RISK COMMUNICATION, LESSONS FROM NATURAL HAZARDS: AN ANNOTATED BIBLIOGRAPHY

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INTRODUCTION

Risk communication has come to be viewed as a critical step in a three component process: risk analysis, risk communication, and risk management. The goal of risk communication is to disseminate information in a way that allows people to make better judgments about risk exposure and avoidance. As a risk management concept, risk communication has evolved almost exclusively in relation to hazards associated with human technology. Yet, effective risk communication has been a priority goal in the field of natural hazards research and management for over three decades. Substantial experience with the process has developed under the guise of perception and awareness studies, educational materials, and prediction, warning, and evacuation programs. Hazard managers concerned with natural events have long practiced risk communication to wide and varied audiences.

The goal of this bibliography is to identify and encapsulate this knowledge in a way useful both to risk communicators struggling with new technological risks, as well as to risk managers concerned with natural hazards. For the most part, sources were derived from holdings at the Natural Hazards Research and Applications Information Center (NHRAIC)*. Each of the 216 entries includes 1) a citation number and publication information, 2) an annotation or edited version of the author's abstract or conclusions, and 3) a set of key words. The bibliography is divided into eight chapters: 1) General Discussion; 2) Reviews, along with other bibliographies; 3) Predictions and Warnings; 4) Probabilities; 5) Education and Awareness Programs, together with materials and analyses of particular programs; 6) Media Studies; 7) Special Populations; and 8) Case Studies.

Placement of entries in these categories is somewhat arbitrary and many could fit into several different sections. The reader, therefore, should make use of the author and subject indexes to gain the most benefit from the bibliography. Although of value to researchers, this compilation was created with the practitioner in mind. While entries have been selected from a large body of work, to provide some guidance on the relative usefulness of entries a single rating system is used: *** are those publications with which every risk communicator should be familar, and ** are key works of interest to those looking for more comprehensive knowledge.

Contributions to risk communication have occurred in a number of areas. Especially valuable are studies and examples on the use of predictions, the issuance of and response to warnings, and the development of a diverse array of educational and awareness

materials. Other investigations on the utilization of probabilities to explain risk levels and the reporting of risk to different ethnic, social, and economic groups have also furnished lessons and guidelines for risk communicators. Most of these "lessons" come from real world experiences of strategies and policies that resulted in varying degrees of success. Of special importance is the research and experience with earthquakes, hurricanes, and floods. More recently, materials and programs to communicate and mitigate geologic radon hazards have offered learning and application opportunities for risk managers.

At least four broad themes emerge from this collection of studies. Risk communicators must learn to 1) target, 2) research, 3) interact, and 4) specify. Not only should at-risk groups be targeted, but communication channels, education materials, timing, legislators, and other elements that can directly or indirectly influence the effectiveness of information flow and acceptance must also be identified. In like manner, successful targeting requires research into the perceptions, needs, and social characteristics of all involved. Risk communication should also be a reciprocal process of interaction between information disseminators, decision makers, and local people. Interaction often results in higher manager credibility, increased hazard salience, two way learning, and frequent revision of plans. Finally, it is important to specify program goals, rationale, physical features, and desired actions. Ambiguity results in exaggeration and/or inappropriate and unpredictable behavior. These and other lessons useful to risk communicators are contained in this bibliography.

This study would not have been possible without the help of others. The United States Environmental Protection Agency contributed initial funding for the project. William Riebsame, NHRAIC Director, provided guidance and encouragement, and David Morton, NHRAIC librarian, helped gather and select sources to be annotated. Wendy Haubert did most of the data entry, and David Butler assisted in computer logistics and printing.

*The Natural Hazards Research and Applications Information Center at the University of Colorado, Boulder acts as a national clearinghouse of information on impacts and response to natural hazards. It is funded by a consortium of federal agencies, including the National Science Foundation, U.S. Geological Survey, National Oceanic and Atmospheric Administration, Federal Emergency Management Agency, Environmental Protection Agency, Army Corps of Engineers, National Institutes of Mental Health, and the Tennessee Valley Authority.

GENERAL DISCUSSION

1**
Anderson, William A. 1978. Some Factors to Consider in Communicating Information on Earthquake Hazards Reduction. In Walter W. Hays (ed), Proceedings of Conference V, Communicating Earthquake Hazard Reduction Information, pp. 372-379. United States Department of Interior, Geological Survey Open File Report 78-933.

This paper reviews the National Science Foundation's (NSF) involvement in earthquake risk communication. NSF encourages the consideration of the following factors when establishing programs to disseminate information: 1) Two way communication between producers and users is desirable; 2) user groups vary in their information needs; 3) users require opportunities to update their skills; 4) transmission of information should incorporate several channels and formats; and 5) dissemination programs should undergo periodic evaluation to determine usefulness and possible improvements.

KW: General discussion, earthquake, dissemination.

2
Andrews, Richard. 1982. Lessons From Seismic Safety Planning in California. In Walter W. Hays (ed), Proceedings of Conference XV, A Workshop on "Preparing for and Responding to a Damaging Earthquake in the Eastern United States", pp. 106-123. United States Dept. of Interior, Geological Survey Open File Report 82-220.

California's experiences in seismic safety planning are discussed in three areas: hazard awareness and public information, public sector participation, and intergovernmental relations and cooperation. Drawing upon work by practitioners and researchers in California and those involved in the Southern California Earthquake Preparedness Project (SCEPP) this paper summarizes lessons in the above listed areas that might be relevant to the eastern U.S. Some of the suggested approaches for improving the state of earthquake preparedness through public sector participation include: 1) ally proposals with other desirable social goals; 2) involve affected parties as active participants in the planning process; 3) gain popular support, which will foster more attention to seismic matters by officials; and 4) provide technical assistance to local entities.

KW: General Discussion, earthquake.

3
Atkisson, Arthur A. and William J. Petak. 1982. The Politics of Community Seismic Safety. In Walter W. Hays (ed), Proceedings of Conference XV, A Workshop on "Preparing for and Responding to a Damaging Earthquake in the Eastern United States", pp. 92-105. United States Dept. of Interior, Geological Survey Open File Report 82-220.

Mitigating the effects of future earthquakes must ultimately consider the political variables which can influence activities during pre- and post-disaster periods. Impediments to desirable seismic safety action include: 1) other contemporary problems appear to be more important; 2) there may be an absence of earthquake-oriented political constituencies; 3) "inside" advocates may be lacking; 4) problems in communicating complexity and uncertainty; 5) the cost of problem-solving policies; 6) issues of fact and value; and 7) inadequate preparation for timely political activity. The author suggests that planners discuss technical issues before problem-solving proposals are submitted to legislative bodies. Model legislation and action programs should be ready before an earthquake occurs. Constituent groups should be formed and/or educated. Then get the constituent organizations to identify and cultivate individual legislators for support of seismic safety legislation.

