Chapter VII

SOCIAL CONSIDERATIONS IN FORECASTING AND WARNING

The ultimate goal of a warning system is to influence people to take precautionary action. A warning provides the opportunity for people to prepare for the impact of a hazard. A disaster warning system is evaluated according to its ability to motivate actions to minimize loss of life and social disruption.

Disasters fall into two distinct groups — those that occur unheralded and others for which some prior warning can be given [1]

Earthquakes are unexpected events because it is not yet possible to predict accurately when and where they will occur. While weather-related disasters are the most common disasters for which some prior warning is given, warning is also possible for dam collapses, volcanic eruptions, landslides, and tsunamis.

The amount of warning possible varies considerably from just a few minutes for tornadoes, an hour or two for thunderstorm squalls and flash floods, a day or two for tropical cyclones, up to a week or even much longer for floods in slow-moving rivers in extensive flat terrain.[1]

Disaster warning, as already mentioned, is an integral part of disaster preparedness. The establishment and implementation of a warning and response system is itself complex and requires co-ordinated activities by different departments for diverse audiences within very restricted time limits, and on the basis of often uncertain information. The warning system must bring together geophysical sciences, social sciences and technology.

Disaster warning systems for different hazards may differ in some ways. In spite of differences, most warning systems will include four basic functions :

(i) Detection, evaluation and prediction of hazard;
(ii) Formulation of forecast and warning messages;
(iii) Dissemination of warning messages; and
(iv) Initiating appropriate preparedness responses

The technical and social aspects of these four warning system functions constitute the largest single field of study in the international analysis of disaster preparedness. The literature is extensive. This chapter attempts to focus on what research has suggested are the major social considerations.

1. Detection, evaluation and prediction of a hazard

Over the last 30 years, significant strides have been made in the capability to detect hazards earlier, evaluate them more fully, and predict more accurately what their effects are likely to be. Advances in technology have facilitated the use of such equipment as computers, satellites, improved weather radar systems, flood monitoring devices, and advanced seismic instrumentation as part of warning systems. With satellites, for example, it is now possible to detect the formation of cyclones in their early stages, determine the flood potential from the melting of mountain snow-caps, monitor the silting of rivers, and detect seismic fault movements. These advances have resulted in the establishment of many different disaster warning systems, including early warning systems for tsunami, cyclones, flooding, winter storms and thunderstorms. Advances in science and technology offer a more reliable basis for forecasting how hazardous situations may develop, which communities are likely to be affected, and the possible effects.

Problems

The international community has not, to date, benefited uniformly from these technological advances. In some countries advanced warning systems exist while in other countries only minimal efforts have been made to establish effective systems for the detection, evaluation and prediction of hazardous situations There are various reasons for this. The related sciences, for example, are still evolving; the new technologies are often extremely expensive; various countries have different levels of risk; and more active collaboration in training and in the sharing of information and technology is needed. There is significant opportunity for international co-operation to improve the capability of detection, evaluation and prediction.

While major advances have been made, there are still significant limitations to consistent and accurate identification, evaluation, and prediction of natural hazards. For many hazards, scientists can at best suggest the probability that an event will occur but cannot predict the specific time of occurrence, the intensity, or the exact communities to be affected. This is more true of cyclone prediction than is often assumed. For example, in the United States when predicting the landfall of cyclones, the average 24-hour forecast error is 100 miles.[2] Those who are not scientists in hazard detection may not appreciate the degrees of error existing. They often have unrealistic ideas about what instruments such as satellites and computers can do, and

---

[1] A D. Crane, "Warning Systems: Possibilities and Problems", in *Response to Disaster,* ed. John Oliver (Townsville, James Cook University of North Queensland, 1980), p 47.

[2] Earl J. Baker, "Coping with Hurricane Evacuation Difficulties", in his *Hurricanes and Coastal Storms* (Gainsville, Florida Sea Grant College, 1980), p 13.

may have exaggerated expectations as a consequence. A realistic understanding of forecasting limitations may help in maintaining credibility of the warning service. The general public is unlikely to respond optimally to warnings if the credibility of the warning service is questioned.

