdrawal on Catastrophic Climate Change

www.greengroove.org

Climate resilient cities are all fine and good but change begins at home – this nifty Web site will help individuals and families get their green groove on. Just sign in, choose a time frame and pick a level of commitment from Easy Does It to Green Machine. Green Groove will create a custom plan to reduce your impact on the climate one week at a time and even throw in a widget to track your progress.

Association of American Geographers EDGE

www.aag.org/edge/index.cfm

This site was created as part of a nearly \$1 million effort to give geography students and faculty and EDGE—Enhancing Departments in Graduate Education in Geography. The National Science Foundation-backed project charges the Association of American Geographers with studying graduate geographers' professional development. The site has material for both professors teaching college course and students.

HOWCALM

www.howcalm.org

Faith-based communities and those interested in how faith-based organizations operate in times of crisis will be interested in a burgeoning project by New York Disaster Interfaith Services (NYDIS). HOWCALM—it stands for House of Worship Community-wide Asset and Logistics Management—is a free Web site that allows the faith community to track assets in a disaster, provides a means of communicating during emergencies, and lists local disaster training opportunities. Now available in New York City, NYDIS plans to take the tool outside the city in the future.



Conferences and Training

November 12-13, 2008

Morse-Arctic Coast Initiative User Consultation Workshop

**Canadian Space Agency and the European Space Agency
Newfoundland, Canada**

Cost and Registration: Free

The goal of this workshop is to gain an understanding of Morse initiative user needs regarding mapping, characterization of arctic coastal areas environmental monitoring, sustainable economic development of natural resources, and safety and emergency response.

www.morsearcfic.net/index.php

November 16-19, 2008

Rebuilding Sustainable Communities for Children and Their Families After Disasters

**Center for Rebuilding Sustainable Communities After Disasters
Boston, Massachusetts**

Cost and Registration: \$225 until filled

The conference aims to bring specialists from various disciplines to explore ways to reconstruct sustainable communities that are safe for children and their families following disaster. Experts will make recommendations for increasing safe, sustainable reconstruction.

www.rebuilding.umb.edu/rscfd/index.html

November 16-20, 2008

Fourth National Floodproofing Conference and Exposition

**Association of State Floodplain Managers
New Orleans, Louisiana**

Cost and Registration: \$350

The theme of this year's conference is sustainable, non-structural flood protection for buildings and communities. It will focus on floodproofing techniques, materials, issues, and programs. Measures to remove structures from areas prone to flooding will be discussed.

www.floods.org/Conferences,%20Calendar/nfpc4.asp

November 19-20, 2008

Geomatics Atlantic 2008: Discovering the Way to Sustainable Future

**Canadian Institute of Geomatics New Brunswick Branch
New Brunswick, Canada**

Cost and Registration: \$350 non-members

This conference focuses on sustainable community planning, including a track examining coastal and river flood mapping using LiDAR. Academics, practitioners, vendors, and policy makers are encouraged to attend.

www.geomaticsatlantic.com

November 20, 2008

National Communication Association 94th Annual Convention

**NCA and the National Consortium for the Study of Terrorism & Responses to Terrorism (START)
San Diego, California**

Cost and Registration: \$195

This conference brings communication researchers together with emergency management practitioners to discuss

pre-event communication research and practice. Issues to be addressed include comparisons of communication needs before terrorist threats with those before natural hazards; stakeholders challenges in communicating imminent attacks; and the role of the public in pre-event planning and problem-solving.

www.natcom.org

November 21, 2008

2008 COSMOS Technical Session

Consortium of Organizations for Strong Motion Observation Systems

Oakland, California

Cost and Registration: \$240 non-member

This year's technical session addresses ground motion selection and scaling site analysis and geotechnical evaluations. Presentations will include ground motion time histories and how site-specific response analysis links to structural design in building codes.

