RISK COMMUNICATION, LESSONS FROM NATURAL HAZARDS: AN ANNOTATED BIBLIOGRAPHY

Natural Hazards Research And Applications Information Center

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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.

58***
Anderson, William A. 1969. Disaster Warning and Communication Processes in Two Communities. Journal of Communication 19 (2): 92-104.

This often cited paper is based on a study of disaster warning in the communities of Crescent City, California and Hilo, Hawaii, both of which have had a history of tsunami threats and warnings. Disaster warning is viewed in the paper as a process consisting of a number of interrelated activities and procedures in which a variety of organizations and individuals become involved. The study indicates that local officials are responsible for evaluating incoming information concerning potentially disruptive environmental changes and for determining if a public warning is to be issued. Local officials may face problems of inadequate information on which to base critical decisions and the difficulty of maintaining public willingness to comply with requests for evacuation when there have been repeated alerts not followed by disaster. Although both communities in the study have undergone major tsunami disasters, the data show that this has been followed by significant change and improvement in warning procedures. These changes came about (especially in Hilo) largely because local officials received feedback from scientific experts and others regarding the kinds of improvements needed in the community's warning system.

KW: Prediction/warning, tsunami, evacuation.

59**
Blair, M.L. 1987. Response to a warning of volcanic hazards in Long Valley, California. In P.L. Gori and W.W. Hays (eds), Proceedings of a Workshop on the U.S. Geological Survey's Role in Hazard Warnings, pp. 105-120. United States Dept. of Interior, Geological Survey Open File Report 87-269.

This is a study yields valuable lessons in message content, source credibility, economic impact, timing, and the conflict between risk assessors and "potentially affected interests (PAIs)". One important conclusion was that despite very cautious wording of the message, it resulted in exaggerated public reaction and greater anxiety than the geologists anticipated or desired. Blair suggested that this is due to the ultimate message: that a catastrophe might occur.

KW: Prediction/warning, case studies, volcano, message source, message channel, message content, economic impact.

60
Clary, Mike. 1985. Hurricane Gloria--Were We Overwarned? Weatherwise (December): 296-303.

An analysis of the National Weather Service (NWS) forecasting and warning process before and during Hurricane Gloria is provided by the author. Much of the article revolves around an interview with National Hurricane Center director Neil Frank, who in three days gave 276 live interviews. The slow moving storm allowed the media to move equipment and personnel to predicted impact areas. Once there, they had to report, even though the storm's impact was much less than had been anticipated. The underlying theme of this article is whether the Weather Bureau had cried "wolf" once too often, thus affecting the credibility of NWS information.

KW: Prediction/warning, hurricane, source credibility, false alarm.

61
Compton, Andrew J. and John Sanders. 1984. Is It Time to Modernize the Hurricane Warning System? Proceedings of the 15th Conference on Hurricanes and Tropical Meteorology, pp. 545-548. Boston: American Meteorological Society.

This paper briefly reviews the current hurricane warning capability of the United States, and discusses major aspects of the current hurricane dilemma and recommendations for means by which the warning system could be improved in order to mitigate the possible occurrence of a hurricane disaster. The authors point out that recent evidence exists which shows the lack of public understanding of physical aspects of hurricanes, a low level of comprehension of hurricane warning terminology and appropriate precautionary actions, and an inability of individuals to assess the risks they face from an approaching storm. A hurricane warning system should be based upon both technical capability and knowledge of interrelated social factors.

KW: Prediction/warning, hurricane.

62
Gleck, James. January 27, 1985. They're Getting Better About Predicting the Weather (Even Though You Don't Believe it). New York Times Magazine, pp. 30-45.

This article examines weather forecasting programs in the United States and Europe. The author notes Americans' fascination with weather and the desire for information. During the last few decades enormous gains have been achieved in weather forecasting accuracy and timing. Yet what have been viewed as gains by the scientific community have often been perceived as an inability of

forecasters to adequately predict precise system movement, temperature changes, and precipitation amounts.

KW: Prediction/warning, severe storm, receiver perception.

63
Gordon, Ian E. and Neil Bestwick. 1969. Understanding Weather Forecasts. New Society 4:898-899.

The authors question whether the present form of BBC radio forecasts is the best method to put across the information. Some of the ways that forecasts could be improved include: 1) the order of information presentation should be changed to providing forecasts, first of local areas, then on to other larger regions; 2) if technical terms must be kept, then the approach should be more didactic; 3) many of the dynamic conversational phrases used by forecasters are often merely elegant variations, and they don't aid the rapid understanding and remembering of forecasts; 4) forecast areas should be smaller; 5) there are too many statements of uncertainty, express uncertainties in probabilities; and 6) don't use the present method of presenting pairs of centigrade and fahrenheit readings, use one or the other.

KW: Prediction/warning, receiver perception.

64
Hirose, Hirotada. 1986. The Psychological Impact of the Tokai Earthquake Prediction: Individual's Responses and the Mass Media's Coverage. Japanese Psychological Research 28 (2): 64-76.

To date, there are two regions where large earthquakes have been scientifically predicted on a long-term time scale: southern California and the Tokai district of Japan. Focusing on the Tokai earthquake prediction, the author carried out survey analyses of individual reactions and the mass media's coverage of this prediction in Shizuoka Prefecture, where the heaviest casualties are expected to be caused by the Tokai earthquake. The mass media relayed a large volume of information to the public. They also played a major role in strengthening public concern and anxiety. People in Shizuoka Prefecture are anxious about the possibility of the Tokai earthquake, and they are aware of the danger which the earthquake poses, but preparedness activity is fast approaching a plateau and is not expected to show any significant increases in the near future.

KW: Prediction/warning, media studies, earthquake.

65
Hutton, Janice R., Dennis S. Mileti, and John H. Sorensen. 1979. Factors Affecting Earthquake Warning-Dissemination System Effectiveness. International Symposium on Earthquake Prediction, UNESCO, Paris, April 2-6, 1979. SC-79/Conf. 801/Col. 14/VII-1.

The purpose of this paper is to recommend policy guidelines which will promote effectiveness in earthquake warning systems in the United States. The authors suggest that officials can be guided by the previous experience for those responsible for warnings of other natural hazards. Surveys were conducted of officials and families to determine credibility of sources and reputation of sources. The family survey provides findings that may be of interest to risk communicators. Persons with high occupational prestige and/or high incomes are likely to view the government as a credible source of advice. The young, old, minorities and persons with low incomes are likely to see private volunteer organizations as credible sources of advice. Persons of middle age and/or high incomes are likely to view federal agencies and scientists as credible sources of advice.

KW: Prediction/warning, earthquake, message source, source credibility, effectiveness.

66
Lachman, Roy, Maurice Tatsuoka, and William J. Bonk. 1961. Human Behavior During the Tsunami of May 1960. Science 133 (3462): 1405-1409.

On May 23, 1960, a tsunami hit the city of Hilo, Hawaii, killing 61 persons. In the wake of the disaster a study group was organized by the Hawaiian Academy of Science to examine subjective interpretations of the warnings and the resulting behavior. The authors found that formal education was not a determinant of whether or not an individual exhibited adaptive behavior in the form of evacuating or staying awake during the emergency. Previous experience played only a minor role in increasing adaptive behavior. The survey showed that those of Hawaiian race tended to evacuate. This could be related to an elaborate mythology pertaining to Hawaiian deities and geophysical events.

KW: Prediction/warning, tsunami, group response, evacuation.

67**
Leik, Robert K., T. Michael Carter, and John P. Clark. 1981. Community Response to Natural Hazard Warnings: Summary Final Report. University of Minnesota, Department of Sociology. Minneapolis, Minnesota. 77 pp.

The focus of this study is on processes which 1) govern the response of local emergency service agencies to warnings, 2) dictate dissemination of warnings from community service agencies to other community organizations and to the general public, and 3) influence public response to warnings. Recommendations that may be useful to risk communicators include: 1) reliable communication facilities by which hazard warning agencies can disseminate warnings to broadcast media and local emergency services is vital; 2) when possible communication facilities should be shared by a wide variety of government entities; 3) in regard to warnings, specific local areas should be identified, detailed response provided, and consistency in message content should be encouraged.

KW: Prediction/warning, flood, hurricane, message content, message channel, dissemination.

68
Mader, George G. 1986. Reactions to Volcanic Risk Information in Mammoth Lakes, California. Presentation made at the Hazards Research and Applications Workshop, July 21, 1986, Boulder, CO.

The author describes the flow of information and responses that followed the USGS issuance of a formal "notice" of a potential volcanic hazard for the Mammoth Lakes, California area on May 26, 1982. Positive effects of the notice were: 1) the notice got the attention of the audience; 2) USGS publications and workshops were instructive for public officials and members of the public; 3) an evacuation route was constructed; 4) emergency response plans were prepared; and 5) evidence suggests that land use planning has improved. Negative effects of the false prediction were: 1) the notice was released to the media before it was disseminated to public officials, putting officials on the defensive; 2) major and continuing coverage by the media probably exaggerated the hazard and led to excessive alarm for tourists; and 3) risk levels were and still are not well defined. As information was refined, officials were better prepared to deal with the threat and took positive actions.

KW: Prediction/warning, case studies, volcano, false alarm.

69**
Mader, George G., Martha L. Blair, and Robert A. Olson. 1987. Living with a Volcanic Threat: Response to Volcanic Hazards, Long Valley, California. Portola Valley, California: William Spangle & Associates. 105 pp.

This report on the USGS volcanic activity predictions of 1982 presents findings about emergency preparedness and land use regulations, as well as observations about the difficulties of

evaluating volcanic risk and the complexities inherent in communicating scientific information--especially uncertainties--to the public. The study concludes with a number of recommendations. A formal (in contrast to the current informal), official means for the USGS to convey to local entities information about low probability hazards is desirable. Supporting technical data should be accessible at the time a warning is issued. Guidelines should be developed on how local governments can define and understand low-probability, high-magnitude hazards. Typical risk calculations, such as deaths per million, are not in themselves adequate to communicate risk.

KW: Prediction/warning, case studies, volcano, economic impact, false alarm, source credibility, uncertainty.

70
McLuckie, Benjamin F. 1970. The Warning System in Disaster Situations: a Selective Analysis. Disaster Research Center Report # 9. Ohio State University. 69 pp.

In many ways warnings can be the most important phase of the disaster response. Warning is thought of not just in terms of mechanical devices but also in terms of psychological and sociological structures and processes. Warning is not only advance notification of the existence of danger but also information about what can be done to prevent, avoid or minimize the danger. The characteristics of the disaster agent affect the warning process. Before a warning message can be issued, threat data must be collected, collated, and evaluated. Drawing heavily from natural hazards, this report examines what is included in these processes. Multiple organizations are frequently involved in collecting data, thus it must be compiled. In order for the information to be useful it must be evaluated. The decision to warn and message dissemination are discussed. The response to warnings is also considered. Included among the factors influencing response are the socio-cultural framework, the historical setting, and the immediate ongoing social situation. The report concludes with a discussion of implications for nuclear catastrophe.

KW: Prediction/warning, dissemination.

71
McPherson, T.F. 1981. Notices, Watches and Warnings: An Appraisal of the USGS's Warning System with a Case Study from Kodiak, Alaska. Natural Hazard Research Working Paper #42. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 91 pp.

This paper analyzes the impact of a USGS advising of a potential landslide near Kodiak, Alaska in 1977. Procedures followed by the USGS alienated the community and drew criticism from a variety of sources. Citizens felt that the USGS had threatened Kodiak's economic development and well-being by issuing notification: 1) without providing complete information directly to the public; 2) without estimates of the extent of the risk or the probability of the landslide occurring; and 3) without suggestions as to what actions could be taken to reduce potential damage. A better method of communicating warning information to the public should be developed.

KW: Prediction/warning, landslide, message content, economic impact, public input.

72**
Mileti, Dennis S. and E.M. Beck. 1975. Communication in Crisis: Explaining Evacuation Symbolically. Communication Research 2 (1): 24-49.

The communication of messages of the impending impact of some natural disaster agent can play a key role in averting natural catastrophe. This paper examines the social processes involved in disaster warnings which function to elicit evacuation in such threat situations. These processes and the role of the mass media in forming situational definitions requisite for evacuation are examined in reference to data gathered from the June 9, 1972, flash flood that devastated a part of Rapid City, South Dakota. The data suggest that warning belief is more a function of the perceived certainty with which the warning is delivered and the confirmation of that warning, rather than how the warning is delivered. Time as a variable appears to be of central importance in explaining behavior elicited by warnings in predisaster settings. Before and during the flood, evacuation could have been maximized had more warnings been issued over the media. This would have fostered confirmation by voluntary and involuntary means. Thus evacuation seems to be a function of warning belief which appears, itself, to be a function of confirmation.

KW: Prediction/warning, flood, evacuation, individual response.

73**
Mileti, Dennis S., Janice R. Hutton, and John H. Sorensen. 1981. Earthquake Prediction Response and Options for Public Policy. Program on Technology, Environment and Man, Monograph # 31. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 152 pp.

Through examination of a number of earthquake predictions the authors attempt to: 1) review the range of possible decisions and

behavior elicited by a prediction; and 2) discuss policy options that will maximize the benefits of prediction while minimizing social and economic costs. Much of the discussion revolves around information-dissemination-response. It is especially important to improve methods of portraying images of damage and risk. Inaccurate images can arise from: 1) a tendency for people to deny that they themselves are at risk; 2) media attention and use of pictures and accounts of earthquake damage from other events, not applicable to the current prediction or quake; 3) past earthquake experiences or lack of experience in the population; and 4) conflicting damage maps for the predicted earthquake. The authors suggest that policy can be formulated on two issues to enhance accurate images of damage: 1) the timely issuance of maps and 2) earthquake damage information packages. Furthermore, information should be prepared in different ways so that different population groups all perceive the problem accurately. Likewise, the information should be presented or delivered in separate ways applicable to different people and decision makers, all of whom have varying levels of access to the information.

KW: Prediction/warning, earthquake, dissemination, maps.

74**
National Advisory Committee on Oceans and Atmosphere. 1972. The Agnes Floods: a Post-Audit of the Effectiveness of the Storm and Flood Warning System of the National Oceanic and Atmospheric Administration. Washington, DC: Government Printing Office. 35 pp.

Hurricane Agnes, which battered the eastern seaboard of the United States, is the topic of this study. The effectiveness of the storm and flood warning systems were found to have had a mixed performance. During Agnes, warnings were principally issued to select agencies and media. It was assumed that: 1) messages would be transmitted without being altered; 2) recipients would understand the messages; 3) proper response would occur; and 4) everyone concerned would receive the message. This did not occur in many areas affected by Agnes. The area of risk should be precisely defined. Effective linkage between federal, state and local programs is needed if appropriate individual response is to occur. Many people have difficulty distinguishing between a "watch" and a "warning".

KW: Prediction/warning, case studies, hurricane, flood, dissemination.

75
Nigg, Joanne. 1982. Awareness and Behavior: Public Response to Prediction Awareness. In T.F. Saarinen (ed), Perspectives on Increasing Hazard Awareness, pp. 70-94. Program on Environment and Behavior Monograph #35. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.

This chapter describes the relationship between the kinds of earthquake predictions (Jan. 1977 - Dec. 1978) that southern California residents remembered and the importance they attributed to earthquake preparedness actions both for themselves and the community. Predictions were categorized by source: scientific, general, pseudoscientific, or prophetic. The author found that while awareness of predictions and forecasts, earthquake fear, and the expectancy of a damaging quake within a year declined with time, no similar decline occurred in either personal preparedness or support for additional government preparedness planning. Futhermore, if false predictions are issued from legitimate scientific sources and are seen as credible, near predictions may ultimately have positive, long-term effects on both household and community preparedness.

KW: Case studies, prediction/warning, earthquake, message source, receiver perception, source credibility, false alarm, preparedness.

76**
Nigg, Joanne M. 1986. The Issuance of Earthquake "Predictions": Information Diffusion and Public Response. Paper presented at the Italy-U.S. Conference on Disasters, Disaster Research Center, University of Delaware, October 6-10, 1986. 32 pp.

The author reviews community response studies done by prediction and seismic planning researchers, identifies important policy issues, and discusses incentives for the implementation of relevant policy. The major problems to be overcome in issuing warnings relate to the media's involvement in information dissemination and formulation of effective messages. Watches actually present an opportunity for communities to decrease their exposure to risk in a planned, rational manner. A major problem is the communication of scientific information to decision makers in a fashion that will encourage them to include earthquake hazard mitigation measures in their planning. It is also difficult to maintain government and public interest in hazard reduction measures after the initial disclosure of the information.

Prediction/warning, earthquake, dissemination.

77
Ordono, Arg. Mario Soso. 1980. Communications and Joint Investigations Among Neighboring Countries. In Walter W. Hays (ed), Proceedings of Conference XII, Earthquake Prediction, pp. 165-168. United States Department of the Interior, Geological Survey Open File Report 80-843.

The author briefly discusses the impact of misinformation on individual response to a prediction in Mexico and the signing of a disaster-cooperation agreement between the U.S. and Mexico. One problem which can occur when a seismic prediction is made, is the tendency of many channels of information to augment and distort the news and often emphasize differences of opinion among scientists. This can result in distortion of the prediction to local people and officials. Direct participation of local authorities in the prediction process is vital. If this is not done rumors could result. In one earthquake prediction in Pinotepa Nacional, Oaxaca, misinformation and distortion resulted in the creation of rumors which ranged from the belief that atomic bombs had been placed at great depths to the notion that the government was going to build a bridge for evacuation and would need all the region's trucks.

