

BREAKOUT SESSIONS

Breakout Session 1. Process of Conducting Risk Assessments

Session 1A: Characterize/Quantify Exposure

Moderator: Mr. Michael Buckley, Director, Technical Services Division, Mitigation Directorate, FEMA

Rapporteur: Dr. Timothy Cohn, Theme Coordinator for Hazards, USGS National Center

Questions Considered.

- 1) Are there better ways to characterize the exposure to known natural hazards that will be useful for a variety of audiences (public, media, state and local government, and federal government)?
- 2) Are there indicators of natural disaster vulnerability similar to economic indicators that can be used for this purpose?
- 3) Should the presentation of the information be as risk hazard maps in GIS Spatial Representation?

Synopsis. This breakout session focused on trying to characterize or quantify exposure. There was a good mix of people from various disciplines including engineers, scientists, planners, a physician, and a philosopher, even someone with a background in English. The discussion began with defining the meaning of terms, including vulnerability, exposure, and risk, among others. Participants found that there was a lot of confusion, there was no common terminology, and single term definitions were difficult. The terms vulnerability, exposure and risk relate to space and time relationships such as a person or building that may not be vulnerable at any one time. The group went through a discussion of examples. One was on the risk of heart attacks where factors such as weight, blood pressure, and diet are important. How does one compare that to school violence where the risk at schools is not high but receives a lot of attention? When does risk become critical in the vulnerability characterization of a situation? When a machete is being swung in school, students are more vulnerable. There needs to be a clarification of terms in ordinary language, and a number of audiences must be involved such as engineers, planners, businesses, government, and medics. Are there indicators of exposure that relate to economic indicators? All of these elements point to the inconsistencies in language and vocabulary with respect to hazards, disciplines, cultural backgrounds, and socio-economic class.

Accessibility of data is another problem area. Not all data are accessible. In order to understand risk, vulnerability and exposure, one must have data. There is a need for the loss history of flood insurance claims to show where there have been repetitive losses. Data are needed on the number of variances issued by local governments for buildings that do not comply with flood plain management (people building on beaches). Some felt that FEMA is not communicating well regarding the need for detailed data to understand risk in a community. FEMA does not supply detailed inventories of data in communities—that is the responsibility of the state and local levels. As a result, the need to collect detailed data was felt to be not well communicated.

There was also a discussion of HAZUS. Is it the right tool? There was a sense of concern about HAZUS in that there is variability in results in its use, thus the results may not be reliable. Mr. Buckley also recommended that the audience review the FEMA strategic plan, a copy of which was available at the exhibit table.

Recommendations.

- Develop a consistent standard language for communicating exposures to risk with respect to:
 - ▶ Hazards (floods vs volcanoes)
 - ▶ Discipline
 - ▶ Cultural background
 - ▶ Socio-economic class
- Improve detailed data accessibility through better communication of need for the data to improve understanding of a community's risk.
- Resolve issues on financial accounting:
 - ▶ Agreement on units
 - ▶ Agreement on definition of terms
 - ▶ Across cultures and socio-economic groups

Session 1B: Predict/Forecast Probability of Occurrence

Moderator: Dr. David Cleaves, National Program Leader, Fire Systems Research, Research and Development, Vegetation Management and Protection Research, USDA Forest Service

Rapporteur: Dr. Rachelle D. Hollander, Program Director, Societal Dimensions of Engineering, Science, and Technology Program, Ethics and Values studies, Research on Science and Technology, National Science Foundation

Questions Considered.

- 1) Do we need to expand use of the existing models, create new models, and/or better integrate models?
- 2) What criteria are needed for evaluating existing models? For example:
 - + Limitations/assumptions
 - + Standard comparable results
 - + Design criteria and language for standards
 - + How to improve quality of assessment
- 3) Are there better ways to use the results of these models in our risk assessments?

- 4) How do we improve/develop the coordination loop between research and operations to ensure innovative capabilities and technology quickly transition into operational use?

Synopsis. This group discussed problems and issues for the development and operational use of predictive or probabilistic models for risk assessment. Participants focused on questions concerning the probability of phenomena that create hazards in relationship to risk assessment. They agreed that there are difficulties in assessment, prediction, and forecasting for risk assessment purposes. In considering what SNDR could do to promote multi-hazard risk assessment at the national level, they classified their recommendations into four areas: foundational issues, applications issues, technical quality, and communications. Foundational issues included responding to questions like, "Why do this and what do you tell people about?" In addition, each agency has its own risk focus or foci. Applications issues concerned the technical components and communication of probabilities. There are many different users with different needs, many of which are not documented. In the technical quality area, more research is needed to help describe how low probability/high consequence events affect the public's mitigation desires and actions. Probability is a concept and skill that most people have problems with understanding, many cannot handle statistical concepts or factor probabilities into their decisions effectively.

