Research Digest

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Research Digest is a quarterly online publication (www.colorado.edu/hazards/rd) that compiles recent research into an easily accessible format to advance and communicate knowledge on hazard mitigation and disaster preparedness, response, and recovery within an all-hazard, interdisciplinary framework for the hazards and disasters community. It provides complete references and abstracts (when available) for current research in the field. The issues are compiled by Center staff and include abstracts from peer-reviewed publications.

Research Digest articles are categorized into 25 different topic areas, though not every topic may appear in each issue. Abstracts are lightly edited to match Natural Hazards Center style. Most articles are cataloged as part of the Natural Hazards Center's library holdings. Check with your local institution for article availability. The Natural Hazards Center Library (subject to copyright laws and conventions) will copy otherwise difficult to obtain material for the cost of reproduction and shipping. For inquiries and feedback, send e-mails to hazlib@colorado.edu.

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The Natural Hazards Center is funded through a National Science Foundation grant and supplemented by contributions from a consortium of federal agencies and nonprofit organizations dedicated to reducing vulnerability to disasters. Visit the Center at www.colorado.edu/hazards/.

All Hazards

Afshari, Hessam M., Paul N. Cervone, Mark J. Seaton, Miley A. Taylor, and Bruce S. Rudy. 2008. The effects of training on disaster response: Lessons learned from recent events. ***Journal of Emergency Management*** **6(5): 57-63.**

National attention to emergency preparedness has resulted in the development of numerous tabletop and exercise-based training programs for responders. The importance of this type of training with respect to the effectiveness of disaster response, while not in doubt, is difficult to measure. Here, the authors examined after action reports (AARs) from a variety of disasters in an attempt to determine what effect training has had on the response to a particular event and on disaster response in general. The authors also examined AARs and lessons learned from two training exercises. Possibly, the most significant effect of training was the opportunity for people from different response units to interact as a team. Exposure to the Incident Command System was vital to the smooth deployment of assets.

Aini, M. S., and A. Fakhru'l-Razi. 2008. Management of inquiries into disasters: Experts' views and perspectives. ***Journal of Emergency Management*** **6(5): 37-50.**

In most democratic countries, inquiries are conducted into major accidents. One of the main functions of these inquiries is to establish the causes and to learn lessons to prevent a recurrence. However, previous studies showed the learning aspect is often curtailed because of the inadequate guides to the conduct and procedures of inquiry management. A study was conducted to determine the disaster experts' views and perspectives on management of disaster inquiries. A sample of 80 experts representing various organizations in Malaysia was selected using judgmental sampling method. The data indicated that they were less in agreement with regards to statements about recommendations and learning aspects

as compared with function and procedural issues. Suggestions for improvements of inquiry management into disasters were discussed. Inquiry into disasters is costly to manage and may last from a few months to a few years. Thus, these shortcomings ought to be addressed since they will remain as one of the valuable sources of information for society and corporations to learn from past incidents.

Berlin, Johan M., and Eric D. Carlstrom. 2008. The 90-second collaboration: A critical study of collaboration exercises at extensive accident sites. ***Journal of Contingencies and Crisis Management*** **16(4): 177-185.**

In this study, a critical examination of collaboration, focusing on the alternatives, is carried out. The study is based on empirical data from four inter-organizational exercises involving ambulance, police, and fire departments. We studied collaboration between the three organizations from the arrival of the first units until the mission was completed. It was found that collaboration was practiced to a relatively small degree, and that it primarily took place due to understaffing. In summary, the different organizational phenomena are sorted on a scale of stability vs. change. The result of the study shows that the organizations observed strive for stability, preferring repeated and well-known behavior.

Bolton, Matthew, and Alex Jeffrey. 2008. The politics of NGO registration in international protectorates: The cases of Bosnia and Iraq. ***Disasters*** **32(4): 586-608.**

Following international interventions in Bosnia-Herzegovina and Iraq, nongovernmental organizations (NGOs) have played a central role in delivering humanitarian relief, encouraging participation in new systems of government, and advocating on behalf of marginalized groups. Although intervening agencies have framed such autonomous organizations as unquestionably virtuous, scholars have increasingly questioned the agency of NGOs, pointing to the constraining effects of funding and regulatory mechanisms. This paper contributes to this body of work by offering a detailed examination of legislation requiring NGOs to register with nascent state institutions. Drawing on case study material from Bosnia and Iraq, it argues that NGO registration should not be dismissed as a technical or legal matter, but should be embraced as a significant political practice embedded in relations of power. Registration legislation has increased the transparency of NGO funding origins and institutional practices, yet it has simultaneously acted as a barrier to smaller organizations and led to the transmission of international objectives through civil society entities.

Clark, Robin J., and Megan H. Timmins. 2008. Continuity of operations planning: Meeting the standard of care. ***Journal of Emergency Management*** **6(5): 17-22.**

Recent disasters have increased the public's awareness of the lack of emergency preparedness of state and local governments. The attacks on the World Trade Center in 2001 highlighted failures in government agency coordination, while the anthrax attacks that followed and the more recent natural disasters of Hurricanes Katrina and Rita in 2005 have deepened concerns that our government is unprepared for emergencies. Partially in response to the public's concern, the federal government has encouraged Continuity of Operations (COOP) planning at the federal, state, and local government levels. Public attention, government engagement, and the promulgation of federal directives and guidance are leading to an increase in the standard of care for all public sector planning efforts, thus creating potential liabilities in the areas of COOP planning, testing, training, and maintenance. At this point, COOP planning is becoming the norm for state and local government agencies, and while the process of COOP planning may itself expose agencies to certain liabilities, there is also an increase in the potential liability for agencies that do not undertake COOP planning efforts. Further, it appears that the potential liability of agencies that do not engage in COOP planning far exceeds any liabilities incurred through the planning process.

Cohen, Charles, and Eric D. Werker. 2008. The political economy of "natural" disasters. ***Journal of Conflict Resolution*** **52(6): 795-819.**

Natural disasters occur in a political space. Although events beyond our control may trigger a disaster, the level of government preparedness and response greatly determines the extent of suffering incurred by the affected population. The authors use a political-economy model of disaster prevention, supported by case studies and preliminary empirics, to explain why some governments prepare well for disasters and others do not. The authors show how the presence of international aid distorts this choice and increases the chance that governments will underinvest. Policy suggestions to alleviate this problem are discussed.

Cutter, Susan L., Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change* 18(4): 598-606.
There is considerable research interest on the meaning and measurement of resilience from a variety of research perspectives including those from the hazards/disasters and global change communities. The identification of standards and metrics for measuring disaster resilience is one of the challenges faced by local, state, and federal agencies, especially in the United States. This paper provides a new framework, the disaster resilience of place (DROP) model, designed to improve comparative assessments of disaster resilience at the local or community level. A candidate set of variables for implementing the model are also presented as a first step towards its implementation.

Dekker, Sidney W. A., Magnus Jonsen, Johan Bergstrom, and Nicklas Dahlstrom. 2008. Learning from failures in emergency response: Two empirical studies. *Journal of Emergency Management* 6(5): 64-70.
Recent high-visibility disasters have fueled public and political awareness of the importance of managing and mitigating their consequences effectively. In response, various countries have enacted legislation that demands the evaluation of emergency responses so that lessons for improvement can be learned. A series of field and experimental studies were conducted from 2005 to 2007 to assess the ability of first responder organizations (e.g., fire departments) to learn from failures that occurred during their emergency responses. The departments studied often lacked basic organizational requisites for effectively learning from failure (e.g., mutual trust, participation, knowledge of possible learning mechanisms). Further, neither first responder training nor daily practice seems supported by knowledge of generic competencies necessary for effective crisis management. This not only hampers coordination during a response, but also keeps its evaluation from using a language that could help organizations learn and improve.

Henderson, Tammy L., Maria Sirois, Angela Chia-Chen, Christopher Airriess, David A. Swanson, and David Banks. 2008. After a disaster: Lessons in survey methodology from Hurricane Katrina. *Population Research and Policy Review* (ePub).
In 2005, the National Science Foundation funded a number of projects to study the impact of Hurricane Katrina. The current article provides an overview of several research approaches used to conduct post-Katrina research. Each method had some advantages and disadvantages. The post-disaster context meant that experience from traditional survey methods often did not apply. Comparisons of advantages and disadvantages associated with each sampling method serve to inform future post-disaster research and illuminate the limits of classical research methods.

Jennison, Victoria. 2008. Networking to improve community resiliency in disaster planning and response. *International Journal of Public Policy* 3(5/6): 338-352.
This paper discusses the application of networking as a global governance tool to improve community resiliency in preparedness-oriented disaster response. The perspective presented here challenges the trend of humanitarian aid allocation to affected individuals after disaster. Preemptive strengthening of community resiliency via local, government, and international network development may do far more to mitigate disaster impact and aid sustainable recovery for people and communities than any amount of donated monies or supplies.

Kapucu, Naim. 2008. Planning for disasters and responding to catastrophes: Error of the third type in disaster policy and planning. *International Journal of Public Policy* 3(5/6): 313-327.
This paper states that the public increasingly expects better public sector leadership before, during, and after catastrophic disasters than it has seen in the past. The massive numbers of public, nonprofit, and private organizations involved in catastrophic disasters require extensive ability to have horizontal, as well as vertical, communication, coordination and decision-making capabilities. High performance in response to catastrophic disasters requires an ability to assess and adapt capacity rapidly, restore or enhance disrupted or inadequate communications, utilize uncharacteristically flexible decision making, and expand coordination and trust of emergency response organizations. These requirements are superimposed on conventional bureaucratic systems that rely on relatively rigid plans, exact decision protocols, and formal relationships that assume uninterrupted communications. Yet, policy makers and policy analysts frequently focus on certain aspects of disaster managements after a significant disaster and commit errors of the third type. This paper sug-

gests investing in building bottom-up community capacity in a networked environment.

King, David. 2008. Reducing hazard vulnerability through local government engagement and action. *Natural Hazards* 47(3): 497-508.
The concept of a natural hazard is a human construct. It is the interaction with human communities and settlements that defines a natural phenomenon as a natural hazard. Thus the end point of hazard mitigation and hazard vulnerability assessment must involve an attempt to reduce, or mitigate, the impact of the natural hazard on human communities. The responsibility to mitigate hazard impact falls primarily upon governments and closely connected non-government and private institutional agencies. In particular, it is most often local government that takes the responsibility for safeguarding its own communities, infrastructure, and people. Hazard vulnerability of specific local communities is best assessed by the local government or council, which then faces the responsibility to translate that assessment into community education and infrastructural safeguards for hazard mitigation. This paper illustrates the process of local government engagement in hazard mitigation in Australia, through the Natural Disaster Risk Management Studies, as a first step toward natural disaster reduction.

Labadie, John R. 2008. Auditing of post-disaster recovery and reconstruction activities. *Disaster Prevention and Management* 17(5): 575-586.
This paper seeks to explore the application of auditing and quality assurance principles and practices to the planning and implementation of post-disaster recovery and reconstruction. It notes the risk to a disaster recovery organization's credibility if fraud and poor performance are apparent in its efforts to support disaster recovery and reconstruction, and it provides examples of relief organizations' efforts to ensure that their actions are both credible and effective. Examining the complex and multi-faceted processes of post-disaster recovery and reconstruction, the paper describes the growing emphasis around the world on social justice/equity issues and the importance of proper governance. It explores the advantages and pitfalls of incorporating auditing practices into the effective implementation of recovery and reconstruction activities. The paper concludes with a discussion of the importance to the affected communities of knowing that expenditures both financial and emotional will achieve something better.

Meizoso, Jonathan P., David V. Shatz, Keith G. Fletcher, Matthew V. Shpiner, Daniel Carvajal, Allison Ring, William Coffin, Michelle Pearlman, Amy Pearlman, Stephanie Ragland, Sean M. Murphy, David Rivero, William Gerlach, John Pepper, and John Tighe. 2008. University of Miami 'Canes Emergency Response Team: A look at an undergraduate disaster response team. *Journal of Emergency Management* 6(6): 48-52.
Through recurrent disasters, both natural and man-made, the US government has developed a sophisticated emergency and disaster response system, ranging from local to federal government responses. But in large-scale disasters, the number of professional responders and the response times may be inadequate both for the physical magnitude of the disaster area involved and the number of victims. With that experience in hand, the Los Angeles City Fire Department promoted the concept of citizen response and training in 1985, which is now known as the Community Emergency Response Teams (CERT). The CERT program seeks to educate the lay public in disaster preparedness and train volunteers in basic disaster response skills. Training has been made available through the Federal Emergency Management Agency, the Emergency Management Institute, and the National Fire Academy (http://www.citizencorps.gov/cert/). These teams can be used to promote awareness programs in the community and to be readily available in the event of a local incident. Their proximity to the event and knowledge of the area can be a valuable asset both prior to and after the arrival of professional responders. But building such a team from scratch can be a daunting challenge. Known more for their football program, this article describes the system built by the undergraduate student body of the University of Miami Hurricanes.

Schultz, Jessica, and Tina Soreide. 2008. Corruption in emergency procurement. *Disasters* 32(4): 516-536.
Corruption in emergency procurement reduces the resources available for life-saving operations, lowers the quality of products and services provided, and diverts aid from those who need it most. It also negatively influences public support for humanitarian relief, both in the affected country and abroad. This paper analyzes the following question in order to mitigate risk: how and where does corruption typically occur, and what can be done? Suggested strategies reflect a multi-layered approach that stresses internal agency control mechanisms, conflict-sensi-

tive management, and the need for common systems among operators.

Simpson, David M. 2008. Disaster preparedness measures: A test case development and application. ***Disaster Prevention and Management*** **17(5): 645-661.**
This paper develops disaster preparedness measurement methodology using a small test case of two communities. It is aimed at furthering discussion of the issues and complexities of developing measurement of preparedness indicators for application and utilization. The study used a multi-modal approach, utilizing several data sources, including: a survey of essential facility managers in the two communities; document data extracted from the two city's comprehensive plans, budgets, and emergency operation plans; and key informant interviews. Data collected from these sources formed the basis of the model construction and testing. The primary conclusion is that a preparedness measurement model, while inherently difficult to construct and execute, has the potential to assist in the comparison and evaluation of community preparedness. Further such development requires additional refinement, calibration, and applied testing. This effort is preliminary, and needs to be tested across a larger number of communities to gauge its accuracy. It would benefit from the creation of consistent baseline scores for a larger cross-section of communities. Baseline scores could be examined for disasters that affect multiple communities, and comparison and evaluations of the preparedness measures applied. Future research should calibrate the model using expert and community feedback. Should a standardized measurement and indicator system be developed with wide application, there would be effects in the insurance, regulatory and management sectors. The paper creates a measurement and indexing process for discussion and evaluation in the hazards research community.

Thompson, Wiley. 2008. School-based relief centers: A community level assessment and discussion. ***Journal of Emergency Management*** **6(6): 63-72.**
An effective community relief center plan provides emergency managers with the ability to provide shelter and services to a population following the onset of a hazard and is a key component of emergency preparedness and disaster recovery. This paper presents a practical method whereby an assessment of schools as the basis of a community-wide relief center plan is made. The paper suggests desired characteristics of a relief center, details a selection methodology, and provides recommendations for implementation of a community relief center plan. Alternative considerations and the role of GIS are also discussed.

Verger, Pierre, Denis Bard, Christine Noiville, and Reza Lahidji. 2008. Environmental disasters: Preparing for impact assessments and operational feedback. ***American Journal of Disaster Medicine*** **3(6): 358-368.**
On March 24, 2006, the French Minister of Environment asked the Committee for Prevention and Precaution (CPP), an independent multidisciplinary committee created in 1996, to conduct a methodological analysis of operational feedback of natural and technological disasters to determine if France is equipped to collect the information and data necessary for the assessment, and optimal management of a disaster and its consequences. The Committee's analysis was based on the testimony it heard from 13 experts, scientists and representatives of associations and advocacy groups and its review of the literature, including operational feedback reports. Its response to the minister focused on the assessment of the health, social, environmental, and economic impacts of disasters and on their operational feedback (defined as the systematic analysis of a past event to draw lessons for the management of the risk), as practiced in France. It presents the results of the literature review about the consequences of disasters, experts' views on the current utility and limitations of impact assessments and operational feedback, the CPP's discussion of these results, and its recommendations to improve impact assessment and operational feedback of disasters. These recommendations cover preparation for and activation of data collection and operational feedback, financial provisions, coordination of stakeholders, education and training in disaster preparedness, and the distribution and use of data from operational feedback.

Vineburgh, Nancy T., David M. Benedek, Carol S. Fullerton, Robert K. Gifford, and Robert J. Ursano. 2008. Workplace resources for crisis management: Iimplications for public-private sector planning, policy and response to disasters. ***International Journal of Public Policy*** **3(5/6): 378-388.**
The interface and cooperation of the public and private sector is essential in disaster planning and response at the federal, state and local level. The resources of private industry and the integration of resources from multiple corporations have been proven necessary for effective community and

regional responses to large-scale disasters (natural disasters, terrorism, bioterrorism and the threat of a pandemic). Large corporations often possess sophisticated crisis management capabilities that may exceed the disaster response capacities of the communities in which they are located. Important crisis management resources of large employers that have implications for community planning and response to disasters include the corporation's security and threat assessment, communications, human resources and Employee Assistance Programs (EAP). Workplace preparedness influences family and community preparedness and impacts population health, safety and resilience. Workplace crisis resources, often forgotten and untapped by public sector planners, need to be considered in the continued development and implementation of disaster planning and response policies.

Webbink, Dinand. 2008. The effect of local calamities on educational achievement. *Disasters* 32(4): 499-515.
This study investigates the impact on the educational achievement of primary school children of two local calamities: an explosion at a firework factory in the city of Enschede on May 13, 2001; and a fire at a discotheque on January 1, 2001 during a New Years Eve party in the town of Volendamon. Based on a quasi-experimental design with both control groups and pre-tests, we found that in the three years following the two tragedies, the test scores of girls in those areas closest to the events were on average 0.2 standard deviations lower. This corresponds to a downward shift in the distribution of girls' test scores. Boys' test scores, meanwhile, were not significantly affected by the disasters, and nor were the scores of pupils from nearby areas. In the three years following the calamities, girls' test scores in one of the areas (Volendam) have slowly recovered, although they remain well below their pre-event level.

Youngs, George A., and H. Katherine O'Neill. 2008. Strategies for resilience: A qualitative analysis of rural community leaders' advice on disaster recovery. *Journal of Emergency Management* 6(5): 71-80.
Resilience refers to the capacity to withstand, overcome, or recover from serious threat, such as a natural disaster. In small towns, community leaders are intimately involved with their towns' response and recovery from a disaster and can see resilience processes, or their absence, virtually one person at a time. The authors interviewed 30 community leaders in two small towns along the Red River of the North, seven to eight years after a devastating flood. Responses to the question, "Based on your experience and observations (in your community), what advice would you give a similar community that was trying to recover from a major flood?" revealed a pattern of suggestions consistent with resilience strategies identified in the psychological literature. Specifically, the strategies of taking action, accepting help from others, engaging in self-discovery, maintaining a realistic long-term perspective, and fostering hope and optimism were mentioned repeatedly by the respondents. The authors also found rich subthemes within each of these general strategies. These findings support the applicability of psychological resilience strategies to a community's disaster response and recovery processes.

Zhang, Yang, Michael K. Lindell, and Carla S. Prater. 2009. Vulnerability of community businesses to environmental disasters. *Disasters* 33(1): 38-57.
Business plays important roles in community functioning. However, disaster research has been disproportionately focused on units of analysis such as families, households and government agencies. This paper synthesizes the major findings within the business development research field and the disaster research field. It constructs a framework for evaluating business vulnerability to natural disasters. Our theoretical integration of the research conducted to date addresses five major issues. First, it defines the ways in which businesses are subject to the impacts of natural disasters. Second, it identifies the factors that determine the magnitude of business impacts after a disaster. Third, it identifies how and when businesses return to their pre-disaster level in the disaster stricken community. Fourth, it describes measures that can be taken by individual firms and community planners to reduce the impacts of environmental disasters. Fifth, it identifies needs for public policy and future research to reduce business vulnerability to environmental disasters.

Business Continuity

Clark, Robin J., and Megan H. Timmins. 2008. Continuity of operations planning: Meeting the standard of care. *Journal of Emergency Management* 6(5): 17-22.
Recent disasters have increased the public's awareness of the lack of emergency preparedness of state and local governments. The attacks on the World Trade Center in 2001 highlighted failures in govern-

ment agency coordination, while the anthrax attacks that followed and the more recent natural disasters of Hurricanes Katrina and Rita in 2005 have deepened concerns that our government is unprepared for emergencies. Partially in response to the public's concern, the federal government has encouraged Continuity of Operations (COOP) planning at the federal, state, and local government levels. Public attention, government engagement, and the promulgation of federal directives and guidance are leading to an increase in the standard of care for all public sector planning efforts, thus creating potential liabilities in the areas of COOP planning, testing, training, and maintenance. At this point, COOP planning is becoming the norm for state and local government agencies, and while the process of COOP planning may itself expose agencies to certain liabilities, there is also an increase in the potential liability for agencies that do not undertake COOP planning efforts. Further, it appears that the potential liability of agencies that do not engage in COOP planning far exceeds any liabilities incurred through the planning process.

Zhang, Yang, Michael K. Lindell, and Carla S. Prater. 2009. Vulnerability of community businesses to environmental disasters. *Disasters* 33(1): 38-57.
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Climate Change, Drought and El Nino

Bartlett, Sheridan. 2008. Climate change and urban children: Impacts and implications for adaptation in low- and middle income countries. *Environment & Urbanization* 20(2): 501-519.
This paper discusses the particular and disproportionate risks to urban children in poverty from various aspects of climate change, both extreme events and changing means. It explores the potential impacts on children's health, learning and psychosocial well-being, and considers the implications of family coping strategies for children. The paper goes on to discuss the implications for adaptation, making recommendations for an adaptation agenda that focuses on the realities for children. Preparatory measures are considered, as well as responses to extreme events and to changes in weather patterns.

Benhin, James K. A. 2008. South African crop farming and climate change: An economic assessment of impacts. *Global Environmental Change* 18(4): 666-678.
This paper assesses the economic impact of the expected adverse changes in the climate on crop farming in South Africa using a revised Ricardian model and data from farm household surveys, long-term climate data, major soils and runoffs. Mean annual estimates indicate that a one percent increase in temperature will lead to about US$80.00 increase in net crop revenue while a 1 mm/month fall in precipitation leads to US$2.00 decrease, but with significant seasonal differences in impacts. There are also significant spatial differences and across the different farming systems. Using selected climate scenarios, the study predicts that crop net revenues are expected to fall by as much as 90 percent by 2100 with small-scale farmers most affected. Policies therefore need to be fine-tuned and more focused to take advantage of the relative benefits across seasons, farming systems, and area. By so doing, climate change may be beneficial rather than harmful.

Enfors, Elin I., and Line J. Gordon. 2008. Dealing with drought: The challenge of using water system technologies to break dryland poverty traps. *Global Environmental Change* 18(4): 607-616.
This article explores strategies among farmers in semi-arid Tanzania to cope with drought, and investigate if access to a local supplemental irrigation system (the Ndiva system) can improve coping capacity. Results show high dependency on local ecosystem services when harvests fail, and indicate that farmers commonly exhaust asset holdings during droughts. Ndiva access did not have any direct effects on coping capacity, but seemed to have some indirect effects. Drawing on their findings the

authors discuss the complexity of escaping persistent dryland poverty, and outline the circumstances under which small-scale water system technologies, such as Ndiva irrigation, may help.

Ruuhela, Reija, Laura Hiltunen, Ari Venalainen, Pentti Prininen, and Timo Partonen. 2008. Climate impact on suicide rates in Finland from 1971 to 2003. ***International Journal of Biometeorology*** **(ePub).**
Seasonal patterns of death from suicide are well-documented and have been attributed to climatic factors such as solar radiation and ambient temperature. However, studies on the impact of weather and climate on suicide are not consistent, and conflicting data have been reported. In this study, we performed a correlation analysis between nationwide suicide rates and weather variables in Finland during the period 1971-2003. The weather parameters studied were global solar radiation, temperature and precipitation, and a range of time spans from one month to one year were used in order to elucidate the dose-response relationship, if any, between weather variables and suicide. Single and multiple linear regression models show weak associations using one-month and three-month time spans, but robust associations using a 12-month time span. Cumulative global solar radiation had the best explanatory power, while average temperature and cumulative precipitation had only a minor impact on suicide rates. Our results demonstrate that winters with low global radiation may increase the risk of suicide. The best correlation found was for the five-month period from November to March; the inter-annual variability in the cumulative global radiation for that period explained 40 percent of the variation in the male suicide rate and 14 percent of the variation in the female suicide rate, both at a statistically significant level. Long-term variations in global radiation may also explain, in part, the observed increasing trend in the suicide rate until 1990 and the decreasing trend since then in Finland.

Saldana-Zorilla, Sergio O. 2008. Stakeholders' views in reducing rural vulnerability to natural disasters in Southern Mexico: Hazard exposure and coping and adaptive capacity. ***Global Environmental Change*** **18(4): 583-597.**
This paper examines how climatic events affect agricultural livelihoods. Special emphasis is given to the effects of natural disasters on migration patterns. In addition, this manuscript assesses policy options to reduce the vulnerability of small-scale farmers (e.g. government-supported insurance schemes) in the context of the Mexican government's withdrawal from directly subsidizing the agricultural sector over the past 18 years. The work draws on stakeholder consultations (based on questionnaires and interviews) and descriptive analysis in three communities in the southern state of Chiapas, Mexico. It also puts forward stakeholder-based solutions, which embrace loss-sharing and risk-transfer mechanisms. The coping strategies revealed in this study encompass both immediate responses (e.g. sources of off-farm income, post-disaster financing sources, and emigration plans), and more structural and long-term strategies, such as re-orientation of production and improvement of infrastructure for production.

Sanghi, Apurva, and Robert Mendelsohn. 2008. The impacts of global warming on farmers in Brazil and India. ***Global Environmental Change*** **18(4): 655-665.**
How big a threat is global warming to climate-sensitive and economically important sectors such as agriculture in developing countries? How well will farmers be able to adapt to the threats of global warming? This paper attempts to shed light on these two important questions. A cross-sectional analysis is employed to estimate the climate sensitivity of agriculture in Brazil and India. Using panel data from both countries, the study measures how net farm income or property values vary with climate, and consequently, how farmers in India and Brazil react and adapt to climate. The estimated relationships are then used to predict the consequence of alternative climate scenarios. Global warming by the end of the next century could cause annual damages in Brazil between 1 percent and 39 percent and between 4 percent and 26 percent in India, although some of this effect may be potentially offset by carbon fertilization. These estimates do not factor into account climate-induced extreme weather events.

Sullivan, Karl. 2008. Policy implications of future increases in extreme weather events due to climate change. ***Australian Journal of Emergency Management*** **23(4): 37-42.**
The article outlines the shifts required to increase future communities' resilience to more extreme weather events. The first part focuses on the importance of community resilience and what makes a community resilient. The second part focuses on the contribution of insurance to resilience. The third part examines possible ways to improve community resilience in the areas of emergency and recovery planning and

financial risk mitigation against extreme events due to climate change.

Tompkins, Emma L., Maria Carmen Lemos, and Emily Boyd. 2008. A less disastrous disaster: Managing response to climate-driven hazards in the Cayman Islands and NE Brazil. *Global Environmental Change* 18(4): 736-745.

This paper explores the relationship between disaster risk reduction and long-term adaptive capacity building in two climate vulnerable areas: the Cayman Islands in the Caribbean, and Ceará, in NE Brazil. Drawing on past applications of the disaster risk reduction framework, the article identifies four critical factors that have led to reductions in risk: flexible, learning-based, responsive governance; committed, reform-minded and politically active actors; disaster risk reduction integrated into other social and economic policy processes; and a long-term commitment to managing risk. Findings show that while the presence of these factors has reduced overall risk in both regions, in Ceará, disaster response as it is currently practiced, has fallen short of addressing the fundamental causes of vulnerability that leave those prone to hazards able to cope in the short term, yet enmeshed in poverty and at risk from the longer-term changes associated with climate change. Although calls for integration of disaster risk management with poverty eradication are not new, there has been insufficient attention paid in the literature on how to foster such integration. Based on the two case studies, the article argues that the adoption of good governance mechanisms (such as stakeholder participation, access to knowledge, accountability and transparency) in disaster risk reduction policy may create the policy environment that is conducive to the kind of structural reform needed to build long-term adaptive capacity to climate-driven impacts. It concludes that without a synergistic two-tiered approach that includes both disaster risk reduction and structural reform, disaster risk reduction, in the face of climate changes, will prove to be an expensive and ineffective palliative treatment of changing risks.

Uggla, Ylva. 2008. Strategies to create risk awareness and legitimacy: the Swedish climate campaign. *Journal of Risk Research* 11(5): 719-734.