KW: Prediction/warning, general discussion, earthquake, false alarm.

78
Pearson, Waverly. 1978. Effectiveness of the Earthquake Early Reporting Service of the USGS, NEIS. In Walter W. Hays (ed), Proceedings of Conference V, Communicating Earthquake Hazard Reduction Information, pp. 213-225. United States Dept. of Interior, Geological Survey Open File Report 78-933.

This report is in an easy to read outline format which briefly describes the National Earthquake Information Service's (NEIS) earthquake alerting service system and the communication channels that are commonly used. In dealing with domestic earthquakes lessons learned include: 1) an initial information release to the media should be accurate (e.g. location, magnitude, etc.); 2) avoid semantic confusion; 3) state the truth, but do not encourage panic; 4) involve local experts both in the problem and in resolving political controversies; and 5) successful communication usually involves notifying many people and agencies. NEIS's experience with foreign earthquakes suggests that: 1) the more information provided the more you will receive; 2) the State Department is the key to initial communication; and 3) foreign scientific counterparts are important to productive research.

KW: Prediction/Warning, education and awareness programs, earthquake, message channel.

79**
Penning-Rowsell, Edmund C. et al. 1983. Flood Warning Dissemination: an Evaluation of Some Current Practices in the Severn Trent Water Authority Area. Middlesex Polytechnic, Social Science Faculty, Flood Hazard Research Centre, Geography and Planning Paper #7. Queensway, Enfield, Middlesex, Great Britain. 186 pp.

Flood warning systems in Britain have developed capriciously and incrementally and reflect the different needs and characteristics of the affected areas and agencies. Study objectives were to examine the likely response of the public to warnings of impending floods; to examine the way in which that response may be modified by altering the content of the warning and the means in which it is given; and to make recommendations concerning the warning content and development of methods and procedures to maximize the effectiveness of public mitigation actions. Among the 53 recommendations are: 1) the general public should not be issued flood maps as part of a pre-flood public awareness campaign; 2) initial warning message formats should be standardized within areas responsible for warning dissemination; 3) police should be discouraged from using bullhorns except in extreme situations; and 4) probabilistic elements on flood warning messages should not be included merely to limit liability of those issuing the forecast for the accuracy of their work.

KW: Prediction/warning, dissemination, public policy, flood.

80
Perry, Ronald W. 1983. Population Evacuation in Volcanic Eruptions, Floods, and Nuclear Power Plant Accidents: Some Elementary Comparisons. Journal of Community Psychology 11 (1): 36-47.

This paper reports a comparative analysis of citizen evacuation response to three different types of environmental threats: a riverine flood, a volcanic eruption, and the nuclear reaction at Three Mile Island, Pennsylvania. While there have been numerous discussions in the theoretical literature regarding the extent to which human response to nuclear and non-nuclear threats are likely to be comparable, to date there have been no empirical studies of the phenomenon. It was found that citizen belief in real danger and warnings were most frequently cited by evacuees as reasons for leaving in all three disasters. Mass media warnings were infrequently cited as important reasons for evacuating, and social network contacts were relatively more important to evacuation decision making in the natural disasters than at Three Mile Island. For both the natural disasters and the nuclear accident, most citizens who did not evacuate chose not to do so because they did not believe that a real danger existed.

KW: Prediction/warning, flood, volcano, individual response, evacuation.

81
Perry, Ronald W. and Alvin H. Mushkatel. 1984. Disaster Management: Warning Response and Community Relocation. Westport: Quorum Books. 280 pp.

The authors address two common problems encountered by emergency services personnel. The first is the issue of the design and implementation of warning systems that will ensure public compliance with official directives. The second is the permanent relocation of families repeatedly threatened by hazards. The first part of the study pays particular attention to the problems of constructing warning messages, the citizen's interpretation of message content, techniques for delivering warning notices, and the management of evacuation of at risk populations. Administrative issues dealing with variations in compliance among ethnic groups are also noted.

KW: Prediction/warning, evacuation, flood, special populations, message content.

82
Pifer, Bob and H. Michael Mogil. 1978. NWS Hazardous Weather Terminology. Bulletin of the American Meteorological Society 59 (12): 1583-1588.

The hazardous weather terminology used by the National Weather Service (NWS) has slowly evolved since the beginning of the U.S. Weather Service in the 1800s. Use of the terms "watch" and "warning" has proved to be the most controversial aspect of the present warning system. Very little research has been conducted to determine if the public understands hazardous weather terminology. However, public surveys to date seem to indicate that the general public at least understands the difference between watch and warning. The authors believe that more surveys are needed in order to establish an optimum weather warning system.

KW: Prediction/warning, message content.

83
Rhinehart, Julian F. 1985. Effectiveness of Public Information Programs During 1983 Colorado River Flooding. In Flood Hazard Management in Government and the Private Sector: Proceedings of the 9th Annual Conference of the Association of State Floodplain Managers, April 29-May 3, 1985, New Orleans, pp. 35-42. Boulder, Colorado: NHRAIC Special Publication #12.

This short article describes the U.S. Bureau of Reclamation's handling of the 1983 flooding on the Colorado River. Late spring snows followed by a sudden heat wave, and full reservoirs combined to quickly push a slightly above average runoff forecast into a record runoff. Subsequent reservoir releases and resulting flooding raised questions regarding the quality of Bureau of Reclamation engineering and information personnel. Earlier programs to inform communities downstream from Lake Powell that a more normal flood regime would return after the reservoir was full met with only limited success. In early June of 1983 releases from Parker Dam were increased to damaging levels. Methods used by the Bureau to cope with the situation included: 1) Bureau personnel and engineers visiting the area and meeting with potential flood victims and media members; 2) providing technical information on releases, water levels, and protective measures; 3) media contacts were coordinated through the regional office rather than from the field; 4) toll-free 800 telephone lines were installed to provide a daily update of river conditions; and 5) public information personnel were encouraged to be both open and responsive.

KW: Prediction/warning, flood, source credibility, message channel.

84
Saarinen, T.F., and J.L. Sell. 1985. Warning and Response to the Mount St. Helen's Eruption. Albany: State University of New York. 240 pp.

A survey of first hand accounts of the May 1980 Mount St. Helen's eruption from officials in government and private industry, volunteer organizations, and others provides a unique overview of the problems and procedures involved in communications, planning, and dealing with a major disaster. Throughout the study the authors address the risk communication process. Information must be taken to those likely to be affected. Communicating information must occur before a major hazard takes place. When the event occurs it is too late to control activities and decide whom to warn. To avoid false rumors, information should be evaluated and provided to the public as quickly as possible. Hazard monitoring, assessment, and warning are "equivalent functions". A stable organization of trained public information officers who can combine geological knowledge with social science and communication is essential.

KW: Prediction/warning, case studies, volcano, mudflow, avalanche, message source, message content, message channel, emergency communication, evacuation.

85
Schware, Robert, and Douglas Lippoldt. 1982. An Examination of Community Flood Warning Systems: Are We Providing the Right Assistance? Disasters 6 (3): 195-201.

The technology transfer of flood warning systems offers great potential for reducing human losses and property damage in flood-prone regions. Much of this technology and methodology is readily transferable from developed countries and "appropriate" for developing countries. This paper examines some community folk warning systems in the United States that could be incorporated into a rational strategy for technology transfer. It discusses why official organized systems should not be relied on completely and how participation in and transfer of highly cost-effective and reliable community warning systems by development agencies could greatly benefit the people as well as the governments of developing countries.

KW: Prediction/warning, dissemination, effectiveness, flood.

86
Sorensen, John H., and Philip J. Gersmehl. 1980. Volcanic Hazard Warning Systems: Persistence and Transferability. Environmental Management 4 (2): 125-136.

This study examines the normative functions of the volcano warning system on the island of Hawaii. Several recommendations are offered for improving environmental hazard warning systems. An off-limits emergency operations center reduces confusion, helps to decrease conflict, and increases officious behavior by officials. One spokesperson reduces conflicting information, gives information flows between subsystems greater credibility, and reduces the likelihood of rumors. A data base of community organizations in high-risk areas could serve as an efficient method of communicating risk. A warning system can be improved if every time it is used a careful post-hazard audit of performance is carried out.

KW: Prediction/warning, volcano, message channel.

87**
Sorensen, John H., Janice R. Hutton, and Dennis S. Mileti. 1979. Institutional Management of Risk Information Following Earthquake Predictions. International Symposium on Earthquake Prediction, UNESCO, Paris, April 2-6, 1979. SC-79/Conf. 801/Col. 14/VI-10.

The authors attempt to examine the risk assessment activities which will follow a credible earthquake prediction. Four issues are addressed in the paper: 1) relationships between risk concepts, earthquakes, predictions and decisions; 2) types of risk

information that would be disseminated; 3) factors that shape the supply and demand for risk information; and 4) how risk assessment capabilities can be enhanced by governmental efforts. Problems that could result from a prediction include: 1) people will have different capabilities for identifying earthquake and prediction related risks; 2) people will not always understand the meanings of risk concepts such as earthquake probability, magnitude or intensity; 3) damage map style and information contents will have a strong influence on public perceptions and response; 4) detailed assessments of vulnerability and potential damages will be available following a prediction, unfortunately not all will be provided by a reputable source; and 5) because of education, employment, or other situational factors, some people and organizations will have easier access to information.

KW: Prediction/warning, earthquake, message source.

88
Turner, Ralph H. 1983. Waiting for Disaster: Changing Reactions to Earthquake Forecasts in Southern California. International Journal of Mass Emergencies and Disasters 1 (2): 307-334.

Several near earthquake predictions in 1976 initiated a period of waiting in Los Angeles County for a great and destructive earthquake. Hypothesized negative effects of an extended period of waiting under an open-ended threat of disaster include: 1) declining sense of urgency and vigilance; 2) disillusionment and disbelief; 3) accumulating anxiety and defensive denial of danger; and 4) resentment and scapegoating. Positive effects are hypothesized to include: 1) familiarization, appreciation, and sensitization; and 2) symbolic and active rehearsal of responses. Interviews with adult county residents over a period of nearly two years, followed by interviews after a moderate but nondestructive earthquake, provided measures of fear, imminent expectation for a damaging earthquake, household preparedness, confidence in scientific earthquake prediction capability, suspicion that information was being withheld, attitude toward releasing uncertain predictions, focus on scientific as compared with unscientific forecasts, and preferred media source of information on forecasts. These tend to disconfirm the disillusionment, denial and scapegoating hypotheses, to support reduced urgency and familiarization hypotheses, and to provide weak support for the rehearsal hypothesis.

KW: Prediction/warning, earthquake, message source, receiver perception.

89**
Turner, Ralph H., Joanne M. Nigg, Denise Heller Paz, and Barbara Shaw Young. 1976. Earthquake Threat: the Human Response in Southern California. Los Angeles, California: Institute for Social Science Research, University of California.

This report is a factual description of the public state of mind one year after the announcement of the southern California uplift. One of the more interesting sections in the study is on whether the public respects scientific predictions. The authors note that public appreciation of science and trust in scientists is especially important during earthquake predictions and warnings, because there are no generally accepted signs by which people can confirm an earthquake forecast through the testimony of their own senses. Two of the many findings/conclusions include: 1) there is a widespread belief in folk signs, suggesting that people feel that nature can be comprehended directly and personally, without appeal to an authority or to technical knowledge; and 2) respect for science and nonscience coexist in public thought. Thus, scientists must be prepared to deal constructively with a public that puts its faith overwhelmingly in science, but is not ready to pledge exclusive allegiance to science. However, the survey's findings conclude that there was no evidence that religion played a part in whatever resistance was found to the acceptance of scientific earthquake prediction.

KW: Prediction/warning, earthquake, message source, source credibility, uncertainty.

90***
Turner, Ralph H., Joanne M. Nigg, Denise Heller Paz, and Barbara Shaw Young. 1980-81. Community Response to Earthquake Threat in Southern California. Los Angeles, California: Institute for Social Science Research, University of California. (10 volumes).

This study examines public and media beliefs, concerns, and reactions to the 1976 USGS announcement of the southern California uplift (and subsequent near-prediction of an earthquake). The report is presented in 10 parts: Objectives and Utilization; the Media Response; the Organizational Response; Awareness and Concern in the Public; Action Response in the Public; Ethnic and Racial Differentials; Vulnerabilities Zones and Earthquake Subculture; Grass Roots Organization and Resistance; Change and Stability in the Public Response; and Conclusions, Problems, and Recommendations. Risk communicators will find the volumes on Media Response, Awareness and Concern in the Public, and Change and Stability in the Public Response especially useful. The study contains 59 recommendations.

KW: Prediction/warning, media studies, special populations, earthquake, message source, message content, message channel,

receiver perception, economic impact, source credibility, false alarms, uncertainty.

91
Wilkinson, Kenneth P. and Peggy J. Ross. 1970. Citizens' Responses to Warnings of Hurricane Camille. Social Science Research Center Report # 35, Mississippi State University. 60 pp.

Factors which influenced individuals to leave or to stay in the face of widespread and generally accurate official warnings during Hurricane Camille in 1969 are the topic of this paper. Interviews were completed with 384 respondents along the Mississippi coast. The study concluded that there were significant communications problems during the event. While nearly all respondents received the message that the storm was coming, there were substantial variations in message content and persuasiveness. These problems were also found in official advisories and bulletins. The state of prediction abilities and the uniqueness of the storm reduced the accuracy of early predictions. There was also concern as to whether a more personal persuasive message would be preferred over a coordinated, precise message using technical language.

KW: Prediction/warning, hurricane, message source, message content, individual response, effectiveness.

92***
Williams, Harry B. 1964. Human Factors in Warning-and-Response Systems. In G.H. Grosser, H. Wechsler and M. Greenblatt (eds), The Threat of Impending Disaster: Contributions to the Psychology of Stress, pp.79-104. Cambridge: MIT Press.

Through the use of studies of natural disasters and civil-defense false alarms, this paper uses a systems approach to examine the warning process. Clarity and specificity of information and instructions about the danger and mitigation of the hazard increase the probability of an effective warning. Prior experience, training, and/or practice among the populace and the presence of trained, organized leadership at the time of warning also add to warning effectiveness. When there is little time to take action after a warning is received, or when means are not available to disseminate instructions for action, the information about what to do must be in the hands of the population before the warning is given. People seek out and desire confirmation of a warning.

KW: Prediction/warning, flood, individual response, false alarm, effectiveness.

93***
World Meteorological Organization. 1983. Human Response to Tropical Cyclone Warnings and Their Content. Project #12. Geneva: World Meteorological Organization, Tropical Cyclone Programme.

Timely and accurate warning messages properly disseminated to the population at risk are ineffective if that population fails to respond in a meaningful way. Compiling official directives, exerts from government surveys, and research papers on human response to cyclone warning, this study is an important contribution to the field of risk communication. Detailed discussions and guidelines are provided for writing warning messages, message hierarchy, organization of message contents, style, specific wording, familiar landmarks, forecast accuracy, message frequency, personal context, sociological factors affecting message content, experience level, knowledge of storm structure, cultural consideration, and age.

KW: Prediction/warning, review, hurricane, message content, emergency communication, dissemination, effectiveness.

94
Budnitz, Robert J. 1984. External Initiators in Probabilistic Reactor Accident Analysis--Earthquakes, Fires, Floods, Winds. Risk Analysis 4 (4): 323-335.

This article discusses the methodologies presently available for analyzing the contribution of "external initiators" to overall risks in the context of PRA (Probabilistic risk assessment) of large commercial nuclear power reactors. The external initiators examined in this report are earthquakes, fires, floods, and wind. In general, uncertainties associated with the calculated risks from external initiators are much larger than those associated with internal initiators. The principal uncertainties lie with development of hazard curves. For assessment of earthquakes, internal fires and floods, and high winds, the methodology is reasonably mature for qualitative assessment but not quantitative application. Risks from other external initiators are generally considered to be low, either because of the very long recurrence time associated with the events or because the plants are judged to be well designed to withstand them.

KW: Probabilities, earthquake, fire, flood, wind, uncertainty.

95**
Carter, T. Michael. 1983. Probability of Hurricane/Tropical Storm Conditions: a User's Guide for Local Decision Making. U.S. Department of Commerce, NOAA. 25 pp.

This manual explains how the National Weather Service intends on using landfall probabilities in predicting hurricane movements along the Atlantic coast of the United States and how these probabilities are computed, how they should be interpreted, and how they can be most effectively utilized in decision making. The author notes a number of weaknesses in the use of probabilities. It is only in the last few hours (usually less than 24) before landfall that forecasts are accurate and consistent enough to provide decision makers with a sure guide for preparatory or evacuation actions. If long lead times are required for evacuation/preparedness, relatively low probability thresholds will have to be used. Thus, there must be a trade off between probabilities and time to accomplish actions. Furthermore, probabilities are not related to hurricane intensity. The article is geared towards decision makers and therefore does not discuss the dynamics of perception and acceptance of probabilities by the general public.

KW: Probabilities, hurricane, message content.

96***
Griffith, David A. 1984. The Issuance of Hurricane Probabilities as Effectuating Local Evacuation Management: Will They Help or Hurt? Proceedings of the 15th Technical Conference of Hurricane and Tropical Meteorology, p. 535-538. Boston: American Meteorological Society.