Suggestions

Experience suggests that improving hazard assessment and forecasting entails more than improving technology. For weather warning, further technological advances will only give marginal additional benefits, and at ever increasing costs.[3] In a study of flood warning systems, the lesson learned in both developing and developed countries is not to rely exclusively on any one system.[4] In rural areas where people do not benefit from reliable flood warning, there should be more consideration of the local population's empirical understanding and knowledge. Other non-technical considerations which must be taken into account include improving the personal skills of forecasters and increasing the public's understanding of the causes and development of hazardous phenomena.

2. Formulation of forecast and warning messages

In the past, disaster warning services issued warnings as though their only purpose was to deliver the message

> What happened to them (the warning messages) afterwards, whether they were received, believed, or acted upon, was of no concern to the warning system, which was concerned about technologically efficient and accurate forecasts about the geophysical disaster agent.[5]

Disaster warning messages often do not have the desired impact, a fact consistently substantiated by social science research.

> The public warning disseminators usually proceed without sufficient knowledge or training in what information should be contained in public warnings, or the best means of delivery. The result is often an inadequately warned public and needless deaths and injuries.[6]

After the study of 31 disaster sites in the United States, it was concluded that:

> Warning messages are generally not formulated in a manner which motivates optimal response. Standard messages presented by the broadcast media motivate people to seek additional information, but do not induce protective action. In fact, a standard statement may actually reduce response, unless information is given which convinces residents in susceptible areas that they are at risk.[7]

Examination of warning messages must include analysis of whether the message contains the necessary information, whether the message was understood by receivers and whether the warning message stimulated receivers to take necessary action.

Problems

The following are some of the problems associated with disaster warning messages that arise from social rather than technical issues:

(*a*) Warning terms are often developed as an organizational code to indicate different time phases or degrees of danger. Surveys suggest that the public often confuses or fails to appreciate the difference between the warning terms used, such as "watch" and "warning", "intensity one" and "intensity two", or "flash flood" and "river flood". The language in some warnings is too technical, For example, terms such as latitude and longitude may not be readily understood. Technical information alone, or eye-witness reports, have been shown not to be particularly persuasive in stimulating people to act decisively.

(*b*) Conflicting warning messages are sometimes conveyed at different times, and from different sources.

(*c*) People are often unable to translate general weather conditions into specific dangers likely to occur at the local level. For example, on the basis of a weather notice which forecasts the amount of rainfall, they may not anticipate that roads will be flooded.

(*d*) Warning messages often contain insufficient geographical information to provide meaningful reference points.

(*e*) Research has shown that awareness of an approaching hazard does not necessarily lead to the adoption of appropriate precautions.

The problems mentioned above were identified in a review of eight major studies of social response to cyclones cited in the noteworthy monograph of the World Meteorological Organization entitled *Human Response to Tropical Cyclone Warnings and their Content*. The problems mentioned, however, are only a sampling of the difficulties which may exist in formulating and disseminating warning messages. The social considerations which enhance or limit the effectiveness of hazard warning messages must be assessed locally, since many factors are likely to be culturally and community specific.

Suggestions

In order to improve disaster warning messages, the information contained must include more than technical information. Greater attention must be given to information for the general public, and to the success of messages in stimulating people to take appropriate action. In consideration of the social factors, the following practical suggestions have been derived from a review of social science research :

(i) Warning messages must convince the general public that they are personally at risk. People will find it more helpful to know they are in danger as a result

[3] Oliver, 1980, 50.

[4] Robert Schware, *The Folk Wireless · An Example of Indigenous Technology for Flood Information Systems* (Geneva, United Nations Research Institute for Social Development, 1982).