Social means of risk regulation often only arise in response to media attention and public opinion. In contrast, in the case of climate change, the Swedish government proactively launched a public information campaign to promote public awareness and knowledge of the risks associated with climate change, with the explicit objective of promoting acceptance of public means of reducing greenhouse gas emissions. This paper analyses the framing of climate change in the Swedish climate campaign and its communication strategy. What was the message of the campaign narrative? What did it imply concerning the causes, effects, management of, and responsibility for climate change? What means were used to communicate the risks of climate change? The paper analyses the campaign narrative, its references to various affective images of climate change, and the various storytelling techniques it used. It concludes that the Swedish climate campaign relied on a unidirectional view of risk communication and proffered a narrative containing inconsistencies and ambivalence. The analysis demonstrates that despite a thoroughly worked-out strategy, a well-defined message, and the intention to speak clearly, a complex problem such as climate change cannot easily be transformed into a single, coherent story.

Wilhelmi, Olga V., Michael J. Hayes, and Deorah S. K. Thomas. 2008. Managing drought in mountain resort communities: Colorado's experiences. *Disaster Prevention and Management* 17(5): 672-680.

This article investigates drought impacts and vulnerabilities specific to mountain resort communities and the implications for the tourism industry, in order to derive a set of recommendations for reducing drought vulnerability of this economic sector. It presents the results from a case study conducted in Colorado, USA, mountain communities evaluating the multi-year drought that culminated in 2002. Using qualitative research methods, a series of interviews were conducted to garner the experiences of state and local tourism officials, ski resort representatives, and environmental, municipal, and agricultural organizations. The study finds that drought alone was not responsible for creating the variety of direct and secondary impacts on Colorado resort communities. The paper highlights the importance of water resources to the economic wellbeing of resort communities and recognizes the critical roles of communication, planning, media and public perception during a drought. Societal vulnerability in mountain resort communities in relation to drought has rarely been addressed in the literature. The study provides specific recommendations to the resort managers and tourism officials for mitigating drought impacts of, and reducing resort communities' vulnerability to, drought.

Critical Infrastructure

Luiijf, H. A. M., and A. H. Nieuwenhuijs. 2008. Extensible threat taxonomy for critical infrastructures. ***International Journal of Critical Infrastructures*** **4(4): 409-417.**

The European Union-sponsored project Vital Infrastructure Threats and Assurance (VITA) has the objective of exploring and showing new paths in Critical Infrastructure Protection (CIP) R&D. This paper describes one of VITA's results: the idea and the development of a novel extensible and generic threat taxonomy for Critical Infrastructures (CIs). Over 300 threats have been categorized. The threat taxonomy makes a sharp distinction between threats, threat cause categories (nature, human or both), and human intent. It is shown that activism, sabotage, and terror threats should be regarded as an expression of human intent combined with other existing threats. The taxonomy helps to select in a balanced way all the all-hazard threats which may threaten existing CIs.

McGinnis, Mike, and Wayne Buck. 2008. NATO and Old Dominion University co-host disaster and incident management symposium. ***International Journal of Critical Infrastructures*** **4(4): 445-454.**

The 2008 Azalea Festival Symposium entitled, "Katrina over Hampton Roads: Are We Ready?" brought together over 250 attendees from 25 nations. The afternoon panel sessions featured discussions with state emergency management executives, federal officials, industry executives and academic subject matter experts. The symposium and resulting workshops generated a wide range of important observations and actionable recommendations for making the citizens and governments better prepared for dealing with all hazards incidents. Key recommendations were made in the areas of incident preparedness and response management, technology, emergency management policy, plans and processes, and individual and staff training and exercises will be used to inform the NATO countries, local, state, and federal representatives and citizenry on actions that can be taken to create the "culture of preparedness" that is needed.

Vracken, Jos, Jan van den Berg, and Michael Santos Soares. 2008. Human factors in system reliability: Lessons learnt from the Maeslant storm surge barrier in The Netherlands. ***International Journal of Critical Infrastructures*** **4(4): 418-429.**

The Maeslant storm surge barrier in the Netherlands is an interesting case in system reliability: first because of the great effort that has been put into making its operation reliable and into assessing its reliability; and second, because it has characteristics that make reliability assessment extremely hard. From its history a number of interesting conclusions can be drawn, of which the most important one is that there is no straightforward, definitive solution to reliability, but reliability is obtained and maintained in a continuous process of improvement. Other conclusions are that humans cannot be excluded from the operation or decision making in systems such as the Maeslant barrier, that all methods for improving system reliability are most effective when the people involved are sharply aware of each method's limitations and that a continuous, open process of consulting a variety of experts is crucial to obtain the best possible reliability.

Disaster and Emergency Managment

Arbuthnot, Kevin. 2008. A command gap? A practitioner's analysis of the value of comparisons between the UK's military and emergency services' command and the control models in the context of UK resilience operations. ***Journal of Contingencies and Crisis Management*** **16(4):186-194.**

The Gold, Silver and Bronze model of incident command incidents equates to hierarchical levels of command and managerial control termed "strategic, tactical and operational," respectively. However, the military, NATO wide, are more used to a system that defines strategic, operational and tactical. Author contends that the systems are fundamentally different in scope and function, and a fuller and more complete understanding of the nature and purpose of each system is needed before they can be effectively reconciled with each other to the extent that they might become operationally useful in the field of civil emergency incident response, and the potential for an operational failure can be eradicated. A model is offered that seeks to address these issues.

Bullock, Jane A., and Geroge D. Haddow. 2008. How the next president of the United States can fix FEMA. ***Journal of Emergency Management*** **6(5): 13-14.**

The nation continues to experience increased frequency and severity of weather disasters. All of these risks demand that we look at the current system and assess if this system, which predicated on strong federal leadership in partnership with state and local governments and which failed so visibly in Hurricane Katrina, needs to be rebuilt on a new model. A plan of action is suggested that is practical, achievable, and will reduce costs in lives, property, environmental and economic damage from future disasters. The next

president is the only person who can make this happen. The authors suggest that the next president takes these steps: 1) move FEMA out of the Department of Homeland Security; 2) appoint a FEMA director, who is a trusted advisor to the pPresident; 3) include the appointment of the FEMA director in the first round of presidential appointees to the cabinet; 4) rebuild the Federal Response Plan; 5) remove hazardous mitigation and long-term recovery functions from FEMA; 6) invest $2.5 billion annually in hazard mitigation; 7) support community disaster resiliency efforts. The next president will have the opportunity to build the new partnership of federal, state and local governments, voluntary agencies, nonprofits and the private sector that is needed to make our nation resilient. The question is will the next president take advantage of this opportunity?

Capri, Salvatore, Matteo Ignaccolo, and Giuseppe Inturri. 2009. VTOL aircraft in emergency planning and management: a model for a helipad network. ***Disasters*** **33, (1): 82-94.**
The scientific literature regarding HEMS (Helicopter Emergency Medical Service) planning lacks a method for defining optimal sites for helipads that takes into account risk distribution and hospital location. Such a method could minimize overall rescue time in emergency situations. In this paper a method that supports the decisions taken by disaster planners and managers is developed, focusing on the quantification of necessary air resources for the management of some probable calamities. Given a region characterized by a natural and non-natural disaster risk map, along with a comprehensive transport system (also characterized by a risk map), a set of emergency destinations (hospitals), a set of heliports/helipads dislocated on the territory and a number of available HEMS rotorcraft, the aim of the paper is to assess the adequacy of the VTOL/FATO (Vertical Take-Off and Landing/Final Take-Off and Landing Area) system in order to deal with a set of possible emergencies.

Devitt, Katharine R., and Edward P. Borodzicz. 2008. Interwoven leadership: The missing link in multi-agency major incident response. ***Journal of Contingencies and Crisis Management*** **16(4): 208-216.**
This paper reports on research into the effectiveness of strategic commanders and their multi-agency teams in response to major incidents. It is argued that current models of crisis leadership fail to establish a balance between the requirement for task skills, interpersonal skills, stakeholder awareness and personal qualities of commanders and their teams. The paper sets out a theoretical model for interwoven leadership combining these features.

McEntire, David A. 2008. A critique of emergency management policy: Recommendations to reduce disaster vulnerability. ***International Journal of Public Policy*** **3(5/6): 302-312.**
The problems currently evident in emergency management give ample reason to reflect upon the direction of this profession in the USA. This paper evaluates the founding principles upon which this profession was based in the 1980s. It then highlights the strengths and weaknesses of the sustainability school that appeared a decade later. After illustrating the need for and problems associated with homeland security, it puts forward the concept of vulnerability management. This policy guide is based on the notions of liability reduction and capacity building, and has close relation to increasingly popular terms such as risk, susceptibility, resistance and resilience. The paper concludes with recommendations on how to implement a policy of vulnerability management.

Meizoso, Jonathan P., David V. Shatz, Keith G. fletcher, Matthew V. Shpiner, Daniel Carvajal, Allison Ring, William Coffin, Michelle Pearlman, Amy Pearlman, Stephanie Ragland, Sean M. Murphy, David Rivero, William Gerlach, John Pepper, and John Tighe. 2008. University of Miami 'Canes Emergency Response Team: A look at an undergraduate disaster response team. ***Journal of Emergency Management*** **6(6): 48-52.**
Through recurrent disasters, both natural and man-made, the US government has developed a sophisticated emergency and disaster response system, ranging from local to federal government responses. But in large-scale disasters, the number of professional responders and the response times may be inadequate both for the physical magnitude of the disaster area involved and the number of victims. With that experience in hand, the Los Angeles City Fire Department promoted the concept of citizen response and training in 1985, which is now known as the Community Emergency Response Teams (CERT). The CERT program seeks to educate the lay public in disaster preparedness and train volunteers in basic disaster response skills. Training has been made available through the Federal Emergency Management Agency, the Emergency Management Institute, and the National Fire Academy (http://www.citizencorps.gov/cert/). These teams can be used to promote awareness programs in the community and to be readily available in the event of a local incident. Their proximity to the event and knowledge of the area can be a valuable asset both prior to and af-

ter the arrival of professional responders. But building such a team from scratch can be a daunting challenge. Known more for their football program, this article describes the system built by the undergraduate student body of the University of Miami Hurricanes.

Molka-Danielsen, Judith, and Thomas Beke. 2008. Rumors interplay in disaster management. ***International Journal of Risk Assessment and Management*** **9(4): 334-350.**
Rumors affect how rational individuals assess risks, evaluate needs, and make decisions in disaster-affected environments. This paper presents a comprehensive understanding of the role of rumors in disaster management. First the authors present an objective definition of "'rumor"' that is a compound definition including both a message with some degree of false content and a method of transporting the content. Second, the authors analyze two well-documented cases of technological and biological disaster events that have resulted in both losses to human welfare and economic losses and the interplay of rumors in these cases. Explained is how rumors as objects become enacted and activate other objects. A model for understanding these interactions of rumors in disaster environments is developed and explained. Finally, the authors outline a strategy for authorities and assistance agencies that can contribute to disaster management.

Patricelli, Frederic, James E. Beakley, Angelo Carnevale, Marcello Tarabochia, and Dag K. J. E. von Lubitz. 2009. Disaster management and mitigation: The telecommunications infrastructure. ***Disasters*** **33(1): 23-37.**
Among the most typical consequences of disasters is the near or complete collapse of terrestrial telecommunications infrastructures (especially the distribution network the "'last mile"') and their concomitant unavailability to the rescuers and the higher echelons of mitigation teams. Even when such damage does not take place, the communications overload/congestion resulting from significantly elevated traffic generated by affected residents can be highly disturbing. The paper proposes innovative remedies to the telecommunications difficulties in disaster struck regions. The offered solutions are network-centric operations-cap able, and can be employed in management of disasters of any magnitude (local to national or international). Their implementation provide ground rescue teams (such as law enforcement, firemen, healthcare personnel, civilian authorities) with tactical connectivity among themselves, and, through the Next Generation Network backbone, ensure the essential bidirectional free flow of information and distribution of aActionable kKnowledge among ground units, command/control centerres, and civilian and military agencies participating in the rescue effort.

Pilemalm, Sofie, Dennis Andersson, and Niklas Hallberg. 2008. Reconstruction and exploration of large-scale distributed operations: Multimedia tools for evaluation of emergency management response. ***Journal of Emergency Management*** **6(6): 31-47.**
This study presents an approach for computer-supported reconstruction and exploration (R&E) of distributed tactical operations. The approach involves several steps for constructing a time-synchronized, event-driven multimedia model of the course of events collected from multiple sources in the operational environment and visualizes this model in the F-REX Studio multimedia suite. In this study, the use of R&E and F-REX is explored in large-scale emergency management exercises. The approach's possibilities, limitations, and needs for modification are first outlined followed by a comparison to traditional quantitative and qualitative data collection methods applied in the same context. It is found that the R&E approach in combination with F-REX has several advantages in relation to the other methods, in terms of avoiding problems of retrospection and in being able to provide an overview of the entire operation based on multiple perspectivesaddressing the question "why" something happened rather than "what happened." Correctly used, multimedia-supported R&E can thereby be used for more solid evaluations of large-scale emergency management exercises and operations, thus contributing to more effective handling of future crises.

Scholtens, Astrid. 2008. Controlled collaboration in disaster and crisis management in the Netherlands, history and practice of an overestimated concept. ***Journal of Contingencies and Crisis Management*** **16(4): 195-207.**
In the Netherlands disaster and crisis management is a local responsibility. The official point of view is that this asks for central controlled collaboration. Authority to enforce this is legally given to the mayor and a dedicated operational leader. Practice however shows that during the acute phase of a disaster or crisis that central controlled coordination cannot be achieved. In this article it is shown that control over the collaboration in the acute phase of a disaster or crisis can only be accomplished in an indirect way via controlled collaboration in the preparatory phase. Practice however shows that in the preparatory phase collaboration of organizations involved in disaster or crisis management is not enforced but based on voluntary actions of these organizations.

Srivastava, Sanjay K. 2009. Making a technological choice for disaster management and poverty alleviation in India. *Disasters* 33(1): 58-81.

The right mix of policy, institutional arrangements and use of technology provides the framework for a country's approach to disaster mitigation. Worldwide, there has been a shift away from a strictly 'top-down' approach relying on government alone, to a combination of 'top-down' and 'bottom-up' approaches. The aim is to enhance the indigenous coping mechanisms of vulnerable communities; draw on their cooperative spirit and energy; and empower them through appropriate information and contextual knowledge to mitigate natural disasters. In light of this, the paper examines India's use of space technology in its disaster management efforts. Poverty alleviation and disaster management are almost inseparable in many parts of the country, as vulnerability to natural disasters is closely aligned with poverty. Addressing these issues together requires integrated knowledge systems. The paper examines how knowledge inputs from space technology have strengthened the national resolve to combat natural disasters in conjunction with alleviating rural poverty.

Vineburgh, Nancy T., David M. Benedek, Carol S. Fullerton, Robert K. Gifford, and Robert J. Ursano. 2008. Workplace resources for crisis management: Iimplications for public-private sector planning, policy and response to disasters. *International Journal of Public Policy* 3(5/6): 378-388.

The interface and cooperation of the public and private sector is essential in disaster planning and response at the federal, state and local level. The resources of private industry and the integration of resources from multiple corporations have been proven necessary for effective community and regional responses to large-scale disasters (natural disasters, terrorism, bioterrorism and the threat of a pandemic). Large corporations often possess sophisticated crisis management capabilities that may exceed the disaster response capacities of the communities in which they are located. Important crisis management resources of large employers that have implications for community planning and response to disasters include the corporation's security and threat assessment, communications, human resources and Employee Assistance Programs (EAP). Workplace preparedness influences family and community preparedness and impacts population health, safety and resilience. Workplace crisis resources, often forgotten and untapped by public sector planners, need to be considered in the continued development and implementation of disaster planning and response policies.

Waugh, William L. 2008. The principles as the foundation of emergency management. *Journal of Emergency Managemen*t 6(5): 15-16.

Williams, Jillian A., and Aileen B. Xenakis. 2008. Establishing identity during a disaster: The Emergency Management Assistance Compact and the First Responder Authentication Credential. *Journal of Emergency Management* 6(6): 11-15.

As emergencies consistently overwhelm the resources of the jurisdictions they affect, the emergency management community responds with legislation enacting programs to send aid more efficiently, including the Emergency Management Assistance Compact (EMAC). Correspondingly, emergency management technology develops to meet the field's evolving needs. The Office of the National Capital Region Coordination (ONCRC) finds that the technology behind First Responder Authentication Credentials, or FRAC cards, will supplement the EMAC program by providing the trust framework that will enable identity and typing to be electronically verified to one individual issued from an authoritative source. It puts into practice "trust but verify" with verification being enabled electronically and provides a trust framework that assures the incident scene commander that a visiting first responder is who he says he is and is certified to perform the tasks that he has been assigned. In the chaos that accompanies such disasters, there is a latent threat of doing more harm by admitting unauthenticated people to an already vulnerable asset or scene; in an effort to protect against further harm, capable and available assisting responders are often prevented from actually helping. The FRAC program is the next stage in the emergency management field's development of more efficient response mechanisms. In essence, FRAC picks up where EMAC left off: it provides a credential with photo and biometric identification that accesses computer data confirming the visiting first responder's attributes and skill sets. It allows on-scene security to confirm a visiting first responder's identity and credentials. Necessity is the mother of invention, and the FRAC program meets the current need for electronic verification of identity and skills, while simultaneously allowing for greater accountability on the scene of a disaster. The FRAC technology will be a critical element in reaching the next level of success in emergency response. It should fit seamlessly into the programs that have already yielded positive results and should help first responders to be more effective and efficient.

Disaster Relief

Brevard, Sidney B., Sharon L. Weintraub, James B. Aiken, Edward B. Halton, Juan C. Duchesne, Norman E. McSwain, John P. Hunt, and Alan B. Marr. 2008. Analysis of disaster response plans and the aftermath of Hurricane Katrina: Lessons learned from a Level I trauma center. ***The Journal of Trauma*** **65(5): 1126-1132.**
This study compares disaster preparedness of a level I trauma center with performance in an actual disaster. Previous disaster response evaluations have shown that the key to succeeding in responding to a catastrophic event is to anticipate the event, plan the response, and practice the plan. The Emergency Management Team had identified natural disaster as the hospital's highest threat. The hospital also served as the regional hospital for the Louisiana Health Resources and Service Administration Bioterrorism Hospital Preparedness Program. The hospital master disaster plan, including the Code Gray annex, was retrospectively reviewed and compared with the actual events that occurred after Hurricane Katrina. Vital support areas were evaluated for adequacy using a systematic approach. In addition, a survey of 10 key personnel from trauma and emergency medicine present during Hurricane Katrina was conducted. The survey of vital support areas were scored as adequate (three points), partially adequate (two points), or inadequate (one point). Ninety-three percent of the line items on the Code Gray Checklist were accomplished before landfall of the storm. The results of the survey of vital support areas were: water, 3.0 points; food, 2.4; sanitation, 1.5; communication, 1.4; and power, 1.5. Despite identifying the threat of a major hurricane, preparing a response plan, and exercising the plan, a major medical center can be overwhelmed by a catastrophic disaster like Hurricane Katrina. The study offers lessons learned as an aid for other medical centers that are developing and exercising their plans.

Bolton, Matthew, and Alex Jeffrey. 2008. The politics of NGO registration in international protectorates: The cases of Bosnia and Iraq. ***Disasters*** **32(4): 586-608.**
Following international interventions in Bosnia-Herzegovina and Iraq, nongovernmental organizations (NGOs) have played a central role in delivering humanitarian relief, encouraging participation in new systems of government, and advocating on behalf of marginalized groups. Although intervening agencies have framed such autonomous organizations as unquestionably virtuous, scholars have increasingly questioned the agency of NGOs, pointing to the constraining effects of funding and regulatory mechanisms. This paper contributes to this body of work by offering a detailed examination of legislation requiring NGOs to register with nascent state institutions. Drawing on case study material from Bosnia and Iraq, it argues that NGO registration should not be dismissed as a technical or legal matter, but should be embraced as a significant political practice embedded in relations of power. Registration legislation has increased the transparency of NGO funding origins and institutional practices, yet it has simultaneously acted as a barrier to smaller organizations and led to the transmission of international objectives through civil society entities.

Labadie, John R. 2008. Auditing of post-disaster recovery and reconstruction activities. ***Disaster Prevention and Management*** **17(5): 575-586.**
This paper seeks to explore the application of auditing and quality assurance principles and practices to the planning and implementation of post-disaster recovery and reconstruction. It notes the risk to a disaster recovery organization's credibility if fraud and poor performance are apparent in its efforts to support disaster recovery and reconstruction, and it provides examples of relief organizations' efforts to ensure that their actions are both credible and effective. Examining the complex and multi-faceted processes of post-disaster recovery and reconstruction, the paper describes the growing emphasis around the world on social justice/equity issues and the importance of proper governance. It explores the advantages and pitfalls of incorporating auditing practices into the effective implementation of recovery and reconstruction activities. The paper concludes with a discussion of the importance to the affected communities of knowing that expenditures both financial and emotional will achieve something better.

Leeson, Peter T, and Russell S. Sobel. 2008. Weathering Corruption. ***Journal of Law and Economics*** **51(4): 667-681.**
Could bad weather be responsible for U.S. corruption? Natural disasters create resource windfalls in the states they strike by triggering federally provided natural-disaster relief. By increasing the benefit of fraudulent appropriation and creating new opportunities for such theft, disaster-relief windfalls may also increase corruption. This article investigates this hypothesis by exploring the effect of disaster relief provided by the Federal Emergency Management Agency (FEMA) on public corruption. The results support the hypothesis. Each additional $100 per capita in FEMA relief increases the average state's corruption by nearly 102 percent. Findings suggest notoriously corrupt regions of the United States, such as the Gulf Coast, are in part

notoriously corrupt because natural disasters frequently strike them. They attract more disaster relief, which makes them more corrupt.

McCoy, Jessica. 2008. Humanitarian response: Improving logistics to save lives. ***American Journal of Disaster Medicine*** **3(5): 283-293.**

Each year, millions of people worldwide are affected by disasters, underscoring the importance of effective relief efforts. Many highly visible disaster responses have been inefficient and ineffective. Humanitarian agencies typically play a key role in disaster response (eg, procuring and distributing relief items to an affected population, assisting with evacuation, providing healthcare, assisting in the development of long-term shelter), and thus their efficiency is critical for a successful disaster response. The field of disaster and emergency response modeling is well established, but the application of such techniques to humanitarian logistics is relatively recent. This article surveys models of humanitarian response logistics and identifies promising opportunities for future work. Existing models analyze a variety of preparation and response decisions (e.g., warehouse location and the distribution of relief supplies), consider both natural and manmade disasters, and typically seek to minimize cost or unmet demand. Opportunities to enhance the logistics of humanitarian response include the adaptation of models developed for general disaster response; the use of existing models, techniques, and insights from the literature on commercial supply chain management; the development of working partnerships between humanitarian aid organizations and private companies with expertise in logistics; and the consideration of behavioral factors relevant to a response. Implementable, realistic models that support the logistics of humanitarian relief can improve the preparation for and the response to disasters, which in turn can save lives.

Reaves, Erik J., Kenneth W. Schor, and Frederick M. Burkle. 2008. Implementation of evidence-based humanitarian programs in military-led missions: Part I. Qualitative gap analysis of current military and international aid programs. ***Disaster Medicine and Public Health Preparedness*** **2(4): 230-236.**

A recent Department of Defense instruction mandates country-specific assessments, identification of interventions, and development of guidance for Department of Defense to plan, train, and prepare for the provision of humanitarian assistance in stability operations. It also directs the use of outcome-based measures of effectiveness and the establishment of processes facilitating transparency of information. Whereas this would align military-led projects closer to the standards of the international aid community, how this process will be developed and implemented within the military has not yet been determined. To begin developing an evidence-based program for military-led humanitarian aid, the authors conducted a qualitative gap analysis comparing information from a Web search of Department of Defense medical after-action reports, lessons learned, and expert interviews with the internationally accepted standards in humanitarian assistance impact assessment. There is a major gap in the ability of the Department of Defense to assess the impact of humanitarian assistance in stability operations compared with international development standards. Of the 1000 Department of Defense after-action reports and lessons learned reviewed, only 7 (0.7 percent) reports refer to, but do not discuss, impact assessment or outcome-based measures of effectiveness. This investigation shows that the Department of Defense humanitarian assistance operations are, historically, recorded without documentation using quantifiable health data identifying which aid activities contributed directly to desired outcomes or favorable public opinion, and rarely are analyzed for effectiveness. As humanitarian assistance operations assume an ever greater role in U.S. military strategy, it is imperative that the authors investigate useful impact assessment models to meet mission directives and, more important, to maximize coordination in a necessarily integrated and cooperative development environment. These findings provide baseline knowledge for the implementation of an evidence-based impact assessment process to validate future Department of Defense humanitarian assistance operations.

Schultz, Jessica, and Tina Soreide. 2008. Corruption in emergency procurement. ***Disasters*** **32(4): 516-536.**

Corruption in emergency procurement reduces the resources available for life-saving operations, lowers the quality of products and services provided, and diverts aid from those who need it most. It also negatively influences public support for humanitarian relief, both in the affected country and abroad. This paper analyzes the following question in order to mitigate risk: how and where does corruption typically occur, and what can be done? Suggested strategies reflect a multilayered approach that stresses internal agency control mechanisms, conflict-sensitive management, and the need for common systems among operators.

Thompson, Wiley. 2008. School-based relief centers: A community level assessment and discussion. ***Journal of Emergency Management*** **6(6): 63-72.**

An effective community relief center plan provides emergency managers with the ability to provide shelter and services to a population following the onset of a hazard and is a key component of emergency preparedness and disaster recovery. This paper presents a practical method whereby an assessment of schools as the basis of a community-wide relief center plan is made. The paper suggests desired characteristics of a relief center, details a selection methodology, and provides recommendations for implementation of a community relief center plan. Alternative considerations and the role of GIS are also discussed.

Earthquakes

Armas, Iuliana. 2008. Social vulnerability and seismic risk perception. Case study: The historic center of the Bucharest Municipality/Romania. ***Natural Hazards*** **47(3): 397-410.**

Social vulnerability is as much a part of risk as building damage, hazard magnitude, and economic loss. Social vulnerability refers to the capacity of a human community exposed during the impact of a natural hazard event (in this case, an earthquake) to resist, cope with, and recover from that impact. In the perspective of the 3rd millennium, we come to understand that the most efficient and accessible way to reduce the pressure of natural risks is to reduce the vulnerability level of the human communities exposed to that certain hazard. This study aims to test, in an exposed and vulnerable area, the relationship between social vulnerability and the perception of the seismic risk. The research focuses only on the first level of social vulnerability, defined as the ability of an individual within a household to recover from a natural hazard impact (Dwyer et al. 2004). A prevailing assumption was that social vulnerability influences the level of perception of the seismic risk, in an exposed, vulnerable area. To this end, two samples were used, different under the aspect of social vulnerability, in the context of the same residential area. Social vulnerability was computed as a normalized composed index that includes the poverty ratio and the demographic vulnerability ratio (depending on the age, gender, and education level indicators). The statistical processing has indicated a significant difference in the high perception level for the two samples that were compared, in the sense that in the context of an increased level of social vulnerability, people generally better acknowledge the seismic risk.

Benini, Aldo, Charles Conley, Brody Dittemore, and Zachary Waksman. 2009. Survivor needs or logistical convenience? Factors shaping decisions to deliver relief to earthquake-affected communities, Pakistan 2005–06. ***Disasters*** **33(1): 110-131.**

In Bureaucratizing the Good Samaritan, Waters (2001) argues that bureaucratic rationality distracts humanitarian agencies from the needs of the people they are supposed to assist in favor of other values that their institutional frameworks dictate. This articles tests Waters' claim by investigating the response to the Pakistan 2005 earthquake. The authors use statistical models to probe whether survivor needs significantly guided decisions to deliver relief to affected communities. Needs assessments remained incomplete and incoherent. The authors find that, despite strong logistics effects, needs orientations were significant. However, the strength of decision factors varies between commodity types (food versus clothing and shelter versus reconstruction materials) as well as over the different phases of the response. This study confirms Thomas's observation that logistics databases are rich 'repositories of data that can be analyzed to provide post-event learning' (Thomas, 2003). This article is an invitation for others to engage in creative humanitarian data management.

Hussein, H. M., K. M. Abou Elenean, I. A. Marzouk, A. Peresan, I. M. Korrat, E. Abu El-Nader, G. F. Panza, and M. N. El-Gabry. 2008. Integration and magnitude homogenizaion of the Egyptian earthquake catalogue. ***Natural Hazards*** **47(3): 525-546.**

This work compiles and updates a catalogue of the instrumentally recorded earthquakes in Egypt, with uniform and homogeneous source parameters as required for the analysis of seismicity and seismic hazard assessment. This in turn requires a detailed analysis and comparison of the properties of different available sources, including the distribution of events with time, the magnitude completeness, and the scaling relations between different kinds of magnitude reported by different agencies. The observational data cover the time interval 1900-2004 and an area between 22°33.5° N and 25°36° E. The linear regressions between various magnitude types have been evaluated for different magnitude ranges. Using the best linear relationship determined for each available pair of magnitudes, as well as those identified between the magnitudes and the seismic moment, the different magnitude types were converted into moment magnitudes M W. Analysis of the catalogue completeness, based on the M W thus estimated, allows for the identification of two different time intervals with homogeneous properties.

