

PANEL SESSIONS

Panel 1. Risk Assessment: Methodology and Approach

Moderator: Col (sel) Mark Welshinger (USAF), Assistant Federal Coordinator for Department of Defense/Air Force and Army Affairs, OFCM

Rapporteur: Mr. Robert Dumont, OFCM Senior Staff Meteorologist

Panelists

Ms. Karen Carson, Deputy Director, Office of Plant and Dairy Foods and Beverages, Food and Drug Administration (FDA)

Mr. Clifford Oliver, Chief, Assessment Branch, Mitigation Directorate, FEMA

Dr. Michael MacCracken, Director, National Assessment Center, U.S. Global Change Research Program (USGCRP)

Introduction

Col (sel) Mark Welshinger (USAF)

The purpose of this panel was to describe, from the perspective of three different agencies, methodologies and approaches used to conduct risk assessments.

Risk Assessment: Food Safety and Public Health Hazards

Ms. Karen Carson, FDA

Synopsis. Ms. Carson stated that within the Office of Plant and Dairy Foods and Beverages, risk assessments are done to characterize the nature and magnitude of the risk to human health in order to choose the best risk management option. The options include: regulations, action levels, guidance, and recalls. Chemical risk assessments for food ingredients (principally additives) and chemical contaminants, like lead, patulin, and dioxins, have been ongoing for 40 years. The goal is to provide a 100-fold safety factor. Microbial risk assessment (for example, *salmonella enteritidis* in eggs, *listeria monocytogenes*, and *vibrio parahaemolyticus*) is a new, but rapidly growing scientific discipline. The first step in the public health risk assessment process is to identify the hazard as a potential health risk, and Ms. Carson stressed the importance of the immediate involvement of risk managers. The remaining steps in the process include constructing a model of the risk, drawing conclusions and recommendations, sending the results out for public comment, and insuring comments include supporting data, finalizing the report, and developing an action plan to mitigate the risk/hazard.

Overview of the HAZards U.S. (HAZUS) Loss Estimation Modules

Mr. Clifford Oliver, FEMA

Synopsis. Mr. Oliver reported that FEMA, under a cooperative agreement with National Institute of Building Sciences, has developed a standardized, nationally applicable earthquake loss estimation methodology. This methodology is implemented through PC-based Geographic Information System (GIS) software called HAZUS. HAZUS provides an improved basis for making decisions on risk reduction and is an essential element of FEMA's Project Impact initiative, which is a national movement to create safer and more disaster resistant communities. User involvement and strong technical oversight throughout the process were key elements in the HAZUS development effort. HAZUS is being expanded into a multi-hazard methodology with new models for estimating potential losses from wind (hurricanes, thunderstorms, tornadoes, extra-tropical storms, and hail) and flood (riverine and coastal) hazards. The full flood and wind (hurricane) preview modules are scheduled for completion in December 2002. Annualized earthquake losses in the United States are \$4.4 billion per year, and FEMA recognizes that mounting dollar losses cannot be adequately addressed by a fragmented approach to natural hazards. Instead, estimated losses for other hazards are needed to support FEMA's risk-based approach to mitigation and emergency preparedness and comprehensive mitigation programs by local communities. Mr. Oliver concluded by stating that FEMA is committed to developing and implementing state-of-the-art risk assessment models and technology; providing training and education, and technical support; developing partnerships (for example, FEMA is partnering with NASA on the hurricane module); and ensuring private sector involvement throughout the process.

National Assessment of the Consequences of Climate Variability and Change for the United States

Dr. Michael MacCracken, USGCRP

Synopsis. Dr. MacCracken reported that the overall goal of the National Assessment of the Consequences of Climate Variability and Change for the United States was to analyze and evaluate what is known about the potential consequences of such changes in the context of other pressures on the public, the environment, and the Nation's resources. Three types of activities underpinned the Assessment effort: regional analyses and assessments; sectoral analyses which included agriculture, forests, human health, water, and coastal areas and marine resources; and a National overview. The results are summarized as follows:

- The magnitude of climate change impacts depends on time period and geographic scale. Short-term impacts differ from long-term impacts. Regional and local level impacts are much more pronounced than those at the national level.