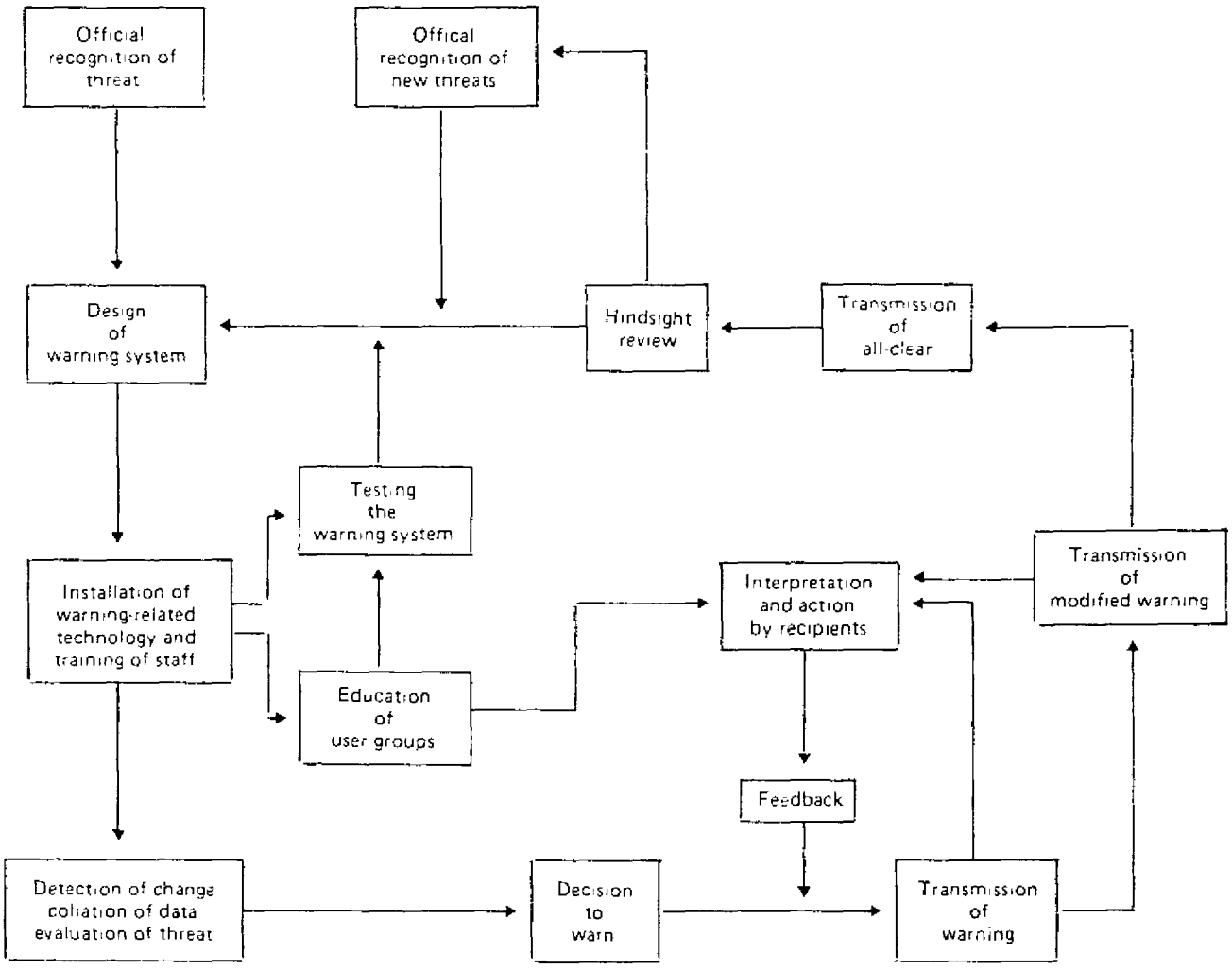
[5] Ian A. Murray, "Social and Political Aspects of Disaster Warnings", in *Response to Disaster*, ed. John Oliver (Brisbane, James Cook University of North Queensland, 1980), p. 61

[6] *Ibid*, p. 71, quoting Mileti, 1975.

[7] Robert K. Leik, T. Michael Carter, and John P. Clark, *Community Response to Natural Hazard Warnings* (Minnesota, University of Minnesota, 1981), p. 72.

FIGURE 8

Idealized warning system



Source Harold D Foster 1980

of an approaching cyclone than to know only that a cyclone is approaching.

(ii) Warning messages must be issued in a language understood by the receivers. In multilingual communities and in communities with migrant workers or tourists, warning messages in different languages will be required. Warnings must also be issued in a vocabulary meaningful to the average person.

(iii) Warnings should be consistent in content. This requires a carefully co-ordinated and rehearsed warning process.

(iv) Warning messages should not use technical terms which are unlikely to be understood.

(v) In conveying hazard intensity, technical concepts should be supplemented with information about the likely physical consequences. Understanding of the effects of wind velocity, often indicated in metres/sec. or kms/hr, is enhanced by descriptions of the wind's effects on trees and roofs, for example.