Kohiyama, Masayuki, Anne S. Kiremidjian, Kimiro Meguro, and Miho Yoshimura Ohara. 2008. Incentives and disincentives analysis for improving policy for seismic risk management of homeowners in Japan. ***Natural Hazards Review*** **9(4): 170-178.**

To improve policy and programs for retrofitting houses in Japan, incentives and disincentives for seismic risk management by homeowners were studied by two approaches: a fault tree analysis (FTA) method and a questionnaire survey to homeowners. The result of the FTA revealed two common causes that hindered homeowners' seismic risk management: disaster awareness and fear of dishonest contractors. The questionnaire survey identified both incentives and disincentives. It was observed that neighbors could prompt retrofitting and that there were three major disincentives to retrofitting: high retrofitting cost, low contractor credibility, and little engineering information. The current policy in Japan puts emphasis on seismic diagnosis in comparison withthe United States. However, based on the above-mentioned observations, it was suggested that planning and reviewing of retrofitting work, as well as management after retrofitting, should be assisted more comprehensively to promote retrofitting. In addition, more attention should be paid to risk communication to provide engineering information on retrofitting, to foster mutual trust between homeowners and contractors/engineers, and to encourage information exchange with neighbors.

Lee, Selina, Rachel Davidson, Norihito Ohnishi, and Charles Scawthorn. 2008. Fire following earthquake: Reviewing the state-of-the-art of modeling. ***Earthquake Spectra*** **29(4): 933-967.**

Models for estimating the effects of fire following earthquake (FFE) are reviewed, including comparisons of available ignition and spread/suppression models. While researchers have been modeling FFEs for more than 50 years, there has been a notable burst of research since 2000. In particular, borrowing from other fire modeling fields and taking advantage of improved computational power and data, there is a new trend towards physics-based rather than strictly empirical spread models; and towards employing different simulation techniques, such as cellular automata, rather than assuming fires spread in an elliptical shape. Past achievements include identification of the factors affecting FFE, documentation of historical events, and years of FFE model use by practitioners. Opportunities for future advances include continued development of physics-based spread models; better treatment of slope, water and transportation system functionality, and suppression by fire departments; and more validation and sensitivity analyses.

Lin, Wen-Tzu, Wen-Chieh Chou, and Chao-Yuan Lin. 2008. Earthquake-induced landslide hazard and vegetation recovery assessment using remotely sensed data and a neural network-based classifier: A case study in central Taiwan. ***Natural Hazards*** **47(3): 331-347.**

A catastrophic earthquake with a Richter magnitude of 7.3 occurred in the Chi-Chi area of Nantou County on September 21, 1999, generating large-scale landslides in the Chiufenershan area of Nantou County in central Taiwan. This study used a neural network-based classifier and the proposed NDVI-based quantitative index coupled with multitemporal SPOT images and digital elevation models (DEMs) for the assessment of long-term landscape changes and vegetation recovery conditions at the sites of these landslides. The analyzed results indicate that high accuracy of landslide mapping can be extracted using a neural network-based classifier, and the areas affected by these landslides have gradually been restored from 211.52ha on 27 September 1999 to 113.71ha on 11 March 2006, a reduction of 46.2 percent, after six and a half years of assessment. In accordance with topographic analysis at the sites of the landslides, the collapsed and deposited areas of the landslide were 100.54 and 110.98ha, with corresponding debris volumes of 31,983,800 and 39,339,500m3. Under natural succession, average vegetation recovery rate at the sites of the landslides reached 36.68 percent on 11 March 2006. The vegetation recovery conditions at the collapsed area (29.17 percent) are shown to be worse than at the deposited area (57.13 percent) due to topsoil removal and the steep slope, which can be verified based on the field survey. From 1999 to 2006, even though the landslide areas frequently suffered from the interference of typhoon strikes, the vegetation succession process at the sites of the landslides was still ongoing, which indicates that nature itself has the capability for strong vegetation recovery for the denuded sites. The results provide very useful information for decision making and policy planning in the landslide area.

Liu, Chia-Nan, Hsiao-Fung Huang, and Jia-Hyun Dong. 2008. Impacts of September 21, 1999 Chi-Chi earthquake on the characteristics of gully-type debris flows in central Taiwan. ***Natural Hazards*** **47(3): 349-368.**

Debris flows are more frequent in central Taiwan because of its mountainous geography. For example, many debris flows were induced by Typhoon Herb in

1996. The 1999 Chi-Chi 7.3-magnitude earthquake in central Taiwan induced many landslides in this region. Some landslides turned into debris flows when Typhoon Toraji struck Taiwan in 2001. This study investigates the characteristics of the gullies where debris flows have occurred for a comparison. Aerial photos of these regions dated in 1997 (before the earthquake) and 2001 (after the earthquake) are used to identify the occurrence of gully-type debris flows. A Geographic Information System (GIS) is applied to acquire hydrological and geomorphic characteristics: stream gradient, stream length, catchment gradient, catchment area, form factor, and geology unit of these gullies. These characteristics in different study regions are presented in a statistical approach. The study of how strong ground motion affects the debris flows occurrence is conducted. The characteristics of the debris flow gullies triggered by typhoons before and after the Chi-Chi earthquake are quantitatively compared. The analysis results show that a significant transformation in the characteristics was induced by the Chi-Chi earthquake. In general, the transformation points out a lower hydrological and geomorphic threshold to trigger debris flows after the Chi-Chi earthquake. The susceptibility of rock units to strong ground motion is also examined. The analysis of debris flow density and accumulated rainfall in regions of different ground motion also reveal that the rainfall threshold decreases after the Chi-Chi earthquake.

Nichols, John M., and James E. Beavers. 2008. World earthquake fatalities from the past: Implications for the present and future. ***Natural Hazards Review*** **9(4): 179-189.**

A method to estimate the likely fatalities in earthquakes in the twenty-first century is a statistical analysis of the data for fatalities in earthquakes from the last two millennia. The National Oceanic and Atmospheric Administration (NOAA) collects and collates earthquake fatality data for the world. The NOAA database has records dating to 186 Before Common Era. The fatality information is incomplete, like all such historically collected data sets. A standard statistical analysis of the known fatality data provides earthquake fatality models for the twentieth century and the last two millennia. The analysis uses a generalized Poissonian distribution to provide a mathematical mapping for each fatality data set. The generalized Poissonian distribution provides a method that can allow for over- and underdispersion of the data not accommodated by a standard Poissonian model. The results show a higher mean for the two millennia data set, which is expected due to the undercounting of the smaller fatal events prior to the twentieth century, so, for example, someone dying in an earthquake in Papua, New Guinea, in the twelfth century will not be in the NOAA database. The generalized Poissonian model is consistent for the two millennia and the 20th century. The generalized Poissonian model for the twentieth century appears to represent an acceptable statistical method to estimate deaths in the current century. This analysis of fatality distributions in earthquakes points to a likely peak death toll for this century in the range of 600,000 to one million people in a single urban center, with this event most likely occurring in an intraplate region rather than an interplate region of the world.

Ozturk, Serkan, Yusuf Bayrak, Hakan Cmar, George Koravos, and Theodoros M. Tsapanos. 2008. A quantitative appraisal of earthquake hazard parameters computed from Gumbel I method for different regions in and around Turkey. ***Natural Hazards*** **47(3): 471-495.**

Useful information concerning the earthquake hazard parameters distributed in Turkey and the adjacent areas is estimated in the present work. Based on Gumbel's I distribution parameters, we are able to estimate the hazard values of the investigated area which are the mean return periods, the most probable maximum magnitude in the time period of t-years and the probability for an earthquake occurrence of magnitude=M during a time span of t-years. Figures concerning the spatial distribution of probabilities and the return periods are plotted and we considered them of particular interest for mapping the earthquake hazard in Turkey and the surrounding areas. These figures effectively produce a brief earthquake hazard atlas. The quantitative appraisal of the hazard parameters is useful for engineers, planners, etc., because it provides a tool for earthquake resistant design.

Sengezer, Betul, Atilla Ansal, and Omer Bilen. 2008. Evaluation of parameters affecting earthquake damage by decision tree techniques. ***Natural Hazards*** **47(3): 547-568.**

Earthquake damages are assessed based on a holistic approach using structural as well as non-structural factors to model earthquake damage distributions with Decision Tree Techniques, using the Answer Tree program and the damage data from recent major earthquakes in Turkey. The damage dataset consists of approximately 9,400 buildings that were surveyed to evaluate the factors affecting building damage after Erzincan [1992], Dinar [1995], and Kocaeli [1999] earthquakes. The earthquake damage is defined as the dependent variable, while earthquake magnitude (M),

intensity (I) in the city, peak ground acceleration (PGA) in each city, epicenter distance (ED), building types (BT), number of storeys (NS), presence of soft storey (SS), building position (BP) on the site, and site conditions (SC) are independent variables in the proposed model. The damage level (DL) was classified with respect to red, yellow, and green codes. The main purpose was: (a) to identify the factors controlling building damage during earthquakes; (b) to determine the most significant factor; (c) to evaluate the effects of different factors for different earthquakes; (d) to develop damage distribution models for different subgroups based on the Decision Tree Techniques.

Vora, Mauli, Zu-Hsu Lee, and Wenshen Pong. 2008. The cost of seismic structural damage and preventive action. ***Disaster Prevention and Management*** **17(5): 601-621.**

This paper first aims to estimate the economic loss due to an earthquake, such as building-related losses, the damage of debris generation and fire, and the social impact. Then, it seeks to evaluate the feasibility of retrofit to prevent buildings from seismic structural damages. The HAZUS software is used for the seismic loss estimation using default demographic data, which were obtained from San Francisco Assessor record. The HAZUS estimates the damage using the earthquake of 6.7 magnitude. Based on the HAZUS report incorporated with probabilistic scenarios of earthquakes, Federal Emergency Management Agency (FEMA) guidelines are used to calculate the cost of structural rehabilitation in San Francisco. It is recommended that either Options 1 and 3 or Options 2 and 3 provided by FEMA 156 and 157 respectively should be used to calculate the cost of seismic rehabilitation of a structure. The results provide estimated costs of retrofit plans for different types of existing buildings. The implementation of quantitative and computer methods in the field of natural hazard management is demonstrated. The outcome provides economic guidelines for assessment and prevention (or reduction) of possible seismic loss and building damage. The study may be a useful reference for retrofit plans for homeowners and business management. The cost estimation also can help government establish or revise some policies properly to provide homeowners with economic incentives (e.g. tax reduction, low interest loan) in retrofitting their homes.

Floods

Australian National Flood Risk Advisory Group. 2008. Flood risk management in Australia. ***Australian Journal of Emergency Management*** **23(4): 21-27.**

This paper introduces the work of the National Flood Risk Advisory Group in providing advice and guidance on the management of flood risk in Australia, in particular its work on the development of a set of national guidelines. The guidelines are included as an appendix and they highlight that communities utilize the support and cooperation of departments and agencies across all levels of government to effectively access the broad range of skills and the funding essential to implement flood risk management solutions. The paper discusses the more important flood risk considerations embodied in the guidelines.

Bingley, R. M., F. N. Teferle, E. J. Orliac, A. H. Dodson, S. D. P. Williams, D. L. Blackman, T. F. Baker, M. Riedmann, M. Haynes, N. Press, D. T. Aldiss, H. C. Burke, B. C. Chacksfield, D. Tragheim, O. Tarrant, S. Tanner, T. Reeder, S. Lavery, I. Meadowcroft, S. Surendran, J. R. Goudie, and D. Richardson. 2008. Measurement of current changes in land levels as input to long-term planning for flood risk management along the Thames estuary. ***Journal of Flood Risk Management*** **1(3): 162-172.**

Long-term planning for flood risk management in coastal and estuarine areas requires timely and reliable information on changes in land and sea levels. This paper describes how the authors produced a detailed, high-resolution map of current changes in land levels for the Thames region, and carried out a new assessment of the changes in sea level relative to the land along the Thames Estuary over the past few decades/past century. The paper concludes by considering the potential benefits of extended monitoring for the long-term planning of flood and coastal defenses in that region.

Chang, C. T., and J. Leentvaar. 2008. Risk trading in trans-boundary flood management: Case study of the Dutch and German Rhine. ***Journal of Flood Risk Management*** **1(3): 133-141.**

This paper explores the potential of applying a newly developed risk trading system, the so-called "tradeable flood mitigation permit," to international flood management. Trading, aimed at complementing binding agreements or regulations, offers a new approach to transnational collaboration. A case study on the Dutch and German River Rhine is presented. The principle of internalizing externalities using direct financial means is applied. The expected result is a higher level of river basin management in the upstream area, with financial resources coming from downstream. Specific institutional conditions, at both national and international

levels, are identified in order to facilitate the establishment of the transactions.

Crichton, David. 2008. Towards a comparison of public and private insurance responses to flooding risks. ***International Journal of Water Resources Development—Special Issue: The Public-Private Divide in Flood Management*** **24(4): 583-592.**
This paper considers the problem of flood risks in the context of public and private insurance responses with a particular focus on residential property. The role and take-up of insurance is demonstrated with examples from OECD countries. The importance of insurance as a tool to implement sustainable flood management policies is highlighted and the ways in which insurance has influenced local authorities in Scotland is described.

Gray, Selena. 2008. Long-term health effects of flooding. ***Journal of Public Health*** **30(4): 353-354.**

Handmer, John. 2008. Risk creation, bearing and sharing on Australian floodplains. ***International Journal of Water Resources Development—Special Issue: The Public-Private Divide in Flood Management*** **24(4): 527-540.**
The fundamental characteristic of flood risk management in contemporary Australia is the tension between private sector land development interests and their allies who create the risk and the quite different groups, largely comprising the public sector, households and small businesses, who bear the main consequences. Flooded businesses may suffer losses, but commerce profits from the event and subsequent reconstruction. Elements of public flood risk management such as warning, emergency response, and recovery attempt to reduce vulnerability. There is a very uneven distribution of risks and benefits, with the public sector bearing most of the risk, while the private sector gains most of the benefits. This may be good for the national economy, but does not provide incentives for flood risk reduction.

Johnson, Clare L., and Sally J. Priest. 2008. Flood risk management in England: A changing landscape of risk responsibility? ***International Journal of Water Resources Development—Special Issue: The Public-Private Divide in Flood Management*** **24(4): 513-525.**
Flood risk management (FRM) in England is undergoing a major paradigm shift as it moves from an ideology dominated by flood defense to one in which the management of all floods, their probabilities and consequences is now of central concern. This change has led to searching questions both within government, and more widely, concerning the appropriate division of responsibility between the state and its citizens, the appropriate balance between structural and non-structural risk management options, and the "fitness for purpose" of the current appraisal, prioritization and decision-making processes. In this paper, the authors examine how a desire to "make space for water" in England has the potential to alter the division of responsibility between the public and private domain, presenting new opportunities, potential barriers and possible solutions.

Loucks, Daniel P., Jery R. Stedinger, DaArryl W. Davis, and Eugene Z. Stakhiv. 2008. Private and public responses to flood risks. ***International Journal of Water Resources Development—Special Issue: The Public-Private Divide in Flood Management*** **24(4): 541-553.**
People continue to build and live on land subject to flooding. People do this knowing that their property may be flooded, if not totally destroyed, by raging waters and accompanying debris. Many do not, however, fully understand and appreciate that risk. As a result, each year on average observes increasing property damage, more lives being threatened, and increased degradation of floodplain ecological functions. It can be argued that with regard to floodplain development governmental policies are not preventing it. Indeed, they may be facilitating it.

Meijerink, Sander, and Willemijn Dicke. 2008. Shifts in the public-private divide in flood management. ***International Journal of Water Resources Development—Special Issue: The Public-Private Divide in Flood Management*** **24(4): 499-512.**
Flood management is changing in many countries across the globe. In spite of the different institutional paths taken in these countries, various common shifts in the governance arrangements for flood management can be observed, most notably decentralization and the increasing influence of the private sector. The central argument of this paper is that a new conceptualization of the public-private divide in flood management, which is based on the dimensions of collectivity and visibility, is helpful in understanding and judging these shifts. Modern flood risk management asks for new cooperative arrangements between state, market, and civil society in which the visibility and collectivity dimensions are reunited.

Morita, Masaru. 2008. Flood risk analysis for determining optimal flood protection levels in urban river

management. *Journal of Flood Risk Management* 1(3): 142-149.

The objective of the paper is to present a specific risk-analysis method for the assessment of optimal flood protection levels in urban flood risk management using intensity, duration, and frequency relationships. Risk herein is understood as the product of flood damage potential and its occurrence probability. The risk analysis is based on a geographic information system-based flood damage prediction model to calculate flood damage for design storms with different return periods. Estimation of the monetary damages for these design storms and their return periods is the prerequisite for quantifying flood risk based on an annual risk density curve. The risk-analysis method is applied to determine optimal flood protection levels for the Kanda River basin in Tokyo, Japan. It shows how two cost curves can be used: risk cost reduction curves and capital cost curves.

Morris, Mark, Greg Hanson, and Mohamed Hassan. 2008. Improving the accuracy of breach modeling: Why are we not progressing faster? *Journal of Flood Risk Management* 1(3): 150-161.

Flood risk assessment and management often requires the prediction of potential breaching of a flood defense embankment or dam in order to either assess potential impacts or provide information to assist emergency planning, evacuation, repair strategies, and improve alternative future design strategies. There are many different aspects of the overall breaching process, which are relevant to the wide range of potential end users of such information. Consequently, the prediction of breach growth is an area where research has been undertaken for many decades in an attempt to provide more reliable models and predictions. However, despite many initiatives providing observations and recommendations about processes observed and how research might progress, more detailed literature searches will often uncover conclusions and observations noted a decade or two or three earlier that are similar to those being made today. In particular, observations relating to material type, state (such as water content and compaction), and properties are relevant here. This prompts the question: why our ability to predict breach initiation and growth has not progressed further over this period? Why are so many studies identifying similar issues and, in effect, "reinventing the wheel?" With a program of research into breach initiation and growth under the EC FLOODsite Project and continued pressure to improve tools and techniques following events such as those seen at New Orleans in August 2005, this paper considers this question of apparent slow progress and offers some suggestions as to why this may have occurred and what direction might prove more effective in the future.

Omidvar, Babak, and Hanieh Khodaei. 2008. Using value engineering to optimize flood forecasting and flood warning systems: Golestan and Golabdare watersheds in Iran as case studies. *Natural Hazards* 47(3): 281-296.

Flood occurrence has always been one of the most important natural phenomena, which is often associated with disaster. Consequently, flood forecasting (FF) and flood warning (FW) systems, as the most efficient non-structural measures in reducing flood loss and damage, are of prime importance. These systems are low cost and the time required for their implementation is relatively short. It is emphasized that for designing the components of these systems for various rivers, climatic conditions, and geographical settings different methods are required. One of the major difficulties during implementing these systems in different projects is the fact that sometimes the main functions of these systems are ignored. Based on a systematic and practical approach and considering the components of these systems, it would be possible to extract the most essential key functions of the system and save time, effort, and money by this way. For instance, in a small watershed with low concentration and small lead time, the main emphasis should be on predicting and monitoring weather conditions. In this article, different components of flood forecasting and flood warning systems have been introduced. Then analysis of the FF and FW system functions has been undertaken based on the value engineering (VE) technique. Utilizing a functional view based on function analysis system technique (FAST), the total trend of FF and FW functions has been identified. The systematic trend and holistic view of this technique have been used in optimizing FF and FW systems of the Golestan province and Golabdare watersheds in Iran as the case studies.

Scholz, Miklas, and Adam J. Sadowski. 2009. Conceptual classification model for Sustainable Flood Retention Basins. *Journal of Environmental Management* 90(1): 624-633.

This paper recommends a rapid conceptual classification model for Sustainable Flood Retention Basins (SFRB) used to control runoff in a temperate climate. An SFRB is an aesthetically pleasing retention basin predominantly used for flood protection adhering to sustainable drainage and best management practices. The classification model was developed on the basis of a database of 141 SFRB using the River Rhine catch-

ment in Baden (part of Baden-Wurttemberg, Germany) as a case study. It is based on an agglomerative cluster analysis and is intended to be used by engineers and scientists to adequately classify the following different types of SFRB: Hydraulic Flood Retention Basin, Traditional Flood Retention Basin, Sustainable Flood Retention Wetland, Aesthetic Flood Retention Wetland, Integrated Flood Retention Wetland and Natural Flood Retention Wetland. The selection of classification variables was supported by a principal component analysis. The identification of SFRB in the data set was based on a Ward cluster analysis of 34 weighted classification variables. Scoring tables were defined to enable the assignment of the six SFRB definitions to retention basins in the data set. The efficiency of these tables was based on a scoring system which gave the conceptual model for the example case study sites an overall efficiency of approximately 60 percent (as opposed to 17 percent by chance). This conceptual classification model should be utilized to improve communication by providing definitions for SFRB types. The classification definitions are likely to be applicable for other regions with both temperate oceanic and temperate continental climates.

Tanaka, Kenji, Sayaka Kamohara, Fumihiko Yamada, Terunori Ohmoto, and Satoru Sugio. 2008. Orographical effects of heavy rainfall by typhoon 0514 (NABI). ***Natural Hazards Review*** **9(4): 190-198.**
Numerical experiments using a mesoscale meteorological model were performed to evaluate the mountainous orographical effects on heavy rainfalls brought by Typhoon 0514 (NABI), which caused a flooding disaster in the southeast Kyushu area of Japan. The studies examined three terrain conditions using a numerical model: a flat terrain with altitude one meter above mean sea level; an idealized, line-shaped mountain terrain; and a complex terrain using topography data from the U.S. Geological Survey. Although the total observed rainfall due to Typhoon 0514 was greater than 1,000 miloimeters, the rainfall value calculated using the flat terrain conditions was 250-300mm; and the value calculated using the complex terrain conditions was 500-900mm. This discrepancy was found to result from the evolution of convective cells, generated by water vapor lifted along the mountain slope in the windward areas. The ratio of forecasted rainfall with and without orography provides an important index for evaluating the risk of heavy rain in a tropical cyclone.

Terpstra, Teun, and Jan M. Gutteling. 2008. Households' perceived responsibilities in flood risk management in the Netherlands. ***International Journal of Water Resources Development—Special Issue: The Public-Private Divide in Flood Management*** **24(4): 555-565.**
Flood risk management in the Netherlands is on the eve of shifting primarily from prevention toward risk management, including disaster preparedness and response and citizen participation. This study explores Dutch households' perceived responsibility for taking private protection measures. Survey results (n=658) indicate that flood risk perception is low, that 73 percent of the respondents regard the government as primarily responsible for protection against flood damage, but that about 50 percent viewed disaster preparedness as an equal responsibility between themselves and the government. Thus, a substantial part of the public may have an open attitude to communication about disaster preparation measures. Dilemmas for increasing citizen participation are discussed.

Tran, Phong, Rajib Shaw, Guillaume Chantry, and John Norton. 2009. GIS and local knowledge in disaster management: A case study of flood risk mapping in Viet Nam. ***Disasters*** **33(1): 152-169.**
Linking community knowledge with modern techniques to record and analyzse risk-related data is one way of engaging and mobilizsing community capacity. This paper discusses the use of the Geographic Information System (GIS) at the local level and the need for integrating modern technology and indigenous knowledge into disaster management. It suggests a way to mobilize available human and technical resources in order to strengthen a partnership between local communities and local and national institutions. The paper also analyses the current vulnerability of two communes by correlating hazard risk and loss/damage caused by disasters, and the contribution that domestic risk maps in the community can make to reduce this risk. The disadvantages, advantages, and lessons learned from the GIS flood risk mapping project are presented through the case study of the Quang Tho Commune in Thua Thien Hue province, central Vietnam.

Warner, Jeroen. 2008. Emergency river storage in the Ooij Polder: A bridge too far? Forms of participation in flood preparedness policy. ***International Journal of Water Resources Development- Special Issue: The Public-Private Divide in Flood Management*** **24(4): 567-582.**
Disaster policy tends to be in the domain of top-down security governance. However, international organizations are calling for more "horizontal," participatory forms of planning for flood preparedness together with local stakeholders. But what modality

of public involvement do they mean? A case study of decision making on emergency flood storage in the Netherlands, proposed in 2000, illustrates a rift over the degree of public consultation in decisions for emergency flood storage in an extreme event, concluding that the course of action taken was perhaps a "missed opportunity." The analysis leads to a typology and discussion of modalities of local participation in disaster governance.

Zahran, Sammy, Samuel D. Brody, Walter Gillis Peacock, Arnold Vedlitz, and Himanshu Grover. 2008. Social vulnerability and the natural and built environment: A model of flood casuatliescasualties in Texas. ***Disasters*** **32(4): 537-560.**

Studies on the impacts of hurricanes, tropical storms, and tornados indicate that poor communities of color suffer disproportionately in human death and injury. Few quantitative studies have been conducted on the degree to which flood events affect socially vulnerable populations. We address this research void by analyzing 832 countywide flood events in Texas from 1997 to 2001. Specifically, we examine whether geographic localities characterized by high percentages of socially vulnerable populations experience significantly more casualties due to flood events, adjusting for characteristics of the natural and built environment. Zero-inflated negative binomial regression models indicate that the odds of a flood casualty increase with the level of precipitation on the day of a flood event, flood duration, property damage caused by the flood, population density, and the presence of socially vulnerable populations. Odds decrease with the number of dams, the level of precipitation on the day before a recorded flood event, and the extent to which localities have enacted flood mitigation strategies. The study concludes with comments on hazard-resilient communities and protection of casualty-prone populations.

Gender and Vulnerable Populations

Armas, Iuliana. 2008. Social vulnerability and seismic risk perception. Case study: The historic center of the Bucharest Municipality/Romania. ***Natural Hazards*** **47(3): 397-410.**

Social vulnerability is as much a part of risk as building damage, hazard magnitude, and economic loss. Social vulnerability refers to the capacity of a human community exposed during the impact of a natural hazard event (in this case, an earthquake) to resist, cope with, and recover from that impact. In the perspective of the 3rd millennium, we come to understand that the most efficient and accessible way to reduce the pressure of natural risks is to reduce the vulnerability level of the human communities exposed to that certain hazard. This study aims to test, in an exposed and vulnerable area, the relationship between social vulnerability and the perception of the seismic risk. The research focuses only on the first level of social vulnerability, defined as the ability of an individual within a household to recover from a natural hazard impact (Dwyer et al. 2004). A prevailing assumption was that social vulnerability influences the level of perception of the seismic risk, in an exposed, vulnerable area. To this end, two samples were used, different under the aspect of social vulnerability, in the context of the same residential area. Social vulnerability was computed as a normalized composed index that includes the poverty ratio and the demographic vulnerability ratio (depending on the age, gender, and education level indicators). The statistical processing has indicated a significant difference in the high perception level for the two samples that were compared, in the sense that in the context of an increased level of social vulnerability, people generally better acknowledge the seismic risk.

Bartlett, Sheridan. 2008. Climate change and urban children: Impacts and implications for adaptation in low- and middle income countries. ***Environment & Urbanization*** **20(2): 501-519.**

This paper discusses the particular and disproportionate risks to urban children in poverty from various aspects of climate change, both extreme events and changing means. It explores the potential impacts on children's health, learning and psychosocial well-being, and considers the implications of family coping strategies for children. The paper goes on to discuss the implications for adaptation, making recommendations for an adaptation agenda that focuses on the realities for children. Preparatory measures are considered, as well as responses to extreme events and to changes in weather patterns.

Batlan, Felice. 2008. Weathering the storm together (Torn apart by race, gender, and class). ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 163-191.**

This genre-bending piece blurs the line between a primary document and a secondary document, a folktale and academic scholarship. It provides a first-hand account from when the author, then a professor at Tulane, first learned of a potential hurricane, through evacuation, homelessness, and the reoccupation of New Orleans what she refers to as a newly constituted "city of men." Using the analytical lens of gender and

feminist theory, the author attempts to make sense of her own experience of Katrina, while situating the hurricane within a larger historical framework. Ultimately, the story, however, is about how the author, a white woman, and her evacuation companion, an older black man, struggled to find ways to communicate and express their grief, anger, and fears across the chasm of race, gender, and class.

Brunkard, Joan, Gonza Namulanda, and Raoult Ratard. 2008. Hurricane Katrina Deaths, Louisiana, 2005. *Disaster Medicine and Public Health Preparedness* 2(4): 215-223.

