



BUSHFIRE COOPERATIVE RESEARCH CENTRE  
PROGRAM C: COMMUNITY SELF SUFFICIENCY FOR FIRE SAFETY

## RISK COMMUNICATION PROJECT (C4)

# Warning Systems: Issues and considerations for warning the public

DRAFT REPORT

**Douglas Paton**

School of Psychology, University of Tasmania, Launceston. Tasmania

November 2006

© Bushfire Cooperative Research Centre 2006.

No part of this publication must be reproduced, stored in a retrieval system or transmitted in any form without prior written permission from the copyright owner, except under the conditions permitted under the Australian Copyright Act 1968 and subsequent amendments.

November 2006

Cover image courtesy of NSW RFS



**BUSHFIRE COOPERATIVE RESEARCH CENTRE**  
**PROGRAM C: COMMUNITY SELF SUFFICIENCY FOR FIRE SAFETY**

## **RISK COMMUNICATION PROJECT (C4)**

# **Warning Systems: Issues and considerations for warning the public**

**DRAFT REPORT**

**Douglas Paton**

School of Psychology, University of Tasmania, Launceston. Tasmania

November 2006

\_\_\_\_\_

Introduction	1
Functions and Roles of Warnings	2
Hearing or Receiving a warning	5
Understanding the warning	5
Belief	7
Personalisation of the warning	9
Respond	10
Warning Confirmation Process	11
Warning Factors Influencing Public Response	13
Warning Source	13
Warning Message Consistency	15
Message Accuracy	16
Warning Clarity	16
Certainty of the Message	17
Sufficient Information	17
Guidance	19
Frequency of Warning	20
Risk Location Information	21
Channel of Communication	22
Receiver Factors that Influence Public Response	24
Environmental factors	24
Social Context	24
Social Networks	25
Socio-demographic characteristics	26
Psychological characteristics	29
Pre-warning perceptions	30
The Media	36
References	44

## Introduction

Many towns and cities, and, in particular, the communities located in the peri-urban fringe are susceptible to bushfires that can impact on them suddenly or with various degrees of warning. However, many bushfire hazard events can be detected in advance of their impact on a given community, allowing some warning to be given to populations at risk. In those circumstances where this is feasible, effective warning has the potential for saving both lives and property, and as such, warnings represent one of the most important types of risk communication (Auf der Heide, 1989). However, the ability to issue a warning in a timely and comprehensive format is only one component of an effective warning system. The value of a warning is also a function of whether people can respond effectively on receiving it. Thus attention to warnings within a risk management process must address both the development of effective warning messages and dissemination media and promote the capacity of those who receive them to respond to them in a timely and effective manner. The issues that need to be addressed to prepare people to respond to a warning have been outlined in an earlier report (Paton, 2006). However, even though warnings advise people of threats that have significant implications for them, several factors can interact to result in warnings be neither heeded nor acted upon by their recipients.

The disaster literature records several instances where warnings go unheeded or where peoples acted on them when it was too late for action to be effective. Similar findings illustrate that when a warning is received, the recipients may not know what to do or are not capable of responding to them within what can be a very short period of time. In some cases this can reflect a conscious choice on the part of those living in at risk areas. For example, residents in at-risk suburbs in Hobart stated that warnings would act as a trigger for action only when signs of fire were directly visible to them (Paton & Burgelt, 2005).

While vigilance to natural warning signs, and a capacity to respond to them, would be valuable when faced with a bushfire that may well be visible over some distance from a property, recent evidence suggests that even when such natural signs present, people may still wait for formal warnings to be issued before they act (Gregg et al., in press). This reliance on formal authorities is supported by recent work on people's response to bushfires in Australian and elsewhere (McGee & Russell, 2003; Kumagai et al., 2004). These authors found that while people in communities at risk for bushfires believe they have a responsibility to mitigate bushfire risk, in reality this responsibility translates into assisting the fire brigade rather than acting themselves. Under these circumstances, people may perceive a warning as a signal that fire and emergency agencies will arrive and not as a catalyst for action on their part (Kumagai et al., 2004). If it is possible to identify the reasons why these problems arise, fire and other civic emergency management agencies will be in a better position to develop both effective warnings and ensure that the intended recipients can respond appropriately on receipt of a warning.

### **Functions and Roles of Warnings**

Warnings can allow communities to take a number of protective, mitigatory, or precautionary actions that permit those who receive such warnings to activate plans (e.g., to stay and defend a property) lessen the effect of hazard impact or to avoid the threat altogether (e.g., warning acts as a trigger to evacuate an endangered area) (Quarantelli, 1984) while there is sufficient time to do this safely. The events that occur in the warning phase of a disaster will often determine the magnitude of the impact of hazard consequences (Anderson, 1969), but only if people receive it and use the warning as a trigger for protective actions.

Warnings are, therefore, a useful if not essential weapon in the risk management armoury, and one that has a substantial role to play in facilitating adaptive behaviour in the face of

hazardous environmental changes that put life, property, social functions and routines and the ecological balance in peril (Quarantelli, 1984). The warning period is critical in determining the likely survival of threatened individuals and families, and the way citizens behave in response to disaster warnings has implications for their subsequent ability to deal with the consequences of hazard activity and the rate and quality of their recovery as well as that of their community (Perry & Lindell 1997; Perry et al, 1982).

The overarching objective of a warning system is facilitating a timely and effective public response. In this context, an emphasis on the need for a timely response reiterates the need for attention to be directed to the capability to respond and ensure that, given the potential for destruction and disruption from a bushfire, allow for the maximum preparatory and protective behaviours on the part of those who reside in an endangered area (Anderson, 1969). Given the short time frame that may prevail, warning effectiveness is also a function of the knowledge and competencies that people have developed well before the warning issued. In the absence of this capability being in place prior to the receipt of the warning, more serious consequences will ensue. Not only will the time frame from warning to hazard impact preclude the development or full implementation of protective measures in place, the stress associated with the impending impact will further reduce the capacity of people to act in ways that will result in a measurable reduction in their risk (Paton & Burgelt, 2005). The purpose of a warning is, therefore, to stimulate a decision process on the part of the citizen, or to provide a "cue" that danger is imminent (Perry et al, 1980) and to trigger an appropriate set of actions.

Quarantelli (1984) observed that there is no such thing as a warning message *per se*. Rather, content is perceived or interpreted by people, and it this perception of meaning which recipients impose upon the warning message may or may not correspond to that intended by those who issue the warning (Quarantelli, 1984). For example, in the example outlined



earlier, in which people base decisions on visible signs of fire, the receipt of a warning message could be discounted and ignored if the cues that make the message meaningful (e.g., visible smoke coming in their direction) are not present. This is due to the fact that people's response to a warning is not solely a consequence of the perceptions they form immediately prior to taking action, but it is also influenced by their beliefs, understandings, expectations, and cues from various events including the behaviour of other people (Mileti & Peek, 2000; Vogt et al., 2005). As such, hazard warnings must be considered as being a component of a communication process and any inadequacy or breakdown in any one part of the warning process, including as a result of differences between people and fire agencies in how they interpret or render meaningful the information conveyed, may result in failure of the system as a whole (Anderson, 1969). A primary requirement for a warning to be effective is that it is based on accurate assumptions about human behaviour and their reaction patterns and capabilities that could arise in circumstances in which hazard activity is imminent or already commenced (Auf der Heide, 1989; Paton et al., 2006; Perry et al., 1980). To develop effective warnings, it is essential that warning messages are developed in the context of the characteristics of the community that will receive it (Paton, 2005). While the sources of warnings generally see themselves as independent providers of warning messages, these agencies are integral components of the social context. This is reflected in the fact that the level of trust in these agencies reflects prior experience with agencies and represents a significant predictor of whether the information they provide is seen as credible and likely to trigger the intended actions on disseminating a warning (Johnston et al., 2005; Paton, in press; Vogt et al., 2005).

In order for a new hazard warning message system to be generated, a research of the relevant literature regarding the use of warning messages and what is required for the public to perceive, acknowledge, take notice of, and accept as credible the information transmitted

in such a message is required. The social psychological principles of how people respond to warnings remain constant across hazard agents as diverse as bushfires, floods, earthquakes, tornadoes, explosions, and toxic chemicals (Mileti, 1995; Mileti & Peek, 2000; Perry et al, 1980). The behavioural process involved in receipt of a disaster warning is divided into several phases: receiving it, believing it, making it personal, responding, and confirmation.

### **Hearing or Receiving a warning:**

In order for a warning to be effective people need to receive it in one form or another. It should not be assumed that everyone would hear the warning. Factors such as habituation (e.g., consequence of prior false alarms) and selective perception (e.g., denial, unrealistic optimism bias) may effect an individuals ability to receive a warning and this may preclude or delay self-protection action (Mileti, 1995; Paton, 2006). Hearing the risk information also depends upon the areal extent of warning dissemination and ambient conditions (e.g., audibility, access to media broadcasting warning) within that warning zone (Hiroi et al, 1985; Mileti & Peek, 2000). In response to a hurricane warning, of residents who said they heard the official warning to evacuate the area, up to 88% of warning recipients did so. Of those who did not hear the warning only 8% to 20% left the endangered area (Baker, 1991).

### **Understanding the warning:**

Individuals need to form a personal understanding of what was meant or intended by the warning message. Understanding and meaning varies from person to person and is connected to their knowledge, previous experience and frame of reference (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000; Paton, 2006; in press). The social context also plays an important role in the process.

People are not passive recipients of information, even when it is intended to inform them about significant issues in their environment. Rather, they actively and constantly interpret information and events from the environment while they interact with that environment, and integrate their interpretations of these interactions through a process of reflection with already existing beliefs, attitudes and expectations (Blumer, 1969). People thus construct the meaning of the things they interact with and then act towards them in ways consistent with these meanings. How people interpret the world (their reality) differs from person to person, changes over time, depends on context, and reflects the unique experiences they have accumulated during their lives (Blumer, 1969). However, people may not always interpret warning or other information made available to them in a manner that contributes to their responding as expected (Cortner, Gardner, & Taylor, 1990).

