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# A BRIEF SUMMARY OF SOCIAL SCIENCE WARNING AND RESPONSE LITERATURE: A REPORT TO COT NETHERLANDS

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## Introduction

For more than five decades, researchers have explored the dynamics of warnings and warning response in the disaster context. This report is intended to briefly summarize findings related to this topic. The ultimate goal is to provide a basic understanding of how social science research related to warnings and evacuations might inform policy makers and emergency managers.

Before we begin discussing the details of warning messages, the first and most important issue for readers to note is that the decision making processes of most evacuees and even non-evacuees are rational and calculated. Contrary to media depictions and other's perceptions of the public that suggest animal-like, irrational, or antisocial behavior it is important that we begin this discussion knowing that people typically "rise to the occasion" during disasters. Although it would be wrong to suggest that people *never* make irrational decisions it is important that we begin this summary by recognizing that when we look at the broad patterns of human behavior documented through scientific/empirical studies, people who are experiencing a disaster far more often than not act in very rational and predictable ways. This finding above all others holds true in social science research. It is important to recognize this truth because it allows policy makers and emergency managers to move beyond the notion that the problem with warning and response is "getting people to be rational and do what we say" and instead allows us to move towards understanding "how can we change our approach so that it takes into account how people process warning

information.  While the difference may seem subtle, in practice it is quite important. The first sees overcoming irrationality as the problem while the second sees the institutional/organizational approach to warning as the problem.

This report attempts to provide information that can help policy makers understand the factors that affect warning response in the US context. In so doing, this report addresses two important pieces of information. First, it outlines the stages of information processing that people move through when deciding to take or not take protective actions.  Second, it summarizes findings from research on how social structural factors and patterns of human behavioral response influence people at each phase.  The goal is to help readers better understand warning message processing.

## Integrated Warnings

Although many warning efforts begin when a storm is pending it has long been suggested that the only truly successful warning systems are those that are integrated into the communities they serve. As Nigg points out such a system includes: reliable or at least consistent forecasts about a hazard; warning message that server to communicate the threat; preparedness and the ability of stake holders to respond. A true integrated warning system also includes public education about the threat and an awareness of how people can mitigate the threats.  Much agreement exists about what makes for effective warning messages, and their need to be clear and understandable, accurate, frequent, credible, specific to the life situation of the intended users, giving potential victims specific instructions about the likely effect of the hazard and about what they should do to minimize their vulnerability. Even in the best of systems, how people will eventually respond depend only partly on the warnings they receive, for other matters, such as personal disabilities, previous experience and knowledge of the hazards, social memberships in social networks and cultural formations, and proximity and other physical clues to the hazard, have important impact on how people define the situations in which they find themselves and fashion their lines of action. The elements above are of vital importance for a successful warning

and response. Given that it was requested we focus on warnings and response to warning, the remainder of this report highlights issues related to this part of an integrated warning system the focus is based solely on the request made of us and not on the relative importance of these elements.

## The Warning Message

Within warning and response research there are literally hundreds of social science studies. Among these four major works (Donner 2007; Lindell and Perry 1992; Mileti and Sorensen 1990; Mileti 1999) have been instrumental in developing an understanding of the phases of information processing that must be taken into account when designing a "warning message." These works have outlined the following eight stage process of warning.

1. Stage One-Receive the Warning-People must physically receive a warning.
2. Stage Two- Understand the Warning-Once people receive a warning they must be able to process the message and understand what it means.
3. Step Three- Believe the warning is credible-People must believe that the source of the warning is reliable and the threat could materialize.
4. Step Four- Confirm the threat-People must take steps in order to verify that the threat described in the warning is real.
5. Step Five- Personalize the threat-People must believe that the threat is something that can potentially effect them.
6. Step Six-Determine whether or not protective action is needed-People need to decide if they need to take action.
7. Step Seven-Determine whether protective action is feasible-People need to decide if they are able to take action.
8. Step Eight- Take Protective Action- Finally people need to have the resources to actually do what is required

Below we address the relationship between these stages and present a very simplistic review of the main issues that affect people's interpretations at each stage.

