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Futuristic Hazard and Risk Assessment: How Do We Learn to Look Ahead?

--an invited comment

Not all hazard-generating processes are independent of time or human influence. Even if hazards did not vary with time, the associated risks would inevitably increase since populations and hazard-exposed assets increase with time. Yet, do we allow for these sometimes human-induced factors in our risk mitigation policies and actions?

Not as much as we should. Quantitative probabilistic hazard assessment is generally based on the record of past hazardous events and used to account for present and near-future hazards. However, the catalog of hazardous events is not always the only input to the assessment. Sometimes, generalized models based on the historic record that account for the physical processes in the region are used.

To be maximally effective, the latest scientific knowledge must be applied when estimating future hazards and risks. Take, for instance, National Flood Insurance Program (NFIP) maps. For most localities, flood zones were mapped many decades ago. Since then, in many of the most rapidly developing regions of the U.S., land-use patterns have drastically changed, altering the ability of the land to absorb high amounts of precipitation and to extend the duration of run-off in rivers and floodplains. Flooding beyond designated flood zones appears to be increasing, although systematic surveys to confirm this notion are generally lacking. Hence, flood-zone mapping does not depict the present state of the hazard, nor have we evaluated other increasing risk exposures threatening many

parts of the U.S.

The Risk to the MEC

The Metropolitan East Coast (MEC) region provides an example of an area in which future risks in relation to storm surge floods need to be evaluated. The MEC is composed of 31 counties in southern New York, northern New Jersey, and southwestern Connecticut, with New York City as its economic hub. The region has a population of almost 20 million, built assets of \$2 trillion--almost half of which are infrastructure (roads, bridges, airports, harbors, railroads, utilities, and communication facilities). The remaining assets include residential, commercial, and public buildings and their contents. The region generates an annual economic output of just below \$1 trillion.

Many of the region's built assets are close to the waterfront and exposed to coastal storm surges. Many transportation systems have lowest points of elevation of only six to 20 feet above NGVD,¹ exposing them to flooding and jeopardizing their operations.

The MEC is one of more than a dozen regions across the U.S. participating in the U.S. Global Change Research Program's Assessment of Regional and National Impacts of Global Climate Change, and is the only megalopolis being studied. The region is exposed to an increasing frequency of coastal storm surge floods, a good portion of which can be attributed to global warming and subsequent sea level rise.

Indeed, different climate models adopted by the U.S. Global Climate Change Program predict sea level increases of one to three feet by the year 2100. These estimates take into account local land subsidence, melting of alpine glaciers and icecaps, and the thermal expansion of warming oceans.

What the Models Show

Analyses of past storm surges caused by hurricanes and "nor'easter" winter storms (about a dozen in the last 100 to 200 years) indicate that flooding at the southern tip of Manhattan in excess of 10 feet above NGVD occurs about once every 50 years. Lesser storm surge floods occur more frequently, higher surges less frequently. Some New York City subway and Hudson and East River tunnel entrances, La Guardia Airport, some harbor facilities, and some highways near the waterfront have been flooded more than once since they were built over the last 50 to 100 years.

The U.S. Army Corps of Engineers, together with the National Weather Service, used the Sea and Lake Overland Surge Height (SLOSH) model to calculate worst-case storm-track surges in New York Harbor and adjacent coastal regions. Worst-case hurricane tracks make landfall south of New York City, in New Jersey. The model calculates worst-

case surge heights near the Manhattan entrance of the Lincoln Tunnel as 7.5 feet above NGVD for a Saffir-Simpson category 1 hurricane; 17.2 feet for a category 2; 20.5 feet for a category 3; and 30.8 feet for a category 4 (should one ever occur at this latitude). According to the models, a worst-case-track hurricane above category 2 will cause extensive flooding that could split lower Manhattan along Canal Street into two islands.

How will the modest one to three feet of sea level rise change the frequency of storm surge heights? The surprising answer is that storm surges less than 20 feet in height may occur between two and 10 times more often, with an average of three times more often, by the year 2100. Currently, only rough estimates can be made of economic losses due to surges at current sea levels or at the raised sea levels in the year 2100. (Systematic loss estimates using the Federal Emergency Management Agency's HAZUS [hazard mapping] programs are not yet available for flood and wind [in contrast to earthquakes].) The table below summarizes initial findings.

Even without accounting for an increase in assets and their valuations, losses from these coastal storms and floods will increase as the hazard increases. Expected annualized losses from coastal storms, on the order of a billion dollars per year, could be absorbed by the MEC economy. However, actual losses do not occur neatly in regular annual doses. Rather, they occur because of infrequent and irregular extreme events that can cause hundreds of billions of dollars in damage at one time. Insurers, policy holders, and those without insurance would be stretched to the brink. Indeed, if these and smaller events become two to 10 times more frequent, mitigating actions will have to be taken, and taken fast. Without them, the region will experience increasing losses and be forced to bear the rising costs of recovery *and* remediation.

Estimates for Surge Heights and Losses in the MEC and Their Recurrence Periods for the Years 2000 and 2100					
Equivalent Saffir-Simpson Category*	Surge Height above NGVD (in feet)	Estimated Total Loss (\$ billion)**	Average Recurrence Period		Annualized Losses*** (\$ million per year)
			Year 2000	Year 2100	
Extratropical Storm	8	1	20	6	50 - 170
1	10	5	50	15	100 - 330
2	11	10	100	30	100 - 300
3	13	50	500	150	100 - 300
3-4	14	100	1,000	300	100 - 300
4	16	>250	2,500	800	100 - 300
All Categories			Approximately 500 - 1,500		

* The changes in average recurrence periods do not apply to this column since the storm frequency itself is assumed constant, only the frequency of reaching a given storm surge elevation above NGVD changes due to sea level rise. Use only the year 2000 recurrence period for this column.

** All losses are measured in Year 2000 dollars.

*** The lower value applies to Year 2000, the greater to 2100.

Loss Prevention and Public Policy Implications

The MEC is already revamping its basic infrastructure at a cost of about a billion dollars per year. The most cost-effective way to protect this investment against future storm surge losses is to adopt and comply with technical standards during rebuilding that reflect increased flood potentials. A coherent policy, based on sound technical input, is needed. Although some uncertainties about the increased hazards and loss potentials exist (and will persist even after future detailed technical and scientific studies), they must not be used as excuses for inaction. Losses will accelerate just from the sheer growth of built and newly exposed assets. If billions of dollars are invested in new structures without accounting for sea level rise, tens or hundreds of billions of dollars in future losses will occur.

The best mitigation is to avoid placing new or refurbished structures and assets at low elevations. This requires an innovative land-use plan and tough zoning enforcement, and would work best if combined with new national engineering codes that place all critical components at sufficiently high elevations. Such mitigation could be effectively achieved by a Voluntary National Model Code. The NFIP would have a new role to play in remapping coastal and other high-risk flood zones. Congress should provide the additional resources for the NFIP or create a successor program to deal with this major undertaking. Current haphazard updating of existing coastal and other flood-zone maps will not do.

The sea level rise that New York City and the MEC are about to face will affect all coastal megacities and shore-bound populations around the U.S. and throughout the world. New York City and its surrounding region could muster the financial and intellectual resources, perhaps even the political wit and will, to set an example for dealing with this fundamental issue. Climate-change-induced sea level rise is forcing us into a race against time that we must face, finance, and win.

Klaus H. Jacob, Lamont-Doherty Earth Observatory, Columbia University

1. National Geodetic Vertical Datum, formerly known as "Sea Level Datum of 1929" or "mean sea level." Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific coasts, it does not necessarily represent local mean sea level at any particular place.

Additional Sources of Information on Climate Change

Of course, many volumes have been written about the possible implications of climate change and global warming for sea level rise and natural hazards. Below are some recent additions to this anthology.

Sea-Level Rise and Global Climate Change: A Review of Impacts to U.S. Coasts. James E. Neumann, Gary Yohe, and Robert Nicholls. 2000. 44 pp. The complete report is available at the Pew Center on Global Climate Change Web site: http://www.pewclimate.org/projects/env_sealevel.html. For further information, contact the Pew Center on Global Climate Change, 2101 Wilson Boulevard, Suite 550, Arlington, VA 22201; (703) 516-4146.

Sections include a review of factors affecting the vulnerability of the U.S. coastal zone, a summary of key concepts in the science of sea-level rise assessment, a description of physical impacts of climate change on coastal resources, a discussion of human response and adaptation to coastal threats, a review of economic impacts of sea-level rise on coastal properties and wetlands, and conclusions.

El Niño 1997-1998: The Climate Event of the Century. Stanley A. Changnon, Editor. 2000. 232 pp. \$29.95, paper; \$60.00, clothbound. To purchase a copy, contact Oxford University Press Order Department, 2001 Evans Road, Cary, NC 27513; WWW: <http://www.oup.com>.

This volume assembles the perspectives of experts in science, public policy, and the media regarding El Niño. Topics include causes, predictions, El Niño as a weather metaphor for global warming, scientific issues, uses and benefits of El Niño forecasts, and implications for improved forecasts and climate services to the U.S.

El Niño and La Niña: Tracing the Dance of Ocean and Atmosphere. 2000. 8 pp. Free. Available via the World Wide Web: <http://www.nationalacademies.org/opus/elniño>.

This brochure chronicles decades of basic scientific research leading to greater understanding of the relationship between earth's oceans and the climatological phenomena of El Niño and La Niña.

Global Environmental Change: Research Pathways for the Next Decade. 2000. 616 pp. \$89.95. Copies can be ordered from the National Academy Press, 2101 Constitution Avenue, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242. To place an order on-line that provides a 20% discount or to view the complete text free, see <http://www.nap.edu>.

In order to adapt to global climate change, we must understand the processes that control changes in climate and the composition of the atmosphere, as well as how ecosystems and humans interact with these changes. This volume encourages a renewed commitment to understanding global climate change and sets a direction for research in the decade ahead. Through case studies, the book explores the lessons of the past 20 years and poses the scientific questions that remain.

Assessing Regional Impacts of Climate Change, El Niño, La Niña, and More: Extreme Weather, Climate Variability, and the Mississippi Basin. Weather Backgrounder Series. 1998. 20 pp. Free. Available on-line: <http://www.nsc.org/ehc/jrn/weather/weath2.htm>. For further information, contact the National Safety Council's Environmental Health Center, 1025 Connecticut Avenue, N.W., Suite 1200, Washington, DC 20036; (202) 293-2270; e-mail: ehc@nsc.org; WWW: <http://www.nsc.org/ehc.htm>.

This document examines flood and drought in the Mississippi Basin, describes weather extremes and climate variability, and explains how El Niño and La Niña could affect the Midwest as well as what would happen if global warming should occur. It also describes possible regional vulnerabilities, including flooding, transportation disruption, ecological disruption, agricultural impacts, and changes in quality of municipal water supply and sewage treatment. Finally, it lists several story ideas for journalists that relate to Midwestern climate vulnerability.

Of Floods, Hurricanes, and Political Fallout . . .

The Latest Publications from the Hazards Center

Quick Response Reports

The Natural Hazards Center has published two new Quick Response reports on the Web. Conducted days to weeks after disasters, these studies are intended to reveal information about immediate effects and response. They are disseminated via the Internet by the center as quickly as possible when they are received.

<http://www.colorado.edu/hazards/qr/qr126/qr126.html>

• **QR126: Hurricane Floyd Flood Mapping Integrating Landsat 7 TM Satellite Imagery and DEM Data**, by Jeffrey D. Colby, Yong Wang, and Karen Mulcahy, East Carolina University.

The authors introduce this report by stating, "Capturing the extent of flooding during an extreme event in an efficient manner is essential for response, recovery, and mitigation activities. An efficient and economical method for mapping flood extent in a coastal floodplain is described in this paper. The method was based on [satellite] images (acquired before and during the flood event) [integrated with] digital elevation model (DEM) data . . . The method proved to be reliable and could be applied quickly using data that are relatively inexpensive, easy to obtain, and easy to analyze."

<http://www.colorado.edu/hazards/qr/qr127/qr127.html>

• **QR127: Hurricane Georges: A Multinational Study Examining Preparedness, Resource Loss, and Psychological Distress in the U.S. Virgin Islands, Puerto Rico, Dominican Republic, and the United States**, by David N. Sattler and Charles F. Kaiser, College of Charleston.

This study examines preparation by and psychological functioning of victims before and after Hurricane Georges. Four to five weeks following the event, the researchers surveyed almost 700 individuals who weathered the hurricane. They found that in all locations, resource loss was of substantial importance among variables that predicted psychological distress. In addition, storm strength and location accounted for a significant portion of psychological distress variance. The authors go on to discuss the implications of their findings for mitigating psychological distress due to disasters as well as other problems in human disaster response.

A complete list of Quick Response reports is posted at <http://www.colorado.edu/hazards/qr/qr.html>. Printed copies can be purchased for \$5.00 each, plus shipping charges (\$4.00 for surface mail to any destination; and \$9.00 for international air printed matter). Orders should be directed to the *Publications Clerk, Natural Hazards Research and Applications Information Center, Campus Box 482, University of Colorado, Boulder, CO 80309-0482; (303) 492-6819; fax: (303) 492-2151 ; e-mail: janet.kroeckel@colorado.edu*. Prepayment is required, and checks should be payable to the University of Colorado.

Coping (or Not) with El Niño in South America

In the previous *Observer* (Vol. XXIV, No. 5, p. 4), we announced the publication (in printed form) of the Hazard Center's Special Publication 36--*The Marginalization of Disaster Response Institutions: The 1997-1998 El Niño Experience in Peru, Bolivia, and Ecuador*, by Richard Olson and friends. That paper examines governmental response to the 1997-98 El Niño and concludes that national civil defense organizations in the respective countries--the organizations nominally responsible for managing such emergencies--were quickly shouldered aside when the event became national and international news, and thus a political issue. New, temporary governmental organizations were created to deal with the consequences of the El Niño, and the result was a poorly designed and poorly implemented response. The authors recommend how standing civil defense agencies can better prepare for such events.

The Marginalization of Disaster Response Institutions is now available from the Natural Hazards Center Web site: <http://www.colorado.edu/hazards/sp/sp.html>. It can be viewed on-line or downloaded in Microsoft Word97 or PDF format. A Spanish version is also available in print or on-line from the Regional Disaster Information Center for Latin America and the Caribbean (CRID): <http://www.crid.or.cr>, or <http://www.crid.or.cr/crid/ENG/NEWS/not7.htm>.