These interpretive processes must be accommodated in risk communication about bushfires (Kneeshaw et al., 2004; Kumagai et al., 2004; Paton et al., in press). It must also be borne in mind that the misconceptions about bushfires that may prevail within a community can reflect the history and culture of the community, and are not likely to be corrected simply by providing people with information no matter how objective and factual it is (Kumagai et al., 2004; Paton et al., in press).

It is also relevant to accommodate the fact that communities are dynamic entities. Over time, the strategies used to develop warnings must accommodate changing hazard implications (e.g., increased incidence of bushfires from global warming, increased bushfire risk (even if likelihood of occurrence remains stable) from development in the peri-urban fringe, as well as changes in community membership, needs and expectations (e.g., increased transfer of responsibility to fire service (Kumagai et al, 2004)). The latter issue is particularly significant. It implies that warnings may trigger the expectation that fire services will respond rather than it acting as a catalyst for household action.

Thus, when designing warning messages and planning how and to whom they will be delivered, it is important to understand that people make judgements about the information presented to them and actively interpret it within frames of reference that can differ, sometimes substantially, from their scientific and civic counterparts who develop and deliver warning messages. It is not information per se that determines action, but how people interpret it (e.g., render it meaningful) in a context defined by their personal and community expectations (e.g., regarding who is responsible for responding when a warning is issued), experience, beliefs and misconceptions about hazards, the actions recommended on receipt of a warning (e.g., stay or go), and the sources of information (Dake, 1992; Dow & Cutter, 2000; Johnston et al., 2005; Kneeshaw et al., 2004; Lasker, 2004; Lion et al., 2004; Marris et al., 1998; Rippl, 2002; Paton, 2003), with people actively evaluating the relevance of information for them accordingly.

Within the hazard-warning context, understanding does not refer simply to interpretation of the given warning, but also to the attachment of meaning to the information, and this includes the perception of risk. For example a 50% probability of hazard impact may be interpreted as "almost certain" by some and "relatively unlikely" by others (Mileti & Peek, 2000). Understanding defines and sets the boundaries of our perception of risk, thereby influencing the decision making process (Fitzpatrick & Mileti, 1991; Mileti, 1995). It may be difficult for people to understand a warning when they do not understand the hazard they are being warned about (Fitzpatrick & Mileti, 1991; Gregg et al., 2004; Paton, 2006; Perry & Lindell, 1991).

**Belief:**

People must perceive the threat described in the hazard warning as real and valid before they will undertake protective measures (Fitzpatrick & Mileti, 1991; Perry et al, 1982). The

greater the level of this belief, the greater the probability that the individual will engage in an adaptive response to the warning message (Mileti, 1995; Mileti & Peek, 2000; Perry et al, 1982). In this context, unrealistic optimism (see Paton, 2006) can lead people to believe that the warning is intended for others. Similarly, a warning that triggers anxiety can increase the use of denial and a consequent reduction in the likelihood that the warning will lead to its intended actions. It is not what those issuing the warning message think is the certainty, severity, immediacy, and duration of the threat, but what are the perceptions of the recipients in the risk area (Lindell, 2000). The perceived proximity, severity and certainty of immediate personal danger are very important to personal belief, and the perception of this personal danger as real is crucial for the implementation of self-protective actions. If people define a situation as real, it is real insofar as consequences are concerned (Fitzpatrick & Mileti, 1991; Quarantelli, 1984). This individual belief can be fragile as demonstrated in radio broadcasts of disaster warning messages. If a radio station broadcasts what is supposedly an urgent message, and then reverts to normal programming, the message is less likely to be believed than if the station converts completely and immediately to broadcasting emergency messages (Quarantelli, 1984). People's beliefs regarding the nature of the warning-response process can also influence the timing of actions. For example, Paton & Burgelt (2005) described how some residents in high risk areas believed that warnings needed to be heeded only when smoke and flames were visible. As such, they may not act on the warning and leave themselves insufficient time to act, reducing the effectiveness of the warning. It is thus important to understand the beliefs of the intended recipients and to ensure that public education programs are used to correct misconceptions and increase people's preparedness for the responses (e.g., stay or go) that could prevail.

**Personalisation of the warning:**

Recipients of a warning message are more likely to heed the warning if they believe they are the intended recipient (Baker, 1991) and perceive the contents as applicable to them personally. Proximity to the area of impact and the certainty and severity of the hazard impact influences a person's conception of personal risk. If someone believes that the fire will result in direct personal harm then compliance with official recommended protective actions is more likely (Baker, 1991; Paton et al., 2006; Perry & Lindell, 1991; Quarantelli, 1984). The perception of personal risk is the strongest predictor of evacuation compliance: the higher the level of perceived personal risk the greater likelihood of evacuation (Perry & Lindell, 1991).

The level of perceived risk is an important determinant of public compliance with warnings irrespective of whether the hazard event has a long or short fore-warning period, whether the hazard is familiar or not, and whether the hazard agent is technological or natural in nature (Perry & Lindell, 1991). Perceptions of personal relevance are based upon specific aspects of the nature of the hazard event (Seydlitz et al, 1994).

Even when people receive a warning and accept the fact that a disaster is threatening, they may still fail to comply with recommended protective actions if they do not believe they themselves are likely to be directly threatened or face personal danger (Auf der Heide, 1989; Hiroi et al, 1985). In Hilo, Hawaii after the 1960 tsunami, many people failed to heed the sirens which signalled a need for evacuation prior to the impact because they believed themselves to be in a safe area (Anderson, 1969). A belief that they are in a safe area and not in immediate danger is a common reason why people do not evacuate when warned to do so (Auf der Heide, 1989). Dow and Cutter (1997) reported that the reasons for non-evacuation after warning of impending hurricane impact centred on the perception of safety of the housing unit and/or the persons location relative to the danger. Baker (1991) likewise found

that residents who feel unsafe staying where they are during a storm tend to leave, and those who feel safe tend to stay (Baker, 1991).

**Respond:**

The response to a warning message follows from a series of decisions, and is the result of an emerging and complex process which is continually modified as incoming information changes (Mileti & Peek, 2000). Responding to a warning represents the final stage in the decision making process (Kirschenbaum, 1992). The behavioural responses considered most appropriate and adaptive will of course vary with the nature of the threat involved (Perry et al, 1980). But the public response behaviours exhibited will depend on people's perceptions of their circumstances (Mileti, 1995). As illustrated by the above listed behavioural principles People often have several reasons upon which their decision to respond to a warning message is based (Dow & Cutter, 1997).

People are most likely to follow instructions given in a warning message if the reasoning for the instructions is given in the message, and that those reasons make sense to them. If instructions are unclear or not readily understandable, people will typically respond to information sources that do make sense to them. As such, warning messages should clearly define the rationale for all recommended actions (Mileti & Peek, 2000). If the respondents do not trust the information provided by official sources, or if they do not have any or sufficient information about the situation people will generally follow the example of others (Lindell, 2000; Paton, in press).

Incentives to evacuate, or to comply with recommended protective actions, must be devised in advance. Such incentives represent the results of careful planning and are not simply a response to some immediate threat to the community (Perry et al, 1980).

**Warning Confirmation Process:**

People do not simply take action in response to warning messages as soon as they hear the first warning (Mileti, 1995). The most common initial reaction to the receipt of a disaster warning is disbelief (Drabek, 2001; Perry & Lindell, 1991). There is often a period of cognitive preparation during which people typically think about the warning information they have received, discuss it with other people, and seek further information from additional sources (Earle, 2004; Lindell, 2000). When people are in ambiguous or fear-arousing conditions, they seek the advice of others in their efforts to interpret the situation (Atwood & Major, 2000). This need to confirm and verify the warning message and to seek more information about the hazard threat and what responses are considered appropriate represents an important component of the decision making process that culminates in whether or people act on a warning (Earle, 2004; Fitzpatrick & Mileti, 1991; Mileti & Peek, 2000; Paton, in press).

There is almost always social confirmation, or disconfirmation, of the disaster message (Quarantelli, 1984). This information-seeking process by the public is a common and well-documented phenomenon following the receipt of a disaster warning. It is not unusual for people to contact several potential sources, especially when there is sufficient lead-time before the disaster impact (Perry & Lindell, 1991; Perry et al, 1982).

Some people contact sources that they believe are impeccable, whereas others look for consistency of information between sources (Perry & Lindell, 1991). Individuals also contact friends and family to get their interpretation of events and information regarding what they are going to do about the impending threat. Further information is often sought by monitoring the news media, and from contacting emergency and civil defence authorities (Mileti & Peek, 2000). But generally individuals will seek contact with sources they consider credible (Perry & Lindell, 1991; Perry et al, 1982), is easy to obtain, and the most obvious (Drabek, 2001).



Seeking to confirm information is involved at each stage of the behavioural process and impacts upon the individuals understanding, belief, and personalisation of their level of risk. The contact with friends, relatives, and neighbours and the social and informational exchange that occurs are critical in the formation of response decisions (Leik et al, 1981; Mileti, 1995). As such we must make allowances for the social process of confirmation in the development of warning messages (Quarantelli, 1984). The very common behaviour of many people to utilise the telephone to confirm or relay warning information to others is also an important factor for emergency planners to consider (Legates & Biddle, 1998).

In conditions where there is a long forewarning and the hazard agent is familiar, the warning itself is considered an event which initiates the gathering of information and confirmation rather than as the principal source of information in itself (Perry & Lindell, 1991). Confirmation is also more likely to occur for warnings of unfamiliar or unusual disaster agents (Quarantelli, 1984).

People often spend time confirming the warning and delay taking action until they are convinced that evacuation or other protective actions are absolutely necessary (Lindell, 2000). Unless there is a clear explanation of the need for an immediate response, they might wait for a second, third or fourth official warning before responding. For this reason a good warning plan will call for frequent messages in the early stages of an emergency (Mileti & Peek, 2000).

Recipients of a warning message who confirm it to their satisfaction are more likely to comply with official recommended protective actions (Perry & Lindell, 1991). If, however, there is disconfirmation or doubt expressed, sometimes additional information sources may be sought, but more likely the perception will be that the warning message was irrelevant or incorrect. The warning is usually confirmed or disconfirmed by interaction with others, hence, it is a group or collective process which generates the interpretation given to the

warning message rather than what the individual alone may hear or believe (Earle, 2004; Quarantelli, 1984).