Recommendations.

- Foundational issues:
 - ▶ Develop an organizing framework and terms.
 - ▶ Clarify assumptions underlying the forecasting mission.

- Applications:
 - ▶ Develop a user list and model specifications for each group.
 - ▶ Develop a set of guidelines for customizing forecasts.

- Technical quality:
 - ▶ Foster research into low probability/high consequence events.
 - ▶ Characterize comparisons and interactions among hazard processes.
 - ▶ Foster research into measuring or evaluating mitigation effects on low probability/high consequence events.

- ▶ Develop methods for two-way communication/education about event uncertainties.

Session 1C: Estimating Losses

Moderator: Dr. Christopher Adams, Research Scientist, Cooperative Institute for Research in the Atmosphere (CIRA), Colorado State University

Rapporteur: Mr. Floyd Hauth, OFCM Staff (STC)

Questions Considered.

- 1) What new or improved tools or techniques are available to characterize or evaluate alternative risk assessments for natural hazards? What criteria should be used in such assessments?
- 2) Should an assessment be conducted for each hazard, each part of society, or for specific economic impacts/benefits? Or is an integrated assessment more useful? For example: Societal, built environment, economic/business, and infrastructure losses could be associated with each natural hazard or with multiple hazards for a specified location.
- 3) What types of economic considerations and consequences should be considered in an assessment of economic losses? For example: Potential losses (or savings) from a home or business being destroyed/severely damaged vice potential costs of repairing a home/business that is less damaged and able to be quickly rebuilt.
- 4) What role does community development and rebuilding policies and regulations serve in the assessment process?
- 5) What improvements are needed in tools to better assess the costs, benefits, effectiveness, priorities, and consequences of alternative risk assessment policies and strategies?

Synopsis. Session participants represented government agencies and non-government organizations such as insurance and academia (research). In general, the participants agreed that a full range of direct and indirect loss data is needed to serve the various organizations that are involved with responding to natural hazards/disasters. Concerns were expressed about the availability of data, the quality or completeness/comprehensiveness of data, and the sharing of data among agencies or organizations that prepare for and respond to natural hazards/disasters. Several participants emphasized the importance of building capabilities that would be useful for those who initiate responses at the local levels of government. Others noted that it is often the case that emergency response team members don't know what data may already be available or is being collected, or whether it is archived and available for sharing (depending on the proprietary nature of the information).

Loss-estimate models are often designed to serve specific needs of an agency or organization or to serve a specific function. In many cases, the output of the models is difficult to compare with other models because of the unique nature of some data and assumptions used in the design of the model. Further, research results on modeling and its applications are not readily available or well publicized leading to some duplication of effort and possibly wasted resources.

Leveraging research results might facilitate earlier solutions and more efficient/effective use of models.

Participants agreed that data collection would benefit from building on some of the current initiatives such as Project Impact. Templates could be provided to the 250 communities involved in this program for use in collecting additional or more complete data, including improved spatial coverage, if needed. There are many working groups in place that could assist with refining the data collection, archival, and distribution activities. It was also suggested that funding and other incentives may be needed to gather more or better information in some regions or areas. Proposed Federal legislation hold some promise for future improvements in both data collection and in research.

Recommendations.

- Define, standardize, collect, and make information available:
 - ▶ small steps
 - ▶ know what is currently available
 - ▶ improving the spatial component
 - ▶ leveraging current working groups;
- Address compatibility of loss-estimate models by addressing data sharing problems:
 - ▶ provide incentives for data sharing among federal, state and private sector
 - ▶ tie funding for projects to data sharing;
- Build capabilities for use by local governments;
- Leverage current programs (such as Project Impact) to gather more data (provide template for use by communities to collect more/better data);
- Review and publicize current federally-sponsored risk assessment and management research; and
- Promoting data collection as part of mitigation plans required by Stafford Act.

Breakout Session 2. Risk Management Discussions: Ramifications for Risk Assessment and Decision Making for Natural Hazards

Session 2A: How to characterize and reconcile the tradeoffs implicit in making risk management decisions?