Printed copies of *The Marginalization of Disaster Response Institutions* (SP36, 44 pp.) remain available and can be purchased for \$10.00, plus shipping (\$5.00 for the U.S., Canada, and Mexico; \$8.00 for international mail beyond North America). Orders should be directed to the *Publications Clerk, Natural Hazards Research and Applications Information Center, Campus Box 482, University of Colorado, Boulder, CO 80309-0482; (303) 492-6819; fax: (303) 492-2151; e-mail: janet.kroeckel@colorado.edu*. Prepayment is required. Checks should be payable to the University of Colorado. Visa, Master Card, American Express, and Diners Club cards are also accepted.

Now in Paperback!

Floodplain Managers Look to the Future

A little foresight can go a long way when it comes to reducing the impacts of natural disasters. In an effort to lessen the destructive powers of floods in the U.S., floodplain managers recently met to discuss techniques for anticipating and responding to the next great deluge. The latest publication from the Natural Hazards Center, *Planning Ahead: Reducing Flood Losses in the 21st Century*, contains technical papers presented at that meeting, the 23rd Annual Conference of the Association of State Floodplain Managers (ASFPM), held in May 1999 in Portland, Oregon.



Topics include local projects and programs for planning, mitigation, acquisition, and recovery; watershed management; protecting and restoring natural and cultural resources in floodplains; community assistance for the National Flood Insurance Program; stormwater management; hydrological forecasting; flood modeling; hazard mapping; special flood-related hazards; international approaches to floodplain management; flood insurance; and federal programs, policies, and initiatives.

Copies of *Planning Ahead* (Special Publication #37, 295 pp., \$20.00, plus \$6.00 shipping) can be ordered from the *Publications Clerk, Natural Hazards Research and Applications Information Center, Campus Box 482, University of Colorado, Boulder, CO 80309-0482; (303) 492-6819; fax: (303) 492-2151; e-mail: janet.kroeckel@colorado.edu; <http://www.colorado.edu/hazards>*. All orders must be prepaid. Visa, MasterCard, American Express, and Diners Club cards are accepted.

North Carolina Wins Court Battle Over Seawall Ban

North Carolina's ban on seawalls to protect its beaches was recently upheld in court after being challenged by a group of homeowners trying to defend their \$22 million resort property from destruction by ocean tides. According to the North Carolina Division of Coastal Management, the ban was instituted in response to research demonstrating that hard structures on beachfronts caused the demise of sandy beaches.



In the late 1970s, the North Carolina Coastal Resources Commission, which is the policy making authority for the coastal program, prohibited the use of hard erosion control structures to protect new buildings. In 1985, the commission revised the rule to prohibit such

structures for protection of any building, unless it is historic and cannot be relocated, or to protect a waterway for navigation purposes.

When the nine-story Shell Island Resort was built in the 1980s on Wrightsville Beach, its developers signed permits acknowledging they were building in an erosion-prone area, then sold individual condominium units to the public. In 1996, when a nearby inlet had moved to within 200 feet of the resort, homeowners asked for permission to build a steel seawall, and the commission denied their request. Shell Island filed suit in 1998 against the commission, challenging the hard structure rule and arguing that the map used to base issuance of the original building permit underestimated the hazard area of the inlet as well as the degree to which it would migrate. The suit further asserted that, because of these conditions, the state should have never issued a building permit and should now allow the owners of the resort to build a seawall to counteract the erosion. The North Carolina Court of Appeals upheld the commission and the state, ruling that the state did not "take the homeowners property and that "no property owner has the right to construct an erosion control structure on state-owned submerged lands."

For more information about North Carolina's ban on seawalls or the Shell Island Resort Case, contact *Donna Moffitt*: (919) 733-2293; e-mail: donna.moffitt@mcmail.net. The NOAA Coastal Services Center has an article on its Web site describing the decision, as well as a link to the complete text of the decision. To view, access: <http://www.csc.noaa.gov/newsletter/2000/02/nc.html>.

(Re)Introducing the Central United States Partnership

In the May 1999 *Observer* ([Vol. XXIII, No. 5, p. 5](#)), we introduced a new initiative--then called the Mid-America Partnership (MAP)--established by representatives of several public and private central United States organizations. The partnership's goal was to link these groups so that they might help one another in dealing with hazards (particularly earthquakes) affecting the region.



Since then, MAP has been renamed CUSP--the Central United States Partnership. The partnership's goals have been refined, and it is now developing a long-term strategic plan to reduce the risk posed by damaging earthquakes in the central U.S. Member agencies intend to launch a cooperative effort to enlighten residents and policymakers in the region regarding the need to prepare for and mitigate the consequences of earthquakes. CUSP core organizations include the Central U.S. Earthquake Consortium, Association of CUSEC State Geologists, Institute for Business and Home Safety, Mid America Earthquake Center, Federal Emergency Management Agency, and U.S. Geological Survey. The group also involves numerous other partner organizations from the region, and more will be added as plans and programs are defined.

One current goal is to develop a regional seismic advisory council to advise the various partners on directions they should take in order to best coordinate their strengths.

An initial meeting of CUSP was held in July 1999 and a second meeting May 23-24 of this year to refine the long-term plan and define partner expectations around three key issues: living with earthquakes, building for earthquakes, and learning from earthquakes. For more information about CUSP, contact *CUSEC*, 2630 East Holmes Road, Memphis, TN 38118-8001; (901) 544-3570; fax: (901) 544-

0544; e-mail: cusec@cusec.org.

Virginia Tech Establishes Earthquake Engineering Center

In January 2000, Virginia Polytechnic Institute and State University (Virginia Tech) announced the creation of the Earthquake Engineering Center for the Southeastern United States (ECSUS). Those affiliated with the center possess expertise in geotechnical and structural engineering, earthquake seismology, strong ground-motion modeling, seismic hazard assessment, geographic information systems application, and earthquake response planning and mitigation.



The primary roles of ECSUS are to:

- Perform basic and applied earthquake engineering research.
- Manage transfer of seismic technology to the southeastern region.
- Promote continued evolution of regional building codes.
- Disseminate new findings to the regional engineering community.
- Act as a regional earthquake data resource center.
- Provide a unified "voice" for regional earthquake issues.

For more information about ECSUS, contact the directors, *Martin Chapman and James Martin*, Department of Civil and Environmental Engineering, 200 Patton Hall, Virginia Tech, Blacksburg, VA 24061; (540) 231-6635; fax: (540) 231-7532; WWW: <http://ecsus.ce.vt.edu>.

On the Line

Climate Forecasts: A New Tool for Hazard Management in the Southwestern U.S.

Astute management of limited water resources in the Western U.S. is more important than ever. New tools available to resource and flood managers include climate forecasts that predict above or below normal precipitation and temperature up to a year in advance. Predictions of the 1997-98 El Niño event and its potentially damaging impacts greatly increased the visibility of these forecasts and have left many wondering how best to take advantage of this new technology.

To find out which forecasts agencies access, how they are interpreted, and how they are used, we conducted in-depth interviews with water suppliers, flood control districts, and emergency managers in Arizona. We asked agencies to discuss their experiences with the forecasts, suggest improvements to them, and discuss some of the barriers that prevent agencies from responding to forecasts effectively. The intent of this article is to provide practical advice to emergency managers who are considering incorporating climate

forecasts into their operations.

The 1997-98 El Niño and Arizona

El Niño refers to the appearance of anomalously warm waters along the equator from the coast of Peru nearly to Indonesia. La Niña is the appearance of anomalously cold waters; collectively, they are known as El Niño Southern Oscillation (ENSO) events. These events reappear every two to seven years and can last for one or more years. El Niño effects in the U.S. are strongest in winter, particularly in the Pacific Northwest (dry), Florida (wet), and in the Southwest (wet); La Niña has opposite impacts.



Prior to 1997-98, the 1982-83 El Niño was the strongest event in modern history, during which the Southwest experienced unprecedented flood damage. Hence, many agencies paid heed when forecasts indicated the 1997-98 El Niño would be as strong or stronger than the prior event and that Arizona was in store for a wet winter. Media coverage was pervasive, especially in September 1997 when Hurricane Nora threatened the Southwest. Although hurricanes rarely strike this region, their probability is higher in El Niño years. Early forecasts placed Nora on a track toward the metropolitan centers of Arizona--Phoenix and Tucson-- although the observed track was over a hundred miles to the west. While little rain fell in urban regions, 24-hour rainfall records (approximately one foot) were broken west of Phoenix, two towns were flooded, and crop losses reached \$300 million. As predicted, the 1997-98 winter was wetter than normal, although ultimately only Hurricane Nora produced floods. Winter precipitation was steady and produced elevated streamflows during winter and spring 1998, without significant flooding.

Arizona's Response

Several unprecedented water management actions were taken in Arizona in anticipation of El Niño. The major water supplier for Phoenix, the Salt River Project (SRP), released 41,000 acre-feet of water from Verde River reservoirs in anticipation of elevated streamflow. This water replaced pumped groundwater and the resulting reservoir storage space reduced downstream flood risks. SRP faced losses of \$5-\$6 million if the forecasts were wrong. In addition, various emergency management agencies sponsored interagency briefings, reviewed flood response plans, identified hazards in the field, prioritized mitigation opportunities, and provided information about flood insurance, among other activities. One flood control district's in-house research revealed that floods during El Niño tend to occur on large rivers. Subsequently, the district shifted their annual flood training to involve multiple agencies and focus on large river floods instead of flash floods in usually dry washes. However, a surprising number of agencies were not able to respond to the forecasts and engage in serious preparations for a wet winter.

Getting the Most from the Forecast

Based on the Arizona experience during the 1997-98 El Niño, there appear to be four major questions that agencies should ask before they can effectively incorporate forecasts into their decision-making process.

- **Is this forecast the official product?** There is a confusing mix of forecast products available, some experimental, others official. The official climate forecast is the "Climate Outlook" produced by the National Weather Service (NWS) Climate

Prediction Center (CPC).

- **Do I understand this forecast correctly?** There were surprisingly diverse interpretations of the Climate Outlooks. A common mistake was to think the outlook maps identified regions where precipitation quantities would be extreme. However, the map contours actually express forecast *confidence*, not *extremity*.
- **Is this forecast relevant to my operations?** Many agencies are more concerned with floods than seasonal precipitation totals. However, the translation from precipitation to streamflow is not direct, and connections between seasonal precipitation and flood events are even more tenuous.
- **Given what I know about forecast accuracy, am I willing to risk taking action?** Forecast accuracy was unknown to many agencies; thus, they were reluctant to act. Unfortunately, few evaluations of forecast accuracy exist. Most agencies prefer to avoid negative consequences that can result from using poor forecast.

Agencies with the most sophisticated understanding of the forecasts had the closest connection with forecasters. Therefore, we recommend that you get to know your local or regional NWS forecasters and understand, in advance, the forecast products. We fully agree with the sentiments expressed in the *Natural Hazards Observer* ([Vol. XXIII, Number 3, p. 1](#)) that the forecast process should be open to user involvement. The CPC, local and regional climate offices (e.g., Regional Climate Centers, NWS Weather Forecast Offices), and regional assessment projects (e.g., CLIMAS) are all interested in suggestions from forecast users that lead to better products.

Institutional Barriers

Even if a forecast is sufficiently accurate and relevant, barriers can exist to its appropriate use. For example, some agencies contend they are always prepared for floods. Does being more prepared during El Niño mean agencies can be less prepared otherwise? The issue is not being more or less prepared, but rather *how* your agency prepares and *where* your resources are focused. Major institutional barriers to readiness include:

- **Multiple Hazards**--Flood and drought are only two of many hazards that influence agency operations. Potential impacts from the 1998-2000 La Niña were overshadowed by the Y2K millennium bug.
- **Personal versus Institutional Risk**--Who accepts responsibility for agency decisions if the forecast is wrong? Blame may be shifted to climate forecasters or an agency may face rebuke after a difficult experience. However, individual decision makers within an agency shoulder significant personal career risk. Further, a long record of appropriate decisions can be negated by one "bad" decision.
- **Reactive versus Proactive Response**--Some mitigation activities require a long and complicated approval process that can be bypassed in an emergency (e.g., infrastructure repairs in environmentally sensitive regions). Further, mitigation can stress limited budgets, while crisis response may be funded with emergency, off-budget appropriations.
- **Fixed Operating Procedures**--Agencies may be required to operate facilities using procedures fixed by legislation or legal decree. Adapting those procedures to include climate variability promises to be a long, complicated, and painful process, even though gains may be significant.

Future Directions

Water management agencies are paving the way for others to take advantage of climate forecasts. However, broad progress requires shifts in agency perspectives and procedures, including recognition that forecasts for winter precipitation in certain regions of the U.S. are useful, especially during strong ENSO events. Now is the time for agencies to develop close relationships with climate forecasters, as well as adaptive management strategies and contingency plans to maximize the utility of climate forecasts for hazard mitigation.

Thomas Pagano, Holly Hartmann, and Soroosh Sorooshian, Department of Hydrology and Water Resources, University of Arizona

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Washington Update

National Drought Policy Commission Issues Recommendations

Recognizing that drought is a regular occurrence in the U.S., the National Drought Policy Commission has issued recommendations saying, essentially, that we as a nation need to be better prepared to cope with this hazard. In 1998, Congress passed the National Drought Policy Act (see the *Observer*, [Vol. XXIII, No. 1, p. 10](#)), which created the commission and charged it with recommending to Congress policies for improving drought response. On May 16, 2000, the commission announced its proposals in its report *Preparing for Drought in the 21st Century* (2000, 60 pp., free).



The commission concluded that federal policy must shift from its current emphasis on drought relief and instead focus on reducing vulnerability. Programs should:

- Favor preparedness over insurance, insurance over relief, and incentives over regulation.
- Base research priorities on their potential to reduce drought impacts; and
- Coordinate the delivery of federal services through collaboration with nonfederal entities.

The commission urges Congress to pass a National Drought Preparedness Act that would:

- Incorporate planning, mitigation measures, risk management, resource stewardship, environmental considerations, and public education as key elements of a national drought policy;
- Promote collaboration among scientists and managers to improve drought monitoring, prediction, education, and preparedness;
- Incorporate comprehensive insurance and other financial strategies into drought planning;
- Establish emergency assistance measures that encourage and reward natural resource stewardship and self-help; and
- Coordinate drought programs and response through a National Drought Council made up of both federal and nonfederal representatives. Among its many tasks, the council would oversee the timely and effective delivery of more than 80 existing federal drought programs, assess drought-related assistance efforts, identify regions with the most pressing needs, develop drought response coordination strategies, develop a handbook of emergency drought preparedness measures, establish drought impact assessment teams to survey impacts, and advocate drought-related educational programs within universities, agencies, and public sector programs.

The full text of the report, as well as a 16-page *Executive Summary*, are available from the U.S.