### **Warning Factors Influencing Public Response**

The purpose of a warning is to provide a threatened population with critical information. The communication process by which this information is disseminated plays a key role in the definition of risk perceptions (Anderson, 1969; Mileti & Peek, 2000). Advice or orders from public officials and the way in which they are worded and disseminated effect the probability of self-protective behaviours occurring more than any other factor, with the possible exception of proximity to risk area (Baker, 1991). The communication process used in issuing disaster warnings provides the key to understanding how to motivate people to engage in protective actions (Fitzpatrick & Mileti, 1991).

### **Warning Source:**

The credibility of the warning source can be nearly as important as the information disseminated (Perry et al, 1980). The individual or agency from which the warning emanates must seem credible and reliable for the information to be believed by the public (Fitzpatrick & Mileti, 1991; Gregg et al., in press; Mileti, 1995; Mileti & Peek, 2000; Paton, in press). Warnings from trusted credible sources lead recipients to be more confident in the accuracy, completeness of the message, and the appropriateness of suggested protective measures (Johnston et al., 2005; Paton et al., 2001; Perry & Lindell, 1991). When a citizen receives a warning message from a source that is perceived as credible the likelihood of warning compliance is increased (Perry & Lindell, 1991). Confidence in the warning source is an important factor in gauging message legitimacy (Perry & Lindell, 1991). Obviously, it is not possible to develop credibility during the process of disseminating warnings. This must be

done prior to the occurrence of hazard activity that necessitates delivering a warning. Consequently, the quality of the pre-event relationships between a community and the source of warning is important. The amount of influence the message will have upon the community at risk is a direct result of the perceived expertise and trustworthiness of the warning source (Lindell, 2000).

In situations where the forewarning of the event is short and where people must act quickly, the credibility of the message takes on even greater significance (Perry & Lindell, 1991). If the warning source is given only marginal credibility, it is most likely to evoke confirmation behaviour (Legates & Biddle, 1998). The credibility of a source is comprised of two main components - trustworthiness and expertise. Trustworthiness is gauged from the source's characteristics and the perceptions of motives, and expertise in terms of the knowledge, skill or role the agency plays (Driscoll & Salwen, 1996; Earle, 2004; Kee & Knox, 1970; McAllister, 1995; McGee & Russell, 2003) and expertise

Warnings effectiveness can be increased if it is delivered by several sources. While the actions and recommendations of public officials are often reported as the most influential factors determining warning response rates, reliance on the news media, the weather service or other sources of intelligence suggest that individuals rely on a variety of information sources in making personal risk evaluations (Dow & Cutter, 1997).

People have differing views about who is credible (Fitzpatrick & Mileti, 1991; Mileti, 1995). Information that comes from a mix of scientists, reputable organisations and public officials facilitates belief in the message being issued (Mileti & Peek, 2000). That is, it increases the likelihood that people will have access to information from at least one source they perceive as credible. Credibility is also a function of familiarity. Individuals and groups with the most pre-disaster credibility have linked to warning effectiveness (Quarantelli,

1984). However, it is essential that, if information is available from several sources, that the messages that are delivered are consistent (Auf der Heide, 1989; Mileti & Peek, 2000).

The credibility of warning is also enhanced if it is issued in a context that is consistent with a condition of urgency. If a warning is issued via the media and is followed by a return to normal programming, the threat is not taken so seriously. In some cases information given out with the message can have a neutralising effect upon the warning (Auf der Heide, 1989).

### **Warning Message Consistency:**

Inconsistent information can cause confusion (Mileti, 1995) and destroys credibility (Quarantelli, 1984), so consistency in and between warning sources and the messages they convey is essential (Drabek, 1983). The message must be consistent in the way it conveys information about the level of risk, and the tone in which it is given (Fitzpatrick & Mileti, 1991; Mileti, 1995).

An important issue in this context concern the implications of delivering warning messages repeatedly in response to changing circumstances (e.g., changes in the rate of advance of a fire as a result of changing weather conditions that can increase or decrease level of threat or change the locations under threat etc). A need for conveying changes in message content introduces considerable scope for confusion and apparent inconsistency. However, problems in this regard can be contained across messages simply by repeating what was last said, what had changed, and explaining why the situation has altered (Mileti, 1995; Mileti & Peek, 2000). Overall, a warning message that is consistent in the information it provides promotes the formation of accurate perceptions about the nature of the threat and appropriate self-protective actions (Mileti & Peek 2000).

**Message Accuracy:**

A warning message must contain accurate, timely, and be as comprehensive and pertinent to the recipients as possible. Message accuracy applies to the extent to which the message is, or is not, fully factual. Being open and honest with the public about the hazard enhances accuracy. If people suspect they are not receiving the "full truth" they are likely to ignore instructions and instead respond in ways consistent with their suspicions (Mileti, 1995). Perceptions of inaccuracy have been found to cause people to disbelieve what they hear, and if the public suspect they are being lied to, or even that they are not receiving the whole truth, they may well lose the ability to believe further messages from that source (Johnston et al., 2005).

Perceived accuracy is enhanced simply by being fully open and honest with the public for the outset of an emergency (Fitzpatrick & Mileti, 1991; Mileti & Peek, 2000). When information is ambiguous or incomplete, people will turn to unofficial sources to provide additional, though less firm, bases for evaluation (Anderson, 1969). Therefore the issue of accuracy is important (Perry & Lindell, 1991).

**Warning Clarity:**

The message must be worded clearly and simply in language that can be understood by the general populace. Lack of clarity can lead to the public misunderstanding the message (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000; Nimmo, 1984). If warning messages are unclear, ambiguous or easily interpreted as not involving immediate danger, no warning will be perceived (Quarantelli, 1984).

**Certainty of the Message:**

Certainty determines the level of belief in a warning and will affect subsequent decision-making. So, a message must convey a high level of certainty about the events taking place and about what people should do (Mileti, 1995). When the danger is thought to have a high degree of certainty for impact belief in the warning is also very high (Quarantelli, 1984). Even in an ambiguous situation a message stated with certainty will impact public belief in the message and influence the decision making process (Mileti & Peek, 2000).

Certainty in the warning message extends beyond actual message content and also includes the style of delivery. It should be spoken by a source delivering the message in a tone that conveys that he or she believes or is certain about what is being said (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000).

**Sufficient Information:**

The message must contain enough information so that the public knows exactly what is happening (Fitzpatrick & Mileti, 1991; Mileti, 1995). Warning messages delivered by a credible source which are specific and contain information about the probable severity and impact location are more likely to elicit an effective coping response from the public (Perry et al, 1982), because detailed information leads to higher levels of perceived risk, and therefore, increases the likelihood to people taking protective action (Mileti, 1995). The content of a warning message impacts directly on warning belief and the person's perception of personal risk. As warning message specificity increases, so does the likelihood that personal risk will be perceived in a manner likely to encourage action (as long as people know how to act) (Perry et al, 1982). Effective warnings describe the danger, estimate when the impact will arrive and suggest appropriate protective actions (Perry & Lindell, 1991).

Insufficient information creates confusion, uncertainty and anxiety which can lead to people filling in the information void with uninformed misperceptions or fears (Mileti, 1995). Likewise, vagueness in warning messages will result in different members of the public defining the hazard in different ways and then responding in ways consistent their own definitions (Mileti & Peek, 2000). If there is any ambiguity in the warning message it is often interpreted as evidence that the best rather than the worst situation exists (Auf der Heide, 1989). The more general the warning message is, the less likely it will be perceived as a warning. The more it details something relevant to the listener, the more it is believed (Quarantelli, 1984). A study of response to the Mt St Helen's eruption found that detailed information led to higher levels of perceived risk and a greater likelihood of public protective action being taken (Mileti & Peek, 2000). Individuals inexperienced with a hazard agent take defensive action sooner when warnings are more frequent and detailed (Leik et al, 1981).

A warning message should provide enough detail for all members of the public to understand the physical character of the hazard agent from which they are to protect themselves. If a hazard is well described, people are better able to understand the logic of the protective actions being advised (Mileti, 1995; Mileti & Peek, 2000). The more specific the warning content, the greater the likelihood of compliance to the protective recommendations (Perry & Lindell, 1991). Warning messages must contain information about, and be specific, regarding the nature of the hazard agent, likely timing and magnitude of the event, the risks of unprotected exposure, the location of the risk, the recommended protective action, the amount of time available before impact and concrete suggestions about what actions would be protective (Mileti & Peek, 2000; Perry et al, 1980; Perry & Lindell, 1991). Because most protective actions and household and personal response plans must be known and implemented in advance, it is essential to ensure that warning systems development proceeds

in concert with public education programs designed to facilitate bushfire knowledge and preparedness.

The time and place to communicate a detailed adaptive plan is not in the warning message issued just prior to disaster impact. It is considered optimal for the recommended actions to serve as brief cues to the individual, bringing to mind detailed adaptive strategies which have been previously communicated (Perry et al, 1980).

**Guidance:**

Warning messages must not only indicate that there is danger, but also what should be done in the situation. As outlined above, the ideal situation is to ensure that households and people are well prepared in advance of the issues of a bushfire warning. However, prevailing levels of preparedness tend to be low (McLeod, 2003). Under these circumstances, the effectiveness of a warning message may be increased by including cues to the protective actions required. This can provide timely prompts to those already prepared, and provide guidance to those that are not. The limited time frame that may prevail when a warning is issued means that the latter will rarely represent a comprehensive basis for facilitating public safety. Including information in warning messages regarding how the threat might be prevented, avoided or minimised it cannot elicit an appropriate response to the situation (Quarantelli, 1984). It cannot be assumed that the public will know what would constitute an appropriate protective action.

The ability to act on this can also be affected by levels of stress likely to prevail during this period, and the effectiveness of this strategy will also be a function of the availability of an effective source of specific information (e.g., fire agencies, local radio). Both of these issues are discussed below.



However, warning message must include information about what people should do to protect themselves from an impending hazard (Auf der Heide, 1989; Mileti & Peek, 2000). People are more likely to take the recommended protective action if the message provides specific guidance about what to do and how to do it (Lindell, 2000). A warning message must contain specifics regarding what people should do about the event being described, how much time they have to act, and specify safe areas to which people should evacuate (Fitzpatrick & Mileti, 1991; Mileti, 1995). The evacuation route, destination and method of transportation should also be clearly defined. In the case of sheltering in-place, guidance should instruct people appropriately (Mileti & Peek, 2000).