KW: General discussion, legislation/regulation, public policy, earthquake.

4
Barton, A.H. 1969. Communities in Disaster: A Sociological Analysis of Collective Stress Situations. Garden City, NY: Doubleday and Company, Inc. 352 pp.

This study summarizes and codifies existing knowledge about social responses to disaster. Discussion of risk communication related techniques and processes can be found throughout the study (i.e. pp. 163-171). Cooperation between organizations is not easily facilitated during a disaster, where each organization tends to give priority to its own communication outlet. Prior planning, either of specific cooperative relationships or for a general local communications center should be encouraged.

KW: General discussion, emergency communications, individual response, group response.

5
Bates, Thomas F. 1979. Transferring Earth Science Information to Decisionmakers: Problems and Opportunities as Experienced by the USGS. United States Dept. of Interior, Geological Survey, USGS Circular 813. 30 pp.

The USGS's concern with an expanding need to enlarge its traditional style and format of public communications led to the establishment, in 1975, of the Land Information and Analysis Office (LIA), where experimental programs could be carried out to develop new methods of information transfer. Following a general discussion of USGS activities in land use planning, the report examines various programs and projects administered by the LIA. Experience gained from these programs suggest that: 1) the earth scientist must be able to view a problem from the decision maker's perspective to facilitate development of useful information; and 2) consultation and follow-up contact is necessary until the use by planners and decision makers of a particular kind of earth science information becomes a regularly accepted practice. Furthermore, areas throughout the nation which have an urgent need for this type of information -- such as flood plains, earthquake zones, shrink-swell soils, etc. -- must be identified and these needs must be continuously reassessed.

KW: General Discussion, education and awareness programs.

6**
Browers, John. 1980. Some Thoughts on Communication. Disasters 4 (1): 22-26.

The author provides some thoughts on the problem of communicating ideas through visual materials to semi-literate and illiterate populations. Some of the suggestions to risk communicators on visual and verbal communications made by the author include: 1) representation should be realistic, using objects depicted as they would appear in real life; 2) objects are likely to be recognized by well-known 'clues', which should therefore be clearly visible; 3) exclude irrelevant and distracting background detail; 4) where possible show the entire person or object, not just part; 5) avoid overlap in drawings; 6) conventions of perspective are not generally perceived, e.g., converging lines will not convey distance; 7) sophisticated literate symbols (e.g., exclamation marks, crosses, arrows, etc.) are likely to be meaningless or to be interpreted literally; 8) size of objects can best be indicated by including a familiar object on the same plane; 9) attempts to portray motion are unlikely to be understood; and 10) in writing for semi-literate people use short, simple sentences that contain concrete nouns and active verbs.

KW: General discussion, message content, effectiveness.

7
Chartrand, Robert L. 1985. Information Technology Utilization in Emergency Management. Washington, DC: Congressional Research Service, Library of Congress. 97 pp.

The crucial role of information technologies--computers, telecommunications, multi-sensor collection systems, audio and video configurations--in anticipating or coping with emergency situations is a subject of heightened focus on the contemporary scene, both in the public and private sectors. This report features illustrative technology supported systems which perform planning and response functions within a context of new issues and recent initiatives to improve the national posture. A section on information technology and its application to selected disasters (hurricanes, earthquakes, floods, volcanoes) should be of special interest to risk communicators.

KW: General discussion, message channel, emergency communication.

8
Cullen, Janet M. 1980. The Role of Mental Attitudes in Personal Hazard Awareness and Response to Earthquake Predictions. In Walter W. Hays (ed). Proceedings of Conference XII, Earthquake Prediction Information, pp. 289-306. United States Dept. of Interior, Geological Survey Open File Report 80-843.

This paper provides important cues that risk communicators should heed in developing a communication program and determining the target audience. Anxiety reduction is seen as a fundamental law of human behavior. If information is perceived as threatening, this arouses anxiety, which in turn must be reduced if the individual is to stay physically and emotionally healthy. The resulting anxiety-reducing behavior may be either positive or negative. There are key personality factors which can affect positive or negative adjustment to a hazard. Likewise different forms of information will prepare people with diverse personality characteristics. For example, people that are confident, capable, and courageous will have or gain access to media, libraries, education, public meetings, etc. and will more likely develop personal preparedness plans based on facts, reliable opinions, and personal needs. On the other hand, those who feel incapable, inadequate, or inferior are likely to accept what is told to them by a recognized authority figure, or if that is not available, they will examine and accept only that which fits into a rigid structure.

KW: General discussion, receiver perception, individual response.

9
Earthquake Engineering Research Institute (EERI). 1986. Reducing Earthquake Hazards: Lessons Learned from Earthquakes. Publication No. 8602. El Cerrito, California: EERI. 208 pp.

While this publication only peripherally deals with risk communication, the study does list some lessons learned from

earthquake experiences that may be of interest to the risk communicator. Precursory phenomena, such as foreshocks or predictions, increase public awareness and can lead to public action that could reduce losses and enhance preparedness. Public awareness of the earthquake hazard may increase because of personal experience with earthquakes, public education, and public information; however, the effect of education and information on public action has not yet been established for the general public. There is a dramatic need for information following a disaster, and people seek it from a myriad of sources. The media, by focusing on "newsworthy" cases of severe physical damage or destruction, can overemphasize the extent and type of earthquake effects. The educational function of media information during earthquake emergencies is usually late in coming and, when it does, is sporadic.

KW: General discussion, earthquake, effectiveness.

10**
Gastel, B. 1983. Presenting Science to the Public. ISI Press. 146 pp.

This book provides a general overview of approaches to communicating scientific principles, findings, and questions to the public. It is a "how to" book that addresses: dealing with the news media, managing a media interview, recognizing the different limitations and biases of alternative channels (eg., radio, newspaper, magazine), writing informational material, and making oral presentations. Unfortunately, it only obliquely touches on communicating scientific uncertainty and risks.

KW: General discussion, source credibility, message content, dissemination.

11
Golden, Joseph H. 1984. On the Role of the Private Sector in Disseminating Hurricane Forecasts and Warnings. Bulletin of the American Meteorological Society 65 (9): 972-980.

