SESSION SUMMARIES
29TH ANNUAL HAZARDS RESEARCH AND APPLICATIONS WORKSHOP
JULY 11-14, 2004
BOULDER, COLORADO

ADD-ON SESSION SUMMARIES ARE NOT INCLUDED

HAZARDS AND DISASTERS IN A HOMELAND SECURITY ENVIRONMENT: CONSEQUENCES OF FEDERAL-LEVEL CHANGES

Moderator: Janet Benini, Homeland Security Council, The White House
Recorder: Ross Nagy, Vermont Emergency Management
Discussants: Frances Edwards, City of San Jose, California
Bob Shea, Department of Homeland Security
Bill Waugh, Georgia State University

Janet Benini introduced herself and the panel. Benini indicated that although homeland security has become an emotional issue for the emergency management community, the goal of this session was for participants to leave with the feeling that there are dimensions of homeland security they may not have considered before.

Benini opened the dialog by asking the discussants to comment on three things that indicated that the nation is better prepared than it was three years ago. Bob Shea noted that the spotlight was certainly on the "system" as never before, but this could be an opportunity. Although the initial reaction to the events surrounding September 11, 2001 were emotional, we are entering a phase that requires some serious input into the National Response Plan and the National Incident Management System. Frances Edwards followed by saying that from a local government point of view, public interest was high and new segments of the population were now involved. Edwards noted that there is more money available but there are challenges associated with that. The active participation of the public health community was also a positive as was the opportunity for more expansive interagency coordination. Bill Waugh noted that the effort to integrate multiple plans was long overdue.

Benini then focused on federal funding, noting that the window for funding seems to be wider than ever. Shea commented that the funding infusion happened so quickly that most state and local governments are unclear about its impact. He also acknowledged that although mitigation is a long-term investment, it is clear that the emphasis is currently in other areas. Edwards saw some challenges in this aspect of the topic. The amount and speed at which the money was provided aggravated the existing budget crunch. Edwards noted that the allocation process seemed based on the premise that "more toys are a good thing." She also was concerned that more attention was given to a successful model – Major Metro Task Force (MMTF) – when determining federal allocation strategies. MMTF was results-oriented, based on interagency cooperation to produce capability based on a jointly developed plan at the local level. The amount of money and the dispersal timeline puts some locals in the position of choosing between vendors, some of whom who are less than honorable, without adequate information. The technical information is not available upon which to make good decisions that actually improve capability. Shea observed that there was a minimum amount of time available to make good decisions at the state and local level. Further, the amount of money has changed the focus of some segments of the academic community and fosters a consultant culture. Benini noted that the amount of available money would help the nation respond to a new level and range of hazards. The intent has been to give the responsibility to the locals to determine how to spend the money.

Benini then asked the panel to comment on to what extent the knowledge from natural hazards preparedness and planning has been transferred to homeland security initiatives, and how could this be improved as well as to what extent has there been a transfer from homeland security to natural hazards. Shea indicated that this has been a source of some frustration for the academic community. For example, an evacuation associated with a major natural disaster could be related to a terrorism incident. He also feels that DHS does not share information with the academic community. The process is not transparent and in most cases DHS favors contractor research. Edwards reminded the group that mitigation was her "home" and that she has noted that the opportunity for integrating mitigation has been ignored. DHS is implying that prevention replaces mitigation. In natural hazards, not all occurrences are preventable but they can be mitigated. Edwards seconded the comment about the consultant culture and added that the government finds it easier to pay consultants than allow money to be spent on staff. Inability to staff a local HAZMAT response team is an example. It is possible to combine other hazard messages with terrorism messages. Shea thought he could bring his mitigation knowledge into play when he came from FEMA to DHS headquarters, but new players (law enforcement and intelligence) influence current thinking. However, he does believe that the NRP and NIMS are largely built on a natural hazards foundation.

Audience questions addressed funding flow and challenges, whether or not DHS has given consideration to a regional structure for homeland security and emergency management integration, and ideas for educating state and state and local agencies to better and more knowledgably choose information sources and contractors. Discussants acknowledged that challenges remain, but the goal is still to get the money out to locals.

It seems that the field has moved from the earthquake phase to the hurricane phase to the mitigation phase and now to the homeland security phase. Shea suggested that the process would be easier and more effective if there was more transparency across systems. Security given as a reason not to share may be an excuse, not a reason. Edwards noted that people are interested, so we have a chance to spread the word and reinforce the commonality for a true all-hazards approach to mitigation, planning, practice and training. Shea urged patience. Although we may have started with a blank sheet of paper, we are beginning to build on things that have been successful in the past and adjusting to the new environment.

THE NATIONAL RESPONSE PLAN-IMPLICATIONS FOR THE EMERGENCY MANAGEMENT COMMUNITY

Moderator: Richard Sylves, University of Delaware
Recorder: Pat Skinner, Louisiana State University
With thanks to Abigail Borron, Cooperative Extension/EDEN
Discussants: Keith Bea, Congressional Research Service
Armond Mascelli, American Red Cross
Claire Rubin, The George Washington University
Bob Shea, Department of Homeland Security
Bill Waugh, Georgia State University

Discussants focused their remarks on the necessity of the planning effort for the National Response Plan (NRP), whether it represents a fundamental change in federal policy for extreme events, and how it may change relationships among governmental levels and public sectors.

Bob Shea presented the framework and key concepts of the NRP, an umbrella for existing federal response plans that was developed in response to Homeland Security Presidential Directive 5 "Management of Domestic Incidents" (HSPD-5). The NRP combines crisis and consequence management and provides for a national incident command and a principle federal official, whose role will be nondirective.

Jan Benini, an audience member, defined five features that distinguish the NRP: some disasters only start as local; incidents not covered by the Stafford Act are included; emergency support functions are functional rather than organizational; support annexes are included for international, private sector, tribal, and work safety; and more attention is paid to catastrophic planning.

While acknowledging the necessity of the planning effort, Keith Bea recognized that the NRP reflects a fundamental change in policy: a movement toward protective federalism, where the federal government may respond without being invited into the state. One alternative approach would be asymmetric federalism, i.e., recognition that the states have different needs and capabilities. Just as terrorism presents asymmetric threat conditions throughout the nation, the NRP could recognize the different authorities and priorities of the states. A review of state statutes for homeland security is underway. The NRP probably will not result in funds being allocated differently.

Armond Mascelli said the Federal Response Plan (FRP) has become standard operating procedure for federal response and noted that it lacks a catastrophic emphasis. The current planning effort was necessary because the FRP is twelve years old and needs updating and does not cover all hazards, actively engage the private sector, or standardize incident command. The NRP represents a change in policy for extreme events and it is making the federal level proactive to a greater degree. It includes catastrophic planning, expands the range of disasters covered, and gives serious consideration to recovery. Research is needed in the recovery phase to explore who is in charge and what mechanisms support cooperation among government and private sectors.

Claire Rubin referenced the July ***Natural Hazards Observer***, and directed her comments to the NRP planning process, suggesting that the impacts of organizational changes need to be examined. While stakeholder involvement was attempted, both the National Incident

Management System (NIMS) and the NRP were developed in a top-down manner, leaving the academic hazards community largely absent from the process. In addition, legal issues related to the Stafford Act must be addressed. Rubin questioned whether the NRP would work, whether it will be transparent enough to enable the hazards research community to participate, whether it was truly needed, and what its unintended consequences will be.

Bill Waugh recognized that the NRP integrates previously scattered authorities. The July version (final draft) reflects stakeholder input received in response to the unpopular April version. Waugh notes that there are much better ways of organizing people than the incident command system framework. Nongovernmental agencies may lack the capacity to manage volunteers at the level needed to support the plan and more research is needed on local capacity building. Mitigation measures are listed in the sections on prevention, preparedness, response, and recovery, but mitigation should get greater emphasis or be a separate function. Waugh suggested that all-hazards planning is more locally saleable than terrorism planning. He questioned whether integration of emergency management and homeland security is possible without a clear all-hazards approach.

TRANSPORTATION AND EVACUATION ISSUES IN EMERGENCIES

Moderator: Joe Scanlon, Carleton University
Recorder: Fred Dilger, Black Mountain Research
Discussants: James Ballard, California State University, Northridge
Michael Foran, U.S. Department of Transportation/Federal Aviation Administration
Dave Genova, City of Denver, Colorado
Edd Hauser, University of North Carolina, Charlotte
Alan Nelson, Nuclear Energy Institute
Vince Pearce, U.S. Department of Transportation/Federal Highway Administration

Joe Scanlon opened the session by recognizing that transportation systems play a significant role in hazards research. Vince Pearce indicated that while there may be emergency plans for transportation systems, there may be multiple plans across several agencies and these plans may not be integrated. Additionally, the Transportation Security Administration (TSA) requires plans for certain systems. Pearce noted that the trend in evacuation management is toward real-time emergency management and that evacuation plans must be tested in exercises.

Dave Genova stated that Denver, Colorado, has had a great deal of experience with exercises and responses. On September 11, 2001, the Denver Regional Transportation District (RTD) was confronted with the demand for people to return to their homes and families following the terrorist attacks. RTD ran a reverse peak hour commute immediately on the heels of the peak hour travel. A key conclusion of Genova's presentation was that transit assets are both critical infrastructures as well as critical evacuation assets.

James Ballard addressed the problem of methodological research during these events. He stated that while probabilistic risk techniques are not perfect tools in understanding risks, they have utility. Ballard argued that triangulating methods in hazards research can provide more robust and reliable findings. Ballard cited his recent work on a project for the North Atlantic Treaty Organization (NATO), which involved assessing the potential consequences of terrorist attacks on shipments of spent nuclear fuel. He cited the use of expert panels and modeling as two methods used to make the study conclusions stronger, and concluded by describing the interconnections between the NATO project and the shipments of spent nuclear fuel to the proposed Yucca Mountain repository. Ballard also indicated that the past paradigm of risk management for transportation systems is changing in response to the occurrence of human-initiated events.

Edd Hauser described a case study from Charlotte, North Carolina, to update a city emergency response plan. The study began by examining area risks that included major banks and two nuclear power plants. The city created a local alert team to respond to emergencies. However, this team was operating in isolation from other important sources of information. The area began moving toward integrating its response coordination into a regional center as part of an all-hazards approach. This was organized as a high-level executive committee with working groups for smaller communities near the nuclear power plants. Based on the planning from the

committees, a new plan, which is currently in draft form, was prepared. The plan includes emergency evacuation priorities for the area and specifically examines the problem of controlling entry and exit from the city.

Alan Nelson stated that the nuclear industry is highly regulated and provides substantial financial support to enhance the emergency management capabilities of the areas surrounding nuclear power plants. He then described the very difficult regulatory tests that spent nuclear fuel casks must endure in order to be licensed. Nelson emphasized that the cask is a key component of system safety. He described how Probabilistic Risk Assessment (PRA) has been used to examine the vulnerability of the casks to various modes of attack. He then indicated that extensive local coordination was an extremely important lesson from previous shipping campaigns. Adopting an all-hazards approach to thinking about the problem is also important. Nelson cited the area around the Duane Arnold nuclear plant as an example of an area with numerous technological challenges that occur within a transportation system. Nelson then described the various memoranda of understanding that have been in place since 1982 to support emergency management planning within the nuclear industry.

Mike Foran began by indicating that most of his time is spent working on emergency response. He then described the Web-based Evacuation Traffic Information System (ETIS) as a resource for people to use in the event of an evacuation. A key feature of ETIS is that it was constructed using the behavioral lessons learned from the hurricane evacuation studies performed by the U.S. Army Corps of Engineers. Foran noted that evacuations are a regional problem. People evacuate across jurisdictional borders and it is therefore necessary to consider evacuations at a larger geographic scale. The ETIS system allows for real-time traffic flow information and can be used to indicate contra-flow routes (highways where all traffic lanes are used to move vehicles away from the hazard). Evacuation planning has been used in other kinds of events. For example, during the recent G-8 summit, evacuation planning was used to assess potential problems.

DISASTER MENTAL HEALTH RESEARCH AND PRACTICE

Moderator: Cheryl Childers, Washburn University
Recorder: Barbara Bryant, Independent Consultant
Panel: Charles Benight, University of Colorado at Colorado Springs
Richard Gist, Kansas City, Missouri Fire Department
Michael Hopmeier, Unconventional Concepts, Inc.
Dave Hutton, Centre for Emergency Preparedness and Response
Gil Reyes, University of South Dakota

The discussants focused on how to better assess the type and extent of therapeutic response that should be offered to address to disaster-induced mental health problems. No one specifically addressed the suitability of specific interventions. The discussants attributed the need for better assessment to the nature of the problems themselves, the uncertainty caused by gaps in research, and a lack of reliable findings about many fundamental aspects of disaster-induced mental instability, including how to define these conditions, their causes, and if treatment is in fact indicated.

Discussants pointed out that many fundamental questions are still being asked, such as whether the goal is to simply treat the discrete symptoms that appear to have been triggered by the disaster or rather to teach those affected to adapt in positive ways to affect long-term or permanent changes brought about by the impact of a given event. There was agreement that the goal may in fact be for patients to become more self-aware, flexible, resilient, and self-reliant rather than identifying specific treatment modalities in response to the effects of disaster.

Another key problem is that the current standard of practice for mental health response following a major disaster is based on limited empirical evidence. There is a critical need for interagency cooperation to generate *a priori* plans on how to conduct ethical research on mental health interventions following a major disaster. This type of basic research will eventually determine a best standard of practice that can help professionals elucidate critical variables that may moderate or mediate different types of interventions' effects and provide direction for future studies.

Disaster mental health researchers must begin to think past a medical model approach to understanding disaster response and move toward a comprehensive human adaptation view. Such an approach will allow researchers to capture a complete picture of human response to disasters and provide insight into resiliency as well as distress. In keeping with this argument, several panelists noted that professionals outside the U.S. have much to teach their American counterparts about how to deal with numerous disasters of a discrete but potentially serial nature (Israel) and on a community/region-wide basis (Canada), reflecting the fact that improved stress response is a general public health issue that affects everyone.