Research has shown that people are not inclined to leave their homes unless they have a specific evacuation plan (Lindell, 2000). Situations requiring evacuation can become even more complicated when the route or destination information is not clear or obvious (Perry & Lindell, 1991). People who are not provided with an evacuation plan are also often slow to take action (Perry et al, 1980).

The protective action recommendations must be perceived to be commensurate with the threat. The public perception is crucial here (Lindell, 2000). Community members should be provided with concrete action plans that are reinforced in community groups (Sattler et al, 2000). Knowing what to do and how to prepare gives the public a degree of control and thus a greater feeling of security (Blanchard-Boehm, 1997). The public should also be advised what to do about their pets (Heath et al, 2000).

### **Frequency of Warning:**

The number of times a warning message is delivered affects the likelihood that it will be received, understood, believed, and acted upon. As such is important as a condition for adaptive risk perception and response. People should also be informed about when they will

hear the message, or an updated version, again as this aids in confirmation of the warning and helps to reduce anxiety (Mileti, 1995; Mileti & Peek, 2000). Hearing repeated warnings can heighten the perception of risk (Seydlitz et al, 1994) thereby increasing the likelihood of people taking protective action (Auf der Heide, 1989). This is achieved by reducing the effect of misinformation and misperceptions by focusing people to the official warning message, reduces rumours, and increases public confidence in the validity of the warnings (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000). Detailed messages can and should be repeated (Mileti & Peek, 2000). The frequency of this repetition is best dictated by the needs of the public at risk and hazard characteristics such as speed of onset and the distribution of hazard consequences (Mileti, 1995).

**Risk Location Information:**

Identifying the location of risk is important in determining belief and levels of personal risk (Fitzpatrick & Mileti, 1991). The closer the respondent's proximity to the threatened area, the more likely that person will believe the message, hence the more location-specific a message is the greater the level of personalised risk. Messages should also be directed toward other residents who are safe and explain why they are safe because researches have found that some of them will also take protective action. This is important if evacuation by those who are not at risk might overload evacuation routes and the resulting traffic congestion would endanger those who are closer to the source of danger. Smoke from the fire is a significant hazard under these circumstances. Detailing the locations at risk and identifying safe evacuation routes is best done by reference to landmarks that are readily identifiable and understood by the public (Mileti, 1995; Mileti & Peek, 2000).

**Channel of Communication:**

Warnings can be issued to the public using several media and sources. Voice messages can be broadcast over loudspeakers, public address systems, telephone, radio, or television. Signals include sirens, alarms, whistles, signs and lights. Leaflets, brochures, or video can be used to distribute graphic information and printed messages (Mileti & Peek, 2000). The success of each type of warning channel depends on the geographical distribution of the risk area population and the activities in which the population is engaged (Lindell, 2000).

The mode or mechanism by which a warning is communicated is important. Messages received through the mass media, loudspeakers, telephones, or in face-to-face conversations are all perceived as having different degrees of credibility, authoritativeness, and legitimacy. The more personal the manner in which the message is delivered, the more it will be given credence, and the more the message is person specific, rather than a communication directed to the public in general the greater the credibility. Warnings delivered directly by other people are more likely to be believed than when communicated by an impersonal medium (Quarantelli, 1984).

The more personalised modes of delivering the message result in higher response, with the most effective procedure being having authority figures (ie. police or fire service personnel) go door-to-door through neighbourhoods, especially where evacuation is being advised as the recommended protective action (Baker, 1991; Sorensen, 1991). Having an authority figure delivering the message adds credibility to the warning as well as providing face-to-face communication which can supply opportunities for explanations and questions to be answered (Baker, 1991). A warning received directly from local officials facilitates decision making (Leik et al, 1981). Face-to-face warnings require some time to implement (Lindell & Perry, 1987), suggesting that they are most effective only when time permits.

Although sirens can alert a large number of people, they carry the least specific type of information. Sirens, and other simple signals, cannot convey clear instructions about the nature of the hazard and what are the appropriate protective action recommendations to a population at risk (Lindell & Perry, 1987). They do, however, get people to turn to potentially more specific sources of information, such as the mass media (Auf der Heide, 1989; Lindell & Perry, 1987). Sirens are best used as signals for the public to seek out emergency information rather than as signals that should elicit specific protective actions (Mileti & Peek, 2000).

The greater the number of different warning sources the larger the potential for the number of people contacted (Auf der Heide, 1989). Risk information communicated over multiple channels (ie. voice, electronic media, signals, printed or personally delivered) have been shown to enhance hearing, understanding, belief and response by the public at risk (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000). People who had multiple or more-detailed warning sources also generally had longer lead-times before disaster impact, and were more apt to relay the warning to a third party. In a study of response to tornado warnings, one third of those surveyed reported that they, or someone in their company, relayed warning information to a third party (Legates & Biddle, 1998). There is often considerable unofficial "word of mouth" warnings exchanged among neighbours (Perry et al, 1980).

One of the most potentially effective technological approaches to warning is the use of computers to contact selected populations by phone and give recorded warning information (Auf der Heide, 1989).

## **Receiver Factors that Influence Public Response**

### **Environmental factors:**

Few people accept warning messages at face value - people will usually check for environmental cues - ie rising water, signs of fire, darkening skies, smoke clouds and so forth. Greater credence often tends to be given to these cues than to the warning messages (Quarantelli, 1984). Environmental cues, which are the physical characteristics of the setting in which the public receives emergency information, interact with other information factors such as risk location (Mileti & Peek, 2000), with proximal cues often being a significant determinant of response to bushfire warnings (Paton & Burgelt, 2006).

### **Social Context:**

This is the context in which the emergency information is received. Is the family together when the warning is given? What activities are being performed? What are others doing to respond? (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000).

There is a very strong tendency for families to deal with disasters as a unit (Auf der Heide, 1989; Perry & Lindell, 1991; Lindell, 2000; Perry et al, 1980; Drabek, 1983). Evacuation is less likely to occur if family members are separated at the time of the warning. Family members will often wait in an endangered area until family members can come together. When families do evacuate, they move as units (Perry & Lindell, 1991; Quarantelli, 1984). It is well established that separated households attempt to reunite before evacuating together unless members can confirm that they can reunite at a safe location after evacuating separately (Lindell, 2000). People will often go to great efforts to obtain information on missing family members before complying with evacuation orders (Perry & Lindell, 1991; Lindell, 2000). Family context thus exerts a strong influence on response behaviour in that

citizens will tend not to comply with disaster warnings unless the safety of family members is known or if people can be reassured of family safety if they are separated when a warning issued (Lasker, 2004).

Family unity at the time of a warning increases the likelihood of belief (Mileti & Peek, 2000). Sometimes this definition of "family" applies to the household pets, particularly dogs (Auf der Heide, 1989), and many of those who re-enter an evacuated area do so to rescue pets (Heath et al, 2000). Being responsible for family members, having a pet, and having a car are positively associated with disaster preparedness (Sattler et al, 2000). Families should be encouraged to design plans of how to handle emergency situations, including ways to facilitate communication among family members during and after the disaster threat, in order to reduce anxiety and to promote timely preparation and execution of their disaster plan (Sattler et al, 2000).

### **Social Networks:**

The recipient's social ties can affect decisions to respond to warnings (Fitzpatrick & Mileti, 1991; Mileti, 1995; Mileti & Peek, 2000). How others are seen as acting becomes crucial in confirming or disconfirming the original individual perception of the warning message. When others are seen as behaving as if they believe a warning to be valid, the message is more likely to be believed (Quarantelli, 1984). One of the better predictors of whether someone will evacuate is the extent to which their neighbours are evacuating, because generally they and their neighbours will leave, or stay, for the same reasons (Baker, 1991). The perception of living in a friendly neighbourhood can influence the decision to evacuate, but people who feel that they can rely on their neighbours to help them are more likely to stay in a hazardous situation (Kirschenbaum, 1992). The actions of significant

others have been found to have a greater effect of what people plan to do in response to an earthquake prediction than did believing or not believing the prediction (Farley, 1993).

Personal role obligations cause strong ties to friends, relatives, neighbours and co-workers, and a desire to ensure that these people will also be safe can affect response decisions. These ties give rise to informal warning networks in which people call to ensure that others have heard the warning, see how they have interpreted the message, determine whether others have additional information, and inquire how they are going to respond (Lindell, 2000). It is commonly reported that they, or someone in their company, relayed warning information to a third party (Legates & Biddle, 1998).

### **Socio-demographic characteristics:**

Resource availability and demographic factors influence hearing, interpretation, believing, personalising and responding to a warning (Fitzpatrick & Mileti, 1991; Mileti, 1995). Consequently, the community that receives a warning is best conceptualized in terms of this demographic diversity, with each sub-group interpreting their experience quite differently (Mohiuddin, 1998).

Research indicates that minority groups are disproportionately likely to experience negative consequences in connection with natural disasters. Minority group members, especially those whose primary language is not English, appear to be more subject to the warning-related difficulties than are non-minorities (Perry et al, 1982). Perry & Lindell (1991) found that ethnic group membership is not always a significant factor in warning compliance, but there are ethnic differences in defining which sources of information are credible and the approach one takes to warning confirmation. When the forewarning time is short and the hazard threat unfamiliar, most citizens regardless of ethnicity regard the authorities as the most credible source (Perry & Lindell, 1991).

In a survey of low key warning information regarding earthquake probabilities in Southern California, minority groups mainly learned of the warning message by watching television. Asian respondents were the least likely to have developed an earthquake plan, and to know of friends and neighbours and family who had engaged in preparedness measures. While minority ethnic groups typically gathered information from informal sources, Caucasian respondents were more likely to seek information from formal sources (Blanchard-Boehm, 1997).

Ethnic group membership can also mean that the same message will be interpreted in very different ways. Even when confronted with the same warning message some ethnic groups don't define the level of personal risk as high. When the minority group members agree with their Caucasian counterparts about level of risk they are often less likely to undertake the officially suggested adaptive response (Perry et al, 1982).