Department of Agriculture's Web site: <http://www.fsa.usda.gov/drought/finalreport/accesstoreports.htm>.

Project Impact: IG Examines Partner Contributions

According to the Federal Emergency Management Agency (FEMA) Inspector General (IG), the agency needs to improve the identification and reporting of partner contributions for its Project Impact program. Project Impact: Building Disaster Resistant Communities is an initiative developed by FEMA to help communities create public-private partnerships that work to improve local disaster resistance (see the *Observer*, [Vol. XXIII, No. 1, p. 15](#)). The IG was recently asked to evaluate nonfederal contributions to this program by the Senate Appropriations Subcommittee on VA, HUD, and Independent Agencies, and their report is contained in *Project Impact: Identifying and Reporting Partner Contributions* (Publication No. I-01-00, 2000, 51 pp., free).

The IG determined the following:

- Reported partner contributions are not accurate. Communities are reporting funds and activities that preceded or cannot be attributed to Project Impact. They are reporting contributions with no evidence of partner commitments, are identifying matching funds as partner contributions, and do

not always recognize legitimate contributions.

- Project Impact creates intangible contributions. Although these qualities cannot be quantified, Project Impact has created attitudinal and behavioral changes. The IG urges FEMA to improve its strategies for reporting these contributions.
- "Best Practices" information should be disseminated. The IG recommends FEMA disseminate examples other communities can emulate and establish a forum on its Web site through which communities can exchange ideas.
- Some communities are spending Project Impact funds so slowly that it may be difficult for FEMA to justify future increases in program funding.
- The number of regional project coordinators is not keeping pace with the number of Project Impact communities, jeopardizing the effectiveness and efficiency of the program.

Copies of the report can be obtained from the *FEMA Office of Inspector General, 500 C Street, S.W., Washington, DC 20472; (202) 646-4166; fax: (202) 646-3901; WWW: <http://www.fema.gov/ig>.*

GAO Recommends Budget Cutting Strategies



Recently, both the Senate and House Budget committees asked the General Accounting Office (GAO) to compile a single document that describes program reforms suggested by GAO but not yet implemented by federal agencies. The report was created to help Congress identify options that could be used to reduce federal spending or increase revenues. Among the 120 options suggested by GAO, the report

indicates FEMA could improve its budget by:

- Limiting eligibility for public assistance--GAO notes that the Public Assistance Program has expanded over the years, and costs could be contained by limiting the number of appeals for funding, eliminating eligibility for some facilities that lack flood insurance or do not deliver government services, and upgrading only disaster-damaged portions of structures.
- Eliminating the flood insurance subsidy on properties that suffer the greatest flood losses--GAO notes that the National Flood Insurance Program (NFIP) is not actuarially sound because about a third of the 4.1 million policies in force are subsidized, making total income from premiums about \$500 million less than if these properties were charged rates based on actual risk.
- Eliminating flood insurance for certain repeatedly flooded properties--Repetitive flood losses are one of the major factors contributing to the financial difficulties facing the NFIP. These losses account for about 36% of all program claims, even though these structures represent only 1% or 2% of the total number of insured properties. Although FEMA has targeted most of these properties for acquisition, relocation, or elevation, GAO believes eliminating flood insurance for some of them would save the federal government money.

Copies of *Budget Issues: Budgetary Implications of Selected GAO Work for Fiscal Year 2001* (Report #GAO/OCG-00-8, 2000, 327 pp., free) can be obtained from GAO, P.O. Box 37050; Washington, DC 20013; (202) 512-6000; fax: (202) 512-6061; e-mail: info@www.gao.gov; WWW: <http://www.gao.gov>.

CDC Evaluates Health Impacts of Hurricane Floyd

When Hurricane Floyd struck North Carolina on September 16, 1999, the leading cause of death from the storm was drowning of occupants of motor vehicles. The storm dropped up to 20 inches of rain in eastern regions of the state, and the Centers for Disease Control and Prevention (CDC) gathered epidemiologic information from the state's medical examiner to monitor illness and injury related to the hurricane and its subsequent flooding. The agency recently released its data in its weekly publication, *Morbidity and Mortality Weekly Report*, in the article "Morbidity and Mortality Associated with Hurricane Floyd--North Carolina, September-October 1999" (May 5, 2000; Volume 49, No. 17; pp. 369-372).





Floyd caused 52 deaths, two-thirds of which were drownings--many among persons who attempted to drive through moving water and were swept away. Others died due to car crashes, heart attacks, and fires. Seven people died in capsized boats, and five rescue workers also lost their lives. The CDC also tracked emergency room visits to 20 hospitals in 18 flooded counties and found that hypothermia, carbon monoxide poisonings, dog bites, violent crime, diarrhea, and asthma attacks all rose significantly.

The CDC suggests public health intervention strategies that should be followed in future hurricane-related disasters. They recommend state agencies identify regional and local organizations that represent at-risk communities, better coordinate disaster response, identify flood-prone areas, and educate the public on how to take appropriate actions. In particular, motorists should be warned not to drive through areas in imminent danger of flash flooding or onto roads and bridges covered by rapidly moving water. Safe evacuation routes should be identified in advance. Finally, the CDC suggests that appropriate mental health services be made available through all phases of disaster relief.

Copies of *Morbidity and Mortality Weekly Report* can be found in any *federal repository library*. It can also be viewed on-line: <http://www.cdc.gov/epo/mmwr>. To receive a free electronic copy every Friday, send an e-mail to listserv@listserv.cdc.gov with the message "SUBscribe mmwr-toc."

For a paid subscription, contact the *Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; (202) 512-1800*.

FEMA and Berkeley Examine EQ Economic Losses

When, not if, a major earthquake takes place on the Hayward Fault in the San Francisco Bay Area, the economic losses will be staggering--\$4 billion in physical destruction and economic losses of \$1.2 billion. A recent study commissioned by FEMA and the University of California-Berkeley underscores the possibility of long-term and widespread economic losses due to significant quakes. According to the U.S. Geological Survey, there is a 67% chance of a magnitude 7 or larger quake in the Bay Area in the next 30 years, and the Hayward Fault passes next to or under several structures on the Berkeley campus.



Designated a Disaster Resistant University, the university is part of FEMA's Project Impact, an initiative to reduce future disaster risks. This initiative will eventually involve the development of disaster recovery and business resumption plans for other universities facing the threat of natural disasters, including earthquakes, floods, hurricanes, and tornadoes.

In the report, researchers conclude that the Berkeley campus alone contributes \$685 million annually to the local and regional economies and provides 20,000 jobs. Extensive earthquake damage would create staggering losses to the immediate area and also impact the regional high technology economy by reducing the number of engineering and other graduates.

History provides some telling examples. The 1994 Northridge earthquake forced California State University-Northridge to close for a month and reopen with temporary buildings. The 1989 Loma Prieta quake shut down a dozen buildings on the Stanford University campus in Palo Alto, some of which are still closed. Because of these experiences, Berkeley is retrofitting six major buildings and plans to retrofit four more by 2006.

The complete text of the report, *The Economic Benefits of a Disaster Resistant University: Earthquake Loss Estimation for UC Berkeley*, by Mary C. Comerio (2000, 47 pp.), can be viewed on-line: http://www.berkeley.edu/news/media/releases/2000/05/01_disaster.html. For more information, contact *Mary Comerio*, (510) 642-2406; or *John Quigley*: (510) 643-7411.

GAO Looks at South Florida Restoration

Following major droughts in the 1930s and 1940s and drenching hurricanes in 1947, Congress established the Central and Southern Florida Project in 1948, an extensive network of canals, levees, and pump stations to prevent flooding and saltwater intrusion into the state's aquifer while providing drainage and drinking water to the residents of South Florida. These changes reduced the Everglades to half their original size and have had a detrimental effect on wildlife habitats and water quality. In 1993,

the South Florida Ecosystem Restoration Initiative, a complex, long-term effort by a federal interagency task force to restore the south Florida ecosystem (including the Everglades), began to coordinate ongoing federal restoration activities. The Water Resources Development Act of 1996 formalized the task force and charged it with coordinating and facilitating the overall restoration of 18,000 square miles of land.

A key component of this effort is acquiring lands in order to store water needed to re-establish natural hydrology, build water quality treatment areas, restore lost and altered habitats, and curtail the outward growth of urban areas. In its report, *South Florida Ecosystem Restoration: A Land Acquisition Plan Would Help Identify Lands that Need to be Acquired*, (#GAO/RCED-00-84, 2000, 67 pp., free), GAO examines what the South Florida Ecosystem Restoration Task Force did from 1996 through 1999 to identify and acquire lands needed to accomplish its goals, and what the Department of the Interior did to help ensure that it maximized the acreage purchases with \$200 million in Farm Bill grants.

GAO notes that the task force has not yet developed a land acquisition plan that identifies all of the lands needed, although each federal and state agency has made independent acquisition decisions. Without an overall plan, the task force cannot identify all the lands needed for restoration, estimate the cost of land acquisitions, measure progress in acquiring lands, or increase the chances that acquired lands are needed for the restoration.

Copies of the report, along with *South Florida Ecosystem Restoration: A Land Acquisition Plan is Needed to Supplement the Strategic Plan Being Developed* (Testimony No. GAO/T-RCED-00-137, 2000, 8 pp., free), which contains the Testimony of Jim Wells, Director of GAO's Energy, Resources, and Science Issues Division before the Subcommittee on Interior and Related Agencies, Committee on Appropriations, House of Representatives, can be obtained from GAO, P.O. Box 37050, Washington, DC 20013; (202) 512-6000; fax: (202) 512-6061; e-mail: info@www.gao.gov; WWW: <http://www.gao.gov>.

President Endorses GDIN

On May 2, President Clinton issued an Executive Order directing the executive branch of the federal government to support the creation of a "Global Disaster Information Network [GDIN] to use information technology more effectively to reduce loss of life and property from natural and man-made [sic] disaster." In part, the order states:

Section 1. Policy. (a) It is the policy of this Administration to use information technology more effectively to coordinate the Federal Government's collection and dissemination of information to appropriate response agencies and State governments to prepare for and respond to natural and man-made disasters. . . . While many agencies provide disaster-related information, they may not always provide it in a coordinated manner. To improve

the provision of disaster-related information, the agencies shall, as set out in this order, use information technology to coordinate the Federal Government's provision of information to prepare for, respond to, and recover from domestic disasters.

(b) It is also the policy of this Administration to use information technology and existing channels of disaster assistance to improve the Federal Government's provision of information that could be helpful to foreign governments preparing for or responding to foreign disasters. . . .

(c) To carry out the policies in this order, there is established the Global Disaster Information Network. . . The Network is defined as the coordinated effort by Federal agencies to develop a strategy and to use existing technical infrastructure, to the extent permitted by law and subject to the availability of appropriations and under the guidance of the Interagency Coordinating Committee and the Committee Support Office, to make more effective use of information technology to assist our Government, and foreign governments where appropriate, by providing disaster-related information to prepare for and respond to disasters.

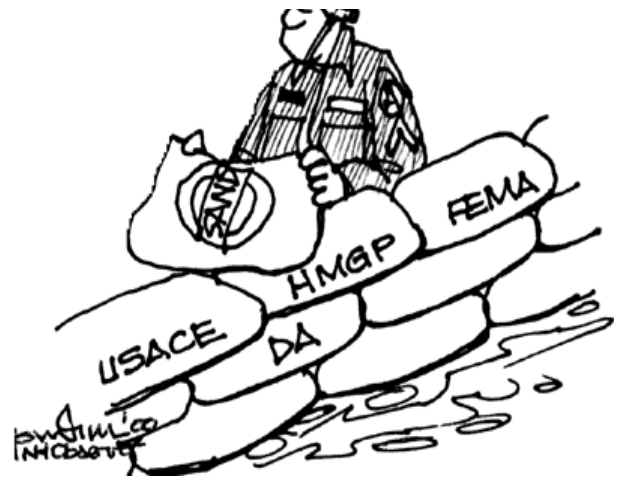
The order then defines the above-mentioned Interagency Coordinating Committee that will oversee the development of the GDIN. The committee will include representatives from the Office of the Vice President, the Department of Commerce (through the National Oceanic and Atmospheric Administration), and the Department of State, who will serve as co-chairpersons of the committee. It will also comprise representatives from at least 13 other departments and agencies. The order further directs the Committee Support Office to "assist the Committee by developing plans and projects that would further the creation of the Network." The goals and duties of both the committee and its support office are also enumerated.

The complete executive order is available on the World Wide Web: <http://www.pub.whitehouse.gov/urires/I2R?urn:pdi://oma.eop.gov.us/2000/4/28/1.text.2>.

FEMA and Army Agree to Promote Nonstructural Flood Solutions

The Federal Emergency Management Agency (FEMA) and the Department of the Army (DA) signed a Memorandum of Agreement (MOA) on March 29, 2000, to improve cooperation and consistency between FEMA's Hazard Mitigation Grant Program (HMGP) open space acquisition projects and the U. S. Army Corps of Engineers' flood-damage-reduction levee projects.¹ This agreement establishes a standard process for addressing existing conflicts.





FEMA and the DA share a common interest in reducing the property damage and loss of life from flooding through the use of nonstructural approaches where practicable. The Corps, in cooperation with nonfederal sponsors, plans, designs, and constructs projects to reduce future flood losses in a community. While the Corps recognizes that permanent removal of people and property from the floodplain often is the ideal solution, after all economic, environmental, financial, and local preference factors are considered, at times structural measures such as levees are the only practical alternative.

The HMGP provides grants to states and local governments for measures that will reduce or eliminate long-term risks to people and property from the impacts of natural hazards. In response to flood hazards, the HMGP emphasizes nonstructural measures, such as the purchase or relocation of flood-prone properties. At-risk structures are removed and acquired lands are required to have permanent open space restrictions placed on their deeds to restore and preserve the natural and beneficial functions of the floodplains. The MOA acknowledges that constructing flood-damage-reduction levees and floodwalls on HMGP land is incompatible with open space uses.²

A number of cases have surfaced in which the Corps has proposed construction of levees on HMGP open space. These cases prompted the development of the MOA to improve cooperation between the two programs. The MOA also sets forth criteria to address these current land-use conflicts. In response, this agreement prescribes an improved joint coordination process to better ensure HMGP lands are preserved permanently for open space.

In an effort to ensure applicant communities are aware of the HMGP's restrictions at the earliest stages of project development, the MOA requires FEMA regional offices and Corps district offices to coordinate activities to ensure applicants understand that acceptance of HMGP funds for the purchase of flood-prone properties precludes the construction of flood-damage-reduction levees on those parcels. Further, FEMA now requires local governments developing HMGP acquisition projects to undergo a preapplication planning process, in cooperation with the Corps, that considers fully both structural and nonstructural measures in their long-term flood mitigation strategies.

