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THE WARNING PROCESS AND
EVACUATION BEHAVIOR:
THE RESEARCH EVIDENCE

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One might or might not accept the authenticity of the well known Biblical story of Noah, The Ark, and the Great Flood. But whatever one's view on that matter, the account illustrates well that organized efforts to move away from an identified danger is as old as human history. In the alleged incident there was an acceptable warning and collective evacuation from a threatened locality.

One of the very first research focus in the disaster area was the issuance of emergency warnings and the reactions to them (Williams, 1956; Fritz, 1961). This is understandable. If there is warning of a threat, preventive, mitigatory, precautionary, and protective measures can be taken, including evacuation. Warnings can obviously be useful if not necessary for adaptive behavior to environmental changes--natural or human created--which put life, property, group routines, and the ecological balance in peril. It is not surprising therefore that when social scientists started to do research on disasters about 35 years ago, many of the studies focused on the question of disaster warnings and how people and groups react to them. This interest has continued to the present time (see several chapters in Dynes, DeMarchi and Pelanda, 1987).

Thus, over a period of several decades there has now accumulated substantial and systematic knowledge about the warning process and how it affects behavior (see Drabek, 1986). Organizational monitoring of danger cues, mass media and other communications about dangers, as well as the reaction of individuals and groups to information about possible disasters have been examined (see, e.g., Hiroi, Mikami and Miyata, 1985; Walters, Wilkins and Walters, 1989; Wenger and Quarantelli, 1989). Out of this work has developed the idea that it is useful to conceive of warning as involving a social system which consists of three basic elements or activities: (1) assessment, (2) dissemination, and (3) response (e.g. McLuckie 1970).

Assessment involves those organizational activities taking place from the time of the detection of the specific hazard to the environment to the point at which some means, mechanical or otherwise, are used to convey a message to the threatened locality of the probable impact of the disaster agent. In many societies this is usually the strongest part of the warning system. The issuance and transmission of such a message is the dissemination phase of the warning process. This is often the least effective part of the process. Response consists of the specific adjustive behavior which is part of the general reaction pattern to indications of danger, including warning messages. Of course this

aspect is the most important aspect of the total warning system since the major effectiveness of warning is directly dependent on the evoked response.

In this paper we primarily summarize and highlight the major findings regarding reactions of human beings to disaster warnings of an immediate threat (see for summaries e.g., McLuckie, 1970; Drabek, 1986). Response in this approach is viewed more narrowly as the adjustive behavioral outcome of the reaction pattern. Reaction is the broader set of activities involving in exposure to and use of disseminated warning messages as well as other observations regarding a dangerous situation.

Our focus is on the reaction of individuals to relatively short-term warnings as might be issued in a sudden crisis resulting from a flood generated by a dam collapse or quickly rising river, the winds and tsunamis brought about by a hurricane/typhoon/cyclone, transportation wrecks which involve fire or explosion of dangerous chemicals, or a major radiation fallout from an accident in a nuclear plant. We do not concern ourselves with messages of longer term threats such as might be involved in famines, droughts, most epidemics, diffuse toxic poisonings, or even long range earthquake predictions. More than logic is involved in distinguishing between warnings in short run and long run crisis situations. Research studies have empirically shown that there are qualitative differences in reactions to warnings in the two kinds of situations (e.g., warnings are less recognized, believed, and responded to in the longer run crises).

The Warning Process

While not all questions about reactions to warnings have been answered, disaster researchers agree about the general perspective which ought to be taken, and about many specifics of the reaction pattern. There is a high degree of consensus that the warning process must be approached differently than is commonly and mistakenly thought or sometimes planned. A mistaken assumption is that there is a warning message, and that when it is transmitted, it impinges directly on relatively passive individuals. They are seen as responding directly to the warning. In essence the model assumes that the message is a stimulus and the response is the reaction to it. However, according to the work of social scientists in the disaster area, this very simple stimulus-response model is wrong in almost all respects (e.g., Mileti and Beck, 1975).

Most researchers argue that in order to understand response to warning it is necessary to lay aside the idea that any message is in itself a warning message, and that individuals as such respond to such messages. Warning involves far more than linear transmission of a message from a warning source to the public visualized as an aggregate of individuals. Instead, studies

2

indicate that there is <u>no</u> such thing as a warning message; there is instead what is perceived or believed by people, the meaning they give to the message which may or may not correspond to the message intended by those who issue the warning. What is crucial is the interpretation which is given to the message which , as we shall point out, is affected in very complex ways by a variety of factors--before, during, and after exposure to the message.