- For the Nation as a whole, direct economic impacts are likely to be modest, while in some places, economic losses or gains are likely to be large. For example, while crop yields are likely to increase at the national scale over the next few decades, large increases or decreases in yields of specific crops in particular places are likely.
- Through time, climate change will possibly affect the same resource in opposite ways. For example, forest productivity is likely to increase in the short term, while over the longer term, changes in processes such as fire, insects, drought, and disease will possibly decrease forest productivity.

In addition, the vulnerability in the United States is linked to the fates of other nations. Dr. MacCracken stated we cannot evaluate national consequences due to climate variability and change without considering the consequences elsewhere in the world. The U.S. is linked to other nations in many ways, and both our vulnerabilities and our potential responses will likely depend in part on impacts and responses in other nations. Results from these research efforts will assist future assessments in continuing the process of building our understanding of humanity's impacts on climate and climate's impacts on us.

Additional information is available at: <http://www.nacc.usgcrp.gov>

Panel 2. National Perspectives on Risk Assessment and Decision Making for Natural Hazards

Moderator: Dr. Susan Cutter, President, Association of American Geographers and Director, Hazards Research Laboratory, University of South Carolina

Rapporteur: Dr. Nathalie Valette-Silver, National Centers for Coastal Ocean Science, National Ocean Service, NOAA and SNDR Executive Secretary

Panelists

Dr. Ronald McPherson, Executive Director, American Meteorological Society

Dr. Robert Hamilton, Deputy Executive Director, Division on Earth and Life Studies, National Research Council (NRC)

Dr. Margaret Davidson, Acting Assistant Administrator for Ocean Services and Coastal Zone Management, National Oceanic and Atmospheric Administration

Dr. Robert Hirsch, Associate Director for Water, U.S. Geological Survey

Mr. Robert F. Shea, Director, Program Support Division, Mitigation Directorate, Federal Emergency Management Agency

Questions considered.

- 1) What are the political, economic and societal benefits for instituting a national risk assessment program for all natural hazards?
 - ▶ Things to consider are personnel injuries/deaths, transportation infrastructure and built environment, crops and livestock, fisheries, direct and indirect economic impacts caused by natural disasters.
- 2) What are some of the mechanisms for efficiently and effectively coordinating legislative efforts to support a risk assessment methodology for all natural hazards?
 - ▶ Examples to date that have created effective programs are the National Flood Insurance Program and the Earthquake Hazards Reduction Act.
- 3) What are the organizational roles (Federal/State agencies, private sector, professional, scientific, and technological organizations) in developing and implementing a risk assessment methodology for all natural hazards?
- 4) What is the best method for encouraging appropriate research activities and ensuring technology transfer into operations?

Dr. Susan Cutter

Synopsis. As an introduction to this panel session, Dr. Cutter stated that risk assessment is not a new concept. She reviewed the questions provided to the panel members and then noted that the National Research Council developed in 1983 a framework for the government that includes four steps:

- Risk Identification,
- Dose Response,
- Exposure Assessment, and
- Risk Characterization.

More recently this general concept was modified for hazard assessment. This framework can be found in Mileti, 1999 and Cutter et. al., 2001 and includes three steps:

- Identification of the hazard (risk estimation models for specific hazards, mapping hazard zones, etc.),
- Assessment of the risks (pattern of human occupancy, differential impacts on people and places, etc.), and
- Management/mitigation of the impacts (differential adjustment and adaptation to the risk, variability in preparedness, response and mitigation capabilities, etc.).

Dr. Ronald McPherson

Synopsis. Dr. McPherson described the value of risk assessment as a way to keep score which helps to focus on our progress and on our deficiencies. In addition, risk assessment suggests where to do the right investments. He stated that assessments should be complete and consistent from hazard to hazard and should go beyond fatalities and property damage and include business disruption. Dr. McPherson gave the example of a plant flooded that was out of business for over 6 months. The costs associated with this interruption were larger than the repair costs.