Moderator: Dr. John Sorensen, Director, Emergency Management Program, Oak Ridge National Laboratory (DOE)

Rapporteur: Col (sel) David A. Smarsh (USAF), PhD, Deputy to NOAA for Federal and National Programs

Questions Considered.

- 1) What new or improved tools or techniques are available to characterize or evaluate alternative risk assessments for natural hazards? What criteria should be used in such assessments?
- 2) Should an assessment be conducted for each hazard, each part of society, or for specific economic impacts/benefits? Or is an integrated assessment more useful? For example: Societal, built environment, economic/business, and infrastructure losses could be associated with each natural hazard or with multiple hazards for a specified location.
- 3) What types of economic considerations and consequences should be considered in an assessment of economic losses? For example: Potential losses (or savings) from a home or business being destroyed/severely damaged vice potential costs of repairing a home/business that is less damaged and able to be quickly rebuilt.
- 4) What role does community development and rebuilding policies and regulations serve in the assessment process?
- 5) What improvements are needed in tools to better assess the costs, benefits, effectiveness, priorities, and consequences of alternative risk assessment policies and strategies?

Synopsis. Twelve people attended the session concerning tradeoffs in making risk management decisions. A basic question that was addressed at the beginning by the moderator was "What is a trade-off?" The classical definition is two-fold: a balancing of factors all of which are not attainable at the same time and giving up one thing in return for another. The group noted that the following issues make the explicit process of making risk management decisions somewhat difficult: identifying all relevant factors that may be relevant to a decision, characterizing all relevant factors that may be vying for attention, and comparing those factors. It was noted that a number of factors clouded these questions. First is the timeframe of the decision. One may make very different decisions about managing the risk of a hazard in a 100-year timeframe as opposed to a 4-year frame. The geographic scale is the second factor. Global change may be

managed at a regional level, whereas floods may require management at a household level. Third is the distribution of costs and benefits. Releases of hazardous materials caused by flooding may have disproportional impacts on low income or minority households. The choice of alternatives to consider in risk management is the fourth factor. Until recently many mitigation options for reducing losses were not politically feasible. Finally, uncertainties make quantifying the tradeoffs difficult. For example, historical rainfall records may not be represented by a single probability distribution. Four major themes captured most of the session's discussions: status of risk assessment models, role of formal methods and models, how to conduct a national assessment, and when to conduct a national assessment.

Status of Risk Assessment Models. A central concern of the discussion group was the ability of risk assessment models to support decision making about investing in hazard reduction. It was noted that the nature of formal models differed greatly among hazards. Some models are primarily stochastic, while others are deterministic. This makes comparisons very challenging and perhaps misleading. In addition, uncertainties will vary markedly between models, further confounding the comparison issue. A second concern was model validation. There is no standard method to validate a model. How does one validate the results of a model? A variety of methods are used in science for validation of results. It was suggested that standardization is needed in order to compare model results. A third concern raised was that the scientific community does not even know what models exist and at what stage of development they are. Furthermore, the appropriate uses of alternative models is not really clear.

Role of Formal Methods/Models. A second point concerned whether or not formal models are needed for risk management. Considerable discussion ensued that centered on HAZUS. Some felt that formal models are necessary for good risk management. Others suggested that the process is more important and risk management decisions must be negotiated, as models cannot fully incorporate values and other non-comensurables. A related theme was the usefulness of formal models to state and local government. At present, there is a very poor understanding of how any model is used in risk management decision making. Moreover, the costs of obtaining data to use in the models (such as HAZUS) may restrict the use of the models. It was also noted that institutional barriers limited the use of models. Some politicians simply refuse to believe the results of models when they are non-intuitive or challenge a political position. Finally, the ability of models to capture non-quantifiable dimensions of risk tradeoffs was discussed. It is likely that formal methods will never satisfy critics over the difficult issues of valuing human life or making explicit changes in the quality of human life.

How to Conduct a National Assessment. A major issue, on risk management decision making, concerned scale and approach. On the one hand, the group concluded this was relevant to conducting a national risk assessment of natural hazards. It was suggested that the National Climate Change Impact Assessment might provide a useful model. On the other hand, it was noted what was meaningful for the nation may not be relevant for the neighborhood or the community. This argues for a different approach to risk management that begins with assessments at the local level.

When to Conduct a National Assessment. The final issue concerned when to conduct an assessment. Some argued that the current state of modeling precluded timely assessment and that it was premature to assess risks due to both model and data limitations. It may be a decade before adequate tools and data make an assessment worth conducting. A second and less vocal position was to conduct an assessment now. This would be valuable in identifying limitations and setting priorities for data collection or model development.