This paper is a review of a joint panel session of the 15th Technical Conference on Hurricanes and Tropical Meteorology and the Third Technical Conference on Meteorology of the Coastal Zone, held in Miami, Florida, in 1984. A group of professional meteorologists (including E.J. Baker, Neil Frank, J.R. Hope, Joel Myers, and R.H. Simpson) were asked to debate several issues related to private as opposed to government issuance of hurricane information. Major topics of discussion included hurricane information dissemination, conflicting information types, NWS services, and whether a new standardized, improved evaluation procedure for all watches and warnings should be developed.

KW: General discussion, prediction/warning, hurricane.

12
Gori, Paula L. and Walter W. Hays (eds). 1983. Proceedings of Conference XVIII, A Workshop on "Continuing Actions to Reduce Losses from Earthquakes in the Mississippi Valley Area". United States Dept. of Interior, Geological Survey Open File Report 83-157.

Included in this workshop proceeding is a section on suggested approaches to achieve implementation of earthquake hazard reduction measures. The 67 page section contains 15 short papers by noted authors on the following six topics: 1) what can be realistically achieved with regard to earthquake-resistant design of new buildings and lifelines and the renovation of existing facilities; 2) how to gain the attention and commitment of business and industry; 3) how to gain the attention and commitment of the political leadership at the state and local levels; 4) how to gain the attention and commitment of public service organizations, volunteer agencies, and professional societies; 5) how to develop a targeted program of public education; and 6) what should be the role of the mass media in increasing the public's awareness of earthquake hazards in the Mississippi Valley area. The papers contain a plethora of helpful hints for risk communicators.

KW: General discussion, earthquake.

13
Gori, P.L., and W.W. Hays (eds). 1987. Proceedings of a Workshop on "The U.S. Geological Survey's Role in Hazards Warnings". United States Dept. of Interior, Geological Survey Open File Report 87-269.

The forward to this volume provides a valuable and concise statement of some of the problems of hazard communication via five myths of communication (attributed to Gilbert White). Myth 1: Mailing a report constitutes communication; Myth 2: There is a consistency between what people say and what they do; Myth 3: There is a general relationship between the provision of scientific information and what is done with the information; Myth 4: There is a general public or "the public"; Myth 5: Scientific assessment is the equivalent of a group assessment (or consensus).

KW: General discussion, public policy, individual response, group response, receiver perception.

14
Guha-Sapir, Debarati and Michael F. Lechat. 1986. Information Systems and Needs Assessment in Natural Disasters: an Approach for Better Disaster Relief Management. Disasters 10 (3): 232-237.

Risk communicators interested in development of their own data systems and the issue of information in disaster relief should find this article useful. The paper begins by establishing the need for planning and systematic organization in disaster action, in order to produce a long term effect on the vulnerability levels of communities. Information is introduced as a key element in any phase of disaster management. The different information needs are described by phases; information types and possible sources are briefly discussed. The authors state that the main issues to be considered by the scientific and policy-making community are: 1) the concept of a national and international disaster related health information system; 2) the recognition of necessary tools to develop such systems; 3) recommendations on technical co-operation at national and international levels; 4) development of training programs for information system personnel; and 5) strategies for disaster preparedness action integrated with on-going primary health care programs.

KW: General discussion.

15***
Hance, Billie Jo, Caron Chess, and Peter M. Sandman. 1988. Improving Dialogue with Communities: a Risk Communication Manual for Government. Trenton: New Jersey Department of Environmental Protection, Division of Science and Research. 83 pp.

Productive risk communication can help agencies to: 1) understand public perception and more easily predict community response to agency actions; 2) increase the effectiveness of risk management decisions by involving concerned publics; 3) improve interaction and reduce unwarranted tension between communities and agencies; 4) explain risks more adequately; and 5) alert communities to risk in productive ways. This manual is based largely on interviews with government officials, industry representatives, academic experts, and others, and is meant to provide guidelines for planning and undertaking effective environmental health risk communications. The study is divided into chapters on: How Communities See Risk; Earning Trust and Credibility; Deciding When to Release Information; Interacting with the Community; and Explaining Risk. This is a highly useful guide for communicating risk associated with both natural and technological hazards and is a must for any risk communicator's library.

KW: General discussion, radon, message source, source credibility, effectiveness, uncertainty.

16**
Hays, Walter W. 1978. Communicating Earthquake Hazard Reduction Information. In Walter W. Hays (ed), Proceedings of Conference V, Communicating Earthquake Hazard Reduction Information, pp. 1-14. United States Dept. of Interior, Geological Survey Open File Report 78-933.

This paper is a review and summary of the 5th conference proceedings of the National Earthquake Hazards Reduction Program. A number of earthquake related issues are addressed from around the United States. Participants identified lessons learned through experience and recommendations for productive risk communication. Some of the more general categories of recommendations suggested were: 1) be prepared to take advantage of triggering events to maximize effectiveness; 2) key communication activities to enabling legislation; 3) develop staff capabilities for communication; 4) carefully develop the message to be communicated by agency personnel; 5) promote interfaces with decision makers, user groups, and the public; 6) define programs that lead to optimal communication of the message; 7) develop education processes that can achieve both current and long range goals; 8) use legal liability potential to improve the communication process; 9) be innovative; and 10) cultivate effective methods of utilizing the media.

KW: General discussion, earthquake, landslide, liquefaction, effectiveness.

17***
Holt, J. 1980. Some Observations on Communication with Non-Literate Communities. Disasters 4 (1): 19-21.

This brief paper presents some of the issues and problems of communication with non-literate communities. It is common for educators to try to simplify their language for non-literate groups, but instead of just leaving out unneeded jargon, the educator will simplify the message as though the audience were children. This can quickly take on the appearence of a form of racism. Likewise, the waving of a book or printed material to a non-literate audience does little good. Maps and diagrams, on the other hand, can be useful if the educator confines him/herself to a representation of familiar spatial relations in two dimensions. Pictures and photographs should also be limited to local objects, dress, and colors rather than unfamiliar items. Excessive detail and unfamiliar markings can detract and confuse local people. Visual aids have been the dominant method used in communication, but it is important to remember that this may not always be the most effective form of communication in different cultures.

KW: General discussion, receiver perception, effectiveness, group response.

18**
Kaplan, Howard. 1978. How to Improve Communication on Earthquake Hazard Reduction. In Walter W. Hays (ed), Proceedings of Conference V. Communicating Earthquake Hazard Reduction Information, pp. 422-426. United States Department of the Interior, Geological Survey Open File Report 78-933.