Dr. McPherson next described one risk assessment coordination mechanism. This mechanism is the Congressional National Hazard Caucus, which is co-chaired by Senators Stevens and Edwards. The Caucus is led by the American Geophysical Union and the American Meteorological Society, among other professional organizations. A Natural Hazards transition document was prepared by the Caucus for the new administration.

Dr. McPherson discussed a recent National Research Council report which suggested that, in the Federal Government, the Department of Commerce (DOC) should take the lead for risk assessment, to encourage uniformity and consistency of the results. DOC would have to work with FEMA, USGS, USACE and other Federal agencies. Another consideration was the private sector which was currently doing risk assessment, but it was not generally doing it on a national scale. This is an ideal topic where public/private organizations could partner very well.

Recommendations. Dr. McPherson closed with two recommendations. A National Risk Assessment should be done, but it has to be complete and well done. There is a need to encourage risk assessment research, technology development, and their transfer to operational use.

Dr. Robert Hamilton

Remarks. In regard to the first question, I would say that we should undertake a National Risk Assessment. One of the problems is to know which natural hazards are included in it. We need to include hazard assessment for severe weather, flood, earthquake, volcanic activity, landslide, tsunami, wildfire, climatic variation (e.g., drought, rain, El Niño/La Niña). Many different agencies are working on these topics and have a clear role to play. The main difficulty is to coordinate activities among the various players. The main roles and responsibilities (not exhaustive) of various agencies are:

- Severe Weather: NOAA;
- Floods: FEMA/NFIP, NWS, USGS;
- Earthquakes and Volcanoes: USGS, NASA;
- Landslides: State and local gov., and many players;
- Tsunamis: NOAA, USGS;
- Wildfires: USFS, BLM, NPS;
- Climatic variability: NOAA, Agriculture; and
- Space weather: NASA, DOD, NSF, USGS, NOAA, FCC.

The value of a risk assessment derives from facilitating comparison among risks, guiding the identification of the gaps, and allocation of research. It will indicate common issues, opportunities for collaboration, and help suppress redundancies. This would also promote public awareness and political commitment and guide national policy. However, we need to look at compounded risk. For example, Charleston is located in an area subjected to hurricanes, earthquakes and floods, so we need to look at wind and seismic risk together. Where do we stand for the various hazards?

- For the earthquake, we are fairly OK since we have HAZUS;
- For volcanoes, we do not have too much, but there are 24 active volcanoes close to population centers;
- For wind and floods, it is a more difficult problem and HAZUS is in the process of developing a module for those hazards; and
- For climate changes, we do not have too much, but it is coming too.

Recommendations. In conclusion, we are facing some challenges. Yes, we need to develop a National Risk Assessment and all the agencies need to coordinate their activities. This will help in priority setting, advancing methodology, and creating a data base. To move ahead, we need to gradually improve with time what we have and go step by step. Most of all, we need somebody or some entity to take the responsibility for moving ahead.

Dr. Margaret Davidson

Remarks. Regardless of the killer storms and inconveniences caused by hurricanes and other weather-related disasters, growth along the coast is increasing. It is pretty stupid to live very close to the coast since it is the place that has seen up to 70% repeated losses. I am living along the coast in Charleston, and after the devastation of Hurricane Hugo, we were expecting housing to slow down but there was no fire sale after Hugo. In fact, the resale value of my house has increased 400% in the past 15 years.

Risk assessment data quality is very variable. Large and small companies presently have better data than government and academia, because they need the data to do business. Having good data is the first step in creating effective hazard mitigation measures, and it is important, that the data collected and used, are FGDC (Federal Geographic Data Committee) approved format and have well documented metadata. New data collected with new technologies are increasing. For example, LIDAR data are airborne lasers that are being used to make beach surveying quicker and more accurate. These data are very important for states since they are used to predict erosion rates, set construction setback lines and create oceanfront policies. LIDAR is also used after a storm to assess beach damages.