www.cosmos-eq.org/

November 21-23, 2008

Australian Earthquake Engineering Conference 2008

**Australian Earthquake Engineering Society
Ballarat, Victoria, Australia**

Cost: Not available

The theme of this conference is open to encourage the participation of all individuals involved in earthquake engineering or engineering seismology. Topics will include engineering- and seismology-related issues and extreme events such as blast, tsunami, critical infrastructure protection, emergency management and insurance.

www.aees.org.au

December 1-4, 2008

Next Generation Warning Services Workshop

**National Oceanic and Atmospheric Administration
Norman, Oklahoma**

Cost: Free

Registration: Closes November 26, 2008

The workshop will bring technical and operation experts from private weather enterprise, the broadcast media, emergency managers, and academia together to determine needs for accurate, accessible, and timely services from the National Weather Service.

John.T.Ferree@noaa.gov

apps.weather.gov/partners/index.php

December 2-4, 2008

Third Asian Ministerial Conference on Disaster Risk Reduction

**Government of Malaysia
Kuala Lumpur, Malaysia**

Cost and registration: Not available

The conference will focus on stakeholder partnerships for reducing risk in the Asian-Pacific region, with an

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Conferences...

(Continued from page twenty-one)

emphasis on public-private partnerships. Community-based disaster risk reduction activities also will be featured.

www.amcdrrmalaysia.com.my/website_in_progress.html

December 9-10, 2008

Disability and Special Needs Technical Assistance Conference

**Government*Horizons and National Organization on Disability
San Diego, California**

Cost and Registration: \$495

The conference will discuss the need for emergency management processes to integrate procedures for special needs populations into the four phases of emergency management. Government officials, emergency managers, first responders, special needs service providers, and community-based organization officials are urged to attend.

www.governmenthorizons.org/Disability-Special-Needs-Technical-Assistance.html

December 9-12, 2008

Arctic Change 2008

**ArcticNet Network of Centres of Excellence of Canada
Quebec City, Canada**

Cost and Registration: \$550

This conference will address global challenges and opportunities related to climate change in the circum-Arctic. Tracks focusing on monitoring socioeconomic and cultural change in the Arctic, as well as community adaptation and vulnerability will be offered.

www.arctic-change2008.com

December 11, 2008

RUSI Workshop: Emergency Response 2008

**Royal United Services Institute
London, England**

Cost and Registration: see Web site

This workshop looks at organizations involved in emergency response, training and preparation received, and ways lessons learned can be used to inform future response.

www.rusi.org/events

December 15-17, 2008

2008 Caribbean All-Hazards Conference

Caribbean All-Hazards Association

Montego Bay, Jamaica

Cost and Registration: \$75 before November 3, \$95 after

This conference brings together government agencies, academic institutions, and the private sector to exchange information and develop ways to reduce the impacts of hazards and disasters in the Caribbean. Presentations of case studies and other discussions will foster interaction among participants in sessions ranging from tourism issues to warning systems and building codes.

www.caribbeanallhazards.org

February 10-13, 2009

Map World Forum: Geospatial Technologies for Sustainable Planet Earth

Hyderabad, India

Cost and Registration: \$500

This conference brings together stakeholders from diverse fields to share and explore needs and utility

of geospatial technologies that promote sustainable development.

www.mapworldforum.org/2009/index.htm

February 19-22, 2009

2009 International Disaster Management Conference

Emergency Medicine Learning and Resource Center

Orlando, Florida

Cost and Registration: \$390 before January 23

This conference highlights the role first responders and response agencies play in disaster planning, response and mitigation. Emergency management challenges and lessons from the past year will provide the basis for many of the conference sessions.

www.emlrc.org/disaster2009.htm

March 20-24, 2009

2009 ASPA Annual Conference

The American Society for Public Administration

Miami, Florida

Cost and Registration: Not available

This conference will explore and develop innovative practices for public administration to address the growing diversity of communities around the country. It emphasizes the importance of context and culture on the sustainability of innovations and the ASPA's role in supporting public administration globally from a U.S. perspective. This conference seeks to provide a platform on which to build a new knowledge base that can help inform public administration practice and theory in the midst of diversity.

