Safety Science 61 (2014) 43–50

Contents lists available at SciVerse ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Warning the world of extreme events: A global perspective on risk communication for natural and technological disaster

Christopher B. Mayhorn *, Anne Collins McLaughlin

Department of Psychology, North Carolina State University, United States

ARTICLE INFO

Article history:
Available online 7 June 2012

Keywords:
Warnings
Risk communication
Disasters
Receiver characteristics

ABSTRACT

Due to a variety of factors such as population growth, globalization, and environmental change, mankind is increasingly susceptible to both natural and technological disasters. To prevent the unnecessary loss of life, human suffering, and property loss, nations around the world now recognize that warning systems are an integral part of risk communication. The current work reviews a number of theoretical frameworks that describe how the public responds to warnings. It seeks to identify the components of effective warnings and evaluative techniques that can be used to judge successful implementation of warning systems. Our goal is to describe the variables that influence disaster warnings in general before discussing terrorism as a case study in disaster warning. Lastly, implications for future research in the area of international disaster warnings are discussed.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Disasters are the consequences that occur when natural or technological hazards impact a vulnerable society. For instance, events such as floods, tornados, or other natural hazards killed over 1.2 million and affected 2.5 billion people worldwide from 1991 to 2005 (Centre for Research on the Epidemiology of Disasters, 2005). Accompanying these human costs are financial costs. Over the same period of time, conservative estimates indicate that natural disasters throughout the world have caused more than $1.3 trillion dollars in economic losses associated with damage to property and crops. These statistics are distressing and a number of scholars have communicated the realization that human susceptibility to disaster is increasing due to population growth, globalization, and climate change (Huppert and Sparks, 2006). In the past century (from 1900 to 2006), there have been 15,833 recorded disasters. Shockingly, a third of these occurred between 2000 and 2006 (Lowrey et al., 2007). To some, "a calamity with a million casualties is just a matter of time" (Huppert and Sparks, 2006, p. 1875).

Perhaps the greatest example of a natural disaster in modern history is the Aceh–Andaman earthquake associated tsunami which occurred on 26 December 2004. This one event caused an estimated 280,000 deaths in a dozen nations located near the Indian Ocean (Sieh, 2006). Another example, Hurricane Katrina, which hit the Gulf Coast of the United States in August of 2005, caused approximately 1300 deaths and damage that was estimated at $75 billion (Bourque et al., 2006). The events surrounding Hurricane Katrina are particularly poignant because they illustrate that all nations, regardless of economic strength or diplomatic status, are susceptible to disaster (McCallum and Heming, 2006).

Less well documented are the costs of technological hazards that arise from the industrialization of society. Salient examples of technological hazards include radiation, chemical, or biological hazards. Radiological hazards might occur during nuclear reactor accidents such as Chernobyl within the former Soviet Union in 1986 or Three Mile Island in the United States in 1979. Most recently, the Fukushima Daiichi nuclear reactor suffered three core meltdowns when an earthquake off of Japan's Pacific coast generated a tsunami (Noggerath et al., 2011; Perrow, 2011). Chemical hazards might be due to the release of hazardous materials during industrial facility accidents such as those that occurred in Bhopal, India in 1984 or Ohbu, Japan in 1980, killing thousands. Biological hazards might occur due to pathogens that cause infectious diseases thereby causing epidemics such as the recent hepatitis outbreak in the Darfur region in Africa (UNICEF, 2004).

While technological disasters can occur for a number of reasons such as containment failure and human error, intentional release of hazardous materials by terrorists must also be addressed due to increased frequency of these events. Consider the September 11, 2001 terrorist attacks in the United States that killed more than 3000 or the 1995 sarin nerve gas attacks by the religious cult, Aum Shinrikyo, that killed 12 and injured 3796 people in Tokyo, Japan.

Regardless of how or where a hazard originates, warning systems are one means of reducing the cost. Primarily due to the realization that there are global consequences to disasters such as the Aceh–Andaman tsunami and Hurricane Katrina, United Nations

* Corresponding author. Address: Department of Psychology, 640 Poe Hall, Campus Box 7650, Raleigh, NC 27695-7650, United States. Tel.: +1 919 513 4856; fax: +1 919 515 1716.

E-mail address: chris_mayhorn@ncsu.edu (C.B. Mayhorn).

0925-7535/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ssci.2012.04.014

General Kofi Annan called for the development of a global warning system for all hazards for all countries (United Nations, 2005a). Later on during 2005, the *Hyogo Framework for Action* (*2005–2015*) was adopted during the World Disaster Reduction Conference in Kobe, Japan (United Nations, 2005b). While the *Hyogo Framework* is notable for making the topics of risk and hazard warning one of its top priorities, it is also intimately related to the launch of the UN-sponsored International Early Warning Programme (Basher, 2006). Although the UN early warning program is promising in that it will span the globe, it is currently still in development and must be adapted to many cultures, situations, and environments. Fortunately, the concept of an integrated warning system is not a new idea and previous research can inform the UN plan.