COMMUNITY-BASED HAZARDS MANAGEMENT IN GRAND BAYOU, LOUISIANA: POST-DISASTER RECOVERY AND COASTAL VULNERABILITY

Moderator: Claire Reiss, Public Entity Risk Institute
Recorder: Tom Dapice, Tulsa Partners, Inc.
Discussants: Celu Bering, University of New Orleans
Barrett Kennedy, Louisiana State University
Joselin Landry, University of New Orleans
Shirley Laska, University of New Orleans
Hassan Mashriqui, Louisiana State University
Kristina Peterson, Presbyterian Disaster Assistance
Danny Phillips, Grand Bayou Families United
Kristina Phillips, Grand Bayou Families United
John Pine, Louisiana State University
Jim Schwab, American Planning Association
Patricia Stukes, Texas Woman's University

This example of Participatory Action Research (PAR) concerns a vulnerable coastal community of 125 Native American and French Cajun Indian families in Grand Bayou, Louisiana, subject to natural hazards and corporate (land owner) and political (state and parish) neglect. PAR integrates three types of knowledge: representational, reflective, and relational and is managed with a lot of patience. Ideas are brought up, and local residents are always asked their ideas/opinions first, before any action is taken. A key goal of the PAR process is to engage community residents and scientists/practitioners in a collaborative research process that will work toward developing sustainability in the local community and as a model for other coastal areas.

The humanistic presentation of PAR in this session was evidence of the impact of hurricane vulnerability and coastal erosion on the Grand Bayou community. It conveyed that self-organizing people of faith manage to recover after disasters, but are further challenged by a need and decision to preserve culture inexorably linked to place and compromised livelihoods. The relationship of the two organizations, Grand Bayou Families United (GBFU) and Friends of Grand Bayou (FGB) was discussed; how it originated, how trust was formed, and how that trust guided academically trained scientists and social activists in their work with disaster victims who wish to remain in such a beautiful, fragile and threatened place.

Hurricanes Lily (2002) and Isabel (2003) were the weather events which prompted the formation of GBFU and FGB. FGB was formed around a shared vision and a common goal of heritage preservation. The economic basis for the Louisiana settlement has traditionally been the fishing and shrimping industries. However, due to seafood imports, there is no profit in these fishing industries after paying for fuel and supplies. Grand Bayou residents want to save their community and their heritage. The Friends of Grand Bayou (faith-based practitioners, local and state government, students and academics) work in concert and collaboration with the community to work toward sustainability and provide a model for small coastal communities facing the same risks.

Tropical Storm Bill (2003) caused mold and mildew in houses, left debris of wrecked and abandoned boats and homes on the shoreline, and created stress resulting from a decadent situation. It only took 35 minutes for the tropical storm to do its damage. Families are consolidating to cope. Students are taking oral histories of older residents. Through the PAR method, a demolition/rebuild program is being considered for new storm-resilient houses and may be attainable through the U.S. Army Corps of Engineers' Continuing Authorities Program (CAP). However, a Corps assessment is required. Because information, such as resilient building designs from Tulane University architecture students, storm surge/wind models from the LSU Hurricane Center, and LIDAR maps from LSU, has been shared between the residents, universities, and the Corps, the possibility of using the CAP program is a reasonable goal and a tool to help Grand Bayou residents save their community and heritage.

The six universities (including undergraduates, graduates, doctoral candidates, post-doctoratal researchers and faculty), faith-based organizations, state and federal agencies, and especially the residents are experiencing the social impact of human-made restoration efforts such as levee building and fresh water diversions from the Mississippi River. Restoration efforts often impact the livelihoods of locals as well as the social community. Oral histories are being recorded in the summer of 2004 to help document the events and heritage of the community. The collaboration between the Friends of Grand Bayou and the local community will use combine the time-tested knowledge of the locals with the scientific knowledge of the universities.

Questions from the audience included land loss/levees, the deterioration of oystering, land use changes, and the challenges of the two communities coming together.

ECONOMIC RESILIENCE IN THE FACE OF CATASTROPHE

Moderator: John Copenhaver, Marsh USA
Recorder: Rose Geier Grant, State Farm Insurance
Discussants: Michael Byrne, Microsoft Public Sector
Suzanne Frew, The Frew Group
Adam Rose, Pennsylvania State University
Dan Sutter, University of Oklahoma

This session sought to identify a typical demographic profile or characteristic to help determine if an area or region would be likely to financially survive a disaster or likely to incur lasting losses. The discussants also focused on how communities can improve resilience levels.

Michael Byrne spoke about the nation's capacity to be resilient. He stressed the importance of common terminology and believes that NFPA 1600 will be embraced as the national standard for preparedness. Byrne shared a recent example of successful public/private partnering – before Hurricane Isabel reached the Washington, DC, area, preparedness discussions had included major private sector employers. Therefore, as the Metro and local schools were closed, businesses were already moving ahead with their disaster plans. Byrne believes insufficient resources exist to prepare every community for disaster and that preparation must occur on a regional basis.

Suzanne Frew indicated that communities have to recognize "communities within communities" and address their uniqueness. She emphasized that a community must engage in economic impact analysis, partner, and plan. Characteristics of communities that survive both large and small events include an integrated proactive cross-sector and cross cultural approach to disaster reduction; strong and active public/private leadership; the engagement of planning and regulatory officials; and insurance and continuity planning. Communities need to be aware of their cultural profiles – the language, religion, ethnic makeup, migration patterns, levels of formality – as well as shifts in local economics, globalization, political unrest, and the emergence of informal leaders. All these particulars will affect recovery.

Adam Rose spoke of the preoccupation with property damage and noted that the ability of a community to handle "flow losses" or business interruptions is also a key to its economic resilience. He indicated that resilience can be seen as the capacity of a system to cushion itself against damage or recover from extreme shock. The most successful will be those that can practice "crisis ingenuity" which will allow them to adapt. Rose also discussed ways that a community could address resilience by way of introducing signals that could guide or ration the use of critical resources. Resiliency can be increased by sharing best practices, rewarding ingenuity, establishing a clearinghouse to match customers with suppliers and suppliers to customers and interregional pooling of lifeline services. It must be recognized that no business is an island – there is an interconnectedness that has to be addressed.

Dan Sutter talked about the impact on the economy of loss of life and property and the cost to the economy based on the speed of the recovery. Income is a factor affecting recovery; wealthier persons are more willing to prepare and plan – "safety is a luxury good." This breeds demand

from the public sector for community level changes. Sutter mentioned voluntary risk verses non-voluntary risk. Communities are more resilient if risk can be avoided. Citizens can locate outside a floodplain to avoid floods, but ice storms or tornadoes cannot be avoided. Also, is the hazard foreseeable? If the disaster is a surprise event (undiscovered fault line or dam collapse) the community will be less resilient. Reducing vulnerability necessitates focusing on efficiency in mitigation in a politically feasible way. Is there a way to create incentives for politicians so that they can say no to developers?

In the discussion period that followed, it was stated that the disaster community seems to have a poor understanding of the political decision making process. This may explain why funding is frequently available for recovery but not for pre-event mitigation, a potential area for research. A better understanding of why a business moves or rebuilds elsewhere is necessary to address resilience. Also, risk communication and planning has to occur on a community wide basis; the businesses, schools, local government, even homeowners associations, all need to be engaged. Effective communication must exist between/among all groups, and plans should be devised before a disaster.

THE PROJECT IMPACT SPIRIT: SUSTAINING LOCAL LOSS REDUCTION PARTNERSHIPS

Moderator: Jane Bullock, Bullock & Haddow
Recorder: Patricia Gavelda, Colorado Office of Emergency Management
Discussants: Arrietta Chakos, City of Berkeley, California
Barbara Miller, Jefferson County Office of Homeland Security, West Virginia
Ann Patton, Tulsa Partners, Inc.
Ines Pearce, City of Seattle Emergency Management
Jasmin Ruback, Ruback Associates

The discussants were asked to focus on the following questions:

1) Other than funding, can you identify the three components or elements that have made the largest contributions to the success and sustainability of your mitigation efforts?
2) Do you think your approach/program has encouraged or fostered a next generation of individuals interested in promoting mitigation concepts and activities?
3) What are your thoughts on promoting mitigation as a means of contributing to the war on terrorism?

Although officially departed, Project Impact (PI) lives on in various forms such as Citizen Corps and the Medical Reserve Corps. It is the people that made and continue to make PI work. Leadership, pride, sustainability, community support, documented mitigation successes, enthusiasm for action, local political support, partnerships, interagency technical support, as well as genuine community engagement were highlighted by discussants. Through PI, the ability to change one community at a time was established through a program that fostered trust in the local process of partnerships and education within the community (i.e., government/public officials, the general public, businesses, lending agencies, children, etc.). Another important contribution was keeping the perspective on the goals of the community and taking pride in the "small victories." Overall, PI generated partnerships that were of substantial benefit to many communities and these partnerships have survived political changes. Thus the PI spirit is still alive seven years after the program's demise.

PI promoted an interdisciplinary approach to hazard mitigation that was innovative, performance based, and utilized techniques that could be institutionalized for the next generation. PI spawned many other successful safety activities as well. Community-based programs promote networking and an increase in participatory decision making that will help maintain a collaboratively based pool of knowledge. Mitigation plans are living documents and more resources now exist for local leaders and communities. One example is local hazard mapping as an underlying educational tool. Because PI was a high profile program it was very susceptible to the changing political climate.

Billions of dollars are being spent on antiterrorism efforts. In contrast, PI was successfully built using seed money from the Federal Emergency Management Agency (FEMA). There is minimal federal support post September 11 for mitigation, yet there has been greater outreach to the first responder community. Terrorism is a breakdown of human relations resulting in violence. Real mitigation is the prevention of terrorism at its root cause level. Strengthening facilities against

earthquakes has collateral benefits, but a hardened built environment also signals societal barriers instead of bridges. In linking with the war on terrorism, PI taught us to take care of one another. What is needed in the local war on terrorism is to optimize the mitigation process and empower our communities through a national coalition of grassroots community emergency management activists, a coalition of willing emergency managers to change the landscape, and a common culture and vocabulary so we are all speaking the same language while promoting disaster resistant communities.

EMERGING ISSUES IN RISK COMMUNICATION

Moderator: Barbara Vogt Sorenson, Oak Ridge National Laboratory
Recorder: Marlys Mason, Oklahoma State University
Discussants: Suzanne Frew, The Frew Group
Joe Golden, NOAA/Forecast Systems Laboratory
Rocky Lopes, American Red Cross
Christopher Mayhorn, North Carolina State University
Kevin Simmons, Austin College

Barbara Vogt Sorenson opened the session by highlighting the importance of risk communication in providing both pre-event preparedness and post-event information. She posed several questions to the panelists related to the techniques, approaches, and technologies that are needed for designing effective risk communication; the presentation of complicated information in an understandable manner; and whether the different issues apply for communicating risk in an age of terrorism.

Suzanne Frew addressed the increasing challenge of communicating hazard information in a complex and global world. She suggested that terrorism has had significant psychological impacts upon individuals and risk messages related to terrorism need to be designed with the recognition of the emotions (such as fear or anger) that the message may elicit. Frew also suggested that major demographic and cultural shifts are a very large challenge to effective risk communication and advocated the need to extend beyond traditional messages and modes of delivery. She recommended and offered international examples of new and alternative ways to communicate hazard messages in order to extend across broadly diverse cultures and worldviews.

Joe Golden identified several technological advancements that have improved the forecasting of natural hazards and discussed a new technology being tested to improve the dissemination of warning information. A relatively new type of public warning, Reverse 911, is tailored to communicate a warning message to as many as 11,000 telephones in 30 seconds. Golden suggested that this technology enables focused targeting to citizens directly impacted by the hazard and allows an alert to be communicated at hours when individuals may have turned off traditional mass media. The Reverse 911 technique will be tested in two cities, New Orleans, Louisiana, and Houston, Texas, to communicate flash flood and tornado warnings.

Rocky Lopes discussed the National Disaster Education Coalition's release of *Talking about Disaster: A Guide for Standard Messages*. This free, updated guide was produced with collaboration from 20 disaster preparedness organizations in the U.S. and attempts to provide consistent, accurate information on various types of disasters to the public. It includes standardized safety messages on 20 natural, technological, and human-induced hazards as well as general disaster preparedness and safety topics. The guide can be downloaded at http://www.disastereducation.org/.

Christopher Mayhorn spoke about the importance of designing risk communications that can be understood by the growing segment of elderly citizens. Age-related declines in perception and

cognition raise issues that must be considered in the design and dissemination of warning messages. Vision and auditory difficulties suggest a need to avoid specific fonts, color shades, and frequencies, while cognitive declines require an emphasis on reducing distraction and not overtaxing working memory.

Kevin Simmons discussed the positive impact that Doppler radar has had on the effectiveness of tornado warnings. Based on data tracking of more than 15,000 tornadoes from 1986 through 1999, Doppler radar has improved the percentage of tornadoes that are actually given a warning and significantly increased the lead-time of warnings before the disaster. When compared with socioeconomic data from the U.S. census, it was noted that fatalities and injuries also went down significantly given the Doppler technology. Tornadoes occurring at night and the presence of mobile homes were the two critical factors associated with death and injuries despite Doppler radar warnings.

Audience questions centered on the impact diverse individual characteristics may have on communicating through the new technologies. Comments were also made about the communication source's appeal to the individual household and issues of appealing to broader community levels.

INNOVATIONS IN LAND USE PLANNING FOR NATURAL HAZARDS

Moderator: Paula Gori, U.S. Geological Survey
Recorder: Colin Polsky, Clark University
Discussants: Terry Baker, FEMA/Mitigation Division
Jane Preuss, GeoEngineers, Inc.
Paula Schulz, Natural Hazards Mitigation
James Schwab, American Planning Association

Terry Baker provided a federal perspective on the matter of land use planning for natural hazards in general and how the Disaster Mitigation Act of 2000 (DMA2000) fits into that process. Effective fall 2004, communities that wish to receive some types of FEMA disaster relief must first have an approved plan outlining efforts to mitigate the effects of disasters. For several years, FEMA has been collaborating with organizations such as the American Planning Association to promote the integration of mitigation, land use, and other community planning efforts through publications, courses, and post-graduate educational support.