This is a quick report on "what to do and what not to do" when communicating earthquake risk information to the general public. Keep in mind that you are usually attempting to send information to people that do not have extensive scientific background. It is essential to be completely honest, and do not "fake it". Misrepresentation is the quickest way to lose credibility. Own up to any errors you made as quickly as possible. Establish lines of communication before an emergency happens and determine which of these are most effective. Learn what the public wants. Be understanding of reporters and do not consider them adversaries. Finally, don't use labels or "glittering generalities" - play the straight scientist.

KW: General discussion, earthquake, message content.

19***
Kasperson, Roger E. 1986. Six Propositions on Public Participation and Their Relevance for Risk Communication. Risk Analysis 6 (3): 275 281.

Drawing upon societal experience with citizen participation, this article identifies how risk communication efforts may be effectively structured and implemented. Six major propositions address such themes as means/ends differences in expectations, the timing of the program, the role of credibility and trust, the need for technical and analytical resources, differing thresholds of public involvement, and limitations upon current understandings. A number of key conclusions are reached. Public consideration of risk occurs in a context consisting of multiple sources and channels of information, peer groups and other ongoing social issues. Improved understanding is needed of the social dynamics of risk consideration in the context of actual controversies and community processes. Risk communication is often a vehicle of conflict which community groups seek to create resources with which to bargain in risk management decisions. Improved understanding is needed as to effective ways to communicate in a timely manner while minimizing potential errors of conflicting information. There is a need to develop different communication packages and strategies to reach the attention and provide assistance to different social groups. A successful risk communication program depends on the development of indigenous technical capability to deal with problems and institutional means by which the public can act on the enlarged information. Innovative programs are needed to achieve short-run informing of

the public coupled with long-run strategies aimed at recovering social trust. Public participation efforts should employ a wide range of methods.

KW: General discussion, public input, effectiveness.

20
Meltsner, Arnold J. 1979. Communications of Scientific Information to the Wider Public: the Case of Seismology in California. Minerva--A Review of Science, Learning, and Policy 17 (3): 331-354.

The problem of transmitting scientific information--or what passes for scientific information--to managers and the general public is the topic of this paper. The author criticizes: the media, who have often suppressed valid information by simply omitting it; scientists who take their rhetoric and exaggerations too seriously; politicians who distort or suppress information for the enhancement of their own economic or power status; and the federal government, whose initial interest on funding seismological research was stimulated far more by its desire to detect nuclear explosions than by disinterested basic research.

KW: General discussion, earthquake, message source.

21
Morentz, James W. 1983. Information Technology in Rural Emergency Management. The Information Society 2 (2): 131-143.

Rural communities face a multitude of hazardous conditions--from blizzards, floods, droughts, and insect infestations caused by nature to hazardous material spills, transportation accidents and dam failures that result from human activities. Information technology offers to rural emergency managers potentially important tools with which to better plan, alert and respond to disasters. Three case studies are presented about uses of different technologies. The first is the use of a microcomputer in a rural Minnesota county to manage emergency resources, aid planning and other important tasks. In the second, cable TV is used as a two-way alerting link to fire, emergency medical and police systems. The third case involves the use of satellites to form a statewide communication system among emergency service offices. Each use of information technology clearly contributes to improved emergency management, but widespread application is necessary before the full impact of information technology in rural emergency management can be felt.

KW: General discussion, message channel.

22
Mazur, Allan. 1987. Putting Radon on the Public's Risk Agenda. Science, Technology, and Human Values 12 (3&4): 86-93.

This article traces the history of radon risk communication and the way the radon hazard came to the public's attention. While the mass media ultimately calls any issue to widespread notice, it is too simplistic to claim that the media brought the radon issue to public attention alone. In this case it was the Pennsylvania Department of Environmental Resources (DER) which through an expanded testing program brought the issue to the media's attention. Other factors converged in 1985 to make radon a national issue. These included new Environmental Protection Agency radon risk estimates, articles in the New York Times on the scope of the problem, and late 1984 interviews on national television.

KW: General discussion, radon.

23
Nigg, Joanne M. 1983. Increasing Hazard Awareness in the Southeast: Barriers and Recommendations. In Walter W. Hays and Paula L. Gori (eds), Proceedings of Conference XX, A Workshop on "The 1886 Charleston, South Carolina, Earthquake and Its Implications for Today", United States Dept. of Interior, Geological Survey Open File Report 83-843.

Major problems and recommendations that may be confronted in improving seismic hazard awareness in the Southeast are addressed in this paper. Probabilistic interpretations may be seen by the public that threat is negligible. Thus geoscientific information should be disseminated in an understandable language. While it is important to present "worst case" scenarios, lower magnitude events should also be communicated. Hazard awareness information should be coupled with suggestions about what individuals can do to lessen the risk to themselves and their families. In areas, such as the Southeast, unaccustomed to thinking about seismic safety, hazard awareness programs should be long-term. Both information and communication channels should be geared towards target groups. Realistic expectations of assistance during and after a disaster should be cultivated by local officials.

KW: General discussion, earthquake.

24
Nilson, Linda Burzotta, and Douglas C. Nilson. 1981. Resolving the "Sooner vs. Later" Controversy Surrounding the Public Announcement of Earthquake Predictions. Disasters 5 (4): 391-397.

This paper outlines the controversy surrounding the issue of prediction-announcement-timing, presents the advantages and disadvantages of each side, and proposes a possible solution to the timing question. The authors propose a timing policy which alerts the public in stages to an increasing likelihood of an earthquake, but reserves the actual prediction announcement until several days before the anticipated event. A color code scheme would be used: blue could represent the initial stage (below 40% probability); yellow would be more certain, 40-60% probability; and red would signal a short-term, high probability (greater than 60%) prediction. The authors believe that advantages of such a system include: 1) it forestalls public alarm; 2) it avoids delayed-announcement problems of information leaks, public suspicion, and needless losses of life and property; 3) it provides a more adaptive public response process; and 4) it furnishes officials and scientists with some resources to meet their responsibilities.

KW: General discussion, prediction/warning, earthquake, uncertainty.

25
Palm, Risa I. 1983. Improving Hazard Awareness. In Walter W. Hays and Paula L. Gori (eds), Proceedings of Conference XX, a Workshop on "the 1886 Charleston, South Carolina, Earthquake and Its Implications for Today", pp. 55-61. United States Department of the Interior, Geological Survey Open File Report 83-843.

This paper provides a brief review of elements that appear to be successful in communicating hazards information and may be applicable to Charleston. Information should be geared towards the residents' particular situation. Costs and benefits of adoption/non-adoption of the mitigation measured should be provided to residents, homeowners and others. Messages should be unambiguous and detail mitigation strategies. Information should come from a source the target group views as credible. Social reinforcement of the information is helpful.

KW: General discussion, earthquake.