(vi) Warning messages are most helpful if they contain detailed information about specific community

FIGURE 9

(Credit : United Nations/André Bureau/Sigma)

Effective forecast and warning systems are an essential element of disaster preparedness and response, as illustrated by evidence of the destruction left by cyclones and tidal waves.

risks. It is more helpful to know which roads are likely to be flooded than to know only that there will be general flooding.

(vii) The warning message must state explicitly what precautions must be taken and when. It is important, for example, to be reminded of the precautions to protect property, to know which emergency provisions to adopt, and what supplies to take when evacuating.

(viii) Motivation should be considered in the formulation of the warning. Warnings are likely to be more effective when they include a combination of fear of consequences, factual information, and personal accounts

3. Dissemination of warning messages

A disaster warning system is first an information system. Response to warning depends upon an effective and efficient network of communications between the sender of the warning messages and all parties who should receive that warning. All must receive the information they need within a very short time The process of sending warning messages to such a large and diverse audience in such limited time requires careful assessment and planning.

Most, if not all, disaster services have developed plans for the dissemination of disaster messages and, as written, they often appear exemplary. In actual situations, however, they seldom function as well as imagined. The cyclone which struck Bangladesh on 12-13 November 1970, killing at least 225,000 people, provides a memorable example.

Although the cyclone had been identified by neighbouring meteorological services as early as 9 November and tracked by satellite and later by radar as it moved north-eastward up the Bay of Bengal the initial warning was not passed on by the local radio station which closed at 11 p m Moreover, a newly adopted streamlined system of warning was resented by officials, high and low, who blocked it.[8]

[8] Harold D Foster, *Disaster Planning The Preservation of Life and Property* (New York, Springer-Verlag, 1980), p 189

Problems

Less dramatic examples of problems in the dissemination process are cited after all emergency situations. Sometimes the dissemination of warning messages is influenced by political or economic pressures. Some warning messages are not sent on time, or are sent to the wrong person, or are not forwarded appropriately. Communication linkages may not exist between certain organizations, or the linkages that do exist are out of date and irrelevant. In some situations the warning message is not relayed because of a damaged or overloaded technical communications system. Sometimes the warning methods have simply been ineffective, with the result that people have not received any warning. For example, studies of disaster warning response in the United States revealed that, in some disaster-struck communities, an average of one third of the general public did not receive warning messages.[9]

Suggestions

(*a*) The success with which disaster warning messages are disseminated is influenced by such factors as :

(i) The decision to warn;
(ii) The source of the information;
(iii) The dissemination network; and
(iv) The communication methods.

(*b*) The decision as to when and how often to warn, is a very difficult one. There is always a tension between a meteorologist's desire not to alarm a population unduly when the risk is uncertain, and a community's need for early information in order to carry out necessary precautions. Repeated warnings for which no hazardous situations develop, the "cry wolf" syndrome, may cause people to be less willing to take precautions. Delaying a warning until there is certainty can be disastrous. The frequency of warning messages is further complicated by the fact that even when there is acute danger, the frequency of warnings influences people's decision to take action or to delay. Research in the United States suggests that people may be less likely to take action if the warnings are issued frequently.[10] The optimal frequency with which warning messages should be issued requires examination in each culture.

(*c*) The source of the warning influences people's response to the message, a point which should be noted in determining under whose name or auspices the warning message should be issued. The person or agency that may elicit the most community response may not necessarily be the head of the emergency co-ordination office. It could be, for example, a local official, the police, popular figures, reprsentatives of technical services, national leaders, etc. In the United States, persons without hurricane experience have been shown to be most motivated by respected authorities.[11]

(*d*) The communication network between the organizations that must participate in the warning system provides the basis for the transfer of warning messages. The dissemination process is judged largely by how well warning messages can be transmitted throughout the system, and by the efficiency of feedback. This, for example, is reflected in the communication channels which exist between the meteorological department, officials, the police department, area hospitals, local industries, emergency services and radio stations. The effectiveness of the communication network also depends upon the channels of communication between the various organizations and the general public. Organizations which never communicate with each other prior to an emergency will predictably not communicate well during an emergency. Dissemination therefore means more than preparing a list of telephone numbers of persons to be contacted in an emergency. It depends on the continuous testing and use of the communication channels to ensure the practicability of conveying warning messages in an emergency situation.