In addition, recipients of warning messages do not normally respond directly as individual persons; they react instead in the context of interaction with other people who may or may not be physically present or involved. The interpretation given the intended warning message therefore is almost always a group or collective product rather than what individual persons may hear or believe. Put another way, there usually is social <u>confirmation</u> (or disconfirmation) of the interpretation of the message which the individual recipient might initially perceive.

Stated in more technical terms, the response to a warning involves a definition of the situation. This definition depends upon the interpretation or perception of the message and the confirmation of that message by others. So reactions to warning is a function of both selective perception and social confirmation. It is impossible to overstate the fact that what might be intended as a warning message by those who issue and disseminate it, might not be seen in any such way by its recipients, and they may not at all respond as if it were a warning about danger or threat. The definition of the situation intervenes between the intentions of those issuing what they call warning messages and the perceptions and reactions of the intended recipients. An intended warning message may be seen and reacted to as a warning; however, the converse may be equally true and often is.

What affects the definition of the situation? We have already indicated that it is dependent on the perception or belief that it is a warning, and confirmation of that belief or perception by others. In this paper we will only illustrate some of the major empirical findings from the research conducted by social scientists in more than a dozen countries in the last several decades.

Such matters as the mode, the form and substance, and especially the perceived relevance of the communication will affect belief about warning messages. THus, the mode (way or mechanism by which a warning is communicated) makes a difference. Messages received through the mass media, or sound trucks and loudspeakers, or telephones, of in face-to-face conversations, are seen as having different degrees of credibility, authoritativeness, or legitimacy. Warnings delivered directly by other people are more likely to be believed than when communicated by an impersonal medium. The more personal the manner in which a message is delivered the more it will be given credence. This is related to the probability that the more personal the means used, the more likely the delivered

3

message will be person specific rather than a communication directed to a larger entity such as the public in general.

However, warnings sent via the mass media are more likely to be believed if delivered by governmental officials rather than by private citizens, or by personnel from emergency organizations than by members of other groups. Also, different mass media sources in a community are likely to have different degrees of credibility. Those with the most predisaster credibility are most likely to be seen as issuing a disaster warning.

In general, warnings issued via the mass media are more likely to be perceived as indicating to people something is "wrong" rather than mobilizing them to directly respond to the warning. Few accept such messages at face value, especially initial ones. In crises where it is possible, persons will check for environmental cues--e.g., rising waters, signs of fires, darkening clouds, smoke clouds, noxious smells, etc. Greater credence is given to the latter than to warning messages--a good reasons why populations living in dangerous zones need to be educated about physical danger cues. Mass media communications alert more than they motivate people to respond directly.

However, the more sources (formal and informal, mass media and personal) from which messages about dangers are received, the more likely the warning will be believed. This is especially true if the content is consistent. Inconsistent content in warning messages destroys believability.

Also important is the perceived form and substance of the content of a warning message. But context is more important than substance. For example, if a radio station broadcasts what supposedly is an urgent warning and then reverts to normal programming, it will be far less believed than if the station converts completely and immediately to broadcasting emergency messages.

Nevertheless, content substance can be very significant. If messages are unclear, ambiguous, or easily interpreted as not involving immediate danger, no warning will perceived. It has long been noted that there is a strong tendency on the part of potential disaster victims to assimilate all possible threat cues to the normal. That is, normal human beings will quite normally interpret all possible indications of danger as something that is not usually dangerous (thus a loud noise and jarring will be perceived as a car backfire, a jet plane noise, or construction blasting rather than an explosion). Everything else being equal, verbal messages that warn of danger are easily downplayed or discounted.

The more general a warning message is, the less likely it will be perceived as a warning. The more specific information such a message contains and especially the more it details something

relevant to a listener, the more it will be believed. In short, the degree of message specificity is directly related to belief about the warning.

The perceived proximity, severity, and certainty of immediate personal danger is also very important in warning belief. Danger warnings afar in time and/or space are usually rather ineffective. In contrast, communications which indicate immediate and close threat of impact will usually evoke a reaction. Perceived severity is also important. Thus any message which communicates that there may be extreme danger to self and/or loved ones is usually effective in making people aware of the threat. However, not only must personal risk be seen as high but it must also be perceived as relatively certain. Warning belief is very high when the danger is thought to have a high degree of certainty for impacting.

