Report on:

Review of literature on response behaviours in overseas disaster events

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This report consists of a review of literature on behavioural responses in overseas disaster events. Opus International Consultants developed as part of a wider programme of research that studies social and economic recovery following a natural disaster, including the travel and information needs of populations.

Section 1 provides an introduction and overview of this report.

Section 2 consists of an introduction to the field of research and the types of literature within it, as well as a consideration of key themes in the relevant literature, including post-event behaviour types and some myths about human behaviour. This section concludes by noting a general lack of social or social-psychological research to support or debunk these myths.

Section 3 explores issues of transport after a natural disaster, including the significance of information on response behaviours.

Section 4 discusses natural disaster recovery, resilience and planning, and how these processes impact on demands for travel and information during and after an event.

This report concludes with a comment on the key themes discussed in the body of the report.

Contents

1 Introduction

Overview

Opus Central Laboratories is undertaking a four-year Foundation for Research, Science & Technology (FRST) programme on the topic of community resilience and natural disasters. The purpose of this research is to examine how we can enhance the resilience of New Zealand urban communities. Resilience promotes a more rapid social and economic recovery following a devastating natural disaster. The research recognises the intent of the Civil Defence and Emergency Management Act to promote resilience among individuals and communities so that they can help themselves in times of disaster. This research aims to understand the likely response of New Zealanders to a natural disaster in order to develop effective planning within a more robust framework of knowledge.

Resilience accelerates social recovery, and social recovery concerns economic recovery. We need to understand this inter-relationship in a New Zealand context so as to speed the economic recovery of the wider community following disaster.

Mobility, communication and information bind our communities and underpin their resilience to disasters. We examine these factors in order to understand their roles in shaping our responses, as well as their contribution to social and economic recovery. The programme will examine these factors in the context of a devastating earthquake in an urban New Zealand setting, but the generic findings will also be applicable to other possible natural disasters with the potential to destroy or seriously disrupt the normal function of urban infrastructure.

The full research programme has four objectives:

1. To identify the relationship between resilience, social recovery and economic recovery in the context of a natural disaster in a New Zealand urban area, and in particular identify the aspects of resilience and social recovery that are most effective at facilitating economic recovery;

2. To identify the role of mobility in community resilience to natural disasters including: (1) our need for mobility in the response to a natural disaster and its aftermath; (2) the extent that these needs are likely to be met; and (3) the contribution that improvements to mobility will make to social recovery;

3. To identify the role of communication and information in community resilience, including: (1) the community's need for information; (2) sources of "authoritative" information, (3) the availability and accessibility of information; and (4) the influence that the available information, or lack of it, will have on individual and community actions, (5) the ability of the media to provide the necessary authoritative information;

4. To identify and develop the processes and tools for building both formal and informal emergency leadership within the community.

The primary purpose of this current report reviewing response behaviours in overseas disaster events is to provide a context for the wider research programme and for Objective 2 in particular, which seeks to identify the role of mobility in community resilience to natural disasters including: our need for mobility in the response to a natural disaster and its aftermath; the extent that needs are

likely to be met; and the contribution that improving mobility within the response and initial recovery period will make to social recovery.

Objectives

The objectives of this report are as follows:

- Discuss post-event behaviour types
- Examine myths about human response behaviours during and after natural disasters
- Argue a general lack of social or social-psychological research to support or debate the myths
- Examine the above in the context of transport mobility and community recovery

Report content and structure

Section 2: General approach to the research

Section 3: Transport

Section 4: Recovery

Section 5: Comment

2 General approach to the research

Introduction

The literature on disasters is extensive. As outlined by Dynes (1970, p.6-7), three different types of literature can be distinguished: (1) popular, (2) official, and (3) professional:

Popular literature contains both eyewitness accounts and reconstructed accounts of particular disasters. Since a sense of drama is inherent in disasters, many writers use such events as a vehicle to opportunity to write a dramatic recounting. A writer's personal experience of the disaster adds to the vividness of the account, but not necessarily to its accuracy. In attempting to reconstruct the event, the writer often selects the unique, the personal and the atypical and concentrates on the comedic and tragic aspects of the event. Such reports add little to cumulative knowledge since attention is given to the heroic individual and to the isolated action within the total event.