26
Perkins, David M. 1974. Seismic Risk Maps. Earthquake Information Bulletin 6 (6): 10-15.

This article discusses the development of various forms of seismic risk maps. The needs of the insurance and engineering industries are discussed. A review of some of the problems with seismic maps advises that the map should: 1) by some principle, generalize from the historical record in order to suggest where earthquakes can happen in the future; and 2) display the geographic variation of a

parameter that is appropriate for a particular application. Seismological information needed by the insurance and engineering professions can be provided by determining either the rate at which certain selected intensities will be exceeded, or the probability that these intensities will be exceeded within a given time.

KW: General discussion, earthquake, probabilities, maps.

37***
Perry, R.W., and J.M. Nigg. 1985. Emergency Management Strategies for Communicating Hazard Information. Public Administration Review 45 (special issue): 72-77.

The purpose of this paper is to examine the process of communicating information to the public about environmental risks to increase the likelihood that citizens will adopt protective measures. Specifically, the article contains sections on agency credibility, viable communication systems and channels, the planning process, and message content. Developing agency credibility is an ongoing process that takes place during times of acute threat and during normal times. Communication systems, in part, must aim at allowing emergency authorities to get to know their community better and familiarize citizens with emergency response planning and operations. Competent emergency planning should encourage appropriate adoptive actions by both emergency service personnel and the public, which requires inter-organizational coordination, a proper communication system, and mutually agreed upon response priorities. Message content will differ depending upon whether the hazard agent constitutes clear and imminent danger or the information is part of a continuing educational effort.

KW: General discussion, message content, message channel, source credibility.

28
Perry, Ronald W., Marjorie R. Greene, and Michael K. Lindell. 1980. Enhancing Evacuation Warning Compliance: Suggestions for Emergency Planning. Disasters 4 (4): 433-449.

Four flood-stricken communities in the U.S. where evacuees were questioned regarding their evacuation experiences are used to examine the utility of several potential incentives for evacuation. Drawing upon past studies, the authors suggest several ways to improve, among other aspects, the communication process. Since evacuees often do not hear of evacuation shelters from warning messages and, when given an opportunity, people prefer to go to homes of friends and relatives, it may be useful to distribute evacuation information in threatened areas which

would describe advance safe areas and routes. Residents could also be encouraged to arrange shelter with friends and relatives. The establishment of "family message centers", where evacuees could obtain information on the whereabouts and condition of family members, could be included in evacuation shelter planning. Local communities should communicate to homeowners, businesses and others the general nature of plans to prevent looting in case of a disaster. This would expedite evacuation of those concerned about security measures.

KW: General discussion, flood, evacuation.

29
Quarantelli, E.L. 1984. Perceptions and Reactions to Emergency Warnings of Sudden Hazards. Ekistics 51 (309): 511-515.

This paper summarizes and highlights major findings regarding human response to disaster warnings of an immediate event and subsequent evacuation. The authors suggest that initial concern with warning message content is an inappropriate starting point. Instead, risk communicators should begin with examining the likely perceptual behavior of the target group. Second, warning message confirmation is done in the course of interactions with others. Thus, planners, risk communicators, and others must make the social process of confirmation central in developing how warnings of disasters should be handled. Finally, groups threatened by disaster do not passively wait to be guided by governmental or emergency organizations. Warning messages will be only one factor in the decision to evacuate.

KW: General discussion, group response.

30***
Quarantelli, E.L. and Verta Taylor. 1978. Warning in Disasters: Some Views on the Problem as Suggested by Sociological Research. Emergency Planning Digest 5 (3): 13-15.

The authors set forth, in a selective fashion, what sociological research has established about misconceptions as to disaster warnings and what such studies suggest as to untraditional ways of looking at the problem. Warnings should be thought of primarily as involving psychological functions and social structures. An adequate warning message is one which gradually prepares for action by providing various and multiple cues which are convincing about threat and at the same time presenting possible alternative actions to be considered that would be adaptive and available. Dissemination of and response to warnings are discussed. Risk communicators should find this short paper a helpful guide.

KW: General discussion, effectiveness, dissemination.

31**
Rubin, C.B. 1982. Disseminating Disaster-Related Information to Public and Private Users. Natural Hazards Working Paper #47. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 32 pp.

This paper briefly examines possible approaches to providing scientific knowledge and technical assistance to public and private institutions. Advantages and disadvantages of communication techniques surveyed include user needs identification, approaches to dissemination, and means of dissemination. Effectiveness of scientific and technical information transfer is determined in large part by recognizing and responding to user needs. An efficacious transfer mode will consider the user's pertinent characteristics and design all communications with those characteristics in mind.

KW: General discussion, dissemination.

32***
Ruch, Carlton E., and Larry B. Christensen. 1981. Hurricane Message Enhancement. Sea Grant College Program no. TAMU-SG-80-202. College Station, Texas: Texas A&M University. 143 pp.

Psychological experiments, as interpreted by statistical analysis, served as a foundation for constructing a hurricane response model. Subject areas under investigation included: 1) simulated hurricane variables; 2) influence of other coastal residents and authority figures; 3) the influence of television in depicting hurricane forces; and 4) the responses, particularly fear, which the information in current hurricane awareness materials engender. Several ways are identified whereby the mass media can enhance a warning message's effectiveness. They consist of: 1) a satellite photo showing the storm's actual magnitude; 2) persons without hurricane experience are best motivated by a respected authority figure; 3) whereas people with experience are best motivated by previous indicators that they associate with a serious storm threat; and 4) the media should establish a connection between hurricanes and hurricane spawned tornadoes.

KW: General discussion, hurricane, media studies.

33
Scanlon, Joseph, and Alan Frizzell. 1979. Old Theories Don't Apply: Implications of Communications in Crises. Disasters 3 (3): 315-319.

The authors suggest that the media is not an effective entity and instead of being essential or at least useful in disasters, the media is often either absent or dysfunctional. They note that

previous communications models have failed in their application to crisis situations. New theory will have to make greater allowance for situations in which mass communications occur without the media. Communications models will also need to incorporate overlapping of information and interacting and contradictory information patterns. The media needs to understand the initial problem of confusion during a disaster. Their information demands can harass overworked officials and tie up surviving communications systems. Inaccurate media reports may lead to unwanted responses and unnecessary inquiries. One possible way to avoid this may be to quickly provide information about what has not happened as well as what has happened.

KW: General discussion, media studies, message channel.

34**
Slovic, Paul. 1985. Informing and Educating the Public about Risk. Decision Research Report 85-5. Eugene, Oregon. 45 pp.