Studies examining gender differences in risk perception have not reported consistent findings. However, the majority of these studies indicate that when compared with men, women are more likely to perceive greater risk when faced with a threatening situation (Atwood & Major, 2000; Fothergill, 1996). Women are more likely to receive warning information from their peers, friends, relatives and neighbours due to their social networks, and are more likely to take warnings seriously and to respond to them than are men (Fothergill, 1996). Women are also more likely than men to seek information from formal sources (Blanchard-Boehm, 1997). Males, however, tended to have greater access to multiple warning sources and were more apt to consult additional sources than were females (Legates & Biddle, 1998).

Most studies have also failed to find consistent associations between age of the respondent and evacuation behaviour (Baker, 1991; Sorensen, 1991). Much of the research has highlighted the apparent isolation of many elderly, thus it has been reported that older people



are somewhat less likely to receive disaster warning messages upon which they could act: a situation usually attributed to less involvement in social networks (Perry & Lindell, 1997). However, Sorensen (1991) found that older people do not hear disaster warnings later nor are they slower in responding to those warnings than other age groups. Although age is clearly important in recovery and reconstruction, in the warning phase what is important is the extent to which physical, psychological, financial, and social conditions impact such factors as the probability of receiving a warning, understanding it and taking action based upon it (Perry & Lindell, 1997). Legates & Biddle (1998) found that compromised mobility, situational communication factors and previous experience with the risk agent were important factors with regard to the elderly complying with recommended protective actions (Legates & Biddle, 1998). However, once a warning message is received, the ability to interpret and act upon it does not appear to be a function of age (Perry & Lindell, 1997).

Household resources, such as the availability of a credit card or ready cash and access to transportation, are also important in compliance with protective action recommendations. Those who can evacuate to the home of a friend or relative will experience relatively little cost of an evacuation and might find the experience to be relatively pleasant. A family that evacuates to a hotel, but has a credit card, may find the evacuation expensive, but not unpleasant. For those who must evacuate to a public shelter, the decision to leave their home may be more difficult, as mass care facilities are locations that most people would prefer to avoid. Consequently, the inconvenience of evacuating is something that people tend to balance against the perceived risk (Lindell, 2000).

The use of public shelters tends to increase when community preparedness is high, when the entire community must be evacuated, and when the evacuees anticipate that the necessary period of absence will be long. Under these conditions about a quarter of evacuees at a given site will be attracted to public shelters. People still primarily seek shelter in the homes of

friends and family (Perry et al, 1980). Those living in disaster-threatened areas are more likely to "evacuate by invitation" if they are encouraged by invitations from relatives and friends outside the impact area (Auf der Heide, 1989; Perry et al, 1980).

Those groups least likely to evacuate in response to a disaster warning are people with livestock, because they stand to lose substantial amounts of money if they abandon their animals for an extended period of time. This trend was exhibited at both Mt St Helens and Three Mile Island (Lindell, 2000). Education, occupation, marital status, gender, the presence of children or whether the occupant owns or rents the dwelling are variables which have been found to have no association with, or impact upon, evacuation behaviour (Baker, 1991).

As a rule it is poverty which determines the nature of the vulnerability (Mohiuddin, 1998). In general terms it is the poor who remain at the highest risk due to factors related to cultural architecture (style of the era for older homes), education, shelter availability, community infrastructure, family logistics, and access to services (Legates & Biddle, 1998). Personal risk is not connected solely to a lack of awareness among the poor, disenfranchised, and elderly. Rather, the more common concerns of daily life usually overshadow considerations of the low probability event, no matter how catastrophic or lethal its potential. This is especially true if individuals perceive little control over its probability (Legates & Biddle, 1998).

### **Psychological characteristics:**

Cognitive abilities, personality, or attitudes can influence reception of a warning (Fitzpatrick & Mileti, 1991; Mileti, 1995). In a survey undertaken by Atwood and Major (2000) pessimistic respondents believed they were at greater risk than others and were more likely to believe in a pseudo-scientific earthquake prediction. Optimistic respondents were less likely than pessimists to seek information and their lack of information about the risk may have led to denial of the threat (Atwood & Major, 2000). Unrealistic optimism - an

individual's belief that he or she is less likely than others to experience negative life events - may help reduce anxiety, but it also may restrain people from taking precautionary or preventive actions (Paton, 2006; Sattler et al, 2000).

The personality factor investigated most extensively in the context of warning response is locus of control. Simply stated, people with an internal locus of control are self-determined and tend to feel they have control over their fate. Conversely, people with an external locus of control have fatalistic views of the world and feel their fate is in the hands of chance, powerful others or "divine power". Those with an internal locus of control are more likely to believe, personalise, and respond to a protective action recommendation than the latter (Fitzpatrick & Mileti, 1991; Legates & Biddle, 1998; Mileti & Peek, 2000).

Those who reported high levels of stress as a result of previous hurricane experience had better disaster preparation than those who had lower levels of stress (Sattler et al, 2000). Residents in areas that incurred near misses or "false alarms" when a hurricane seriously threatened the region but impacted elsewhere may develop an optimistic bias, or a false impression that subsequent disasters will not strike the area (Sattler et al, 2000).

### **Pre-warning perceptions:**

A person's views of the world are shaped by a lifetime of social and cultural interactions, and people have a tendency to filter information to conform to their individual worldview (Fitzpatrick & Mileti, 1991). Disaster warnings may be disregarded if their risk perceptions are already biased (Mileti, 1995). Preconceived ideas of an emergency can impact situational perceptions of risk, and if their perception of the hazard is inaccurate, people may disregard warnings, or respond unnecessarily (Paton et al., 2001). People who have erroneous beliefs about protective actions may fail to comply with official protective action recommendations (Mileti & Peek, 2000; Paton, 2006; Seydlitz et al, 1991).

On the other hand, the possession of an adaptive plan is positively correlated with evacuation, and the more precise the plan the greater the likelihood of compliance with an evacuation warning. Warning effectiveness is greatly enhanced when the recipient knows appropriate routes, safe destinations, takes important personal papers and medications etc (Perry & Lindell, 1991).

Community familiarity with the hazard needs to be taken into consideration because this will affect the way people will define the level of risk they are exposed to and therefore also the need for information seeking (Perry & Lindell, 1991; Russel & McGee, 2003). Although no consistent relationship between previous hazard experience and evacuation behaviour has been documented, experience does contribute to awareness of the hazard (Baker, 1991), and influences the way in which people perceive and prepare for disaster threats, experience psychological distress, and assist survivors (Sattler et al, 2000). However, experience of low level impacts (Paton et al., 2001) and attributing the cause of bushfire to others (Kumagai et al., 2004) decreases the likelihood that warning information will be attended to in future.

Sattler et al (2000) found that persons who have experienced a natural disaster may accrue certain benefits that promote preparation activities and attempt to minimise loss of resources during subsequent disaster threats. Persons who live in areas that are frequently threatened by natural disasters may be more likely to acknowledge that a threat exists, to take more preventive measures, and to comply with warnings than persons who are infrequently threatened by disasters (Sattler et al, 2000). But there may also be limits to the extent to which disaster experience may make subsequent warnings salient or may activate cognitive and behavioural schemas that help survivors cope with the threat. Disaster experience may have a paradoxical effect and may create an optimistic bias. Survivors harbouring this bias may minimise the need to engage in extensive preparation, or erroneously conclude that subsequent disasters will be similar in size, will cause similar amounts of damage and do not

warrant additional preparation (Sattler et al, 2000). Some of the positive effects of disaster experience in promoting preparation may also fade over time (Sattler et al, 2000).

Officials frequently express concern that if people evacuate unnecessarily then they won't be willing to leave during the next threat: a behavioural pattern called "cry wolf syndrome" (Baker, 1991; Legates & Biddle, 1998). If local officials call for an evacuation and the expected hazard consequences fail to materialise, the officials may be held up to public criticism and ridicule with a resultant loss of future warning effectiveness. Hence there is sometimes hesitancy in deciding upon initiating alert procedures which can be attributed to having received a number of false alarms previously (Anderson, 1969).

False alarms are thought to destroy a regard for future warnings (Anderson, 1969). But when stayers were asked why they didn't evacuate during a hurricane warning, fewer than 5% cited previous unnecessary evacuation as the reason (Baker, 1991). Dow & Cutter (1997) found that only 2% of those surveyed indicated that they would not evacuate in the future because the last few forecast hurricanes did not hit. One of the better predictors of evacuation compliance was whether people had evacuated in the past - those who had left previously were more likely to evacuate again (Baker, 1991). This reiterates the need to understand the decision making process that leads people to decide to evacuate in the future.

As a general rule people tend to express just as much concern about a false-positive response (ie. recommending protective action when it is not needed) as about a false-negative response (ie. failing to recommend action when it should be taken). By contrast, the government agencies tend to have substantially less concern about a false-positive response than a false-negative response (Lindell, 2000). All parties should recognise that either error could have significant consequences for at risk populations, but it is important to recognise that the two types of errors have different kinds of consequences. The consequences of a

false-positive response are generally economic. By contrast, the consequences of a false-negative response may affect public health and safety (Lindell, 2000).

Persons living in areas frequently warned about approaching threats, but which rarely sustain a severe impact, tend to discount the seriousness of subsequent messages (Auf der Heide, 1989; Paton et al., 2001). But the effectiveness of people's response to warnings is not always diminished by what has come to be labelled the "cry wolf" syndrome. This is a significant issue for fire warnings. People have general access to signs indicating prevailing levels of fire danger (e.g., low, high, extreme). Anecdotal accounts (Paton & Bugelt, 2006) suggest that these can be a source of confusion or uncertainty. For example, an interview with a resident in a high risk area was confused about the difference between 'high' and 'extreme' fire danger because switches between these different levels of (apparent) risk were rarely accompanied by differences in visible signs of greater risk (e.g., seeing smoke on 'extreme' days). If they actual conditions do not change, it may be difficult for members of the public to develop coherent vies of risk and this may affect the perceived credibility of the source.

The integrity of the system will be preserved if the reasons for the mistake are clearly communicated to the public (Mileti & Peek, 2000; Mileti & Sorensen, 1990). In the case of repeated activation of the alert mechanisms (likely during the peak of the fire season), if such false alarms occur and no attempt is made to explain why they were false alarms, subsequent public response to the alert of an event could be affected negatively. This highlight the need for warning system development to be accompanied by higher levels of community engagement than is currently the norm. This is particularly true of inadvertent sounding of sirens; people eventually will ignore the sirens in a true emergency if such malfunctions are frequent and not explained. If false alarms are explained, they can actually enhance public hazard awareness and ability to process risk information during later warning events. A good emergency plan will have a procedure for explaining false alarms (Mileti & Peek, 2000).