Recommendations.

- Establish a subcommittee to identify and assess the potential uses of risk assessment models for hazard management which would:
 - ▶ examine the data inputs needed to use the model and the information that is produced by the model,
 - ▶ assess the usefulness to risk management, and
 - ▶ develop validation guidelines;
- Develop a mechanism for disseminating information on local experiences with hazard risk management experiences;
- Work at both scales (global and local) at the same time by conducting a national assessment while conducting a carefully chosen set of localized assessments; and
- Conduct a relative risk assessment on a hazard by hazard basis to prioritize risk management policies.

Session 2B. How do we improve and/or change policies (private or government) regarding risk management to reduce the effects of natural disasters?

Moderator: Dr. Ben Wisner, Environmental Studies Program, Vice-chair, IGU Commission on Hazards and Risks and Vice-chair, Earthquakes and Megacities Initiative, Oberlin College

Rapporteur: Dr. Paula Davidson, Science Plans Branch, Office of Science and Technology, National Weather Service, NOAA

Questions Considered.

- 1) What are the roles of private industry and government? How do we enlist the support of interest groups; e.g., insurance industry, business development, and humanitarian groups?
- 2) Are there the necessary baseline vulnerability studies that could provide a measure of our success in decreasing risk? If not, what are the procedures necessary to complete them?

- 3) How do we improve program and budget coordination among federal and state agencies and non-government organizations? How do we factor-in risk assessment in agency budget requests?
- 4) Where should the U.S. be in 10 years in the use of risk management for mitigation of natural hazards? Is a national natural hazards risk assessment(s) part of this future?

Synopsis. The group began by identifying some long term value shifts necessary to underpin and provide the political saliency necessary for policy changes. These include: mainstreaming disaster risk reduction into routine planning, elevation of the importance of comprehensive planning, and

development of a consistent "culture of prevention." With notable exceptions, all three are largely missing in U.S. popular and political culture, especially at the local level.

In the spirit of a prologue, the group also acknowledged an interplay between "top down" policy changes and the demand for change that comes through the political process and marketplace from "the bottom up." Considerable time was spent identifying bottlenecks to effective planning, hence mitigation of hazard impacts, at local level. It was noted that most important land use and development decisions in this country are highly localized. At local level, the influence of groups, that benefit from even unwise land use decisions in the short run, is very strong. Much of the consideration of land use proposals is done by untrained volunteers. An example of how a political action may help promote mitigation is in the revision of the Stafford Act. It allows states to be reimbursed at a higher percentage of disaster recovery costs if the state has a comprehensive mitigation plan.

The group also discussed two more general changes necessary at the Federal level. The group felt that setting a good example by ensuring that all Federal property is disaster resistant and land use incorporates hazard mitigation and sustainability (e.g. some DOD housing is not disaster resistant) was important. One positive example mentioned was how, in the aftermath of the 1971 San Fernando Valley earthquake in California, all VA hospitals were inspected and made disaster resistant. Also necessary is to build greater appreciation of the perspective of business in matters of risk management on the part of government, and vice versa. Business and government need to understand one another's perspectives better.

Virtually all of the group's recommendations implied, in one way or another, the importance of full cost accounting of disaster losses. At the moment, not even all economic costs are accounted, let alone non-economic costs such as health effects, psychological impacts, and social consequences. Full cost accounting would be an important tool in motivating localities, businesses, and other entities and jurisdictions to invest in mitigation. It was noted that, even though some costs of disaster are not quantifiable, they are real and should be included and taken seriously (e.g. some social and psychological costs). Better assessment of the baseline situation as

regards community economic development, health, and social integrity at the local level would also help assess total costs of natural hazard impacts.

Recommendations.

- Encourage government development of incentives for comprehensive planning at local level;
- Develop all-hazard insurance by government and/or private industry;
- Encourage enforcement of building codes;
- Improve data availability (especially private sector insurance data, possibly in a pooled form) for planning;
- Improve knowledge and information dissemination to the local level (for example the use of scenarios);
- Set a good example by ensuring that all Federal property is disaster resistant and land use incorporates hazard mitigation and sustainability (e.g. some DOD housing is not disaster resistant); and
- Build greater appreciation of the perspective of business in matters of risk management (business and government).

Session 2C. Risk Management and Public Perception of Vulnerabilities: How do we build the public's awareness of risks and their vulnerabilities so that mitigation efforts will provide the maximum benefits?