Coastal resources managers have rated near shore bathymetry as being the most needed data set. NOAA is presently focusing some of its resources to increase knowledge about offshore contours that will, in turn, improve the accuracy of models. Topographic seamless maps are also very important and small scale projects are presently underway (Tampa, FL and Louisiana).

Speaking of models, NOAA is committed to improving the predictive models themselves, as well as access to this important information. Two new examples are the Risk Atlas and the Coastal Storm Initiative. The Risk Atlas is being developed by NOS (National Ocean Service) in partnership with many other entities such as the USGS and the National Climatic Data Center (NCDC). The Risk Atlas will provide a geographically referenced tool containing the information needed to determine vulnerability. Data sets include weather trend information, erosion rates, demographics, economic information, reports on the location and capacity of the infrastructure, and other pertinent data and information.

Recommendations. In conclusion, the difficult step is how to graphically and accurately communicate the danger to the general public. We need to have something tied to the pocket book, if not via taxes or lost property value. It is very important that the land-planning and zoning decision be done at the local level in the right way. Technology transfer is an essential part of this needed education and must be available to the local planner. On the legislative front, we can use the recently created Natural Hazards Caucus as a vehicle.

Dr. Robert Hirsch

Remarks. **The role of science and technology in risk assessment.** Hazards do not know the political boundaries of states. Science and technology is important at two time scales: 1) to understand the risk and make long-term decisions and 2) to anticipate and prepare for an event and make short term decisions. The role of the USGS is to document the events (before, during, and after) to try to understand the processes underlying earthquake, floods and volcanic eruptions and prepare risk maps for each hazard. Presently, flood frequency analysis looks at the relationship between topography, bathymetry and river flow. The instruments deployed by the agency are used to enhance understanding of these processes and give real-time information.

It seems that presently, we have both the knowledge and the technology at hand to prepare better for disasters. However, it is not obvious that we have the political will to use this knowledge. For example, stream gages are essential to predict flooding, since the data are an essential component of NOAA's flood modeling. Unfortunately, the program is not funded in a coherent way, and in a recent case, the removal of a stream gage (that was out of order) resulted in NWS's inability to provide an adequate forecast, and lives were lost. In some other cases, property is lost because of the lack of warning due to the inadequacy of the observing system.

The same is true for earthquakes. For example, in the case of the Loma Prieta earthquake, all 911 lines were down, and the officials were unable to send emergency response.

Recommendations. We need to have a reliable observation system and have the will power to use the available technology. The technology is available to provide rational, quick decisions. We need to develop instruments that will continue to function and communicate during the event. We also need to improve risk maps.

Dr. Robert Shea

Remarks. I will cover the following topics regarding the various questions that were posed from an operational view point.

National Risk Assessment. We are trying to do an impossible task. To be successful we need to:

- Formulate a common goal with many different people involved, including Federal agencies;
- Address terrorist activity; and
- Partner and develop a common agenda for risk assessment.

We need to admit where we are and the fact there are the people living in harms way. Disasters need not to be so disruptive. The present paradigm is not right. Good and reliable risk assessment is one of the major ways to achieve this goal. We have the tools and could do it now.

Organizational models. We should stay away from various organizational models such as NEHRP (National Earthquake Hazard Reduction Program), which gives the model of destructive behavior, and NFIP (National Flood Insurance Program) which is an antiquity created 30 years ago. We should create a paradigm that has a united goal based on community needs.

Principal criteria. Science is crucial to be able to implement good ideas, but we can't ignore business interests. We can't be a closed society in terms of risk assessments and we need to reach out to others. Academia needs to be at the table, but the results need to be integrated. We do not need a perfect science to start to communicate in clear terms. We need to deliver the message in an understandable way, so that middle America will have the common sense to take the appropriate measures.

Recommendations.

New opportunities. A new administration is coming and we need to educate them on this topic. Under the Disaster Mitigation Act of 2000, there is \$50M/year for planned risk assessment. We need to be involved in pre-disaster studies. We also need post-disaster studies. Maybe we should have a Federal interagency task force on risk assessment, including members from all pertinent parts of DOD.