In addition, prior to the commencement of acquisition projects or the construction of flood damage reduction levees, the MOA requires FEMA and the Corps to coordinate their activities to avert future

land-use incompatibilities.

The MOA also sets forth criteria to resolve several cases where FEMA has received requests for amendments to deed restrictions that would allow construction of levees on previously acquired HMGP lands. The criteria provide an objective, consistent method for evaluating these limited cases and determining if there is sufficient justification for granting an amendment. In cases where the agencies agree an amendment is warranted, open space lands made available for flood-control structures will be limited to only the amount needed for levee construction, operation, and maintenance activities.

FEMA and the DA are confident the joint procedures in this agreement will be instrumental in resolving existing conflicts and providing a framework that supports the distinct flood reduction efforts of each agency.

The MOA can be found on both FEMA's Web site: <http://www.fema.gov> and the Corps' site: <http://www.usace.army.mil/inet/functions/cw/cecwp/cecwp.htm>. For further information about this agreement, contact *Jan Rasgus, U.S. Army Corps of Engineers, (202) 761-0121; e-mail: Janice.E.Rasgus@HQ02.usace.army.mil* or *Robert F. Shea, FEMA, Program Support Division, Mitigation Directorate, 500 C Street, S.W., Washington, DC 20472; (202) 646-3619; e-mail: bob.shea@fema.gov*.

- 1. Flood damage reduction levee projects include berms, floodwalls and dikes.**
- 2. This restriction on levee construction generally does not apply to structures designed specifically for ecosystem preservation, restoration, or enhancement, which are deemed consistent with the open space uses requirement of the HMGP.**



The Internet Pages

Below are some of the more useful disaster Internet resources we've encountered recently. For a comprehensive list of selected sites dealing with hazards and disasters, see <http://www.colorado.edu/hazards/sites/sites.html>.

All Hazards

<http://www.doi.gov/nathaz/index.html>

The U.S. Department of the Interior has devoted one portion of its Web site entirely to natural hazards, with sections on wildfires, volcanoes, earthquakes, floods, landslides, wildlife diseases, geomagnetism, storms and tsunamis, and other hazards. For each topic, the site offers selected links--primarily to U.S. Geological Survey Web pages--as well as a link to a "Fact Sheet" on the given subject.

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

Recognizing that they may have critical knowledge and expertise concerning disaster management, the Ericsson Corporation, specialists in advanced communication technology, have launched a major initiative to support disaster response worldwide. The company has stated, "As we have in the past, we will continue to provide communications aid. But we want to do more. To build knowledge about disasters and disaster response. To champion involvement of the global business sector in support of established relief organizations. To advance the development of new ideas and approaches to reducing human suffering caused by disasters." To further these goals, Ericsson has launched this highly interactive Web site, providing information and case studies, links to other resources, and various forums for exploring new ideas and options to improve response, lessons learned, and new technologies.

<http://www.helpage.org>

The United Nations High Commissioner for Refugees (UNHCR) estimates that on average 10% of refugees in humanitarian crises are over 60 years old, the majority being women. Based on research supported by the European Union and UNHCR, HelpAge (an international network of nonprofit organizations dedicated to improving the lives of older people) recently published an instructive guide focusing on this population--***Older People in Disasters and Humanitarian Crises: Guidelines for Best Practice***. The organization is making the document available in English, Spanish, Portuguese, and French, with the complete English version available from their Web site. The guidelines address priorities expressed by older people: basic needs (shelter, fuel, water), mobility, health care access, psychological/emotional issues, family contacts, and economic and legal concerns. For further information, or to obtain a copy of the guidelines, see the Web site above, or contact *HelpAge International*, 67-74 Saffron Hill, London EC1N 8QX, U.K.; tel: +44 20 7404 7201; fax: +44 20 7404 7203; e-mail: hai@helpage.org.

<http://members.spree.com/education/helpu>

<http://members.spree.com/education/helpu/maynews2000.html>

<http://members.spree.com/education/helpu/hurricanpage5.htm>

The HELPU Web site is intended to serve all members of the disabled community, their care-givers, attendants, fire and rescue personnel, and emergency services departments. The site offers *numerous* pages with tips on emergency/disaster preparedness for various hazards. For example, the May HELPU newsletter at the second URL above includes a "Hurricane Season Mitigation and Preparations Guide," available at the third address. Interested persons should also take a look at <http://members.spree.com/education/helpu/mitigationcalendar.html> for a "Mitigation and Preparation Scheduling Calendar."

<http://www.tallytown.com/redcross>

In support of FEMA's Project Impact and disaster reduction generally, the Mitigation and Community Disaster Preparedness Unit of the American Red Cross publishes a newsletter, *What's New--Mitigation and Preparedness Activities Across the Country*, which is available in PDF format from the Web site of Florida's Capital Area Chapter of the Red Cross. Click on the "News" button to obtain a list of downloadable issues.

<http://coe-dmha.org>

The Center of Excellence in Disaster Management and Humanitarian Assistance in Hawaii has completely revamped its Web site (including moving to the new address above). The new site lists the many training and education opportunities supported by the center, incorporates an on-line version of the Center's magazine *The Liaison*, and provides much other information about disaster management and humanitarian aid worldwide.

<http://www.dec.org.uk>

<http://www.unhcr.ch/evaluate/main.htm>

The Disasters Emergency Committee (DEC) and the United Nations High Commissioner for Refugees (UNHCR) have decided to make evaluations of their efforts publicly available via their Web sites. The DEC, an umbrella organization that launches and coordinates national appeals in Britain in response to major disasters overseas, is posting evaluations of all its appeals since 1998. The first, on response to Bangladesh floods in 1998, is on-line, and an evaluation of Hurricane Mitch response is due shortly. The UNHCR is posting all evaluation reports since 1996; earlier reports are available in hard copy.

<http://www.teraserver.microsoft.com>

Need a map? The Microsoft Corporation has scanned more than 57,000 U.S. Geological Survey topographic maps into digital form and made them available on the Web. Users can search for locations by place name or by zooming in on a world/U.S. map. The maps can be downloaded and printed for free. The data are primarily for the U.S., although a few other selected regions around the world are also displayed.

<http://atlas.gc.ca/>

<http://atlas.gc.ca/english/index.html>

Need a map of Canada? With hazards? Natural Resources Canada has published a new on-line edition of the Canadian National Atlas of Canada at the URL above. The atlas, available in French and English, includes extensive information about natural hazard occurrence in Canada, including data on earthquakes, floods, hurricanes, tornadoes, tsunamis, volcanic eruptions, landslides, hailstorms, and forest fires.

disastercom-request@disastercenter.com

The Disaster Center--a nexus of considerable disaster information--has established an e-mail list for discussion about improved ways of collecting and communicating information during and after disasters using the Internet. To subscribe to this list send an e-mail message to the address above with the single

word "subscribe" in the body of the message.

Severe Weather

<http://www.nws.noaa.gov/om/svrawar/svrwx.htm>

<http://www.nws.noaa.gov/om/winter/index.html>

<http://www.nws.noaa.gov/om/hazstats.htm>

<http://www.nws.noaa.gov/om/nwspub.htm>

The National Weather Service Office of Meteorology, a prodigious producer of Web-based hazards information, has created two new Web pages: a remodeled "Severe Weather Awareness Page" with information on thunderstorms, tornadoes, and floods; and a "Winter Weather Awareness Page" with links to awareness and preparedness guides, forecasts, warnings, outlooks, historical information, and a calendar of upcoming events and meetings. These pages are available at the first two addresses above.

The Office of Meteorology also recently released U.S. natural hazard statistics for 1998 at the third URL. Among the many significant numbers: 687 lives were lost to weather and flood-related hazards; 11,171 people were injured; and property and crop damage totaled \$16 billion. Extreme heat ranked as the number one weather-related killer, with 173 fatalities. Floods resulted in 136 deaths; tornadoes in 130. More than one-fourth of the damage was due to tropical storms and hurricanes.

The final address provides a list of the numerous publications available on-line or from the office. The newest include, *Saving Lives With an All-Hazard Warning Network*, a report that outlines the potential benefits of a national initiative to improve hazard warnings, and *Thunderstorms . . . Tornadoes . . . Lightning: Nature's Most Violent Storms--A Preparedness Guide*, which describes these meteorological hazards and tells what individuals, families, and schools can do to protect themselves when threatened. All National Weather Service publications listed are available for free and can be ordered from *your local National Weather Service office or National Weather Service Headquarters, attn: Publications, 1325 East West Highway, SSMC2, Room 14408, Silver Spring, MD 20910; (301) 713-0090, ext. 118.*

<http://www.noaanews.noaa.gov/stories/s334.htm>

At the end of last year, the climate and weather experts at the National Oceanic and Atmospheric Administration (NOAA) published yet another "Top [pick a number] List for the 20th Century"--this time, the top weather, water, and climate events. In fact, NOAA published two lists--one for the U.S. and one for the world. Together they provide students of meteorological disasters a good overview of the diverse storms and climate events that shaped our world this century--from the Galveston Hurricane of 1900 to the Oklahoma/Kansas tornado outbreak in 1999; from the great China floods of 1931 to Hurricane Mitch in Central America in 1998. Some factors taken into consideration in preparing the lists included an event's magnitude, its meteorological uniqueness, and its economic impact and death toll. Beyond the lists, this site also provides extensive background information on the named disasters, as well as other meteorological and disaster information.

<http://www.comet.ucar.edu/resources/cases>

The Cooperative Program for Operational Meteorology Education and Training (COMET--see the *Observer*, [Vol. XXIII, No. 1, p. 13](#)) provides materials, including numerous Web-based case studies, for the education of meteorologists and other hazards professionals. The program has recently added studies of the May 1999 Oklahoma/Kansas tornado outbreak, Hurricane Floyd, severe rain and flooding in Kansas in October 1999, and an outbreak of severe weather in the Northeast in June 1998. More than 20 case studies are now available. Interested persons can stay informed of the latest developments in the COMET case study project by subscribing to the COMET mailing list; for details, see <http://www.joss.ucar.edu/cometCases>.

<http://www.srh.noaa.gov/oun/papers/overpass.html>

This URL provides a paper prepared by National Severe Storms Laboratory and National Weather Service personnel on the effectiveness of using the undersides of highway overpasses as shelters from tornadoes and other severe storms. The authors conclude that the public has wrongly identified such areas as appropriate shelters (in fact, they are extremely dangerous places in which to hide) and that public education about tornado/severe-storm safety should specifically point out the danger of such shelters.

Hurricanes and Coastal Hazards

<http://state-of-coast.noaa.gov>

In 1996, Vice President Al Gore challenged federal agencies to develop a "report card" on the state of the nation's environment. In response, the National Oceanic and Atmospheric Administration (NOAA) created the *State of the Coast Report* provided at this Web site. The foundation of the report is a series of essays on important coastal issues, two of which are entitled "Population at Risk from Natural Hazards" and "Reducing the Impacts of Coastal Hazards." These thorough articles include overviews of the problem of coastal hazards nationally, regional analyses, specific case studies, interviews with experts, suggested readings and references, and glossaries.

Earthquakes

<http://www.nycem.org/default.asp>

Recognizing the poor condition of the area's infrastructure and the lack of prior planning, a group of concerned organizations has banded together to form the New York Consortium for Earthquake Loss Mitigation (NYCEM--see the *Observer*, [Vol. XXIII, No. 3, p. 4](#)). The group is developing a detailed seismic vulnerability study of the New York City region, which (surprisingly to some) has been assessed by the U.S. Geological Survey as moderately susceptible to earthquakes. Sponsored principally by the Federal Emergency Management Agency and coordinated by the Multidisciplinary Center for Earthquake Engineering Research, the consortium has as its primary aim the promotion of action by businesses, government, and other organizations to reduce possible damage and loss due to earthquakes and other natural hazards. The initial objective for 1999 was to determine risk in Manhattan below 59th

Street. In the future, the project will examine seismic hazards in other parts of the city and northern New Jersey. The NYCEM Web site provides background information on the project, a description of current research and education/outreach efforts, and several on-line technical documents, including an extensive bibliography on the economic effects of disasters on the New York City area.

<http://www.scec.org/instanet>

The Southern California Earthquake Center (SCEC) recently launched "SCEC INSTANeT News," an e-mail/Web-based service that provides weekly coverage of earthquake research and news. A SCEC INSTANeT article is announced via e-mail in the form of a short summary, with a link to the complete article, commentary, interview, announcement, event description, etc. available from the Web site above. The SCEC INSTANeT News service replaces the *SCEC Quarterly Newsletter*. Subscription instructions for the INSTANeT News e-mail list are available at <http://www.scec.org/instanet/subscribe.html>.

listserv@listserv.buffalo.edu

The Northeast States Emergency Consortium (NESEC), in partnership with the Multidisciplinary Center for Earthquake Engineering Research (MCEER) and the Federal Emergency Management Agency (FEMA), has created an e-mail list called HAZUSNET-USA as a discussion forum for persons interested in HAZUS, FEMA's hazard evaluation software program. HAZUSNET-USA is an unmoderated discussion group open to anyone. The list includes announcements of upcoming events, new publications, and other resources; stories; questions; ideas; and other material related to HAZUS. To subscribe, send a message to the e-mail address above; leave the subject line blank and send only the message: *sub hazusnet-usa-list <your first and last names>*. For more information, consult the NESEC Home Page: <http://www.nesec.org>.

Tsunamis

<http://www.nerc-bas.ac.uk/tsunami-risks/>

The Tsunami Risks Project, based in the U.K., was launched to introduce the British insurance industry to the risks posed by tsunamis and to quantify tsunami hazards by determining frequency-magnitude distributions and direct and indirect insurance risks. The project is currently examining subjects ranging from how tsunamis are generated and how they propagate across the oceans, to the mechanisms by which they cause damage when they make landfall, the means by which disaster planning can reduce the economic losses that result, and the sources of postdisaster information and mapping that can be consulted to validate tsunami-related insurance claims. The project's Web site provides details about this initiative, as well as an interactive map with accompanying articles about historic tsunami disasters of the world; a "Risk Atlas"--another interactive map showing tsunami risk around the world; a case study of the 1964 Alaska earthquake and tsunami; an extensive report by A.G. Dawson entitled, *Tsunami Risk in the North Atlantic Region*; a bibliography; and an index of related Web sites.