This paper describes the potential impacts of probabilities on the local management of hurricane evacuation by examining the interpretation of the probabilities from three different perspectives: 1) the general public; 2) local elected officials; and 3) local emergency managers. Basic elements are recommended for integration into a local decision-making guidance system. Issuance of probabilities and their utilization will only be successful if strong and comprehensive efforts are taken by the National Weather Service (NWS) and local and state emergency management agencies. The NWS must inform, educate, and train potential users of probabilities as to their uses and limitations. Local and state emergency management organizations should view the probabilities as pieces of quantitative information that must be incorporated into their individual decision systems. Finally, a strong and close coordinative link between NWS educational programs and local/state emergency managers' efforts must be maintained.

KW: Probabilities, hurricane.

97
Kaplan, Stanley. 1981. On the Method of Discrete Probability Distributions in Risk and Reliability Calculations--Application to Seismic Risk Assessment. Risk Analysis 1 (3): 189-196.

The author suggests that if the point of view is adopted that in calculations of real-world phenomena we almost invariably have significant uncertainty in the numerical values of our parameters, then in these calculations, numerical quantities should be replaced by probability distributions and mathematical operations between these quantities should be replaced by analogous operations between probability distributions. Also, Practical calculations one way or another always require discretization or truncation. Combining these two thoughts leads to a numerical approach to probabilistic calculations having great simplicity, power, and elegance. The philosophy and technique of this approach is described, some pitfalls are pointed out, and an application to seismic risk assessment is outlined.

KW: Probabilities, earthquake.

98
Murphy, Allan H. 1979. Probabilistic Temperature Forecasts: the Case for an Operational Program. Bulletin of the American Meteorological Society 60 (1): 12-19.

The case for an operational program involving the formulation and dissemination of probabilistic temperature forecasts is presented. First, the need for information concerning the uncertainty in temperature forecasts is discussed, and examples of formal and informal decision-making situations in which such information would be useful are described. The results of experiments on probabilistic temperature forecasting are then reviewed, and it is concluded that experienced weather forecasters can quantify the uncertainty inherent in temperature forecasts in a reliable and skillful manner. Finally, the essential components of an operational probabilistic temperature forecasting program are outlined, and some suggestions are made regarding specific temperature events (e.g. frost) that should receive probabilistic treatment on an operational basis.

KW: Probabilities, uncertainty, effectiveness.

99
Murphy, Allan H. and Robert L. Winkler. 1971. Forecasters and Probability Forecasts: the Responses to a Questionnaire. Bulletin of the American Meteorological Society 52 (3): 158-165.

This paper summarizes the responses of Travelers Weather Service forecasters to a questionnaire concerning probability forecasting. The survey was designed to elicit information from the forecasters relative to the process of precipitation probability forecasting, the relationship between judgments and forecasts, the effect of the definition of precipitation on the forecasts, the meaning of the forecasts, the effects of feedback and experience on the forecasts, and related matters. The responses to the questionnaire and subsequent discussions with Travelers Weather Service and National Weather forecasters suggest the presence of a number of "problems" related to probability forecasting.

KW: Probabilities.

100**
Murphy, Allan H. and Robert L. Winkler. 1971. Forecasters and Probability Forecasts: Some Current Problems. Bulletin of the American Meteorological Society 52 (4): 239-247.

Using responses from a questionnaire which was administered to forecasters actively involved in probability forecasting and subsequent discussions with the forecasters, the authors document a number of problems concerning probability forecasting. The

authors identify several of the more important problems, describe their nature, indicate some approaches and results which clarify certain aspects of the problems, and make some recommendations related to research studies and operational practices in probability forecasting. In particular, topics discussed include the formulation of judgments and the assessment process, the interpretation of probability forecasts, the occurrence of "hedging" by forecasters, and the evaluation of probability forecasts and forecasters.

KW: Probabilities.

101
Murphy, Allan H. and Robert L. Winkler. 1977. Probabilistic Tornado Forecasts: Some Experimental Results. In Preprint Volume: Tenth Conference on Severe Local Storms, October 18-21, 1977, pp. 403-449. Boston: American Meteorological Society.

It is generally agreed that forecasts expressed in probabilistic terms offer two advantages vis-a-vis traditional forecasts. First, this mode of expression provides forecasters with a means of quantitatively describing forecast uncertainty. Second, probabilistic forecasts provide users with valuable data for making rational decisions in uncertain situations. This paper describes some preliminary results of an experiment in which National Weather Service (NWS) forecasters at the National Severe Storms Forecast Center (NSSFC) expressed forecasts of tornado occurrence and intensity in probabilistic terms. Results indicate that the experiment was generally successful. The authors discuss possible areas of improvement.

KW: Probabilities, tornado.

102**
Murphy, Allan H. et al. 1980. Misinterpretations of Precipitation Probability Forecasts. Bulletin of the American Meteorological Society 61 (7): 695-701.

Previous studies have suggested that the general public misinterprets probability of precipitation (PoP) forecasts leading some meteorologists to argue that probabilities should not be included in public weather forecasts. Upon closer examination, these studies prove to be ambiguous with regard to the nature of the misunderstandings. If event misinterpretation is the source of the confusion, then elimination of the probabilities would not reduce the level of misunderstanding. The present paper summarizes a study of Eugene, Oregon residents, who completed a questionnaire designed to investigate their understanding of and attitude toward precipitation probability forecasts. Results indicate that both traditional and PoP forecasts were

misunderstood and misinterpreted. On the other hand, the probabilities themselves are well understood. Moreover, most respondents revealed a preference for the use of probabilities to express the uncertainty inherent in precipitation forecasts. The results of this study support the inclusion of probabilities in public forecasting of precipitation occurrence.

KW: Probabilities, receiver perception.

103**
Sheets, Robert C. 1985. The National Weather Service Hurricane Probability Program. Bulletin of the American Meteorological Society 66 (1): 4-13.

Historically the National Weather Service (NWS) has attempted to provide a minimum of 12 hours of daylight warning for coastal communities to prepare for a hurricane. However, recent studies have shown that in some instances and communities longer lead times are desirable. Furthermore, these watches are qualitative in nature where a need has been expressed for quantitative assessments of risk. In response to these concerns and needs the NWS initiated a program using probabilities to quantitatively assess the uncertainties in the forecast tracks of hurricanes. Probabilities were used along with regular advisories during the 1983 hurricane season. Optimum use of probabilities requires users to develop plans based upon their own needs. It is hoped that the program will aid in the perceived credibility of officials.

KW: Probabilities, hurricane.

104
Simpson, R.H., B. Hayden, Michael M. Garstang, and H.L. Massie. 1985. Timing of Hurricane Emergency Actions. Environmental Management 9 (1): 61-70.

Emergency actions to prepare for hurricanes often require more time than is available from official public warnings. This means that the preparedness official must decide not only what to do but when to do it. The action decision system, described in this article, was developed for use in Florida and reformats the hurricane track forecast, a 72 hour projection prepared at the National Hurricane Center in Miami. The system specifies the probability of a strike at each of 12 vulnerable coastal communities, and then normalizes the value in terms of a composite of probabilities computed for historic hurricanes that struck the respective communities. The system is founded upon individual hurricane climatologies and decision procedures that are tailored for use at each community. The action recommendations generated by the risk analyses with a 93% level of confidence relieve the

preparedness official of the need to make meteorological decisions in timing evacuations and other critical measures, even when these must begin before official hurricane warnings are received.

KW: Probabilities, Prediction/warning, hurricane.

105
Wallace, Robert E., James F. Davis, and Karen C. McNally. 1984. Terms for Expressing Earthquake Potential, Prediction, and Probability. Bulletin of the Seismological Society of America 74 (5): 1819-1825.

The authors were designated as a committee of the Policy Advisory Board of the Southern California Earthquake Preparedness Project to consider predictive terms and their application. It is interesting to note that this paper does not focus on the communication of "probability", but instead, more easily understandable terms were developed, although indirectly they may be based on probability figures. Terms for expressing earthquake potential and prediction include two main categories, "long-term earthquake potential" and "earthquake prediction". Earthquake prediction is subdivided into three categories: "long-term prediction", "Intermediate-term prediction", and "short-term prediction". Long-term prediction is not subdivided, but two terms, "watch" and "forecast", are recognized as having similar meanings. "Short-term prediction" is subdivided into "alert" and "imminent alert". The subdivisions of earthquake prediction are based on different time frames. Earthquake potential or probability can be expressed either numerically or verbally according to a variety of schemes.

KW: Probabilities, earthquakes.

EDUCATION AND AWARENESS PROGRAMS

106
American Red Cross. 1984. Safety and Survival in an Earthquake. 2nd Edition. American Red Cross, Los Angeles Chapter. 47 pp.

This handbook is part of an earthquake preparedness course entitled: Safety and Survival in an Earthquake. The booklet is comprehensive, examines individual preparedness and emergency response to an earthquake. The handbook is somewhat unique in two aspects: 1) there is a brief, easy to understand scientific explanation of what happens when an earthquake occurs; and 2) the booklet uses "visual keys" in association with preparedness and response suggestions.

KW: Education and awareness programs, earthquake.

107**
Battisti, Francesco. 1982. The Organization of a Mass Education Program in Order to Mitigate Earthquake Hazards in Calabria. In Barclay Jones and Miha Tomazevic (eds.), Proceedings of the 3rd International Conference: the Social and Economic Aspects of Earthquakes and Planning to Mitigate Their Impacts, pp. 341-362. Institute for Testing and Research in Materials, Ljubljana, and Program in Urban and Regional Studies, Cornell University, Ithaca, New York.

This paper is an account of one of the first experiences in mass education undertaken by a local government in Italy. Mass education about earthquakes must not be independent from other measures for increasing the general preparedness of the community against unscheduled events. Mass education is most effective if it is achieved one or two years before the earthquake; its utility decreases as time passes before such an event happens again. It is also necessary to discriminate between information which is subject to obsolescence and that which may continue to be effective through time. Items not subject to obsolescence include: 1) elementary notions of what is an earthquake; 2) patterns of earthquake recognition; 3) personal safety behavior; 4) patterns of family organization and response; 5) evacuation procedures; 6) home safety; and 7) structural building improvements. Items most likely to become obsolete are: 1) evacuation sites; 2) evacuation roads; 3) location of health services; 4) location of administrative offices and emergency personnel; 5) channels of public communication; and 6) other channels of communication. To protect against obsolescence a hazard education program should undergo revision every four or five years.

KW: Education and awareness programs, earthquake, education.

108**
California Earthquake Education Project. 1986. CALEEP--California Earthquake Education Project--Sampler. Berkeley, California: Lawrence Hall of Science, University of California. 62 pp.

This publication provides a description and sample materials of the California Earthquake Education Project (CALEEP). The CALEEP program works with and provides materials to the state Office of Emergency Services, Department of Education, county and school disaster preparedness agencies, and local curriculum development and teacher training programs. Beyond increasing students' understanding of earthquakes, CALEEP activities attempt to motivate students and their families to take pre-event actions which would minimize injury, loss of property, and psychological upset. Risk communicators will find this sampler a useful introduction to one of the better earthquake education projects in the United States.

KW: Education and awareness programs, earthquake, education.

109
California Office of Emergency Services. 1983. California Earthquake Response Plan, Southern San Andreas Fault (draft). California Office of Emergency Services.

This plan describes the organization, agencies, tasks, and responsibilities which comprise the emergency response system following a catastrophic earthquake on the southern San Andreas Fault. While directed mostly at the state's response, the plan also addresses incorporation of private sector, federal, and local government resources that are available on a statewide basis. The plan discusses the likely impacts of a major earthquake on public and private communication systems. An earthquake poses a matrix of events that would reduce the effectiveness of communication systems, rather than destroy them. However, the failure of one line in the chain can effectively disable a large portion of the system. Risk communicators may be interested in the "communication chain" discussed in this plan. In providing emergency communication to the public, five categories of information are needed: transportation, utilities, medical/health, mass care, and volunteer services.

KW: Education and awareness programs, earthquake, liquefaction, emergency communication, dissemination.

110**
Chess, Caron. April 1986. Recommendations for the New Jersey Department of Environmental Protection's Radon Communications Program: a Working Document. Unpublished paper. 7 pp.

Representing the New Jersey Department of Environmental Protection (DEP), the author summarizes recommendations from a symposium convened in October 1985 to deal with communication aspects of the radon contamination issue. Government efforts can greatly influence the public's perceptions of the problem and ways in which the DEP is perceived. These perceptions can, in turn, lead to action or inaction on the part of the public that could seriously affect public health in the state. Symposium participants suggested that the state should take the initiative in explaining the problem and mitigation plans to the press, health personnel, elected officials, and others. They also believed that an information campaign should be delayed for a few months to allow for planning and verification of preliminary data. Factors that were key in determining that an active public information campaign was necessary include: 1) fill the information vacuum; 2) maintain trust and credibility; 3) provide information; and 4) the need to emphasize planning. Special importance should be given to: 1) increasing feelings of individual efficacy; 2) responding to the public's concerns; 3) maintaining the state's credibility; and 4) defining audiences and channels of communication.

KW: Education and awareness programs, radon.

111***
Christensen, Larry and Carlton E. Ruch. 1978. Assessment of Brochures and Radio and Television Presentations on Hurricane Awareness. Mass Emergencies 3 (4): 209-216.

This article assesses the effectiveness of a Hurricane Awareness Program to alert Texas coastal residents of hurricane dangers and preparedness measures. The program included radio and television spots and the distribution of 750,000 brochures. The assessment took the form of a survey of 1,350 Texas coastal residents. The survey revealed that radio presentations had virtually no effect on hurricane awareness or preparedness. Television spots did enhance the respondents' belief about the destructiveness of hurricanes. The brochure increased the accuracy of subjects' information. To be effective, specific responses must be identified, and material and information presented to the public must directly bear on these responses. Terms must be defined and residents told explicitly what they should know. Likewise, to generate desirable behavior, residents must be informed about what they are to do during a hurricane watch and warning.

KW: Education and awareness studies, media studies, hurricane, message channel, effectiveness.

112**
Colorado Division of Disaster Emergency Services. Undated. Citizen Emergency Preparedness Guide. Colorado Division of Disaster Emergency Services.

This attention catching brochure is meant for general dissemination. Topics covered include: emergency telephone numbers, warnings, major natural disasters, floods, tornadoes, lightning, winter storms, earthquakes, fire, fallout shelters, national emergency evacuation, and emergency care. The pamphlet uses color indexing of the topics to catch the readers attention and provide quick referencing. Diagrams and drawings are used to illustrate major points.

KW: Education and awareness programs, brochures, education.

113
Comerio, Mary et al. 1982. An Earthquake Advisor's Handbook for Wood Frame Houses. Publication #CP26. Berkely, California: Center for Planning and Development Research, College of Environmental Design, University of California. 90 pp.

The purpose of this publication is twofold: 1) to document the Center for Planning and Development Research's Earthquake Assistance Service (EAS) program; and 2) to illustrate to those organizations and agencies interested in setting up their own EAS what the process entails. The intent of an EAS project is to develop a service that will inform residents of seismic hazards and assist them to voluntarily, effectively, and economically make modifications that will improve the safety of their homes. This type of program could be broadly applicable to other natural and technological hazards. The report contains sample news releases, publicity flyers, client contact sheets, liability release forms, maps, and other "tools" important in the risk communication process.

KW: Education and awareness programs, earthquake, preparedness.

114
Comerio, Mary et al. 1982. Earthquake Hazards and Wood Frame Houses: What You Should Know and Can Do. Publication #CP15. Berkeley, California: Center for Planning and Development Research, College of Environmental Design, University of California. 46 pp.

This manual is intended to help homeowners improve the seismic resistance of their homes. As part of the Earthquake Advisory Service (EAS), this manual includes detailed discussions of identifying structural weaknesses in wood frame houses. Earthquake safety and inspection checklists are included. The booklet provides good examples of how somewhat technical diagrams and photographs can be effectively incorporated for educational material.

KW: Education and awareness programs, earthquake, education, maps.

115**
Davenport, Sally S. and Penny Waterstone. 1980. Hazard Awareness Guidebook: Planning For What Comes Naturally. Austin, Texas: Texas Coastal and Marine Council. 41 pp.

This publication, an outgrowth of a National Hazard Awareness Workshop held in Corpus Christi, Texas, was compiled in order to help those who are currently involved in planning programs to improve the public awareness of threats stemming from hazards, together with results of recent research; these are utilized to produce an outline of elements which need to be considered when putting together a hazard information program. A discussion of the ability of various forms of communication, both written and electronic, to reach certain audiences, plus suggestions for dealing with the mass media, provides a practical foundation for maximizing the distribution of relevant information. The material discussed in the text is presented in convenient "do's" and "don'ts" lists. A sampling of these guidelines include: 1) make your message specific and let it indicate what constructive action can be taken; 2) repeat and reinforce your message regularly; 3) don't assume that distributing information will by itself change people's actions; 4) avoid duplication and obtain ideas for useful materials and approaches by knowing what others have done; 5) don't attempt to use information which cannot be transferred into a clearly understandable form; 6) structure your message to your chosen audience and relate it to experiences with which they can identify; and 7) use newspapers for long term education.

KW: Education and awareness programs, effectiveness.