Jim Schwab observed that in response to recent federal mandates, mitigation planning is generally weak on "safe growth" efforts and superior in states with state-level mandates compared to those without. The situation could be improved by greater consistency between state and local planning regulations. Related suggestions are available in the American Planning Association's ***Growing Smart*** report (http://www.planning.org/growingsmart/). Schwab also noted that mitigation planning could be improved by increased coordination among existing FEMA regulations such as DMA2000, Flood Mitigation Assistance, and the Community Rating System. Similar observations have been made in the FEMA-sponsored course, ***Planning for a Disaster-Resistant Community***.

Paula Schulz discussed the interactions between established safety planning procedures and new federal mandates. Her experience as the California state mitigation officer is that acquiring federal relief during disasters is impeded by the need to construct and submit a mitigation plan during the response effort. California has allowed communities to submit mitigation plans since 1927 and has required the plans since 1976. Yet there remains significant variation in community-level plans, a fact highlighted by the DMA2000 deadline this fall. For example, the city of Berkeley has reacted to the deadline by finalizing its comprehensive plan and making it more specific and aggressive. In contrast, Sonoma County, which began updating its plan in 2001, has not finalized it and the draft provisions are relatively limited in scope.

Jane Preuss suggested that hazard mitigation plans represent an opportunity to coordinate with other planning requirements; for example with vulnerability assessments of water utilities as required by the EPA for bioterrorism threats. Key issues for coordination are to identify compatibilities and conflicting requirements. It is clear that for terrorism prevention, some level of private decision making is in order. Yet the process of using planning to mitigate natural hazards requires a complete knowledge of local hazards and infrastructure, which are increasingly viewed as nonpublic information. This can play an important role in prioritization of maintenance and even design of public infrastructure and mitigation strategies, such as open space acquisition.

COORDINATING POST-DISASTER INVESTIGATIONS

Moderator: Tom Holzer, U.S. Geological Survey
Recorder: Lianne Bellisario, Public Safety and Emergency Preparedness Canada
Discussants: Bo Bienkiewicz, American Association for Wind Engineering
Rhonda Montgomery, State of Kansas
Susan Tubbesing, Earthquake Engineering Research Institute
Galip Ulsoy, National Science Foundation
Kevin Vranes, Senator Ron Wyden (OR)

This session explored the advantages and challenges inherent in coordinating multi-agency, interdisciplinary post-disaster investigations. Discussion evolved around four key questions:

1) Can and should post-disaster research investigations be coordinated after a disaster caused by your hazard?
2) Can elements of the *"*Plan to Coordinate NEHRP Post-Earthquake Investigations" be modified and applied to your hazard?
3) How do we promote the development and application of new technologies for post-disaster investigations?
4) What rights do research investigators have to data they personally collect under publicly funded programs? When does it go into the public domain?

The session began with an introduction to the National Earthquake Hazards Reduction Program (NEHRP) plan (U.S. Geological Survey Circular 1242), which coordinates and streamlines the post-earthquake investigation activities of four agencies (FEMA, NIST, NSF, and USGS). NEHRP reflects an all hazards approach toward scientific research and policy and includes a process for formal decisions to implement the plan, a technical information clearinghouse on-site, Web site management, and an investigation coordinator.

Many hazards could benefit from a similar type of research coordination program, since "disasters are laboratories" for not only policy and engineering, but also for public education. The primary rationale for integrating various post-disaster investigations is the opportunity to learn through multidisciplinary and interdisciplinary teams. One extra element that coordination could offer to other hazards would be the ability to encourage work in certain areas that have been identified as knowledge gaps.

A good plan works to advance knowledge and stimulate change in response to research findings. Ideally, it provides a virtual and physical home base for researchers and supports and coordinates research without controlling it. It promotes information sharing, transparency, and reporting, and facilitates exchanges between researchers and the local operations team, which opens communication lines and ensures that the response community has access to early intelligence data gathered by the reconnaissance team.

Not all communities are as well integrated as the earthquake research community, which includes engineering, geosciences and social sciences, so it may take time for other hazard communities to come together in a similar fashion. However, recent advances have been made in

coordinating wind hazard post-disaster research. A bill was passed supporting a National Wind Hazard Reduction Program, which supports a post-disaster research program coordinated through the National Oceanographic and Atmospheric Administration (NOAA). Since warnings are provided before some wind disasters, their model plan might include pre-disaster reconnaissance, allowing researchers to focus their investigations in advance. In contrast, post-disaster flood research coordination does not yet have an independent group identified which could lead floodplain investigations and collaborate with others to coordinate and harness the research findings.

An ongoing challenge is the development of data and training standards for post-disaster research. The technologies, standards, and protocols need to be assessed. Flexible data collection systems that can evolve and incorporate the latest technological advances are needed. Market demand may help to drive standards for data collection technologies, allowing the best tools to rise to the surface over time.

Having a plan provides a framework within which standards and protocols can be developed and adopted by the research community. However, we do not want to lose sight of the desire to collect data that will provide information to the local communities to answer questions that they need answered. Protocols they need to be driven first by the needs of researchers and professionals and then stored and archived in a way that the data can be accessed by others.

Since post-disaster investigations are multidisciplinary, resolving these issues and setting standards requires recommendations from all the disciplines participating. Protocols for data acquisition, standardization, quality control and storage remain as outstanding concerns for NEHRP. Each hazard may have its own key variables to monitor, and will need to identify commonalities which will allow the comparative and longitudinal analyses we want to see in the future.

Finally, the issues of privacy and security (disaster site access) are becoming increasingly important. Researchers need to collect detailed information but are often frustrated in their attempts because of laws protecting individual privacy. In addition they would like access to private sector data, such as design plans for damaged, privately owned structures. Given these sensitivities, data may need to be aggregated before it can be shared and this requires time and standards. One of the greatest future challenges to coordinated investigations will be to keep the data free and accessible while allowing protections of privacy and a reasonable amount of time for the researcher to use their data themselves. We must as a community decide in advance how we want to tackle these issues.

INTEGRATED COASTAL MANAGEMENT: SUSTAINABILITY COMMUNITY PARTICIPATION AND MITIGATION

Moderator: Margaret Davidson, NOAA Coastal Services Center
Recorder: Eugene Henry, Hillsborough County, Florida Hazard Mitigation
Discussants: Virginia Lee, University of Rhode Island, Coastal Resources Center
George Rogers, Texas A&M University
Sally Ziolkowski, FEMA/Region IX
James McGoodwin, University of Colorado, Boulder

Margaret Davidson opened the session describing various coastal events and introducing discussants, a varied group that included practitioners and scholars active in coastal mitigation and disaster research.

Discussions principally focused on understanding what is needed to develop sustainable coastal communities. Topics covered included societal organization, local public policy, and land use management. Within the discussion, "smart growth" was used to describe how local leaders may be able to use science to develop a constituency in support of regulations that have less adverse impacts on coastal areas. Many times, however, community participation in support of mitigating development in coastal communities comes following a flood or devastating storm and the subsequent loss of environmental systems – learning from lessons and greatest failures. Initial discussions in this area were illustrated from experience by Sally Ziolkowski.

George Rogers stated that a great deal of hazards mitigation is attempted through local-scale solutions. He provided data to illustrate how one community's attempts to construct infrastructure to protect development against floods had little or no impact, or was too little or too late. Rogers stated that communities may better mitigate development from hazards if community constituencies support greater restrictions within a respective risk area (such as a watershed) by limiting impervious cover and total development, and encouraging alternative development, such as minimizing pavement for roads. Data in support of such decisions exists for decision makers; however, decisions that guide local policies rarely use this type of interdisciplinary analyses. One point made was that sustainable policies have to be informed policies to be effective and must be tailored to the needs of the people they are designed to assist.

Virginia Lee presented similar information by describing processes in which coastal communities plan for a more sustainable future, including enhancing coastal watersheds by promoting good science, supporting local watershed organizations, and linking local, state, and national watershed management. To accomplish this, local issues and the specific mitigation techniques that work for a respective area must be understood.

James McGoodwin presented information on all-hazards mapping and analysis, which may be used for local communities to become involved in the multi-hazards planning process. Such analyses illustrate that land use management need not be an impediment to sustainable coastal planning, but an expression of how a community may negotiate and better identify aggregate impacts of development in high-risk areas. Providing local governments with information in the

GIS context can help build visual referencing, which assists in developing a constituency in support of building a coastal community that is more disaster resistant.

FROM THE ASHES OF THE 2003 CALIFORNIA WILDFIRES: PERSPECTIVES ON THE FUTURE

Moderator: James Russell, Institute for Business & Home Safety
Recorder: Sarah McCaffrey, USDA Forest Service
Discussants: Thomas Cova, University of Utah
David Evans, National Institute of Standards and Technology
Stephen Sellers, California Governor's Office of Emergency Services

This session presented perspectives and research related to the 2003 Southern California wildfires.

Tom Cova presented animated maps of the Old/Grand Prix fires and Cedar/Paradise fires showing the progression of the fires and of evacuation orders (the animation can be found at: http://www.geog.utah.edu/faculty/index.html?id=1). Cova looked at variables related to evacuation such as type of evacuation order and distance from fire when issued. Cova's research addresses the question of mandatory evacuation versus sheltering in place. No one who stayed in their house died. He expects use of shelter in place to increase, especially in areas with good defensible space and/or limited egress.

David Evans discussed local building regulations and how they often allow structures to be built as close together as two meters. This creates a type of fire that primarily spreads by house-to-house ignition; not really a wildland fire, but a "community fire." Scripps Ranch in the Cedar fire is a good example of this – all but one or two houses were completely burned, while surrounding eucalyptus trees were relatively untouched. NIST is developing a "neighborhood scale" fire spread model because the assumptions used to model wildland fire spread are insufficient for wildland/urban interface and community fire modeling. For instance, there are different time scales for trees and for houses burning – fires tend to go through a community fairly quickly but houses burn for much longer.

Steve Sellers noted that the 1991 Oakland Hills fire led to a lot of changes in areas such as emergency management, improved land use and building codes, increased citizen involvement, and political leadership. The impact of these changes played an important role in recent fires. For instance, changes in land use and building codes are one reason why fires often stopped when they hit newer subdivisions. Local issues are some of the biggest challenges now and in the future, especially in San Diego where fire management is very fragmented and citizens will not support more organized fire services. In Cedar Glen (part of the Old fire), an area with very old infrastructure, a lot of people want to rebuild in the same manner as what was there before. An after action report on emergency management highlighted the need for better integration across all phases of emergency management; improved access to information before, during, and after an event; and better post-fire hazard identification and inter-agency collaboration.

SOCIAL IMPACTS OF THE BAM EARTHQUAKE AND IMPLICATIONS FOR COMMUNITY RECOVERY

Moderator: Marjorie Green, Earthquake Engineering Research Institute
Recorder: Patricia Jones Kershaw, National Research Council
Discussants: Beverley Adams, ImageCat, Inc.
Hassan Movahedi, Kaiser Permanente
Farzad Naeim, John A. Martin & Associates
L. Thomas Tobin, Tobin and Associates

On December 26, 2003, a magnitude 6.6 earthquake hit Bam, Iran, devastating Bam and the communities surrounding the ancient city. The Earthquake Engineering Research Institute (EERI) sent two reconnaissance teams to Bam, the first just 16 days following the earthquake, and the second, a social science team, followed four months later.

Farzad Naeim provided historical, cultural, and physical background on the city of Bam. He noted that although Bam is a wealthy city, it is also an ancient city steeped in culture and tradition. Three types of housing existed in Bam prior to the earthquake: historic, traditional, and contemporary. The type of housing and its location impacted whether the structure was destroyed during the earthquake. Ancient adobe housing fared poorly while the more contemporary housing did slightly better. The ancient citadel, Arg-e-Bam, a major cultural center of the city, was completely destroyed. The earthquake severely damaged the ancient agricultural irrigation system and hampered the transport of water to the palm trees that help feed and shade the city. Drinking water pipes were damaged which created leaks. In the question period it was emphasized that although the housing structures in Bam are not earthquake resistant, it is not because the people do not have the means to do so, but rather because they live in the same houses of their forefathers.

Beverley Adams provided an overview of the urban damage distribution and severity caused by the Bam earthquake. As a leading member of the EERI remote sensing team, she explained how satellite imagery played a key role in determining the amount of damage to Bam's infrastructure. By comparing Quickbird satellite images acquired before and soon after the earthquake, the remote sensing team produced a city-wide damage map within a couple of days of the event. This map agrees closely with damage assessments performed by organizations such as USAID, showing that damage was concentrated in the east of the city. Progressing from a city-wide to a neighborhood scale, Adams explained how close-up visual inspection of the before and after satellite imagery enabled the detailed assessment of damage to individual buildings. The EERI team that went to Bam just days later deployed the remote sensing imagery and damage map through the VIEWS (Visualizing Impacts of Earthquakes with Satellites) reconnaissance system. VIEWS technology enabled the field team to track routes taken through the city, overlaid on the pre- and post-earthquake images that act like a base map. To streamline the data collection process, damage observations, comments, and photographs were also GPS-linked to the imagery.

Hassan Movahedi spoke about the search, rescue, and medical care after the earthquake. The response was three-tiered. Locals from Bam and surrounding areas were the first to respond by using their hands to clear the rubble. The lack of electricity coupled with early darkness and cold temperatures limited the amount of immediate rescues. Iranian national rescue workers came in

the day after the event and began airlifting victims out of the city. Many injured were transported to the closest hospitals in operation in the nearby city of Kerman. International groups began arriving within a few days to assist in search and rescue and medical assistance, and, by the end of the first week, field hospitals were up and running.

There were several major issues in providing medical care to the injured. Triage issues emerged as a result of injured people arriving at the hospital with relatives and friends, thus clogging the triage areas. Staffing fatigue was a major issue although some relief came from volunteers such as retired hospital staff and international aid workers. Other major issues included: identifying and prioritizing emergency cases and stabilizing non-emergency cases; finding space to place the large number of corpses; identifying victims; and finding resources. Food, medical supplies, and even major equipment such as x-ray machines, were in short supply. The medical staff was necessarily creative with the resources they had.