Floods

<http://ks.water.usgs.gov/Kansas/pubs/fact-sheets/fs.024-00.html>

Not to be outdone by NOAA (see the description above of <http://www.noaanews.noaa.gov/stories/s334.htm>), in March of this year, the U.S. Geological Survey (USGS) issued a fact sheet entitled ***Significant Floods in the United States During the 20th Century--USGS Measures a Century of Floods***, by Charles A. Perry. According to Perry, during the 20th century, floods were the number one disaster in the United States, both in terms of lives lost and property damage. Since 1900 flooding has killed more than 10,000 people, and property damage from flooding now totals over \$1 billion a year. The fact sheet discusses 32 significant floods that occurred during the 20th century. These events are broken down into six types: large regional floods, flash floods, storm surge, ice-jam floods, dam and levee failures, and mudflows. The USGS agrees with NOAA, naming the flood in Galveston, Texas, brought on by the September 1900 hurricane, as the worst of the century. Besides examining these disasters, this Web site describes the Survey's efforts to measure floods and lists additional sources of flood information on the Internet. Printed copies of Fact Sheet #024-00 are available from the *USGS, Information Services, Box 25286, Federal Center, Denver, CO 80225-0286; (888) 275-8747*.

<http://www.egroups.com/group/Floodsystems>

A new Internet list has been established for professionals involved in flood warning. The free "Floodsystem" listserv is distributed via e-mail and offers a convenient way of posing a technical question or posting information to a large number of people in the profession. To obtain more information or to subscribe, see the Web site above.

<http://www.egroups.com/group/waterforum>

"WaterForum" is a free and open forum for discussion of surface water and groundwater issues. Topics include drinking water, water conservation, environmental chemistry, wetlands, wastewater, irrigation, recreational uses, fisheries and wildlife, aquaculture, coastal issues, oceanography, environmental and public health issues, contamination/remediation, computer modeling, climatology, flooding, and any other relevant water resources topics. WaterForum seeks a broad range of members from academia, industry, government, and the general public, as well as wide ranging geographic diversity, to ensure an interesting and helpful forum. To join, simply send a blank e-mail to waterforum-subscribe@eGroups.com, or consult the Web site above.



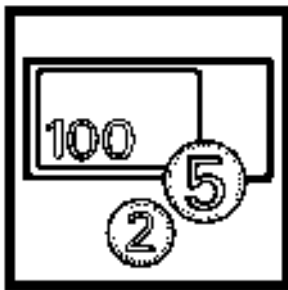
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Contracts and Grants

Below are descriptions of recently awarded contracts and grants for the study of hazards and disasters. An inventory of contracts and grants awarded from 1995 to the present (primarily those funded by the National Science Foundation) is available on the Natural Hazards Center's Web site: <http://www.colorado.edu/hazards/grants.html>.

Understanding Damaging Floods in the United States: Data Reanalysis and Correlation with Precipitation Trends. Funding: National Oceanic and Atmospheric Administration-OGP Programs on Climate Change Data and Detection, Economics, and Human Dimensions of Climate Fluctuations, and GEWEX Continental Scale International Project; \$150,000; 24 months. Principal Investigator: *Roger A. Pielke, Jr., Environmental and Societal Impacts Group, National Center for Atmospheric Research, P.O. Box 3000, Boulder, CO 80307-3000; (303) 497-8117; fax (303) 497-8125; e-mail: rogerp@ucar.edu; WWW: <http://www.esig.ucar.edu>.*

Despite extensive efforts over several decades to reduce the damaging impacts of floods in the U.S., losses (adjusted for inflation) have increased markedly in recent years. This project will create an improved historical flood-loss dataset that will involve re-analyzing NOAA flood damage information to determine estimated flood losses for each state in the conterminous U.S., identify river basins or large watershed areas for which it may be possible to construct a flood-loss time series, and evaluate the quality of available data. In addition, the project will identify precipitation measurements related to damaging floods and will delineate social and economic factors that are major contributors to flood losses. Finally, it will use the data to estimate the contributions of socioeconomic and weather-related factors to flood damage.

Training Program for Disaster Medical Assistance Teams (DMATs). Funding: U.S. Public Health Service, Office of Emergency Preparedness; \$2.4 million; 48 months. Recipient: *Department of Emergency Health Services, Academic IV Building, Room 316, University of Maryland-Baltimore County, 5401 Wilkens Avenue, Baltimore, MD 21250; (410) 455-6241; WWW: <http://ehs.umbc.edu>.*

DMATs are composed of professional and paraprofessional medical personnel that provide emergency medical care during a disaster or other event. These teams are part of the federally coordinated National Disaster Medical System, which assists states and local governments in dealing with the medical aspects

of such incidents. The grant recipient will develop and deliver training to an estimated 6,500 DMAT personnel, covering topics ranging from basic team management to technical and medical applications in a disaster situation. The first training materials will be available on the World Wide Web in the fall of 2000.

Initial Planning Study for Earthquake Risk Reduction. Funding: City and County of San Francisco Department of Building Inspection, 24 months. Principal Investigator: *Charles Scawthorn, Applied Technology Council (ATC), 555 Twin Dolphin Drive, Suite 550, Redwood City, CA 94065; (650) 595-1542 or (510) 817-3153; fax: (650) 593-2320; e-mail: atc@atcouncil.org; WWW: <http://www.atcouncil.org>.*

This project will develop a "Community Action Program for Seismic Safety" for the City and County of San Francisco. Tasks include reviewing the seismic risk reduction programs of other cities, suggesting requirements for postearthquake repairs, examining current earthquake retrofit standards, adapting the guideline, *ATC-20 Post Earthquake Evaluation of Buildings*, to the specific needs of San Francisco, and developing a comprehensive estimate of the earthquake risk to that city.

Taiwan Earthquake Reconnaissance. Funding: National Science Foundation, \$14,999, 12 months. Principal Investigator: *Steven L. Kramer, Department of Civil and Environmental Engineering, 265 Wilcox Hall, University of Washington, Seattle, WA 98195; (206) 685-2642 or (206) 685-1024; fax: (206) 685-3836; e-mail: kramer@u.washington.edu.*

A magnitude 7.6 earthquake occurred on September 21, 1999, about 90 miles south of Taipei, Taiwan, resulting in extensive damage, injuries, and loss of life. The fault rupture occurred in heavily developed areas, causing considerable damage to major transportation and river control structures, and triggering hundreds of landslides, including several that were catastrophic. This funding will support a coordinated industry-academia reconnaissance team to document the features of this quake, particularly its impacts on urban infrastructure. This is a multi-institutional award that includes the University of California-Berkeley and the University of Southern California.

Geotechnical Earthquake Engineering Reconnaissance of the August 17, 1999, Izmit Earthquake. Funding: National Science Foundation, \$22,000, 12 months. Principal Investigator: *Jonathan D. Bray, Department of Civil and Environmental Engineering, 437 Davis Hall, MC 1710, University of California, Berkeley, CA 94720-1710; (510) 642-9843; e-mail: bray@ce.berkeley.edu.*

About one month before the above-mentioned Taiwan quake, a magnitude 7.4 earthquake struck in the area of Izmit, Turkey, also causing extensive damage and loss of life. This funding provides partial support for a reconnaissance team dispatched shortly after the quake to document the geotechnical, engineering, geological, seismological, and tsunamigenic features. The team coordinated its activities with other reconnaissance efforts from Turkey, Japan, and the U.S. The award also provides funding to the University of California-Berkeley and University of Southern California.

The Efficiency Gains from Probabilistic Weather Forecasts: A Case Study of Oil and Gas Producers in the Gulf of Mexico. Funding: U.S. Weather Research Program (National Science Foundation, National Oceanic and Atmospheric Administration, National Aeronautics and Space

Administration, and Office of Naval Research); \$118,000, six months. Principal Investigators: *Timothy J. Considine and Craig Bishop, Department of Mineral Economics, College of Earth and Mineral Sciences, Pennsylvania State University, 0221 Walker Building, University Park, PA 16802; (814) 863-0810; e-mail: cpw@psu.edu.*

Considine and Bishop will examine the value of hurricane forecasts to crude oil and natural gas producers in the Gulf of Mexico. The threat of hurricanes often forces producers to temporarily halt production and evacuate offshore drilling rigs. Thus, the potential gains from improving hurricane forecasts may be substantial, perhaps approaching \$150 million a year. Using probabilistic hurricane forecasts issued by the National Hurricane Center over the past 10 years, the investigators will employ a decision model that takes into account the costs of protective actions, the potential losses of inaction, and functions of forecasts and weather conditions.

Preparing and Publishing the Report on the Great Tangshan Earthquake. Funding: National Science Foundation, \$20,000, 12 months. Principal Investigator: *George W. Housner, California Institute of Technology, Department of Engineering and Applied Science, M/C 104-44, Pasadena, CA 91125; (626) 395-4226.*

One of the worst earthquake disasters in history occurred in Tangshan, China, in the 1970s, causing several hundred thousand deaths and the destruction of Tangshan itself. So far, only one report has been issued in China, and no detailed account of this quake has ever been published in English. In a collaborative effort, that report has been translated into English and edited at the California Institute of Technology. This grant will fund the preparation of this report for publication in the U.S. and distribution to libraries at universities and cities at risk for earthquakes. Excerpts of the report will also be published in suitable journals.

ISDR Establishes Inter-Agency Task Force for Disaster Reduction

The United Nation's International Strategy for Disaster Reduction (ISDR) Secretariat is establishing an Inter-Agency Task Force for Disaster Reduction as directed last year by the U.N. Secretary-General in a report to the General Assembly (#A/54/497). The ISDR is the U.N.'s program to succeed the International Decade for Natural Disaster Reduction (IDNDR) (see the *Observer*, [Vol. XXIV, No. 4, p. 9](#)). The primary functions of the task force are:



- To serve as the main forum within the U.N. system for reducing natural hazards;
- To identify gaps in disaster reduction policies and programs and recommend remedial action;
- To ensure complementary action by agencies involved in disaster reduction;
- To guide policies of the ISDR Secretariat; and
- To convene meetings of experts on issues related to disaster reduction.

The task force is chaired by the U.N. undersecretary general for humanitarian affairs; the director of the ISDR Secretariat acts as secretary. Members are appointed for two years and include eight representatives of U.N. organizations; eight representatives of civil society and nongovernmental organizations; and six representatives from regional entities.

In April, the task force convened for the first time in Geneva and identified areas that it will address:

- El Niño/La Niña;
- Early warning and vulnerability indicators;
- The quantification of the impacts of future disasters and insurability, and measuring the economic and environmental costs of disasters;
- Disaster reduction within sustainable development;
- The application of science and technology in disaster prevention, information technology, and telecommunications; and
- Capacity building in developing countries.

The task force agreed to establish three subgroups--on El Niño and La Niña; early warning and vulnerability indicators; and quantification of disaster impacts as justification for investment in prevention--and it is examining whether additional subgroups are warranted. The group also asked the ISDR Secretariat to work on creating and strengthening the network of national committees for ISDR.

Additional information about the ISDR Inter-Agency Task Force for Disaster Reduction can be obtained from the *ISDR Secretariat, Palais des Nations, CH-1211 Geneva 10, Switzerland; tel: (41-22) 917-9000; fax: (41-22) 917-9098 or 917-9099; e-mail: idndr@dha.unicc.org; WWW: <http://www.unisdr.org>* . (Note: this new Web site provides background information on the ISDR; a list of events; on-line versions of the ISDR *Highlights* newsletter; descriptions of various ISDR programs; and numerous reports, tools, brochures, and other U.N. documents.)

Adapted from *International Strategy for Disaster Reduction--ISDR Highlights, March 2000, Vol. III, Issue 3.*



Conferences and Training

Below are some of the more recent conference announcements received by the Natural Hazards Center. A comprehensive list of hazard/disaster meetings is posted on our World Wide Web site: <http://www.colorado.edu/hazards/conf.html>.

Postponed: This course will now be held in the summer of 2001: *Advanced Summer Course on Public Health and Humanitarian Aid*. Offered by: Centre for Research on the Epidemiology of Disasters (CRED). Brussels, Belgium: Originally scheduled for July 17-28, 2000. For details, contact CRED, School of Public Health, Catholic University of Louvain, 30.94 Clos Chapelle-aux-Champs, 1200 Brussels, Belgium; tel: +32-2-764-3327; fax: +32-2-764-3441; WWW: <http://www.cred.be>.

Health Emergencies in Large Populations (HELP) Course. Organizers: International Committee of the Red Cross (ICRC) and numerous local sponsors. With the aid of the University of Geneva and the World Health Organization, the ICRC created the HELP course to educate professionals regarding public health needs and issues in emergency situations. Offered for the first time in 1986, the course has always been open to any organization or institution working in this area. To date over 50 HELP courses have been conducted around the world, training more than 1,000 health professionals. Currently scheduled courses include:

- Honolulu, Hawaii: July 17-August 4, 2000. WWW: <http://coe-dmha.org>.
- Cuernavaca, Mexico: September 25-October 13, 2000. E-mail: cicr@intranet.con.mx.
- Pretoria, South Africa: November 13-December 1, 2000. E-mail: maritzc@postillion.up.ac.za.
- Lome/Togo: Around November (dates not yet decided). Contact the ICRC at the address below.
- Melbourne, Australia: March 19-April 6, 2001. E-mail: azogopou@nat.redcross.org.au.

For general information about the HELP course and to obtain a current schedule, contact the ICRC, GEN_SAN Help Courses, 19, avenue de la Paix, 1202 Geneva, Switzerland; +41 22 730 28 10; fax: +41 22 733 96 74; e-mail: pperrin.gva@icrc.org; WWW: <http://www.icrc.org>.

Association of Contingency Planners (ACP) International Symposium: "Planning for the Inevitable." Seattle, Washington: August 14-16, 2000. The 2000 ACP symposium will examine five phases of disaster (planning, mitigation, response, recovery, and reconstruction) in six categories of risk (general,

geophysical, weather, cyberspace, terrorism, and other). For more information, contact: *Washington State-Pacific Northwest Chapter, ACP, P.O. Box 1144, Renton, WA 98057; (425) 865-2797.*

XXVII General Assembly of the European Seismological Commission. Lisbon, Portugal: September 10-15, 2000. To host its 2000 General Assembly, the European Seismological Commission has aptly chosen Lisbon, the site of the great earthquake, tsunami, and fire of 1755. The assembly will examine all aspects of seismology, from earthquake source physics, to prediction research, to engineering seismology. More information is available from the *Conference Secretariat, XXVII General Assembly of the European Seismological Commission, Rua da Escola Politécnica, 58, 1269-102 Lisbon, Portugal; tel: +351 21 3970892; fax: +351 21 3953327; e-mail: esc2000@fc.ul.pt; WWW: <http://www.igidl.ul.pt/esc2000/>.*

Virtual Fire and Rescue Expo (VFRE) 2000. On the Internet: September 11-22, 2000. Sponsor: National Fire & Rescue magazine. The VFRE includes sessions on emergency management, emergency medicine, hazmat response, and other related issues. To learn more or to participate, see: <http://www.vfre.com>.