Hurricane Katrina struck the US Gulf Coast on August 29, 2005, causing unprecedented damage to numerous communities in Louisiana and Mississippi. This article verifies, documents, and characterizes Katrina-related mortality in Louisiana, and helps identify strategies to reduce mortality in future disasters. The authors assessed Hurricane Katrina mortality data sources received in 2007, including Louisiana and out-of-state death certificates for deaths occurring from August 27 to October 31, 2005, and the Disaster Mortuary Operational Response Team's confirmed victims' database. The authors calculated age-, race-, and sex-specific mortality rates for Orleans, St. Bernard, and Jefferson Parishes, where 95 percent of Katrina victims resided and conducted stratified analyses by parish of residence to compare differences between observed proportions of victim demographic characteristics and expected values based on 2000 US Census data, using Pearson chi square and Fisher exact tests. The authors identified 971 Katrina-related deaths in Louisiana and 15 deaths among Katrina evacuees in other states. Drowning (40 percent), injury and trauma (25 percent), and heart conditions (11 percent) were the major causes of death among Louisiana victims. Forty-nine percent of victims were people 75 years old and older. Fifty-three percent of victims were men; 51 percent were black; and 42 percent were white. In Orleans Parish, the mortality rate among blacks was 1.7 to 4 times higher than that among whites for all people 18 years old and older. People 75 years old and older were significantly more likely to be storm victims ($P < .0001$). Future disaster preparedness efforts must focus on evacuating and caring for vulnerable populations, including those in hospitals, long-term care facilities, and personal residences. Improving mortality reporting timeliness will enable response teams to provide appropriate interventions to these populations and to prepare and implement preventive measures before the next disaster.

Burg, Jericho. 2008. Measuring populations' vulnerabilities for famine and food security interventions: The case of Ethiopia's Chronic Vulnerability Index. *Disasters* 32(4): 609-630.

The concept of vulnerability has become an important part of food security analyses since the 1980s. It is seen as having two sides: exposure to external hazards; and an inability to cope with those shocks attributed to social, political, and economic factors. Numerous attempts have been made to construct models to determine levels of vulnerability among populations. This paper analyses one such attempt, the Chronic Vulnerability Index (CVI), developed to measure levels of vulnerability to food insecurity in Ethiopia. The example of the CVI reveals many of the difficulties associated with producing a basic model of vulnerability that can be used in disaster mitigation. Ultimately, the CVI assumes that vulnerability is a linear, additive phenomenon with discrete causes and effects and fails to capture interactions between hazards and the human systems that produce and complicate them. The paper concludes with a discussion of alternatives to the CVI.

Clerveaux, Virginia, Balfour Spence, and Toshitaka Katada. 2008. Evaluating and promoting disaster awareness among children: The disaster awareness game. *Journal of Emergency Management* 6(6): 17-30.

Children account for the greatest proportion of casualties from hazard impacts, especially in developing countries where they comprise the largest percentage of total population. This disproportionate vulnerability of children has recently been the focus of various United Nations initiatives for disaster risk reduction and is increasingly being the focus of local and national measures to reduce the impacts of hazards. The overarching focus of these children-specific measures has been the promotion of disaster education to enhance the level of awareness among school-age children. However, this new trust toward disaster awareness among children presents a new challenge for disaster planners, especially as this relates to the development of appropriate tools and techniques for the enhancement of the disaster knowledge base of children. Specifically, disaster management planners are challenged to ensure not only that the information provided is appropriate to the information-assimilation capacity of children but also that the appropriate tools and techniques are developed to ensure effective conveyance of information through a medium that is neither stoic nor boring. The disaster awareness game presented in this article was designed with these challenges in mind and is intended to evaluate and promote disaster

awareness in children. Preliminary results suggest that the tool is effective in meeting this objective.

David, Emmanuel. 2008. Cultural trauma, memory, and gendered collective action: The case of women of the storm following Hurricane Katrina. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 138-162.**
This essay examines cultural trauma, memory, gender, and performance in the aftermath of Hurricane Katrina. Drawing on ethnographic fieldwork, in-depth interviews, and documentary sources, this feminist analysis of cultural trauma and memory examines how an emergent, women-centered group, Women of the Storm, engaged in performative political practices aimed at increasing government support for Gulf Coast recovery efforts. The author argues that the group modified place-based practices related to ritual acts of mourning and remembrance, appropriated and transformed disaster-related symbol systems, and aimed to establish new forms of moral responsibility as part of its collective actions.

Eisenman, David P., Deborah Glik, Michael Ong, Qiong Zhou, Chi-Hong Tseng, Anna Long, Jonathan Fielding, and Steven Asch. 2009. Terrorism-related fear and avoidance behavior in a multiethnic urban population. ***American Journal of Public Health*** **99(1): 168-174**
This research seeks to determine whether groups traditionally most vulnerable to disasters would be more likely than would be others to perceive population-level risk as high (as measured by the estimated color-coded alert level), would worry more about terrorism, and would avoid activities because of terrorism concerns. Researchers conducted a random digit dial survey of the Los Angeles County population October 2004 through January 2005 in six languages. They asked respondents what color alert level the country was under, how often they worry about terrorist attacks, and how often they avoid activities because of terrorism. Multivariate regression modeled correlates of worry and avoidance, including mental illness, disability, demographic factors, and estimated color-coded alert level. Results show that persons who are mentally ill, those who are disabled, African Americans, Latinos, Chinese Americans, Korean Americans, and non-US citizens were more likely to perceive population-level risk as high, as measured by the estimated color-coded alert level. These groups also reported more worry and avoidance behaviors because of concerns about terrorism. The researchers conclude that vulnerable populations experience a disproportionate burden of the psychosocial impact of terrorism threats and our national response. Further studies should investigate the specific behaviors affected and further elucidate disparities in the disaster burden associated with terrorism and terrorism policies.

Enfors, Elin I., and Line J. Gordon. 2008. Dealing with drought: The challenge of using water system technologies to break dryland poverty traps. ***Global Environmental Change*** **18(4): 607-616.**
This article explores strategies among farmers in semi-arid Tanzania to cope with drought, and investigate if access to a local supplemental irrigation system (the Ndiva system) can improve coping capacity. Results show high dependency on local ecosystem services when harvests fail, and indicate that farmers commonly exhaust asset holdings during droughts. Ndiva access did not have any direct effects on coping capacity, but seemed to have some indirect effects. Drawing on their findings the authors discuss the complexity of escaping persistent dryland poverty, and outline the circumstances under which small-scale water system technologies, such as Ndiva irrigation, may help.

Hampshire, Katherine, Rachel Casiday, Kate Kilpatrick, and Catherine Panter-Brick. 2009. The social context of childcare practices and child malnutrition in Niger's recent food crisis. ***Disasters*** **33(1): 132-151.**
In 2004-2005, Niger suffered a food crisis during which global attention focused on high levels of acute malnutrition among children. In response, decentralized emergency nutrition programs were introduced into much of southern Niger. Child malnutrition, however, is a chronic problem and its links with food production and household food security are complex. This qualitative, anthropological study investigates pathways by which children are rendered vulnerable in the context of a nutritional "emergency." It focuses on household-level decisions that determine resource allocation and childcare practices in order to explain why practices apparently detrimental to children's health persist. Risk aversion, the need to maintain self-identity and status, and constrained decision making result in a failure to invest extra necessary resources in growth-faltering children. Understanding and responding to the social context of child malnutrition will help humanitarian workers to integrate their efforts more effectively with longer-term development programs aimed at improving livelihood security.

Jenkins, Pam, and Brenda Phillips. 2008. Battered women, catastrophe, and the context of safety after Hurricane

Katrina. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 50-68.**
This paper examines domestic violence and disaster in post-Hurricane Katrina New Orleans while concomitantly contributing to the literature that demonstrates ways in which feminist orientations can make vital differences in disaster contexts. The authors show that by listening to the voices of victims in post-disaster contexts, new insights can be gleaned as to how to make all women safer during disasters. Domestic violence survivors often experienced heightened levels of violence during the hurricane and its aftermath; however, even in that difficult context, some women made the choice to leave abusive situations and advocates responded in new ways to help these women meet their unique needs.

Litt, Jacquelyn N. 2008. Getting out or staying put: An African American women's network in evacuation from Katrina. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 32-48.**
This article examines the emergency evacuation from New Orleans in a network of low-income African Americans in the day before Hurricane Katrina. The author argues that the quick action of key women mobilized the successful evacuation of 25 individuals who could not otherwise have left the city. The network was successful during evacuation for three reasons. First, government warnings did not appear to carry the same authority as the passing of informal knowledge through these trusted women-centered networks. Second, women were able to pull together network members and resources already embedded in their daily lives. Third, network members recognized pre-existing personal ties and expanded network membership when necessary. The article concludes that any formal disaster planning should take into consideration, in a practical way, not only the existence but the usefulness of women's networking skills for the survival of vulnerable individuals in harm's way.

Luft, Rachel E. 2008. Looking for common ground: Relief work in post-Katrina New Orleans as an American parable of race and gender violence. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 5-31.**
This article provides an interdisciplinary examination of race and gender intersectionality in the context of disaster "recovery" in New Orleans. Based on a case study of a grassroots relief organization, the Common Ground Collective, the findings demonstrate that in the absence of intersectional practice, sexism furthers racism and racism furthers sexism. After a series of sexual assaults were reported by white women volunteers in Common Ground in 2006, participant discourse criminalized the surrounding black community, although almost every accused perpetrator was a nonlocal white man. Contextualizing these events in the broader American history of violence and assistance traditions helps to reveal domestic and global patterns. The challenges Common Ground members faced in producing an antiracist, feminist response to both the assaults and the dominant organizational framing further point to the difficulties of just, intersectional recovery interventions.

Mayer, Vicki, Beth Willinger, Pamela Jenkins, Susan Tucker, Susanne Dietzel, Pamela Waldron Moore, Betsy Jones Hemenway, Crystal Kile, Violet Harrington Bryan, and Julia Reineman. 2008. Losing ground but finding the high road: Teaching Women's Studies in post-Katrina New Orleans. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 185-192.**
This essay combines the experiences and participation of women's studies members from four campuses in New Orleans, Louisiana. It reflects both on the damage suffered by women in the academy and the strides that have been made in the post-Katrina environment.

Murakami-Ramalho, Elizabeth, and Beth A. Durodoye. 2008. Looking back to move forward: Katrina's black women survivors speak. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(3): 116-137.**
This study examines the experiences of black women who were displaced as a result of Hurricane Katrina. A discussion of commonalities between the evacuees and internally displaced persons around the world is included. Interviews with nine African American women who fled New Orleans and resettled in San Antonio, Texas provide material for the analysis of the meanings of their displacement and struggle to create new meaning in their own and their families' lives. Their narratives illuminate the challenges faced by Katrina evacuees and the gendered and racialized politics of forced diaspora. The study identifies four stages of transition common to all those interviewed for this study: reliving the hurricane; remembering New Orleans; saying goodbye and coping with change; and finally, moving forward. The article attends to how these findings may

inform individuals and families in similar resettlement processes. The relevance of the research for service providers and others working with disaster relief missions is underscored.

Peek, Lori, and Alice Fothergill. 2008. Displacement, gender, and the challenges of parenting after Hurricane Katrina. ***National Women's Studies Journal: New Orleans: A Special Issue on Gender, the Meaning of Place, and the Politics of Displacement*** **20(30: 69-105.**
In emergency situations and in the aftermath of disaster, parents are essential in caring for children. Yet very little has been written explicitly about the experiences of mothers and fathers either as individuals or partners in post-disaster contexts. With the understanding that parenting is a gendered endeavor that occurs in a society stratified by race and class, this article focuses on the responses of mothers and fathers to Hurricane Katrina. This article draws on data gathered in Louisiana through observations, focus groups, and in-depth interviews with parents and other adults responsible for the care of children. Through a qualitative analysis, this research examines the strategies that mothers and fathers used to deal with the challenges of parenting in the aftermath of Katrina, the role of advocates who worked on behalf of families, the importance of kin networks, and the uniqueness of New Orleans and what the city means for families struggling to recover after the storm.

Ruuhela, Reija, Laura Hiltunen, Ari Venalainen, Pentti Prininen, and Timo Partonen. 2008. Climate impact on suicide rates in Finland from 1971 to 2003. ***International Journal of Biometeorology*** **(ePub).**
Seasonal patterns of death from suicide are well-documented and have been attributed to climatic factors such as solar radiation and ambient temperature. However, studies on the impact of weather and climate on suicide are not consistent, and conflicting data have been reported. In this study, we performed a correlation analysis between nationwide suicide rates and weather variables in Finland during the period 1971-2003. The weather parameters studied were global solar radiation, temperature and precipitation, and a range of time spans from one month to one year were used in order to elucidate the dose-response relationship, if any, between weather variables and suicide. Single and multiple linear regression models show weak associations using one-month and three-month time spans, but robust associations using a 12-month time span. Cumulative global solar radiation had the best explanatory power, while average temperature and cumulative precipitation had only a minor impact on suicide rates. Our results demonstrate that winters with low global radiation may increase the risk of suicide. The best correlation found was for the five-month period from November to March; the inter-annual variability in the cumulative global radiation for that period explained 40 percent of the variation in the male suicide rate and 14 percent of the variation in the female suicide rate, both at a statistically significant level. Long-term variations in global radiation may also explain, in part, the observed increasing trend in the suicide rate until 1990 and the decreasing trend since then in Finland.

Saldana-Zorilla, Sergio O. 2008. Stakeholders' views in reducing rural vulnerability to natural disasters in Southern Mexico: Hazard exposure and coping and adaptive capacity. ***Global Environmental Change*** **18(4): 583-597.**
This paper examines how climatic events affect agricultural livelihoods. Special emphasis is given to the effects of natural disasters on migration patterns. In addition, this manuscript assesses policy options to reduce the vulnerability of small-scale farmers (e.g. government-supported insurance schemes) in the context of the Mexican government's withdrawal from directly subsidizing the agricultural sector over the past 18 years. The work draws on stakeholder consultations (based on questionnaires and interviews) and descriptive analysis in three communities in the southern state of Chiapas, Mexico. It also puts forward stakeholder-based solutions, which embrace loss-sharing and risk-transfer mechanisms. The coping strategies revealed in this study encompass both immediate responses (e.g. sources of off-farm income, post-disaster financing sources, and emigration plans), and more structural and long-term strategies, such as re-orientation of production and improvement of infrastructure for production.

Srivastava, Sanjay K. 2009. Making a technological choice for disaster management and poverty alleviation in India. ***Disasters*** **33(1): 58-81.**
The right mix of policy, institutional arrangements and use of technology provides the framework for a country's approach to disaster mitigation. Worldwide, there has been a shift away from a strictly 'top-down' approach relying on government alone, to a combination of 'top-down' and 'bottom-up' approaches. The aim is to enhance the indigenous coping mechanisms of vulnerable communities; draw on their cooperative spirit and energy; and empower them through appropriate information and contextual knowledge to mitigate natural disasters. In light of this, the paper

examines India's use of space technology in its disaster management efforts. Poverty alleviation and disaster management are almost inseparable in many parts of the country, as vulnerability to natural disasters is closely aligned with poverty. Addressing these issues together requires integrated knowledge systems. The paper examines how knowledge inputs from space technology have strengthened the national resolve to combat natural disasters in conjunction with alleviating rural poverty.

Webbink, Dinand. 2008. The effect of local calamities on educational achievement. *Disasters* 32(4): 499-515.
This study investigates the impact on the educational achievement of primary school children of two local calamities: an explosion at a firework factory in the city of Enschede on May 13, 2001; and a fire at a discotheque on January 1, 2001 during a New Years Eve party in the town of Volendamon. Based on a quasi-experimental design with both control groups and pre-tests, we found that in the three years following the two tragedies, the test scores of girls in those areas closest to the events were on average 0.2 standard deviations lower. This corresponds to a downward shift in the distribution of girls' test scores. Boys' test scores, meanwhile, were not significantly affected by the disasters, and nor were the scores of pupils from nearby areas. In the three years following the calamities, girls' test scores in one of the areas (Volendam) have slowly recovered, although they remain well below their pre-event level.

Zahran, Sammy, Samuel D. Brody, Walter Gillis Peacock, Arnold Vedlitz, and Himanshu Grover. 2008. Social vulnerability and the natural and built environment: A model of flood casuatliescasualties in Texas. *Disasters* 32(4): 537-560.
Studies on the impacts of hurricanes, tropical storms, and tornados indicate that poor communities of color suffer disproportionately in human death and injury. Few quantitative studies have been conducted on the degree to which flood events affect socially vulnerable populations. We address this research void by analyzing 832 countywide flood events in Texas from 1997 to 2001. Specifically, we examine whether geographic localities characterized by high percentages of socially vulnerable populations experience significantly more casualties due to flood events, adjusting for characteristics of the natural and built environment. Zero-inflated negative binomial regression models indicate that the odds of a flood casualty increase with the level of precipitation on the day of a flood event, flood duration, property damage caused by the flood, population density, and the presence of socially vulnerable populations. Odds decrease with the number of dams, the level of precipitation on the day before a recorded flood event, and the extent to which localities have enacted flood mitigation strategies. The study concludes with comments on hazard-resilient communities and protection of casualty-prone populations.

Homeland Security and Terrorism

Cox, Louis Anthony. 2008. Some limitations of "Risk = Threat × Vulnerability × Consequence" for risk analysis of terrorist attacks. *Risk Analysis* 28(6): 1749-1761.
Several important risk analysis methods now used in setting priorities for protecting U.S. infrastructures against terrorist attacks are based on the formula: Risk = Threat × Vulnerability × Consequence. This article identifies potential limitations in such methods that can undermine their ability to guide resource allocations to effectively optimize risk reductions. After considering specific examples for the Risk Analysis and Management for Critical Asset Protection (RAMCAPTM) framework used by the Department of Homeland Security, the article addresses more fundamental limitations of the product formula. These include its failure to adjust for correlations among its components, nonadditivity of risks estimated using the formula, inability to use risk-scoring results to optimally allocate defensive resources, and intrinsic subjectivity and ambiguity of Threat, Vulnerability, and Consequence numbers. Trying to directly assess probabilities for the actions of intelligent antagonists instead of modeling how they adaptively pursue their goals in light of available information and experience can produce ambiguous or mistaken risk estimates. Recent work demonstrates that two-level (or few-level) hierarchical optimization models can provide a useful alternative to Risk = Threat × Vulnerability × Consequence scoring rules, and also to probabilistic risk assessment (PRA) techniques that ignore rational planning and adaptation. In such two-level optimization models, defender predicts attacker's best response to defender's own actions, and then chooses his or her own actions taking into account these best responses. Such models appear valuable as practical approaches to antiterrorism risk analysis.

Eastridge, Brian J., Lorne Blackbourne, Charles E. Wade, and John B. Holcomb. 2008. Radiologic diagnosis of explosion casualties. *American Journal of Disaster Medicine* 3(5): 301-305.
The threat of terrorist events on domestic soil remains an ever-present risk. Despite the notoriety of unconventional weapons, the mainstay in the armament of

the terrorist organization is the conventional explosive. Conventional explosives are easily weaponized and readily obtainable, and the recipes are widely available over the Internet. According to the U.S. Department of State and the Federal Bureau of Investigation, over one-half of the global terrorist events involve explosions, averaging two explosive events per day worldwide in 2005 (Terrorism Research Center. Available at www.terrorism.com. Accessed April 1, 2007). The Future of Emergency Care in the United States Health System: Emergency Medical Services at the Crossroads, published by the Institute of Medicine, states that explosions were the most common cause of injuries associated with terrorism. Explosive events have the potential to inflict numerous casualties with multiple injuries. The complexity of this scenario is exacerbated by the fact that few providers or medical facilities have experience with mass casualty events in which human and material resources can be rapidly overwhelmed. Care of explosive-related injury is based on same principles as that of standard trauma management paradigms. The basic difference between explosion-related injury and other injury mechanisms are the number of patients and multiplicity of injuries, which require a higher allocation of resources. With this caveat, the appropriate utilization of radiology resources has the potential to impact in-hospital diagnosis and triage and is an essential element in optimizing the management of the explosive-injured patients.

Eisenman, David P., Deborah Glik, Michael Ong, Qiong Zhou, Chi-Hong Tseng, Anna Long, Jonathan Fielding, and Steven Asch. 2009. Terrorism-related fear and avoidance behavior in a multiethnic urban population. ***American Journal of Public Health*** **99(1): 168-174.**

This research seeks to determine whether groups traditionally most vulnerable to disasters would be more likely than would be others to perceive population-level risk as high (as measured by the estimated color-coded alert level), would worry more about terrorism, and would avoid activities because of terrorism concerns. Researchers conducted a random digit dial survey of the Los Angeles County population October 2004 through January 2005 in six languages. They asked respondents what color alert level the country was under, how often they worry about terrorist attacks, and how often they avoid activities because of terrorism. Multivariate regression modeled correlates of worry and avoidance, including mental illness, disability, demographic factors, and estimated color-coded alert level. Results show that persons who are mentally ill, those who are disabled, African Americans, Latinos, Chinese Americans, Korean Americans, and non-US citizens were more likely to perceive population-level risk as high, as measured by the estimated color-coded alert level. These groups also reported more worry and avoidance behaviors because of concerns about terrorism. The researchers conclude that vulnerable populations experience a disproportionate burden of the psychosocial impact of terrorism threats and our national response. Further studies should investigate the specific behaviors affected and further elucidate disparities in the disaster burden associated with terrorism and terrorism policies.

Fenzl, Mark, Heath Jolliff, and Marcus Topinka. 2008. Chemical exposure preparedness for emergency departments in a midwestern city. ***American Journal of Disaster Medicine*** **3(5): 273-81.**

The objective of this paper is to determine if each hospital in a large midwestern city has the resources to treat 50 patients exposed to terrorist chemical agents and/or industrial chemicals. Surveys specific to each department were sent to emergency department (ED) nursing supervisors, safety officers, and pharmacy directors of each hospital. The survey was performed in a large Midwestern city (metropolitan population of 1.5 million). The survey measured the presence of written materials, amount of equipment, quantities of pharmaceuticals, and number of staff available in each hospital. Hospital staff also rated the preparedness of their hospital. Twelve of the 27 respondents returned the survey for a response rate of 44 percent. None of the EDs had a known cooperative written plan with the police or fire departments. Three safety officers reported limited numbers of hospital security personnel and a total of 35 ventilators for respiratory failure. The four pharmacy directors reported limited sum doses of atropine (315), cyanide antidote (10 complete kits), and succimer (100). Respondents who felt qualified to evaluate the ED gave a mean score of 5.4 on a scale of 1-10 when asked how prepared they felt their ED was to treat 50 chemical exposure patients. Conclusions: Despite hospital staff rating chemical exposure preparedness as 5.4, it is unlikely that each hospital could handle 50 patients exposed to some chemicals due to lack of prearranged coordination, security, antidotes, and ventilators.

Goffman, Thomas E. 2008. Nuclear disasters: Current plans and future directions for oncologists. ***American Journal of Disaster Medicine*** **3(6): 317-320.**

The objective of this paper is to show that there is a significant role for oncologists in the event of a terrorist nuclear disaster. Professionals need data on current

political issues regarding a nuclear attack already put in place by the administration and the military. Review of what actually occurs during a fission bomb's explosion helps to point out what medical care will be most needed. The author contends that those trained in the oncologies could play a major part. The setting is modern-day America. The subjects are potential civilian survivors. Large gaps are noted in statewide disaster plans. Oncologists must get involved now in disaster planning. Statewide plans are necessary throughout the nation. The public needs to know the basics of what to do in the advent of a nuclear bomb explosion.

Goodwin Veenema, Tener, Bonnie Walden, Nancy Feinstein, and Jacqueline P. Williams. 2008. Factors affecting hospital-based nurses' willingness to respond to a radiation emergency. ***Disaster Medicine and Public Health Preparedness*** **2(4): 224-229.**
Despite increased government and public awareness of the threat of a radiological emergency resulting from a terrorist attack or industrial accident, limited emphasis has been placed on preparing the US health care workforce for such an event. The purpose of this study was to develop and apply a rapid survey to evaluate hospital-based nurses' baseline knowledge, self-assessed clinical competence, perception of personal safety, and willingness to respond in the event of a radiological emergency. The study was conducted in two phases, the first targeting nursing units likely to respond in the event of a radiological emergency and the second focusing more generally on members of the New York State Emergency Nurses Association currently employed as hospital-based nurses. Among the 668 nurses surveyed, baseline knowledge was found to be inadequate. Although baseline knowledge, clinical competence, and perception of personal safety were all positively associated with willingness to respond, perception of safety appeared to be the primary determinant. Furthermore, baseline knowledge did not appear to be strongly associated with perception of personal safety. Based on these results, the investigators recommend further clinical training to enhance preparedness and a more detailed exploration of the determinants of perceived personal safety.

Jayasinghe, Nimali, Cezar Giosan, Susan Evans, Lisa Spielman, and JoAnn Difede. 2008. Anger and posttraumatic stress disorder in disaster relief workers exposed to the September 11, 2001 World Trade Center disaster: One-year follow-up study. ***The Journal of Nervous and Mental Disease*** **196(11): 844-846.**
Although anger is an important feature of posttraumatic stress disorder (PTSD) it is unclear whether it is simply concomitant or plays a role in maintaining symptoms. A previous study of disaster workers responding to the terrorist attacks of September 11, 2001 indicated that those with PTSD evidenced more severe anger than those without. The purpose of this study was to conduct a one-year follow-up to assess the role of anger in maintaining PTSD. Workers with PTSD continued to report more severe anger than those without. There were statistically significant associations between changes in anger, PTSD severity, depression, and psychiatric distress. Multiple regression analysis indicated initial anger severity to be a significant predictor of PTSD severity at follow-up, which is consistent with the notion that anger maintains PTSD. One implication is that disaster workers with high anger may benefit from early intervention to prevent chronic PTSD.

Koc-Menard, Sergio. 2009. Trends in terrorist detection systems. ***Journal of Homeland Security and Emergency Management*** **6(1).**
Industrialized countries face the challenge of spotting international terrorists at points of entry and homegrown terrorists on their borders. This paper reviews the development of detection programs since 9/11 and identifies three emerging trends that, it argues, will shape the security environment in North America in the years to come. The first trend is a move away from evidence-based detection to rule-based discovery. The second trend is a move away from the observation of actual behavior to the analysis of electronic records. The third trend is a move away from national discovery systems to multinational structures. The paper will explain each of these three trends and briefly explore their implications for individual privacy.

Pederson, Ulrik Bo, and John-Erik Stig Hansen. 2008. Assessment tools in support of epidemiological investigation of airborne dispersion of pathogens. ***American Journal of Disaster Medicine*** **3(6): 327-333.**
Human health threats posed by airborne pathogens are difficult to handle for healthcare responders because the contaminated area is not immediately recognizable. By means of wind dispersion modeling, it is possible to estimate the extent and geographical position of hazardous areas and health impact. Contemporary modeling tools can run on standard personal computers, with short processing time and easy-to-use interfaces. This enables health professionals without modeling experience to assess consequences of dispersion incidents, for example, from accidental releases from industries, shedding of pathogens from infectious animals or humans, or intentional releases caused by terrorist activity. Dispersion assessments can provide response

managers with a chance to get on top of events. In the absence of modeling, reliable estimates of hazard areas may not be available until the appearance of the first cases or after time-consuming sampling and laboratory analysis. The authors describe using wind dispersion assessments in epidemiological field investigations of naturally occurring disease outbreaks, as well as for bioterror scenarios. They describe the specifications of user friendly and real-time functional wind dispersion modeling systems that can serve as decision support tools during outbreak investigations and outline some of the currently available software packages.

Ross, Lenard H., and Matthew Mihelic. 2008. Healthcare vulnerabilities to electromagnetic pulse. ***American Journal of Disaster Medicine*** **3(6): 321-325.**
The U.S. healthcare system is particularly vulnerable to the effects of electromagnetic pulse (EMP) attack because of the system's technological sophistication, but while national defense planners prepare for the considerable threat that EMP poses, there has been little or no recognition of this threat within the U.S. healthcare community. Neither has there been any significant healthcare planning to deal with such an eventuality. Recognition of the risk presented by EMP, and advance institution of appropriate strategies to mitigate its effects on the healthcare system, could enable the preservation of much of that system's function in the face of EMP-related disruptions, and will greatly further all-hazards disaster preparations.

Wassel, John J. 2008. Public health preparedness for maritime terrorist attacks on ports and coastal waters. ***American Journal of Disaster Medicine*** **3(6): 377-384.**
The objective of this paper is to assess the risk of mass casualties and necessary public health and provider preparation relating to maritime terrorist attacks on U.S. ports. Articles were obtained by searching PubMed database, Google, and Google Scholar search engines using terms such as "maritime security," "maritime terrorism," "port security," "terrorist attacks on the US ports," "terrorist nuclear attacks," "terrorist attacks on liquefied natural gas tankers," and "terrorist attack on high occupancy ships." Setting: US ports and coastal waters. Seventy-six journal articles were reviewed. Morbidity and mortality high for nuclear terrorist attack; mortality low but morbidity potentially high for radiological attacks. It would be more difficult for terrorist attack on natural gas tankers to cause high mortality and/or morbidity.