Tom Tobin presented some of the social and policy issues of the earthquake recovery process. Tobin served on the EERI social science team that arrived in Bam in May 2004, four months after the earthquake. The team found that among the ruins was the cultural heart of Bam and that the casualties included Bam's mayor and foremost singer, cultural icons. They also found that the city population increased post-earthquake owing to a convergence on Bam by volunteers, aid workers, and opportunists. Landowners feared that leaving their property would result in its loss, so many pitched tents in front of the remains of their homes. Recovery in Bam included the "Bam Housing Bazaar," an innovative way to begin the rebuilding process by opening an international competition on the rebuilding of homes. Citizens were able to choose the basic home they desired, the contractor, and the additional amenities.

Four months after the earthquake, serious medical conditions were being treated in hospitals in Kerman, and less serious injuries and mental health issues were dealt with in clinics housed in tents. Residents were screened by mental health professionals to ensure that those that needed psychological support received it.

There is no knowledge gap in Iran. Scientist and engineers move back in forth between Iran and the U.S. In fact, FEMA publication 356 is published in Farsi. Iranians have the information and the expertise, what they lack is collaboration and interaction with American social scientists and policy specialists. Iranians want to collaborate and make linkages to develop capabilities in the social sciences. They want to know how to integrate hazards into their land use planning.

In the discussion that ensued after the panel, several issues emerged. The only one not dealt with in the prior discussion is the issue of risk communication. There was no warning for this event. A few foreshocks occurred in the night, but most people were sleeping. Although people felt that they should have been warned, this event happened so quickly that people inside homes near the epicenter had no chance of survival. There was a measure of misunderstanding among the survivors as well, and the credibility of the government was challenged as a result.

HURRICANE ISABEL: IMPACTS AND RECOVERY

Moderator: John Gaynor, NOAA/U.S. Weather Research Program
Recorder: Joshua Comenetz, University of Florida
Discussants: Janet Clements, State of Virginia Department of Emergency Management
Robert Dobkin, Pepco
Martin Kalis, Centers for Disease Control and Prevention
Steven Leatherman, Florida International University
Claire Rubin, The George Washington University

Hurricane Isabel happened in September 2003. It was one of the best-forecast recent storms, both in its landfall and intensity. The hurricane was a Category 5 storm offshore and decreased to a Category 2 upon landfall. It was the first major natural disaster since the Federal Emergency Management Agency (FEMA) was placed under the Department of Homeland Security (DHS), so the response was more politicized than previous FEMA responses.

From a forecasting perspective, the forecast of Hurricane Isabel's track was excellent; however forecasting the hurricane's impact was not as accurate as anticipated. The major tree damage forecast was off, due in part to the weakness of the trees after years of drought, and resources such as water were slow to arrive to impacted areas. Discussants agreed that forecasts from the National Weather Service should be more specific on flooding and storm surge potential.

The Baltimore/Washington, D.C./Richmond corridor is the most heavily treed urban corridors in the U.S. Two-thirds of Pepco's customers were without power. This was an unprecedented number that resulted in the dispatch of over one thousand repair crews. Pepco customers were increasingly unhappy as tree damage slowed repairs and Pepco was unable to tell customers when to expect the return of electrical power.

The Department of Health and Human Services deployed Secretary Emergency Response Teams (SERTs) to provide disease vector control for West Nile virus and equine encephalitis and food and water safety. The response of the Centers for Disease Control and Prevention (CDC) was slower than that of the state of North Carolina. The response indicated the importance of an all-hazards response. For example, bioterrorism teams were dispatched to help with Hurricane Isabel.

Hurricanes move quickly and therefore are responsible for less coastal erosion than slower winter coastal storms. Residents therefore felt that the evacuation period lasted too long. The storm surge prediction was inaccurate in both height and geographical pattern due to the complexity of the coastline. NOAA needs a more accurate storm surge forecast model to accommodate these complexities. The Outer Banks experienced a great deal of coastal erosion due to its level of development.

The government in Washington, DC, responded well. However, the early closure of the Metro with inadequate warning to commuters was unfortunate. DC does not have the resources to respond to a larger event or to simultaneous events.

BENEFITS AND COSTS OF MITIGATION

Moderator: Doug Bausch, FEMA/DHS
Recorder: Stephen Bender, Organization of American States
Discussants: Linda Bourque, UCLA Center for Public Health and Disasters
Ronald Eguchi, ImageCat, Inc.
Elliott Mittler, Independent Policy Analyst
Adam Rose, Pennsylvania State University
L. Thomas Tobin, Tobin & Associates

The panelists developed their presentations in the context of a U.S. Congressional charge to undertake an independent study through the Multihazard Mitigation Council (MMC) to assess the possible future savings from the various types of mitigation investments mandated by the federal government through disaster mitigation legislation. The presentations addressed questions related to the reasons to measure the benefits and costs of mitigation, the best tools and systems for undertaking such measurements, and examples of benefit-cost analyses. The benefits to be measured focused on losses to be avoided, and benefits and costs to society and the federal government. The benefits and costs are being examined in two contexts of federal intervention: mitigation grants on a one-time basis to communities (Track A) and multiple grants to communities (Track B).

Tom Tobin focused on the study design and the contribution of the PMC and the precursor group and what information can be discussed prior to releasing the report to congress. Ron Eguchi followed with a description of the study methods and use of the FEMA HAZUS assessment model to measure the benefits of mitigation. This was followed by a description of the process of selecting communities and interviews, sampling techniques, and the purpose of the sample information used in Track B (Linda Bourque), and a discussion of how the consequences of FEMA grants will be treated in Track B (Eliot Mittler). And finally, a summary of the evaluation of progress on, and project orientation of, the mitigation-oriented activities and the type and accuracy of the study results of Track A was presented by Adam Rose.

The discussion between panel members and the audience focused on issues related to the Track A study the use of information about actual mitigation activity types, the disconnect between the research and local communities' experience, the timeframe for presentation (2004), its utility at the state level (representing a ten year database), and its integration with Track B results (can be undertaken). Overall discussion focused on whether or not the studies represented an adequate sample for each federal region (the selection of the communities was driven by multiple criteria); spin-off effects such as probabilistic analysis (for frequency of events and uncertainty will be included); the integration of programs in Track B analysis and the rating of community plans, particularly building codes (difficult but to be undertaken); substantiating attribution to FEMA's contribution (also difficult); and HAZUS' fragility function for casualties. Also mentioned was appreciation for the clarity of the methodology and future access to the database, considered by some to be the most important contribution of the studies.

SOCIAL VULNERABILITY AND DISASTERS: THE INTERSECTION OF RACE, CLASS, AND GENDER

Moderator: Brent Woodworth, IBM Crisis Response Team
Recorder: Maurita Williams, Capital Area Crisis Response Team
Discussants: Susan Cutter, University of South Carolina
Elaine Enarson, University of Colorado, Boulder
Daniel Haught, East Carolina University
Kathy Lynn, University of Oregon
Betty Morrow, Consulting Sociologist

This panel explored the complex intersections of race, class, gender, social vulnerability, and disasters. The discussants focused on previous research regarding the relationship between these factors, issues that need further exploration in the disaster field, and the impacts of shifting demographic trends on disaster preparedness and response.

Susan Cutter presented demographic issues that are changing the face of America regarding race and wealth. Over the past 40 years there has been a trend toward increasing diversity of ethnicity and race. There is a decline of economic status of those with high school diplomas. Future economic disparity will continue to make the poor poorer and the wealthy wealthier. For example, by 2020, females located in the southeast and borderland regions will be heads of households.

Elaine Enarson's researched focused on gender analysis, racial differences, disabilities, household structure, and culture. Enarson noted that the necessity of global exchange is resulting in international partnerships. She also shared the importance of having a national five-year action plan and why it is essential to develop an educational curriculum to address these issues.

Daniel Haught discussed his research exploring the disproportionate impact of the Pitt County, North Carolina, 2003 hurricane on low income and non-white populations. Haught's survey topics were evacuation, home damage, family damage, job loss, insurance status, income reduction, condemned property, and other disruptions. Haught interviewed 383 people, 20% of whom lived below the poverty level prior to the disaster. Most of the non-white individuals had to evacuate, experienced home damage, family deaths, and loss of employment. It was a classic case of vulnerability. A restructure plan was done with FEMA, but FEMA needs to look at this trend.

Kathy Lynn focused on social vulnerability in the Pacific Northwest. Lynn spoke about re-building rural community policy on the local level; tribal needs assessment, education, empowerment, and equity in communities. She discussed the importance of roof types, smoke alarms, and particulars for rental homes and the effectiveness of mitigation collaboration in some communities.

Betty Morrow discussed why it is important for practitioners (volunteer organizations), emergency managers, and educators to work together. Morrow included examples of barriers such as social class, language, literacy, foreign birth, and community analysis, and discussed how to promote employment and work with students.

Overall, there is a great need for research in the area of vulnerability to disasters and emergencies that is influenced by race, ethnicity, and culture. When there is communication, collaboration, cooperation and coordination, practitioners, emergency managers, and educators can review what went well and what could be done better.

DEVELOPMENTS IN REMOTE SENSING, GIS, AND HAZARDS MANAGEMENT

Moderator: Vince Ambrosia, California State University, Monterey Bay/NASA-Ames Research Center
Recorder: Peter Lyttle, U.S. Geological Survey
Discussants: Jeff Baranyi, ESRI
Barbara Buttenfield, University of Colorado, Boulder
Bruce Davis, National Aeronautics and Space Administration
Michael Hodgson, University of South Carolina

Barbara Buttenfield noted that in the field of research cartography and information flow and management there are several assumptions in the literature that may not be true. One is that if information technology is in place, disaster response will automatically be improved. This does not follow as there is often discord between design and practice. For example, in the area of fire response it is important to recognize that responders will not change their work practices to conform to new technology. Information technology needs to filter incoming datastreams to fire responders so the information received is what is really needed. In the future, it will become more important to embed uncertainty into the individual data streams being transmitted. By putting wireless sensors directly into the uniforms of fire teams, real-time field measurements could be shared among crews and commanders.

Bruce Davis spoke about the fact that many modern technologies such as LIDAR and thermal imaging could be more effectively used in disaster response, but few of these technologies are actually integrated into operating procedures. Conversely, some types of images are integrated into response operations, but are rarely used. One of the reasons for this mismatch is a lack of cross training between technology developers and response personnel. The suggestion was made that state emergency managers should work more closely with the many professors and students with GIS expertise. Interesting cooperative internships could benefit both parties.

Michael Hodgson added that GIS folks do not really understand the hazard cycle (response, recovery, analysis, monitoring and warning). Most GIS technology is applied to the analysis phase but could be better integrated throughout the cycle. It is important to determine, through surveys, what the hazard community really needs in regard to GIS and other remote sensing technologies. Development of new technologies needs to be user driven.

Jeff Baranyi discussed the importance of better integration of field responders with regional and headquarters management. To make this happen there needs to be real-time dispersal of information. The example of the Mountain Area Safety Taskforce was used. This example includes 14 government agencies who decided to work out a common database to share information before they actually needed to share the information. ESRI is beginning to serve geospatial models over the Internet, so one does not need to actually own the GIS software on personal computers.

HIGHER EDUCATION AND THE HAZARDS MANAGER OF THE 21ST CENTURY

Moderator: Deborah Thomas, University of Colorado, Denver
Recorder: Wendy Steinhacker, Natural Hazards Center
Discussants: Wayne Blanchard, FEMA/Emergency Management Institute
Rory Connell, Innovative Emergency Management, Inc.
Kay Goss, Electronic Data Systems
Ed Hecker, U.S. Army Corps of Engineers
David McEntire, University of North Texas
Joanne Nigg, University of Delaware

The discussants spoke about their perspectives on the relationship between higher education and emergency managers, with an emphasis on underlying educational philosophies, didactic methods, successful academic preparation, and how to maintain academic currency among professionals entering or working in the field.

Rory Connell noted that students need a strong knowledge base about the science of hazards. Communications skills and strategies, knowing how people interact with hazards (their "public behavior"), technical capability, understanding emerging tools and technologies, knowledge of political landscapes, best practices, and management skills form the basic and broad background of necessary skills for newly minted and experienced emergency mangers. In addition, exposure to new knowledge sources and interdisciplinary training that integrates academics with private/public sector practitioners are important for strong hazards managers. From an educational standpoint, hazards and emergency management skills are difficult to find in a single person. Curriculum development should focus on these skills and teach toward this goal while recognizing the realities of the profession. An all-hazards scope and project management skills are also important.

Kay Goss focused on the "new generation" and changes in the field during her professional life. Ten years ago there were very few women in emergency management, few people had access to the Internet, there were three degree programs in the U.S. and people were emergency managers almost by accident. Her current work for a large company is largely internal. Generally, there is now a greater emphasis on mitigation; an increase in the numbers of books, papers, and conferences; more disasters; a broader definition of hazards which causes natural hazards to get lost; new partnerships; a new scope of preparing for the unimaginable; and continuing to use old technologies to fight new wars. The profession needs a return to emergency management and an all-hazards approach. Core competencies for students should also include business continuity, homeland security, and an emphasis on sharing information rather than turf battles.

Ed Hecker referenced the fact that many of the discussants (and audience members) were contributors to the ***Designing Educational Opportunities for the Hazards Manager of the 21st Century*** report which contains the best cross-section of people working on this issue. The way ahead is to take the best of field-based knowledge and bring it closer to decision makers and planers as well as making academic work available to practitioners. It is also crucial to have practitioner knowledge inform academics. One way to address these issues is a greater focus on internships and a deliberate effort to take advantage of and seek out opportunities to a greater degree. The best learning experience occurs during response situations, and it is necessary to plan ahead and bridge this gap. Needed skills include organization theory, research, the ability to influence decision makers through planning, and superior people skills (one-on-one and cross-discipline).