116
Emergency Planning Department, City of Littleton, Colorado. 1981. To Save a Life, Yours!--Disaster Handbook for Citizens. Littleton, Colorado. 20 pp.

This booklet is meant for general circulation and provides basic information on disaster and emergency preparedness. Topics of discussion include: where to call for help, types of disaster, how the city is prepared, individual preplanning preparedness, and how

to react during different disasters. The brochure is a good example of local efforts to educate the public.

KW: Education and awareness programs, brochures.

117
EQE Incorporated. 1987. The EQE Earthquake Home Preparedness Guide. 4th Edition. San Francisco: EQE Incorporated. 25 pp.

A brief description of basic structural measures that can be taken to reduce earthquake damage (e.g. hanging pictures, securing bookcases, etc.) is provided in this brochure. There are three noteworthy aspects of this booklet that risk communicators might find useful. First, black and white photographs used in the pamphlet are clear and easy to view. Second, diagrams are well drawn, precise and appropriately labeled. Finally, the booklet is an example of how black and white printing can be effectively and tastefully used to produce an attractive product.

KW: Education and awareness materials, earthquake.

118
Fisher, Anne. 1987. Risk Communication: Getting Out the Message About Radon. EPA Journal 13 (9): 27-28.

The author describes the Environmental Protection Agency's (EPA) involvement in the communication of radon risk. The EPA's program has been based primarily on a strategy that encourages voluntary mitigation methods, since EPA lacks regulatory authority in this area. This along with the difficulty of residents to perceive the risk as real has made risk communication difficult. EPA and others are currently testing the effectiveness of various educational materials and programs. It is hoped that results will help EPA to improve its radon information programs.

KW: Education and awareness programs, radon.

119**
Geer, Ira W. 1978. Increasing Weather Awareness--Hurricanes: an Assessment Study of School-Based Hurricane Education in the Gulf and Atlantic Coastal States. Final Report. Brockport, New York: National Weather Service Project, State University of New York. 110 pp.

During the 1976-77 school year, this study found that there were 18.5 million students enrolled in 31,000 schools in the coastal states extending from Texas to Maine. Few of these schools offered hurricane instruction beyond that found in conventional curricular materials. Some of the guidelines and recommendations

suggested include: 1) schools and school personnel are more likely to be receptive to curricular innovations that focus on broad educational goals and include opportunities for student activities; 2) education programs should consist of both long- and short-term preparedness considerations; 3) hazard preparedness education should be coupled with instruction on more normal weather patterns; 4) education materials should be general enough to assure wide distribution, yet specific enough to be based on local environmental and social conditions; and 5) successful programs require teacher training.

KW: Education and awareness programs, hurricane, education.

120
Heider, Claret M. (ed.). 1986. Improving Seismic Safety of New Buildings: a Community Handbook of Societal Implications. Earthquake Hazards Reduction Series #13. Washington, DC: Prepared for the Federal Emergency Management Agency by the Building Seismic Safety Council. 99 pp.

This handbook was developed to provide community decision-makers with information they can use in assessing the extent to which these effects will be felt in their community and in making more reasoned decisions. The handbook is geared to a broad audience and is structured in a way risk communicators may wish to emulate. For example, chapter headings are in the form of common questions such as: How do I determine my community's seismic hazard?; What does an earthquake do to buildings?; What does a seismic building code do?; Will design and construction costs increase in my community?; How do I get my community to act?; Where do I go for information?; and What do those technical terms mean?.

KW: Education and awareness programs, earthquake, education.

121
INTERTECT and Peace Corps. 1984. Disasters and Development: a Peace Corps Pre-Service Training Module. Washington, DC: Peace Corps Information Collection and Exchange. 221 pp.

Materials in this module have been developed to introduce Peace Corps trainees to natural hazards and how natural disasters can affect development. Information is intended to prepare trainees to make decisions on appropriate actions to take during an emergency and how to integrate into their primary development assignments activities that can mitigate the effects of future disasters. The module contains everything from samples of hazard maps to questionnaires. The value of this training module to risk communicators is not so much its hints on risk communication, but instead as an example of how one might develop their own training module for hazard managers.

KW: Education and awareness programs, education.

122
Judson, Arthur. 1976. Colorado's Avalanche Warning Program. Weatherwise 29 (6): 268-277.

This article discusses the principal components of Colorado's avalanche warning system. These include a network of reporting stations in the mountains, high country weather forecasts, the Avalanche Warning Center (AWC) in Fort Collins, and a communications system for dissemination of warnings to the public. Warnings prepared by the AWC are disseminated through the National Weather Service's communication network by national teletype lines, local VHF radio, and recorded phone messages at special numbers. Approximately 50 radio and television stations, major newspapers, and wire services simultaneously receive the warnings. Each warning states the area covered, duration of the warning, reason for the warning, and instructions to minimize risk. Improvements in the system could be made by installing more reporting stations in western Colorado, where station density is low, and implementation of an efficient communications system to link field stations with the AWC.

KW: Education and awareness programs, avalanche, message channel, message content.

123
Kockelman, William J. 1978. Communicating Research Products Developed by the San Francisco Bay Region Environment and Resources Planning Study. In Walter W. Hays (ed). Proceedings of Conference V, Communicating Earthquake Hazard Reduction Information, pp. 307-334. United States Dept. of Interior, Geological Survey Open File Report 78-933.

The six year (1970-1976) San Francisco Bay Region Environmental and Resources Planning Study (SFBRS) is the topic of this paper. The goal of SFBRS was to identify and provide earth-science information needed for regional land-use decisions, provide a wide range of data at a regional scale, and test and evaluate how this data is being used for planning and decision making. The author makes several suggestions that would improve the effective use of earth-science data. Some of these include: 1) making a greater effort to provide engineering interpretations and land and water use capability rating; 2) make available earth-science information at scales and levels of detail commonly used by local and regional governments; 3) releasing data on critical issues early through verbal briefings, seminars, maps, open-file reports, and publications and reports of cooperating agencies; and 4) provide educational, advisory, and review services along with any data collection and analysis program.

KW: Education and awareness programs, earthquake, maps.

124
Leslie, Jolyon. 1986. A Building Education Programme in North Yemen. Disasters 10 (3): 163-171.

In 1982 the central highlands of the Yemen Arab Republic suffered an earthquake that caused extensive damage to traditional buildings. In the aftermath of the relief effort for victims of the disaster, a project was set up to provide local builders with simple information about the means of strengthening homes. This report describes the activities of the project, and assesses some of the issues that emerge from this kind of education work, and the methods that have been used. Since most communities had one or more men considered as builders, who would be employed to plan and set out a building, organize materials and supervise construction, it was felt that these people would represent a key target group to communicate the risk of traditional structures. Builders also generally maintained a high level of respect within the villages. Persuasion was the only realistic tool in North Yemen, where building legislation was nearly non-existent. Builders that had been through a two day training course were found to had persuaded a substantial number of their clients to incur the extra expense of earthquake resistent building techniques.

KW: Education and awareness programs, earthquake, education.

125
M & M Protection Consultants. 1983. Natural Hazards Information System: Purpose and Application Bulletin. Marsh & McLennan, Inc. 7 pp.

This report describes the authors' Natural Hazards Information System which is a computerized data base using modeling techniques combined with raw data available from government and other sources providing natural hazard frequency and intensity information for almost any location in the world. Both area and site specific impact reports are available. Data from the computerized database can be used for such things as property damage loss estimates, risk assessments, insurance premium determination and allocation, engineering design considerations, site selection and expansion decisions, business interruption/interdependency studies, pre-loss funding calculations, and contingency planning. Examples of the database are provided.

KW: Education and awareness programs.

126
McNamara, E.F., T. Kurth, and D. Hansen. 1981. Communication Efforts to Prevent Wildfires. In R.E. Rice and W.J. Paisley (eds), Public Communication Campaigns, pp. 143-160. Beverly Hills: Sage Publications.

This paper is divided into three sections: 1) description of the nature and scope of the wildfire problem; 2) basic agency organization, role of each administrative level in a successful fire prevention program, and local approaches to prevent wildfires; and 3) the history development, extent, and impacts of the national forestry community's Smokey Bear Campaign. The campaign is considered highly successful.

KW: Education and Awareness Programs, fire, education.

127
Mogil, H. Michael, John C. Monro, and Herbert S. Groper. 1978. NWS's Flash Flood Warning and Disaster Preparedness Programs. Bulletin of the American Meteorological Society 59 (6): 690-699.

In the 1970s flash floods became the nation's number one stormy weather killer. To combat escalating losses the National Weather Service (NWS) expanded its efforts to improve forecasting and warning of flash floods and to improve the public's response to flash flood threats. This paper summarizes current (1978) and planned NWS operational flash flood warning and disaster preparedness programs. The authors recommend initiatives that the NWS and other agencies could take to improve warning dissemination and increase public awareness/response. Some of these include: 1) place more emphasis on predisaster efforts; 2) encourage the private sector to develop inexpensive automated precipitation and river alarms; 3) increase public understanding of and response to hazardous weather; and 4) provide additional NOAA Weather Radio transmission capability, especially for high use recreational areas.

KW: Education and awareness programs, severe storm, flood.

128
National Association for Search and Rescue. 1980. School Emergency Response Plan: a Model Plan for Emergency Response in the Schools. La Jolla, CA. 33 pp.

This is a suggested emergency plan for individual schools or school districts. The plan is a straightforward and relatively simple description of what school employees should do in case of an emergency. The project includes not only emergency communication information but also discussion of communication with parents and the setting up of a "communications team". At

the beginning of each academic year parents should be advised of the school's emergency plans including communication channels that the school will use during an emergency.

KW: Education and awareness programs, education.

129**
National Oceanic and Atmospheric Administration, National Weather Service. 1983. Watch Out...Storms Ahead! Owlie Skywarn's Weather Book. Washington, DC: Government Printing Office. 27 pp.

This pamphlet is intended for school age children and provides a relatively comprehensive discussion of characteristics and adjustive strategies for hurricanes, tornadoes, lightning, flash floods, and winter storm hazards. Four communication techniques stand out in the pamphlet. The booklet is well illustrated. Personal experiences are used to portray the possible destructiveness of hazards. Attention getting facts are used (although this may result in undo fear of a hazard). In some instances, comparisons to common objects (eg. hail the size of marbles, golf balls, or baseballs) are incorporated into the discussion of the hazard. A series of quizzes are available at the end of the brochure.

KW: Education and Awareness programs, education.

130
National Weather Service, National Oceanic and Atmospheric Administration. Undated. When a Hurricane Threatens: Safety Precautions During the Greatest Storm on Earth. Washington, DC: Government Printing Office. 15 pp.

This pamphlet is designed to tell the reader what to do to protect himself and family when a hurricane threatens. A general discussion of hurricanes is provided along with sections on the storm surge, floods and winds. Each of the sections has an "action checklist" of what the reader should do and when to evacuate. The study suggests that during a hurricane that the reader evacuate if his/her residence can be reached by the storm surge or flood from associated rainfall. However, little information is provided for the reader on how to determine if their residence is subject to flooding or where that information can be obtained.

KW: Education and awareness programs, hurricane, flood, brochure.

131
Owen, H. James. 1977. Guide for Flood and Flash Flood Preparedness Planning. National Oceanic and Atmospheric Administration, National Weather Service. 47 pp.

The purpose of this guide is to assist local officials in: 1) assessing the present state of a community's existing flood warning and preparedness plan; 2) deciding what is needed to write a preparedness plan; and 3) actually developing an adequate flood preparedness plan. General guidelines are provided for such topics as warning dissemination, community information, emergency communication, and mapping.

KW: Education and awareness programs, flood, brochure, maps.

132
Pulley, H. Roger. 1980. California's Earthquake Prediction Response Plan. In Walter W. Hays (ed), Proceedings of Conference XII, Earthquake Prediction Information, pp. 180-232. United States Department of the Interior, Geological Survey Open File Report 80-843.

This paper, for the most part, duplicates the California Earthquake Prediction Response Plan. A detailed discussion and diagram on the information flow process are provided for the reader. The plan allows for several forms of earthquake warning information: 1) area of intensified geophysical research; 2) earthquake advisory; 3) earthquake watch; 4) earthquake warning; and 5) cancellation. The plan describes model public information and education goals at three time levels of an earthquake prediction: short, intermediate, and long term.

KW: Education and awareness programs, earthquake, prediction/warning, dissemination.

133
Rold, John W. 1978. The Communication of Information for Geologic Hazard Mitigation --The Colorado Example. In Walter W. Hays (ed), Proceedings of Conference V, Communicating Earthquake Hazard Reduction Information, pp. 120-133. United States Dept. of Interior, Geological Survey Open File Report 78-933.

The author, director of the Colorado Geological Survey, traces the historical and legislative development of the State's policies dealing with geological hazards. Education was the major strategy used by geologists to convince opponents about the importance of hazard information dissemination and legislation. Education often had to be approached with missionary zeal and geologists had to demonstrate that geological information would save money, lessen development time, and provide a better end product to the

consumer. Communication was most successfully achieved through one-on-one situations. The state utilized the talents of others such as oil or mining company geologists in locating hazardous area and conveying information. Maintaining communications is a continuing effort. Agencies must be prepared to respond quickly to information and aid requests. It is vital to acquire and utilize "converts". Agencies must provide a local government with strong support when they have made a decision on your advice. Legislation itself is a communication method because it can legally require that information be used.

KW: Education and Awareness Programs, landslide, legislation/regulation.

134**
Saarinen, Thomas F. 1982. The Relation of Hazard Awareness to Adoption of Mitigation Measures. In T.F. Saarinen (ed), Perspectives on Increasing Hazard Awareness, pp. 1-34. Program on Environment & Behavior Monograph #35. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.

Through the use of examples, this study explores the relationship of hazard perception to the adoption of mitigation methods. In trying to understand the link, Saarinen suggests that the communication process (especially education) is important. Some of the issues and topics discussed in this article include: the role of experience, hurricane evacuation and awareness programs, attitude and behavior discrepancies, flood hazard brochures, earthquake awareness and information, forced awareness, availability bias, and public service advertising. The author accepts that hazard awareness based on experience is associated with greater adoption of mitigation measures, but questions whether people can always substitute information for experience. Public education on natural hazards is necessary but questions remain to be answered about the most effective format for presenting information in each communication medium, including sequence, timing, and duration of presentation.

KW: Education and awareness programs, review, hurricane, earthquake, flood, message content, education, evacuation, legislation/ regulation, receiver perception, effectiveness

135
Sanders, John. 1985. An Analysis of the North Carolina Coastal Weather Awareness Program. Marina, CA: Sanders Scientific Enterprises. Prepared for Severe Weather Branch, National Weather Service, NOAA. 23 pp.

This report provides a perspective on hurricane awareness and education programs and illustrates some of the relationships

between hazard awareness, disaster preparedness, and emergency response. Data suggest that perception of flood risk is based primarily on a person's prior notion of threat rather than on information supplied in hurricane warnings. Younger adults show poorer recall of information. People who have had "fringe" hurricane experience are more attentive to awareness material. Those with prior or "fringe" experience are more positive about the reliability of hurricane forecasts.

KW: Education and awareness programs, case studies, hurricane, flood, receiver perception.

136
Shearer, C.F. 1980. U.S. Geological Survey Hazard Warning Program Procedures and Problems. In Walter W. Hays (ed), Proceedings of Conference XII, Earthquake Prediction Information, pp. 156-164. United States Department of the Interior, Geological Survey Open File Report 80-843.

The Geologic Hazard Warning and Preparedness Program, which was developed in response to the Disaster Relief Act of 1974, is the topic of this paper. The program's procedures define three levels of geologic hazard information: 1) notice of potential hazard; 2) hazard watch; and 3) hazard warning. Lack of precise definitions for these terms have resulted in confusion in their communication and comprehension. USGS experience in sending information to state and federal governments has been generally positive. Local government reaction, however, has been less enthusiastic. Two reasons are cited for this. First, local governments lack the technical ability to assess the risk and funding to develop solutions. Second, local governments are faced with the possibility that once given the information, they may be liable for any failure to reduce the hazard. An appendix of hazard warning procedures is also provided.

KW: Education and awareness programs, earthquake.

137
Slosson, James E. 1980. Technical Consideration in Personal Preparedness. In Walter W. Hays (ed), Proceedings of Conference XII, Earthquake Prediction Information, pp. 279-288. United States Department of the Interior, Geological Survey Open File Report 80-843.

The author reviews and discusses: 1) common methods and message suggestions for communicating pre-earthquake building mitigation measures; and 2) how structures might be categorized for earthquake vulnerability purposes. Pacific Telephone in California was approached in the hope that they would print an eight page section on earthquake information and survival in their

telephone books. The company agreed and the project has been deemed a success. Other information is proposed to be added, including earthquake information and tips for homeowners, apartment dwellers and those working in office buildings.

KW: Education and awareness programs, earthquake, preparedness.

138
Smith, Shirley M. 1980. Earthquake Predictions and Their Effects on Preparedness: A Public Education Perspective. In Walter W. Hays (ed), Proceedings of Conference XII, Earthquake Prediction Information, pp. 307-328. United States Dept. of Interior, Geological Survey Open File Report 80-843.