Past experiences with disasters affects all aspects of warning beliefs. The relationship however is a complex one. Prior experience tends to render current warnings more credible if disasters are part of regular experience. On the other hand, while past experience may make people more attentive to threat cues, also appears to lead them to a more complex assessment of possible personal threats. Also, where disaster subcultures exist, persons will tend to define some potential impacts in terms of their prior experience with that specific disaster agent, regardless of the content of the warning message.

Equally important to the perceptions of warnings is warning confirmation; the almost inevitable social interaction that will occur to obtain additional information or validation concerning the original message--a confirmation of the interpretation. If in the ensuing interaction there is confirmation the warning message will be believed. If there is disconfirmation or doubt expressed, additional sources of information may be sought but more likely there will be a perception that the warning was irrelevant or incorrect.

Very seldom do people receive warning messages while they are in total social isolation. In fact, the typical situation is for exposure to such messages to be in the presence of others, or where others can be quickly and directly contact, such as in person or over the phone. Thus, unless the danger is immediately and directly threatening--as in the case of persons who see a tsunami approaching a beach or a toxic cloud coming from an overturned truck--how others are seen as acting becomes crucial in confirming or disconfirming the initial individual perception of the warning message.

Message believability is partly dependent on what happens in the confirmation process. Thus when others are seen as behaving as if they believe a warning to be valid, the message is likely to be believed. Similarly, the answer of official sources to inquires

which call for validation, corroboration, or refutation helps
determine the believability of warnings. However, greater credence
will be given to other persons than impersonal sources, and to
known others than to strangers. Confirmation is also more likely
to be attempt for unfamiliar or unusual disaster agents.

Another way of thinking about this is to visualize that there
usually is a reaction rather than response to warning messages.
Part of this reaction involves social interaction with others. Out
of this interaction there may social confirmation that there is a
threat and this can lead to a response. But if there is
disconfirmation, the reactive social behavior may lead to no
response at all.

For purposes of exposition we have treated the matter of perception
and of confirmation independently of one another. Within each of
these processes we have discussed separately the factors which
influence warning belief and confirmation. Of course in reality
these processes and factors are not and do not operate
independently of one another. They are all interlined. For
example, the closer a person is to the presumed impact area
indicated in a warning, the greater the number of face-to-face
communications and the larger the number of sources used in the
confirmation effort.

Thus, in thinking about warnings it is necessary to imagine a
variety of different processes and factors all operating at almost
the same time. The warning behavior of people is an outcome of the
product of synthesis of these many matters and not simply the
outcome of one process or factor. As said earlier, a warning is
not simply certain information hitting a particular person who then
responds. Instead, as we have indicated, warning behavior involves
collective, multiple, and selective perceptions and interactions,
a far more complex picture than will be captured by a simple
stimulus-response model. Sometimes reality is complex and it is to
delude oneself to seek overly simple explanations.

Evacuation Behavior

So far we have primarily discussed differential perceptions or what
might lead to different definitions of situations in crises where
warnings have been issued. However, similar definitions of
situations need not necessarily lead to similar responses. For
example, an individual might hear and accept as valid a warning
message about a sudden flood; another individual might do likewise
for the same flood. Yet their manifest behavior may differ
radically; one might evacuate the area, the other might not. The
reason for this is that there are other factors which will affect
the behavioral response besides the definition of the situation.

To give some focus to our discussion, we will consider some of
these other factors which will influence whether or not evacuation

will occur. Evacuation, or movement away from the endangered area, is only one possible response--there are a variety of preventive, mitigatory, precautionary measures possible--but generally evacuation is a very adaptive one. Contrary to some widespread mythological beliefs, evacuation is usually very orderly and does not degenerate into panic-like behavior. If there are problems in evacuation, they often stem from organizational failures to provide guidance and the necessary resources rather than from the behavior of evacuees themselves. Too often evacuees are blamed for difficulties which stem from the decision, policies and actions of groups and agencies which have the responsibility for and the carrying out the evacuation (for a general discussion, see Quarantelli, 1984; also Perry, 1985).

In particular we want to touch upon the general reluctance to evacuate, the fact that evacuees may or may not be reacting to a warning message, and that evacuation almost always involves a great deal of self control and small group initiative. As in the instance of perceptions of warning messages, there can be considerable differentiation in evacuation responses.

Given a choice, non-evacuation is preferred to evacuation. Even when a warning message is perceived as valid and is socially confirmed, there still may be a reluctance to leave. This is not because people are paralyzed in the face of danger. On the contrary, individuals under stress typically attempt to consider which would be the least disruptive behavioral option in the situation. Therefore, sometimes there is a collective decision that the behavior ought to be something other than an evacuation of the area. Some protective action other than flight if especially likely if there is only a moderate rather than strong belief in a warning threat. Even when people feel endangered, they attempt as much as possible to maintain their traditional and routine ways of behaving. Leaving a locality in the face of a threat is not an everyday occurrence.