Emergency Medical Preparedness Educational Symposium. Sponsors: U.S. Department of Veterans Affairs in conjunction with the Emergency Management Strategic Healthcare Group and others. Albany, New York: September 18-21, 2000. In the five years that this symposium has been held, it has grown from a regional program to an international meeting. This year's symposium will focus on an "all hazards" approach to emergency preparedness, response, and recovery. Additional information is available from *Paul D. Kim, Area Emergency Manager, Emergency Management Strategic Healthcare Group, VAMC ALBANY (00D), 113 Holland Avenue, Albany, NY 12208; (518) 462-3311, ext. 2364; fax: (518) 462-2519; e-mail: Paul.Kim@med.va.gov; or Carolyn Burton, (207) 623-5744.*

First International Course on Urban Flood Mitigation. Offered by: Asian Disaster Preparedness Center (ADPC). Bangkok, Thailand: September 18-29, 2000. ADPC provides comprehensive training, consultation, research, and information services concerning disaster management for the countries of Asia and the Pacific. This, the center's first international course on urban flooding, will include classroom sessions presented by world experts in flood mitigation as well as participatory exercises and field excursions. More information is available from the *Training and Education Division, ADPC, Asian Institute of Technology, P.O Box 4 Klong Luang, Pathumthani 12120, Thailand; tel: (66 2) 5245362 or 5245363; fax: (66 2) 5245360; e-mail: tedadpc@ait.ac.th; WWW: <http://www.adpc.ait.ac.th>.*

EMS Summit: Knowledge Management in EMS. Presented by: Florida Emergency Medicine Foundation and Sunstar Emergency Medical Services. Clearwater Beach, Florida: September 28-29, 2000. This conference will focus on data management and the use of technology in emergency medical systems (EMS). Specifically, it will address quality management, adult education, clinical management, and EMS operations. The organizers will provide information about how data can be acquired, manipulated, and applied; and about the training necessary to optimize the use of information and technology in EMS. Details are available from the *Florida Emergency Medicine Foundation, 3717 South Conway Road, Orlando, FL 32812; (800) 766-6335; (407) 281-7396; fax: (407) 281-4407; WWW: <http://www.fcep.org>.*

"Disasters: Who Cares?" Sponsors: Cleveland Emergency Planning Unit and others. Wynyard Park, U.K.: October 5, 2000. This conference is dedicated to exploring the psychosocial impact of major incidents and disasters. For further information, contact *Chris Samuel, Cleveland Emergency Planning Unit, P.O. Box 194, Middlesbrough, U.K.; tel: +44-1642-221121; e-mail: christopher.samuel@hartlepool.gov.uk.*

First International Global Disaster Information Network (GDIN) Information Technology Exposition and Conference. Honolulu, Hawaii: October 9-11, 2000. The GDIN is a major national and international effort to coordinate and enhance the use of various advanced information technologies and technologically derived information (from satellite imagery to geographic information systems) via the Internet to improve disaster response worldwide (see [p. 12](#) of this *Observer*). Sessions will address emergency management information needs and applications, data resources, networking technologies, funding strategies, information analysis and assessment, and many other aspects of the use of advanced information technology to mitigate and respond to disasters. For more information contact *Peter Colvin, GDIN Information Technology Conference, c/o ERIM International, P.O. Box 134008, Ann Arbor, MI 48113-4008; (734) 994-1200, ext. 2438; e-mail: pcolvin@erim-int.com; WWW: <http://www.erim-int.com/CONF/GDIN.html>.*

Third Meeting of the Asian Seismological Commission and Symposium on Seismology, Earthquake Hazard Assessment, and Earth's Interior Related Topics. Sponsors: Asian Seismological Commission, International Association of Seismology and Physics of the Earth's Interior, and Ministry of Culture and Higher Education of Iran. Tehran, I.R. Iran: October 10-12, 2000. Beyond the meeting and symposium, this conference includes a pre-symposium international training course on "Seismology and Mitigation of Seismic Disaster," and post-symposium field trips and technical workshops on "Educating the Public about Earthquake Hazard and Risk" and "Seismic Networks and Site Selection." The official language of the meeting will be English. More information is available on the World Wide Web at <http://www.ut.ac.ir/geo/asc2000.htm>; or contact the *Organizing Secretary, ASC2000, Institute of Geophysics, Tehran University, P.O. Box 14155-6466, Tehran, I.R. Iran; tel: +98-21-8027009; fax: +98-21-8009560; e-mail: ascloc@chamran.ut.ac.ir.*

13th Annual Emergency Preparedness Conference. Sponsors: Emergency Planners and Managers Association of British Columbia and others. Vancouver, British Columbia, Canada: October 17-19, 2000. The goal of this meeting is "to raise the level of emergency preparedness and make the world a safer place by: promoting awareness; providing information, tools, and solutions to problems; sharing experiences; showcasing technologies; and creating networking opportunities." It includes a preconference workshop on October 16 on the functions of an emergency operations center, tours, four extended workshops, numerous plenary and concurrent sessions, and an exhibit area. Further information is available by contacting the *Emergency Preparedness Conference, 700 West 57th Avenue, Vancouver, BC, Canada V6P 1S1; (604) 322-8365; fax: (604) 322-8359; e-mail: ccox@vanhosp.bc.ca; WWW: <http://epma.bc.ca/epc/>.*

Combined Humanitarian Assistance Response Training (CHART). Offered by: Center of Excellence in Disaster Management and Humanitarian Assistance (CEDMHA). Honolulu, Hawaii: October 18-24, 2000; San Antonio, Texas: November 13-17, 2000. CEDMHA's CHART program is an introductory course designed to furnish military and civilian agency members with basic information about humanitarian emergencies in the international arena. The overall intent is to prepare graduates to carry out humanitarian missions in major complex emergencies. For a course description, see the CEDMHA Web site: <http://www.coe-dmha.org>, or contact the *Center of Excellence in Disaster Management and Humanitarian Assistance, c/o Tripler Army Medical Center, 1 Jarrett White Road (MCPA-DM), Tripler AMC, HI 96859-5000; (808) 433-7035; fax: (808) 433-1757; e-mail: pr@coe-dmha.org.* To register for a course, contact *Lt. Jessie Gee, Defense Medical Readiness Training Institute, MCCA-TEV, 1706 Stanley Road, Building 2263, Ft. Sam Houston, TX 78234-6100; (210) 221-9523; fax: (210) 221-9061; e-mail: jgee@dmrti.army.mil.*

Fifth Annual Conference on Crises and Disasters. Organized by the Crisis Research Unit, Ain Shams University. Cairo, Egypt: October 28-29, 2000. This conference is considered unique in the Arab World; it provides Arabic-speaking researchers and disaster managers an opportunity to examine the entire spectrum of natural- and human-caused disasters and to discuss issues ranging from effects on manufacturing to political and legal issues. Simultaneous English translation will be provided if warranted. A request for presentations has been issued and papers are due July 31, 2000. For details, contact *Mohamed Rashad Elhamalawy, Crisis Research Unit, Faculty of Commerce, Ain Shams University, Cairo, Egypt 11566; tel: (202) 4049260/2609167; fax: (202) 4049259; e-mail: cruegypt@hotmail.com.*

Disaster Forum 2000. Sponsors: Emergency Preparedness Canada and others; offered by: Disaster Forum Association. Edmonton, Alberta, Canada: November 1-4, 2000. Disaster Forum 2000 offers preconference workshops; plenary speakers on such topics as building resilient communities, the media's perspective on disasters, Y2K, lessons learned from the Swiss Air Flight 111 disaster, and international cooperation in disasters; and concurrent sessions that cover a *broad* range of disaster concerns--from the use of the Internet in disaster management to "livestock emergency response." For much more information, see the conference Web site: WWW: <http://www.edmc.net/disaster>, or contact *Disaster Forum Association, 11215 Jasper Avenue, Suite 437, Edmonton, Alberta, Canada T5K 0L5; (780) 427-8626; fax: (780) 422-1549; e-mail: disaster@edmc.net.*

American Water Resources Association (AWRA) Annual Conference. Miami, Florida: November 6-9, 2000. The AWRA annual conference always covers a wide range of aqueous topics, but given this year's venue (Miami), there will be a particular focus on coastal and estuarine issues. For details, contact *AWRA, 4 West Federal Street, P.O. Box 1626, Middleburg, VA 20118-1626; (540) 687-8390; fax: (540) 687-8395; e-mail: info@awra.org; WWW: <http://www.awra.org>.*

26th Course on Disaster Management. Offered by: Asian Disaster Preparedness Center (ADPC). Bangkok, Thailand: November 6-24, 2000. The Course on Disaster Management is the cornerstone of

ADPC's professional development program for disaster managers in the Asia/Pacific region. The curriculum, which has evolved over 15 years, provides the basic concepts, tools, and skills of emergency management through lectures, group exercises, individual projects, field trips, and other participatory programs. Details are available from the *Learning and Professional Development Program, ADPC, Asian Institute of Technology, P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand: tel: 66 2 524 5378/5354; fax: 66 2 534 5360; e-mail: lpdadpc@ait.ac.th; WWW: <http://www.adpc.ait.ac.th>.*

Fire Conference 2000: The First National Congress on Fire Ecology, Prevention, and Management. Presented by: International Association of Wildland Fire and others. San Diego, California: November 27-December 1, 2000. Wildfire management is being increasingly recognized as a critical and complex component of resource management and land-use planning. This conference will bring together fire researchers, managers, professionals and other experts in the field to examine both the overarching issues and specific needs and problems in fire management. The primary goal is to increase communication among the various government, nonprofit, and business organizations dealing with wildland fire problems. More information and/or a conference brochure are available from *Sandra Cooper, University Extension, UC Davis, 1333 Research Park Drive, Davis, CA 95616-4852; (530) 757-8948; e-mail: scooper@unexmail.ucdavis.edu; WWW: <http://www.universityextension.ucdavis.edu/fire/>.*

Coastal GeoTools. Sponsored by: National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center. Charleston, South Carolina: January 8-11, 2001. This conference is designed to enhance participants' ability to use geospatial data, tools, and technology, including geographic information systems, the Internet, remote sensing, metadata, and global positioning systems. Among others, areas to be addressed include hazard mitigation and shoreline erosion. For a conference flier, contact the *NOAA Coastal Services Center, 2234 South Hobson Avenue, Charleston, SC 29405-2413; (843) 740-1200; WWW: <http://www.csc.noaa.gov/GeoTools/>.*

CPM [Contingency Planning and Management] 2001. Sponsor: Contingency Planning and Management magazine. Boston, Massachusetts: April 24-25, 2001. This annual conference and exhibition on business continuity provides an educational opportunity for any individual charged with developing, maintaining, or implementing an organization's business continuity plan. The organizers are currently seeking speakers and presenters. For more information, contact the *Alicia LoVerso, Conference Coordinator, WPC Expositions, 84 Park Avenue, Flemington, NJ 08822; (908) 788-0343, ext. 154; fax: (908) 788-9381; WWW: <http://www.ContingencyPlanExpo.com>.*

Seventh National Watershed Conference. Sponsor: National Watershed Coalition. Richmond, Virginia: May 20-23, 2001. The theme of this conference, "Small Watershed Programs: Past, Present, and Future," reflects the need for the sponsors of local watershed projects to be increasingly knowledgeable and innovative if their projects are going to succeed. It also recognizes the multiobjective nature of such programs, whose purposes include flood damage reduction, erosion and sediment control, drainage, irrigation, recreation, fish and wildlife habitat development, water quality improvement, water supply, water conservation, watershed restoration, and groundwater recharge. Considering this theme, abstracts for oral and poster papers will be accepted in the following categories:

- Innovative funding
- Effect of changing government roles
- Infrastructure concerns
- Case histories
- Creating new partnerships
- Water quality in old projects
- Political and legal issues
- Application of new technology

Abstract deadline is October 1, 2000. More information is available from *John W. Peterson, National Watershed Coalition, 9304 Lundy Court, Burke, VA 22015-3431; (703) 455-6886; fax: (703) 455-6888; e-mail: jwpeterson@erols.com.*

Eighth International Conference on Structural Safety and Reliability (ICOSSAR '01). Organized by: International Association for Structural Safety and Reliability. Newport Beach, California: June 17-22, 2001. This conference will include sessions on hazards analysis, earthquake engineering, wind engineering, and other hazards-related issues. For details, contact the *ICOSSAR '01 Secretariat, University of Colorado, College of Engineering and Applied Science, Campus Box 422, Boulder, CO 80309-0422; (303) 492-7006; fax: (303) 492-0353; e-mail: corotis@colorado.edu, or icossar@usc.edu; WWW: <http://www.colorado.edu/engineering/ICOSSAR>.*

International Tsunami Symposium 2001 (ITS 2001). Sponsors: National Oceanic and Atmospheric Administration/Pacific Marine Environmental Laboratory (NOAA/PMEL) and others. Seattle, Washington: August 7-10, 2001. The aim of this symposium is to bring together scientists, engineers, and emergency managers from all over the world specializing in tsunami research and mitigation. They will exchange current information on technical advances and discuss other progress in the science. The symposium will cover all aspects of tsunami phenomena, such as tsunami generation, propagation, and seismic focus; tsunami prediction and simulation; tsunami disasters and mitigation; instrumentation and observation; tsunami warning and preparedness; and tsunami databases. Abstracts should be submitted on-line or by e-mail not later than September 1, 2000. See <http://www.pmel.noaa.gov/its2001> for complete instructions and additional information; or contact: *E.N. Bernard, NOAA/PMEL, 7600 Sand Point Way N.E., Seattle, WA 98115-6349; (206) 526-6800; fax: (206) 526-4576; e-mail: bernard@pmel.noaa.gov.*

Third International Symposium on Earthquake Resistant Engineering Structures (ERES 2001). Malaga, Spain: September 4-6, 2001. The problems of protecting the built environment can be divided into two parts: the upgrading or rehabilitation of existing structures and the optimal design and construction of new facilities. This conference will examine both issues, focusing on research problems that still exist in earthquake engineering. A call for papers has been issued, and abstracts are due January 3, 2001. More information is available from *Susan Hanley, Conference Secretariat, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, U.K.; tel: 44-0-238-029-3223; fax: 44-0-238-029-*

2853; e-mail: shanley@wessex.ac.uk; WWW: <http://www.wessex.ac.uk/conferences>.