Williams, Kenneth A., Francis Sullivan, Selim Suner, Marc Shapiro, Leo Kobayashi, Robert Woolard, Whit Hill, and Charlie Seekal. 2008. Rhode Island disaster initiative. ***International Journal of Risk Assessment and Management*** **9(4): 394-408.**
The Rhode Island Disaster Initiative (RIDI) is providing research in the areas of readiness, technology and training to address the significant gaps that remain in real-time medical response to events involving the use of weapons of mass destruction; terrorist use of chemical, biological, radiological, nuclear, and explosive devices; mass casualty incidents and toxic industrial chemical and material accidents. Through a series of focused studies and full-scale exercises, RIDI is examining the underpinnings of common failures in disaster response, researching a number of potential best practice solutions to these failures and disseminating recommended solutions. Failed logistics, coordination, communication and inadequate decontamination practices are among the addressed areas.

Hurricanes and Coastal Hazards

Alam Khan, M. Shah. 2008. Disaster preparedness for sustainable development in Bangladesh. ***Disaster Prevention and Management*** **17(5): 662-671.**
Bangladesh is one of the most disaster-prone countries in the world with natural disasters adversely affecting the country's economy and deterring its development. Thus preparedness for the disasters, along with effective prevention and mitigation measures, is imperative for sustainable development of the country. This paper examines the present state of disaster preparedness in the country with special attention to the more frequent and damaging disasters such as floods and cyclones. A detailed study of the effects of natural disasters, disaster prevention and mitigation measures, and institutional setting for disaster preparedness was undertaken. The authors found that plans and programs have been formulated to manage natural disasters. In a "Cyclone Preparedness Program," trained volunteers facilitate emergency response and proper use of the multipurpose shelters. Within an institutional framework for disaster management, several nongovernmental organizations (NGOs) work for disaster preparedness alongside the government organizations. Formal and informal disaster preparedness education programs have a common objective of promoting resilient and sustainable communities. The authors conclude that planning and design of structural interventions for prevention and mitigation of natural disasters should be done more carefully to avoid adverse impacts on the environment. A participatory approach is essential in this process. Education and awareness-building programs need wider and easier access to the people.

Arthur, Craig, Anthony Schofield, and Bob Cechet. 2008. Assessing the impacts of tropical cyclones. *Australian Journal of Emergency Management* 23(4): 14-20.

Using Darwin as a test case, the authors assess the benefits of Geoscience Australia's Tropical Cyclone Risk Modeling tool in assessing the potential impact of a tropical cyclone. Tropical Cyclone (TC) Tracy impacted Darwin early on Christmas Day, 1974, resulting in 71 deaths, the destruction of thousands of homes and the evacuation of over 35,000 people. Several factors contributed to the widespread destruction, including the intensity of the cyclone, vegetation overhanging buildings and construction materials employed in Darwin at the time. Since 1974, the population of Darwin has grown rapidly, from 46,000 to nearly 115,000 in 2006. If TC Tracy were to strike Darwin in 2008, the impacts could be catastrophic. However, tools such as Geoscience Australia's Tropical Cyclone Risk Model (TCRM) could be used to allow emergency managers to plan for such a scenario. The authors perform a validation of TCRM to assess the impacts TC Tracy would have on the 1974 landscape of Darwin, and compare the impacts to those determined from a post-impact survey. They found an underestimate of the damage at 36 percent of replacement cost (RC), compared to survey estimate of 50 percent to 60 percent RC. Some of this deficit can be accounted for through the effects of large debris. Qualitatively, TCRM can spatially replicate the damage inflicted on Darwin by the small cyclone, identifying localized areas of increased damage. For the 2008 scenario, TCRM indicates a nearly 90 percent reduction in the overall damage over the Darwin region. Once again, the spatial nature of the damage is captured well, with the greatest damage inflicted close to the eye of the cyclone. Areas that have been developed since 1974 such as Palmerston suffer very little damage due to the small extent of the severe winds. The northern suburbs, rebuilt in the years following TC Tracy, are much more resilient, largely due to the influence of very high building standards in place between 1975 and 1980.

Brevard, Sidney B., Sharon L. Weintraub, James B. Aiken, Edward B. Halton, Juan C. Duchesne, Norman E. McSwain, John P. Hunt, and Alan B. Marr. 2008. Analysis of disaster response plans and the aftermath of Hurricane Katrina: Lessons learned from a Level I trauma center. *The Journal of Trauma* 65(5): 1126-1132.

This study compares disaster preparedness of a level I trauma center with performance in an actual disaster. Previous disaster response evaluations have shown that the key to succeeding in responding to a catastrophic event is to anticipate the event, plan the response, and practice the plan. The Emergency Management Team had identified natural disaster as the hospital's highest threat. The hospital also served as the regional hospital for the Louisiana Health Resources and Service Administration Bioterrorism Hospital Preparedness Program. The hospital master disaster plan, including the Code Gray annex, was retrospectively reviewed and compared with the actual events that occurred after Hurricane Katrina. Vital support areas were evaluated for adequacy using a systematic approach. In addition, a survey of 10 key personnel from trauma and emergency medicine present during Hurricane Katrina was conducted. The survey of vital support areas were scored as adequate (three points), partially adequate (two points), or inadequate (one point). Ninety-three percent of the line items on the Code Gray Checklist were accomplished before landfall of the storm. The results of the survey of vital support areas were: water, 3.0 points; food, 2.4; sanitation, 1.5; communication, 1.4; and power, 1.5. Despite identifying the threat of a major hurricane, preparing a response plan, and exercising the plan, a major medical center can be overwhelmed by a catastrophic disaster like Hurricane Katrina. The study offers lessons learned as an aid for other medical centers that are developing and exercising their plans.

Brunkard, Joan, Gonza Namulanda, and Raoult Ratard. 2008. Hurricane Katrina Deaths, Louisiana, 2005. *Disaster Medicine and Public Health Preparedness* 2(4): 215-223.

Hurricane Katrina struck the US Gulf Coast on August 29, 2005, causing unprecedented damage to numerous communities in Louisiana and Mississippi. This article verifies, documents, and characterizes Katrina-related mortality in Louisiana, and helps identify strategies to reduce mortality in future disasters. The authors assessed Hurricane Katrina mortality data sources received in 2007, including Louisiana and out-of-state death certificates for deaths occurring from August 27 to October 31, 2005, and the Disaster Mortuary Operational Response Team's confirmed victims' database. The authors calculated age-, race-, and sex-specific mortality rates for Orleans, St. Bernard, and Jefferson Parishes, where 95 percent of Katrina victims resided and conducted stratified analyses by parish

of residence to compare differences between observed proportions of victim demographic characteristics and expected values based on 2000 US Census data, using Pearson chi square and Fisher exact tests. The authors identified 971 Katrina-related deaths in Louisiana and 15 deaths among Katrina evacuees in other states. Drowning (40 percent), injury and trauma (25 percent), and heart conditions (11 percent) were the major causes of death among Louisiana victims. Forty-nine percent of victims were people 75 years old and older. Fifty-three percent of victims were men; 51 percent were black; and 42 percent were white. In Orleans Parish, the mortality rate among blacks was 1.7 to 4 times higher than that among whites for all people 18 years old and older. People 75 years old and older were significantly more likely to be storm victims ($P < .0001$). Future disaster preparedness efforts must focus on evacuating and caring for vulnerable populations, including those in hospitals, long-term care facilities, and personal residences. Improving mortality reporting timeliness will enable response teams to provide appropriate interventions to these populations and to prepare and implement preventive measures before the next disaster.

Henderson, Tammy L., Maria Sirois, Angela Chia-Chen, Christopher Airriess, David A. Swanson, and David Banks. 2008. After a disaster: Lessons in survey methodology from Hurricane Katrina. ***Population Research and Policy Review*** **(ePub).**

In 2005, the National Science Foundation funded a number of projects to study the impact of Hurricane Katrina. The current article provides an overview of several research approaches used to conduct post-Katrina research. Each method had some advantages and disadvantages. The post-disaster context meant that experience from traditional survey methods often did not apply. Comparisons of advantages and disadvantages associated with each sampling method serve to inform future post-disaster research and illuminate the limits of classical research methods.

Kishore, Vimal, Katherine P. Theall, William Robinson, Jamilia Pichon, Richard Scribner, Emily Roberson, and Sandy Johnson. 2008. Resource loss, coping, alcohol use, and posttraumatic stress symptoms among survivors of Hurricane Katrina: A cross-sectional study. ***American Journal of Disaster Medicine*** **3(6): 345-357.**

This paper assesses the impact of Hurricane Katrina on the faculty, staff, and students at a university located in New Orleans, Louisiana. Using a cross-sectional, Web-based survey, a total of 364 faculty, staff, and students were surveyed between mid-July and September, 2006. The main outcome measures are posttraumatic stress disorder (PTSD) symptoms, coping, resource loss, and substance use. The study revealed substantial degree of resource loss and consequences due to Katrina. Approximately 22 percent of respondents had PTSD symptoms one year post-Katrina. Positive coping was strongly protective of PTSD symptoms in the sample. Alcohol and drug consumption, on the other hand, was associated with greater PTSD symptoms. Coping, alcohol use, and personal and family injury were also associated with resource loss. The paper concludes that survivors of a disaster need mental health and substance use services and resources well beyond the first year postdisaster, and that the student population should be factored in any evacuation planning.

Post, David E., Jan M. Kasofsky, Christopher N. Hunte, and James H. Diaz. 2008. A regional services authority's rapid needs assessment of evacuees following natural disasters. ***American Journal of Disaster Medicine*** **3(5): 253-64.**

The Atlantic hurricane season of 2005 was not an ordinary season, and Hurricane Katrina was not an ordinary hurricane. Hurricane Katrina damaged more than 93,000 square miles of Gulf of Mexico coastline, displaced more than one million residents from New Orleans, and flooded more than 80 percent of New Orleans for weeks. The storm killed more than 1,300 people, mostly New Orleanians. Inland, regional, state, and local healthcare and human services agencies rushed to assist evacuees, most of whom were uninsured or displaced without employer healthcare coverage. The initial evacuation brought more than 350,000 evacuees seeking shelter to the greater Baton Rouge, Louisiana, area, 80 miles north of New Orleans, the closest high ground. This investigation describes the rapid needs assessment developed and conducted by the Capital Area Human Services District of the greater Baton Rouge area, a quasi-governmental human services authority, the regional provider of state funded mental health, treatment for addictive disorders, and developmental disabilities services, on a sample of 6,553 Katrina evacuees in the greater Baton Rouge area. In the event of catastrophic natural and manmade disasters, state and federal decision makers should follow the National Incident Management System and support local designated lead agencies with additional resources as requested. They must rely on designated lead agencies to use their knowledge of the locale, local resources, and relationships with other providers and volunteers to respond rapidly and efficiently to evacuee needs identified through a designated, concise tool

that is singularly utilized across the impacted region by all providers to determine the needed response.

Smith, V. Kerry. 2008. Risk perceptions, optimism, and natural hazards. ***Risk Analysis*** **28(6): 1763-1767.**
This article uses the panel survey developed for the Health and Retirement Study to evaluate whether Hurricane Andrew in 1992 altered longevity expectations of respondents who lived in Dade County, Florida, the location experiencing the majority of about $20 billion of damage. Longevity expectations have been used as a proxy measure for both individual subjective risk assessments and dispositional optimism. The panel structure allows comparison of those respondents' longevity assessments when the timing of their survey responses bracket Andrew with those of individuals where it does not. After controlling for health effects, the results indicate a significant reduction in longevity expectations due to the information respondents appear to have associated with the storm.

Swanson, David A. 2008. The demographic effects of Hurricane Katrina on the Mississippi Gulf Coast: An analysis by zip code. ***Journal of Mississippi Academy of Sciences*** **53(4): 213-231.**
This paper provides an estimate of the effects of Hurricane Katrina on the population of 20 selected zip code areas in Hancock, Harrison and Jackson counties, Mississippi, that were at or near the epicenter of Hurricane Katrina. The effects are examined by using 1990 and 2000 census data, information from a special data collection funded by the National Science Foundation, and special county-level "Katrina impact" 2006 population estimates prepared by the U. S. Census Bureau. The Cohort Change Ratio Method is applied to 1990 and 2000 census data to generate 2007 population estimates in the absence of Katrina. These estimates are then adjusted to take Katrina's effects into account. By comparing the adjusted to the unadjusted estimates provides an idea of the absolute and relative impact of Katrina. The comparison suggests that Katrina's demographic effects are profound and not only likely to affect the 2010 census counts in these areas, but that they may persist well beyond. Given the long-lasting demographic effects of such disasters, the author suggests that these methods be used in the future and provide specific recommendations on how this can be accomplished.

Tanaka, Kenji, Sayaka Kamohara, Fumihiko Yamada, Terunori Ohmoto, and Satoru Sugio. 2008. Orographical effects of heavy rainfall by typhoon 0514 (NABI). ***Natural Hazards Review*** **9(4): 190-198.**
Numerical experiments using a mesoscale meteorological model were performed to evaluate the mountainous orographical effects on heavy rainfalls brought by Typhoon 0514 (NABI), which caused a flooding disaster in the southeast Kyushu area of Japan. The studies examined three terrain conditions using a numerical model: a flat terrain with altitude one meter above mean sea level; an idealized, line-shaped mountain terrain; and a complex terrain using topography data from the U.S. Geological Survey. Although the total observed rainfall due to Typhoon 0514 was greater than 1,000 miloimeters, the rainfall value calculated using the flat terrain conditions was 250-300mm; and the value calculated using the complex terrain conditions was 500-900mm. This discrepancy was found to result from the evolution of convective cells, generated by water vapor lifted along the mountain slope in the windward areas. The ratio of forecasted rainfall with and without orography provides an important index for evaluating the risk of heavy rain in a tropical cyclone.

Valas, Josh, Kristine M. Gebbie, Lisandro Irizarry, Clair P. Millet, Matthew J. Levy, Virginia A. Tufaro, and Knox Andress. 2008. Framing emergency and disaster training needs post Hurricane Katrina: A round-table discussion. ***International Journal of Public Policy*** **3(5/6): 366-376.**
On August 23, 2006, Hurricane Katrina formed as a tropical storm and made landfall on the Gulf Coast of the USA as a category 3 hurricane on August 29, 2006. This storm damaged far more property than any other natural disaster in the US since 1928. Before the impact of this storm was understood, Hurricane Rita followed in its path, extending the devastation and increasing the need for additional response efforts from already stressed emergency response sectors. Several national reports have been written and distributed in efforts to understand and evaluate that response. With a similar interest and with the intent to inform the work of the Center of Health Policy's work in the area of emergency preparedness training for health professionals, a round-table was convened to explore the experiences of a diverse group of emergency responders.

Zhu, Ping. 2008. A multiple scale modeling system for coastal hurricane wind damage mitigation. Natural Hazards 47(3): 577-591.
Hurricane wind damage constitutes the largest percentage of catastrophic insured losses in the US. Yet the complicated wind structures and their changes are not

fully understood and, thus, have not been considered in current risk catastrophic models. To obtain realistic landfall hurricane surface winds, a large eddy simulation (LES) framework in a weather forecasting mode has been developed from a multiple nested Weather Research & Forecasting (WRF) model to explicitly simulate a spectrum of scales from large-scale background flow, hurricane vortex, mesoscale organizations, down to fine-scale turbulent eddies in a unified system. The unique WRF-LES enables the high resolution data to be generated in a realistic environment as a hurricane evolves. In this paper, a simulation of the land falling Hurricane Katrina is presented to demonstrate various features of the WRF-LES. It shows that the localized damaging winds are caused by the large eddy circulations generated in the hurricane boundary layer. With a sufficient computational power, WRF-LES has the potential to be developed into the next generation operational public wind-field model for hurricane wind damage mitigation.

Information and Spatial Technology

Graschew, Georgi, Theo A. Roelofs, Stefan Rakowsky, Peter M. Schlag, Andreas Lieber, Uwe Muller, Ralf Czymek, and Wolfgang Dusel. 2008. DELTASS – Disaster emergency logistic telemedicine advanced satellites system: Telemedical services for disaster emergencies. ***International Journal of Risk Assessment and Management*** **9(4): 251-266.**

In the Disaster Emergency Logistic Telemedicine Advanced Satellites Systems (DELTASS) project, a disaster scenario was analyzed and an appropriate telecommunication system for effective rescue measures for victims was set up. OP 2000 has designed various telemedical services for the support of the medical staff in a Mobile Field Hospital (MFH), which can be located in a disaster area by experts in a Reference Hospital (RH) located outside a disaster area. These services use a Workstation for Telemedical Applications via Satellite (WoTeSa) and Wavelet-based interactive Video Communication System (WinVicos) for the telemedical communication at the required quality, given the satellite bandwidth of 2 Mbit sec-1. Thus medical experts in the RH can support medical treatments in the MFH as well as a quick and reliable decision on to which hospital a victim/patient needs to be evacuated in order to get the best medical service (early triage).

Magliulo, Paolo, Antonio Di Lisio, Filippo Russo, and Antonio Zelano. 2008. Geomorphology and landslide susceptibility assessment using GIS and bivariate statistics: A case study in southern Italy. ***Natural Hazards*** **47(3): 411-435.**

This article assesses the landslide susceptibility in the Calaggio Torrent basin (Campanian Apennines, southern Italy). landslide susceptibility was assessed using two bivariate-statistics-based methods in a GIS environment. In the first method, widely used weighting values (Wi) have been calculated for each class of the selected causal factors (lithology, land-use, slope angle and aspect) taking into account the landslide density (detachment zones + landslide body) within each class. In the second method, a modification of the first method, only the landslide detachment zone (LDZ) density has been taken into account to calculate the weighting values. This latter method is characterized by a major geomorphological coherence. In fact, differently from the landslide bodies, LDZ must necessarily occur in geoenvironmental classes prone to failure. Thus, the calculated Wi seemed more reliable in estimating the propensity of a given class to generate failure. The thematic maps have been reclassified on the basis of the calculated Wi and overlaid to produce landslide susceptibility maps. The methods indicate that most part of the study area is characterized by a high/very high landslide susceptibility and in the location and extent of the low-susceptible areas. However, an increase of both the high/very high and moderate/high susceptible areas occurs in using the second method. Both the susceptibility maps produced have been compared with the geomorphological map, highlighting an excellent coherence which is higher using method-2. In both methods, the percentage of each susceptibility class affected by landslides increases with the degree of susceptibility, as expected. However, the percentage at issue in the lowest susceptibility class obtained using method-2, even if low, is higher than that obtained using method-1. This suggests that method-2, notwithstanding its major geomorphological coherence, probably still needs further refinements.

Platt, R. V., T. T. Veblen, and R. L. Sheriff. 2008. Spatial model of forest management strategies and outcomes in the wildland-urban interface. ***Natural Hazards Review*** **9(4): 199-208.**

In fire-prone areas of the western United States, mechanical thinning is often seen as a way to achieve two outcomes: Wildfire mitigation and restoration of historical forest structure. In this study, a spatial modeling approach is used to (1) find which forests are likely to be thinned under different criteria; (2) for these forests, evaluate whether wildfire mitigation and restoration of historical forest structure are potentially needed; and

(3) determine whether these results change under alternative assumptions related to weather and fire history. Effectively, the spatial models in this study allow us to "test" thinning criteria to see if they lead to the selection of land where the stated management goals are needed in the study area of the montane zone of Boulder County, Colo. The spatial modeling results indicate that common management practices such as thinning dense stands on Forest Service land near communities may be inappropriate if the desired outcome is both wildfire mitigation and restoration of historical forest structure. Instead, modeling results suggest that lower elevation forests in the study area should receive priority. Though specific to the montane zone of Boulder County, the results of this study support wider criticisms of national fire policy.

Srivastava, Sanjay K. 2009. Making a technological choice for disaster management and poverty alleviation in India. *Disasters* 33(1): 58-81.
The right mix of policy, institutional arrangements and use of technology provides the framework for a country's approach to disaster mitigation. Worldwide, there has been a shift away from a strictly 'top-down' approach relying on government alone, to a combination of 'top-down' and 'bottom-up' approaches. The aim is to enhance the indigenous coping mechanisms of vulnerable communities; draw on their cooperative spirit and energy; and empower them through appropriate information and contextual knowledge to mitigate natural disasters. In light of this, the paper examines India's use of space technology in its disaster management efforts. Poverty alleviation and disaster management are almost inseparable in many parts of the country, as vulnerability to natural disasters is closely aligned with poverty. Addressing these issues together requires integrated knowledge systems. The paper examines how knowledge inputs from space technology have strengthened the national resolve to combat natural disasters in conjunction with alleviating rural poverty.

Thompson, Wiley. 2008. School-based relief centers: A community level assessment and discussion. *Journal of Emergency Management* 6(6): 63-72.
An effective community relief center plan provides emergency managers with the ability to provide shelter and services to a population following the onset of a hazard and is a key component of emergency preparedness and disaster recovery. This paper presents a practical method whereby an assessment of schools as the basis of a community-wide relief center plan is made. The paper suggests desired characteristics of a relief center, details a selection methodology, and provides recommendations for implementation of a community relief center plan. Alternative considerations and the role of GIS are also discussed.

Tran, Phong, Rajib Shaw, Guillaume Chantry, and John Norton. 2009. GIS and local knowledge in disaster management: A case study of flood risk mapping in Viet Nam. *Disasters* 33(1): 152-169.
Linking community knowledge with modern techniques to record and analyzse risk-related data is one way of engaging and mobilizsing community capacity. This paper discusses the use of the Geographic Information System (GIS) at the local level and the need for integrating modern technology and indigenous knowledge into disaster management. It suggests a way to mobilize available human and technical resources in order to strengthen a partnership between local communities and local and national institutions. The paper also analyses the current vulnerability of two communes by correlating hazard risk and loss/damage caused by disasters, and the contribution that domestic risk maps in the community can make to reduce this risk. The disadvantages, advantages, and lessons learned from the GIS flood risk mapping project are presented through the case study of the Quang Tho Commune in Thua Thien Hue province, central Vietnam.

von Lubitz, Dag. 2008. Medical readiness for operations other than war: Boyd's OODA loop and training using advanced distributed simulation technology. *International Journal of Risk Assessment and Management* 9(4): 409-432.
Synthetic Distributed Readiness Training Environment (SDRTE) combines Advanced Distributed Interactive Simulation (A-DIS) and Medical Application Service Provider (Med-ASP) concepts into a seamlessly integrated training platform for the development and maintenance of First Responder (1RP) operational medical readiness. A synthetic substitute for the traditional, restrictive methods of training, SDRTE is based on the already developed and tested fusion of Virtual Reality (VR), Auto Stereoscopy (AS), High Fidelity Human Patient Simulation (HFPS), videoconferencing (VCON) and visualization of complex data with the existing high speed internet connectivity (ISDN, DSL, I2), that operates as a real time, distributed simulation net-

work. Full scale implementation of SDRTE allows real time "free play" training of multi-agency personnel in a near-real-life environment that permits incorporation of fluidity, stressors, and unpredictable elements. Neither of these elements can be successfully implemented in the currently practiced, predetermined, and strictly scripted physical drills. While the proposed synthetic readiness training environment will not substitute for physical drills, it will assist in the development of critical command and decision making skills required for the successful conduct of operations in dynamically changing disaster environments. Moreover, the synthetic nature of SDRTE permits collection of quantitative data necessary for the development of performance metrics, development of operational standards and doctrines and ultimately for the unbiased data-based assessment of the existing readiness levels.

Insurance and Economic Impacts

Benhin, James K. A. 2008. South African crop farming and climate change: An economic assessment of impacts. ***Global Environmental Change*** **18(4): 666-678.**
This paper assesses the economic impact of the expected adverse changes in the climate on crop farming in South Africa using a revised Ricardian model and data from farm household surveys, long-term climate data, major soils and runoffs. Mean annual estimates indicate that a one percent increase in temperature will lead to about US$80.00 increase in net crop revenue while a 1 mm/month fall in precipitation leads to US$2.00 decrease, but with significant seasonal differences in impacts. There are also significant spatial differences and across the different farming systems. Using selected climate scenarios, the study predicts that crop net revenues are expected to fall by as much as 90 percent by 2100 with small-scale farmers most affected. Policies therefore need to be fine-tuned and more focused to take advantage of the relative benefits across seasons, farming systems, and area. By so doing, climate change may be beneficial rather than harmful.

De Silva, Dakshina G., Jamie B. Kruse, and Yongsheng Wang. 2008. Spatial dependencies in wind-related housing damage. ***Natural Hazards*** **47(3): 317-330.**
This article examines the spatial dependence among housing losses due to tornadoes using data from the May 1999 Oklahoma City tornado. In order to examine the existence of spatial dependence and its impacts on the damage analysis, the authors compare an estimation based on a traditional ordinary least square model with the general spatial model. The results show that housing damage in this disaster area is highly correlated. Monetary losses not only depend on the tornado that struck residences, but are related to the damage magnitudes of neighboring houses. Average losses as well as the loss ratio increase with the Fujita Scale damage rating. The authors conclude that the general spatial model provides unbiased estimates compared to the ordinary least square model. In order to construct appropriate home insurance policies for tornado disasters or to improve the damage resistance capabilities of houses, it is necessary for insurance underwriters and builders to consider spatial correlation of tornado damage.

Sanghi, Apurva, and Robert Mendelsohn. 2008. The impacts of global warming on farmers in Brazil and India. ***Global Environmental Change*** **18(4): 655-665.**
How big a threat is global warming to climate-sensitive and economically important sectors such as agriculture in developing countries? How well will farmers be able to adapt to the threats of global warming? This paper attempts to shed light on these two important questions. A cross-sectional analysis is employed to estimate the climate sensitivity of agriculture in Brazil and India. Using panel data from both countries, the study measures how net farm income or property values vary with climate, and consequently, how farmers in India and Brazil react and adapt to climate. The estimated relationships are then used to predict the consequence of alternative climate scenarios. Global warming by the end of the next century could cause annual damages in Brazil between 1 percent and 39 percent and between 4 percent and 26 percent in India, although some of this effect may be potentially offset by carbon fertilization. These estimates do not factor into account climate-induced extreme weather events.

Sullivan, Karl. 2008. Policy implications of future increases in extreme weather events due to climate change. ***Australian Journal of Emergency Management*** **23(4): 37-42.**
The article outlines the shifts required to increase future communities' resilience to more extreme weather events. The first part focuses on the importance of community resilience and what makes a community resilient. The second part focuses on the contribution of insurance to resilience. The third part examines possible ways to improve community resilience in the areas of emergency and recovery planning and financial risk mitigation against extreme events due to climate change.

Searle, Annie. 2008. Pandemic readiness in the US financial services sector: When failure is not an option.

Journal of Business Continuity & Emergency Planning **2(4): 357-364.**

This paper examines the state of pandemic readiness one year later, referencing four new publications available for planning in the United States. The paper focuses on key observations and lessons learned from the U.S. Department of Treasury's autumn 2007 exercise, which was conducted among 2,775 financial services institutions. The paper briefly discusses the pandemic guidance issued by the Federal Financial Institutions Examination Council in December 2007.

Landslides and Avalanches

Anderson, Malcolm, Liz Holcombe, Rob Flory, and Jean-Philippe Renaud. 2008. Implementing low-cost landslide risk reduction: A pilot study in unplanned housing areas of the Caribbean. ***Natural Hazards*** **47(3): 297-315.**

Landslides pose a serious physical and environmental threat to vulnerable communities living in areas of unplanned housing on steep slopes in the Caribbean. Some of these communities have, in the past, had to be relocated, at costs of millions of dollars, because of major slides triggered by tropical storm rainfall. Even so, evidence shows that: (1) risk reduction is a marginal activity; (2) there has been minimal uptake of hazard maps and vulnerability assessments, and; (3) there is little on-the-ground delivery of construction for risk reduction. This article directly addresses these issues by developing a low-cost approach to the identification of the potential pore pressure changes that trigger such slides we seek to address these three commentaries directly. A complex 45-60° slope site in St Lucia, West Indies was selected as a pilot for a modeling approach that uses numerical models (FLAC and CHASM) to verify the need for surface water management to effectively reduce landslide risk. Following the model confirmation, a series of drains was designed and constructed at the site. Post-construction evidence indicates the methodology to be sound, in that the site was stable in subsequent 1-in-1 to 1-in-4 year rainfall events. A critical feature of the approach is that it is community-based from data acquisition through to community members participating in construction.