The objective of informing and educating the public about risk issues seems easy to attain in principle, but in practice may be difficult to accomplish. To be effective, risk communicators must recognize and overcome a number of obstacles that have their roots in the limitations of scientific risk assessment and the idiosyncracies of the human mind. Doing an adequate job of communicating means finding comprehensible ways of presenting complex technical material that is difficult to understand. The problem may not be insurmountable, however, if designers of risk information programs are sensitive to the difficulties.

KW: General discussion, receiver perception, probabilities, message channel.

35***
Sood, Rahul. 1982. Communicating for Improved Hazard Awareness. In T.F. Saarinen (ed), Perspectives on Increasing Hazard Awareness, pp. 97-129. Program on Environment and Behavior Monograph #35. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.

This chapter suggests ways in which communication principles and research findings can be used to create an awareness of natural hazard issues among residents of vulnerable communities. In order to create and sustain a realistic audience awareness of natural hazard issues and provide effective and feasible mitigation measures, three general approaches are suggested and discussed: 1) using the mass media to disseminate awareness messages and to provide news coverage of hazards; 2) conducting well-designed, on-going public information campaigns; and 3) involving members of vulnerable communities in the awareness effort. The paper

contains step by step procedures and strategies in communicating hazard and risk information.

KW: General discussion, media studies, message channel, dissemination.

36**
Sood, Rahul and Geoffrey Stockdale. 1985. A Model of Agency-Media Relations. Paper presented at the 35th Conference of the International Communication Association, Information Systems Division, Honolulu, Hawaii, May 24-28, 1985.

This paper attempts to develop a model of interactions between members of the media, public officials and the public in an emergent "disaster information system" (DIS). The model should explain "conflict" in DIS communication in a way that is comprehensible to emergency managers, providing them with prescriptive analyses. Limitations identified by the authors to the use of the DIS model include: the typical problem of extending theory into new contexts of inquiry; the lack of good "first hand" data; and the possibility that false inferences may have been made. The May 2, 1983 Coalinga, California earthquake is used to test the model.

KW: General discussion, earthquake.

37***
Stallings, Robert A. 1971. Communications in Natural Disasters. Disaster Research Center Report Series No. 10. Columbus, Ohio: Ohio State University. 53 pp.

Field data collected on a sample of 24 natural disasters in the United States from 1963 to 1970 are analyzed in a summary of communication processes and problems. Three kinds of communication structures are examined. Internal communication refers to message transmission between points within single organizations; interorganizational communication involves messages passing between two or more separate organizations; and public-to-organization communication refers to messages received by groups from a number of individual members of the general public. Comparatively speaking, problems created by informational convergence seem more easily resolved than difficulties in the areas of internal and interorganizational communications. It appears that problems of internal communication have greater saliency than those involved in communicating with other organizations. Both before and subsequent to involvement in crisis situations relatively more effort seems to focus on securing more and better communications hardware than on developing new social mechanisms.

KW: General discussion, message channel.

38***
United Nations. 1979. Disaster Prevention and Mitigation a Compendium of Current Knowledge, Volume 10, Public Information Aspects. New York: United Nations, Office of the United Nations Disaster Relief Coordinator. 142 pp.

This monograph overviews the problems associated with preparing and disseminating natural hazards information to the public. After a general discussion of disaster and public information needs, the functions of both governmental and non-governmental communication services are evaluated. The study also investigates the theory and practice of public information and the necessity of educating the public in disaster response. Once a specific need is identified, the mode of information dissemination is examined. Both technological and word-of-mouth modes are reviewed for usefulness while the effectiveness of message diffusion is evaluated. The study cites 20 areas for future research including: 1) a need to know more about how people communicate at the local level, and how to tap this "people's network"; 2) the role of the extended family and community communication networks; 3) the need for a standardized objective way of evaluating public information programs; and 4) how much of a barrier is mis-information and rumor in the transmission chain at the local level. This study provides an excellent starting point for practitioners and researchers interested in public information aspects of risk communication.

KW: General discussion, review, effectiveness, public input, education, dissemination.

39
United Nations. 1984. Disaster Prevention and Mitigation: a Compendium of Current Knowledge, Volume 11, Preparedness Aspects. Geneva: Office of the United Nations Disaster Relief Coordinator. 218 pp.

The purpose of the series of volumes, of which this study is one, is to provide the international community with a general review of existing knowledge of the causes and characteristics of those natural and other phenomena which can cause disasters, and of the measures which can be taken to reduce or eliminate their impact. This volume, in particular, contains information on current preparedness practices and provides more detailed sources of information which should be readily available to, or obtainable by, emergency planners. Risk communicators will find sections on communications; predictions, forecasts and warnings; public warnings and information; and training and education. Also, special measures for specific types of disasters are discussed.

KW: General discussion, preparedness, earthquake, flood, drought, volcano.

40
U.S. Federal Emergency Management Agency (FEMA). 1986. Disaster Assistance Programs, Making Mitigation Work: a Handbook for State Officials. FEMA/DAP-12. Washington, DC: FEMA. 121 pp.

Prepared for state officials who have been assigned the lead responsibility for coordinating hazard mitigation activities, this handbook presents pertinent information in a convenient and easily accessible format. Part I provides an overview of mitigation concepts and discusses the federal framework for mitigation policy, particularly through the special case of presidentially declared disasters. Part II consists of several chapters that examine how mitigative actions can be influenced by state agencies, local communities, and federal policies. Also included in this section is a chapter that identifies opportunities for creating public awareness and enlisting legislative support for natural hazard mitigation. Some of the suggestions for officials that risk communicators may be interested in include: 1) some form of "networking" is usually an essential element of state mitigation strategy; 2) utilize existing organizations for information assistance; 3) focus on mitigation measures that are relatively easy to adopt and administer, this can stimulate local interest; 4) be aware of FEMA resources; 5) develop the means for widespread information dissemination; 6) distribute a variety of printed materials on a regular basis to the public and key legislators; 7) involve the public media and know the reporters who cover environmental affairs; and 8) organize hazard awareness weeks.

KW: General discussion, education and awareness programs.

41**
Williams, Harry B. 1957. Some Functions of Communication in Crisis Behavior. Human Organization 16 (2): 15-19.