David McEntire discussed the value of educating non-hazards people to understand hazards and risk and spoke about the need to focus also on epistemology and how we acquire knowledge as well as how we form research questions and the assumptions they are based upon. Our understanding of disaster is socially constructed. Globally, almost 90% of funds go toward response and recovery. Disasters cannot be prevented and our policies toward them seem to shift every ten years or so. The focus has shifted from disaster response to resistance to mitigation. A theoretical focus on sustainable development and mitigation with an emphasis on long-term quality of life and environment will move us farther from the traditional emphasis on response and recovery. We need to focus on the social aspects of risk and unpack the theoretical assumptions that influence what and how we teach. The concept of vulnerability is a nice umbrella to provide a conceptual overview to facilitate thinking seriously about our current educational (and practical) assumptions and epistemology.

Joanne Nigg shared the programs available at the University of Delaware and made the point that emergency management is a profession and not an occupation, and that emergency managers should be educated and not trained. Nigg presented a comparison of jobs as occupations and jobs as professions. Occupations utilize a specific skill set, are routinely applied with not a lot of improvising and extrinsic satisfaction. In contrast, professions are based on a broad and deep knowledge of a field. That knowledge is applied to problem solving, and there is greater flexibility and satisfaction is intrinsic to the work. At Delaware, the philosophy behind the undergraduate program is broad and designed to give students abilities. Nigg noted that important topics for students include a history of emergency management in the U.S. and how it functions, knowledge of the multidisciplinary hazards/disaster literature, organizational behavior, social organizations and their characteristics, and policy analysis. Problem-based learning that challenges students to "learn to learn" is crucial.

Wayne Blanchard noted that there is not much disagreement on the core competencies for emergency managers; the current challenge is to work with stakeholders and employers to tailor programs to meet demonstrated needs. There has been phenomenal growth in emergency management programs at colleges and universities. Blanchard noted that the profession of emergency management is much like the profession of planning was twenty years ago. He referred the audience to the Web site of the Higher Education Project at http://training.fema.gov/EMIWeb/edu/.

Discussion focused on where the jobs are (and will be) and the numbers and types of people working in emergency management as well as the opportunities that currently exist for continuing education and suggestions for improvement.

Deborah Thomas made copies of the higher education report available to the audience. The report can also be downloaded for free at http://www.colorado.edu/hazards/wp/wp109/wp109.html.

FOSTERING COMMUNICATION, COLLABORATION, AND THE CAPACITY FOR RISK REDUCTION THROUGH SERVICE LEARNING AND PARTNERSHIPS

Moderator: Robert Parker, University of Oregon
Recorder: Erika Lund, Seattle Emergency Management
Discussants: Gerard Hoetmer, Public Entity Risk Institute (PERI)
Andre LeDuc, University of Oregon
Kathleen Hollingsworth, Congressman Dana Rohrabacher
Jane Sibley, University of North Carolina, Chapel Hill/FEMA Community Planning Fellow
William Siembieda, California Polytechnic State University

This session addressed questions surrounding the types of partnerships that are successful in risk reduction, what is needed to sustain them over time, and how to engage students and new professionals in the effort.

Gerard Hoetmer drew on his experience with two very different organizations – the International City/County Management Association (ICMA) and the Public Entity Risk Institute (PERI) – to highlight common lessons of successful partnerships. His main points included know who you are as an organization, be clear about your mission and intent, and know your strengths. Also important is to focus on the needs of the constituents and look for partners with similar mandates and interests. Hoetmer advised to not be afraid of risk; adopt a "yes" attitude towards unique, creative partnerships, but do not be afraid to say "no" when necessary.

Jane Sibley discussed her experience engaging faith-based and community organizations in local hazard mitigation planning. She sees the planning process as a good opportunity to build consensus and develop partnerships to serve a community well. This process is not easy, though. Constraints include lack of resources and time, and a perception on the part of such organizations that their mission does not relate to mitigation. Sibley suggested that the most effective approach is for planners to involve community-based organizations strategically at key points throughout the process.

William Siembieda offered a case study on building partnerships with the urban poor in Caracas, Venezuela. Half the population of the city lives in unplanned barrios on the hillsides, which are vulnerable to earthquake, landslides, and floods. Civil protections exist under the law and community organizations are recognized within the local government framework, but the partnerships and mechanisms for reducing risk are undeveloped. Siembieda discussed efforts made to expand existing and new community groups, such as youth and health services, and involve them in risk reduction measures, such as implementing early alert systems and low-cost structural improvements to vulnerable homes.

Kathleen Hollingsworth talked about the use of partnerships to build a "culture of safety" within her congressional district. Her approach includes engaging hard-to-reach constituents on security topics that affect them, such as theft, Medicare, and school safety. This provides an opportunity to involve them more broadly, such as in neighborhood response teams. Drawing on the theme of strengths that was raised earlier, Hollingsworth highlighted some of the strengths the

congressional office brings to the risk reduction effort: perceived influence with members of Congress, service learning opportunities for interns, and the ability to connect people with existing resources.

Andre LeDuc introduced Partners for Disaster Resistance and Resilience, a unique approach to building disaster mitigation partnerships in Oregon. As opposed to direct action, this initiative strives to serve as an incubator for building capacity and fostering communication by providing a framework for collaboration, assembling resources, identifying best practices, and setting up peer-to-peer learning. Partners works with all types of organizations – public, private and nonprofit – but at the core is a service learning model. By serving as an intermediary that links students with communities with risk reduction needs, LeDuc noted how they are also helping to shape the next generation of professionals.

The moderator summarized the common themes in these presentations: building partnerships requires sustained energy as well as creativity; focusing on organizational strengths and clients needs is key; and the value of looking for short-term successes and building upon them.

PUBLIC HEALTH, BIOTERRORISM, AND NATIONAL SECURITY

Moderator: Joanne McGlown, University of Alabama, Birmingham
Recorder: Thomas D. Beamish, University of California Davis
Discussants: Gregory Button, University of Michigan
Woody Odom, Emergency Manager Coordinator, Jefferson County, Alabama
Monica Schoch-Spana, University of Pittsburgh, Medical Center for Biodiversity
Kim Shoaf, UCLA Center for Public Health and Disasters

The panelists addressed a range of issues that relate to managing public health, from federal to local levels, in an age where planning against bioterrorism is necessary. The discussion was framed by three overarching questions: how bioterrorism or a toxic hazards event preparedness differs from more traditional public health planning; the status of public health planning for national security threats; and barriers to more effective preparedness and response.

Monica Schoch-Spana stated that bioterrorism event planning and policy must pursue effective risk communication that fosters public engagement. The federal government has acknowledged that risk communication is critical. However, on the downside, "risk communication" has increasingly become a "catch all phrase" for federal planners. In addition, the federal government's risk communication strategy has taken form as a mass media approach. When the federal authorities invoke "risk communication" they mean something very different from what the public expects.

Gregory Button stated that the current bioterrorism agenda will not work. He felt the news on preparedness was primarily bad. Risk communication at the federal level is mostly a phrase that ignores the basic properties that would make such communication processes effective. For example, the federal authorities have ignored the importance of informal networks in risk communication during crises, preferring a mass media approach instead. Button noted that a bioterrorist attack would not be local, regional, or even national as current plans implicitly assume, but would be transnational in nature requiring sustained inter-organizational and community coordination. Finally, changing programs, priorities, and messages have undermined the credibility of the federal government with local and regional planners.

Woody Odom noted that the mission of public engagement is critical. Odom added that bioterrorism is very different from other hazards because the agent would be initially unknown and that such an attack is not preventable. Finally, he stated that money from the federal government targeting bioterrorism has improved Jefferson County's preparedness.

Kim Shoaf advocated an all hazards approach to bioterror event planning. Problems with current response regimes include risk communication barriers between law enforcement and public health practitioners that impede effective risk communication and coordination.

Joanne McGlown emphasized that the top down federal approach to planning and risk communication is creating great resistance at the local level. Secondly, program instability is also problematic.

NIST WORLD TRADE CENTER INVESTIGATION: PROGRESS AND FINDINGS

Moderator: Michael Lindell, Texas A&M University
Recorder: Tricia Wachtendorf, University of Delaware
Discussants: Jason Averill, National Institute of Standard and Technology
Dennis Mileti, Natural Hazards Center

Jason Averill and Dennis Mileti provided an overview of the development of the National Institute of Standard and Technology's (NIST) investigation of the World Trade Center Collapse and presented preliminary findings from Project 7 of the study. The purpose of this component of the investigation is to determine the fate and behavior of building occupants and responders in an effort to enhance both evacuation systems and the safety of building occupants in the future. Project 7's sample of interviews included only those occupants of tower 1 (WTC1) and tower 2 (WTC2) who had occupant badges. Interviewees were also asked about people they knew who had died in the buildings. Averill and Mileti noted that evacuation models produced in Project 7 were guided by evacuation theory and literature. They then explained their methodological approaches, provided a basic timeline of the disaster and evacuation, and compared findings of occupant characteristics and behavior in WTC 1 to those of WTC 2 as well as findings consistent in both towers.

Occupants in WTC1 tended to have worked in the building for a slightly longer period of time than those occupants of WTC2. Sixty-six percent of occupants reported partaking in at least one fire drill during the year before the attacks, of which 93% were shown the closest stairwell. Approximately half (51%) of all WTC occupants had never used a stairwell in either building prior to September 11, 2001. Fifteen percent (15%) of all occupants were also present during the 1993 evacuation.

In WTC1, 92% of survivors began their evacuation before WTC2 was hit, and 29% began to evacuate within the first minute of the WTC1 impact. Twenty-one percent (21%) had exited the building before WTC2 was hit. In WTC2, 91% of survivors began their evacuation before the building was hit, with 22% within the first minute of WTC1's impact. In WTC2 building, 41% of survivors exited before WTC2 was hit. Overall, approximately 87% of WTC occupants and 99% of those below the impact floors were able to successfully evacuate. Self evacuation, and use of elevators during the 16 minutes they were functioning in WTC2, saved approximately 3,000 lives.

Occupants in WTC1 reported a great deal of ambiguity in the stairways about WTC2 being hit, but over time, the use of technology brought that information into the stairways. In WTC2, occupants reported differing understanding of the damage to the building. Those in the stairways of WTC2 indicated lower risk perceptions during evacuation than those who were still on their floors when the second plane hit. WTC2 reported a huge spike in evacuation early on (particularly since the elevator was still functioning in this building prior to the second attack), while the evacuation of WTC1 was more steady.

During the last 20 minutes before each building collapsed, the evacuation rate had slowed to one-fifth of the rate immediately prior. This suggested that for those seeking to and able to access the

undamaged exit and stairways, egress capacity was adequate. To achieve similar evacuation rates at full building capacity, more egress space (number and width of exits and stairways) would have been necessary.

Egress models produced similar findings for both towers, with one notable difference. In WTC1, environmental cues and floor height led people to seek additional information and actions to prepare to evacuate, which delayed the initiation of evacuation. In WTC2, environmental cues and floor height led people to perceive risk, and seek additional information and actions to prepare to evacuate, which delayed the initiation of evacuation.

Most of the questions from the audience focused on the methodology of the study as well as on issues still under analysis. Other findings have been reported on NIST's Web page or will be posted over the coming months as additional analyses are completed, including demographic and backflow analyses, and the decision process as reported in oral histories. Reports will continue to be posted at http://wtc.nist.gov/.

LINKING RESEARCH AND PRACTITIONER COMMUNITIES THROUGH EFFECTIVE INFORMATION TRANSFER

Moderator: Helen Wood, National Oceanic and Atmospheric Administration
Recorder: Louise Comfort, University of Pittsburgh
Discussants: Jim Buika, Pacific Disaster Center
Paul Earle, U.S. Geological Survey
Robert O'Connor, National Science Foundation
Darrin Punchard, PBS& J
Richard Rotanz, Nassau County, New York Office of Emergency Management

Helen Wood introduced the panel, focusing the discussion on exploring innovative ways to foster constructive dialog between the communities of research and practice. Each discussant spoke briefly regarding his responsibilities for integrating research into practice and his concept of an appropriate "bridge" between the two communities.

Bob O'Connor focused his remarks on "why the National Science Foundation (NSF) cares about effective knowledge transfer and how it applies to basic research." The NSF supports basic research that produces fundamental theoretical knowledge and develops new research methods for understanding and exploring the world of practice. The NSF uses two primary criteria in making decisions regarding its funding allocations: intellectual merit and broader societal impacts. Knowledge transfer, per se, is not the NSF's job. Rather, the NSF asks how research will advance the theoretical understanding of scientific problems. Information on research initiatives for interdisciplinary research is available on the NSF Web site.

Paul Earle works at the National Earthquake Information Center (NEIC). The NEIC is the only U.S. federally mandated center that provides global earthquake information. The NEIC produces near real-time information on the location, magnitude, and depth of earthquakes worldwide. The USGS/NEIC is developing a system to rapidly assess an earthquake's impact on humans, Prompt Assessment of Global Earthquakes for Response (PAGER). The system makes an impact assessment based on calculations of ground shaking, population density, and the region's vulnerability. A major concern for USGS is how to design information transfer for maximum utility to their respective audiences. The USGS has explored various means of building collaboration with their users, including holding formal workshops; building a working prototype to demonstrate the three-phase process of developing earthquake information; and attending the Hazards Workshop.

Jim Buika works at the Pacific Disaster Research Center (PDC). PDC is based in Hawaii and works to support disaster managers in the Asia Pacific region. The PDC uses advanced Web-based technologies to distribute GIS maps, satellite imagery, and information about risk assessment, scenario development, and risk reduction planning. Buika finds lack of clear communication to be the major impediment to effective knowledge transfer between the research and practitioner communities. Buika ranked these two communities on a set of performance criteria: peer review, treatment of uncertainty, and technical proficiency. On Buika's scorecard, the scientific community rated high on peer review and treatment of uncertainty, but did so with a complex vocabulary and largely within technical groups and associations. In contrast, public decision makers prefer public dissemination of information to peer review, simple language to complex, and wide public dissemination channels to specialized professional associations. PDC is launching a six-year initiative with the Earthquakes and Megacities Initiative (http//www.earthquakesandmegacities.org) to develop capacity for risk reduction with practicing managers in major cities in Asia.