### *Relationships between Phases*

Although these stages were initially though to operate in a linear fashion where a person or community must move through phase one in order to reach phase two and so on, it is now though that later stages for one person or

community often act on earlier stages for others. This is important because it highlights that the warning process is a matter of collective behavior, involving, among other things, cooperation, coordination, and interaction among people.(Donner 2007) In other words, these messages are processed by groups not by individuals alone. In addition, individuals' movement from phase to phase is affected by:

1. Interdependence- decision made in one phase effect the range of responses people see as feasible or rational in other phases.
2. Movement through stages is based on interaction- this means that as people make choices at each phase they influence and are simultaneously influenced by other people's decision making process.
3. Social variables have complex effects on the process - In other words we need to recognize that characteristics such as age, gender, race, etc will have different levels and different types of influence at different phase (Donner 2007)
4. Resources matter- in other words regardless of if people want to act their ability to do so is limited by the resources they posses.
5. The process of responding to warnings is characterized by a complex process of information seeking, keynoting, and, most of all, interaction.

Thus, contrary to the beliefs of officials, warning response is not simply an "individual" decision that determines whether someone will take protective action. Such a view is simplistic, poorly conceptualized, and ignores years of research. It is important to know that groups and families should be targeted rather than individuals and that messages should be tailored to specific sub-populations interests.

## Social Factors that affect the Warning Process

As discussed above, many of the forces that drive the warning process are social and involve interaction, communication, and collective definition. Research strongly suggests, moreover, that pre-existing social structures and emergent behaviors (Turner and Killian 1987; Aguirre, Wenger, and Vigo 1998) also play a role in shaping warning response and evacuation behavior. In this section we discuss a few of the more salient factors. Empirical studies in the fields of sociology, political science, and anthropology continue frequently and

consistently corroborate these ideas As noted previously, there are a variety of factors including age, language and culture which might inhibit actors from understanding and successfully interpreting a warning message (Aguirre 1998; Bausell 1986; Belloc and Breslow 1972; Levanthal and Prohaska 1986; Linsk 1994; 2000; Nichols et al. 2002; Puleo 1996). The dynamics behind warning understanding are well documented as a result the following list presents a simplified overview of these findings:

1. Social Power
    a. The more freedom a person has to leave their place of employment, the more likely they are to respond to a warning message
    b. Spousal control plays an important dynamic in warning decision making
    c. Individuals and groups that are marginalized in their everyday lives will have a more difficult time taking protective action
2. Resources
    a. Having resources increases the likelihood of a person responding to a warning message. Both Balluz et al. (2000) and Baker (1979) show the presence of resources increases the likelihood of response.
    b. The perceived availability of resources shapes evacuation decision making. (Duval and Mulilis 1999) find clear evidence supporting the mere perception of resources as sufficient to motivate evacuation.
    c. A person is more likely to respond to a warning message if their livelihood will be unaffected by their decision.
    d. The experiences of Hurricane Katrina evacuees within the larger context of socio-structural limitations and builds upon previous research by Barnshaw (2006b) and Trainor, Donner and Torres (forthcoming 2007) which both demonstrated how the “choice” to evacuate was constrained by structured inequality, and a lack of social resources. The level of economic resources cannot be overstated as significantly influencing how evacuation from the impacted area was experienced. Frequently, individuals with greater resources in the from of economic capital were able to locate a place to stay and could move on to the other tasks which were competing for the time and attention of less affluent “underclass” evacuees’ who were most often found in the shelters.
3. Culture
    a. Culture is a salient feature of warning response. In particular, Perry and Hirotada (1991) offer an instructive analysis of values and their influence on sheltering behavior among U.S. and Japanese evacuees. The researchers found the greater likelihood of sheltering among the Japanese chiefly attributable to a “collectivist

culture in which citizens have higher expectations that authorities will provide care in the event of disasters or other disruptions in social life." (112).

   b. (Aguirre 1988) find language a cultural artifact inseparable from the process of receiving tornado warnings, a finding suitably extended to slow-onset events, for there is little reason to believe that communication barriers play any less a role in the process of understanding, belief, and personalization.