Another prevalent disaster myth is the notion of panic. It cannot be overemphasised that the public simply does not panic in response to warning of impending disasters. This is not to say that people never panic, but panic only occurs in very particular circumstances (Auf der Heide, 1989; Cornwall et al, 2001; Mileti & Sorensen, 1990). The conditions required to induce panic include 1) people being enclosed in a defined space, 2) with an immediate and clear source of death, and 3) the presence of an escape route for which it is obvious that there is insufficient time for everyone to escape with their lives. Panic behaviour is different from elevated stress which both the public and media tend to label as panic. This is an important issue for fire warnings, where those not prepared to stay and defend their property fail to respond to initial warnings and leave themselves insufficient time for safe evacuation. Under these circumstances, the elevated levels of psychological stress that people experience affects their information processing and decision making, resulting in it being more difficult for them to respond to information unless their response actions have been considered well in advance. The negative consequences of the myth of panic is that warning officials are reluctant to tell the truth or may withhold warning information because they are afraid of causing panic (Mileti & Peek, 2000). The expectation of panic, or of causing unnecessary anxiety, is still a significant constraint on emergency planning. The risk of causing public anxiety is seen as greater than the risk of evacuation failing to be successful because of public ignorance (Green et al, 1991).

When people use the term "panic" to refer to their own behaviour in a disaster, they seem to be referring to the level of fear they experienced and their perceived inability to cope with the situation. Men are more likely than women to agree with the statement "I panicked" (Green et al, 1991). Officials have put out warning bulletins most cautiously, or withheld warnings until the last minute, because they felt that the inevitable panic would be almost as dangerous as the disaster itself (Auf der Heide, 1989). Research has shown that panic is not a

common reaction to disasters. If panic does occur, it is not widespread nor contagious, it is most always highly localised, involving few people, and of short duration (Auf der Heide, 1989). One of the reasons for the belief that panic is common is a failure to draw the distinction between perceived (and reported) threat and panic (Auf der Heide, 1989; Hiroi et al, 1985). Feeling a threat is not the same as panic. A panic-stricken individual flees without consideration for others. In contrast, persons who leave an area in an orderly evacuation often assist others to get away (Auf der Heide, 1989; Cornwall et al, 2001) despite experiencing a strong sense of threat. It is the feeling of being threatened that is generally reported and misinterpreted as panic. Social roles, such as authority, occupational and gender roles that tend to break down during panic, usually remain prevalent throughout a disaster situation (Cornwall et al, 2001).

Persons may refuse to evacuate because they are concerned their empty homes may be looted. That the concern is an invalid one (there is little empirical support for its occurrence) is irrelevant if people believe that looting is a problem. So messages to evacuate to safer areas may be disregarded because other considerations are deemed more important than safety (Auf der Heide, 1989; Drabek, 1983; Quarantelli, 1984).

Looting apparently occurs so infrequently that it is unnecessary and perhaps a poor use of personnel to deploy police or other personnel in large numbers to guard evacuated areas. Only symbolic security measures are necessary to "create the illusion" of property protection (Perry et al, 1980). It is, however, the evacuees' perception of the problem that must be considered (Perry et al, 1980). Many evacuees express concern about looting and if evacuees feel that their property will be safe from potential looters they will be far more likely to comply with an evacuation program (Perry et al, 1980).



Persons in unfamiliar settings are generally reluctant to remain in them when personal danger is perceived, hence tourists, travellers and strangers in given localities are very likely to leave at the first indication of possible danger (Quarantelli, 1984).

Warning content will be most effective if it addresses people's concerns and does not conflict with the local population's pre-existing hazard beliefs. Emergency managers must understand people's perception of the hazard and alternative protective actions if they want people to comply with their protective action recommendations. If public perceptions are incorrect, the emergency managers must provide information from a credible source that corrects those misconceptions (Lindell, 2000) preferably well before the fire season. This creates a dilemma. Contact between fire agencies and communities is less likely outside of the fire season, and levels of community interest are likely to be so low as to reduce the efficacy of any formal engagement during this period. This observation reiterates the need for systematic understanding of factors that encourage sustained bushfire preparedness, and for levels of preparedness to be developed over time. The local perspective of the nature of the threat is of course crucial to the community's evaluation of hazard information (Mitchell et al, 2000).

### **The Media**

The portrayal of disasters rarely reflects the reality of the event. The nature of the hazards and their physical characteristics are often distorted for dramatic effect. The public learns much about disasters and disaster behaviour from popular culture and media reporting (Couch, 2000; Mitchell et al, 2000; Wilkins, 1986). Research has suggested that the media play an important role in shaping public assessment of risk, especially where the media act as the link between expert and layperson (Dearing & Kazmierczak, 1993; Mitchell et al, 2000). Where the dramatic portrayals are perceived as realistic and the roles being acted are

attractive this perception has influence upon the social-level judgements of risk and psychological assessments of fear (Bahk & Neuwirth, 2000). For many people, their only experience with a hazard event is through the media (Seydlitz et al, 1991).

From a newsworthy viewpoint disaster events are a significant source of news for several reasons. Often they have the same attributes as that of good fiction: drama, conflict, problems, solutions and rising and falling action, and for these reasons such events are often termed "stories" (Auf der Heide, 1989; Nimmo, 1984; Wilkins, 1986). They are also generally easy to cover logistically, and they attract large viewing audiences. It has been estimated that 25% of all news stories involve disasters, hazards or civil disturbances (Auf der Heide, 1989).

Overseas research and observations have, however, highlighted some problems regarding the presence of the media in a disaster situation. Firstly, the media have been known to descend on a disaster scene *en mass*. The presence of so many media personnel can add to the burden of emergency response agencies, and be seen to divert attention away from, and even interfere with, urgent matters such as casualty care, search and rescue, and evacuation activities. Media air traffic can be of a particular concern when it threatens air search efforts (Auf der Heide, 1989).

Secondly, to cater for the entertainment aspect of news broadcasts coverage often focuses on the dramatic and unique aspects of disasters rather than those that are more typical, or representative, of the hazards impact (Auf der Heide, 1989; Hiroi et al, 1985). Television news is often packaged to make the most of the emotional images of a disaster (Moeller, 1999; Seydlitz et al, 1994). This preoccupation with the dramatic can accentuate and exaggerate the destructive magnitude of a disaster event. The "Dresden syndrome" is where the media focus on the scenes of destruction but not on the surrounding undamaged areas which can give the impression that the whole community lies in ruins, when in reality

damage may be limited to just a few blocks (Auf der Heide, 1989). Patterson & Wilkins (1988) found that the media often does not cover the disaster as it really is but reflects a stereotype of what that particular disaster should be (Moeller, 1999; Seydlitz et al, 1991; Seydlitz et al, 1994). Others explain that the portrayal of an event in a strikingly dramatic way puts events into a context that aids public understanding (Wilkins, 1986). The media are seen to frame hazard events for the public (Seydlitz et al, 1994) which helps to give them meaning, makes them understandable, and gives the perception of control (Couch, 2000). In so doing, the media, and the popular culture it generates and supports, produce a simulacrum - something that represents a reality that never was (Couch, 2000). The degree of attention given to an event by the media is not necessarily related to the severity of the hazard (Seydlitz et al, 1991). Exaggerated media coverage can also contribute to the inundation of inquiries by anxious loved ones (Auf der Heide, 1989).

Another observation from overseas concerns the behaviour of reporters. They have been described as descending on disaster officials like 'wolf packs' and demanding specific information that is seldom available in the early phases of mass emergencies. If information is requested and if officials cannot provide it then it is often gathered from unofficial sources that can magnify the possibility of error (Auf der Heide, 1989). The news gathered from other sources may well be different, inaccurate, or even contradictory from official recommendations (Waxman, 1973). But the inaccuracy of the news reports cannot be attributed to the media alone. There are questions about the extent to which the media introduce distortion and to what extent they merely disseminate inaccurate information passed to them by official sources (Auf der Heide, 1989).

Many emergency planners and disaster researchers also consider the media to perpetuate many of the more tenacious disaster myths including the helplessness of disaster victims, and the prevalence of looting and panic behaviours (Auf der Heide, 1989; Couch, 2000; Goltz,

1984; Hiroi et al, 1985; Wilkins, 1986). Although research suggests that the reporting of social breakdown imagery does not dominate the news reports of disasters, it is more likely to appear in the coverage of foreign disaster events than in national coverage. It is suggested that these images of foreign disaster chaos are simply generalised by the public to occur in all natural catastrophes (Goltz, 1984). The media can also be seen to be merely catering to a market and confirm what people already perceive and are willing to believe (Farley, 1993).

Despite these difficulties encountered with the media overseas, the absence of the media in disasters can also create enormous difficulties. The mass media, television and radio in particular, are the most important source from which the public obtains information on disasters (Auf der Heide, 1989; Drabek, 2001; Goltz, 1984; Hiroi et al, 1985; Seydlitz et al, 1994; Wilkins, 1986). This work has significant implications for future responsiveness to warnings because it can undermine the belief that personal action can be effective.

The media also play a number of important roles that help to lessen the effects of disaster including the dissemination of disaster warnings and acting as a source of confirmation for hazard information. They can help educate the public about appropriate protective behaviours and mitigation strategies, as well as notify citizens about where to get further information, and publicise about lists of survivors and casualties (Auf der Heide, 1989; Wilkins, 1986). In Japan, the broadcast media are considered to be an emergency organisation in and of themselves because of the functions they have in the transmission of warnings and protective advice (Hiroi et al, 1985). The media can be very important in signalling a disaster, but the information that needs to be transmitted is that which can be acted upon by the receiver, or "mobilising information" (Patterson & Wilkins, 1988).