Lin, Wen-Tzu, Wen-Chieh Chou, and Chao-Yuan Lin. 2008. Earthquake-induced landslide hazard and vegetation recovery assessment using remotely sensed data and a neural network-based classifier: A case study in central Taiwan. ***Natural Hazards*** **47(3): 331-347.**

A catastrophic earthquake with a Richter magnitude of 7.3 occurred in the Chi-Chi area of Nantou County on September 21, 1999, generating large-scale landslides in the Chiufenershan area of Nantou County in central Taiwan. This study used a neural network-based classifier and the proposed NDVI-based quantitative index coupled with multitemporal SPOT images and digital elevation models (DEMs) for the assessment of long-term landscape changes and vegetation recovery conditions at the sites of these landslides. The analyzed results indicate that high accuracy of landslide mapping can be extracted using a neural network-based classifier, and the areas affected by these landslides have gradually been restored from 211.52ha on 27 September 1999 to 113.71ha on 11 March 2006, a reduction of 46.2 percent, after six and a half years of assessment. In accordance with topographic analysis at the sites of the landslides, the collapsed and deposited areas of the landslide were 100.54 and 110.98ha, with corresponding debris volumes of 31,983,800 and 39,339,500m3. Under natural succession, average vegetation recovery rate at the sites of the landslides reached 36.68 percent on 11 March 2006. The vegetation recovery conditions at the collapsed area (29.17 percent) are shown to be worse than at the deposited area (57.13 percent) due to topsoil removal and the steep slope, which can be verified based on the field survey. From 1999 to 2006, even though the landslide areas frequently suffered from the interference of typhoon strikes, the vegetation succession process at the sites of the landslides was still ongoing, which indicates that nature itself has the capability for strong vegetation recovery for the denuded sites. The results provide very useful information for decision making and policy planning in the landslide area.

Liu, Chia-Nan, Hsiao-Fung Huang, and Jia-Hyun Dong. 2008. Impacts of September 21, 1999 Chi-Chi earthquake on the characteristics of gully-type debris flows in central Taiwan. ***Natural Hazards*** **47(3): 349-368.**

Debris flows are more frequent in central Taiwan because of its mountainous geography. For example, many debris flows were induced by Typhoon Herb in 1996. The 1999 Chi-Chi 7.3-magnitude earthquake in central Taiwan induced many landslides in this region. Some landslides turned into debris flows when Typhoon Toraji struck Taiwan in 2001. This study investigates the characteristics of the gullies where debris flows have occurred for a comparison. Aerial photos of these regions dated in 1997 (before the earthquake) and 2001 (after the earthquake) are used to identify the occurrence of gully-type debris flows.

A Geographic Information System (GIS) is applied to acquire hydrological and geomorphic characteristics: stream gradient, stream length, catchment gradient, catchment area, form factor, and geology unit of these gullies. These characteristics in different study regions are presented in a statistical approach. The study of how strong ground motion affects the debris flows occurrence is conducted. The characteristics of the debris flow gullies triggered by typhoons before and after the Chi-Chi earthquake are quantitatively compared. The analysis results show that a significant transformation in the characteristics was induced by the Chi-Chi earthquake. In general, the transformation points out a lower hydrological and geomorphic threshold to trigger debris flows after the Chi-Chi earthquake. The susceptibility of rock units to strong ground motion is also examined. The analysis of debris flow density and accumulated rainfall in regions of different ground motion also reveal that the rainfall threshold decreases after the Chi-Chi earthquake.

Magliulo, Paolo, Antonio Di Lisio, Filippo Russo, and Antonio Zelano. 2008. Geomorphology and landslide susceptibility assessment using GIS and bivariate statistics: A case study in southern Italy. ***Natural Hazards*** **47(3): 411-435.**

This article assesses the landslide susceptibility in the Calaggio Torrent basin (Campanian Apennines, southern Italy). landslide susceptibility was assessed using two bivariate-statistics-based methods in a GIS environment. In the first method, widely used weighting values (Wi) have been calculated for each class of the selected causal factors (lithology, land-use, slope angle and aspect) taking into account the landslide density (detachment zones + landslide body) within each class. In the second method, a modification of the first method, only the landslide detachment zone (LDZ) density has been taken into account to calculate the weighting values. This latter method is characterized by a major geomorphological coherence. In fact, differently from the landslide bodies, LDZ must necessarily occur in geoenvironmental classes prone to failure. Thus, the calculated Wi seemed more reliable in estimating the propensity of a given class to generate failure. The thematic maps have been reclassified on the basis of the calculated Wi and overlaid to produce landslide susceptibility maps. The methods indicate that most part of the study area is characterized by a high/very high landslide susceptibility and in the location and extent of the low-susceptible areas. However, an increase of both the high/very high and moderate/high susceptible areas occurs in using the second method. Both the susceptibility maps produced have been compared with the geomorphological map, highlighting an excellent coherence which is higher using method-2. In both methods, the percentage of each susceptibility class affected by landslides increases with the degree of susceptibility, as expected. However, the percentage at issue in the lowest susceptibility class obtained using method-2, even if low, is higher than that obtained using method-1. This suggests that method-2, notwithstanding its major geomorphological coherence, probably still needs further refinements.

McGinnis, Mike, and Wayne Buck. 2008. NATO and Old Dominion University co-host disaster and incident management symposium. ***International Journal of Critical Infrastructures*** **4(4): 445-454.**

The 2008 Azalea Festival Symposium entitled, "Katrina over Hampton Roads: Are We Ready?" brought together over 250 attendees from 25 nations. The afternoon panel sessions featured discussions with state emergency management executives, federal officials, industry executives and academic subject matter experts. The symposium and resulting workshops generated a wide range of important observations and actionable recommendations for making the citizens and governments better prepared for dealing with all hazards incidents. Key recommendations were made in the areas of incident preparedness and response management, technology, emergency management policy, plans and processes, and individual and staff training and exercises will be used to inform the NATO countries, local, state, and federal representatives and citizenry on actions that can be taken to create the "culture of preparedness" that is needed.

Rheinberger, Christoph M., Michael Brundl, and Jakob Rhyner. 2009. Dealing with the white death: Avalanche risk management for traffic routes. ***Risk Analysis*** **29(1): 76-94.**

This article discusses mitigation strategies to protect traffic routes from snow avalanches. Up to now, mitigation of snow avalanches on many roads and railways in the Alps has relied on avalanche sheds, which require large initial investments resulting in high opportunity costs. Therefore, avalanche risk managers have increasingly adopted organizational mitigation measures such as warning systems and closure policies instead. The effectiveness of these measures is, however, greatly dependent on human decisions. This article presents a method for optimizing avalanche mitigation for traffic routes in terms of both their risk reduction impact and their net benefit to society. It introduces a generic framework for assessing avalanche risk and for quantifying the impact of mitigation. This allows

for sound cost-benefit comparisons between alternative mitigation strategies. The article also illustrates the framework with a case study from Switzerland. Findings suggest that site-specific characteristics of avalanche paths, as well as the economic importance of a traffic route, are decisive for the choice of optimal mitigation strategies. On routes endangered by few avalanche paths with frequent avalanche occurrences, structural measures are most efficient, whereas reliance on organizational mitigation is often the most appropriate strategy on routes endangered by many paths with infrequent or fuzzy avalanche risk. Finally, keeping a traffic route open may be very important for tourism or the transport industry. Hence, local economic value may promote the use of a hybrid strategy that combines organizational and structural measures to optimize the resource allocation of avalanche risk mitigation.

Uniyal, Aniruddh. 2008. Prognosis and mitigation strategy for major landslide-prone areas: A case study of Varunavat Parvat landslide in Uttarkashi township of Uttarakhand (India). ***Disaster Prevention and Management*** **17(5): 622-644.**

The aim of this paper is to present a discussion on prognosis and mitigation of major landslide zones in an attempt to minimize the impact of such disasters in future. A case study on the sequence of sliding events of Varunavat Parvat, Uttarkashi (India), response of masses, administration, and causative factors of sliding events has been presented in detail for prognosis and mitigation of large slide zones. The prognosis and mitigation strategy discussed is based on the monitoring of mass wasting zones through field investigations and satellite image analysis (of pre- and post-landslide period images) and experiential learning and interaction with village elders in landslide hazard-prone Himalayan terrain. The paper finds that Himalayan habitations such as Uttarkashi (which is situated in an area of fragile rocks, complex tectonics, seismic activity, and cloudburst-prone unstable hill slopes with colluvium and old slide zones) should have minimum anthropogenic activity in the form of slope cutting for road or building construction. The paper reflects an understanding of causative factors and indications of landslides in Varunavat Parvat area in Uttarkashi township of Uttarakhand (India). The paper calls for amalgamation of experience-based local knowledge of villagers of landslide-prone areas and modern scientific and technical know-how and above all the coordinated efforts of community and authorities for prognosis and mitigation of large-scale landslides in the inhabited areas. It has been further emphasized that sensitization and awareness programs and strict implementation of land-use regulations are vital components of effective mitigation strategy.

Public Health, Mental Health, and Emergency Medicine

Brevard, Sidney B., Sharon L. Weintraub, James B. Aiken, Edward B. Halton, Juan C. Duchesne, Norman E. McSwain, John P. Hunt, and Alan B. Marr. 2008. Analysis of disaster response plans and the aftermath of Hurricane Katrina: Lessons learned from a Level I trauma center. ***The Journal of Trauma*** **65(5): 1126-1132.**

This study compares disaster preparedness of a Level I trauma center with performance in an actual disaster. Previous disaster response evaluations have shown that the key to succeeding in responding to a catastrophic event is to anticipate the event, plan the response, and practice the plan. The Emergency Management Team had identified natural disaster as the hospital's highest threat. The hospital also served as the regional hospital for the Louisiana Health Resources and Service Administration Bioterrorism Hospital Preparedness Program. The hospital master disaster plan, including the Code Gray annex, was retrospectively reviewed and compared with the actual events that occurred after Hurricane Katrina. Vital support areas were evaluated for adequacy using a systematic approach. In addition, a survey of 10 key personnel from trauma and emergency medicine present during Hurricane Katrina was conducted. The survey of vital support areas were scored as adequate (three points), partially adequate (two points), or inadequate (one point). Ninety-three percent of the line items on the Code Gray Checklist were accomplished before landfall of the storm. The results of the survey of vital support areas were: water, 3.0 points; food, 2.4; sanitation, 1.5; communication, 1.4; and power, 1.5. Despite identifying the threat of a major hurricane, preparing a response plan, and exercising the plan, a major medical center can be overwhelmed by a catastrophic disaster like Hurricane Katrina. The study offers lessons learned as an aid for other medical centers that are developing and exercising their plans.

Crouse Quinn, Sandra. 2008. Crisis and emergency risk communication in a pandemic: A model for building capacity and resilience of minority communities. ***Health Promotion Practice*** **9(4): 18S-25S.**

As public health agencies prepare for pandemic influenza, it is evident from our experience with Hurricane

Katrina that these events will occur in the same social, historical, and cultural milieu in which marked distrust of government and health disparities already exist. This article grapples with the challenges of crisis and emergency risk communication with special populations during a pandemic. Recognizing that targeting messages to specific groups poses significant difficulties at that time, this article proposes a model of community engagement, disaster risk education, and crisis and emergency risk communication to prepare minority communities and government agencies to work effectively in a pandemic, build the capacity of each to respond, and strengthen the trust that is critical at such moments. Examples of such engagement and potential strategies to enhance trust include tools familiar to many health educators.

Eastridge, Brian J., Lorne Blackbourne, Charles E. Wade, and John B. Holcomb. 2008. Radiologic diagnosis of explosion casualties. ***American Journal of Disaster Medicine*** **3(5): 301-305.**

The threat of terrorist events on domestic soil remains an ever-present risk. Despite the notoriety of unconventional weapons, the mainstay in the armament of the terrorist organization is the conventional explosive. Conventional explosives are easily weaponized and readily obtainable, and the recipes are widely available over the Internet. According to the U.S. Department of State and the Federal Bureau of Investigation, over one-half of the global terrorist events involve explosions, averaging two explosive events per day worldwide in 2005 (Terrorism Research Center. Available at www.terrorism.com. Accessed April 1, 2007). The Future of Emergency Care in the United States Health System: Emergency Medical Services at the Crossroads, published by the Institute of Medicine, states that explosions were the most common cause of injuries associated with terrorism. Explosive events have the potential to inflict numerous casualties with multiple injuries. The complexity of this scenario is exacerbated by the fact that few providers or medical facilities have experience with mass casualty events in which human and material resources can be rapidly overwhelmed. Care of explosive-related injury is based on same principles as that of standard trauma management paradigms. The basic difference between explosion-related injury and other injury mechanisms are the number of patients and multiplicity of injuries, which require a higher allocation of resources. With this caveat, the appropriate utilization of radiology resources has the potential to impact in-hospital diagnosis and triage and is an essential element in optimizing the management of the explosive-injured patients.

Eisenman, David P., Deborah Glik, Michael Ong, Qiong Zhou, Chi-Hong Tseng, Anna Long, Jonathan Fielding, and Steven Asch. 2009. Terrorism-related fear and avoidance behavior in a multiethnic urban population. ***American Journal of Public Health*** **99(1): 168-174.**

This research seeks to determine whether groups traditionally most vulnerable to disasters would be more likely than would be others to perceive population-level risk as high (as measured by the estimated color-coded alert level), would worry more about terrorism, and would avoid activities because of terrorism concerns. Researchers conducted a random digit dial survey of the Los Angeles County population October 2004 through January 2005 in six languages. They asked respondents what color alert level the country was under, how often they worry about terrorist attacks, and how often they avoid activities because of terrorism. Multivariate regression modeled correlates of worry and avoidance, including mental illness, disability, demographic factors, and estimated color-coded alert level. Results show that persons who are mentally ill, those who are disabled, African Americans, Latinos, Chinese Americans, Korean Americans, and non-US citizens were more likely to perceive population-level risk as high, as measured by the estimated color-coded alert level. These groups also reported more worry and avoidance behaviors because of concerns about terrorism. The researchers conclude that vulnerable populations experience a disproportionate burden of the psychosocial impact of terrorism threats and our national response. Further studies should investigate the specific behaviors affected and further elucidate disparities in the disaster burden associated with terrorism and terrorism policies.

Fenzl, Mark, Heath Jolliff, and Marcus Topinka. 2008. Chemical exposure preparedness for emergency departments in a midwestern city. ***American Journal of Disaster Medicine*** **3(5): 273-81.**

The objective of this paper is to determine if each hospital in a large midwestern city has the resources to treat 50 patients exposed to terrorist chemical agents and/or industrial chemicals. Surveys specific to each department were sent to emergency department (ED) nursing supervisors, safety officers, and pharmacy directors of each hospital. The survey was performed in a large Midwestern city (metropolitan population of 1.5 million). The survey measured the presence of written materials, amount of equipment, quantities of pharmaceuticals, and number of staff available in each hospital. Hospital staff also rated the preparedness of their hospital. Twelve of the 27 respondents

returned the survey for a response rate of 44 percent. None of the EDs had a known cooperative written plan with the police or fire departments. Three safety officers reported limited numbers of hospital security personnel and a total of 35 ventilators for respiratory failure. The four pharmacy directors reported limited sum doses of atropine (315), cyanide antidote (10 complete kits), and succimer (100). Respondents who felt qualified to evaluate the ED gave a mean score of 5.4 on a scale of 1-10 when asked how prepared they felt their ED was to treat 50 chemical exposure patients. Conclusions: Despite hospital staff rating chemical exposure preparedness as 5.4, it is unlikely that each hospital could handle 50 patients exposed to some chemicals due to lack of prearranged coordination, security, antidotes, and ventilators.

Goffman, Thomas E. 2008. Nuclear disasters: Current plans and future directions for oncologists. ***American Journal of Disaster Medicine*** **3(6): 317-320.**
The objective of this paper is to show that there is a significant role for oncologists in the event of a terrorist nuclear disaster. Professionals need data on current political issues regarding a nuclear attack already put in place by the administration and the military. Review of what actually occurs during a fission bomb's explosion helps to point out what medical care will be most needed. The author contends that those trained in the oncologies could play a major part. The setting is modern-day America. The subjects are potential civilian survivors. Large gaps are noted in statewide disaster plans. Oncologists must get involved now in disaster planning. Statewide plans are necessary throughout the nation. The public needs to know the basics of what to do in the advent of a nuclear bomb explosion.

Goodwin Veenema, Tener, Bonnie Walden, Nancy Feinstein, and Jacqueline P. Williams. 2008. Factors affecting hospital-based nurses' willingness to respond to a radiation emergency. ***Disaster Medicine and Public Health Preparedness*** **2(4): 224-229.**
Despite increased government and public awareness of the threat of a radiological emergency resulting from a terrorist attack or industrial accident, limited emphasis has been placed on preparing the US health care workforce for such an event. The purpose of this study was to develop and apply a rapid survey to evaluate hospital-based nurses' baseline knowledge, self-assessed clinical competence, perception of personal safety, and willingness to respond in the event of a radiological emergency. The study was conducted in two phases, the first targeting nursing units likely to respond in the event of a radiological emergency and the second focusing more generally on members of the New York State Emergency Nurses Association currently employed as hospital-based nurses. Among the 668 nurses surveyed, baseline knowledge was found to be inadequate. Although baseline knowledge, clinical competence, and perception of personal safety were all positively associated with willingness to respond, perception of safety appeared to be the primary determinant. Furthermore, baseline knowledge did not appear to be strongly associated with perception of personal safety. Based on these results, the investigators recommend further clinical training to enhance preparedness and a more detailed exploration of the determinants of perceived personal safety.

Harper, D. R., L. M. Davies, E. M. Gadd, and S. C. Costigan. 2008. Science into policy: Preparing for pandemic influenza. ***Journal of Public Health*** **30(4): 373-374.**
Authoritative government pandemic preparedness requires an evidence-based approach. The scientific advisory process that has informed the current UK pandemic preparedness plans is described. The final endorsed scientific papers are now publicly available.

Harrison, Jeffrey P., Richard A. Harrison, and Heather J. Piermattei. 2008. The role of emergency medical planning in disaster response. ***International Journal of Public Policy*** **3(5/6): 354-364.**
This paper addresses the importance of emergency medical planning in disaster response and highlights the need for cooperation among community, governmental, and private organizations. Research on emergency medical disaster planning will provide a framework for community leaders, elected officials, and healthcare providers to analyze data to support evidence-based decision making in natural disasters or terrorist incidents. Such decisions increase the effectiveness of the disaster response system, thereby safeguarding the population and the community infrastructure. This study found that approximately 79 percent of rural communities in the United States have hospital emergency rooms with medical disaster response capabilities. Unfortunately, the data demonstrate that 21 percent of rural communities lack emergency rooms, which are important disaster medical response resources. As a result, rural populations could be at risk during disasters. It also emphasizes the importance of building partnerships

among local, state and national organizations to ensure a timely medical response to disasters.

Hong, Rick, Paul R. Sierzenski, Melissa Bollinger, Craig C. Durie, and Robert E. O'Connor. 2008. Does simple triage and rapid treatment method appropriately triage patients based on trauma injury severity score? ***American Journal of Disaster Medicine*** **3(5): 265-271.** The objective of this paper is to correlate the simple triage and rapid treatment (START) colors to trauma injury severity scores (ISS). Six volunteer healthcare providers unfamiliar with START were trained to triage. Each chart was designated a START color by a volunteer healthcare provider and the "expert" trainer. The colors and corresponding ISS were recorded. Level I trauma center at a suburban tertiary care hospital. Patients, participants: One hundred charts of patients at least 65 years old who appear in Christiana Hospital's Trauma Registry were randomly chosen for the study, and 98 charts with complete data were included. Main outcome measure(s): Cohen's Kappa score measures the level of agreement between the "volunteer" and "expert" reviewers. Pearson correlation determines the association between the START colors and mean ISS. The Cohen's Kappa score between the volunteer and expert reviewers was 0.9915, indicating a highly significant agreement between the reviewers on the triage category of the patients. The mean ISS for each color was as follows: green = 11, yellow = 12, red = 20, black = 24. The mean ISS increases as the acuity of the triage category increases, with a Pearson correlation of 0.969. The START method is a simple technique used to triage quickly a large number of patients. Healthcare providers can undergo just-in-time training to learn this technique and use it effectively. The START colors also imply a correlation with the trauma ISS, with higher ISS more likely to be triaged "red" or "black."

Jayasinghe, Nimali, Cezar Giosan, Susan Evans, Lisa Spielman, and JoAnn Difede. 2008. Anger and posttraumatic stress disorder in disaster relief workers exposed to the September 11, 2001 World Trade Center disaster: One-year follow-up study. ***The Journal of Nervous and Mental Disease*** **196(11): 844-846.** Although anger is an important feature of posttraumatic stress disorder (PTSD) it is unclear whether it is simply concomitant or plays a role in maintaining symptoms. A previous study of disaster workers responding to the terrorist attacks of September 11, 2001 indicated that those with PTSD evidenced more severe anger than those without. The purpose of this study was to conduct a one-year follow-up to assess the role of anger in maintaining PTSD. Workers with PTSD continued to report more severe anger than those without. There were statistically significant associations between changes in anger, PTSD severity, depression, and psychiatric distress. Multiple regression analysis indicated initial anger severity to be a significant predictor of PTSD severity at follow-up, which is consistent with the notion that anger maintains PTSD. One implication is that disaster workers with high anger may benefit from early intervention to prevent chronic PTSD.

Kelen, Gabor. 2008. Trend analysis of disaster health articles in peer-reviewed publications pre- and post-9/11. ***American Journal of Disaster Medicine*** **3(6): 369-376.** The aim of this study was to determine which journals publish medical disaster-related work, their individual focus, and publication volume pre and post-9/11. PubMed and Google Scholar were searched using key words to identify peer-review journals (print or electronic) publishing medical and public health disaster-related manuscripts. All medical journals with an average volume of at least five disaster-related publications per year over the 11-year study period (1996-2006) were selected. Identified journals were categorized as either general or specialty medical, or disaster health dedicated. All disaster-related articles in each journal were identified and classified according to 11 subtopics. Of 16 journals meeting entry criteria, 10 were disaster dedicated. Of these, only six existed pre-9/11. Only six general journals (JAMA, American Journal of Public Health, The Lancet, New England Journal of Medicine, Annals of Emergency Medicine, Academic Emergency Medicine) had sufficient publications for analysis. Of the 2,899 disaster articles identified, 1,769 (61 percent) were from the dedicated journals. Publications increased by 320 percent in the general/subspecialty journals and 145 percent for disaster-specific journals in the five-year period post-9/11 (2002-2006) versus the previous five-year period (1996-2000). Among the dedicated journals, Journal of Prehospital and Disaster Medicine published the most (21 percent), followed by Disaster: An International Journal (18 percent). Among the general/subspecialty journals, The Lancet published the most (33 percent), followed by JAMA (28 percent) and Annals of Emergency Medicine (18 percent). These journals published the most pre- and post- 9/11. Bioterrorism (36 percent) and Preparedness (18 percent) were the most frequent topic areas for the general/ subspecialty journals, while General Disasters (38 percent) and Preparedness (27 percent) were of the highest interest for the dedicated journals. The greatest increase in the proportion of publications pre-

and post-9/11 was by the New England Journal of Medicine (2,340 percent) and Academic Emergency Medicine (1,275 percent). Individual journals appear to emphasize particular subtopic areas. Interest in publishing medical disaster-related articles has increased tremendously since 9/11 in both general/subspecialty journals as well as disaster-dedicated medical journals. Some journals focus on certain topics. Details of this study should help authors identify appropriate journals for their manuscript submissions.

Lawry, Lynn, and Frederick M. Burkle. 2008. Measuring the true human cost of natural disasters. ***Disaster Medicine and Public Health Preparedness*** **2(4): 208-209.**

Lurie, Nicole, David J. Dausey, Troy Knighton, Melinda Moore, Sarah Zakowski, and Lawrence Deyton. 2008. Community planning for pandemic influenza: Lessons from the VA health care system. ***Disaster Medicine and Public Health Preparedness*** **2(4): 251-257.**

Coordination and communication among community partners including health departments, emergency management agencies, and hospitals are essential for effective pandemic influenza planning and response. As the nation's largest integrated health care system, the U.S. Department of Veterans Affairs (VA) could be a key component of community planning. The purpose of this paper is to identify issues relevant to VA community pandemic influenza preparedness. As part of a VA community planning process, the authors developed and pilot-tested a series of tabletop exercises for use throughout the VA system. These included exercises for facilities, regions (Veterans Integrated Service Networks), and the VA central office. In each, VA and community participants, including representatives from local health care facilities and public health agencies, were presented with a three-step scenario about an unfolding pandemic and were required to discuss issues and make decisions about how the situation would be handled. Existing communication and coordination for pandemic influenza between VA health care system representatives and local and regional emergency planners are limited. Areas identified that would benefit from better collaborative planning include response coordination, resource sharing, uneven resource distribution, surge capacity, standards of care, workforce policies, and communication with the public. The VA health system and communities throughout the United States have limited understanding of one another's plans and needs in the event of a pandemic. Proactive joint VA community planning and coordination including exercises, followed by deliberate actions to address the issues that arise will likely improve pandemic influenza preparedness and will be mutually beneficial. Most of the issues identified are not unique to VA, but are applicable to all integrated care systems.

Nelson, Christopher D., Ellen Burke Beckjord, David J. Dausey, Edward Chan, Debra Lotsein, and Nicole Lurie. 2008. How can we strengthen the evidence base in public health preparedness. ***Disaster Medicine and Public Health Preparedness*** **2(4): 247-250.**

The lack of frequent real-world opportunities to study preparedness for large-scale public health emergencies has hindered the development of an evidence base to support best practices, performance measures, standards, and other tools needed to assess and improve the nation's multibillion dollar investment in public health preparedness. In this article, we argue that initial funding priorities for public health systems research on preparedness should focus on using engineering-style methods to identify core preparedness processes, developing novel data sources and measures based on smaller-scale proxy events, and developing performance improvement approaches to support the translation of research into practice within the wide variety of public health systems found in the nation.

Pederson, Ulrik Bo, and John-Erik Stig Hansen. 2008. Assessment tools in support of epidemiological investigation of airborne dispersion of pathogens. ***American Journal of Disaster Medicine*** **3(6): 327-333.**

Human health threats posed by airborne pathogens are difficult to handle for healthcare responders because the contaminated area is not immediately recognizable. By means of wind dispersion modeling, it is possible to estimate the extent and geographical position of hazardous areas and health impact. Contemporary modeling tools can run on standard personal computers, with short processing time and easy-to-use interfaces. This enables health professionals without modeling experience to assess consequences of dispersion incidents, for example, from accidental releases from industries, shedding of pathogens from infectious animals or humans, or intentional releases caused by terrorist activity. Dispersion assessments can provide response managers with a chance to get on top of events. In the absence of modeling, reliable estimates of hazard areas

may not be available until the appearance of the first cases or after time-consuming sampling and laboratory analysis. The authors describe using wind dispersion assessments in epidemiological field investigations of naturally occurring disease outbreaks, as well as for bioterror scenarios. They describe the specifications of user friendly and real-time functional wind dispersion modeling systems that can serve as decision support tools during outbreak investigations and outline some of the currently available software packages.

Post, David E., Jan M. Kasofsky, Christopher N. Hunte, and James H. Diaz. 2008. A regional services authority's rapid needs assessment of evacuees following natural disasters. ***American Journal of Disaster Medicine*** **3(5): 253-264.**
The Atlantic hurricane season of 2005 was not an ordinary season, and Hurricane Katrina was not an ordinary hurricane. Hurricane Katrina damaged more than 93,000 square miles of Gulf of Mexico coastline, displaced more than one million residents from New Orleans, and flooded more than 80 percent of New Orleans for weeks. The storm killed more than 1,300 people, mostly New Orleanians. Inland, regional, state, and local healthcare and human services agencies rushed to assist evacuees, most of whom were uninsured or displaced without employer healthcare coverage. The initial evacuation brought more than 350,000 evacuees seeking shelter to the greater Baton Rouge, Louisiana, area, 80 miles north of New Orleans, the closest high ground. This investigation describes the rapid needs assessment developed and conducted by the Capital Area Human Services District of the greater Baton Rouge area, a quasi-governmental human services authority, the regional provider of state funded mental health, treatment for addictive disorders, and developmental disabilities services, on a sample of 6,553 Katrina evacuees in the greater Baton Rouge area. In the event of catastrophic natural and manmade disasters, state and federal decision makers should follow the National Incident Management System and support local designated lead agencies with additional resources as requested. They must rely on designated lead agencies to use their knowledge of the locale, local resources, and relationships with other providers and volunteers to respond rapidly and efficiently to evacuee needs identified through a designated, concise tool that is singularly utilized across the impacted region by all providers to determine the needed response.

Ross, Lenard H., and Matthew Mihelic. 2008. Healthcare vulnerabilities to electromagnetic pulse. ***American Journal of Disaster Medicine*** **3(6): 321-325.**
The U.S. healthcare system is particularly vulnerable to the effects of electromagnetic pulse (EMP) attack because of the system's technological sophistication, but while national defense planners prepare for the considerable threat that EMP poses, there has been little or no recognition of this threat within the U.S. healthcare community. Neither has there been any significant healthcare planning to deal with such an eventuality. Recognition of the risk presented by EMP, and advance institution of appropriate strategies to mitigate its effects on the healthcare system, could enable the preservation of much of that system's function in the face of EMP-related disruptions, and will greatly further all-hazards disaster preparations.