Darrin Punchard works for a planning and engineering consulting firm involved in risk reduction. Punchard had previously worked with the state of North Carolina, the State of Florida, and local city and county governments in Florida. In 1998, Florida experienced a wide range of disasters including hurricanes, floods, tornadoes, and record-setting wildfires. After his work in Florida, Punchard moved to North Carolina to work on Project Impact and several mitigation and recovery programs following Hurricane Floyd. Throughout his work, he saw stronger partnerships emerging between scientists and practitioners through collaborative projects and has since set up a research arm within PBS&J to maintain such partnerships. He believes that researchers need to remain immersed within their fields of study and work immediately alongside practitioners, particularly as it relates to the politics of long-term recovery following devastating hazard events.

Richard Rotanz has thirty-five years of experience as a practicing emergency manager, with professional training in fire services and nursing. Rotanz served in the New York City Office of Emergency Management during the World Trade Center (WTC) attacks. The WTC event caused a paradigm shift in emergency management, compelling managers to re-examine previous policies and practice and devise more effective strategies. The September 11 incident demonstrates the need for researchers to interact with practicing managers more frequently and more effectively. Rotanz considers research vital to improving performance in emergency management and believes that the researchers should be on site during incidents to understand the context of practice.

Wood opened a lively discussion that addressed two issues: the major impediments to knowledge transfer and effective tools to overcome these impediments. The basic points are summarized below:

- Differences in communication, culture, organizational structure, and incentives create the chasm that separates research from practice.
- The chain of ideas between scientists and practitioners is not well developed; new links that bridge current knowledge with practice need to be specified.
- Reward systems differ between the worlds of science and practice; the university system does not reward interdisciplinary research; participating in research entails a cost to practitioners in time and attention.
- Need to take practitioners into research environments, and researchers into environments of practice to increase mutual understanding.
- Professional education for practicing managers contributes to building bridge between theory and practice. Professional standards, such as certification for emergency managers represent an important step forward.
- Basic science education and statistics needs to be increased in public schools.
- Education, broadly defined, is the most effective means for bridging the chasm between research and practice.

LEGAL ASPECTS OF HAZARDS AND DISASTERS

Moderator: John Sorensen, Oak Ridge National Laboratory
Recorder: Clancy Philipsborn, AMEC Earth & Environmental, Inc.
Discussants: Ernest Abbott, FEMA Law Associates
Brent Marshall, University of Central Florida
William Nicholson, Widener University School of Law
Edward Thomas, Michael Baker, Jr., Inc.

Ernest Abbott focused on three points: criminal law, the political environment, and civil law. With regard to criminal law, he used contractor fraud as an example of how disasters can create opportunity for those that do not have others' best interest at heart and noted that FEMA's investigator general addresses criminal elements. Abbott pointed out that in the 1980s there was a dichotomy between planning for emergency preparedness and national security. Security had its roots in federal powers and legislative resource allocations, where non-security events (natural disasters) were addressed through the Disaster Relief Act and the Stafford Act amendments. In the 1990s the Civil Defense Act was repealed and the scope of the Stafford Act was expanded to assist state and local governments in protecting life and property. The liberal interpretation of pre-impact spending for pre-positioning equipment, supplies and staff, along with the space shuttle Columbia recovery effort were used as examples of the expanded scope of the Stafford Act. Abbott concluded by focusing on how the foreseeability of events, such as terrorist acts, can be subject to standards of negligence, depending upon how one interprets "due care," "foreseeable," and "reasonable proactive measures."

Brent Marshall presented the results of his research regarding the long-term impacts of litigation on victims of technological disaster. He documented that "litigation stress" is separate from that stress generated by the event itself, and that stress is higher for litigants. Marshall noted that litigation stress is the biggest predictor of intrusive stress, but stated that more data is needed because his work only looked at a single event. He suggested alternative dispute resolution as a means of reducing litigation stress, as it either avoids litigation altogether, or shortens the time of the process – pointing out that the stress is related to the fact that litigation can be lengthy, often with no closure or resolution in sight.

William Nicholson discussed the application of legal standards to the response to terrorism incidents. He noted that legal issues are frequently feared by first responders and this helps create an environment of consequence management versus crisis management. The Homeland Security Act of 2000 provided the framework for Nicholson's comments. The Act establishes standards for responders, including the National Incident Management System (NIMS); which defines concepts, principles, terminology, and standardized response. It mandates NIMS compliance as a prerequisite for funding beginning in FY05. At the same time, it calls for increased training and credentials requirements within seemingly unrealistic deadlines. Nicholson linked the federal standards on responders with hazardous materials incidents, citing HAZWOPPER, NFPA 1600 and Business Continuity Planning as national standards, and NFA 472 and 160 as Best Practices.

Edward Thomas described the legal aspects of No Adverse Impact (NAI), a fundamental element of commonsense floodplain management and a theme supported by the Association of State

Floodplain Managers (ASFPM). The NAI concept is not new; its "Cause No Harm" backbone is basic to land use and floodplain management, as seen in Executive Order 11988 on Floodplain Management. NAI requires that one "Think Before You Build." Thomas described the ASFPM "NAI Toolkit" and sought comments on a DRAFT paper co-authored with Jon Kusler. Thomas reviewed land use issues and noted that the property rights movement is comprised of people concerned with the over-regulation of land, who together create well-financed opposition to land use regulation. Thomas concluded that use of NAI will significantly reduce the probability of a loss in court due to the primary purpose of trying to prevent harm. It is always better to try to do something well than pretend to be completely unaware of the problem (risk). Thomas concluded by stating that land use and emergency management is local-based and the NFIP is the only national land use program in the country, and that a shift towards federal involvement in land use is worrisome to thoughtful local people.

Audience questions focused on minimum response standards, the precedent-setting impact of the Victims' Compensation Fund for survivors of September 11, 2001, and the foreseeability of an increase in liability.

In conclusion, the entire workshop (audience and panel) felt the session was very interesting and worthwhile, noting that almost every presentation, every year, has some legal issue at its heart, yet this was the first session focused on legal issues that anyone could recall. It was noted that a similar session should be held at future workshops.

SLOW ONSET DISASTERS: PLANNING CHALLENGES AND ISSUES OF PUBLIC ENGAGEMENT

Moderator: John Wiener, University of Colorado, Boulder
Recorder: Olga Wilhelmi, National Center for Atmospheric Research
Discussants: William Hooke, American Meteorological Society
Roger Pielke, Sr., Colorado State University
Koko Warner, Swiss Federal Institute for Snow and Avalanche Research
Klaus Walter, NOAA/Climate Diagnostic Center

John Wiener introduced the session by emphasizing the unique characteristics of slow onset hazards. The incremental nature of these disasters sets them apart from more immediate events and makes their social impacts difficult to discern. Discussants addressed questions related to the challenges of long-term mitigation strategies and risk management for slow onset hazards.

Koko Warner presented a framework for decisions about risk management and discussed its implications for planning and public engagement. Despite the knowledge that pre-disaster actions reduce impacts of a disaster, there is still a lack of mitigation action undertaken worldwide. The results of a survey conducted with policy makers in Latin America revealed that the public faces a number of challenges in pre-disaster mitigation, including difficulty in obtaining resources before an event, difficulty in achieving consensus about disaster prevention, and generally, lack of public visibility of preventive measures. Warner emphasized the importance of incentives for disaster mitigation-oriented strategies as response-oriented disaster management is becoming increasingly costly.

William Hooke addressed a number of questions regarding national policy and the role of federal agencies in slow onset hazard management. Slow onset disasters, such as global climate change, present a challenge for policy makers due to the difficulty reaching national and global consensus about mitigation strategies. Much focus among policy makers has been on extreme events. Focusing on extremes brings the attention of policy makers to hazards management; however, this approach lacks overall strategic thinking about global change. Hooke emphasized that in order to make slow onset disasters more visible for policy makers there should be relevance, accountability for impacts, and an overall shift in cultural values.

Roger Pielke, Sr. and Klaus Walter discussed the challenges associated with slow onset hazards on a different scale, sharing their experience with a recent drought event in Colorado. Pielke presented an overview of drought climatology and emphasized that this drought was not only a climatological event but rather a combination of climatology and an increased demand for water in Colorado due to a growing population. Walter elaborated on the fact that slow onset disasters, such as drought, heat waves, and forest fires associated with drought, have drastic impacts. Walter also discussed benefits of climate predictions and talked about his experience with the Colorado drought task force. The discussion included drought management and better ways to communicate scientific results to the public and decision makers.

The audience emphasized the complexity of slow onset hazards in general and water management in particular. There were discussions about incentives for mitigation-oriented

actions and the importance of accountability for impacts. The moderator also noted that mitigation and preparedness should be in the form of institutional adjustment.

ANALYZING EFFECTIVENESS OF GROWTH MANAGEMENT IN MITIGATING HURRICANE FLOODING EXPOSURE AND VULNERABILITY

Moderator: Frank Koutnik, Florida Division of Emergency Management
Recorder: Tashya Allen, PSGS at the NOAA Coastal Services Center
Discussants: Robert Deyle, Florida State University
Timothy Chapin, Florida State University, Florida Planning and Development Laboratory
E. Jay Baker, Florida State University, Florida Planning and Development Laboratory

This session focused on a current research project known as the Coastal Land Analysis and Management Project developed by Florida State University in partnership with the Florida Planning and Development Laboratory, Florida Sea Grant, Florida Department of Community Affairs, and the Florida State DeVoe Moore Center. The project focuses on determining the extent to which local growth management initiatives have affected exposure and vulnerability to flooding and hurricane hazards in Florida. The team is working with 35 counties and 100 municipalities that have comprehensive plans for coastal communities.

The project will accomplish the following:

- Analyze land use change at the parcel level from 1995-2003
- Compare land use changes within and outside the hurricane hazard zone
- Compare changes in population exposure within the hurricane hazard zone for 1995-2003
- Determine impacts of population changes on shelter demand and evacuation clearance times
- Analyze causal factors for observed land use changes
- Assess changes in vulnerability of private property to hurricane flooding for 1995-2003
- Analyze causal factors for vulnerability changes
- Convene experts to review project findings and develop policy recommendations

Discussion focused on who would be included in the expert panel, how many graduate students were involved in the project, and shelter demand and clearance times. Comments included land use planning as a road block to mitigation, linking geography and meteorology departments, the study area selection process, and tax policy and incentives for growth as a causal factor for development, and finally, the inclusion of Miami-Dade County into the sample population. The project began in 2003 and initial findings will be available soon.

PERCEPTIONS, OPINIONS, AND KNOWLEDGE OF MEDICAL PROFESSIONALS REGARDING THE THREAT OF BIOTERRORISM

Moderator: Abigail Borron, Extension Disaster Education Network, Purdue University
Recorder: Joshua Alexander, UCLA, Center for Public Health and Disasters
Discussant: Denise Blanchard-Boehm, Texas State University, San Marcos

The Reagan Administration push for new federalism shifted the responsibility of various government functions from the federal to the local level. Emergency management was no exception. Eventually it became individuals' responsibility to prepare themselves for emergencies. However, only one-fourth of the population actually prepares for emergencies. Currently, the public is looking again to government for information and assistance before and during emergencies.

Given this, it is important to assess attitudes and perceptions of emergency preparedness. The study presented in this session will be conducted in three phases. The initial phase, already completed, looked at the perceptions of healthcare professionals, especially triage nurses. Phase two will survey state and local officials, and phase three will survey the general public. Phase one was conducted at seven regional workshops in Texas cities drawing acute care nurses from both metropolitan and rural areas.

Respondents were asked to describe what sources they use to learn about terrorist threats and how frequently they use those sources. The results suggest that most of the healthcare practitioners surveyed get information from print media and meetings at work. Print media was loosely defined and may include peer-reviewed journals or newspapers. Participants were also asked what agents they felt would be used and where an attack might occur. Respondents felt that anthrax, botulism toxin, and smallpox would be used in an attack and that the attack was highly likely to be in a large metropolitan area at a government building or healthcare facility. The study also suggests that healthcare practitioners felt that in the event of a major emergency resulting from a terrorist attack, FEMA and the state would manage the emergency and take care of the situation.

Audience members were encouraged to read Janet Bradford's article in the *Journal of Contingencies and Crisis Management* called, "Biological Hazards and Emergency Management" from March 1994.

MULTIDISCIPLINARY, MULTINATIONAL RESEARCH PROJECTS: CHALLENGES AND BENEFITS

Moderator: William Wallace, Rensselaer Polytech Institute
Recorder: Valery Bode, Organization of American States
Discussant: Neil Britton, Earthquake Disaster Mitigation Research Center

Neil Britton presented a multidisciplinary, multinational research project he directed and coordinated, which consisted of a project team researching disaster risk management in Latin America focusing on El Niño events (ENSO), and a project team researching advancements in seismic mitigation for the Asia-Pacific region (EqTAP).

Both projects were initiated on a five year basis and had some commonalities in their goals but each project was carried out differently by the two teams. The overarching similarity between the two projects is the strong interdisciplinary component and the focus on risk management. Each project utilizes researchers and practitioners from different fields and backgrounds. On the ENSO project, research teams were primarily made up of social scientists, all of them Spanish speaking and able and willing to define from the start what they wanted to explore through their project. In contrast, EqTAP project teams contained mainly engineers and few social scientists, and the general working environment was characterized more by self-interest orientation and technicalities.

During the project implementation phases, management strategies differed greatly between the two teams as well. While the Latin American researchers found strategies to work together and communicate, the Asia-Pacific project was characterized by a strict hierarchy and an extremely technical approach. The influence of Japanese technocrats from the academic world was identified as one major source for this. On the ENSO project, the common language of Spanish promoted communication and cooperation and led to the emergence of a common research goal without strict structures. Researchers from all kinds of academic backgrounds as well as governmental agencies participated actively.

Another major difference between the two projects was that the ENSO team had thought through their project right from the start whereas the EqTAP team adopted a more segregated approach and found common goals and objectives only during the second phase of the project cycle. Furthermore, the Latin American researchers were highly focused on interdisciplinary activities and the inclusion of a variety of stakeholders in the project. The interdisciplinary nature of the Asia-Pacific project became a challenge as engineers indicated some reluctance to share information and include researchers from other disciplines. Single-discipline dominance was the major characteristic of the EqTAP project.