This paper is divided into four sections: 1) educational programs for earthquakes, other natural hazards, and successful mass education campaigns outside of natural hazards; 2) history of public education in Southern California which illustrates promising techniques for home-centered preparedness training; 3) implications and recommendations for personal preparedness education; and 4) future issues. A few of the recommendations made by the author for improving public education programs include: 1) update public information periodically; 2) encourage local units to direct the program with help from state and federal governments; 3) design a flexible program; 4) the program should include mass media and live training components; 5) form alliances with adult education facilities; 6) consider long term viability of any awareness program; 7) orient messages to families; 8) training information should be based on realistic scenarios; and 9) workshops should consist of two versions -- one for the public and one to train the trainers.

KW: Education and awareness programs, earthquake, education.

139**
Southern California Earthquake Preparedness Project (SCEPP). 1983. Earthquake Public Information and Education Program Design. Van Nuys, California: SCEPP. 58 pp.

A cooperative agreement between FEMA, the California Seismic Safety Commission, and SCEPP, recognized the importance of public education and information in earthquake preparedness. Task 10 of that agreement asks SCEPP to survey available earthquake safety materials and develop a long-term program design and strategies. This report presents the findings of the SCEPP education staff, together with appropriate discussion and recommendations. Some of the recommendations include: 1) maintain a resource list, such as SCEPP developed, and keep it current; 2) maintain a network of information-providing groups by holding regular meetings and workshops or by newsletters and telephone; 3) follow the Japanese

earthquake model. SCEPP's research team was impressed with the quality of Japan's information materials and the aggressive manner in which the materials were disseminated; 4) combine awareness information with preparedness steps in an integrated awareness campaign; 5) identify and establish links with information providers and furnish training and assistance to support their efforts; 6) identify accessible, informed sources for use by the media; 7) maintain awareness of scientific processes and advances in earthquake prediction to promote credibility of scientists in the public mind; and 8) earthquake information and education programs should convey certain basic messages to the public.

KW: Education and awareness programs, earthquake, review.

140
Speigel, Wayne P. 1982. Tornado Awareness. Topeka, Kansas: Kansas Division of Emergency Preparedness, Natural Resources Planning Section. 19 pp.

This booklet is a concise review of emergency information about tornado hazard. Written in a simple, straight-forward style, it acquaints the reader with the general characteristics of tornadoes, the weather terminology associated with severe storms, and what precautions should be taken to protect oneself in the event of a tornado watch or warning. Additional material deals with emergency supplies, mobile home safety, and how to protect life and property following a tornado strike. Victims of a tornado are offered general advice on what to expect from federal and state disaster assistance programs and frequencies are listed of eight Kansas radio stations serviced by NOAA's F.M. weather radio.

KW: Education and awareness programs, tornado, brochures.

141
Sullivan, Raymond. 1981. Earthquake Games and Curriculum Development Information. Washington, DC: Office of U.S. Foreign Disaster Assistance, Agency for International Development. 93 pp.

The author has collected a variety of educational materials on earthquake awareness, preparedness, and response. Risk communicators may find this collections useful in developing similar educational materials for other hazards. Especially valuable are the numerous games (K-12) found in the handbook.

KW: Education and awareness materials, earthquake, education.

142
U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 1985. Heat Wave: A Major Summer Killer. Washington, D.C.: Government Printing Office. 2 pp.

This brochure for dissemination to the general public provides an explanation of NWS's heat index program, summary of NWS's alert procedures, how heat affects the body, and heat disorder symptoms and their prevention.

KW: Education and awareness programs, pollution, individual response, brochures.

143**
U.S. Environmental Protection Agency (EPA). 1986. A Citizen's Guide to Radon: What It Is and What To Do About It. EPA, Office of Air and Radiation. 13 pp.

This brochure does a fairly good job of describing radon hazards, testing techniques, and mitigation measures. The booklet subheadings are questions that the general public might be interested in, such as: What is radon?; Where does radon come from?; How does radon affect me?; How certain are scientists of the risks?; How does radon cause lung cancer?; When did radon become a problem?; Does every home have a problem?; How does radon get into a home?; How is radon detected?; How can I get a radon detector?; How should radon detectors be used?; What do my test results mean?; How quickly should I take action?; Are there other factors I should consider?; and How can I reduce my risk from radon? Risk communicators may find this format of setting up booklets and other awareness materials an effective method for communicating information about hazards that are especially difficult for people to comprehend. The pamphlet also contains a radon risk evaluation chart (or ladder) that depicts measured levels of radon exposure and compares these with other more easily understood hazards (x-rays and smoking).

KW: Education and awareness programs, radon.

144**
U.S. Federal Emergency Management Agency (FEMA). 1982. Survive Winter Through Self Help and Helping Others: a Resource Workbook. FEMA-29. Washington, DC: FEMA. 175 pp.

This workbook provides planners, hazard managers, and private citizens with a comprehensive and easily accessible body of materials dealing with winter safety and survival. A variety of publicly and privately provided literature is reprinted which discusses safety precautions to be taken during severe winter weather conditions. The workbook is broken into five sections.

The first section is a "Planners Packet" which includes information on how to identify and reach your target audience, how to utilize the media and other resources, and planning and evaluating techniques. In Part 2, Parents/Teachers/Families, the reader can find samples of education materials for children, the elderly and homeowners. Part 3, Camera Ready Materials, contains brochures, pamphlets, and other information to alert consumers to the hazards of winter and how to cope with them. Media materials are provided in Part 4, including radio scripts, public service announcements, and newspaper articles. Finally, in Part 5, Resources, FEMA has compiled a resource directory of organizations offering publications and other materials at little or no cost.

KW: Education and awareness programs, winter storm, brochures, preparedness.

145
U.S. Federal Emergency Management Agency (FEMA). 1983. Flash Flood Awareness Packet. No. FEMA-35. Washington, DC: FEMA, Office of Public Affairs. 47 pp.

In conjunction with the National Oceanic and Atmospheric Administration and the American Red Cross, FEMA has prepared a packet of awareness materials designed to reinforce safety programs developed by local officials. It emphasizes the correct actions people should take, particularly the importance of heeding flood warnings and pre-planning safe evacuation routes. Also included is information on FEMA's National Flood Insurance Program, radio spots, and directions for obtaining free brochures suitable for mass distribution.

KW: Education and awareness programs, flood, brochures.

146**
U.S. Federal Emergency Management Agency (FEMA). 1985. Hurricane Awareness Workbook. Washington, DC: FEMA, Office of Public Affairs. 217 pp.

Designed to aid emergency planners in conducting public awareness campaigns, the workbook is divided into three sections: Resources, Media, and Sample Information for the Public. The resources section includes a list of people and organizations that can provide technical assistance in developing a hurricane awareness program, a bibliography, a monograph that includes papers on various aspects of hurricane awareness, and an awareness guidebook that summarizes the do's and don't's in developing awareness programs. The Media chapter contains a fact sheet on hurricane devastation, sample radio scripts, newspaper articles, and information cartoons. The final section includes copies of many fact sheets, posters, information brochures, and descriptions of

audio-visual products, all of which can be ordered or directly adapted for local use.

KW: Education and awareness programs, hurricane, message content, message channel, brochures.

147
Ward, Delbert B. 1978. Communicating Seismic Safety Information for Public Policy Development. In Walter W. Hays (ed), Proceedings of Conference V, Communicating Earthquake Hazard Reduction Information, pp. 380-394. United States Department of the Interior, Geological Survey Open File Report 78-933.

This paper discusses issues dealing with the transfer of technical information on earthquake hazards reduction to user groups in Utah from the perspective of a state seismic safety policy development program. Purposes of such communications, characteristics of the various user groups having interest in seismic safety policy, functions and goals of the Utah Seismic Safety Advisory Council, and particular information transfer situations are described. Also included are the author's views regarding preferred methods and media for communicating different types of technical and general seismic data to groups of different interests and technical competencies.

KW: Education and awareness programs, earthquake, public policy.

148**
Yuhnke, Robert E., Ellen K. Silbergeld, and Janice E. Caswell. 1987. Radon: the Citizens Guide. New York: Environmental Defense Fund. 24 pp.

This booklet provides an interesting comparison to a similar brochure published by the U.S. Environmental Protection Agency (1986) that is also annotated in this section of the bibliography. Like the EPA guide, this brochure is set up in a question/answer format. It differs in three aspects. First, the Environmental Defense Fund (EDF) pamphlet is much more forceful in its assertion that radon exposure is harmful, thus decreasing the element of uncertainty to the reader but possibly arousing greater fear. Second, a listing of both federal and state agencies that deal with the radon issue is provided. Finally, the EDF booklet contains short author biographies which may help to personalize and increase the credibility of a publication.

KW: Education and awareness programs, radon.

MEDIA STUDIES

149
Bolduc, Jean-Pierre. 1987. Natural Disasters in Developing Countries: Myths and the Role of the Media. Emergency Preparedness Digest 14 (3): 12-14.

Media messages regarding natural disasters are often based on popular myths. These include: 1) people think that victims and their governments are helpless and panicky; 2) the needs of every disaster are always the same; 3) it is essential to fly in food and clothing; 4) medicine, any type, should be sent immediately; 5) disasters should be measured by the number of deaths, the more there are the worse the disaster, and the greater the response needed; 6) dead bodies or carcasses cause large epidemics; 7) special search and rescue teams are essential to pull out victims; and 8) giving cash simply demonstrates that one does not know what to give. During a disaster, the media cause substantial pressure to be exerted on authorities to react immediately, even though information is at best sketchy. This results in the perpetuation of the above listed myths. A journalist should realize that there is an element of responsibility in reporting.

KW: Media studies, message content.

150
Carter, T. Michael. 1980. Community Warning Systems: the Relationship Among the Broadcast Media, Emergency Service Agencies and the National Weather Service. In Committee on Disasters and the Mass Media (eds), Disasters and the Mass Media, pp. 214-228. Washington, DC: National Academy Press.

This paper focuses on the role the broadcast media plays in disseminating severe or hazardous weather warnings to the general public or private organizations. The study is based on a survey of natural hazard warning systems in 20 communities in 18 states. An effective warning system depends on the existence of reliable communication lines between public agencies responsible for issuing severe or hazardous weather warnings and the commercial broadcast media. Two principle issues were examined: 1) the extent to which the broadcast media has the capability to receive hazardous information from a variety of community emergency agencies; and 2) the extent to which such capability is used during threatening weather to inform the public. With the exception of the local weather office, the author's findings show that such a capability is lacking. Furthermore, because information is often unspecific, it is unlikely that this information will prompt large numbers of the public to take immediate defensive actions.

KW: Media studies, hurricane, tornado, severe storm, flood, message source, message channel, emergency communication.

151
Gaddy, Gary D. and Enoh Tanjony. 1986. Earthquake Coverage by the Western Press. Journal of Communication 36 (2): 105-112.

The type and quantity of coverage given by five newspaper and television sources to earthquakes outside their countries is determined not by geographic origin, but by human and physical consequences. The study shows, conceptually and empirically, that care must be taken in assigning the term "bias" to unequal coverage without first examining the underlying news events themselves. Sometimes unequal events demand unequal coverage.

KW: Media studies, earthquake.

152
Goltz, James D. No date. Policy Problem Area: Media Coverage of the Immediate Post Earthquake Period--Sources of Inaccuracy in Media Coverage of Disaster: a Look at Professional Values and News Gathering Procedures. Unpublished paper. Los Angeles: University of California.

This paper examines the professional values of American journalists and the organization of the news gathering process. To increase the effectiveness of media coverage of disaster the author proposes a number of policy recommendations and incentives. Substantive beat reporters should replace generalists in coverage of all aspects of a natural disaster. Adequate research facilities should be provided to journalists by news organizations. Journalists should be aware that they are in an implicit "command post" position. Reporters should expand their coverage of recovery related activities, especially during the immediate post impact phase. Finally, journalists need to develop a better appreciation of audience feedback.

KW: Media studies, earthquake, message channel.

153
Goltz, James D. 1984. Are the News Media Responsible for the Disaster Myths? A Content Analysis of Emergency Response Imagery. International Journal of Emergencies and Disasters 2 (3): 345-368.

Disaster research scholars and emergency planners have often contended that the news media play a major role in creating and perpetuating various myths of natural disaster response. These

myths include widespread panic flight, psychological dependency and vicious competition for necessities on the part of victims and physical convergence for the purpose of looting by non-victims. The evidence which ties the news media to these myths of community breakdown is largely indirect. Survey data reveal a generalized belief among members of the public that the above enumerated behaviors are typical reactions of people faced with a sudden crisis. These data also indicate that the news media are the principal source of information about disasters for most people. Lacking are detailed analyses which document the extent to which the myths of community breakdown actually appear in news coverage of natural disaster events. This study, which focuses on the reporting of four earthquake events by two southern California newspapers, attempts to address this issue. Preliminary results suggest that some caution is warranted in making the generalization that natural disaster coverage disproportionately conveys a breakdown imagery of communities facing a major natural catastrophe.

KW: Media studies, earthquake, individual response.

154**
Hiroi, Osame, Shunji Mikami, and Kakuko Miyata. 1985. A Study of Mass Media Reporting in Emergencies. International Journal of Mass Emergencies and Disasters 3 (1): 21-49.

This paper examines the operations of mass media in disaster, the content of messages in disaster reporting, and the distortion in reporting warnings and disasters based on empirical studies in several communities in Japan. In the warning stage, the authors found that the broadcast media are generally the primary source of information. However, the warnings often did not reach a complete range of audience, nor could it induce an adaptive response among these recipients. During and after the disasters the main obstacles in reporting damages were the difficulties in mobilizing resources, uncertainties in reliable news sources, and malfunctioning communication channels. The article describes the main characteristics of the content of mass media reports in disasters. They include information on: 1) advice or directions; 2) disaster agent; 3) safety message; 4) damage; 5) countermeasures; and 6) restoration. Content analysis of the broadcast of two stations on the day of the Nihonkai-Chuubu earthquake shows that personal messages and damages information were the most heavily broadcast. This did not always match information needs of residents. The media in Japan tend to exaggerate damages in disasters and not to report sufficiently the news people want to obtain. The reasons for these inaccurate reportings are: 1) journalists' attitudes to news editing and reporting; and 2) distorted images or myths among the journalists.

KW: Media studies, earthquake, message channel, false alarm.

155
Kueneman, Rodney M. and Joseph E. Wright. 1975. News Policies of Broadcast Stations for Civil Disturbances and Disasters. Journalism Quarterly 52 (4): 670-677.
The authors examined attitudes of mass communication organizations in regard to their handling of civil disturbances and natural disasters. Findings reported in this study suggest that: 1) media personnel generally perceive their audiences as possessing a quality of heightened excitability in stressful situations; 2) the mass media tend to utilize policies of restricted report checking and the withholding of information so as not to frighten or inflame their audience; 3) planning is more specific for natural disasters than for civil disturbances; and 4) any changes induced by experience with such events tend to be mechanical rather than operational in nature.

KW: Media studies, message source.

156
McKay, Jennifer M. 1983. 1983. Newspaper Reporting of Bush-fire Disaster in South-eastern Australia--Ash Wednesday 1983. Disasters 7 (4): 283-290.

Newspaper reports about a bushfire disaster in SE Australia were analyzed in order to present some understanding of the images those reports conveyed to the victims and non-victims in one affected state. The results demonstrated that newspapers gave limited prominence to reports containing warning or response information before or after the disaster. The newspapers reported most prominently case study descriptions of personal hardship or heroism which portrayed the victims as completely helpless during and after the event. The newspapers also devoted considerable space to reports describing the losses attributable to the bushfire, the factual details of which were accurate. This emphasis on content probably increased community perception of the danger of bushfire threat but, as little warning or response information was given, it is unlikely that the reports improved community preparedness for future events.

KW: Media studies, fire, message channel.

157
Mogil, H. Michael. 1979. Weather Emergencies and the Mass Media. Preprint Volume: Eleventh Conference on Severe Local Storms, Kansas City, Missouri, October 2-5, 1979, pp. 559-564. Boston, MA: American Meteorological Society.

The media plays a vital role in the "total" warning system. They must be made to feel an integral part of it, for they supply not only general weather information and warnings, but also play a

critical role in preparedness and response aspects. This paper briefly describes the warning system with an emphasis on the relationship between the National Weather Service (NWS) and the mass media. The report also examines a 1978 National Association of Broadcasters weather questionnaire that was distributed to its members. Some of the findings include: 1) most stations do not blindly break their programming for all bulletin issuances; 2) however, more than 95 percent of the responders use NWS bulletin information; 3) there was some feeling that the NWS over warns; and 4) several broadcasters noted the need for more information so they could let their audience know that the danger was over.

KW: Media studies, severe storm, tornado.

158
Morentz, J.W. 1980. Communication in the Sahel Drought: Comparing the Mass Media with Other Channels of International Communication. In Committee on Disasters and the Mass Media (eds), Disasters and the Mass Media, pp. 158-183. Washington, DC: National Academy Press.

This article examines the role of the mass media in the Sahel drought in comparison with the role of other channels of international communication. Throughout the long period before the drought became an international issue, coverage by special interest media had little influence on governments, international organizations, or the mass media. Once the mass media became involved, the issue came to the forefront of government and international organization agendas.

KW: Media studies, case studies, drought, message channel, message source.

159
Needham, R.D. 1986. The Cosmopolite-Localite Model: Newspaper Types and Natural Hazard Information Potentials. Environmental Management 10 (2): 271-284.