The author's analysis of communication functions in crisis is based upon the cybernetics concept of communication. In order to make choices to avoid, minimize, or remedy the consequences of a crisis, information is needed about: 1) the probability and characteristics of the crisis; 2) the fact that the crisis is at hand; 3) alternatives for action; 4) what had happened as a result of the crisis; and 5) why the event occurred. A number of working hypotheses are proposed by the author. They include: 1) information about a future possible threat, which has not been previously experienced, tends to have relatively low value; 2) recognition of the existence of crisis tends to follow an emergent or non-linear pattern; 3) information about survival choices is a

major determinant of behavior; 4) compelling pressure to act and a compressed time perspective lead to error; 5) sudden crisis creates great disparity between input from the environment and reference input; 6) the sector of life subject to reference input through institutionalized channels and sources is drastically reduced; 7) there is a considerable need for assistance in the communication and decision making processes; and 8) crisis and disaster events should be interpreted and re-integrated with the actor's value system.

KW: General discussion, individual response.

REVIEWS

42
Arnold, Christopher. 1982. Earthquake Disaster Prevention Planning in Japan. San Mateo, California: Building Systems Development, Inc. 85 pp.

This study was proposed to investigate the state of earthquake preparedness planning in Japan, since it was believed that the Japanese were more advanced in the area of earthquake preparedness. Japanese communication systems are highly technology based and centralized, centered on fire department control and operations centers. Computer retrieval of data is at an advanced level of application. Research, planning, and operations personnel work with a mutual exchange of information and professional interchange which is not found in the United States. The result is that research needs are more easily identified and there is immediate application of research findings. Many of the brochures that are published and distributed are in comic book form, which is familiar and attractive to both children and adults.

KW: Review, earthquake, preparedness.

43
Bay Area Earthquake Study, California Seismic Safety Commission. 1984. Earthquake Preparedness in the San Francisco Bay Region: An Inventory and Assessment of Current Programs and Activities and Recommendations for Future Comprehensive Earthquake Preparedness Projects. In cooperation with the Office of Emergency Services and the Department of Conservation, Division of Mines and Geology. 118 pp.

This study reviews current preparedness planning activities and results of interviews with local officials throughout the Bay Region. Much of the discussion revolves around risk communication issues. Among the major findings are: 1) levels of awareness and concern, as well as quality of local preparedness planning, vary significantly among local jurisdictions; 2) little use is made of existing regional information resources; and 3) local jurisdictions need technical assistance and guidance to formulate and implement plans, interpret geologic data, assess damage, identify hazards, and develop mitigation programs. Recommendations include: 1) creation of regional resource and information systems to support preparedness activities; 2) evaluation, adaption, and dissemination of existing products; 3) development and dissemination of guidelines and methodologies for earthquake hazard mitigation and post-earthquake recovery and

reconstruction planning; and 4) participation in a broad spectrum of public education and information efforts to increase public awareness of earthquake hazards, as well as improve public understanding of the need for more effective preparedness and hazard mitigation.

KW: Review, case studies, earthquake, preparedness.

44
Committee on Socioeconomic Effects of Earthquake Predictions. 1978. A Program of Studies on the Socioeconomic Effects of Earthquake Predictions. Washington, DC: National Academy of Sciences. 162 pp.

The purpose of this publication is to point out some of the possible consequences arising from earthquake predictions and to suggest the research necessary to anticipate and deal with them. Chapter 7, in particular, deals with the generation and dissemination of predictions. Some of the issues discussed and suggested for further research are: 1) perception of seismologists on whether to issue a prediction; 2) description of how mass media reports change during the entire cycle of prediction; and 3) examination of the structures and policies of news organizations and how they handle and affect information on predictions.

KW: Review, prediction/warning, earthquake.

45***
Covello, Vincent T., Detlof von Winterfeldt, and Paul Slovic. 1986. Risk Communication: a Review of the Literature. Risk Abstracts 3 (4): 171-182.

This review of both natural and technological hazards is organized into four general types of risk communication tasks according to the primary objective or intended effect of the communication. They consist of information and education, behavior change and protective action, disaster warnings and emergency information, and joint problem solving and conflict resolution. Some of the general conclusions drawn from the literature include: 1) the roots of most risk communication problems are deeply imbedded in broader social issues; 2) interactive and participatory approaches to risk communication appear to offer the greatest promise of better, less controversial, or less divisive decisions; 3) there is no such entity as "the public", instead, there are many publics; 4) choice of one communications strategy over another often requires a complex balancing of multiple, competing objectives; 5) government officials and individual citizens often hold different views of risk problems; and 6) a large amount of research has been conducted that bears on problems of risk

communication, but the literature specifically focused on risk communication is relatively small.

KW: Review, general discussion, message source, message channel, receiver perception.

46
Cronholm, Margareta and Rolf Sandell. 1987. Scientific Information - a Review of Research. In Lennart Sjoberg (ed), Risk and Society: Studies of Risk Generation and Reactions to Risk, pp. 219-236. London: Allen and Unwin.

This paper surveys research on how scientific information is spread to the general public. Topics discussed include the volume of scientific information in the mass media, the science journalist, the scientist, the audience, objectivity of scientific information, the language and effects of scientific information, scientific information and the environmental movement, and scientific information outside the mass media.

KW: Review, general discussion.

47
Friedman, Barbara et al. 1986. Mass Media and Disaster: Annotated Bibliography. Miscellaneous Report #36, Disaster Research Center, University of Delaware. 21 pp.

This bibliography of 50 annotations is meant to cover major works produced in the field of mass media and disasters. The document covers both technological and natural hazards, although the emphasis appears to be on the latter. Risk communicators may find this bibliography a useful supplement.

KW: Reviews, media studies.

48
Illinois Department of Transportation. 1980. Notifying Floodplain Residents: An Assessment of the Literature. Chicago: Illinois Dept. of Transportation, Division of Water Resources. 29 pp.

This study is a review of research and studies on warning and hazard advice, and trys to determine the success of different hazard mitigation strategies. An important conclusion is that one cannot assume that floodplain residents will respond to a warning any more that any other group at risk. The research implies that many programs which expect a positive response from people once they have been informed about what is good for them have failed. Some of the lessons learned include: 1) information should be

personalized; 2) data on hazard risk should be provided along with the costs and benefits of the damage mitigation adjustments; 3) messages must be clear and unambiguous; 4) information must clearly articulate the most desirable measures; 5) consideration should be given to the residents' perception of source credibility; 6) a program should encourage social reinforcement of information (ex. confirmation); 7) usually, it is desirable to use several different media for risk communication; 8) consideration should be given to the type of appeal, e.g. to what extent should the program emphasize fear or positive action; and 9) it is important to consider relevant attitudes, beliefs, and values of the recipients of messages.

KW: Review, general discussion, flood, message content, individual response.

49
Kindervater, A.D. 1984. Flash Flood, Flash Flood Forecasting and Warning Systems, a Partially Annotated Bibliography. Dartmouth, Nova Scotia: Water Planning and Management Branch, Inland Waters Directorate, Atlantic Region. 332 pp.