www.aspanet.org/scriptcontent/index_aspaconference.cfm

April 6-10, 2009

2009 National Hurricane Conference

Austin, Texas

Cost and Registration: \$300 until February 20, \$350 after

The primary goal of the conference is to improve hurricane preparedness, response, recovery, and mitigation to save lives and property in the United States and the tropical islands of the Caribbean and Pacific. In addition, the conference serves as a national forum for federal, state, and local officials to exchange ideas and recommend new policies to improve emergency management.

www.hurricanemeeting.com

April 8-10, 2008

2009 Annual Meeting of the SSA

The Seismological Society of America

Monterey, California

Cost and Registration: Not posted

The meeting centers around the 20th anniversary of the Loma Prieta earthquake and lessons learned with regard to earthquakes since then.

www.seismosoc.org/meetings/meetings.html

suppression have resulted in more and bigger fires, they ask, "What evidence do we actually have that fire regimes are changing and that fire suppression is at fault?"

Looking at data from 1960 to 2005, they found the number of acres burned annually has gradually increased, but there is no pronounced trend in the number of wildland fires nationally.

"If we agree that the average area burned has increased over time, there are many reasons to conclude that the last century of fire suppression is at least partly responsible," they write.

While the accumulation of fuel is a factor, other things—climate change, grazing practices, invasion of alien species, and so on—have also had an impact. There seems to be a pronounced upward trend in firefighter deaths in the 45 years studied, the authors reported.

Hurricanes

Lowcountry Hurricanes: Three Centuries of Storms at Sea and Ashore. By Walter J. Fraser, Jr. 2006. ISBN: 978-0-8203-2866-9. 319 pp. \$29.92 (cloth). University of Georgia Press. www.ugapress.org.

"Let us begin with the weather," wrote a historian of the South some years ago. Walter Fraser's book on hurricanes begins with the weather and quickly expands to the tropical storms, cyclones, and other systems that for more than 300 years "profoundly affected the human, built, and natural environments" of the South.

Fraser catalogues the long and dramatic history of hurricanes along the coasts of the southeastern United States, complete with sailboats tossed onto highways, ships set ablaze, buildings destroyed, and even the wreckages of carousels.

Is the Gulf Coast Open for Business? *Local Knowledge*, George Mason University. 2008. Free. www.mercatus.org

Local Knowledge is an annual report on disaster research from George Mason University designed to "bridge the gap between the academic and policy worlds by presenting

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

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

www.colorado.edu/hazards/

scholarly analyses of information gathered on the ground." The inaugural issue focuses on how entrepreneurs and the for-profit sector of the Gulf Coast reacted to Hurricane Katrina, including six case studies and numerous reports from researchers. Some economic policy recommendations from the research are avoiding distortion of private sector signals, giving vouchers rather than in-kind assistance, avoiding targeted incentives, achieving accountability through transparency, and removing barriers to local solutions.

Letters

To the Editor,

Regarding your piece, "Exploring the Cell Phone's Role in Disaster," (*Observer*, September 2008) the people on the Indian Ocean did not have time to move to high ground in most areas.

Your statements about the time for warning from an earthquake (probably from the German) are very misleading. Please take a look at how the warning system works. The earthquake must be evaluated, any other data added, and a message sent that there is a real probability of a tsunami for that area. Then a response must occur—and the numbers of people near the shore cannot just move far in little time—especially if a fast response is not in place.

For much of that area, tsunamis are so rare that many systems will be dropped because of not being used.

Clearly, this is an attempt to sell the service.

George Curtis
Affiliate Professor
University of Hawaii

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Support the Natural Hazards Center

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

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

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

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

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

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www.colorado.edu/hazards/about/contribute.html

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