The author presents a description of the cosmopolite- localite model, a conceptual framework in which institutional and news coverage characteristics are organized according to four broad types. Hypothetical reporting patterns for natural hazards are graphed for the types along a continuum exhibiting local, provincial, and international characteristics. The model is tested against the hazard coverage of 13 Canadian and American newspapers. The model was found to be generally useful. Weekly journals at one extreme cover only the most localized hazards; newspapers at the other extreme of the model's continuum produce comprehensive coverage of hazards of national and international

importance; and those in the middle range of the continuum publish a more balanced presentation.

KW: Media studies, message source.

160
Needham, R.D. and J.G. Nelson. 1977. Newspaper Response to Flood and Erosion Hazards on the North Lake Erie Shore. Environmental Management 1 (6): 521-540.

Newspaper responses to flooding and erosion associated with Great Lakes high water in 1952-1953 and 1972-1974 is the focus of this article. Underlying the research is a general interest in informing the public more widely on choices available in resource and environmental decision-making. Suggestions for improving information flow on hazards and related environmental problems include: 1) politicians, civil servants, and the public need to acquire greater appreciation of the limitations of hazard reporting and its relation to newspaper types; 2) agencies should prepare and publish hazard information in such a way as to counterbalance the limitations of newspapers on both a type and overall basis; and 3) types of newspapers and reporting orientations should also be taken into account in disseminating information on a regional basis.

KW: Media studies, message source.

161
Oliver, John E. and Valerie Jones. 1982. Viewer Responses to Television Severe Weather Warnings: a Mid-West Case. In Professional Paper No. 14. Department of Geography and Geology, Indiana State University. 8 pp.

Rapid communication of information concerning severe local weather is necessary to prevent loss of life and minimize property damage. Television and radio are primary sources of this information and these media have developed a variety of methods to impact warnings to the public. Questions still remain regarding public attitudes and responses to warnings; however, this study attempts to evaluate the relative effectiveness of a selected method used to convey severe weather information, to gain insight into responses to broadcast storm warnings, and to analyze responses to see whether any subset of the public differs significantly in its responses. The research strategy utilized a questionnaire that was sent to a random sample of 100 persons living within the viewing area of station WTHI-TV in Terre Haute, Indiana. The survey's major conclusion was that viewers took warnings of severe weather quite seriously. Study results indicated that most people modified their behavior in response to a warning and that very few people would ignore a warning entirely. Type of dwelling, age and

sex did not offer a high degree of correlation to any specific action taken.

KW: Media studies, severe storm, message channel, effectiveness.

162
Riebsame, W.E. 1983. News Coverage of Seasonal Forecasts: The Core of Winter 1982-83. Bulletin of the American Meteorological Society, 64 (12): 1351-1356.

Public interest in the 1982-83 winter forecast was heightened by antecedent press coverage of the possible effects of a solar luminosity decline and the El Chichon eruption on the climate. Several private climatologists and "folk forecasters" issued statements calling for an exceptionally cold winter, especially in the eastern United States. The National Weather Service (NWS) forecast contradicted these by calling for warmer-than-normal winter temperatures in the East. The NWS forecast was carried by slightly more than half of the U.S. daily newspapers, but by only a few weekly newspapers. The reporting was generally quite accurate, although some problems emerged in headlining and in using maps along with stories. The apparent controversy between official and private forecasts was mentioned in virtually every news article. Communication problems such as those surrounding the winter forecast should be of as great a concern to forecasters as is basic accuracy: both affect forecast usefulness.

KW: Media studies, prediction/warning, message source.

163
Ritz, W.R. 1980. A Case Study of Newspaper Disaster Coverage: the Big Thompson Canyon Flood. In Committee on Disasters and the Mass Media (eds), Disasters and the Mass Media, pp. 195-201. Washington, DC: National Academy Press.

The story of the Big Thompson Flood of July 31, 1976, is told by an Associated Press member who reported the event. The author notes in retrospect that much of the coverage was based on a few early decisions by three people. These decisions included minimizing duplication of effort and ignoring advice from the general office in New York. Problems that did arise could be attributed to the insensitivity of a few reporters and amateurish attempts by others to "scoop" the field.

KW: Media studies, flood, message source, emergency communication.

164
Rogers, E.M., and R.S. Sood. 1980. Mass Media Communication and Disasters: a Content Analysis of Media Coverage of the Andhra

Pradesh Cyclone and the Sahel Drought. In Committee on Disasters and the Mass Media (eds), Disasters and the Mass Media, pp. 139-157. Washington, DC: National Academy Press.

This paper describes how the mass media report disasters by using two case studies: the Andhra Pradesh (South India) cyclone-tidal wave disaster of November 19, 1977, and the African drought of 1968-74. Comparison of the two case studies produced conclusions and suggestions on the differences in media reporting of sudden and slow-onset disasters, the media's varying roles in disaster reporting, and suggestions for future research. Information needs on slow-onset disasters are less urgent and pressing than are those needs in a sudden disaster. Newspapers tend to follow and report on disaster related events, whereas magazines wait for events to gain significance before they provide coverage. The media makes more use of visuals in reporting slow-onset disasters than they do in sudden-disaster reporting. Television news programs tend to be slower than other media in providing comprehensive reporting on sudden disasters. Different media play different roles during the various time phases of sudden and slow-onset disasters.

KW: Media studies, tsunami, hurricane, drought, message channel, dissemination.

165
Rogers, Everett M. and Rahul Sood. 1981. Mass Media Operations in a Quick-onset Natural Disaster: Hurricane David in Dominica. Natural Hazards Working Paper # 41. Boulder, Colorado: Institute of Behavioral Science, Unviersity of Colorado. 103 pp.

This study describes mass media operations during Hurricane David's impact on Dominica on August 29, 1979. Risk communicators will find some of the conclusions and recommendations of interest. Reports on a disaster should go beyond objective presentations of facts and show compassion for the victims. Likewise, the media should respect the rights of disaster victims who do not wish to be interviewed or photographed. While local authorities are usually the most reliable information source in a disaster, obtaining information must be done with tact, patience and a sense of cooperation. Mass media personnel must recognize that their audience does not always comprehend weather terminology. Mass communicators should not only interpret the disaster, but also place it in a broader context. To reduce the likelihood of a total loss of external or internal communication capability after a disaster the communications system should be spread over a wide area. Amateur radio operators should be recognized as a vital external communication link. Formal links between available weather information sources and local media should be established and maintained.

KW: Media studies, hurricane.

166
Scanlon, Joseph. 1980. The Media and the 1978 Terrace Floods: an Initial Test of a Hypothesis. In Committee on Disasters and the Mass Media (eds.), Disasters and the Mass Media, pp. 254-263. Washington, DC: National Academy Press.

A preliminary study is used here to test the researcher's hypotheses. They include: the media does not provide advance information about the possibility of disaster, what to do about it, or post disaster information about how to avoid future occurrences; the media focuses almost entirely on the disaster itself; public interest in the disaster fades after the disaster; and media coverage in provincial and federal capitals is especially attuned to the temporary dramatic qualities of the event. Findings generally support the author's hypotheses.

KW: Media studies, case studies, flood, message source.

167***
Scanlon, Joseph et al. 1985. Coping with the Media in Disaster: Some Predictable Problems. Public Administration Review 45 (special issue): 123-133.

While public administrators sometimes decry the mass media, the media can assist in pre-disaster education, provide information and advice to victims and others, help activate local disaster response, and assist in stimulating effective disaster relief. Many of the problems with the media can be managed and controlled because media behavior at all times is highly predictable. The media will inevitably hear of a disaster event, will report that news, and will search for more information. If the event is deemed newsworthy enough more media personnel will arrive making extensive demands on local transportation and communication facilities and disaster managers. The media will have problems with technical stories. If information is lacking the media will find something to report. The media will also withhold information when asked to do so by officials. One of the suggestions made by the author is that local officials should be prepared to bring in a communications expert when a disaster occurs.

KW: Media studies, message channel, effectiveness.

168
Scanlon, T. Joseph, Rudy Luukko, and Gerald Morton. 1978. Media Coverage of Crises: Better Than Reported, Worse Than Necessary. Journalism Quarterly 55 (1): 68-72.

The authors examined media reporting of six crisis and disaster events in Canada. On the whole they found that the media reported information without much regard for the credibility of the information service. They were also reluctant to name their sources, in part because the sources simply did not exist, and the accounts were speculative. Since, in the wake of a disaster, officials focus their attention and resources on aiding the injured, there is less effort on compiling precise reports and communication. The media need to realize that officials will seldom have accurate and detailed information immediately. They should also forgo their habit of reporting of information that cannot be tied to a specific source or verified. Officials, on their part, should be prepared to admit the absence of information.

KW: Media studies, emergency communication.

169
Singer, Benjamin, D., and Lyndsay Green. 1972. The Social Functions of Radio in a Community Emergency. The Copp Clark Publishing Company. 49 pp.

This case study examines radio operations during the London, Ontario blizzard of January 1971. Two central perspectives emerged from the study. First the authors found a microcosmic picture of society as communications, in a state of flux, filtered and channeled through the primary medium of radio during the emergency. Second, the study provided an assessment of the dynamic role played by radio in aiding the community to cope with its changed environment. Some local officials felt there should be a "hot line" linking the radio stations and the municipal government because telephone lines were often busy due to public inquiries.

KW: Case studieš, media studies, winter storm, message channel.

170***
Sood, Rahul, Geoffrey Stockdale, and Everett M. Rogers. 1987. How the News Media Operate in Natural Disasters. Journal of Communication 37 (3): 27-41.

This paper uses research on news media activities during five natural disasters to show how the media and local officials often cooperate and sometimes conflict in accomplishing their respective goals, and how this process affects the public's understanding of the disaster event. The authors found that at the organizational level, the local news media will tend to pull available personnel off of normal tasks and reassign them to cover the disaster. Individual news personnel working in the field during a disaster assume greater independence and autonomy from their superiors.

Those reporters that were able to circumvent access and mobility problems are generally the most successful in filing their stories. The news media tend to seek particular kinds of information about a disaster from authoritative sources. The media seem to prefer law enforcement and fire departments as their prime information source. A centralized source of information (like an "information czar") is often preferred by the media. The media will assign the disaster a news value, which appears to be based on the number of deaths and injuries, extent of property damage, and geographic scope.

KW: Media studies, message channel.

171**
Turner, A.H. 1980. The Mass Media and Preparation for Natural Disaster. In Committee on Disasters and the Mass Media (eds), Disasters and the Mass Media, pp. 281-292. Washington, DC: National Academy Press.

This investigation was prompted by the USGS February 1976 announcement of an uplift on the San Andreas fault near Los Angeles (Palmdale Bulge) and the belief by many that a severe earthquake was imminent. The media's sense of responsibility is most directly reflected in decisions on what to report and what not to report. Editors are anxious to avoid any reporting that may produce mass panic or other undesirable responses. An assessment of responsibility for predictions, accuracy and value of reports must be made in relation to some assumed time span. Much media coverage lacks continuity. Individuals have only a vague awareness of media predictions and announcements concerning the prospect of an earthquake.

KW: Media studies, prediction/warning, earthquake, source credibility.

172
Waxman, Jerry J. 1973. Local Broadcast Gatekeeping During Natural Disasters. Journalism Quarterly 50 (winter): 751-758.

This article focuses upon local broadcast organizations as they attempt to cope with flooding in four communities. Specifically, the author examines "gatekeeping" of news organizations in different situational contexts. Major findings of the study are: 1) while during normal operations radio newsmen were the controllers of the major gate in the flow of news, during local disasters these and other gatekeepers were replaced by an emergent norm that opened all gates; 2) whereas during normal operations news was what newsmen made it, when disasters occurred, the public made the news; and 3) during normal operations there was little feedback between public and station.

KW: Media studies, flood.

173**
Wenger, Dennis, Thomas James, and Charles Faupel. 1980. A Few Empirical Observations Concerning the Relationship Between the Mass Media and Disaster Knowledge: a Research Report. In Committee on Disasters and the Mass Media (eds.), Disasters and the Mass Media, pp. 241-253. Washington, DC: National Academy Press.

This paper is one product of a survey by the Disaster Research Project at the University of Delaware of three midwestern communities that have had extensive disaster (hurricane, flood, tornado) experience. Part of the research has resulted in findings relevant to the importance of the media as a source of information, the relationship between various sources of information and the accuracy of disaster knowledge, and the degree to which members of the public and emergency officials believe that the media accurately portrays the amount of devastation produced by a disaster agent. The mass media is the most important distributor of disaster knowledge. Officials relied less heavily upon the media for disaster information than did the general public. Individuals for whom the mass media is the main source of information about disasters may exhibit less insight into the social aspects of the disaster than people who rely upon other sources. Generally, electronic and print media accounts exaggerate the impact of disasters.

KW: Media studies, hurricane, flood, tornado, message source, message channel, source credibility.

174
Wilkins, Lee. 1985. Television and Newspaper Coverage of a Blizzard: Is the Message Helplessness? Newspaper Research Journal 6: 51-65.

The author analyzed media coverage of the 1982 Denver blizzard. Newspapers were found to offer more information on four of the five phases of hazards: pre-hazard mitigation, preparedness, prediction and warning, and impact. Television, surprisingly, provided more follow-up and coverage of long-term recovery. An important conclusion is that both media focus on the event itself, provide little analysis, and that the event-oriented coverage conveyed messages emphasizing crisis, powerlessness, and individual helplessness. The author suggests that more attention must be given to such covert messages in hazard communication.

KW: Media studies, winter storm, message content, message channel.

SPECIAL POPULATIONS

175
Bagwell, Joyce B. 1983. How to Gain the Attention and Commitment of Public Service Organizations. In Walter W. Hays and Paula L. Gori (eds), Proceedings of Conference XXI, A Workshop on "Continuing Actions to Reduce Potential Losses from Future Earthquakes in the Northeastern United States", pp. 86-90. United States Dept. of Interior, Geological Survey Open File Report 83-844.

Public service organizations play a vital role in pre-event preparedness and post-event response, and gaining their support can reduce loss of life and property. To gain public service organization attention and commitment one should: 1) clearly identify desired groups; 2) reach the groups on a one-on-one basis at outset; 3) incorporate the goals of earthquake awareness and preparedness education with goals of the organizations; 4) write explicit plans; 5) involve the organizations; and 6) reward the work done by each organization.

KW: Special populations, earthquake.

176**
Beady, Charles H., Jr. and Robert C. Bolin. 1986. The Role of the Black Media in Disaster Reporting to the Black Community. Natural Hazards Research Working Paper #56. Boulder Colorado: Institute of Behavioral Science, University of Colorado. 83 pp.

This report analyzes the impact and potential of the black media in reporting and responding to natural disasters. It traces and interprets the sequence followed by black media operators in Mobile, Alabama, in gathering, selecting, and disseminating information about pre- and post-disaster activities. The report reviews the capability of the black media to reach large sections of the black community, assesses the ability of the black media to influence community actions to ensure safety, and describes the current and potential ability of both local and national black media to educate black communities concerning disaster mitigation, relief, and recovery programs. Findings show that there is a lack of information dissemination regarding predisaster preparedness and hazard mitigation on the part of the black media, but an effort to inform both immediately prior to and directly after the disaster. Television was the primary preimpact information medium, with a shift toward radio and newspapers during the postimpact stages. The authors suggest that since there is a greater listenership to black oriented radio stations, they are in a good position to reach a significant portion of the black

community with information concerning disaster mitigation, relief, and recovery. An important finding was that respondents generally did not cite the race of reporters as having any bearing on the believability of warning messages.

KW: Special populations, media studies, hurricane, dissemination.

177**
Coastal Area Planning and Development Commission. undated. Hurricane Awareness: Action Guidelines. Brunswick, Georgia: Coastal Area Planning and Development Commission.

Five booklets have been prepared by the Coastal Area Planning and Development Commission, which are directed towards increasing hurricane hazard awareness among specific age or interest groups. Varying in length from 8 to 16 pages, the booklets are aimed at school children, the elderly, hotel/motel owners, local government employees/officials, and marina/boat operators. Government officials are given concise guidelines on warning communications and emergency broadcast facilities, evacuation procedures, clean-up and recovery measures, and how to use a hurricane-plot map. Marina/boat operators are given tips about checks to make before casting-off and while on the water, equipment and supplies to keep on board in anticipation of severe weather, proper mooring techniques, and what to do while the storm is in progress. The age-group booklets contain information on assembling survival equipment and supplies, securing a house, and what to do during and immediately after a hurricane. While all possible guidelines for each group are not covered, the booklets provide a good model for risk communicators to follow, especially when trying to produce relatively effective materials at low cost.

KW: Special populations, education and awareness programs, hurricane, brochures.

178
Huerta, Faye and Robert Horton. 1978. Coping Behavior of Elderly Flood Victims. The Gerontologist 18 (6):541-586.

A study of the effects of the Teton Dam disaster in 1976 upon the elderly provided a test of the assertion in the literature that the elderly are more likely to over report their losses and express feelings of relative deprivation than younger people. The findings suggest that elderly persons cope quite well with disaster situations and tend to report fewer adverse emotional results and feelings of relative deprivation than younger victims. Elderly persons need to be advised in their own language style of financial, legal, and tax considerations. They also generally would prefer to be in the role of information and opinion disseminators than passive recipients.

KW: Special populations, flood.

179
Lindell, Michael K., Ronald W. Perry, and Marjorie R. Greene. 1980. Race and Disaster Warning Response. Battelle Human Affairs Research Center. 15 pp.