Searle, Annie. 2008. Pandemic readiness in the US financial services sector: When failure is not an option. ***Journal of Business Continuity & Emergency Planning*** **2(4): 357-364.**
This paper examines the state of pandemic readiness one year later, referencing four new publications available for planning in the United States. The paper focuses on key observations and lessons learned from the U.S. Department of Treasury's autumn 2007 exercise, which was conducted among 2,775 financial services institutions. The paper briefly discusses the pandemic guidance issued by the Federal Financial Institutions Examination Council in December 2007.

Silenas, Rasa, Stephen G. Waller, Adanto R. D'Amore, and Paul K. Carlton. 2008. U.S. armed forces medical operations other than war. ***International Journal of Risk Assessment and Management*** **9(4): 367-375.**
Expertise in combat healthcare planning, operations, and technology translates well into domestic and international humanitarian health relief. The U.S. military medical services have extensive daily activities in public health and medicine that are integrated with civilian organizations, and are related to health research, prevention of disease, and healthcare rather than to combat operations. These activities are authorized by U.S. law, and they support, rather than supersede, civilian authority. On U.S. soil, the National Guard and Northern Command have specific responsibilities in disaster response. All of the services conduct international activities, including humanitarian medical missions and disaster relief. Besides direct public health and medical services, relief includes support such as airlift and logistics. These activities are effec-

tive instruments of diplomacy, creating the hope that military medical operations other than war can be instruments of peace.

Sine, David M., and Norvell Northcutt. 2008. A qualitative analysis of the central values of professional paramedics. ***American Journal of Disaster Medicine*** **3(6): 335-343.**
Biomedical ethics decisions are often made after reflection, deliberation, and after a process of communication, reveal the values and interests of the patient or the patient's family. However, acute and rapid changes in the patient, the very public view of the care provided, and a need for rapid decision making by paramedics in a prehospital setting make protracted deliberation and reflection a practical impossibility. As paramedics provide care for patients, they regularly make value-laden choices that affect the type of care, how care is provided, and to whom care is provided. These choices transcend the technical judgment and professional skills necessary for provision of emergency care in prehospital settings. This article identifies, describes, and organizes a number of central values of professional paramedics and discusses how values may be considered by paramedics when resolving conflicting values.

Smith, V. Kerry. 2008. Risk perceptions, optimism, and natural hazards. ***Risk Analysis*** **28(6): 1763-1767.**
This article uses the panel survey developed for the Health and Retirement Study to evaluate whether Hurricane Andrew in 1992 altered longevity expectations of respondents who lived in Dade County, Florida, the location experiencing the majority of about $20 billion of damage. Longevity expectations have been used as a proxy measure for both individual subjective risk assessments and dispositional optimism. The panel structure allows comparison of those respondents' longevity assessments when the timing of their survey responses bracket Andrew with those of individuals where it does not. After controlling for health effects, the results indicate a significant reduction in longevity expectations due to the information respondents appear to have associated with the storm.

Uscher-Pines, Lori. 2009. Health effects of relocation following disaster: A systematic review of the literature. ***Disasters*** **33(1): 1-22.**
This paper reviews the literature on the effects of post-disaster relocation on physical and mental heath, and develops a conceptual framework to guide future research. Forty articles were selected for full-text review and incorporation into the conceptual framework. Twenty-four articles were reviewed for results and methodology. These overwhelmingly tracked mental health outcomes. Only four (16 per cent) focused on physical health. Eight of ten showed an association between relocation and psychological morbidity. Certain outcomes (such as mortality, injury and cardiovascular disease risk factors) revealed inconsistent results, but these were rarely studied. Despite the frequency of post-disaster relocation and evidence of its effect on psychological morbidity, there is a relative paucity of studies; the few examples in the literature reveal weak study designs, inconsistent results, and inattention to physical health impacts and the challenges facing vulnerable populations. Further research guided by theory is needed to inform emergency preparedness and recovery policy.

Vineburgh, Nancy T., Robert J. Ursano, Derrick A. Hamaoka, and Carol S. Fullerton. 2008. Public health communication for disaster planning and response. ***International Journal of Public Policy*** **3(5/6): 292-301.**
Public health communication is an important tool for public policy stakeholders who are engaged in emergency planning and management to influence individual and community preparedness. Historically, the U.S. public has not embraced this essential disaster behavior. This may be attributed to government communication of preparedness as a continuing behavior versus a discreet behavior. Discreet behavior is well described, specific and doable. The "teachable moment" is a communication strategy that uses a current or timely health issue as an opportunity to educate the public about important health behaviors that can have a continuing impact on their lives. Receiving a flu shot educates the public about adherence to disaster medical interventions that protect and sustain health. The capacity to change behavior is a recognized role for public policy professionals and enhances their involvement in policy development and communication for emergency planning and management.

Risk and Decision Making

Ammann, Walter J. 2008. Developing a multi-organizational strategy for managing emergencies and disasters. ***Journal of Business Continuity & Emergency Planning*** **2(4): 390-402.**
The challenge of coping with disasters, risks and emergency situations must be seen as a perma-

nent management process with clearly defined tasks, responsibilities, and resource allocations. This process requires a continuous effort, including periodic identification, analyses, and assessments of the critical stages along the risk circle, thus considering prevention, intervention, and recovery. To cope effectively with disasters demands a clear strategy, involving all stakeholders and risk scenarios. This paper outlines the importance of an integral risk management process and public-private partnership. Taking Switzerland as an example, it describes the process of developing and establishing a widely supported vision and strategy to cope with risks due to natural hazards. The paper also elaborates some ideas on how to expand the strategy to other risks and stakeholders. The Swiss approach involves public and private sector representatives, assembled in an extra-parliamentary commission as a national platform to cope with natural hazards. This multi-stakeholder development process has resulted in an action plan for implementing the strategy. Major progress has been achieved, with all stakeholders committing to a commonly established risk concept, to allocate substantial resources for the improvement of the risk dialogue and, finally, to accept a periodic audit to evaluate the status and success of the strategy.

Arthur, Craig, Anthony Schofield, and Bob Cechet. 2008. Assessing the impacts of tropical cyclones. ***Australian Journal of Emergency Management*** **23(4): 14-20.**
Using Darwin as a test case, the authors assess the benefits of Geoscience Australia's Tropical Cyclone Risk Modeling tool in assessing the potential impact of a tropical cyclone. Tropical Cyclone (TC) Tracy impacted Darwin early on Christmas Day, 1974, resulting in 71 deaths, the destruction of thousands of homes and the evacuation of over 35,000 people. Several factors contributed to the widespread destruction, including the intensity of the cyclone, vegetation overhanging buildings and construction materials employed in Darwin at the time. Since 1974, the population of Darwin has grown rapidly, from 46,000 to nearly 115,000 in 2006. If TC Tracy were to strike Darwin in 2008, the impacts could be catastrophic. However, tools such as Geoscience Australia's Tropical Cyclone Risk Model (TCRM) could be used to allow emergency managers to plan for such a scenario. The authors perform a validation of TCRM to assess the impacts TC Tracy would have on the 1974 landscape of Darwin, and compare the impacts to those determined from a post-impact survey. They found an underestimate of the damage at 36 percent of replacement cost (RC), compared to survey estimate of 50 percent to 60 percent RC. Some of this deficit can be accounted for through the effects of large debris. Qualitatively, TCRM can spatially replicate the damage inflicted on Darwin by the small cyclone, identifying localized areas of increased damage. For the 2008 scenario, TCRM indicates a nearly 90 percent reduction in the overall damage over the Darwin region. Once again, the spatial nature of the damage is captured well, with the greatest damage inflicted close to the eye of the cyclone. Areas that have been developed since 1974 such as Palmerston suffer very little damage due to the small extent of the severe winds. The northern suburbs, rebuilt in the years following TC Tracy, are much more resilient, largely due to the influence of very high building standards in place between 1975 and 1980.

Berlin, Johan M., and Eric D. Carlstrom. 2008. The 90-second collaboration: A critical study of collaboration exercises at extensive accident sites. ***Journal of Contingencies and Crisis Management*** **16(4): 177-185.**
In this study, a critical examination of collaboration, focusing on the alternatives, is carried out. The study is based on empirical data from four inter-organizational exercises involving ambulance, police, and fire departments. We studied collaboration between the three organizations from the arrival of the first units until the mission was completed. It was found that collaboration was practiced to a relatively small degree, and that it primarily took place due to understaffing. In summary, the different organizational phenomena are sorted on a scale of stability vs. change. The result of the study shows that the organizations observed strive for stability, preferring repeated and well-known behavior.

Bronfman, Nicolas C., Esperanza Lopez Vazquez, Virna Vaneza Gutierrez, and Luis Abdon Cifuentes. 2008. Trust, acceptance and knowledge of technological and environmental hazards in Chile. ***Journal of Risk Research*** **11(5): 755-773.**
Studies over the past decade have found empirical links between trust in risk management institutions and the risk perceptions and acceptability of various individual hazards. Mostly addressing food technologies, no study to date has explored wider possible relationships among all four core variables (risk, benefit, trust and acceptability) covering a heterogeneous group of hazards. Our prime objective was to ascertain effects among social trust in regulatory entities, and the public's perceived risk, perceived benefit, and the degree of acceptability towards both technological and environmental hazards. We also assess whether trust in regulatory authorities is the cause (causal model) or a consequence (associationist model) of a hazard's acceptability for a wide and heterogeneous range of

hazards on all four core variables. Using a Web-based survey, 539 undergraduates in Chile rated the five variables across 30 hazards. Implications for technology and environmental risk management organizations are discussed. Independent of the magnitude of the perceived risk or benefit surrounding a given hazard, or how knowledgeable the public claim to be of it, the trust sustained in regulatory institutions will either generate or be the consequence of public attitudes towards the hazard.

Burg, Jericho. 2008. Measuring populations' vulnerabilities for famine and food security interventions: The case of Ethiopia's Chronic Vulnerability Index. *Disasters* 32(4): 609-630.
The concept of vulnerability has become an important part of food security analyses since the 1980s. It is seen as having two sides: exposure to external hazards; and an inability to cope with those shocks attributed to social, political, and economic factors. Numerous attempts have been made to construct models to determine levels of vulnerability among populations. This paper analyses one such attempt, the Chronic Vulnerability Index (CVI), developed to measure levels of vulnerability to food insecurity in Ethiopia. The example of the CVI reveals many of the difficulties associated with producing a basic model of vulnerability that can be used in disaster mitigation. Ultimately, the CVI assumes that vulnerability is a linear, additive phenomenon with discrete causes and effects and fails to capture interactions between hazards and the human systems that produce and complicate them. The paper concludes with a discussion of alternatives to the CVI.

Busby, J. S., and S. A. Bennett. 2008. Analyzing the risks of individual and collective intentionality. *Journal of Risk Research* 11(5): 797-819.
The risk assessment of complex systems often seems to neglect the way in which intentions, collective and individual, are central to our explanations of how risk arises in such systems. Contradictions among the intentions of different actors, for example, are typically an important part of our understanding of how organizations break down. Moreover, risk assessment practice pays little attention to the reflexive problem of how intentions for the risk assessment itself can themselves become problematic. This study was an attempt to develop a framework to support reasoning about intentionality, both individual and collective, during risk assessment. The framework broadly follows a process of: 1) identifying the main social objects in a system; 2) asking what are the collective intentions for these objects in terms of the functions that are conferred on them; 3) asking what obligations and powers these create; and 4) asking what risks of organizational dysfunction can then arise. The approach was applied in a case study of aviation ramp operations. Its main value is as a formative rather than a summative kind of analysis.

Compton, Ryan, and John McAneney. 2008. The cost of natural disasters in Australia: The case for disaster risk reduction. *Australian Journal of Emergency Management* 23(4): 43-46.
After adjusting the Insurance Council of Australia's Disaster List for 2006 societal conditions, the authors estimate Australia's average annual insured loss due to natural perils to be around $1 billion. Worldwide, the costs of natural disasters are increasing leading to concerns that human-induced climate change is contributing to this trend. The authors demonstrate that demographic and societal changes are overwhelmingly responsible for the increasing costs of natural disasters in Australia. While there is no guarantee that this situation will continue, the authors proffer the case for increased efforts and policies aimed at reducing the vulnerability of communities to natural hazards. Any gains in disaster risk reduction made will stand Australia in good stead now and into the future.

Cox, Louis Anthony. 2008. Some limitations of "Risk = Threat × Vulnerability × Consequence" for risk analysis of terrorist attacks. *Risk Analysis* 28(6): 1749-1761.
Several important risk analysis methods now used in setting priorities for protecting U.S. infrastructures against terrorist attacks are based on the formula: Risk = Threat × Vulnerability × Consequence. This article identifies potential limitations in such methods that can undermine their ability to guide resource allocations to effectively optimize risk reductions. After considering specific examples for the Risk Analysis and Management for Critical Asset Protection (RAMCAPTM) framework used by the Department of Homeland Security, the article addresses more fundamental limitations of the product formula. These include its failure to adjust for correlations among its components, nonadditivity of risks estimated using the formula, inability to use risk-scoring results to optimally allocate defensive resources, and intrinsic subjectivity and ambiguity of Threat, Vulnerability, and Consequence numbers. Trying to directly assess probabilities for the actions of intelligent antagonists instead of modeling how they adaptively pursue their goals in light of available information and experience can produce ambiguous or mistaken risk estimates. Recent work demonstrates that two-level (or few-level) hierarchical optimization models can provide

a useful alternative to Risk = Threat × Vulnerability × Consequence scoring rules, and also to probabilistic risk assessment (PRA) techniques that ignore rational planning and adaptation. In such two-level optimization models, defender predicts attacker's best response to defender's own actions, and then chooses his or her own actions taking into account these best responses. Such models appear valuable as practical approaches to antiterrorism risk analysis.

Crouse Quinn, Sandra. 2008. Crisis and emergency risk communication in a pandemic: A model for building capacity and resilience of minority communities. ***Health Promotion Practice*** **9(4): 18S-25S.**
As public health agencies prepare for pandemic influenza, it is evident from our experience with Hurricane Katrina that these events will occur in the same social, historical, and cultural milieu in which marked distrust of government and health disparities already exist. This article grapples with the challenges of crisis and emergency risk communication with special populations during a pandemic. Recognizing that targeting messages to specific groups poses significant difficulties at that time, this article proposes a model of community engagement, disaster risk education, and crisis and emergency risk communication to prepare minority communities and government agencies to work effectively in a pandemic, build the capacity of each to respond, and strengthen the trust that is critical at such moments. Examples of such engagement and potential strategies to enhance trust include tools familiar to many health educators.

Fincucane, Melissa L. 2008. Emotion, affect, and risk communication with older adults: Challenges and opportunities. ***Journal of Risk Research*** **11(8): 983-997.**
Recent research suggests that emotion, affect, and cognition play important roles in risk perception and that their roles in judgment and decision-making processes may change over the lifespan. This paper discusses how emotion and affect might help or hinder risk communication with older adults. Currently, there are few guidelines for developing effective risk messages for the world's aging population, despite the array of complex risk decisions that come with increasing age and the importance of maintaining good decision making in later life. Age-related declines in cognitive abilities such as memory and processing speed, increased reliance on automatic processes, and adaptive motivational shifts toward focusing more on affective information mean that older and younger adults may respond differently to risk messages. Implications for specific risk information formats (probabilities, frequencies, visual displays, and narratives) are discussed and directions for future research are highlighted.

Hawkes, Gillian, and Gene Rowe. 2008. A characterization of the methodology of qualitative research on the nature of perceived risk: trends and omissions. ***Journal of Risk Research*** **11(5): 617-643.**
The issue of how risk is perceived is one of significant research interest and immense practical importance. In spite of this wide interest, however, it is probably fair to say that most emerging risk crises—whether related to natural or technological phenomena—come as a surprise to researchers and to society as a whole. Prediction of human responses to novel potential hazards (or novel manifestations of old hazards) is neither reliable nor complete; strategies to ameliorate inappropriate concerns when they arise (or to make realistic inappropriate absences of concern) do not appear totally effective. It therefore seems apt to ask the question: just what have we learned about "risk perception?" In this paper we conduct a structured review of qualitative research on perceived risk—to be followed by a subsequent analysis of quantitative research in a later paper—focusing upon methodological issues. Qualitative research often precedes quantitative research, and ideally informs it; it seeks depth and meaning from few subjects rather than identifying patterns within larger samples and populations. Without adequate qualitative research, quantitative research risks misanalysis of the target phenomenon, at the very least by the omission of relevant factors and inclusion of irrelevant ones. The analysis here—of qualitative studies conducted across a range of disciplines, not all of which will be familiar to the readers of this journal—suggests that this research suffers from an incomplete coverage of the "risk perception universe," typified by a focus on atypical hazards and study samples. The authors summarize the results of this research, while pointing out its limitations, and draw conclusions about future priorities for research of this type.

Jones, Trevor. 2008. Advances in risk assessment for Australian emergency management. ***Australian Journal of Emergency Management*** **23(4).**
This paper is an introduction to the two AJEM special issues on risk assessment. The role of risk assessment in emergency management in Australia is firmly established. Considerable progress has been made in utilizing risk modeling tools and supporting data to develop new information on risk for some hazards. Several key achievements relating to the governance and science of natural disaster risk assessment are highlighted here and, while significant further work is required to reach

an understanding of all hazards risks nationally, the way forward is clear.

Kohiyama, Masayuki, Anne S. Kiremidjian, Kimiro Meguro, and Miho Yoshimura Ohara. 2008. Incentives and disincentives analysis for improving policy for seismic risk management of homeowners in Japan. ***Natural Hazards Review*** **9(4): 170-178.**

To improve policy and programs for retrofitting houses in Japan, incentives and disincentives for seismic risk management by homeowners were studied by two approaches: a fault tree analysis (FTA) method and a questionnaire survey to homeowners. The result of the FTA revealed two common causes that hindered homeowners' seismic risk management: disaster awareness and fear of dishonest contractors. The questionnaire survey identified both incentives and disincentives. It was observed that neighbors could prompt retrofitting and that there were three major disincentives to retrofitting: high retrofitting cost, low contractor credibility, and little engineering information. The current policy in Japan puts emphasis on seismic diagnosis in comparison withthe United States. However, based on the above-mentioned observations, it was suggested that planning and reviewing of retrofitting work, as well as management after retrofitting, should be assisted more comprehensively to promote retrofitting. In addition, more attention should be paid to risk communication to provide engineering information on retrofitting, to foster mutual trust between homeowners and contractors/engineers, and to encourage information exchange with neighbors.

Petts, Judith. 2008. Public engagement to build trust: false hopes? ***Journal of Risk Research*** **11(5): 821-835.**

Public engagement through deliberative processes is promoted in both academic and policy circles as a potential means to build public trust in risk decisions and decision-makers. Governments in particular seem to optimistically take a positive relationship between public engagement and trust almost for granted. This paper provides a new and critical analysis of this hoped-for relationship, questioning whether such a direct and positive link between engagement and trust is a false hope. The paper draws upon personal experience of deliberative processes to discuss key components of an engagement process that have the potential to impact positively on trust. Specifically, who is engaged and which interests are represented; an open and collaborative framing of the discussion, and a direct and clear relationship between engagement and the risk decision. But the paper argues that given the complexities of optimising these process elements and in the light of the known underlying dimensions of trust, expectations are misplaced and that enduring trust is unlikely to spring from engagement itself. This is not to negate the other benefits of engagement, rather it is to focus on those key elements that will need to be in place, both process and beyond, if trust is to be enhanced.

Rheinberger, Christoph M., Michael Brundl, and Jakob Rhyner. 2009. Dealing with the white death: Avalanche risk management for traffic routes. ***Risk Analysis*** **29(1): 76-94.**

This article discusses mitigation strategies to protect traffic routes from snow avalanches. Up to now, mitigation of snow avalanches on many roads and railways in the Alps has relied on avalanche sheds, which require large initial investments resulting in high opportunity costs. Therefore, avalanche risk managers have increasingly adopted organizational mitigation measures such as warning systems and closure policies instead. The effectiveness of these measures is, however, greatly dependent on human decisions. This article presents a method for optimizing avalanche mitigation for traffic routes in terms of both their risk reduction impact and their net benefit to society. It introduces a generic framework for assessing avalanche risk and for quantifying the impact of mitigation. This allows for sound cost-benefit comparisons between alternative mitigation strategies. The article also illustrates the framework with a case study from Switzerland. Findings suggest that site-specific characteristics of avalanche paths, as well as the economic importance of a traffic route, are decisive for the choice of optimal mitigation strategies. On routes endangered by few avalanche paths with frequent avalanche occurrences, structural measures are most efficient, whereas reliance on organizational mitigation is often the most appropriate strategy on routes endangered by many paths with infrequent or fuzzy avalanche risk. Finally, keeping a traffic route open may be very important for tourism or the transport industry. Hence, local economic value may promote the use of a hybrid strategy that combines organizational and structural measures to optimize the resource allocation of avalanche risk mitigation.

Sharp, Alan. 2008. Assessing risk from meteorlogical phenomena using limited and biased databases. ***Australian Journal of Emergency Management*** **23(4): 9-13.**

This article discusses a number of meteorological databases and briefly evaluates their usefulness in risk assessment. According to the author, the assessment of risk attributable to many phenomena relies on the

analysis of past history. In the ideal situation, statistics derived from these data should reveal probabilities and trends in the occurrence of significant events. For more dangerous meteorological events like tropical cyclones and severe thunderstorms, the number of recorded events is somewhat limited. Changes in the nature of information gathering, and technology have biased these limited observations. We need to consider these factors when using the data to assess future risk.

Smith, V. Kerry. 2008. Risk perceptions, optimism, and natural hazards. *Risk Analysis* 28(6): 1763-1767.
This article uses the panel survey developed for the Health and Retirement Study to evaluate whether Hurricane Andrew in 1992 altered longevity expectations of respondents who lived in Dade County, Florida, the location experiencing the majority of about $20 billion of damage. Longevity expectations have been used as a proxy measure for both individual subjective risk assessments and dispositional optimism. The panel structure allows comparison of those respondents' longevity assessments when the timing of their survey responses bracket Andrew with those of individuals where it does not. After controlling for health effects, the results indicate a significant reduction in longevity expectations due to the information respondents appear to have associated with the storm.

Ter Huurne, Ellen, and Jan Gutteling. 2008. Information needs and risk perception as predictors of risk information seeking. *Journal of Risk Research* 11(7): 847-862.
This theoretical framework describes the importance of the public's information sufficiency, risk perception, and self-efficacy as predictors of intended risk information seeking behavior. Based on theoretical assumptions, measurement instruments for relevant concepts were developed and validated using data from a mail questionnaire. Relationships among selected determinants of risk information seeking behavior were analyzed. Results indicate that information needs, risk perception, and current knowledge are direct predictors of intentions to seek information. Trust, engagement, social influence, and self-efficacy affect risk perception and the need for information is influenced by engagement and social influence.

Tolhurst, Kevin, Brett Shields, and Derek Chong. 2008. Phoenix: Development and application of a bushfire risk management tool. *Australian Journal of Emergency Management* 23(4): 47-53.
The authors discuss the bushfire risk management model being developed by the Bushfire Cooperative Research Center (CRC). The need for an independent and comprehensive risk assessment system for all natural disasters in Australia was recognized by the Council of Australian Governments (COAG). The Australian/New Zealand Standard for Risk Management provides a framework for this consistent and comprehensive approach, but this system needs to be applied to each type of disaster taking into account the unique facets of each. The Bushfire Risk Management Model being developed by the Bushfire CRC is one application of this framework. This model goes further than previous models developed internationally because it directly relates the impact of various management strategies to changes in fire characteristics across the landscape, using PHOENIX, and then to the nature of the impact on various values and assets in the landscape. This model is intended for use by fire agencies, land managers, town and land planners, and policy makers.

Tompkins, Emma L., Maria Carmen Lemos, and Emily Boyd. 2008. A less disastrous disaster: Managing response to climate-driven hazards in the Cayman Islands and NE Brazil. *Global Environmental Change* 18(4): 736-745.
This paper explores the relationship between disaster risk reduction and long-term adaptive capacity building in two climate vulnerable areas: the Cayman Islands in the Caribbean, and Ceará, in NE Brazil. Drawing on past applications of the disaster risk reduction framework, the article identifies four critical factors that have led to reductions in risk: flexible, learning-based, responsive governance; committed, reform-minded and politically active actors; disaster risk reduction integrated into other social and economic policy processes; and a long-term commitment to managing risk. Findings show that while the presence of these factors has reduced overall risk in both regions, in Ceará, disaster response as it is currently practiced, has fallen short of addressing the fundamental causes of vulnerability that leave those prone to hazards able to cope in the short term, yet enmeshed in poverty and at risk from the longer-term changes associated with climate change. Although calls for integration of disaster risk management with poverty eradication are not new, there has been insufficient attention paid in the literature on how to foster such integration. Based on the two case studies, the article argues that the adoption of good governance mechanisms (such as stakeholder participation, access to knowledge, accountability and transparency) in disaster risk reduction policy may

create the policy environment that is conducive to the kind of structural reform needed to build long-term adaptive capacity to climate-driven impacts. It concludes that without a synergistic two-tiered approach that includes both disaster risk reduction and structural reform, disaster risk reduction, in the face of climate changes, will prove to be an expensive and ineffective palliative treatment of changing risks.

Uggla, Ylva. 2008. Strategies to create risk awareness and legitimacy: the Swedish climate campaign. ***Journal of Risk Research*** **11(5): 719-734.**

Social means of risk regulation often only arise in response to media attention and public opinion. In contrast, in the case of climate change, the Swedish government proactively launched a public information campaign to promote public awareness and knowledge of the risks associated with climate change, with the explicit objective of promoting acceptance of public means of reducing greenhouse gas emissions. This paper analyses the framing of climate change in the Swedish climate campaign and its communication strategy. What was the message of the campaign narrative? What did it imply concerning the causes, effects, management of, and responsibility for climate change? What means were used to communicate the risks of climate change? The paper analyses the campaign narrative, its references to various affective images of climate change, and the various storytelling techniques it used. It concludes that the Swedish climate campaign relied on a unidirectional view of risk communication and proffered a narrative containing inconsistencies and ambivalence. The analysis demonstrates that despite a thoroughly worked-out strategy, a well-defined message, and the intention to speak clearly, a complex problem such as climate change cannot easily be transformed into a single, coherent story.

Uniyal, Aniruddh. 2008. Prognosis and mitigation strategy for major landslide-prone areas: A case study of Varunavat Parvat landslide in Uttarkashi township of Uttarakhand (India). ***Disaster Prevention and Management*** **17(5): 622-44.**

The aim of this paper is to present a discussion on prognosis and mitigation of major landslide zones in an attempt to minimize the impact of such disasters in future. A case study on the sequence of sliding events of Varunavat Parvat, Uttarkashi (India), response of masses, administration, and causative factors of sliding events has been presented in detail for prognosis and mitigation of large slide zones. The prognosis and mitigation strategy discussed is based on the monitoring of mass wasting zones through field investigations and satellite image analysis (of pre- and post-landslide period images) and experiential learning and interaction with village elders in landslide hazard-prone Himalayan terrain. The paper finds that Himalayan habitations such as Uttarkashi (which is situated in an area of fragile rocks, complex tectonics, seismic activity, and cloudburst-prone unstable hill slopes with colluvium and old slide zones) should have minimum anthropogenic activity in the form of slope cutting for road or building construction. The paper reflects an understanding of causative factors and indications of landslides in Varunavat Parvat area in Uttarkashi township of Uttarakhand (India). The paper calls for amalgamation of experience-based local knowledge of villagers of landslide-prone areas and modern scientific and technical know-how and above all the coordinated efforts of community and authorities for prognosis and mitigation of large-scale landslides in the inhabited areas. It has been further emphasized that sensitization and awareness programs and strict implementation of land-use regulations are vital components of effective mitigation strategy.

Vracken, Jos, Jan van den Berg, and Michael Santos Soares. 2008. Human factors in system reliability: Lessons learnt from the Maeslant storm surge barrier in The Netherlands. ***International Journal of Critical Infrastructures*** **4(4): 418-429.**

The Maeslant storm surge barrier in the Netherlands is an interesting case in system reliability: first because of the great effort that has been put into making its operation reliable and into assessing its reliability; and second, because it has characteristics that make reliability assessment extremely hard. From its history a number of interesting conclusions can be drawn, of which the most important one is that there is no straightforward, definitive solution to reliability, but reliability is obtained and maintained in a continuous process of improvement. Other conclusions are that humans cannot be excluded from the operation or decision making in systems such as the Maeslant barrier, that all methods for improving system reliability are most effective when the people involved are sharply aware of each method's limitations and that a continuous, open process of consulting a variety of experts is crucial to obtain the best possible reliability.

von Lubitz, DaAg K.J.E., James E. Beakley, and Frederic Patricelli. 2008. "All hazards approach" to disaster

management: The role of information and knowledge management, Boyd's OODA Loop, and network-centricity. *Disasters* 32(4): 561-585.
The increasing complexity of disasters demands utilization of knowledge that exists outside domains traditionally drawn upon in disaster management. To be operationally useful, such knowledge must he extracted, combined with information generated by the disaster itself, and transformed into actionable knowledge. The process, though, is hampered by existing, business-oriented approaches to knowledge management, by technical issues related to access to relevant, multi-domain information/knowledge, and by executive decision-making processes based predominantly on historical knowledge. Consequently, as shown by many recent incidents, the management of large-scale disasters is often inefficient and exceedingly costly. This paper demonstrates that the integration of modified information and knowledge management into the concepts of network-centric operations and network-enabled capabilities, and the employment of Boyd's OODA (Observe, Orient, Decide, and Act) Loop-based decision-making in unpredictable and dynamically changing environments, may address some of these problems.