(*e*) Another aspect of the dissemination network is to define the groups and individuals to whom the warning messages must be sent. Disaster messages involve at least six categories of receivers within a community, including the technical warning service, officials, emergency services, local media, other organizations and establishments, and the general public. Within the general public there are always sub-groups who are outside the mainstream information and communication channels. Each category of receiver may require somewhat different kinds of information. Priority must be given in each category to essential emergency organizations and to the most vulnerable individuals or organizations. Special efforts will always be required to ensure that people in special circumstances are provided with warning according to their needs. People who are potentially more vulnerable may include elderly people, children, people living in isolated or remote places, and people who may face particular danger (e.g., fishermen).

(*f*) The technical methods of disseminating hazard warnings also require careful examination. Analysis of how these work in actual situations confirms that major problems often exist. For example, many dissemination plans are based in part on the use of the telephone for relaying warning messages. However, telephone services are often very weak links in the communication network, due to such problems as disruption of the service by the disaster itself, service malfunctions, and overload when large numbers of people are trying to use the telephone simultaneously. During the approach of the 1977 Sri Lanka cyclone, the number of people calling the meteorological office to request information prevented that office from placing calls. Studies conducted in the United States confirm the unreliability of commercial telephone services for hazard warning. As is well known, radio, television, and newspapers are extremely important channels for relaying warning information. Much more study and analysis is required to identify how disaster warnings can be effectively transmitted by these means in each disaster-prone community.

[9] Leik, p. 9.

[10] *Ibid.*, p. 49

[11] WMO, *Human Response to Tropical Cyclone Warnings and their Content* (Geneva, World Meteorological Organization, 1983), p. 4.7

(*g*) In addition to the technical means of transmitting warning messages, it is important to recognize the more informal communications systems, based on social networks. People rely in part on information from friends and neighbours, local organizations and others. A study of the cyclone warning system in Australia[12] concluded that personal communication channels were the most important source of warning information for migrants and the elderly. As another example, warning messages conveyed through the village head may be the best way of warning everyone within the village.

(*h*) All warning methods must be evaluated. How many people actually hear warning sirens or see warning flags? Will dissemination be effective if the messages must be sent at night or on weekends or holidays? Do people listen to and respond to warning messages presented by radio? What visual methods of presenting a disaster warning by television are most effective? These are only some of the questions that must be asked

Practical Implications

To ensure that the dissemination of warning messages is accurate and timely, social factors which can assist or impede the transfer of warning messages must be understood. The following practical guidelines have been suggested from social science research.

(i) The timing of warnings must be assessed. Warnings which are too early or too frequent may be detrimental and warnings which are too late or too infrequent may be disastrous.

(ii) Communication channels for the dissemination of warning messages must be continually used, updated and tested.

(iii) Warnings may be better if received from local authorities with high status and credibility. A personal announcement from the mayor confirming that flooding is expected and that local precautions should be taken is more likely to stimulate public response than the same announcement made by an unknown meteorologist in the capital city.

(iv) Warnings are more likely to be heeded if personally delivered. In the United States, for example, it is suggested that disaster warnings stimulate more response if delivered "face-to-face" in a family setting.[13]

(v) Warning procedures should be expanded to include as much personal, local contact as possible. Where local law enforcement and emergency service agencies cannot provide sufficient personnel, neighbourhood, friendship and family networks should be organized for action as part of the warning system.[14]

(vi) Warning messages should be delivered in a personal manner which conveys the sender's certainty about the message.[15]

(vii) The transfer of warning messages should not depend on a single dissemination system. For example, door-to-door personal messages may be needed in addition to warnings by siren.

These examples illustrate the social factors that might be taken into consideration to improve a dissemination system. Considering the many cultural and procedural differences that exist between disaster warning systems in various countries and communities, specific improvements are best made by analysis of each particular system.

4. Creating appropriate preparedness responses

Timely and accurate warning messages disseminated quickly and efficiently to the population at risk are ineffective if that population fails to respond in a meaningful way[16]

It is often assumed, at least implicitly, that the public will (or should) respond automatically to hazard warnings.

Most people, however, will not take protective action on the basis of a single warning message. This is particularly true when they have previously received warnings and had no hazard materialize,[17]

or when there is little observable evidence of the danger.

The human response to warnings is much more complicated than simply taking action upon receipt of advice to act. There are five common reactions to hazard warnings:

(i) Taking immediate action as directed;

(ii) Taking some defensive action although the actions may be different to those recommended;

(iii) Seeking confirmation that the warnings are accurate;

(iv) Delaying to "wait and see"; and

(v) Ignoring the warnings.