Fifth Asia-Pacific Conference on Wind Engineering (APCWE V). Kyoto, Japan: October 21-26, 2001. APCWE V will address important current research and technology in wind engineering. Among the many topics to be examined are wind hazards, disaster mitigation and insurance, codes and regulations, and environmental issues. Abstracts are due December 31, 2000. For a complete conference announcement, contact *APCWE V Secretariat, Department of Global Environment Engineering, Kyoto University, Yoshida Honmachi, Sakyo-ku, Kyoto 606-8501, Japan; fax: +81-75-761-0646; e-mail: apcwe5@brdgeng.gee.kyoto-u.ac.jp; or see <http://wwwsoc.nacsis.ac.jp/jawe/apcwe5>.*

NWS/FEMA Offer EM Classes

The National Weather Service (NWS) and Federal Emergency Management Agency (FEMA) have together produced four courses for emergency managers:

- *G365.3: Partnerships for Creating and Maintaining Spotter Groups*
- *G272: Hazardous Weather and Flood Preparedness* -- FEMA's *Hazardous Weather and Flooding Preparedness Resource Guide*, supporting this course, is available on the Web at <http://www.fema.gov/library/toc.doc>.
- *G273: Warning Coordination*
- *IS324: Community Hurricane Preparedness* -- this course is available on the Web at <http://meted.ucar.edu/hurricane/chp/index.htm>.

For more information about these courses, contact *John Ogren, (301) 713-0090, ext. 140; e-mail: john.ogren@noaa.gov*. Courses are taught through individual state emergency management training offices. To schedule a course, interested persons should therefore contact their state training office or the warning coordination meteorologist of the National Weather Service that serves their area.

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Recent Publications

Below are summaries of some of the recent, more useful publications on hazards and disasters received by the Natural Hazards Center. A complete bibliography of publications received from 1995 through 2000 is posted on our World Wide Web site: <http://www.colorado.edu/hazards/bib/bib.html>.

All Hazards

1999 Partnerships Annual Report. 2000. 62 pp. Free. To obtain a copy, contact the Federal Emergency Management Agency (FEMA), Publications Distribution Facility, P.O. Box 2012, Jessup, MD 20794-2012; (800) 480-2520.

This report describes activities undertaken in 1999 by the Preparedness, Training, and Exercises Directorate of FEMA. Among the many achievements of the past year were the implementation of the federal Tribal Policy (see the *Observer*, [Vol. XXIII, No. 4, p. 8](#)), receipt of awards for EENET broadcasts, progress in its Higher Education Project (see the *Observer*, [Vol. XXIV, No. 5, p. 6](#)), creation of the national Comprehensive HAZMAT Emergency Response Capability Assessment Program, and preparation of its *Partnerships in Preparedness: A Compendium of Exemplary Practices in Emergency Management* (Vol. IV).

NFPA 1600: Standard for Disaster Emergency Management. 2000 Edition. 16 pp. \$18.25, NFPA members; \$20.25, nonmembers. Available from Customer Sales, National Fire Protection Association (NFPA), 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; (800) 344-3555 or (617) 770-3000; fax: (800) 593-6372 or (508) 895-8301; e-mail: custserv@nfpa.org; WWW: <http://www.nfpa.org>.

Recently, we mentioned the approval of NFPA 1600, a common set of criteria for disaster management, emergency management, and business continuity programs established by the members of the National Fire Protection Association (NFPA) (see the *Observer*, [Vol. XXIV, No. 3, p. 10](#)). The NFPA recently made printed copies of this standard available. Specific subjects addressed in NFPA 1600 include laws and authorities; hazard identification and risk assessment; hazard mitigation; resource management; planning; strategic plans; emergency operations plans; mitigation plans; business impact analysis; recovery/business continuity plans; direction, communication, and warning; operations and procedures; logistics and facilities; training; exercises, evaluations, and corrective actions; public education and information; and finance and administration.

Community Emergency Preparedness: A Manual for Managers and Policy-makers. 1999. 150 pp. \$37.80. Copies can be purchased from the World Health Organization, Publications Center USA, 49 Sheridan Avenue, Albany, NY 12210; (518) 436-9686; fax: (518) 436-7433; e-mail: Qcorp@compuserve.com.

This book is a guide to policies, procedures, and planning techniques that can mitigate the consequences

of natural and human-caused disasters. It describes methods for identifying vulnerable populations, predicting the likelihood and consequences of emergencies, and planning appropriate responses. The six chapters discuss the concepts of emergency preparedness and vulnerability reduction, policy development, hazard identification and analysis, principles of emergency planning, training and education, and procedures for project monitoring and evaluation. Annexes include tables for gauging the scale of damage caused by windstorms, hurricanes, earthquakes, landslides, and volcanic eruptions.

Disaster Resource Guide. 2000 Edition. Free. To request a copy, contact ***Disaster Resource Guide, P. O. Box 15243, Santa Ana, CA 92735; fax: (714) 558-8901.*** The guide can also be viewed on-line: <http://www.disaster-resource.com>.

This annual magazine provides a directory of resources for business continuity. It contains detailed information on conferences and expositions, educational programs, disaster-related organizations, professionals, vendors of products and services, and Web sites. Information is organized around five major topics: planning and management, information technology and telecommunications, facility issues, crisis communication and response, and resources.

Devastation! The World's Worst Natural Disasters. Lesley Newson. 1998. 160 pp. \$18.75. Copies can be purchased from DK Publishing, 95 Madison Avenue, New York, NY 10016; (877) 884-1600; fax: (800) 260-7658; WWW: <http://www.dk.com/us>.

In the past 100 years, over a million people have been killed by earthquakes; another million have been killed by hurricanes, typhoons, and tropical storms; nine million have drowned in floods; and millions more have died due to drought and disease. ***Devastation!*** catalogs hazards by regions of the world and provides specific information on over 500 disasters. It includes maps that identify natural hazard danger zones throughout the world and describes current scientific developments in monitoring, predicting, and understanding natural disasters. Other sections specifically address volcanoes, earthquakes, severe storms, gales and blizzards, droughts, floods, fires, avalanches and earth movements, mass extinctions, global climate change, and new threats. Numerous color photos and illustrations are included.

Enhancing Access to NEXRAD Data--A Critical National Resource. Global Energy and Water Resource (GEWEX) Panel, National Research Council. 1999. 28 pp. \$12.00; \$9.60 if ordered via the Internet. The complete text is also available free on-line: <http://www.nap.edu>. To obtain a copy, contact the National Academy Press, 2101 Constitution Avenue, N.W., Lockbox 285, Washington, DC 20055; (888) 624-8373 or (202) 334-3313; fax: (202) 334-2451; e-mail: zjones@nas.edu.

The Next Generation Weather Radar (NEXRAD) WSR-88D Doppler network was created to meet the surveillance radar needs of the National Weather Service, the Federal Aviation Administration, and the Department of Defense. Its primary objective is to provide nearly continuous radar coverage of the continental U.S. in order to monitor severe weather, including tornadoes, damaging winds, hail, heavy precipitation, flash floods, and hurricanes. GEWEX was asked to assess the value of NEXRAD data for answering key atmospheric and hydrological science questions, and their conclusions are contained in this booklet. It discusses observations made by the panel, issues they raised, and strategies for increasing the usefulness of this technology.

Results-Based Management at the Federal Emergency Management Agency. Jerry Ellig. 2000. 37 pp. Free. Copies can be obtained from the Mercatus Center, George Mason University, 3401 North Fairfax Drive, Suite 450, Arlington, VA 22201-4433; (703) 993-4930; fax: (703) 993-4935; e-mail: mercatus@gmu.edu. The complete text is also available on-line: <http://www.mercatus.org>.

This report is part of a series of studies from the Mercatus Center that identify exemplary public agencies that have taken the lead in clearly stating their mission and improving their performance.

Results-Based Management notes that the Federal Emergency Management Agency (FEMA) has won widespread praise for changes made in recent years, particularly from lawmakers who once talked of abolishing the agency. It points to specific measures of success: the reduced number of days required to get relief checks to disaster victims; high satisfaction ratings from aid recipients; good ratings from state, local, and nonprofit officials; the prevention of \$2 in disaster losses for every \$1 spent on predisaster mitigation; the prevention of \$750 million in flood losses annually; and high satisfaction ratings from those enrolled in FEMA training courses. The analysis looks at the agency's mission, organizational structure, information systems, organizational culture, communication strategies, and leadership.

Floods

The Next Flood: Getting Prepared. Final Report of the International Red River Basin Task Force to the International Joint Commission. 2000. 164 pp. Free. Printed copies can be requested from the International Joint Commission (IJC), U.S. Section, 1250 23rd Street, N.W., Suite 100, Washington, DC 20440; (202) 736-9000; fax: (202) 736-9015; e-mail: Commission@washington.ijc.org. The complete report can also be found at <http://www.ijc.org/publications/redriver/nextflood-e.pdf>.

Following devastating floods in 1997 in the Red River basin, the governments of Canada and the U.S. asked the International Joint Commission (IJC) to investigate the causes and effects of the flooding and to recommend ways to reduce the impact of future floods. ***The Next Flood*** discusses the history of flooding along the Red River, flow management, communities at risk, the risks to the Canadian city of Winnipeg, flood preparedness and resiliency, flooding in the Lower Pembina River Basin (which, like the Red River, lies in both Canada and the U.S.), water quality issues, the need for improved data and decision support, hydraulic and hydrologic modeling, and flood-related institutional arrangements. The report also provides numerous conclusions and recommendations that focus on preparedness and mitigation for major floods.

Protecting Building Utilities from Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems. FEMA 348. 1999. 196 pp. Free.

Above the Flood: Elevating Your Flood-prone House. FEMA 347. 2000. 70 pp. Free.

Both documents can be obtained from the Federal Emergency Management Agency (FEMA), Publications Distribution Facility, P.O. Box 2012, Jessup, MD 20794-2012; (800) 480-2520. At this writing, the Web version of the first document is available at <http://www.fema.gov/library/lib06.htm>. The second volume will soon be on-line at the same URL.

Despite the efforts of governments and private-sector entities to reduce flood hazards, problems still remain with the design and construction of building utilities. The first document was prepared to illustrate effective utility design and construction for residential and nonresidential structures located in

flood-prone areas in order to assist owners in complying with National Flood Insurance Program requirements. It covers both new and existing building systems and describes how to repair, replace, or rehabilitate flood-damaged building utility systems as well as reduce future flood damage. It also contains information on complying with model building codes.

Above the Flood chronicles the successful efforts to elevate substantially damaged homes in Dade County, Florida, following Hurricane Andrew. It presents an overview and case studies of three common techniques; explains FEMA's technical and regulatory guidance on these projects; and summarizes the benefits of elevating a flood-prone home. Soon, a companion CD-ROM and video will be available that include interviews with contractors and homeowners as well as demonstrations of each of the numerous elevation techniques.



The Upper St. Johns River Basin Project: The Environmental Transformation of a Public Flood Control Project. Maurice Sterling and Charles A. Padera. *Professional Paper SJ98-PP1*. 1998. 18 pp. Free. Copies can be obtained from the Library, St. Johns River Management District, P.O. Box 1429, Palatka, FL 32178-1429; (904) 329-4132.

Begun in the 1980s, the St. Johns River Basin Project, a joint effort of the St. Johns River Water Management District and the U.S. Army Corps of Engineers, is one of the largest and most ambitious wetland restoration projects in the world. The basin was once subject to conventional structural flood-control. In contrast, the current project is designed to balance the multiple uses of the river, restoring environmental habitat, and protecting water quality--while also maintaining flood control. Construction began on the current project in 1988 and was altered several times to address environmental factors. This paper traces that process, describing the project history; project planning; the current project; designation of marsh conservation areas, water management areas, and other restored areas; structural improvements; better water quality and storage, marsh conditions, and wildlife habitat; and opportunities for public recreation.

A Procedure for Estimating Loss of Life Caused by Dam Failure. Wayne J. Graham. *DSO-99-06*. 1999. 48 pp. For availability, contact the Bureau of Reclamation, Dam Safety Office, P.O. Box 25007, Denver, CO 80225.

Risk assessment and other dam safety studies often require an estimate of fatalities resulting from dam failure. To assist such efforts, the Bureau of Reclamation Dam Safety Office conducted an extensive

evaluation of dam failures and the factors that contributed to loss of life. Graham evaluated every U.S. dam failure that caused more than 50 fatalities and every failure that occurred after 1960 that caused any fatalities, obtaining information regarding warning, population at risk, and number of fatalities. He found that loss of life due to dam failure is highly influenced by three factors: the number of people occupying the dam failure floodplain, the amount of warning provided to those at risk, and the severity of the flooding. He outlines a seven-step procedure for estimating loss of life.

Flood Management in Canada at the Crossroads. Dan Shrubsole. *ICLR Research Paper Series No. 5.* 2000. 34 pp. \$25.00 (Canadian), plus shipping. For information on how to obtain a copy, contact the Institute for Catastrophic Loss Reduction (ICLR), 151 Yonge Street, Suite 1800, Toronto, Ontario, Canada M5C 2W7; (416) 362-2031, ext. 342; fax: (416) 362-2602; e-mail: iclr@ibc.ca.

In Canada, decisions to reduce government expenditures have come at a time when the economic losses due to flooding are increasing. This paper suggests initial steps to address this problem and describes the constitutional responsibilities of all levels of government for flood management. It reviews major federal flood management programs, describes the recent Saguenay and Red River Valley floods and responses by communities to these floods, and counsels that significant obstacles to reducing future flood losses in Canada are intertwined with current flood management arrangements. Specifically, Shrubsole concludes there is no federal mechanism to integrate structural and nonstructural adjustments to floods. He adds that, after a community has incurred significant losses, senior government primarily funds disaster relief and structural flood control, while providing little incentive for adoption of floodplain and land-use regulations. He suggests an alternative flood management strategy based on the principles of ecosystem management, partnerships, and science.

Empirical Studies of the Effect of Flood Risk on Housing Prices. Philip T. Chao, James L. Floyd, and William Holliday. *IWR Report No. 98-PS-2.* 1998. 70 pp. Free. Reports may be ordered by writing Arlene Nurthen, Department of the Army, Corps of Engineers, Water Resources Support Center, Casey Building, 7701 Telegraph Road, Alexandria, VA 22315-3868; fax: (703) 428-8171; e-mail: arlene.nurthen@inet.hq.usace.army.mil.