Britton presented some lessons and conclusions from his experience with these multidisciplinary, multinational projects. While both projects were successful, their initial phases and research approaches differed greatly. The Latin American team reached consensus at the beginning about what they wanted to do and how to work together. The EqTAP team stayed focused on the technical engineering parts of the project and did not consider the broader picture. Consequently, they became lost in the separate elements of their research findings and had difficulties pulling the work of different disciplines together to interpret the broader results. Cooperation between

researchers from all disciplines involved was to be an essential part for the success of both projects; a lesson the Latin American team understood and adopted in their implementation strategy to a much greater degree than the Asia-Pacific project.

Britton noted the importance of bringing a third-party to multinational projects to coordinate and supervise the work. Such an outside agent can more easily monitor, guide, and link the agencies involved to facilitate the development of a common strategy within the different disciplines working together. In the end, Britton wrote a protocol based on these two projects to identify a series of approaches for researchers to interact with stakeholders.

Also, Britton stated that it is essential to consider the wider social context into which multi-national projects are put. External environment issues that might impact a project must be identified and recognized during interpretation of research results. Nationalities understand approaches to research in distinctive ways based on their cultural understanding of what constitutes research and where projects are carried out and by whom. This explained the reluctance of Japanese engineers to cooperate and share information with researchers from other disciplines since for them research is not based on equality and findings are shared only to a limited extent. An outside agent would be helpful to explain just what the project mission is and why it would be substantial to cooperate and share information. Britton therefore emphasized the key role of an outside agent for coordination in multidimensional projects of this kind.

These multidisciplinary, multinational projects demonstrate that carrying out research is not based on a “universal standard” but that rather that cultural contexts define and influence how research is understood, carried out, and who may or may not be involved. Without recognizing these facts, multinational, multidisciplinary projects will either be unsuccessful or prone to distorted interpretation.

FEMA'S MULTI-HAZARD FLOOD MAP MODERNIZATION PROGRAM (MHIP)

Moderator: Kenneth Zwickl, U.S. Army Corps of Engineers
Recorder: Marcia Richardson, University of Colorado, Boulder
Discussants: Mike Howard, FEMA/DHS
James Murphy, Michael Baker Jr., Inc.

Kenneth Zwickl introduced the Multi-hazard Flood Map Modernization Program (MHIP), a collaborative effort funded through the Federal Emergency Management Agency (FEMA). This session focused on FEMA's plan for allowing local, regional, and national participants to directly access and update information for multi-hazard flood maps.

The discussants presented an overview, tools, communication strategy, and summary of this project. MHIP's vision includes networking the nation using Internet technology to connect all levels of government; leveraging the use of federal, state, and local resources; reducing processing time and costs for map updates; and increasing partner, stakeholder, and user understanding of flood hazards and risks.

Currently, there are 20,000 mapped communities in the U.S. Approximately 70% of these maps are greater than ten years old and are outdated and insufficient. Under this project, the planned capacity is to reach these communities with updated, digital data online to provide faster and easier accessibility to map information using new products.

MHIP objectives are to improve predictability through enabling technology (establishment of premier data collection and delivery system), effective program management (efficient use of national resources), fast delivery of results, and empowering communities to save lives, protect property, and reduce damage.

The overarching goal is to improve safety from flooding by increasing the percentage of the population with access to GIS data, quality maps, and leveraging fundraising and partnership efforts.

Customer needs (i.e., those of insurance companies and real estate professionals, coastal communities, flood zone determination companies, floodplain managers/planners, state/local disaster and emergence response officials) can be better met with improved data updates; decreased public monies spent on floods, improved floodplain management, and increased trust.

MHIP is a five-year process that requires open communication about priorities to improve responsiveness; variability in funding, scope, and quality; and addressing program and stakeholder needs. Cost, performance and schedule have been mapped out. Digital map layers, tools for analysis and modeling, cost savings, benefits of a premier geospatial system, a repository for a national GIS data layer, the scope of users, and project tracking are addressed as well.

RESEARCH IN HAZARDS BY NEW PROFESSIONALS - I

Moderator: Thomas Birkland, State University of New York, Albany
Recorder: Robin Dillon-Merrill, Georgetown University
Discussants: Sudha Arlikatti, Texas A&M University
Michael Deegan, State University of New York, Albany
Bill Donner, University of Delaware
Jing-Chein Lu, Texas A&M University

Sudha Arlikatti spoke about a project on adoption of seismic hazard adjustments. Arlikatti gathered data from three cities in southern California and three in Washington. The variables were knowledge, trustworthiness, and responses. Arlikatti's results found that Washington and California were equivalent.

Michael Deegan spoke about a system dynamics approach to hazards mitigation with a focus on hurricanes and floods. This is a conceptual model to analyze different policy alternatives.

Bill Donner presented his work on how emergency managers can take advantage of new technologies such as new radar systems. Donner found that the individual background of emergency managers shapes how they use new technology. Additional factors that play a role in the use of new technologies include the political structure of the community, the level of support of megacities for surrounding towns, and how resources are allocated.

Jing-Chein Lu presented work on hurricane evacuations in the U.S. and Taiwan. In the U.S., the risks focus on storm surge; in Taiwan, the risks include mud and landslides. Lu noted that Taiwan needs to focus more research attention on risk communication.

All of the research presented in this session shared the following underlying themes:

- Influence of the media, especially with pre-warnings and warnings;
- The importance of technology;
- The cognitive biases of public officials; and
- The need to elicit qualitative, detailed responses from survey research that goes beyond one-word descriptions.

RESEARCH IN HAZARDS BY NEW PROFESSIONALS - II

Moderator: Robert Schwartz, Ball State University
Recorder: Wendy Steinhacker, Natural Hazards Center
Discussants: Hannah Brenkert, University of Colorado, Boulder
Nikola Garber, University of Southern Mississippi
Tae Kim, University of Utah

Hannah Brenkert presented her work on wildfire mitigation and homeowner activities on private land. The money for fighting wildfire has increased for three reasons: development is increasing in the wildland/urban interface (WUI); there are increased fuel loads in the forested areas; and we are experiencing the impact of a worsening drought. There is a general acceptance of public land management; however, there is a high percentage of private land in the WUI and the risk, options, and mitigation actions/potential on private land is generally overlooked. Not much is known about why people do what they do on their land outside of natural hazards research. Social factors such as demographic characteristics, relationships to community, and relationships with landscape are generally assumed to dictate behavior, but how these factors influence wildfire mitigation behavior has not been explored. The impact of mitigation and an understanding of risk has not been explored either. Brenkert's work is designed to address this and examine how a personal understanding of the landscape and personal experience with both wildfire and wildfire mitigation impact behavior and inform adaptation to both landscape and community. She is exploring the balance between risk and mitigation in the context of the emotional aspects of making landscape decisions on private land.

Nikola Garber discussed the reconstruction efforts undertaken by the National Oceanic and Atmospheric Administration (NOAA) after Hurricane Mitch in 1998. The hurricane stayed over Central America for six days and multiple impacts were felt. Overall, Nicaragua and Honduras were unprepared for the hurricane. Garber conducted research into NOAA's organizational response. NOAA was involved in the "all-cabinet response" to Mitch and conducted reconnaissance trips, sent implementation teams, coordinated meetings, and acted on an agreed-upon exit strategy. NOAA's organizational response differed from the immediate aid rendered by other agencies. It was reactionary and was undertaken without guidelines, protocols, or the completion of an after-action report. Garber's research, conducted through a text analysis and face-to-face interviews, resulted in a number of organizational recommendations for future disaster response including the creation of a natural disaster coordination committee within NOAA; a more diverse reconstruction team; funding mechanisms and protocols for reconnaissance teams; and a more active interagency framework for response.

Tae Kim presented his work on animating the 2003 Southern California wildfire evacuations. Presenting dynamic information is a challenge using Geographic Information Systems (GIS). The study of warning and evacuation behavior in the Grand Prix and Old fires, along with the Cedar and Paradise fires lends itself to an animated analysis. Kim combined data gathered through existing GIS layers (land use, road use, hydrologic features, satellite data, and raster/vector agency data) and Internet searches using Google (press releases, incident reports, news media, personal Web blogs) to animate fire speed, fire trajectory, distances related to evacuations, and velocity of fire from the origin with the goal of helping to better understand

how evacuees got their information and responded to it. This type of data presentation is ideal for dynamic and complex events such as these. The animation Web sites have been very popular and show the utility of exploring this and other techniques to represent changing, moving hazards. The animations allow the state of the fire (its perimeter and human activities) at any given time to be represented through “tweening” the data to extrapolate shape and motion.

U.S. / TAIWAN COLLABORATIVE RESEARCH ON NATURAL HAZARDS

Moderator: William Anderson, National Academies/National Research Council
Recorder: Michael Armstrong, ICF Consulting
Discussants: Michael Lindell, Texas A&M University
Jing-Chein Lu, Texas A&M University
Walter Peacock, Texas A&M University
Carla Prater, Texas A&M University
Yang Zhang, Texas A&M University
Liang-Chun Chen, Taiwanese National Science and Technology Center for Disaster Reduction (TNSTCDR)
Ming-His Hsu, TNSTCDR
Cheng-Shang Lee, TNSTCDR
Daigee Shaw, TNSTCDR
Kou-Liang Wen, TNSTCDR

Liang-Chun Chen presented findings on "Community Participation for Disaster Management." Chen indicated that the natural hazard threats of earthquakes, floods, landslides and debris flow, coupled with recent earthquake and typhoon events, accentuated the need for more community efforts. A community-based initiative began in 2001, and the village of Shan-Ang was a pilot from November 2001 to May 2002. The community is rural with a small population. The focus was on building partnerships, public involvement, field surveys, a community profile, identification of hazards and vulnerability, evaluation and strategies. Researchers found that some lectures and training were too difficult to understand, there was higher interest regarding response, communication and coordination were difficult, and there was a lack of funds to sustain activity. The initiative did result in increased awareness.

Carla Prater presented on "GIS-Based Analysis of Socioeconomic Vulnerability to Disasters." Prater's goals included analyzing how demographics, economics, social systems, and government functions impact vulnerability to disaster. One focus was on neighborhood social vulnerability which looked at residential attributes. Shelby County, Tennessee, was used as an example. Factors in this analysis included income, home ownership, economic status, and age. Data were analyzed to yield a social vulnerability index that was adjusted for population density and to include vulnerability hot spots. Other related data include the theoretical distribution of recovery times for post-disaster residential and business occupancy. This activity will also collect information on community functions in areas of preparedness and mitigation.

Cheng-Shang Lee discussed his project "Warning and Early Response for Typhoons." He indicated that Taiwan averages two large typhoons per year, but that serious damage can be caused by weaker typhoons. Sea warnings impact areas up to 100 kilometers inland, and land warnings can impact coastlines within 18 hours. When wind reaches certain levels, offices are automatically closed – one consequence is unnecessary economic loss when forecasts are inadequate. Most typhoon damage is from flooding and debris flow from continuous heavy rainfall, with extra challenges created by topography.

Ming-His Hsu discussed “Emergency Response During Floods.” Hsu indicated work is being undertaken to have earlier detection to increase response time. Inundation maps are being constructed in 53 watershed areas, integrated by county division. In 2001, over 24,000 residents were able to be evacuated due to improved detection systems.

Michael Lindell presented “Household Evacuation Decision Making During Hurricane Lilli.” His project surveyed southeastern Louisiana parishes, where 53.6% of residents were evacuated. Characteristics of evacuees included younger, female, larger household size, children present in household. Non relevant variables were income and education levels, home ownership, and ethnicity. The project looked at when departure occurred and how long the evacuation took from time of notice to evacuation. On the average, those surveyed took three hours to evacuate from the time the decision to evacuate was made, and another half hour to get to a main departure route. The highest ranking reason for route selection was past experience with the route; the lowest ranking reason was written materials issued pre-hurricane. Other questions included number of vehicles used, location of temporary housing, and cost of housing. Future implications include the increased demand for evacuation routes over longer periods of time. This led to the conclusion that information needs to be provided before and during a response.

Kou-Liang Wen presented on “Probabalistic Earthquake Analysis.” Wen discussed application of a risk analysis model, utilizing a scenario builder approach to look at zoning of earthquakes, as well as their distribution and frequency. “Haz-Taiwan” was applied looking at geologic and inventory data. The methodology progressed from earth science to physical damage to indirect physical damage to socio-economic losses to indirect losses. Daigee Shaw discussed an event loss table that tracks loss by occurrence and aggregate loss. In a case study regarding Taipei, it was determined that the average annual loss was $1 billion.

The amount of information presented curtailed interaction with the audience during the allotted time.

COASTAL COMMUNITY RESPONSE TO LAND LOSS

Moderator: Avagene Moore, Emergency Information Infrastructure Project
Recorder: Carol Hill, Louisiana State University
Discussants: JoAnne Darlington, University of Louisiana, Lafayette
Shirley Laska, University of New Orleans

This session focused on a five-year project with the goal of giving a voice to residents within Louisiana's Shoreline Protection Zone (SPZ). The coastal land loss experienced in Louisiana's SPZ is approximately 23 square miles per year and is the result of several factors, including changed sediment supply, subsidence, geological faulting, and the construction of channels through marshland for oil exploration and production. In response to this land loss, six major governmental agencies and oil interests in the area are dealing with associated environmental problems. However, residents of the coastal communities have previously not been invited to the table to discuss this issue.

The SPZ is comprised of approximately 1.2 million residents. Many of these residents derive their livelihood from the fish, shrimp, oyster, crab, and alligator industries. In addition, coastal Louisiana provides offshore infrastructure for 40% of all oil that comes into the U.S. Birding is also a major industry, with 40% of Canadian birds migrating to this area, as well as South American songbirds.

With funding from the Department of Housing and Urban Development (HUD) Community Development, a research team of faculty and students have identified six communities whose livelihood is directly linked to the coast. By creating micro-maps of the communities and conducting qualitative interviews using snowball sampling, researchers are attempting to identify prevalent themes describing the personal and community attachment to place by examining the communities' response to coastal land loss.