Moderator: Dr. Betty Hearn Morrow, Director, Lab for Social and Behavioral Research, International Hurricane Center, and Professor, Department of Sociology and Anthropology, Florida International University

Rapporteur: Ms. Kathleen Gohn, U.S. Geological Survey

Questions Considered.

- 1) How can mitigation and response decisions be improved?
- 2) What methods would best communicate risks to the public?
- 3) What roles do the public and private sectors have in user outreach and education regarding risk management?
- 4) Does user outreach and education have an impact on the effectiveness of risk management? How do we use outreach and education to change cultural values?

Synopsis. The group discussed the general problem of achieving accurate public perception of risk, and the corollary, encouraging the acceptance of responsibility by individuals. Key points from the discussion include the following: communicating about risk, understanding of

probabilities, behavior in high stress situations, and goals and information needs.

Communication about risk requires knowing the audience, which includes determining what audience you wish most to communicate with. The public is not homogeneous; people have different backgrounds, perceptions, circumstances, and priorities. Any attempt to communicate with the public must reflect this diversity. Minorities, including ethnic populations, the elderly, and poorer segments of society, are especially at risk of being overlooked. Radio is a generally underused resource for communication, and is particularly valuable for reaching minority communities. In general, public television and radio are seen as reliable sources of unbiased information.

There is a general assumption that people don't understand low probability/high consequence events. This assumption may be untrue. They may well understand the probabilities, but have more urgent concerns, such as feeding or clothing themselves or their children. Perhaps there is inadequate understanding of the consequences. Financial constraints are not the only reason for making bad decisions. Vacation homes built on the coast are a decision that may impose burdens on the community. Even if the home is adequately insured, the community must pay to replace infrastructure, such as roads, when a coastal storm strikes.

There was an extended and unresolved discussion of whether people behave rationally or irrationally in high-stress situations. Clearly, the way an issue is framed will shape the response. What an observer perceives as an irrational decision may result from a rational assessment of information that the observer fails to recognize. This discussion re-emphasized the importance of knowing the audience's value systems and perceptions, which is critical to successful communication.

Some choices put individuals at risk; others put communities at risk. Similarly, there are two different goals of safety messages: to take personal action (such as fastening a seat belt and building a tornado safe room) and to support larger community actions (such as building codes and land use planning). Choices must be made about for whom and for what purpose one does mitigation, because resources are limited. We need better information on the effectiveness of various mitigation attempts and techniques and we need to celebrate successes.

Many cultural changes occurred in the past decades, attitudes toward seat belts, smoking, and motorcycle and bicycle helmets, for example. These changes in attitude took a long time, and many different approaches were used to reach different key audiences. A similar long-term multi-faceted effort will be needed to change public attitudes about natural disasters.

Recommendations for government and private sector roles.

- Land-use planning and other activities (helping spark awareness of hazards issues), for which benefits are long term, should continue to be the responsibility of government.
- Mitigating hazards, that may directly affect a business and educating their employees, should be the responsibility of companies. Charles Schwab, for example, has put significant effort into helping employees prepare their homes and communities for potential natural hazards.

- Partnerships between government and the private sector, like those in FEMA's Project Impact, are an excellent way to leverage resources and involve the community.
- Education of the private sector as to the value of mitigation and encouraging a more integrated approach in the private sector is needed.
- Systematic disclosure of structural vulnerability as part of real estate transactions (such as flood risk) should be instituted. This is already done in California for flood risk and proximity to fault zones.

Recommendations for encouraging people to take action.

- Consistent messages, supported by many credible sources, should include specifics on what you can do as well as general educational information about the risk.
- Two-way communication should be initiated, often through respected community leaders who must first understand the message and then facilitate the communication. However, one must be sure the leaders represent the full range of community groups. It's not enough to assume that the most vocal or those in positions of authority are the best avenue to reach a given group.
- Experimental, hands-on projects or graphic/visual demonstration will assist with understanding the problems.
- Recognition that actions can serve more than one goal should be promoted. For example, a homeowner is more likely to strengthen an interior bathroom or closet to serve as a tornado safe room than to build a separate structure. In parts of Florida, extra-strong window screens that act as hurricane shutters also provide more security against break-ins.
- Availability of models, templates, etc. that have been successfully used in one community and can be applied, with minor modifications, in other places must be promoted. For example, a property tax incentive for mitigation in Kauai has been posted on the city web site and could serve as a model for other localities.