In some case the reluctance to evacuate may be because the warning message lacks the second component necessary for the effectiveness of any warning. To evoke an appropriate response, a warning must not only signify there is danger but also what should be done in the situation. If a message does not indicate how the threat may be prevented, avoided, circumvented, or minimized, it cannot itself generate a functional response to the situation--which might include leaving the threatened locality. A failure to evacuate may simply stem from a failure of the warning to communicate explicitly such a message.

Of course there can be evacuation in the absence of such a warning message, or no evacuation in the face of an order, recommendation, or suggestion to leave. Disaster planners and emergency agency personnel often find such behavior disturbing and frequently blame people for not listening to them. Leaving aside the Big Brother

knows best implications of such a criticism, the face is that such behavior is quite understandable and reasonable. In addition to reacting to warning messages, endangered populations are making other observations of the crisis. People interact with one another. Warning messages are only one element that are either individually or collectively considered, and that may not be seen as the more important aspect of actual or potential disaster.

For instance, persons may refuse to evacuate because they are concerned their vacated homes may be looted. That the concern is an invalid one--the supposed prevalence of looting being one of the biggest mythologies about disaster behavior--is irrelevant against the belief of many people that looting is a strong possibility. So warning messages to evacuate to safer areas may be disregarded because other considerations are deemed more important than safety. Conversely, while local residents usually are reluctant to evacuate, other people such as tourists, travelers and strangers in given localities are very likely to leave at the first indication of possible danger. Typically they will evacuate even when no evacuation warning messages have been issued. Individuals in unfamiliar settings are reluctant to remain in them when personal danger is perceived.

However, even when people are afraid--and they usually are when they see themselves personally threatened--they do not bolt in panic flight. Panic is a very rare happening and not at all a typical response to perceptions of danger (see Quarantelli, 1981). In fact, it would be very difficult for a warning message to evoke panic flight. Panic behavior requires certain very specific conditions, including the perception that escape is possible from a very immediately threatening personal situation (a perception of being trapped does not evoke panic flight since it is hope rather than hopelessness which is involved in panic behavior). Thus, warning messages which are perceived as valid and socially confirmed, do not lead to the abandonment of traditional roles and responsibilities.

In fact, warnings may generate much self-control and small group initiatives. This is seen in that evacuation is not likely to occur if family members are separated at the time of the perception of the danger, whether the threat is seen as a result of a warning message or otherwise. If at all possible, family members will wait in an endangered area until absent family members can come together and confirmatory behavior can occur. When they evacuate, families move as units. Ignoring public announcements of their availability, they avoid as much as possible if the physical circumstances of the disaster permit it, mass shelters, and instead choose to go to the homes of kin and friends. One consequence of the delay in waiting for family members to assemble is that the start of an evacuation response may be stretched out over a considerable time period.

As all these examples illustrate, there is no simply or direct response to a warning. There is a reaction rather than a response. But actual or potential disaster victims do not react in a uniform way to perceived and confirmed warning messages. The consequences is that just as there are differentiated perceptions, there are differentiated responses.

We try to pull these various ideas together in the attached diagram. It tries to indicate the complex relationship between the different factors and processes that are involved.

Two Questions About Applicability

The first question has to do with the general applicability of findings about disaster warnings across different disaster agents. Agents differ in such matters as predictability, speed of onset, length of forewarning, duration of impact, destructive potential, controllability, etc. Does not the nature of the disaster agent involved make a difference? The general answer appears to be no, insofar as what we are discussing in this paper. Short run disaster situations, as noted at the beginning of our discussion, are far more alike than they are dissimilar because of the disaster agent involved. Of course threatened populations, for example, may have more familiarity with certain kinds of disaster agents than others, such as those who live in the hurricane/typhoon/cyclone vulnerable regions of the world, or around chemical plant complexes. But the primarily factor which affects the reaction behavior in such cases is familiarity with the disaster agent rather than something inherent in the agent itself. Research studies have consistently shown it is far better for most purposes insofar as human and group behavior is concerned, to assume that disaster phenomena is generic rather than agent specific.