These qualitative interviews do not directly discuss the personal and community response to coastal land loss, but allow researchers to see when and where the topic emerges. In addition to the interviewees responses, family histories and photos are being collected. Once the transcription and analysis of interviews is complete, they will be shared with the communities to allow feedback and to facilitate community response.

A video was shown which documents the responses of many residents of the SPZ. Their accounts tell of the many physical effects of the slow onset land loss that they are experiencing and the way their lives, families, and communities are affected.

INTEGRATING SCIENCE AND SOCIETY: THE USGS SCIENCE IMPACT PROGRAM

Moderator: Chrys Rodrigue, California State University, Long Beach
Recorder: Chris Emrich, University of South Carolina
Discussants: Carl Shapiro, U.S. Geological Survey
Nathan Wood, U.S. Geological Survey

Session discussants provided details about the USGS Science Impact Program: Linking Science and Society and asked for feedback from the audience on the program and what can be done to make it stronger and more effective in the long run. Carl Shapiro and Nathan Wood first defined the term "science impact" as a focused effort to improve and expand the use of USGS science information to support decision making at all levels of society. Three main focuses of this effort are major activities to be undertaken by the USGS: science synthesis, or collaborations with decision makers, scientists, and the public to develop new links between science and societal decisions; tool and product development, the development of integrated, multidisciplinary science products and tools in response to societal needs; and science impact education, which is comprised of courses, workshops, and materials, both internal and external to the USGS, developed to demonstrate and promote the effective use of science information in decision making.

After discussing each of these activities in moderate detail, the audience was asked for feedback pertaining to any and all facets of the program. Once again, the main goal of acquiring knowledge and strengthening the program was addressed. One audience suggestion that was agreed upon by all was support for a Hazards Workshop session based on how organizations bring information to users. Hopes were to bring all levels of government together with users to discuss shortcomings and strengths of federal programs in the information arena. Another audience member comment about decision making was based on the fact that the general public is becoming more informed while at the same time policy makers are not supporting public opinion and not using scientific information in decision making. Basically, everyone in the audience agreed that there was a major disconnect between science and policy.

One of the main suggestions given to Shapiro and Wood was to let emergency managers know what the USGS has to offer, and more importantly, how to get it and how to use it. Additionally, it was pointed out that decision makers and emergency managers will not come to the USGS for data, but would be receptive to data if it were shown to be useful to them.

WORST CASES: CATASTROPHIC EVENTS AND THEIR IMPLICATIONS FOR POLICY AND PRACTICE

Moderator: Nikola Garber, NOAA/National Sea Grant College Program
Recorder: Monika Buchanan, Millersville University of Pennsylvania
Discussant: Lee Clarke, Rutgers University

Lee Clarke introduced the idea of worst-case scenarios. According to Clarke, these scenarios are often beyond our imagination and despite their severe consequences, there is often not enough attention given to these types of calamities. Continuously neglected "worst cases" are ignored because of the minimal probability of their occurrence. However, Clarke noted that there is a greater risk of worst cases because of the population concentrations in modern society. Clarke used the example of Severe Acute Respiratory Syndrome (SARS) which spread at an incredibly fast rate. In this example, the major concern was the rate of spread and not the fatality of the disease.

Another factor contributing to the worst-case phenomenon is our technological interdependence. Clarke used the blackout which took place last summer, the sinking of the Titanic, and the space shuttle Challenger disaster. Moreover, worst-case scenarios can also be physical phenomena in which the death rate is the most significant factor or as cultural abstracts where factors other than the death rate are most significant. However, both viewpoints are equally important. Clarke noted that what is important is not so much the scope of the scenario as the reaction to it. Worst cases seem to be overwhelming and uncontrollable to the people who watch them unfold.

Trains represent one of the worst of the worst-cases scenarios because crashes could expose entire communities to great danger. It is just a matter of time before such a catastrophe takes place since trains derail often, carry dangerous cargo, and are largely unregulated.

Clarke discussed the idea of probabilistic thinking and its correlation with September 11, 2001. Society understands that it is highly unlikely for a plane to crash and it is safer to fly than to drive, yet there exists a great hesitation among Americans when they must choose between driving and flying. However, even if the possibility of a plane crash is low, the probability of surviving them is even lower.

CREDENTIALING AND ACCREDITATION IN EMERGENCY MANAGEMENT AND PREPAREDNESS: SIGNIFICANT TRENDS

Moderator: James Kendra, University of North Texas
Recorder: Jim Rivers, Florida International University
Discussant: Emily Bentley DeMers, Emergency Management Accreditation Program

For most of the past 25 years, disaster response and recovery has slowly and steadily gained public awareness and professional attention. However, interest quickly accelerated following Hurricane Andrew. In the educational aftermath of Andrew, responders were characterized by education-based degree programs in emergency management (EM) and individual certifications such as "Certified Emergency Manager," business continuity certificates, courses from the Emergency Management Institute, and, unfortunately, "vanity" certificates.

By the mid 1990s, the need for program-based, rather than individual-based, EM accreditation was evident. Accreditation standards were recognized as necessary to evaluate state and local EM structures independently and pre-disaster. Following September 11, 2001, the need to scrutinize state and local response capabilities was given additional urgency. Building on extensive groundwork that had been carried out over a five year period, the Emergency Management Accreditation Program (EMAP) standard was published in April 2002 and the first programs were accredited in September 2003.

EMAP is a voluntary accreditation process based on collaboratively developed national standards for state and local government disaster prevention, mitigation, response, and recovery programs. Its approach encompasses a jurisdiction's whole program, not just the EM agency. Emphases are on professionalism in preparedness, accountability, and building capabilities and relationships. The EMAP process features self-assessment, documentation, and independent review. Additionally, standards and accrediting processes are scalable to be useful for programs of various sizes.

Baseline EMAP assessments have been completed for 28 states or territories with 11 more slated to be completed by the end of 2004. Based on the first 19 baseline state assessments completed, hazard identification and risk assessment and planning are the two areas most likely to be found deficient. Only 20% of the sample achieved compliance with operations and procedures, and less than one-third were compliant in program management; resource management; logistics and facilities; direction, control, and coordination; and exercises, evaluation and corrective action. States generally fared better on laws and authorities; hazard mitigation; training; communications and warning; crisis communications, public education and information; and finance and administration. To date, 3 of 28 assessed states have achieved full compliance.

Discussion following the formal presentation raised several pertinent ongoing questions: Can localities really comply with such high standards or is continuing movement toward compliance a sufficient federal or national objective? How well will the EMAP standards be integrated with other standard setting processes, (e.g., comprehensive plans, and individual certification courses)? Are there feasible alternatives and/or reference criteria for measuring community preparedness? What are the legal implications of these standards for states and localities?

RESEARCH IN HAZARDS BY NEW PROFESSIONALS - III

Moderator: John Carroll, California State University – Fullerton
Recorder: Arleen Hill, University of Memphis
Discussants: Valery Bode, Organization of American States
Emily Sjostrom, University of Memphis
Mark Smith, Appalachian State University, University of New Mexico
Rahul Srivastava, University of Arizona

Valery Bode presented her thesis, "Political Aspects of Natural Disasters: Issues of Governance and Risk Management in Developing Countries." Using a survey, best practice documents, political context, mission agencies, funding resources, and a systems approach, Bode found that a sole lack of political will was not the main explanation for the limited implementation of risk reduction in the developing world. Similarly, the presence of a democratic political system did not play the primary role in explaining a lack of implementation, neither did technological capabilities. A strong national economy was found to influence the implementation and success of disaster risk reduction efforts. Findings suggest that the relationship between political will and risk reduction efforts needs to be better understood. Additionally, the double standard of promoting risk reduction while practicing response and recovery needs to be addressed and national political contexts can not be ignored.

Emily Sjostrom shared her thesis, titled "Protein Energy Malnutrition (PEM) Vulnerability in Nine States of India." Her study considered possible explanations for the persistence of PEM despite sustained efforts to address the problem. Factors contributing to the malnutrition characteristics of place were explored. The state-level study was based on data collected and purchased from the government of India and several public and private data clearing houses. Principle component analysis and spatial/statistical comparisons were used to explore the pattern of PEM in the study area. A relative index of the underlying dimensions of PEM vulnerability was constructed and compared with the actual PEM occurrence rates for each study state. Detailed study of Kerala and Tamil Nadu suggested that education attainment, gender parity, and standard of living explained the different experiences of these neighboring states. Addressing vulnerability characteristics may increase the success of programs.

Mark Smith presented his masters work, "Implementing Limited Detailed Studies: A Web-based Course for Local Floodplain Administrators." Smith developed a training and information dissemination tool in the form of an online tutorial as a solution to the challenge of implementing updated information. The study was conducted in North Carolina. The Web-based tutorial successfully dealt with the challenges of distance to training centers, the need to update the course, and maintenance of a dynamic and self-paced tutorial. The tool was developed with a team from Appalachian State and is being reviewed by users and can be seen at http://edtech.ced.appstate.edu/~smith/course/index.html.

Rahul Srivastava presented his masters work on "Natural Hazard Mitigation Resources: Evaluation of Six Counties Comprehensive Plans in Arizona." Drought, floods, and wildfires were the natural hazards used in this investigation of comprehensive land plans based on the growing population at the urban-wildland interface, terrain, and water supply and demand issues

of Arizona. Six counties with populations of at least 125,000 were selected for exploration of the efforts made to protect the environment and reduce vulnerability. Findings suggest that the goals exist but strategies do not. For drought and wildfire awareness and mitigation plans are not addressed within the comprehensive plans. Public awareness, political willingness, and financial feasibility are barriers to mitigation. Srivastava identified areas for future improvements in the incorporation of natural hazards into county comprehensive plans.

RESEARCH IN HAZARDS BY NEW PROFESSIONALS – IV

Moderator: Sandra Sutphen, California State University, Fullerton
Recorder: Craig A. Marks, University of North Carolina, Chapel Hill
Discussants: Kevin Borden, University of South Carolina
Christina Finch, University of South Carolina
Reggie McCarn, University of South Carolina

Christina Finch discussed using the SHELDUS data base and comparing its abilities against the U.S. Army Corps of Engineers (the Corps) data from the 1993 Midwest floods. This flood event was used because it was a wide spatial event that caused over $20 billion in damage, and provided detailed and available data. Finch's findings were that SHELDUS reported more damage than the Corps, possibly due to the distribution of presidential disaster declarations. However, the SHELDUS database only reports losses in excess of $50K and based on data entry analysis while the Corps losses are based on field-based assessments.

Reggie McCarn presented a historical overview of intentional and natural biological occurrences from the 1763 smallpox outbreak through the Avian Flu epidemic of 2004. The threatened use of biological agents upon human beings, animals, or plants to spread fear or intimidation for religious, political or other means is an emerging trend in the world. McCarn noted that spatial modeling and use of GIS can validate hypotheses and provide a visual model for emerging trends and movement of hazard events. It allows remote sensing and combination of data to provide an overall picture to decision makers.

Kevin Borden reported on the vulnerability of built environments and the government's actions to conduct vulnerability assessments and develop comprehensive data on infrastructure. Presidential Directive 53 in 1998 designated vulnerable infrastructure. The U.S. Geological Survey has undertaken an infrastructure assessment in 133 cities and found that the top five most vulnerable cities are: Augusta, Maine; Boston, Massachusetts; Charleston, West Virginia; Charleston, South Carolina; and Juneau, Alaska. The five least vulnerable cities are: Pierre, South Dakota; Bakersfield, California; Riverside, California; Mission Viejo, California; and McAllen, Texas. The end result of the survey is a Built Environment Vulnerability Index (BEVI) to rank cities using 36 variables.

A HOLISTIC ASSESSMENT OF HAZARDS: INTEGRATING PHYSICAL AND SOCIAL SCIENCE

Moderator: Jim Buika, Pacific Disaster Center
Recorder: Ivor van Heerdon, Louisiana State University
Discussants: David Applegate, U.S. Geological Survey
Havidán Rodríguez, University of Delaware
Dennis Wenger, National Science Foundation

There is growing importance for interdisciplinary/multidisciplinary/cross disciplinary research teams to analyze hazards and their potential impacts in a holistic manner. Recognizing that hazard research encompasses the physical, built, and social environments means that very few researchers are specialized in all these areas. A holistic approach to disaster research thus recognizes the contribution of all the different disciplines; encourages and embraces new technologies; recognizes the importance of the media; involves end users; and incorporates socio-economics and demographics.

Multidisciplinary or cross disciplinary (depending on individual definitions) research is difficult to achieve in the standard academic setting. There are many institutional barriers because of scare resources and the interdepartmental competition for these resources. Additionally, many universities do not consider multidisciplinary research as important and do not rate disaster-related research publications as highly as those published in pure science journals. Many funding agencies in engineering and the natural science fields do not understand or appreciate multidisciplinary approaches. Rather, these approaches are thought to dilute the science effort. However, all is not bleak. The advent of GIS, with its very broad applications, has opened pathways for collaborative research. Additionally, the greater use of numerical models and associated parallel computing techniques has attracted many in the social sciences to modeling. This in turn has facilitated multidisciplinary research efforts. The picture is also getting brighter on campuses. Multi degree programs are appearing and a few colleges are offering a hazard/disaster related curriculum, especially in undergraduate programs. Additionally, the recognition by the National Science Foundation (NSF) of its potential role in hazard research is commendable. Real recognition of the values of inter/multi/cross disciplinary research by this agency will be mirrored by others.

The last real obstacle to multidisciplinary research in the academic setting that still has a long way to go to be corrected is the tenure issue. The bias against applied research stifles interest by young researchers in the multidisciplinary aspects of hazard/disaster research.

As new technologies come on line, the understanding of the physical aspects and impacts of disasters improves. This in turn creates challenges for the researcher to ensure that emergency managers fully appreciate the new products. As there is a real potential for a disconnect between researchers and emergency managers, the onus is on the researcher to communicate findings in such a way that emergency managers, social scientists, and public health officials fully appreciate the technical outputs. A mechanism of technology transfer that seems to have some success is to establish end user working groups. Another approach of value is advisory committees comprised of end users that meet regularly. Such an approach ensures that end users have input into end product generation. In this way they become part of the process.