Wan, Thomas T. H., and Tazeen F. Siddiqui. 2008. Addressing disaster risk reduction and human development policy together: An introduction. *International Journal of Public Policy* 3(5/6): 281-291.
The importance of coordinated efforts between local, state, and federal disaster responses and their inherent effects on regional and global emergency preparation is highlighted. By addressing disaster risk reduction and human development policy together, a best practice approach is identified. A brief introduction on this special issue is presented in this paper.

Technological Hazards

Andrews, Wayne L., Monique Helfrich, and John R. Harrald. 2008. The use of multi-attribute methods to respond to a nuclear crisis. *Journal of Homeland Security and Emergency Management* 5(1).
Some researchers have historically seen a potential for applying multi-attribute risk analysis in nuclear emergency management to more effectively address potentially conflicting objectives, stakeholders with different perspectives, and many uncertainties. This approach was expected to ensure that all relevant attributes are considered in decision making; to enhance communication between the stakeholders, including the public; and to provide a method for explicitly including risk analysis in the process. The intent was to develop a decision support tool a priori that provides decision makers with a preplanned, systematic, and transparent approach, ensuring that decisions are made in an effective and timely manner. This research used an expert elicitation methodology for the identification and weighting of model attributes, and selects and executes the optimal one for this application. The research results suggest that: (1) there are multi-attribute, decision-making models available for this application, and the Analytical Hierarchy Process (AHP) methodology is the preferred one; (2) attributes to populate the model could be identified and structured in an AHP format; (3) subject matter experts can be identified and are available for the expert elicitation; and (4) the results can be easily understood and implementable a priori.

Garza, Maria Dolores, Albino Prada, Manuel Varela, Maria Xose, and Vazquez Rodriguez. 2009. Indirect assessment of economic damages from the Prestige oil spill: Consequences for liability and risk prevention. *Disasters* 33(1): 95-109.
The social losses arising from the Prestige oil spill exceed the compensation granted under the International Oil Pollution Compensation system, with losses estimated at 15 times more than the applicable limit of compensations. This is far above the level of costs for which those responsible for hydrocarbons spills are liable. The highest market losses correspond to sectors of extraction, elaboration and commercialization of seafood. However, damages to non-commercial natural resources could constitute an outstanding group of losses for which further primary data are needed: these losses would only be compensable under the current system by means of a refund for cleaning and restoration costs. Results show that, in Europe, the responsibility for oil spills in maritime transport is limited and unclear. The consequence of this is net social losses from recurrent oil spills and internationally accepted incentives for risky strategies in the marine transport of hydrocarbons.

Nordin, John S. 2008. Toxic gas dispersion models: Can they predict protective action distances in case of a chemical spill? *Journal of Emergency Management* 6(5): 23-35.
Emergency responders often use a gas dispersion model to estimate downwind airborne concentrations of a toxic chemical in case of a chemical spill accident. For protecting the public, a protective action distance from

the spill source is established based on the distance where the toxic concentration drops below some level of concern. This distance is used as a basis for evacuation of the public from the area or for instructions to shelter-in-place. However, in real-world accidents, the responders neither know the amount of chemicals released into the air nor the duration of the release, and moreover, the concentrations of chemicals at any location will vary over time. Depending on what input information is put into the model, different results will be obtained. The problem of what input parameters to use for gas dispersion modeling is illustrated for a hypothetical 90-ton chlorine railcar accident, where the railcar is breached. Different answers for a protective action distance are obtained depending on whether the tables in the Emergency Response Guidebook or any of the popular gas dispersion models are used. Very different answers are obtained from any model depending on whether whole of the chemical is released at once as a gas or aerosol or whether the liquefied chlorine evaporates slowly inside a ruptured 90-ton railcar tank, and also the weather conditions. To avoid misunderstandings, people who use models to establish a protective action distance must also communicate the circumstances in which the models are used, e.g., "worst possible what-if scenario," etc, or "nighttime stable conditions," or other situations.

Tornadoes

Collins, Matthew L., and Naim Kapucu. 2008. Early warning systems and disaster preparedness and response in local government. ***Disaster Prevention and Management*** **17(5): 587-600.**
This research seeks to better inform public policy makers and the disaster management community about the use of early warning systems. The central research question of this article is how local governments should provide early warning to the citizenry of impending tornado danger. The main objectives were achieved by reviewing the literature on early warning systems for tornadoes and by conducting a content analysis of news reports from the Orlando Sentinel newspaper, which identified the most cost-effective early warning system for tornadoes. The theoretical approach of the paper covered the responses, results, and recommendations themes from the disaster management early warning system literature. The study concludes with a disaster management policy recommendation for an early warning system for tornadoes for local government and a recommendation to utilize cost-effective NOAA weather radios to alert the citizenry of impending tornado danger. This recommendation is also generalizable to early warning systems for hurricanes, flash flooding, terrorist attacks, and other major natural and man-made disasters. A research limitation is that the paper focuses on central Florida. Future research could begin with the paper's findings and generalize these findings to other areas internationally.

De Silva, Dakshina G., Jamie B. Kruse, and Yongsheng Wang. 2008. Spatial dependencies in wind-related housing damage. ***Natural Hazards*** **47(3): 317-330.**
This article examines the spatial dependence among housing losses due to tornadoes using data from the May 1999 Oklahoma City tornado. In order to examine the existence of spatial dependence and its impacts on the damage analysis, the authors compare an estimation based on a traditional ordinary least square model with the general spatial model. The results show that housing damage in this disaster area is highly correlated. Monetary losses not only depend on the tornado that struck residences, but are related to the damage magnitudes of neighboring houses. Average losses as well as the loss ratio increase with the Fujita Scale damage rating. The authors conclude that the general spatial model provides unbiased estimates compared to the ordinary least square model. In order to construct appropriate home insurance policies for tornado disasters or to improve the damage resistance capabilities of houses, it is necessary for insurance underwriters and builders to consider spatial correlation of tornado damage.

Hall, Soren G., and Walker S. Ashley. 2008. Effects of urban sprawl on the vulnerability to a significant tornado impact in northeastern Illinois. ***Natural Hazards Review*** **9(4): 209-219.**
The U.S. population continues to spread into the fringes of urban development placing both populations and property in areas that were once largely unoccupied. Population tallies, housing unit totals, and housing values for 1990 and 2000 are examined to determine the extent to which this growth has affected the tornado hazard in northeastern Illinois. The growing town of Plainfield, Ill., located southwest of Chicago, is examined to determine how vulnerability to a tornado impact has changed in the town since an F5 tornado stuck the community in 1990. The population and housing data indicate an increase of 8,629 persons and 3,058 housing units would be affected if the tornado were to have occurred in 2000 rather than 1990. Estimations of housing value affected by the Plainfield tornado indicate a 50 percent increase in 2000 compared with 1990 values. In addition to studying the impacts on Plainfield, four other scenarios are

examined in suburban Chicago counties using the 1990 Plainfield tornado as a model for a potentially devastating strike. The large increase in total value of homes affected for each scenario highlights the overall increase in wealth throughout the study area, specifically along the urban fringe of development. The physical vulnerability throughout the study area has increased with the rise in population, but the most socially vulnerable areas appear to remain in the older urban centers.

Schmidlin, Thomas W., Barbara O. Hammer, Yuichi Ono, and Paul S. King. 2009. Tornado shelter-seeking behavior and tornado shelter options among mobile home residents in the United States. ***Natural Hazards*** **48(2): 191-201.**

Residents of 401 mobile homes in Georgia, Mississippi, Illinois, and Oklahoma were surveyed after they heard a tornado warning. Most residents (69 percent) did not seek shelter during the warning. Half of those who sought shelter went to the frame house of a friend, neighbor, or relative, and 25 percent of those sought shelter in a basement or underground shelter. Some of the places where residents sought shelter were of dubious quality, such as their own mobile home, another mobile home, or in an outbuilding. Twenty-one percent of mobile home residents believed that they had a basement or underground shelter available as shelter during a tornado warning, and about half of those said they would drive to the shelter. Residents said they would drive if the shelter was more than 200 meters away. Fifteen percent actually had a basement or underground shelter suitable as shelter within 200 m of their mobile home, but only 43 percent of the residents would use those shelters. The most common reason cited for not using the shelters was that they did not know the people who lived there. Likewise, a frame house or other sturdy building was within 200 m of 58 percent of the mobile homes, but only 35 percent of the residents stated they would use those houses for shelter. Thirty-one percent of mobile home residents had a ditch that was at least 0.5 m deep within 200 m of the mobile home. However, 44 percent of these ditches had utility lines overhead, 23 percent had water in them, and 20 percent had trees overhead. The limited tornado shelter options among mobile home residents in the United States needs to be incorporated into safety instructions so that residents without nearby shelter are allowed to drive to safer shelter.

Tsunamis

Guleria, Sushma, and J. K. Patterson Edward. 2008. Tsunami: Corroborating the need for vulnerability and capacity analysis. ***Journal of Emergency Management*** **6(6): 53-62.**

Conducting vulnerability and capacity assessment (VCA) becomes imperative as it gives an insight about the means people employ to cope with emergencies and is the firmest basis on which we can build appropriate and cost-effective actions for preparedness and mitigation aspects in disaster management. A VCA was conducted to delineate risk zones among the sample villages and group them in risk zones (high, moderate, and low) depending upon the persistent vulnerabilities due to natural hazards, impact caused by the tsunami in 2004, implementation of various disaster management aspects, and assessment of the capacities of the respective sample villages. The methodology was based on collection, collation, and analysis of baseline and historical data. A questionnaire was developed for assessing capacity and vulnerability of the selected villages of three districts, namely, Cuddalore, Nagapattinam, and Kanniyakumari along the Tamil Nadu coast. Researchers found that the most effective approach to reduce the long-term impact of natural hazards is to incorporate natural hazard assessment and mitigation activities into the process of integrated development planning and investment project formulation and implementation. The key to reduce vulnerabilities is through training and education, which are of critical importance by incorporating VCA into any development planning process and thereby upgrade the standard of living to ensure sustained well-being and prosperity and achieve sustainability.

Nunez- Cornu, Francisco J., Modesto Ortiz, and John J. Sanchez. 2008. The great 1787 Mexican tsunami. ***Natural Hazards*** **47(3): 569-576.**

Tsunamis are a significant hazard around the globe and awareness about their occurrence has increased. The Pacific coast in southern México is no exception, because there is firm evidence of the effects of past large tsunamis. This article, focused on the regions located along the Guerrero-Oaxaca coast, presents results from computer-aided modeling of the March 28, 1787 "San Sixto" earthquake and tsunami. From the model's results and based on historical documents and the topography of the area, the authors conclude that the wave heights would have been sufficient to cause inundations. The results are consistent with published and unpublished damage reports that attest to the hazards

associated with great earthquakes and tsunamis along the subduction zone in Mexico.

Phillips, Brenda, Dave Neal, Thomas Wikle, Aswin Subanthore, and Shireen Hyrapiet. 2008. Mass fatality management after the Indian Ocean tsunami. ***Disaster Prevention and Management*** **17(5): 681-697.**

This is the first original research study on mass fatality management in nearly 30 years. A qualitative research design captured local perspectives within a culturally-appropriate context to examine roles and responsibilities of government officials within the State of Tamil Nadu and District of Naggapattinam, India. Research data were gathered in the context of the Indian Ocean tsunami that claimed nearly 300,000 lives across approximately 13 nations. Local officials and residents faced unprecedented challenges during the hours immediately following the tsunami. These included removing debris that covered bodies, body identification, health and sanitation issues, and the necessity of creating mass graves. The findings identify prior experience with disasters, familiarity with the local area, the quality of pre-existing networks among officials, a strong desire to rescue those yet living and the presence of linkages between government and nongovernmental organizations as critical factors affecting an expedited management process. Practical implications include the value of general disaster training that can transcend specific circumstances, the pre-establishment of mutual aid agreements, strong lines of horizontal and vertical cooperation, and inter-organizational coordination and an understanding of local culture and customs. The paper contributes to scant social science understanding of mass fatality management processes and furthers a line of inquiry applicable to a wide variety of hazards such as pandemics, terrorism and natural events.

Robinson, Lyn, and Jim K. Jarvie. 2008. Post-disaster community tourism recovery: The tsunami and Arugam Bay, Sri Lanka. ***Disasters*** **32(4): 631-645.**

Tourism is highly vulnerable to external, non-controllable events. A natural disaster can impact the local tourism industry in numerous ways, and such events are particularly devastating for small communities whose local economy is heavily dependent on the sector. Loss of infra-structure plus negative media stories can have long-term ramifications for the affected destination. In spite of the economic importance of tourism, post-disaster recovery efforts in this sector are often overlooked by nongovernmental organizations (NGOs), which focus on more traditional livelihoods such as agriculture or fishing. This paper describes Mercy Corps' support of tourism recovery activities in Arugam Bay, a remote village on the east coast of Sri Lanka, following the 2004 tsunami. The local economic base is built largely on two sectors: community tourism and fishing. As many other actors were supporting recovery in the local fishing industry, Mercy Corps concentrated on revitalizing the tourism sector.

Sonak, Sangeeta, Prajwala Pangam, and Asha Giriyan. 2008. Green reconstruction of the tsunami-affected areas in India using the integrated coastal zone management concept. ***Journal of Environmental Management*** **89(1): 14-23.**

A tsunami, triggered by a massive undersea earthquake off Sumatra in Indonesia, devastated the lives, property and infrastructure of communities in the coastal states of India, Andaman and Nicobar Islands, Indonesia, Sri Lanka, Malaysia and Thailand. This event attracted the attention of environmental managers at all levels—local, national, regional, and global. It also shifted the focus from the impact of human activities on the environment to the impacts of natural hazards. Recovery/reconstruction of these areas is highly challenging. A clear understanding of the complex dynamics of the coast and the types of challenges faced by the several stakeholders of the coast is required. Issues such as sustainability, equity, and community participation assume importance. The concept of ICZM (integrated coastal zone management) has been effectively used in most parts of the world. This concept emphasizes the holistic assessment of the coast and a multidisciplinary analysis using participatory processes. It integrates anthropocentric and eco-centric approaches. This paper documents several issues involved in the recovery of tsunami-affected areas and recommends the application of the ICZM concept to the reconstruction efforts.

Srinivas, Hari, and Tuko Nakagawa. 2008. Environmental implications for disaster preparedness: Lessons learnt from the Indian Ocean tsunami. ***Journal of Environmental Management*** **89(1): 4-13.**

The impact of disasters, whether natural or man-made, has not only human dimensions, but also environmental ones. Environmental conditions may exacerbate the impact of a disaster, and vice versa. Disasters tend to have an impact on the environment. Deforestation, forest management practices, or agriculture systems can worsen the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting, and ground/surface water contamination. We have only now come to understand these cyclical causes and impacts, and realize that taking care of our natural resources and managing them wisely not only assures that future generations will be able to

live in sustainable ways, but also reduces the risks that natural and man-made hazards pose to people living today. Emphasizing and reinforcing the centrality of environmental concerns in disaster management has become a critical priority, requiring the sound management of natural resources as a tool to prevent disasters and lessen their impacts on people, their homes, and livelihoods. As the impacts of the Asian tsunami of December 2004 continue to be evaluated, and people in the region slowly attempt to build a semblance of normalcy, we have to look to the lessons learned from the tsunami disaster as an opportunity to prepare ourselves better for future disasters. This article focuses on findings and lessons learned on the environmental aspects of the tsunami, and its implications on disaster preparedness plans. It emphasizes the cyclical interrelations between environments and disasters, by studying the findings and assessments of the recent Indian Ocean earthquake and tsunami that struck on December 26, 2004. It specifically looks at four key affected countries—Maldives, Sri Lanka, Indonesia, and Thailand.

Stevens, Russell, Gordon Hall, and Jane Sexton. 2008. Tsunami planning and preparation in Western Australia: Application of scientific modeling and community engagement. ***Australian Journal of Emergency Management*** **23(4): 30-41.**
This article explains how a leading-edge tsunami impact assessments project combines science, technology and spatial data. Tsunami planning and preparation in Western Australia (WA) has been shaped by a collaborative project between the Fire and Emergency Services Authority (WA) and Geoscience Australia. The project has led to the development of tsunami impact assessments in communities identified as vulnerable to tsunami inundation. Tsunami preparation and emergency response plans have been initiated based on community engagement workshops to increase stakeholder awareness of the science and risk of tsunami. The project has integrated data and expertise across state and federal government bodies to build safer communities in WA. This tsunami project demonstrates the advantages of combining science, technology and spatial data to achieve a leading-edge risk assessment. Wang, Jin-Feng, and Lian-Fa Li. 2008. Improving tsunami warning systems with remote sensing and geographical information system input. Risk Analysis 28(6): 1653-1668. An optimal and integrative tsunami warning system is introduced that takes full advantage of remote sensing and geographical information systems (GIS) in monitoring, forecasting, detection, loss evaluation, and relief management for tsunamis. Using the primary impact zone in Banda Aceh, Indonesia as the pilot area, the authors conducted three simulations that showed that while the December 26, 2004 Indian Ocean tsunami claimed about 300,000 lives because there was no tsunami warning system at all, it is possible that only about 15,000 lives would have been lost if the area had used a tsunami warning system like that currently in use in the Pacific Ocean. The simulations further calculated that the death toll could have been about 3,000 deaths if there had been a disaster system further optimized with full use of remote sensing and GIS, although the number of badly damaged or destroyed houses (29,545) would have likely remained unchanged.

Warnings and Evacuations

Collins, Matthew L., and Naim Kapucu. 2008. Early warning systems and disaster preparedness and response in local government. ***Disaster Prevention and Management*** **17(5): 587-600.**
This research seeks to better inform public policy makers and the disaster management community about the use of early warning systems. The central research question of this article is how local governments should provide early warning to the citizenry of impending tornado danger. The main objectives were achieved by reviewing the literature on early warning systems for tornadoes and by conducting a content analysis of news reports from the Orlando Sentinel newspaper, which identified the most cost-effective early warning system for tornadoes. The theoretical approach of the paper covered the responses, results, and recommendations themes from the disaster management early warning system literature. The study concludes with a disaster management policy recommendation for an early warning system for tornadoes for local government and a recommendation to utilize cost-effective NOAA weather radios to alert the citizenry of impending tornado danger. This recommendation is also generalizable to early warning systems for hurricanes, flash flooding, terrorist attacks, and other major natural and man-made disasters. A research limitation is that the paper focuses on central Florida. Future research could begin with the paper's findings and generalize these findings to other areas internationally.

Wang, Jin-Feng, and Lian-Fa Li. 2008. Improving tsunami warning systems with remote sensing and geographical information system input. ***Risk Analysis*** **28(6): 1653-1668.**
An optimal and integrative tsunami warning system is introduced that takes full advantage of remote sens-

ing and geographical information systems (GIS) in monitoring, forecasting, detection, loss evaluation, and relief management for tsunamis. Using the primary impact zone in Banda Aceh, Indonesia as the pilot area, the authors conducted three simulations that showed that while the December 26, 2004 Indian Ocean tsunami claimed about 300,000 lives because there was no tsunami warning system at all, it is possible that only about 15,000 lives would have been lost if the area had used a tsunami warning system like that currently in use in the Pacific Ocean. The simulations further calculated that the death toll could have been about 3,000 deaths if there had been a disaster system further optimized with full use of remote sensing and GIS, although the number of badly damaged or destroyed houses (29,545) would have likely remained unchanged.

Wildfires

Bradstock, Ross A. 2008. Effects of large fires on biodiversity in southeastern Australia: Disaster or template for diversity? *International Journal of Wildland Fire* 17(6): 809-822.

Large fires coincident with drought occurred in southeastern Australia during 2001-2007. Perceptions of large, intense fires as being ecologically 'disastrous' are common. These are summarized by four hypotheses characterizing large fires as: (i) homogenous in extent and intensity; (ii) causing large-scale extinction due to perceived lack of survival and regeneration capacity among biota; (iii) degrading due to erosion and related edaphic effects; (iv) unnatural, as a consequence of contemporary land management. These hypotheses are examined using available evidence and shown to inadequately account for effects of large fires on biodiversity. Large fires do not burn homogeneously, though they may produce intensely burnt patches and areas. The bulk of biota are resilient through a variety of in situ persistence mechanisms that are reinforced by landscape factors. Severe erosive episodes following fire tend to be local and uncertain rather than global and inevitable. Redistribution of soil and nutrients may reinforce habitat variation in some cases. Signals of fire are highly variable over prehistoric and historic eras, and, in some cases, contemporary and pre-European signal levels are equivalent. The most important effects of large fires in these diverse ecological communities and landscapes stem from their recurrence rate. Adaptive management of fire regimes rather than fire events is required, based on an understanding of risks posed by particular regimes to biota.

Collins, Timothy W. 2008. What influences hazard mitigation? Household decision making about wildfire risks in Arizona's White Mountains. *The Professional Geographer* 60(4): 508-526.

Through a study of human response to wildfire hazards, this article addresses the question: What influences hazard mitigation? Results from a household-level multiple regression analysis using structured survey, hazard exposure, and secondary data reveal that social vulnerability, place dependency, and contextual influences are important determinants of mitigation of wildfire hazards. Lower income and renter households engage in less mitigation than higher income and homeowner households. These findings reflect underlying issues of social vulnerability. The role of place dependency as a catalyst for mitigation is illustrated by results showing that longer term, full-time, and resource-dependent residents implement more mitigation measures than shorter term, part-time, and resource-independent residents. In relation to contextual influences, results reveal that apartment complexes and gated residential settings impede mitigation and dwelling cash value motivates mitigation at the household level. Findings suggest that wildfire protection programs, which have traditionally focused on public education, must be expanded to increase levels of household hazard mitigation. Interventions should target gatekeepers from the real estate, government planning, and residential property management institutions that are partly responsible for structuring residents' lives. For example, the provision of public cost-sharing programs could help alleviate the financial burdens of mitigation for low- and fixed-income households, and in contexts where renter-landlord tenure arrangements prevail (e.g., apartment complexes), mitigation plans could be more effectively implemented through collaboration among owners, property managers, and residents.

Keane, Robert E., James K. Agee, Peter Fule, Jon E. Keeley, Carl Key, Stanley G. Kitchen, Richard Miller, and Lisa A. Schulte. 2008. Ecological effects of large fires on US landscapes: Benefit or catastrophe? *International Journal of Wildland Fire* 17(6): 696-712.

The perception is that today's large fires are an ecological catastrophe because they burn vast areas with high intensities and severities. However, little is known of the ecological impacts of large fires on both historical and contemporary landscapes. The present paper pres-

ents a review of the current knowledge of the effects of large fires in the United States by important ecosystems written by regional experts. The ecosystems are (1) ponderosa pine Douglas-fir, (2) sagebrush grasslands, (3) piñon juniper, (4) chaparral, (5) mixed-conifer, and (6) spruce fir. This review found that large fires were common on most historical western US landscapes and they will continue to be common today with exceptions. Sagebrush ecosystems are currently experiencing larger, more severe, and more frequent large fires compared to historical conditions due to exotic cheatgrass invasions. Historical large fires in south-west ponderosa pine forest created a mixed severity mosaic dominated by non-lethal surface fires while today's large fires are mostly high severity crown fires. While large fires play an important role in landscape ecology for most regions, their importance is much less in the dry piñon juniper forests and sage brush grasslands. Fire management must address the role of large fires in maintaining the health of many U.S. fire-dominated ecosystems.

Platt, R. V., T. T. Veblen, and R. L. Sheriff. 2008. Spatial model of forest management strategies and outcomes in the wildland-urban interface. ***Natural Hazards*** **Review 9(4): 199-208.**

In fire-prone areas of the western United States, mechanical thinning is often seen as a way to achieve two outcomes: Wildfire mitigation and restoration of historical forest structure. In this study, a spatial modeling approach is used to (1) find which forests are likely to be thinned under different criteria; (2) for these forests, evaluate whether wildfire mitigation and restoration of historical forest structure are potentially needed; and (3) determine whether these results change under alternative assumptions related to weather and fire history. Effectively, the spatial models in this study allow us to "test" thinning criteria to see if they lead to the selection of land where the stated management goals are needed in the study area of the montane zone of Boulder County, Colo. The spatial modeling results indicate that common management practices such as thinning dense stands on Forest Service land near communities may be inappropriate if the desired outcome is both wildfire mitigation and restoration of historical forest structure. Instead, modeling results suggest that lower elevation forests in the study area should receive priority. Though specific to the montane zone of Boulder County, the results of this study support wider criticisms of national fire policy.

Tolhurst, Kevin, Brett Shields, and Derek Chong. 2008. Phoenix: Development and application of a bushfire risk management tool. ***Australian Journal of Emergency Management*** **23(4): 47-53.**

The authors discuss the bushfire risk management model being developed by the Bushfire Cooperative Research Center (CRC). The need for an independent and comprehensive risk assessment system for all natural disasters in Australia was recognized by the Council of Australian Governments (COAG). The Australian/New Zealand Standard for Risk Management provides a framework for this consistent and comprehensive approach, but this system needs to be applied to each type of disaster taking into account the unique facets of each. The Bushfire Risk Management Model being developed by the Bushfire CRC is one application of this framework. This model goes further than previous models developed internationally because it directly relates the impact of various management strategies to changes in fire characteristics across the landscape, using PHOENIX, and then to the nature of the impact on various values and assets in the landscape. This model is intended for use by fire agencies, land managers, town and land planners, and policy makers.

Wind Storms, Winter Storms, Lightning, and other Severe Weather

Changnon, Stanley A. 2008. Losses from sleet storms in the United States. ***Natural Hazards*** **47(3): 465-470.**

Increasing losses of life and property and damages to the environment due to sleet and related winter storm conditions have increased the need for long-term sleet storm data to better assess the point and regional risks of sleet and their long-term variations. The areas of greatest losses and frequency of catastrophes caused by sleet during 1971-2007 are the Northeast and Central regions of the United States. These two regions experienced 72 percent of all the nation's sleet losses. Most of the western United States had no damaging sleet-related events or losses. When sleet losses occurred, they tended to be in two, three, or four adjacent states. Sleet catastrophes were most common in January with 15 of the 30 events. The earliest storm occurred in October and the latest in March. The temporal distributions of catastrophes and their losses during 1971-2007 were similar. Both showed a secondary peak in 1976-1979, a low in 1988-1991, and then high values during the 1996-2007 period. The temporal distributions of damaging storms and losses indicate an upward trend over time.

De Silva, Dakshina G., Jamie B. Kruse, and Yongsheng Wang. 2008. Spatial dependencies in wind-related housing damage. *Natural Hazards* 47(3): 317-330.
This article examines the spatial dependence among housing losses due to tornadoes using data from the May 1999 Oklahoma City tornado. In order to examine the existence of spatial dependence and its impacts on the damage analysis, the authors compare an estimation based on a traditional ordinary least square model with the general spatial model. The results show that housing damage in this disaster area is highly correlated. Monetary losses not only depend on the tornado that struck residences, but are related to the damage magnitudes of neighboring houses. Average losses as well as the loss ratio increase with the Fujita Scale damage rating. The authors conclude that the general spatial model provides unbiased estimates compared to the ordinary least square model. In order to construct appropriate home insurance policies for tornado disasters or to improve the damage resistance capabilities of houses, it is necessary for insurance underwriters and builders to consider spatial correlation of tornado damage.

Sharp, Alan. 2008. Assessing risk from meteorlogical phenomena using limited and biased databases. *Australian Journal of Emergency Management* 23(4): 9-13.
This article discusses a number of meteorological databases and briefly evaluates their usefulness in risk assessment. According to the author, the assessment of risk attributable to many phenomena relies on the analysis of past history. In the ideal situation, statistics derived from these data should reveal probabilities and trends in the occurrence of significant events. For more dangerous meteorological events like tropical cyclones and severe thunderstorms, the number of recorded events is somewhat limited. Changes in the nature of information gathering, and technology have biased these limited observations. We need to consider these factors when using the data to assess future risk.

Sullivan, Karl. 2008. Policy implications of future increases in extreme weather events due to climate change. *Australian Journal of Emergency Management* 23(4): 37-42.
The article outlines the shifts required to increase future communities' resilience to more extreme weather events. The first part focuses on the importance of community resilience and what makes a community resilient. The second part focuses on the contribution of insurance to resilience. The third part examines possible ways to improve community resilience in the areas of emergency and recovery planning and financial risk mitigation against extreme events due to climate change.

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