4. Gender
   a. Women are more likely than men to respond to warning messages.

5. Characteristics of the Warning Message
   a. The probability of warning receipt and comprehension tends to increase with the dissemination of multiple warnings (Turner et al. 1979).
   b. When it comes to warning systems, accuracy beyond a limited threshold would therefore hold diminishing returns for marginalized social groups, who, in the face of disaster, often experience obstacles to understanding, personalizing, and reducing risk.
   c. Also of great importance are characteristics of message and sender. Such findings would, however, appear to conflict with well-supported observations that warnings of greater specificity elicit greater levels of understanding (Perry 1983).
   d. Evidence from research presents mixed findings regarding whether potential victims share a greater likelihood to believe warnings from official sources and media reports (Drabek 1994; Baker 1987) or "significant others" (Nigg 1987; Sorenson 1982).
   e. Including local information and/or televised maps in a warning message to the public assists the public in understanding the warning message.
   f. The more specific the warning message, the more likely the public is to respond to it.
   g. The more specific a warning message is, the more likely the receiver is to confirm the warning.
   h. Emergency managers should avoid generic approaches to using the media--different hazard agents and different disaster settings require custom-made warnings from the media.
   i. The more consistent a warning message is, the more likely the public is to respond to it.
   j. Officials must make every effort to provide warning messages in formats that are tailored for those midlife and older who have diminished auditory, cognitive and visual acuity and may require larger print messages, greater amplification, frequent summarization and restatement of prevention messages and/or messages in actors native language.

    k. Access to more and more complicated technological info such as weather forecasts may complicate ability to process (Donner 2007) simply receiving more of what one only vaguely—or, not at all—understood in the first place. Thus, while improvements in *reception* are potentially accrued through technological development, there is arguably a concurrent deficit in *understanding* produced from this explosion of information.
6. Characteristics of the Hazard
    a. Threat proximity, for example, is consistently acknowledged as a mechanism behind public response (Sorenson 1982): the likelihood of belief within warned communities located near a disaster is greater, which, of course, may be linked to the reality of greater response rates among those encountering environmental cues (Hammer and Schmidlin 2002; Mileti and O'Brien 1993; Tierney 1987).
    b. The more environmental cues the public observes, the more likely they are to respond to warning messages.
    c. Having confirmation of the disaster/hazard increases the likelihood of a person responding to it
7. Behavioral Response Patterns
    a. "People have a tendency to err on the side of normalcy," McLuckie (1973). "Conditions are evaluated as all right until proven otherwise. Therefore," he concludes, "the burden of proof is on the warning system." In the absence of nearby environmental cues, this "normalcy bias," described by Okabe and Makami (1981), triggers immediate *denial* on the part of potential victims.
    b. Defining a situation is necessary for action (Turner and Killian 1987) and such consensus is often produced through interaction. To be sure, there is strong evidence to suggest that the perception of immediate danger is a necessary factor in the decision to evacuate (Hammer and Schmidlin 2002).
    c. Similarly, as suggested by Aguirre, Wenger, and Vigo (1998) in the case of building evacuation, people often made the decision to evacuate or stay based on a collective emerging definition of the situation and appropriate lines of action.
    d. Risk personalization—or the perception that one is indeed under threat—is no less contingent upon social, psychological, and environmental factors.
    e. Researchers have noted a fundamental difference between the belief of a threat or warning and the personalization of the threat (Donner 2007; Lindell and Perry 1983). Perry, Lindell and Greene (1980) found that actors are more likely to respond to a threat if they personally believe to be a stakeholder in danger.
    f. Warnings need to take into account social time. For example take the example provide by donner : interviewee hesitant to inform her family of tornado warnings: arriving at the risk personalization

stage, she nevertheless felt it unwarranted to contact her daughter about the tornado warning. Doing so, she believed, would have violated norms regulating when, how, and under what conditions the waking of another person is permitted. The reader may at this point be puzzled: are tornado warnings not grounds for violating sleep norms? We may indeed think so, but counterintuitive findings such as these should cause us to rethink our basic assumptions about the power norms hold over behaviors ordinarily thought instinctive

   g. Response often happens in as “cascading” action toward protection. In other words people don’t always move to the safest location instead moving to a safer area in which further information was available (confirmation); further confirmation would then prompt them to seek shelter in the safest place they thought possible.(Donner 2007)