Media function is best carried out when the participants have an adequate disaster knowledge base (Auf der Heide, 1989; Dearing & Kazmierczak, 1993; Hiroi et al, 1985). This can help to reduce inaccurate news reporting, and newscasters should be encouraged not

to withhold news information, warnings and instructions from the public for fear of causing panic (Auf der Heide, 1989; Wilkins, 1986). The media should be made aware that a disaster warning is less likely to be taken seriously if it is followed by a resumption of normal programming. They should also be informed of the importance of announcing the areas not hit by the disaster and the effect this information will have on reducing the number of calls by persons who believe they have loved ones in the impact zone (Auf der Heide, 1989).

Finally, the types of information required by the media can be predicted and thereby planned and anticipated for. Information requests often include the following areas: casualty information, property damage, response and relief activities, other characteristics of the crisis, and causes of the disaster (Auf der Heide, 1989).

The different types of media also require different types of information. The local media have long-range and close-to-home concerns and will generally cover all phases of the disaster from the warning phase through to the impact and response, and on into recovery and rehabilitation. They are more likely to attempt to provide specific information to residents in the areas concerned regarding aspects of the crisis like warning information, evacuation advice, availability of helpful information and how long the areas utilities are likely to be out of action. In contrast, the national media will be more concerned with the overall picture. They are more likely to focus on aspects such as the scope of the impact, the numbers of dead and injured, and the activities of the response and relief agencies rather than concerns of a long-term recovery nature. The international press may take an altogether different approach (Goltz, 1984; Wilkins, 1986). For example, during a flood in Florence Italy, the international press were more concerned with the threat to Renaissance art treasures than on the extent of local human suffering and loss (Auf der Heide, 1989).

To some extent, rumours will still occur, the public will still get information from friends, family members and other sources, and the credibility of government officials and response

agencies will not be guaranteed (Auf der Heide, 1989). This will in many cases occur because the media and their personnel will also be affected by the disaster impact. There will be difficulties in the media organisations being able to mobilise their resources resulting in reporting being allocated to much wider ranges of area than normal. This in itself can produce conflicts in deciding where to send their reporting staff and equipment (Hiroi et al, 1985). The widely acknowledged malfunctioning of communication channels after a hazard impact will likewise affect the functioning of the media. This arises both due to damage to facilities from the disaster impact and also because of the input overload as people try to contact the authorities as well as friends and family (Hiroi et al, 1985).

Uncertainty in the reliability of their sources of information can also arise as unconfirmed, conflicting and fragmentary reports come in from numerable sources, and not just the official authorities (Hiroi et al, 1985). Thus, the normal "gatekeeping" functions of editing and source confirmation is often put aside due to the demands of the unusual disaster situation (Hiroi et al, 1985; Waxman, 1973). Receiving precise information and accurate figures on deaths, injuries, damage, and cause in the early aftermath of a disaster can be an unrealistic expectation (Auf der Heide, 1989).

A number of the problems disaster managers face in dealing with the media in fact results from a failure to fully understand the media. One of the best ways to educate the media about disasters is to have them involved in the disaster planning process. Adequate disaster preparedness requires planning *with* rather than *for* the media (Auf der Heide, 1989). The development of a reasonable and effective working relationship between the emergency manager and the media needs to be a high priority. Such a relationship will facilitate the passage of critical information to the public at large, as well as avoid many of the complications mentioned above, and serve to preserve the credibility of the official protective recommendations and the emergency response agencies (Auf der Heide, 1989).

One of the most important sources of news for the media organisations are the official government agencies and most news about disasters are reported from the perspective of these agencies. This is known as the 'command-post' perspective (Auf der Heide, 1989; Hiroi et al, 1985; Seydlitz et al, 1994). Along with the tendency for reporters to share information, this can facilitate response agency efforts to develop a centralised source for public information (Auf der Heide, 1989). Having a central source from which the media can receive official information about the disaster can help assure that what the public receives is timely, consistent and accurate (Auf der Heide, 1989).

Several characteristics of the media make them receptive to a central source of public information:

- a) the media tend to share information anyway,
- b) the media often prefer to attribute the news to official sources,
- c) due to news deadlines, the media will often congregate where it is easiest to get the greatest amount of news quickly, and
- d) the media will be receptive to press conferences in a central location where 'packaged' news releases are handed out (Auf der Heide, 1989; Hiroi et al, 1985).

One effective strategy for handling media relations is to delegate the responsibility to the local media itself. The local media have a vested interest in cultivating and maintaining good contacts with the local officials. In addition, local reporters have more sensitivity about the needs of the community in which they too live and work (Auf der Heide, 1989). They can serve as a liaison between the emergency operations centre and the outside media. By utilising people who are in contact with the disaster coordinators from the planning stage up, and who are educated about disaster public information will help to avoid the dissemination of disaster myths, can assist the media to understand and sympathise with the difficulties faced by disaster relief and response agencies, and will help the media to be aware of the

types of information that best assist the disaster response efforts (Auf der Heide, 1989; Hiroi et al, 1985). Good media coverage can also be a factor that facilitates future confidence in the incident management system (Lindell, 2000).



## **References**

- Anderson, W. A. (1969) Disaster warning and communication processes in two communities. *The Journal of Communication*, 19, pp92-104.
- Atwood, E. L. & Major, A. M. (2000) Optimism, pessimism, and communication behavior in response to an earthquake prediction. *Public Understanding of Science*, 9, 417-431.
- Auf der Heide, E. (1989) *Disaster response: Principles of Preparation and Coordination*. St. Louis. C.V. Mosby Co.
- Baker, E. J. (1991) Hurricane evacuation behavior. *International Journal of Mass Emergencies and Disasters*, 9:2, 287-310.
- Bahk, C. M. and Neuwirth, K. (2000) Impact of movie depictions of volcanic disaster on risk perception and judgments. *International Journal of Mass Emergencies and Disasters*, 18:1, 63-84.
- Bishop, B., Paton, D., Syme, G., & Nancarrow, B (2000) Coping with environmental degradation: Salination as a community stressor. *Network*, 12, 1-15.
- Blanchard-Boehm, D. (1997) *Risk communication in Southern California: Ethnic and gender response to 1995 revised, upgraded earthquake probabilities*. (Quick Response Report # 94). Boulder, CO: University of Colorado, Natural Hazards Research and Applications Center.
- Bright, A.D. & Manfredi, M.J. (1995) The quality of attitudinal information regarding natural resource issues: The role of attitude strength, importance and information. *Society and Natural Resources*, 8, 399-414.
- Bright, A.D. & Manfredi, M.J. (1997) The influence of balanced information on attitudes toward natural resource issues. *Society and Natural Resources*, 10, 469-483.

- Bright, A.D., Manfredi, M.J., Fishbein, M., & Bath, A (1993) Application of the theory of reasoned action to the National Parks Service's controlled burn policy. *Journal of Leisure Research*, 25, 263.
- Cornwell, B., Harmon, W., Mason, M., Merz, B. And Lampe, M. (2001) Panic or situational constraints? The case of the M/V Estonia. *International Journal of Mass Emergencies and Disasters*, 19:1. 5-25.
- Couch, S. R. (2000) The cultural scene of disaster: Conceptualizing the field of disasters and popular culture. *International Journal of Mass Emergencies and Disaster*, 18:1, 21-37.
- Crozier, M., McClure, J., Vercoe, J., & Wilson, M. (in press). The effects of land zoning information on judgments about earthquake damage. *Area*.
- Dearing, J. W. and Kazmierczak, J. (1993) Making iconoclasts credible: The Iben Browning earthquake prediction. *International Journal of Mass Emergencies and Disasters*, 11:3, 391-403.
- De Lange, W. P. and Healy, T. R. (1986) New Zealand tsunamis 1840 - 1982. *New Zealand Journal of Geology and Geophysics*, 29, 115-134.
- Dow, K. and Cutter, S. L. (1997) *Repeat response to hurricane evacuation orders*. (Quick Response Report #101). Boulder, CO: University of Colorado, Natural Hazards Research and Applications Information Center.
- Drabek, T. E. (1983) Shall we leave? A study on family reactions when disaster strikes. *Emergency Management Review*, 1:1, 25-29.
- Drabek, T. E. (2001) Disaster warning and evacuation responses by private business employees. *Disasters*, 25:1, 76-94.
- Driscoll, P. and Salwen, M. B. (1996) Riding out the storm: Public evaluations of news coverage of Hurricane Andrew. *International Journal of Mass Emergencies and Disasters*, 14:3, 293-303.

- Earle, T. C. (2004). Thinking aloud about trust: A protocol analysis of trust in risk management. *Risk Analysis*, 24, 169-183.
- Ellis, S., Kanowski, P., Whelan, R. (2004). *National inquiry on bushfire mitigation and management*. Commonwealth of Australia: Canberra.
- Farley, J. E. (1993) Public, media, and institutional responses to the Iben Browning earthquake prediction. *International Journal of Mass Emergencies and Disasters*, 11:3, 271-277.
- Fitzpatrick, C. and Mileti, D. S. (1991) Motivating public evacuations. *International Journal of Mass Emergencies and Disasters*, 9:2, 13 -152.
- Fogarty, L. G., Jackson, A. F., and Lindsay, W. T. (1996) Fire behaviour, suppression and lessons from the Berwick Forest Fire of 26 February 1995. New Zealand Forest Research Institute, Rotorua, in association with the National Rural Fire Authority, Wellington. *FRI Bulletin No. 197, Forest and Rural Fire Scientific and Technical Series, Report No. 3*.
- Fothergill, A. (1996) Gender, risk, and disaster. *International Journal of Mass Emergencies and Disasters*, 14:1, 33 -56.
- Fried, J.S., Winter, G.J. & Gilles, J.K. (1999) Assessing the benefits of reducing fire risk in the wildland urban interface: A contingent valuation approach. *International Journal of Wildland Fire*, 9, 9-20.
- Gallen, R.G., Beca, G. S., McCraw, J. D., and Roberts, T. A. (1980) *Report of the Commission of Inquiry into the Abbotsford Landslip Disaster*. Government Printer, Wellington, NZ.
- Goltz, J. D. (1984) Are the news media responsible for the disaster myths? A content analysis of emergency response imagery. *International Journal of Mass Emergencies and Disasters*, 2:3, 345-368.