This paper compares racial groups along critical dimensions related to the interpretation of disaster warning messages. In addition, the authors attempt to develop a theoretical context within which to examine disaster warning response. Three primary race differentials were discovered: 1) Mexican-Americans were more skeptical than whites about believing warning messages, no matter what the level of specificity; 2) Mexican-Americans interpreted the same messages as indicating lower levels of personal danger; and 3) Mexican-Americans were less likely to evacuate than whites, without regard to levels of warning belief and perceived personal risk.

KW: Special populations, flood.

180
Nilson, Douglas C. 1983. How to Gain the Attention and Commitment of Political Officials: An Earthquake Politics Primer. In Walter W. Hays and Paula L. Gori (eds), Proceedings of Conference XXI, A Workshop on "Continuing Actions to Reduce Potential Losses From Future Earthquakes in the Northeastern United States", pp. 73-79. United States Dept. of Interior, Geological Survey Open File Report 83-844.

Since socio-political climates and decision maker psychologies interact to permit local officials to ignore earthquake responsibilities, cleverly formulated strategies are needed to induce approval of mitigation and preparedness measures in earthquake prone communities. Obtaining endorsement of measures from local leaders is vital. Convince elected officials that an earthquake can strike during their term in office. However, let them know that earthquake problems can be managed. Even though earthquakes in themselves are unpreventable, the resulting damage can be substantially reduced. Thus officials should be aware of the "political liability" and reverberations that can result if they did not take action to prevent loss of life and property when they had an opportunity. Presentations of benefit/price ratios facilitate comparisons and impresses policy makers. Let officials know that burdens can be spread across society and time. On the other hand, when needed point out specific industries, professions, firms, or individuals that will benefit from hazard legislation. Finally safety solutions can generate coalitions.

KW: Special populations, earthquake, legislation/regulation.

181***
Palm, Risa. 1981. Real Estate Agents and Special Studies Zones Disclosure: the Response of California Home Buyers to Earthquake Hazards Information. Program on Technology, Environment and Man Monograph #32. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 145 pp.

The Alquist-Priolo Special Studies Zones Act is a legislative effort for regulating real estate practices in areas where a natural disaster, in this case earthquakes, can occur. It requires California real estate agents or sellers to inform prospective buyers whether a property being negotiated lies within one-eighth of a mile of an active earthquake fault trace. This study addressed four questions: 1) whether real estate agents were actually complying with the law; 2) whether home buyers were responding to information on hazards in special zones; 3) whether the law really provided prospective buyers with adequate information to make informed decisions about matters of environmental risk; and 4) whether the agent disclosure process is an effective method to convey natural hazard information to home buyers. Findings indicate that the law has generally been ineffective, since patterns have failed to emerge which would show a measurable response in either buyer behavior or housing price trends. Reasons for low buyer response include role conflict on the part of the real estate agent and the fact that buyers often regard a house as a financial investment rather than a permanent residence.

KW: Disclosure studies, case studies, earthquake, message source, individual response, legislation/regulation, special populations, effectiveness.

182
Palm, Risa I. 1983. How to Gain the Attention and Commitment of Business and Industry to take Action to Lesson the Effects of a Destructive Earthquake: The Role of the Home Mortgage Lender. In Walter W. Hays and Paula L. Gori (eds), Proceedings of Conference XXI, A Workshop on "Continuing Actions to Reduce Potential Losses from Future Earthquakes in the Northeastern United States", pp. 61-68. United States Dept. of Interior, Geological Survey Open File Report 83-844.

The author explores the possible role that home mortgage lenders could play in informing homeowners of hazardous geologic conditions and conditioning home buyer response. If institutions do not discourage home buyers from exposing themselves to earthquake related economic risk, then individuals will not be dissuaded from investing in such property by public information campaigns. The study found that large home mortgage lenders were reluctant to take seismic risk into account in their lending policies.

KW: Special populations, case studies, earthquake.

183
Perry, Ronald W. and Marjorie R. Green. 1982. The Role of Ethnicity in the Emergency Decision-Making Process. Sociological Inquiry 52 (4): 306-334.

Data derived from fatality and injury counts following disasters, though sparse, documents that minority group citizens tend to suffer disproportionately high negative consequences in connection with the impact of disasters. On the basis of this information, it is inferred that differences exist between the emergency decision-making processes of minority and majority citizens. This paper lays the theoretical groundwork for beginning to revise existing conceptual models of warning response behavior to more adequately address the variation associated with minority group status. The authors put forward a comprehensive model of warning response which includes hypothesized relationships of a primary variable to the probability of evacuation. Some of these include: 1) the more precise an individual's adaptive plan, the higher the probability of evacuation; 2) the greater the individual's perception of real threat (warning belief), the greater the probability of evacuation; 3) higher levels of perceived personal risk will result in a greater likelihood of evacuation; 4) more family contact will increase warnings received; 5) ethnic minority status is related to kin contacts; and 6) ethnic minorities tend to have a lower perceived credibility of authorities. While, at first glance, risk communicators may find this article of only peripheral interest, the article provides a good background on group response to warnings and review of the literature.

KW: Special populations, review, group response.

184
Perry, Ronald W., Marjorie Green, and Alvin Mushcatel. 1983. American Minority Citizens in Disaster. Seattle, Washington: Battelle Human Affairs Research Center. 338 pp.

Results are presented of a multi-year study of minority citizen behavior in disasters. Three aspects of emergency management are addressed: warning and response, preparedness behavior, and community relocation as a flood mitigation measure. Study findings support the hypotheses that as levels of perceived personal risk and belief increase, citizens are more likely to comply with evacuation warnings. Blacks who perceive risk to be low are more likely to undertake some protective action as warning belief increases, but the majority still do not evacuate. Whites and Mexican Americans tend to continue their normal routine when they believe their risk is low, even if risk warnings increase.

KW: Special populations, flood, receiver perception, individual response, group response.

185
Prud'homme, Anthony. 1983. How to Gain the Attention and Commitment of Business and Industry. In Walter W. Hays and Paula L. Gori (eds), Proceedings of Conference XXI, A Workshop on "Continuing Actions to Reduce Potential Losses From Future Earthquakes in the Northeastern United States", pp. 69-72. United States Dept. of Interior, Geological Survey Open File Report 83-844.

The author lists and briefly discusses several actions or events which will help to concentrate the minds of business and industry on preparing for earthquakes. Some of these include: 1) focus on all major hazards, not just earthquakes; 2) publicity -- public awareness will compel businesses to respond to their perceived needs; 3) seminars and conferences will also create publicity; 4) get large companies to take a leading role, others will follow; 5) demonstrate the benefits of being prepared; 6) demonstrate the costs of being unprepared; and 7) establish an emergency planning position in the company.

KW: Special populations, earthquake.

186***
Stallings, Robert A. 1986. Reaching the Ethnic Minorities: Earthquake Public Education in the Aftermath of Foreign Disasters. Earthquake Spectra 2 (4): 695-701.

Public education programs intended to increase individual and household preparations for earthquakes often prove to be disappointingly ineffective, especially in reaching minorities and ethnic groups outside the mainstream of community life. This paper argues that the success of such programs can be improved by understanding the ebb and flow of earthquake saliency as well as the complex social structure of our cities. In particular, earthquakes and other major disasters in the ancestral homeland represent "teachable moments" when receptivity to earthquake safety information may be especially high among members of the ethnic community with a variety of psychological and personal links to that nation. Specific suggestions for taking full advantage of these teachable moments include: 1) conduct a detailed community analysis; 2) make contact with key ethnic community leaders; 3) approach local folk heroes; 4) prepare any needed materials beforehand; 5) promote earthquake safety legislation; 6) develop good sources of information about disasters in other countries; and 7) address targeted groups in person as often as possible.

KW: Special populations, education, earthquake.

187
Steele, G. Alec, Morgan Lyons, and Don D. Smith. 1980. Area Agency on Aging Disaster Contingency Planning: the Pre-Disaster Phase. In E.J. Baker (ed.), Hurricanes and Coastal Storms: Awareness, Evacuation, and Mitigation, p. 50-55. Report # 33. Florida Sea Grant College.

In other case studies it has been found that the elderly engaged in precautionary activities less frequently than younger residents, were less frequent listeners to radio and television prior to and during the storm, during evacuation tended to go to friend and relatives, and tended to be more influenced by family and friends. This paper discusses the implications of these findings on the warning and evacuation components of the Area Agency on Aging (AAA) contingency plans for the evacuation of the elderly. Some of the suggestions offered as possible modifications to pre-disaster contingency plans include: 1) design information brochures for specific evacuation plans; 2) localize and write brochures for particular target areas and groups; 3) enlist neighborhood representatives to serve as block captains and alternatives; 4) elderly residents should have a telephone number of the block captain; 5) lines of communication should be verified periodically to update the evacuation needs and intentions of the elderly; and 6) residents should be encouraged to recruit newcomers into the communication network.

KW: Special populations, hurricane, evacuation.

CASE STUDIES

188
Adams, David. 1965. The Minneapolis Tornadoes, May 6, 1965: Notes on the Warning Process. Disaster Research Center Report #16. Columbus, Ohio: Ohio State University. 29 pp.

This paper focuses on the warnings given in Minneapolis-St. Paul on May 6, 1965, when a series of destructive tornadoes hit the northwestern suburbs of the Twin Cities. The author found reason to believe that while Weather Bureau bulletin language was clear to professionals, to the public such bulletins often remained ambiguous at best. A warning signal by itself is incomplete under most conditions. Warning confirmation should be available immediately following the sounding of an alert. Because of the need of confirmation and maximum coverage, as many channels of communication as possible ought to be employed. This case study suggests that it is possible to place too much confidence in the mechanical elements of a warning system.

KW: Case studies, prediction/warning, tornado.

189
Cross, John A. 1985. Flood Hazard Information Disclosure by Realtors. Natural Hazards Working Paper #52. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 46 pp.

This report compares the effects of flood information on home purchasers' behaviors in Florida to the effects of disclosing earthquake information to home buyers in California. Research in California in 1983 showed that familiarity with the fact that a house was in a danger zone rarely altered a purchaser's intention to buy it. The study examined both residential home buyers and mobile home buyers in the Florida Keys, and found that their attitudes were similar to Californians'. Not only do most real estate agents disclose hazard information in a manner least likely to cost them a sale, but the recipient often is not inclined to act upon the information even if it is given. The majority of such recipients do not even want to hear such pejorative information. Another finding specific to the Keys is that prospective home buyers decided where to migrate before they decided to move--a characteristic of the migration of retired persons. The disclosure did have a positive influence on the Keys' residents' acquisition of flood insurance, but did not deter population growth in hazardous areas.

KW: Case studies, disclosure studies, hurricane, flood, earthquake, dissemination.

190**
Danzig, Elliot R., Paul W. Thayer, and Lila R. Glanter. 1958. The Effects of a Threatening Rumor on a Disaster-Stricken Community. Publication 517. Washington, DC: National Academy of Sciences, National Research Council. 116 pp.

This study examines the behavior of people in a flood stricken community (Port Jervis, New York) in response to a false rumor that a large dam upstream from the community had broken. About a quarter of the city's inhabitants fled within an hour. First, a descriptive account of the rumor communication network and of behavior of residents prior to and during the spread of the rumor was prepared from these data. Second, a random sample of city residents and a saturation sample from the previously flooded area were interviewed. Data is presented on variables related and not related to flight behavior, respondents reactions to rumor and denials, confirmation behavior, credibility of sources, etc. In order to maximize predictable and appropriate reactions the authors conclude that it is highly important to provide: 1) an educational program designed to acquaint the public with the nature of potential disaster and actions for survival; and 2) prompt reduction of ambiguity concerning the range of destruction while the disaster is in progress.

KW: Case studies, flood, false alarm, source credibility, uncertainty.

191
Drabek, Thomas E. et al. 1979. The Flood Breakers: Citizens Band Radio Use During the 1978 Flood in the Grand Forks Region. Program on Technology, Environment and Man, Monograph # 29. Boulder, Colorado: Institute of Behavioral Science, University of Colorado. 119 pp.

Citizen Band (CB) radios and their use during the 1978 floods along the Red River Valley near Grand Forks, North Dakota are the topic of this report. Specifically, CB use patterns, problems encountered, perceptions of benefits, and views regarding policy recommendations for CB use in future disasters are discussed. Major findings of the study include: 1) the pre-existing emergency services network reflected minimal pre-planning for CB radio use; 2) community CB use by the emergency system varied, resulting in the identification of three alternative response modes; 3) perceptions of the costs and benefits of CB use did not vary significantly across different sectors of the user community, which attested to various positive contributions and minimized costs; and 4) policy option perceptions did vary among those interviewed reflecting demographic and organizational characteristics, especially in regard to desirability of increased regulation and control.

KW: Case studies, flood, message channel.

192
Gori, P.L. and M.R. Greene. 1987. The Influence of National Attention on Long-Term Earthquake Preparedness Policy in Charleston, South Carolina. Earthquake Spectra 3(1): 91-101.

The Charleston, South Carolina, area offers a unique opportunity to study the implementation of policy for long-term earthquake preparedness at the local level. Interviews of public officials and others documented the low state of preparedness in 1981 and an improved situation in 1986. Five barriers to the implementation of earthquake preparedness policy were: 1) the earthquake problem is not a high priority for local officials or the public; 2) necessary technical information is not definitive; 3) adequate information by itself will not necessarily lead to appropriate action; 4) few advocates are organized around the issue of seismic safety; and 5) the costs associated with seismic safety are seen as prohibitive. These barriers have been overcome, in part, because of the involvement of local leaders, research and information programs by the federal government, media briefings, and numerous local workshops.

KW: Case studies, education, earthquake.

193
Greene, Marjorie R., Ronald W. Perry, and Michael U. Lindell. 1981. The March 1980 Eruptions of Mt. St. Helens: Citizen Perception of Volcano Hazard. Seattle, Washington: Battelle Human Affairs Research Center.

Survey data from this study suggests that intensive dissemination of hazard information during a short period of imminent disaster threat sensitizes people to the pending event. Pre-hazard communication of risk is important if officials want the public to understand the nature of the threat. It is plausible that officials themselves need to be convinced of the nature of volcanic risk. Once risk is communicated to the public, clarification of the hazard and protective guidelines are important for the threatened population.

KW: Case studies, volcano, receiver perception.

194***
Gruntfest, Eve C., Thomas E. Downing, and Gilbert F. White. 1978. Big Thompson Flood Exposes Need for Better Flood Reaction System to Save Lives. Civil Engineering--ASCE 48 (2): 72-73.

This brief article describes some of the lessons that can be learned from the 1976 Big Thompson Flood for the development of effective warning messages and public information programs. Nine guidelines for wording an effective warning message are: 1)convey a moderate sense of urgency; 2) estimate the size of the expected flood; 3) estimate the time before impact; 4) provide specific instructions for actions; 5) confirm the threat; 6) describe actions of others; (7) tell the audience the number of previously issued warnings; 8) mention current environmental conditions; and 9) advise the public to keep away from the hazard zone. Components of a successful public flood information program should include: 1) paint lines on buildings to designate previous floods; 2) place signs on canyons describing safety measures; 3) hold public meetings to plan flash flood preparedness; 4) develop school flood safety programs; 5) hold emergency flood drills; 6) require realtors and lenders to disclose whether a property is in a flood plain; and 7) print notices of flood vulnerability on travel maps.

KW: Case studies, flood, education, prediction/warning.

195**
Handmer, John W. 1980. Flood Hazard Maps as Public Information: an Assessment Within the Context of the Canadian Flood Damage Reduction Program. Canadian Water Resources Journal 5 (4): 82-110.

Flood hazard maps are essential for the successful implementation of a range of flood mitigation measures. However, the use of flood maps for public information is often advanced as partial justification for a mapping program. A number of assumptions implicitly underlie such justifications: that the public will understand the maps, and that they will have some effect on people's attitudes to the flood hazard. A review of the cartographic literature on map perception indicates that no firm statement can be made regarding map comprehension. The results of work by geographers on flood maps as public information suggest that maps have little effect on people's attitudes towards floods, and also reveal difficulties in achieving satisfactory research design. The research reported here examined the flood mapping component of the Canadian Flood Damage Reduction Program. Results indicate that although there was a substantially increased flood awareness among the post-map group this could not be ascribed to the maps. Rather, the increased activity in all communications media appears to have been responsible for the heightened awareness.

KW: Case studies, flood, maps, receiver perception.

196
Hansson, Robert O., Dianne Noulles, and Steven J. Bellovich. 1982. Knowledge, Warning, and Stress: a Study of Comparative Roles in an Urban Floodplain. Environment and Behavior 14 (2): 171-185.

Tulsa, Oklahoma floodplain residents were surveyed to investigate the role of knowledge, experience, and warning in mediating the stress associated with urban flooding. Among the respondents, knowledge about flooding was associated with less trauma during the last flood and reluctance to support indiscriminate government intervention. Increased prior warning of a flood, however, was related to intensified residual fear and feelings of desperation, to more frequent somatic manifestations of stress, and to greater support for all government intervention programs. Previous flood experience (especially recurring experience) was associated with increased fear, depression, and health-stress outcomes. Commitment to adaptive community intervention programs was related to recency of one's flood experience. Having flood insurance was unrelated to stress measures.

KW: Case studies, flood, receiver perception.

197**
McKay, Jennifer M. 1984. Community Response to Hazard Information. Disasters 8 (2): 118-123.