8. Social Networks
   a. People with children are more likely to respond to disaster warning messages, than people without children.
   b. A related feature of social networks is spatial concentration within social networks. Spatial concentration, or network density, refers to the linkages between ties within a given space or time (Wasserman and Faust 1994; McPherson 1982). Spatial concentration may be significant in the transfer of social capital, particularly within a disaster context as geography may influence access to resources.
   c. Many of the evacuees interviewed in Houston were working class elderly with few friends and represented a fragmented social network. As a consequence, these agents could not rely upon others for assistance in the evacuation process or in the securing of provisional resources.
   d. Having membership in social networks increases the likelihood of a person responding to a warning message.
   e. Observing social cues increases the likelihood of a person responding to a warning message.
   f. The more care-giving responsibilities a person has, the more likely they are to respond to a warning. (e.g. children, elderly, sick)
   g. Receiving a warning message through a personal channel increases the likelihood of a person believing the message.
   h. Kirschenbaum (1992) found that a majority of those who attempted to confirm institutionalized warnings, sought confirmation through auxiliary channels such as friends and neighbors.
9. Experience with a Hazard
   a. The less experience a person has with a disaster/hazard, the more likely they are to respond to a warning message.
   b. A person who has had previous experiences with a disaster is more likely to hear a warning message.

c. If a person has had personal experience with a hazard/disaster in the past, they are less likely to believe and respond to a warning message.
d. The public is more likely to hear a warning about a disaster agent with which they are familiar, but is also more likely to verify/confirm longer before acting.
e. The more vulnerable the public feels towards a hazard/disaster, the more likely they are to believe a warning message and respond to it.
f. If a person has had experiences with the cancellation of warnings, they are less likely to believe and respond to warning messages.

10. Credibility of person/agency Issuing the Warning
    a. If warning information comes from an official source, the public is more likely to respond to the warning message
    b. The public is more likely to respond to a warning message if it comes from an official source.
    c. Citizens tend to use social networks to relay and receive warnings
    d. Citizens make use of the mass media when attempting to manage information about hazards
    e. The public is more likely to hear a warning from the mass media. When the media reports on the hazard/disaster with adequate information, the public is more likely to understand the warning message.
11. Knowledge and Ability to take Action
    a. The more knowledge a person has about protective responses, the more likely they are to respond to warning messages.
    b. The more knowledge a person has about protective responses, the more likely they are to respond to warning messages.
    c. The more knowledge a person has about protective responses, the more likely they are to respond to warning messages.
    d. People are more likely to respond to a warning message if it includes informative guidance and/or if there is a lack of response alternatives.
    e. although an actor may personalize the threat, the decision on what action an actor should undertake is a subjective decision open to a variety of interpretations, actions or a lack thereof. For example, Donner (2007) noted that some actors may believe that if institutional actors and organizations, such as public health officials and organizations are attempting to handle the crisis, no additional action is necessary.

**Based on these findings we believe officials should take the following (among others) issues into account when constructing a warning message:**

1. Do I have an effective pre-event public education program to teach people about warning messages and false alarms?
2. There are many popular myths on the subject of risks that need to be countered public education should identify and counter these. (ex. “tornadoes can’t form in the mountains” or “tornadoes can’t pass the river.)
3. Is the message in multiple languages?
4. Is the message tailored to this event?
5. What is the demographic make up of the warning message recipients?
6. Are there people who are at risk because they have weak social networks?
7. Have I identified local community leaders and partnered with them?
8. What are the most appropriate avenues to deliver messages?
9. Have we deployed the message using multiple methods?
10. How might social time play a role
    a. Night or day?
    b. Beginning or end of the month?
    c. Cold or warm weather?
11. How might cultural differences come into play?
12. How much lead time do I have?
13. Have I clearly articulated what people can do to protect themselves?
14. What past experience has this population had with warnings and warning response?
15. It is imperative that emergency managers foster and maintain a sense of urgency and immediacy among the public warnings must be highly *personalized* before action is taken. Have I shown the potential affects from a different area? Have I linked this to effects on loved ones or self?
16. How can we capitalize on local knowledge and culture?

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