- Green, C. H., Tunstall, S. M., and Fordham, M. H. (1991) The risks from flooding: Which risks and whose perception? *Disasters*, 15:3. 227-236.
- Gregg, C., Houghton, B., Paton, D., Swanson, D.A., & Johnston, D. (2004) Community preparedness for lava flows from Mauna Loa and Hualālai volcanoes, Kona, Hawai'i. *Bulletin of Volcanology*, 66, 531–540
- Heath, S. E., Voeks, S. K. and Glickman, L. T. (2000) A study of pet rescue in two disasters. *International Journal of Mass Emergencies and Disasters*, 18:3, 361-381.
- Hiroi, O., Mikami, S., and Miyata, K. (1985) A study of mass media reporting in emergencies. *International Journal of Mass Emergencies and Disasters*, 3:1, 21-49.
- Hood, C. & Jones, D.K.C. (1996), *Accident and Design: Contemporary debates in risk management*. London: UCL Press.
- Hughes, P.W. & White, P.B. (2006) The Media, Bushfires and Community Resilience. In D.Paton & D. Johnston (Eds), *Disaster Resilience: An integrated approach*, Springfield, Ill.: Charles C. Thomas.
- Johnston, D., Paton, D, Crawford, G., Ronan, K., Houghton, B. & Bürgelt, P.T. (2005) Measuring tsunami preparedness in coastal Washington, United States. *Natural Hazards*, 35, 173-184.
- Kirschenbaum, A. (1992) Warning and evacuation during a mass disaster: A multivariate decision making model. *International Journal of Mass Emergencies and Disasters*, 10:1, 91-114.
- Kneeshaw, K., Vaske, J.J., Bright, A., & Absher, J.D. (2004) Situational influences of acceptable wildland fire management actions. *Society and Natural Resources*, 17, 477-489.
- Kumagai, Y., Bliss, J.C., Daniels, S.E., & Carroll, M.S. (2004) Research on causal attribution of bushfire: An exploratory multiple-methods approach. *Society and Natural Resources*, 17, 113-127.

- Lasker, R.D. (2004) *Redefining Readiness: Terrorism Planning Through the Eyes of the Public*. New York, NY: The New York Academy of Medicine.
- Legates, D. R. and Biddle, M. D. (1998) *Warning response and risk behavior in the Oak Grove-Birmingham, Alabama, tornado of 08 April 1998*. (Quick Response Report #116). Boulder, CO: University of Colorado, Natural Hazards Research and Applications Information Center.
- Leik, R. K., Carter, T. M., Clark, J. P., Kendall, S. D., Gifford, G. A. and Ekker, K. (1981) *Community Response to Natural Hazard Warnings: Summary Final Report*. Minneapolis, Minn.: University of Minnesota.
- Lindell, M. K. (2000) An overview of protective action decision-making for a nuclear power plant emergency. *Journal of Hazardous Materials*, 75, 113-129.
- Lindell, M. K. and Perry, R. W. (1987) Warning mechanisms in emergency response systems. *International Journal of Mass Emergencies and Disasters*, 5:2, 137-153.
- Lion, R., Meertens, R.M., & Bot, I. (2002), Priorities in information desire about unknown risks, *Risk Analysis*, 22, 765-776.
- McGee, T.K. & Russell, S. (2003) "Its just a natural way of life..." an investigation of wildfire preparedness in rural Australia. *Environmental Hazards*, 5, 1-12.
- Mileti, D. S. (1995) Factors related to flood warning response. *U.S.-Italy Research Workshop on the Hydrometeorology, Impacts and Management of Extreme Floods, Perugia, Italy*, November, 1995.
- Mileti, D. S. and Peek, L. (2000) The social psychology of public response to warnings of a nuclear power plant accident. *Journal of Hazardous Materials*, 75, 181-194.
- Mileti, D. S. and Sorensen, J. S. (1990) *Communication of Emergency Public Warnings: A Social Science Perspective and State-of-the-Art Assessment*. U.S. Department of Energy, Oak Ridge, Tenn.

- Mitchell, J. T., Thomas, D. S. K., Hill, A. A. and Cutter, S. L. (2000) Catastrophe in reel life versus real life: Perpetuating disaster myth through Hollywood films. *International Journal of Mass Emergencies and Disasters*, 18:3, 383-402.
- Moeller, S. D. (1999) *Compassion Fatigue: How The Media Sell Disease, Famine, War and Death*. Routledge, New York.
- Mohiuddin, H. M. (1998) Gender relations in Bangladesh coastal disaster preparedness: An integrated approach towards application of indigenous techniques in institutional preparedness measures. *AIT-GASAT Asia Conference, August 1998*.
- Nimmo, D. (1984) TV network news coverage of Three Mile Island: Reporting disasters as technological fables. *International Journal of Mass Emergencies and Disasters*, 2:1, 115-145.
- Paton, D. (2000) Emergency Planning: Integrating community development, community resilience and hazard mitigation. *Journal of the American Society of Professional Emergency Managers*, 7, 109-118.
- Paton, D. (2006), Disaster Resilience: Integrating individual, community, institutional and environmental perspectives, In D. Paton & D. Johnston (Eds), *Disaster Resilience: An integrated approach*. Springfield, Ill.: Charles C. Thomas.
- Paton, D. & Bishop B. (1996), Disasters and communities: Promoting psychosocial well-being?'. In D. Paton and N. Long (eds) *Psychological Aspects of Disaster: Impact, Coping, and Intervention*, Palmerston North: Dunmore Press.
- Paton & Burgelt (2005, October) Living with bushfire risk: Residents accounts of their bushfire preparedness behaviour. AFAC/Bushfire CRC Conference, Auckland, New Zealand.

- Paton, D., McClure, J & Bürgelt, P.T. (2006), Natural hazard resilience: The role of individual and household preparedness. In D.Paton & D. Johnston (Eds), *Disaster Resilience: An integrated approach*, Springfield, Ill.: Charles C. Thomas.
- Paton, Kelly, Bürgelt & Doherty (2006) Preparing for Bushfires: Understanding intentions. *Disaster Prevention and Management*, 15, 566-575.
- Paton, D., Millar, M., & Johnston, D. (2001) Community Resilience to Volcanic Hazard Consequences. *Natural Hazards*, 24, 157-169.
- Paton, D., Smith, L.M. & Johnston, D. (2000) Volcanic hazards: Risk Perception and Preparedness. *New Zealand Journal of Psychology*, 29, 84-88.
- Paton, D., Smith, L.M., & Johnston, D. (2005) When good intentions turn bad: Promoting natural hazard preparedness. *Australian Journal of Emergency Management*, 20, 25-30.
- Patterson, P. and Wilkins, L. (1988) Routinized reporting of technological accidents: Television coverage of the Chernobyl disaster. *International Journal of Mass Emergencies and Disasters*, 6:1, 27-46.
- Perry, R. W., Greene, M. R., and Lindell, M. K. (1980) Enhancing evacuation warning compliance: Suggestions for emergency planning. *Disasters*, 4:4, 433-449.
- Perry, R. W. and Lindell, M. K. (1991) The effects of ethnicity on evacuation decision-making. *International Journal of Mass Emergencies and Disasters*, 9:1, 47-68.
- Perry, R. W. and Lindell, M. K. (1997) Aged citizens in the warning phase of disasters: Re-examining the evidence. *International Journal of Aging and Human Development*, 44:4, 257-267.
- Perry, R. W., Lindell, M. K. and Greene, M. R. (1982) Crisis communications: Ethnic differentials in interpreting and acting on disaster warnings. *Social Behavior and Personality*, 10:1, 97-104.

- Poortinga, W. & Pidgeon, N.F. (2004), Trust, the asymmetry principle, and the role of prior beliefs, *Risk Analysis*, 24, 1475- 1486.
- Pouta, E., & Rekola, M (2001) The theory of planned behaviour in predicting willingness to pay for abatement of forest regeneration. *Society and Natural Resources*, 14, 93-106.
- Quarantelli, E. L. (1984) Perceptions and reactions to emergency warnings of sudden hazards. *Ergonomics*, 30, 511-515.
- Taylor, A. J. W. (1989) Observations from a cyclone stress/trauma assignment in the Cook Islands. *Traumatology*, 4:1, Article 3. 1-8.
- Tonkin & Taylor Ltd (1997) *Otago Region Tsunami and Storm Surge Study Final Report*. Prepared for the Otago Regional Council, June 1997.
- Sattler D. N., Kaiser, C. F. and Hittner, J. B. (2000) Disaster Preparedness: Relationships among prior experience, personal characteristics, and distress. *Journal of Applied Social Psychology*, 30:7, 1396-1420.
- Seydlitz, R., Spencer, J. W., Laska, S., and Triche, E. (1991) The effects of newspaper reports on the public's response to a natural hazard event. *International Journal of Mass Emergencies and Disasters*, 9:1, 5-29.
- Seydlitz, R., Spencer, J. W. and Lundskow, G. (1994) Media presentations of a hazard event and the public's responses: An empirical examination. *International Journal of Mass Emergencies and Disasters*, 12:3, 279-301.
- Sorensen, J. H. (1991) When shall we leave? Factors affecting the timing of evacuation departures. *International Journal of Mass Emergencies and Disasters*, 9:2, 153-165.
- Stuart, I. (1979) *Landslide! The Abbotsford Disaster*. Allied Press, Dunedin.
- Vogt, C.A., Winter, G., & Fried, J.S. (2005) Predicting homeowners' approval of fuel management at the wildland-urban interface using the theory of reasoned action. *Society and Natural Resources*, 18, 337-354.



- Waxman, J. J. (1973) Local broadcast gatekeeping during natural disasters. *Journalism Quarterly*, 50, 751-758.
- Wilkins, L. (1986) Media coverage of the Bhopal disaster: A cultural myth in the making. *International Journal of Mass Emergencies and Disasters*, 4:1, 7-33.
- Winter, G. & Fried, J.S. (2000) Homeowner perspectives on fire hazard, responsibility and management strategies and the wildland-urban interface. *Society and Natural Resources*, 13, 33-49.
- Winter, G., Vogt, C.A., & Fried, J.S. (2002) Fuel treatments at the wildland-urban interface: Common concerns in diverse regions. *Journal of Forestry*, 100, 15-21.
- Winter, G., Vogt, C.A., & McCaffrey, S. (2004) Examining social trust in fuels management strategies. *Journal of Forestry*, 102, 8-15.