The impact of flood hazard information on public acceptance of a selected flood mitigation strategy was assessed by an analysis of the control of newspaper reports of community reactions and letters to the editor. The impact of personal delivery of a flood hazard map on individual perception of risk and attitude to such information was assessed using personal interviews. The results indicated that media coverage of the flood hazard information reduced public criticism of the works. This result must be partially attributable to the dramatic style of media coverage and the fact that the media only emphasized the positive value of the works. The interview showed that personal delivery of the information raised perception of risk, improved comprehension of flood risk, and had no impact on risk acceptability; but discouraged some respondents from seeking information in the future. Factors to explain the last negative change were identified to be the format of the map sheet and low salience of flood hazard. Methods to improve community response to hazards include: 1) hazard information should be disseminated after a local (even minor) occurrence of a hazard; and 2) if a map is to be used in awareness materials the most desirable format is obtained by manipulating the scale of size of the map to depict the hazard prone zones as small in relation to the hazard free zones.

KW: Case studies, flood, message content, maps, effectiveness.

198
Moore, Harry E. et al. 1963. Before the Wind: a Study of the Response to Hurricane Carla. Publication 1095. Washington, DC: National Academy of Sciences, National Research Council. 164 pp.

This study represents one of the first reports of a large scale pre-disaster evacuation. The authors interviewed over 1,500 people in Texas and Louisiana during the aftermath of Hurricane Carla in 1961. A number of the findings relate to communication processes, timing and targeting. Evacuation decisions are often made by family groups. Thus official statements and advisories serve as a basis for discussion in family and other primary groups and any feasible plan for action must win assent of all "voting members" of the family group. Members of the larger and more authoritarian institutions appear more likely to seek and accept official advice. Word-of-mouth was probably the most important factor in evaluating formal warnings and developing attitudes toward evacuation. When government and emergency personnel gave advice or orders there was a tendency among residents for discussion to give way to action. Respondents generally rated the performance of the Weather Bureau highly. Overwhelmingly, the greatest reliance for warning was placed on radio and television.

KW: Case studies, prediction/warning, hurricane, evacuation.

199
M.S.I. Services, Incorporated. 1981. Public Requirements for Weather Information and Attitudes Concerning the Weather Service. National Weather Service NA-80-SAC-00654.

This report describes the work and results of a project to determine the public's requirement for weather information. A telephone interview survey of 1300 respondents provided the bulk of the data for this study. Some of the findings of the study should be of interest to risk communicators. T.V. and radio are the primary sources of weather information. Two-thirds of the respondents felt that weather reports contained about the right amount of information. Nearly 70% preferred numerical rather than verbal descriptions of probabilities as part of the forecast. Most respondents said they felt they knew the difference between a watch and a warning. Over 82% want weather forecasts from areas of the country other than their own.

KW: Case studies, severe storm, receiver perception.

200**
Nigg, Joanne M. 1982. Communication Under Conditions of Uncertainty: Understanding Earthquake Forecasting. Journal of Communication 32 (winter): 27-36.

This article addresses the question of how media coverage relates to a community's information-seeking and information-exchange behavior when that community is faced with an unspecific warning of a widespread disaster. In particular, the author focuses on an earthquake prediction. Information exchange and information seeking pertaining to disasters involve four stages--awareness of the threat message, a heightening in interest, the arousal of concern, and threat evaluation and expert surveillance. The need for variety and the need to clarify ambiguous or confusing situations provide two different bases for explaining when and the degree to which people pay attention to news about earthquakes. Dramatic events (such as a new forewarning) are especially important for activating low-level and diffuse interest. To obtain more information, the individual engages in "surveillance" behavior that increases exposure to what is deemed pertinent information. The last step--contacting an expert--can be influenced by the media at all stages of disaster information seeking.

KW: Case studies, media studies, earthquake, group response, uncertainty.

201**
Palm, Risa. 1981. Public Response to Earthquake Hazard Information. Annals of the Association of American Geographers 71 (3): 389-399.

Consumer protection legislation has been based on the assumptions that people prefer to avoid risks and that they make rational decisions given a bounded field of information. The response of California home buyers to mandated disclosure of the location of earthquake fault zones was negligible. Some of the factors which diminished the effectiveness of this method of informing the general public about seismic hazards include: poor credibility of the real estate agent as a source of environmental information, the possible role conflict of the real estate agent in both selling property and protecting prospective buyers, lack of understanding about the hazard zones, emphasis home buyers place on the house as a financial investment, and the widespread belief that there are few alternatives.

KW: Case studies, earthquake, disclosure studies, legislation/regulation, source credibility.

202
Palm, Risa. 1985. Geography and Consumer Protection: Housing Market Response to Earthquake Hazards Disclosure. Southeastern Geographer 25: 63-73.

This article analyzes earthquake hazard disclosure legislation, and finds in the case of real estate laws in California that required disclosure is often ignored, and that the message is so weakened by the channel (in this case real estate appraisers and agents) that it had little impact on home prices or buyer behavior. This appears to be a good example of a case in which the communication process is used to alter the impact of the message.

KW: Disclosure studies, earthquake, dissemination, message channel, legislation/regulation, economic impact, case studies.

203
Perry, Ronald W., and Marjorie R. Greene. 1983. Citizen Response to Volcanic Eruptions: the Case of Mt. St. Helens. New York: Irvington Publishers, Inc. 145 pp.

Using the results of two studies of citizen response to the eruption of Mt. St. Helens, this study documents human response and factors important in individuals' decisions to undertake protective actions when a volcanic eruption threatens. Topics discussed in the study that the risk communicator may find helpful include: sources of general information about the volcano, citizen beliefs regarding protective actions, awareness and obtainment of emergency preparedness information, sources and evaluation of information while the eruption was in progress, and warning belief and response.

KW: Case studies, volcano, receiver perception, individual response, emergency communication.

204
Perry, Ronald W., Michael K. Lindell, and Marjorie R. Greene. 1982. Threat Perception and Public Response to Volcano Hazard. The Journal of Social Psychology 116 (April): 199-204.

This article examines perceptions of the threat posed by a volcano in Washington. Interest is focused upon the level of perceived risk, the sources and frequency of information receipt, and the level of confidence of the affected population regarding the adequacy of the information received. A probability sample of 230 citizens was taken from seven communities situated near Mt. St. Helens, Washington, which resumed activity in March 1980 after a 123 year dormant period. The data analyses indicate that intensive dissemination of hazard information during a short

period of imminent threat of disaster sensitized people to the pending event.

KW: Case studies, volcano, receiver perception.

205**
Ressler, Everett M. 1979. Observations on the Development of Educational Materials Following the Andhra Pradesh Cyclone, 1977. Disasters 3 (3): 283-285.

This report provides some preliminary results from a small sample of villagers on the effectiveness of certain types of drawings for use in the development of cyclone educational materials. Some of the suggestions for future materials include: 1) houses should be portrayed proportionally correct; 2) details should be accurate; 3) color could be used to avoid ambiguity in line drawings, although the color used should be the actual color of the object depicted; 4) pictures cannot convey all information, thus words are necessary for clarification; 5) only one picture per page should be employed; 6) quality paper should be used to lengthen the life-span of materials; 7) drawings not relevant to proposed recipients should be removed; and 8) each picture should carry a positive message.

KW: Case studies, hurricane, message content, education.

206**
Sandman, Peter M., Neil D. Weinstein, and M.L. Klotz. 1987. Public Response to the Risk from Geological Radon. Journal of Communication 37 (3): 93-108.

An analysis of reactions to naturally occurring radon (especially as compared to technologically produced radon) in New Jersey suggests that successful risk communication must bridge the gap between focusing on hazard information and using the potential for public "outrage" as an important motivation to action. In their focus on hazard value, the public tends to overestimate the hazard of high outrage risks and underestimate the hazard of low outrage risks. Risk managers need to find more effective ways to teach the public to attend more to hazard value than outrage value. Furthermore, experts must stop thinking that the public reaction to risk is irrational or unpredictable just because it is based more on outrage than on hazard.

KW: Case studies, receiver perception, radon.

207
Schware, Robert. 1982. Official and Folk Flood Warning Systems: An Assessment. Environmental Management 6 (3): 209-216.

This study examines some socio-economic constraints on the communication of flood warning messages in West Bengal, India. It then looks at perceptions of, and responses by, villagers in a flood prone area of West Bengal to official and folk flood warnings. Warnings were often expressed in volume of water released from upstream dams, but did not indicate the geographic area likely to be inundated. The police were found to be important channels for transmission of flood warnings but depending on their own perception, goals, or ignorance would occasionally delay the conveyance of a message. While the folk communication system, for the most part, complemented the official network, it is perceived to have a high source credibility by local villagers. Finally, interviews revealed that partisan attitudes played a role in the dissemination of warnings.

KW: Case Studies, flood, message channel.

208
Sims, John H. and Duane D. Baumann. 1972. The Tornado Threat: Coping Styles of the North and South. Science 176 (4042): 1386-1392.

The authors note that more tornado deaths occur in the south, yet the actual number of tornadoes and population at risk is greater in the north. Using surveys of Illinois and Alabama residents, the study suggests that it is psychological parameters and beliefs that ultimately influence a person's response to a warning. For example, many of the respondents from Illinois, who believe that they direct their own lives and what they do affects their futures, will go about confronting the possibility of a tornado in a characteristic style. They tend to use their heads and available technology, and take action. On the other hand, many of the Alabama respondents, who believed that God, fate or luck controls their lives, have less confidence in their own actions and their ability to effect change; they confront a tornado in a manner consistent with their attitudes. They place less trust in man's communal knowledge and await the fated onslaught. While this particular study may, by now, be outdated, risk communicators should heed its message, that beliefs, attitudes and values significantly affect a person's understanding and response to a warning.

KW: Case studies, tornado, group response.

209
Sorenson, John H. 1981. Emergency Response to Mount St. Helen's Eruption: March 20 to April 10, 1980. Natural Hazards Research Working Paper #43. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.

The situation in the weeks previous to the cataclysm of May 18th provided a rare opportunity to study the methods used by public officials and decision makers to assess the risk of eruption and potential damages, and the ways in which they warned the public. This working paper identified the key actors and organizations in the response, traces the information flow among those actors and from them to the public, indicates persistent problems faced by emergency personnel, and analyzes how all affected parties perceived and estimated the risks from a future eruption. Conclusions indicate that: 1) the USFS's strong response to the impending eruption facilitated a coordinated response and reduced confusion; 3) much of the communication process was one-directional; 3) rumor was not a major problem; 4) most local and state agencies and organizations were poorly prepared to respond to the eruption despite prior USGS hazard studies; and 5) the experience gained in the non-disaster phase of the eruption was instrumental in preparing officials and some of the public for the May 18th explosion.

KW: Case studies, volcano.

210**
Sorensen, John H. 1983. Knowing How to Behave Under the Threat of Disaster: Can It Be Explained? Environment and Behavior 15 (4): 438-457.

The widely held belief that providing people with information and education on natural disasters will reduce losses is examined in this paper. Results of an empirical study to ascertain the relationship between information, education, and knowledge about adaptive responses in a threatening situation are presented. Findings indicate a poor statistical relationship between knowledge and a number of explanatory factors suggested by previous research. The study indicates that the process of acquiring information on hazards is variable among individuals and poorly understood. Overall, the ways in which people learn about hazards appear to be as fragmented as existing policies to disseminate hazard information.

KW: Case studies, earthquake, tsunami, hurricane, group response.

211
Stewart, Thomas R., Richard W. Katz, and Allan H. Murphy. 1984. Value of Weather Information: a Descriptive Study of the Fruit-Frost Problem. Bulletin of the American Meteorological Society 65 (2): 126-137.

This paper reports some results of a descriptive study of the value of weather information used by fruit growers in the Yakima

Valley of central Washington to decide when to protect their orchards against freezing temperatures. Specifically, the study provides data concerning the decision-making procedures of individual orchardists, the growers' use of weather information (including frost forecasts), and the dimensions of the value of such forecasts. Results from the descriptive study regarding the orchardists' information-processing and decision-making procedures are compared with the procedures included in a previous prescriptive study of the same area done by one of the authors. Some implications of this study for the further development of prescriptive models of the decision-making process in the fruit-frost context and in other weather-information-sensitive contexts are discussed.

KW: Case studies, probabilities.

212
Vining, Kevin C., C. Arden Pope III, and William A. Dugas, Jr. 1984. Usefulness of Weather Information to Texas Agricultural Producers. Bulletin of the American Meteorological Society 65 (12):1316-1319.

The purpose of this paper is to report findings of a mail survey given to 900 Texas farmers and ranchers asking them to rank the importance of various agrometeorological information types to their operations and assessing their willingness to pay for weather information. Most producers ranked as important those information types commonly broadcast over public media. Few producers would be willing to pay for weather information. Comments indicated a distrust of weather data, especially forecasts.

KW: Case studies.

213
Vitek, John D. and Susan M. Berta. 1982. Improving Perception of and Response to Natural Hazards: the Need for Local Education. Journal of Geography (Nov-Dec): 225-228.

This paper is a report on surveys conducted in Flint, Michigan that recorded residents perception of local natural disasters, adequacy of local natural hazard education in grades K-12, and the government's role in improving awareness of natural hazards. Those who had personal experience with tornadoes were only slightly more familiar with hazard education in the city's schools than those with no experience. Neither formal education about natural hazards nor experience motivated the survey respondents to become familiar with local hazard education programs. While most respondents suggested that the government develop hazard education programs, they failed to recognize the educational function of the

local Civil Defense Unit. Reliance upon experience for information about hazardous events is unacceptably risky because they occur infrequently. Coordination of an adult education program on natural hazards would be a logical and worthwhile activity for the Federal Emergency Management Agency (FEMA).

KW: Case studies, receiver perception, education.

214
Waterstone, Marvin. 1978. Hazard Mitigation Behavior of Urban Flood Plain Residents. Natural Hazards Research Working Paper # 35. Boulder, Colorado: University of Colorado, Institute of Behavioral Science. 60 pp.

This paper reports findings of a survey of selected flood prone communities in the Denver metropolitan area. Prior hazard experience, hazard awareness, and hazard information were examined to determine which factors were most significant in explaining mitigation behavior. One major focus of the study was to evaluate the effectiveness of a flood hazard information brochure which had been prepared and distributed by the Denver Urban Drainage and Flood Control District. The brochure generally heightened awareness of the flood hazard and seemed to motivate mitigation behavior. However, the study also showed that a year after the brochures were disseminated, only one-third of the respondents remembered receiving them. Specific recommendations for improving the content of the brochure include: 1) making the map more useful and understandable; 2) specifying clearly on the brochure that it is being distributed only to those who live in the floodplain; 3) provide a history of flooding in particular drainages and a description of maximum levels reached; 4) furnishing flood insurance information; 5) discussing the fact that the occurrence of one flood does not alter the probability of another in the same area; 6) clarifying the definition of a 100-year flood and the 100-year flood plain; and 7) providing a comprehensive list of mitigation actions that individuals can take.

KW: Case studies, flood, message content, individual response, effectiveness.

215
Wenger, Dennis E., Thomas F. James, and Charles E. Fauple. 1980. Disaster Beliefs and Emergency Planning. Disaster Research Project, University of Delaware. 170 pp.

The primary focus of this study is to assess the degree of accurate public knowledge about disaster behavior in communities with substantial disaster experience. Officials of emergency-relevant organizations are also surveyed for their knowledge, beliefs, and attitudes about natural disasters. The authors

recommend that local officials include public education programs as part of an institutionalized, routinized program of disaster planning. As part of this the program should contain information on the social myths of disasters. Enlightenment of a "critical mass" of local residents can result in the distribution of this information to others via interpersonal networks. Since the mass media are the most salient sources of disaster knowledge they should also be part of any communication campaign. Officials should recognize that a majority of residents hold inaccurate beliefs about the social aspects of disaster. Thus, attempts to mitigate the existence and effects of these myths should be included in the set of emergency tasks undertaken by local officials. Interpersonal communication is not a salient source of hazard information for officials. It is necessary, therefore, to develop a local critical mass of emergency officials who interact and discuss their concerns on a regular basis.

KW: Case studies, tornado, hurricane, flood.

216**
Windham, Gerald O., Ellen I. Posey, Peggy J. Ross, and Barbara G. Spencer. 1977. Reactions to Storm Threat During Hurricane Eloise. Social Science Research Center Report # 51, Mississippi State University. 74 pp.

A sample of 378 households were interviewed in the Destin-Fort Walton and Panama City Beach areas in Florida after Hurricane Eloise, which struck on September 23, 1975. Data were gathered on personal and social characteristics, perceptions of the warning system, and perceptions of danger from the storm. Risk communicators should find the study's discussion of "leavers and stayers" helpful in targeting groups. The typical leaver was influenced by official sources and was more concerned with personal and family safety than with possible property damage. Leavers depended on both local radio and TV, which were considered effective sources. Generally, leavers were avid television news fans. Stayers were more often property owners or businesspersons, had a higher educational attainment, and were not newcomers to the area. These people were less likely to be influenced by weather bulletins, messages from public officials, and messages from friends and relatives. Stayers were more likely to be dissatisfied with the information given and the warning system, and may have desired more frequent messages. Stayers tended to be slightly less knowledgeable of warning terms and wind and tide predictions.

KW: Case studies, hurricane, receiver perception, individual response, evacuation.

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