Responding to charges that the Army Corps of Engineers is biased against nonstructural flood damage reduction measures, this study was implemented to identify impediments that may exist to justifying nonstructural flood control measures as alternatives to structural measures. Indeed, the Corps' ***Principles and Guidelines for Water and Related Land Resources Implementation Studies*** provide that "Reduction of flood damages borne by floodplain activities should not be claimed as benefit of evacuation or relocation because they are already accounted for in the fair market value of floodplain properties." This study questions that assumption and compares the price of a floodplain property to a hypothetical, otherwise identical, non-floodplain property. This discount for floodplain location incorporates such attributes (positive or negative) as access to recreational boating, river views, clean-up costs, and loss of income due to a flood. The report reviews academic literature on price models of floodplain real estate and examines case studies from two Corps projects in Abilene, Texas, and South Frankfort, Kentucky.

Troubled Waters: Congress, the Corps of Engineers, and Wasteful Water Projects. 2000. 44 pp.

\$10.00, printed version; free, on-line. To order, contact the Taxpayers for Common Sense, 651 Pennsylvania Avenue, S.E., Washington, DC 20003; (202) 546-8500, ext. 101. To view on-line, see: <http://www.taxpayer.net/corpswatch> or <http://www.nwf.org>.

According to Taxpayers for Common Sense and the National Wildlife Federation, no other federal agency has had such a profound impact on the nation's environmentally sensitive floodplains, waterways, and coastal areas as the U.S. Army Corps of Engineers. The ongoing construction and maintenance of Corps dams, navigation channels, flood-control structures, and other water development projects dramatically alter the American landscape. Although there are many "heartening signs" that the Corps is reforming its civil works program, many Corps districts continue to pursue environmentally harmful, financially wasteful water resource projects. ***Troubled Waters*** profiles 25 Corps projects that will cost \$6 billion in coming years and will destroy irreplaceable wildlife habitat. It challenges concerned citizens to engage the Corps regarding the impacts and costs of these projects on a regional level. It provides an overview of Corps missions, including navigation assistance, flood damage reduction, shoreline protection, and beach replenishment, then presents numerous policy recommendations to "cut the fat" and ensure ecosystem health, describes the Corps' cost-sharing rules for decision making, outlines steps in project development, describes how citizens can affect Corps policies, and lists several organizations from which further information can be obtained.

Flood and Landslides: Integrated Risk Assessment. Riccardo Casale and Claudio Margottini, Editors. 1999. 450 pp. \$159.00. To order a copy, contact Springer-Verlag New York, Inc., P.O. Box 2485, Secaucus, NJ 07096-2485; (800) 777-4643; fax: (201) 348-4505; e-mail: orders@springer-ny.com; WWW: <http://www.springer-ny.com>.

Flood and Landslides reviews state of the art mitigation techniques for these natural disasters, highlighting the possibility of effective land-use planning and management. Noting that floods and landslides are often triggered by heavy rainfall, this book analyzes floods and slope stability phenomena as differing aspects of the same dynamic system-- the drainage basin. Technical papers discuss such topics as the characterization of landslide hazard, flood hazard assessment and mitigation, the impacts of climate change on these hazards, tools and methods of forecasting and monitoring, mapping, integrated floodplain management, the economic consequences of floods and landslides, the vulnerability of megacities, hazard mitigation, and case studies from around the world.

Hurricanes and Severe Storms

Open Skies Aerial Photography of Selected Areas in Central America Affected by Hurricane Mitch. Bruce F. Molina and Cheryl A. Hallam. U.S. Geological Survey (USGS) Circular 1181. 1999. 88 pp., plus CD-ROM. Free. To receive a copy, contact the USGS, Information Services, Box 25286, Federal Center, Denver, CO 80225; (303) 202-4700 or (800) 435-7627; fax: (303) 202-4693.

Between October 27 and November 1, 1998, Central America was devastated by Hurricane Mitch. One of the first informational needs was complete aerial photographic coverage of the storm-ravaged areas so that the governments of the affected countries, the U.S. agencies planning to provide assistance, and the international relief community could provide aid to those in the devastated area. Between December 4 and 19, 1998, an "Open Skies" aircraft conducted five successful missions and obtained more than 5,000

high-resolution aerial photographs and more than 15,000 video images. The aerial data are being used by the international reconstruction task force and many others who are working to rebuild and reduce the risk of future destruction. The CD-ROM contains a digital version of the entire circular plus full-resolution image files of the maps and photographs used in the printed version.

Storms. Roger Pielke Jr. and Roger Pielke Sr., Editors. 2000. 960 pp. (Two-volume set.) \$275.00. To order, contact Routledge Customer Service, 7625 Empire Drive, Florence, KY 41042; (800) 634-7064; fax: (800) 248-4724; e-mail: cserve@routledge-ny.com; WWW: <http://www.routledge-ny.com>.

Although storms are a constant to life on earth, their impacts on society and the environment are not always welcome. As a result, societies seek to reduce their vulnerability to storms, although sometimes these responses can exacerbate vulnerability. *Storms* includes papers from academics from around the world who discuss storm science and social vulnerability, tropical cyclones, extra-tropical cyclones, mesoscale convective systems, and other storms. Detailed accounts of storms in the U.S., Canada, Cuba, China, Australia, India, Russia, Vietnam, Brazil, and Mexico are included.

Earthquakes and Other Geologic Hazards

Some Buildings Just Can't Dance: Politics, Life Safety, and Disaster. Richard Stuart Olson, Robert A. Olson, and Vincent T. Gawronski. 1999. 214 pp. \$78.50. Copies can be purchased from JAI Press, Inc./Ablex Publishing Corporation, 100 Prospect Street, P.O. Box 811, Stamford, CT 06904-0811; (203) 323-9606, ext. 3054; fax: (203) 357-8446; e-mail: a.dirado@elsevier.com.

This book examines the city of Oakland's response to building damage suffered in the 1989 Loma Prieta earthquake. Using a combined "nondecision making and advocacy coalition approach," the authors demonstrate how and why hazardous-structure abatement was kept off the local political agenda prior to the disaster. The book then traces how and why the Oakland city government actively addressed earthquake damage as well as vulnerability to future quakes. Chapters examine policy dynamics and disaster, coalitions and advocacy, agenda control and seismic safety, disasters and policy conflicts, previous research on hazard abatement, the intergovernmental context, hazard mitigation policy prior to the quake, impacts of the quake on city policies, implementation of ordinances, dealing with unreinforced masonry buildings, and general conclusions.

Seismic Reliability Assessment of Critical Facilities: A Handbook, Supporting Documentation, and Model Code Provision. Gayle S. Johnson, Robert E. Sheppard, Marc D. Quilici, Stephen J. Eder, and Charles R. Scawthorn. Technical Report MCEER-99-0008. 1999. 392 pp. \$35.00. To purchase a copy, contact the Multidisciplinary Center for Earthquake Engineering Research (MCEER), University of Buffalo, State University of New York, Red Jacket Quadrangle, Buffalo, NY 14261-0025; (716) 645-3391; fax: (716) 645-3399; e-mail: mceer@acsu.buffalo.edu; WWW: <http://mceer.buffalo.edu>.

Current building standards are primarily intended to preserve life, although some governing bodies recognize that critical facilities, such as hospitals, must survive an earthquake and be operational during and following a seismic event. This report summarizes a multiyear research effort to develop a method of assessing and improving the functional reliability of equipment systems in critical facilities following earthquakes. It is intended to be used by engineers, building officials, building owners, and others

involved in operating facilities that provide critical services. It describes an approach that includes systems definition, evaluation of individual components, systems evaluation, and risk management. It also includes supporting documentation and information on model code provisions.

A second volume, *Nonstructural Damage Database*, by Andrew Kao, T. Soong, and Amanda Vender (*Technical Report MCEER-99-0014, 1999, 60 pp., \$25.00*) is also available from the address above. The database can also be downloaded from the MCEER Web at the URL above.

Case Studies: An Assessment of the NEHRP Guidelines for the Seismic Rehabilitation of Buildings. FEMA 343. 1999. 220 pp. Free. Copies can be obtained from the Federal Emergency Management Agency (FEMA), Publications Distribution Facility, P.O. Box 2012, Jessup, MD 20794-2012; (800) 480-2520.

With many major advances, especially in technical fields, users of a new product often raise concerns about its usefulness, safety, cost, and need. This volume attempts to address such concerns relating to the *NEHRP Guidelines for the Seismic Rehabilitation of Buildings* (FEMA 273) and its companion *Commentary* (FEMA 274) (see the *Observer*, [Vol. XXIV, No. 1, p. 11](#)). Through a scientific evaluation, *Case Studies* concludes that, though in need of refinement, the *Guidelines* are an invaluable tool in improving the resistance of buildings to earthquakes. It provides background concerning the project, a summary of key findings, conclusions regarding usability and technical adequacy, a description of factors in design and construction costs, and recommendations for improvement.

An Assessment of Seismic Monitoring in the United States: Requirement for an Advanced National Seismic System. U.S. Geological Survey (USGS) Circular 1188. 1999. 58 pp. Free. Available from the USGS, Information Services, Box 25286, Federal Center, Denver, CO 80225; (303) 202-4700 or (800) 435-7627; fax: (303) 202-4693.

According to this study, seismic monitoring is vital to meet the United States' need for timely and accurate information to reduce the loss of life and property caused by earthquakes. This report, required by Public Law 105-47, is an assessment of the status of, needs for, and associated costs of seismic monitoring in the U.S. The report assesses existing systems and networks, then proposes an effective, national seismic monitoring strategy and an advanced system linking national, regional, and urban monitoring networks (the Advanced National Seismic System); that system's infrastructure requirements; potential information products and services; and "action items" to create such a system.

Standard Guide for the Estimation of Building Damageability in Earthquakes. E2026-99. 2000. 24 pp. \$40.00. Copies can be purchased from the American Society for Testing and Materials (ASTM) Customer Services; (610) 832-9585; fax: (610) 832-9555; WWW: <http://www.astm.org>.

This guide provides a standard for conducting probabilistic studies of expected building loss from earthquakes in the U.S. It also provides guidance on preparing a narrative report of such a study. As such, it helps users to meet real estate transaction "due diligence" requirements for assessing a specific property's potential for damage due to an earthquake. It explains earthquake ground shaking, soil instability, faulting, landsliding, and tsunamis. It also establishes what can reasonably be expected of a loss estimator in approximating probable damage of buildings, including communicating observations,

opinions, and conclusions in a manner that is not misleading.

Mitigating Geological Hazards in Oregon: A Technical Reference Manual. John D. Beaulieu and Dennis Olmstead. *Special Paper 31.* 1999. 62 pp. \$20.00.

Geological Hazards: Reducing Oregon's Losses. John D. Beaulieu and Dennis Olmstead. *Special Paper 32.* 1999. 29 pp. \$10.00.

Both publications can be purchased through *Nature of the Northwest*, 800 N.E. Oregon Street, No. 5, Portland, OR 97232; (503) 872-2750; e-mail: info@naturenw.org; WWW: <http://www.naturenw.org>.

For more information on these publications, contact James Roddey, Oregon Department of Geology and Mineral Industries, 800 N.E. Oregon Street, Portland, OR 97232; (503) 731-4100, ext. 242.

Earthquakes and tsunamis could take thousands of lives and cost billions of dollars in Oregon. Landslides in the state already cause one to two deaths per year and \$1-\$10 million in damage. Flooding and coastal erosion are even more damaging. These two publications were designed to provide policymakers and the public with information and tools to reduce the toll of these geologic processes. The first document, designed for land-use planners, emergency managers, and public policymakers, includes information on Oregon's past disasters and potential problems, guidance on dealing with multiple hazards, and strategies for mitigating these hazards. The second summarizes the first and is designed for nontechnical users.

Earthquake Risk Management: Toolkit for Decision-Makers. SSC Report 99-04. 1999. 224 pp. \$40.00.

To obtain a copy, contact the California Seismic Safety Commission (SSC), 1755 Creekside Oaks Drive, Suite 100, Sacramento, CA 95833; (916) 263-5506; fax: (916) 263-0594; WWW: <http://www.seismic.ca.gov>.

This product provides the necessary tools for developing an effective earthquake risk management program. It includes information on the characteristics of earthquakes, causes of earthquake damage and loss, damage and loss assessment of structures and equipment, reducing risk, and developing and implementing a risk reduction program. The toolkit is designed for both businesses and local governments. Appendices cover earthquake terms, sources for additional resources, background information on earthquake hazards, measures of quake vulnerability, methods for assessing equipment vulnerability, sample work statements, and worksheets.

Tsunamis

Surviving a Tsunami--Lessons from Chile, Hawaii, and Japan. Brian F. Atwater, Marco Cisternas V., Joanne Bourgeois, Walter C. Dudley, James W. Hendley II, and Peter H. Stauffer, Compilers. *Circular 1187.* 18 pp. Free. Copies are available on the Internet: <http://geopubs.wr.usgs.gov/circular/c1187>.

This booklet contains lessons on how to survive a tsunami and is based on accounts from people who survived the tsunami generated by the largest earthquake ever measured--the magnitude 9.5 quake in Chile on May 22, 1960. It describes the tsunami and the earthquake that caused it, discusses similar tsunamis and strategies for survival, and provides lessons from these experiences. It recommends heeding natural warnings, complying with official warnings, expecting many waves as well as larger ones, heading for higher ground, abandoning belongings, not counting on roads remaining intact, and

other measures that can save lives.

SSA Seeks Papers on Taiwan Quake

The Seismological Society of America (SSA) is planning to publish a special issue of its *Bulletin* covering the 1999 Ji-Ji (Taiwan) earthquake. The issue will encompass investigations into all seismological and engineering aspects of the quake, and researchers working in these areas are encouraged to submit papers for the journal. Submission instructions are available from <http://www.seismosoc.org/publications/bssa.html>. The deadline is August 1. Questions and submissions should be directed to the issue's guest editors: *Leon Teng*, e-mail: lteng@terra.usc.edu; or *Ben Tsai*, e-mail: ybtsai@geps.gep.ncu.edu.tw.

The Hazards Center

The NATURAL HAZARDS RESEARCH AND APPLICATIONS INFORMATION CENTER was founded to strengthen communication among researchers and the individuals and organizations concerned with mitigating natural disasters. The center is funded by the National Science Foundation, Federal Emergency Management Agency, National Weather Service, U.S. Geological Survey, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Department of Transportation, National Aeronautics and Space Administration, the Institute for Business and Home Safety, and the Public Entity Risk Institute. Please send information of potential interest to the center or the readers of this newsletter to the address below. The deadline for the next *Observer* is *July 21, 2000*.

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Other issues of the *Observer* and the Hazards Center's electronic newsletter, *Disaster Research*, are also available from the Natural Hazards Center's World Wide Web site: <http://www.colorado.edu/hazards>.

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