This partially annotated bibliography was developed on the basis of several sources of information, including computerized bibliographic data bases, journals, reference systems, conference proceedings, etc. Risk communicators will find a number of useful sources in this publication.

KW: Review, flood.

50
Mileti, Dennis S. 1975. Natural Hazard Warning Systems in the United States: a Research Assessment. Program on Technology, Environment and Man Monograph No. NSF-RA-E-75-013. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 97 pp.

Natural hazard warning systems are assessed from an integrated perspective which includes evaluation, dissemination and response. Fields in which new research would be most useful are: 1) social and psychological factors affecting public warning response; 2) organizational links in warning systems between the variety of groups and agencies which evaluate threat information and disseminate public warnings; and 3) means of encouraging integrated warning systems as part of preparedness programs.

KW: Review, prediction/warning.

51
Nigg, Joanne M. 1987. Communication and Behavior: Organizational and Individual Response to Warnings. In R.R. Dynes, B. De Marchi, and C. Pelanda (eds.), Sociology of Disasters: Contributions of Sociology to Disaster Research, pp. 103-117. Milano, Italy: Franco Angeli.

In the disaster literature, the role of communication has frequently been highlighted by researchers interested in explaining how both individuals and organizations respond during times of crisis. This paper reviews major communication issues addressed by researchers in the last 30 years and is especially interested in the formulation of "middle range" theories. Major paper headings include: organizational response to disaster threat individual response to disaster threat, and progress in the development of middle-range theories.

KW: Review, message content, source credibility.

52**
Regulska, Joanna. 1982. Public Awareness Programs for Natural Hazards. In T.F. Saarinen (ed), Perspectives on Increasing Hazard Awareness, Program on Environment and Behavior Monograph #35. Boulder, Colorado: Institute of Behavior Science, University of Colorado.

This chapter summarizes natural hazards awareness programs and the experience gained from them in order to improve the exchange of information and increase the effectiveness of future programs. Programs examined include those used for educating the general public, volunteers, weather spotters, and officials. School educational programs, national and state legislation, radio and TV announcements, printed media, and film and slide lectures are also discussed. One important conclusion is that more effort should be made to reach particularly vulnerable groups such as the elderly, mobile home owners, and students.

KW: Education and awareness programs, review, special populations, hurricane, earthquake, message channel, receiver perception, education, emergency communication, public policy, legislation/regulation.

53
Sims, John H. and Duane D. Baumann. 1983. Educational Programs and Human Response to Natural Hazards. Environment and Behavior 15 (2): 165-189.

That an individual is aware of the risk of a natural hazard and the range of damage mitigation measures is no guarantee that he or she will act on this information. Based on a review of the

literature, the available evidence is weak on the relationship between awareness or knowledge and the consequent adoption of damage mitigation measures. Although substantial sums of money are expended each year on natural hazards public information, little effort has focused on the cost-effectiveness of such programs. The effects of information on behavior change are summarized as: Information may lead to behavior change...under highly specified conditions...if properly executed...with specified targets. The research on warnings suggest that: 1) the warning must be clear; 2) the warning should convey the appropriate response; 3) the warning must be perceived as coming from a credible source; 4) the warning must be reinforced socially and at the local level; 5) the medium used to disseminate the warning is important; and 6) the type of appeal must be considered and assessed.

KW: Review, education.

54
Sorensen, John, and Dennis Mileti. 1987. Public Warning Needs. In Paula Gori and Walter Hays (eds), Proceedings of Conference XL, A Workshop on the U.S. Geological Survey's Role in Hazards Warning. United States Dept. of Interior, Geological Survey Open File Report 87-269.

In an attempt to explain variations in human response to emergency warnings, this article reviews the literature on public warnings. The article synthesizes and appraises other empirical findings, gaps in research, and implications for research and policy. A model of the causes and effects of public response to warnings of impending disasters is proposed. In the model, sender and receiver attributes are related to a process of confirmation, believe, understanding, personalize, and finally response (not necessarily in that order) to a hazard warning. The article provides an extensive list of references.

KW: Prediction/warning, general discussion, review, receiver perception.

55***
Southern California Earthquake Preparedness Project (SCEPP). 1982. Earthquake Public Information Materials: an Annotated Bibliography. Van Nuys, California: SCEPP. 47 pp.

One of the tasks of the SCEPP is to survey earthquake safety materials that are available to the public and to develop strategies to disseminate such materials. In order to accomplish this goal, a listing has been compiled of books, pamphlets, brochures, booklets, posters, and other materials that the public may obtain from a variety of sources. Materials were selected

that provide earthquake safety and survival information to a broad spectrum of the population rather than serving just the academic and scientific communities. Among the references are a number of brochures prepared by local governments and California public utility companies. The bibliography gives information about cost (many are free) and availability. A subject index graphically indicates materials dealing with specific topics.

KW: Review, education and awareness programs, earthquake.

56**
U.S. Federal Emergency Management Agency (FEMA). 1984. Perspectives on Hurricane Preparedness: Techniques in Use Today. FEMA. 48 pp.

Increasing public awareness of the enormous destructive capability of hurricanes is an important facet of FEMA's efforts to encourage newly arrived coastal inhabitants to start preparing for future storms. This monograph highlights the successful awareness efforts of various state and local governments, industry, and business in innovative hurricane awareness/education programs. Topics featured in the volume include local use of weather information for emergency planning in small coastal communities; educational programs for families and schools; obtaining and utilizing help from the private sector and volunteer organizations; and measuring public response to help improve a preparedness program already in existence. Risk communicators, coastal planners, and emergency personnel should find this thoughtfully conceived publication useful in developing or improving hazard preparedness and communication programs.

KW: Review, hurricane, preparedness, effectiveness.

57
Vogt, Barbara M., and John H. Sorensen. 1987. Evacuation in Emergencies: an Annotated Guide to Research. Report Number ORNL/TM-10277. Oakridge, Tennessee: Oak Ridge National Laboratory. 200 pp.

The purpose of this literature review was to explore the relevant sources of knowledge regarding evacuation related issues among recent work published in the social and emergency planning fields. Articles included in the review are mostly of a theoretical or empirical nature. Material is divided as to the emphasis placed on individual or group level of behavior. Findings are organized by hazard type including floods, hurricanes, tornadoes, volcanoes, tsunamis, nuclear power plants, hazardous material accidents, and nuclear crises. While many of the annotations are only of peripheral interest to risk communicators, the review nevertheless

provides an important source detailing issues related to evacuation behavior.

KW: Review, individual response, group response, evacuation.