According to Sorensen and Mileti (1987), integrated disaster warning systems have three basic components: hazard detection, emergency management, and public communication. In general, the hazard detection subsystem is responsible for monitoring the environment for potential hazards. If a hazard is detected and judged to be a threat to safety, public officials are notified and the emergency management subsystem is activated. Emergency management personnel determine whether a public warning is necessary and if so, what protective measures are appropriate. While a comprehensive review of the factors that influence all of these components is beyond the scope of this article, emphasis will be focused on the last subsystem: public communications.

A number of theoretical frameworks have been used to describe public response to warning messages (Lindell and Perry, 2004; Mileti and Peek, 2000; Wogalter et al., 1999a,b). According to the Protective Action Decision Model (PADM) proposed by Lindell and Perry (2004), behavioral responses to disaster warnings are often governed by pre-existing personal beliefs about the nature of the hazard and the source of warning information. Consistent with PADM, which utilized elements borrowed from classic persuasion models, the Communication-Human Information Processing (C-HIP) model proposed by Wogalter et al. (1999a,b) describes the product warning process. In both models, members of the public encounter a warning message that describes the nature of a hazard and suggests courses of action to avoid injury or death. Ultimately, the individual decision maker must act to either comply with or ignore the warning message.

Given the apparent commonalities of the PADM and C-HIP warning models, we use the basic communication components of both models to organize our discussion of public response to disaster warnings. In general, three types of variables interact to determine how the public will react when faced with a disaster warning: (1) attributes of the hazard; (2) warning components; and (3) receiver characteristics. Our goal is to describe the variables that influence disaster warnings in general before discussing terrorism as a case study in disaster warning. Lastly, implications for future research in the area of disaster warnings are discussed.

2. Attributes of the hazard: Distinguishing natural from technological hazards

Although the distinction between natural and technological hazards is a topic of considerable debate, one body of research suggests that technological disaster agents such as radiological and chemical hazards produce public responses that differ from those associated with natural hazards (see Tierney et al. (2001) for a review). For instance, compliance with warnings is generally higher for technological than natural disasters (Stallings, 1984). Technological disasters have also been reported to produce more long-term psychological distress, particularly in the wake of nuclear accidents such as Three Mile Island due to fear of exposure to toxins that may not cause symptoms for years (Freudenberg and Jones, 1991). Recently, Lindell and Hwang (2008) discovered distinct differences in public perception of risk and hazard mitigation responses to natural (i.e., flood and hurricane) and technological (i.e., toxic chemical release) hazards when they investigated the residents in Harris County, Texas. For instance, hearing about warnings from all informational sources including the internet was correlated with response in perceived chemical risk, yet no responses significantly correlated to these informational sources and perceived hurricane risk.

The heightened psychological trauma associated with technological disasters can be attributed to the distinctive properties of the hazards. Some have argued that natural disasters are more familiar than technological disasters because they occur more frequently. As a result, people understand the nature of natural disasters and have some idea of what to expect, though an erroneous understanding can keep individuals from complying with emergency instructions. In contrast, technological hazards such as radiation are less familiar and more abstract (Hyams et al., 2002). To illustrate this point, a recent telephone survey conducted in Canada indicated that citizens are often unable to discern the difference between biological and chemical hazards (Etchegary et al., 2008). Because warning may be particularly difficult when abstract concepts are involved (Leonard et al., 1999), the development of effective technological hazard warnings represents a formidable challenge to warning designers.

3. Warning components: Sources, channels, and content

As the type of hazard is likely to influence public behavior, the information that people encounter in the warning itself is likely to affect disaster response. Warning components that will be discussed here include warning sources, warning channels, and message content.

3.1. Warnings sources

A warning source is the entity or agency responsible for initiating hazard communication with the public. Sources can be government authorities, media figures, or peers such as friends and relatives (Lindell and Perry, 2004). When an individual first encounters a warning, he or she judges the credibility of the source. Warnings originating from credible sources are likely to promote warning compliance whereas less credible sources are likely to prompt information seeking. This process is known as warning confirmation and entails seeking information from other warning messages and different sources (Danzig et al., 1958). Because credibility varies between individuals, warnings may be more believable to a larger segment of the population if they come from a mixed panel of scientists, public officials, reputable organizations, and familiar persons (Drabek and Stephenson, 1971). In fact, people are more likely to pay attention to warnings when they perceive that the source of information is "in the same boat" that they are; thus, shared involvement between the source and the receiver is likely to enhance risk perception (Aldoory and Van Dyke, 2006).

Alternately, another side effect of exposure to less credible sources is the likelihood that people might actively disregard or ignore a warning that they do not believe. Such disbelief might also be associated with past experiences. For instance, a weather forecaster that is perceived as continually "over-hyping" the likelihood and impact of storms may result in false alarms where people expect a storm and one does not materialize thereby producing a cry wolf phenomenon (Dow and Cutter, 1998).

While source credibility is inherently tied to the concept of "trust", it is not surprising that trust is a topic of considerable

Download English Version:

https://daneshyari.com/en/article/589305

Download Persian Version:

https://daneshyari.com/article/589305

Daneshyari.com