Response to warning is best seen as a decision-making process through which people attempt rationally to determine whether or not they are at risk and on that basis to decide what course of action to take. The decision to take action is influenced by various experimental, psychological, social and other factors. Consequently, better understanding of human response to warnings depends on better understanding of the decision-making process used to determine a course of action, and the factors which influence those decisions. This has been the general thrust of social science research on human response to hazard warnings.

Research has consistently shown that the initial response to hazard warnings is to seek further information, not to take immediate protective action. Additional "confirming" information is commonly sought from three categories of sources. Authorities are often contacted directly, which must be anticipated and understood as an

[12] *Ibid.*, p. 4.19

[13] Murray, *op. cit.*, quoting Mileti, 1975

[14] WMO, *op. cit.*, p. 4.14

[15] Murray, *op. cit.*, quoting Mileti, 1975.

[16] WMO, p. 1.1

[17] Leik, *op. cit.*, p. 35.

indication of recipient needs, and of its effect on the workload and communications systems of officials. The sudden barrage of telephone calls, telegrams or personal visitors that may inundate the staff of a meteorological service or local authorities indicates the need for further corroborative information. This predictable public response reflects an attempt to base decisions on as much reliable information as possible. Confirmation is also likely to be sought from family, friends and neighbours. This source of information is important because response is influenced by what others are doing or plan to do. If the neighbours are preparing to evacuate, this is an added encouragement to do likewise. Similarly, a community's refusal to evacuate is likely to be a disincentive. The third source of confirmation is the environment. If the sky is clear people are unlikely to react as forcefully as when a tornado funnel can be seen.

Even after the warning has been confirmed, the decision to take precautionary action is influenced by a variety of social and psychological considerations, all of which are influenced by past experience. Foster suggests that three generalizations can be drawn from psychological to sociological research on the way in which individuals and families respond to disaster warnings. "First, even though a wide variety of people may be listening to the same warning message, everybody hears and believes different things. Second, people respond to warnings on the basis of how what they hear encourages them to behave. Third, individuals are stimulated differently depending on who they are, with whom they are, and whom and what they see".[18,19]

Most of the social sciences research on factors which influence human response to hazard warnings has been carried out in Australia, Japan and the United States. Those which may have the broadest implications have been selected.

Experience

There seems to be a marked difference between the response to warnings of persons with and without hazard experience. Prior experience, particularly having lived through a disaster and having received previous warnings that did not develop into hazardous situations, tends to result in a *less* cautious reaction about a present situation. This might be called "survivor's confidence". Research has shown that people with no previous hazard experience are more likely to take protective action and are likely to take such action more quickly, perhaps on the basis of the fear of the unknown. People with experience are more likely to delay in taking protective action.

Psychological factors

Psychological factors which influence response to hazard warning have been labelled the "fear factor".[20] The perception of risk and the feeling of personal danger are significant motivators. Certainly if people do not perceive themselves in danger they are unlikely to take protective action. Even in the face of overwhelming evidence, the response to danger differs. This varying response may be influenced, among other factors, by experience, cultural values, and personality traits. Some people deny the reality of the danger or simply refuse to take protective action. This is seen in many disasters when in a "spirit of defiance" people refuse to evacuate a threatened area.

Several noteworthy issues which influence the sense of risk and quickness of response, relate specifically to disaster preparedness. Research has shown that people who are aware of the hazard risk prior to the warning, are more likely to take protective action. This supports the need for public awareness of disaster risks.[21]

Social considerations

Relationships between people affect their response to warnings. Research has shown that adults with dependants are more likely to take action than adults without dependants. Another common observation is that families will make every effort to stay together and will make disaster-related decisions in consideration of other family members. It is suggested that the extent to which neighbours and friends influence warning actions is dependent upon the degree to which a family is integrated into the community.[22] Seasonal labourers, migrants and tourists, for example, are not assisted or constrained by many social considerations.

Age

Age seems to be a particularly important indicator of the categories of people who are likely to require special protective measures. It has been noted, for example, that adolescents often take undue risks and that the elderly and young children are the groups with the highest death rate.