A second question often raised has to do with the cross-societal validity of disaster research findings. Do the findings apply in all societies? The concern stems from the fact that the majority of disaster studies have been carried out in industrialized and urbanized countries (see Dynes, 1988). Therefore there is an issue about whether the findings of such research are applicable to societies that are more agriculturally and rurally based. In general, the answer appears to be yes. There are some major differences in disaster behavior which appear to be related to such societally rooted matters as centralization of authority, availability of resources and relevant groups, cultural values and beliefs, etc.--there is little doubt about that. However, most of these cross-societal differences appear to be related to macro level aspects of disasters--how the society as a whole, the communities and organizations within it prepared for and respond to disasters. There seems to be less cross-societal differences at the micro level--how individuals and small groups react to the emergency time periods of disasters. That is, human beings are more alike in their personal and interpersonal behaviors under

9

extreme stress than might be suggested by the sometime substantial differences in their larger cultural and societal behaviors. We do not argue for total similarity; only that it is better for the questions addressed in this paper to assume universal human characteristics rather than to be blinded by the actual group or macro level differences which do exist.

Applications of Research Findings

What is implied about disaster preparedness and operations in what we have so far discussed about disaster warnings and evacuations. Studies may uncover all kinds of mythologies or false beliefs as well as how people and groups actually behave in disasters, but unless such knowledge is incorporated into the thinking and activities of disaster planners and emergency operational personnel, the research findings will be useless (see Perry, Greene and Lindell, 1980 and Dynes, Quarantelli, and Kreps, 1981). The fact that relatively few social scientific findings have thus far been used to improve disaster planning, is truly unfortunate. Unlike some other areas of disaster phenomena, we know much about disaster warnings and evacuations. This understanding should be used. We suggest the following three ideas might be especially important in application efforts.

First, disaster planners and operational personnel must work with correct assumptions about the nature of disaster phenomena. Thus an approach which implies that initial and prime concern should be with the content of warning messages per se is an inappropriate starting point. We should start with what we now know people are likely to perceive or believe. The first focus for planning purposes should be on the perceptual behavior of the probable people and groups in the situation, not the words used to warn them.

We have indicated what affects perceptions. We have noted some factors leading to definitions of threats as being real. It is the perception of the danger as real which is crucial. It is not whether there is some threat from the perspective of an outside observer or from the viewpoint of emergency organization officials issuing a warning. As long stated in sociology, if people define a situation as real, it is real insofar as consequences are concerned. A failure by disaster planners and operational personnel to acknowledge this simple but important principle can undermine the best of intentions or most of the resources in efforts to generate appropriate responses to disaster warnings.

Second, good disaster planning must take into account that warning messages do not impinge on isolated or solitary individuals. The warning is either confirmed or disconfirmed in the course of interaction with others. Initially there is a reaction rather than a response. We should therefore start with what we know of how groups are likely to react rather than with what individual

10

response might be. We must make the social process of confirmation central in developing how warnings of disasters should be handled.

The central point here, again drawn from sociology, is that human beings do not live in isolation. To be sure, some categories of persons such as the elderly, certain minorities, and some segments of the urban underclass, are often not in the mainstreams of their societies, but even they are all embedded in a matrix of social networks and relationships. We have noted how the group nature of social life affects perceptions of warnings. We have indicated that social confirmation is crucial for a belief that a message is indicating real danger. Disaster planning must recognize this principle. More important, there is a need to plan in a way that will provide social confirmation rather than disconfirmation of warning messages.

Finally, disaster planning needs to accept the fact that populations threatened by disasters do not passively wait to be guided by governmental or emergency organizations. In crises, the groups will be partially proactive as well as reactive. As such, warning messages will be only one element in the total picture and not necessarily the most salient or important factor. Reactions are only partially to warnings, and therefore a response such as evacuation may or may not be a reaction to warning messages.

A central point of all this, well established by disaster research, is that functional and adaptive reactions are attempted by endangered groups. They do not react irrationally in most senses of the term, and certainly not from their own perspective. They attempt to do what appears to them to be the most appropriate for the situation. Effective disaster planning takes this into account--in the words of some disaster researchers, plans should be adjusted to the probable behavior of people rather than attempting to force people to adjust to plans. This is certainly applicable to the planning of disaster warnings and appropriate responses to be generated by them.

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11

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REACTION PATTERN

WARNING MESSAGE

DEFINITION OF THE SITUATION

PERCEPTION OR
BELIEF ABOUT
     MESSAGE
(mode, form and
 substance, relevance)

SOCIAL CONFIRMATION
OF THE MESSAGE

OTHER OBSERVATIONS OF THE SITUATION

RESPONSE
(preventive,   mitigatory,
 precautionary, protective -
     e.g., evacuation)