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.