Vulnerability tables in tropical cyclone disasters indicate a minimum death rate in the 30-40 years age group, which hopefully combines health, good sense, and mobility, a death rate 3 times greater among those under 10 years; and up to 5 times greater among those over 60 years of age [23]

Feedback and evaluation

An effective warning system requires two-way communication. Feedback must be received by every party involved in transferring warning messages. For a warning to be effective, a sender must know whether it was received and understood, and whether additional information may be required. Warning systems must be designed for such two-way communication since it is unlikely to occur spontaneously. Persons involved in warning others must solicit comments from receivers, in addition to providing warning messages they may think useful.

[18] Foster, *op. cit.*, p. 203, quoting Mileti, 1975.
[19] Murray, *op. cit.*, p. 68.
[20] Leik *et al.*, *op. cit.*, p. 68.
[21] *Ibid.*, p. 30.
[22] WMO, *op cit.*, quoting Southern
[23] *Ibid.*, p. 5.9.

Post-disaster evaluation of the warning system is essential. Disaster experience confirms which planning assumptions were correct and which were incorrect, identifies successful warning measures and unforeseen problems. In some situations there is a reticence to evaluate performance for fear of criticism or reprisals. Experience has shown, however, that unless an honest and thorough review of past experience is conducted, minimal benefit is gained from experience in improving future performance. In fact, the problem within the warning system may even be compounded be new myths.

A post-emergency evaluation of the warning system should be forward-looking. It should be seen as an opportunity to identify ways in which the system can be improved, rather than to apportion blame for mistakes or shortcomings. While independent assessments might be required, a more significant effect may be achieved through participatory evaluations by persons who were themselves involved.

Summary

Disaster warning is not a single warning message but rather a chain of messages set in motion at the time of identification of a hazard, and culminating in a host of community activities. An effective hazard warning system must be integrated, involving both technical and social considerations.

The following table summarizes the factors influencing response to disaster warnings.

Factors influencing response to disaster warnings

1. Any warning messages broadcast, especially the early ones, will be accepted at face value only by a minority of the recipients Most will engage in confirmation efforts for a time.
2. The more warning messages received by an individual, the fewer the attempts at warning confirmation.
3. The closer a person is to the target area of a warning, the higher the incidence of face-to-face communication and the larger the number of sources used in confirmation attempts.
4. Warnings from official sources (police, fire department etc.) are more likely believed.
5. Message content *per se* influences belief The more accurate and consistent the content across several messages, the greater the belief.
6. The more personal the manner in which a message is delivered, the more it will be believed.
7. Belief in eventual impact increases as the number of warnings received increases.
8. The recipient's sense of the sender's certainty about the message is important to belief.
9. Message credibility is related to what happens in the confirmation process. The response of official sources to questions which call for validation, corroboration, or refutation helps determine believability.
10. A person is more likely to believe a warning of impending danger to the extent that perceived changes in his physical environment support the contents of the message.
11. Persons who see others behaving as if they believe a warning to be valid are themselves more likely to believe the warning.
12. Past experience may render current warnings less credible if disaster is not part of that experience.
13. The closer a person is to the target of warning, the more rumours he will hear and the less accurate will be his understanding of the character of the forecast events.
14. Persons do not readily evacuate on the basis of the first warning received and the number of warnings received thereafter is proportional to evacuation initiatives.
15. As warning messages increase in their accuracy, and/or information about survival choices, and/or consistency with other warnings, and/or clarity about the nature of the threat, the probability of positive response increases.
16. Whether or not a person takes action depends on his belief in the warning message But even if he believes, he may fail to take adaptive action due to his misinterpretation of the meaning of the message content.
17. Evacuation tends to be a family phenomenon. The best way to accomplish evacuation appears to be repeated authoritative messages over broadcast media which stimulate discussion within the family and lead to evacuation (if it is going to happen at all).
18. Persons receiving face-to-face warnings in a family setting from authorities are more likely to evacuate.
19. Persons with recent disaster experience are more likely to take protective actions
20. The perceived amount of time to disaster impact is important.
21. Belief that impact could occur at the location from which a person may be about to evacuate is critical
22. Older persons are less likely than the young to receive warnings regardless of warning source, and less likely to take protective actions
23. Regardless of the content of a warning message, people tend to define some potential impact in terms of prior experience with that specific disaster agent

Sources Foster (1980), Haas (1973), and Mileti (1975)