Official documents of governmental and quasi-governmental agencies represent the second type of literature. Since these are organisational reports, they may appear valuable in understanding organisational functioning. These include surveys of damage and costs of reconstruction, official inquiries into the causes of disasters, and reports of organisational activities during a particular disaster. Such reports are filled with descriptive statistics but provide little insight into the activities of the organisational activities that create the statistics. While such reports are useful for purposes of increased budgeting and future fund-raising, they seldom contribute significantly to understanding of the disaster's immediate and sustained effect on the organisation and its operations.

A third type of literature, which has emerged more recently, is **professional** and **scientific**. Universities and research groups may produce such studies. The professional scientific literature produced has definite advantages over popular and official literature. Much of it contains observations on human behaviour under crisis conditions. In addition, the investigators are usually conscious of the observational and methodological problems inherent in such situations. The professional literature can be divided into three different scales of behavioural study: mass, individual and organisational.

Key topics in response behaviour literature

Collective behaviour

Themes of social structure and social interaction are important considerations in collective behaviour (Smith & Belgrave 2003). Aguirre, Wenger & Vigo argue the importance of enduring social relationships as determinants of collective behaviour. Enduring social relationships are not only useful to differentiate collective behaviour from institutionalised behaviour but also specify the dynamics attending the occurrence of collective behaviour (Aguirre et al. 1998).

Household behaviour

On the factors that bias people's response to environmental hazards, Asgary and Willis find that cultural and cognitive variables most important in explaining responses to earthquake risks, concluding that people's positive responses can be encouraged with information and education before the event (Asgary & Willis 1997).

Individual behaviour

Individual and group reactions to natural disasters differ and depend on pre-disaster personality (Glenn 1979).

Human convergence
The impact of the convergences of messages, people, and supplies moving into the areas of treatment, relief and information centres on social organisation following a natural disaster is considerable. Beach (1976) and Fritz & Mathewson (1957) discuss major forms of convergence, the significance of resultant problems, the various types of convergers and their motivations, and the techniques which have been used to deal with the problems of convergence.

Behaviour myth 1: panic
Literature on disaster mythology notes that people caught in disaster situations, such as raging fires and sinking ships, are consumed by panic. 'Panic flight' is viewed as a natural outcome of the intense fear experienced by victims, i.e., the intense fear automatically results in irrational flight, the running in any direction without thought given to a rational escape route (Fisher 1998)(p.14). In other words, the term 'panic' conjures up images of havoc, disorganisation and chaos, and accordingly, panic behaviour is typically seen as "irrational, antisocial, impulsive, non-functional, maladaptive, and inappropriate" (Quarantelli 1954 p. 268). Yet, as Goode and Ben-Yehuda (1994) point out, recent research "has shown that, in the face of disaster, most people do not engage in the barbaric, selfish, unthinking, emotional, and often self-destructive behaviours as depicted in the media" (p. 3). Most contemporary disaster research has found that immediate 'panic' responses to threatening situations are quite uncommon. Instead, responses typically develop sequentially, over a period of time (Tong & Canter 1985). People tend to wait for information about a situation, and look to others for help in interpreting cues of potential threats cues before taking action (Feinberg & Johnson 1995; Tong & Canter 1985). Thus, clarification of ambiguous cues by threatened individuals is seen as an interactive process that precedes any reactions.

Disaster research has uncovered overwhelming evidence of affiliative behaviour and social role maintenance during disasters (Johnson et al. 1994; Sime 1983). In general, contemporary disaster researchers have largely abandoned earlier psychologically-oriented approaches to panic behaviour and have come to view panic as the result of a breakdown of social organisation (Beach 1976; Clarke 2002; Cornwell & Linders 2002; Hayes-Bautista et al. 1993; Heide 2004; Johnson et al. 1994; Keating 1982; Sime 1983; Thapa et al. 2002; Wenger 1975). In other words, a lack of cooperative behaviour is considered an integral component of panic (Quarantelli 1981). Thus, the scientific understanding of panic now centres less on covert psychological states and overt reaction to threats and more how that behaviour can be seen in the context of existing social relationships (Cornwell & Linders 2002).

Behaviour myth 2: Looting
Looting is perhaps the most popularly expected behavioural response to natural disaster. However, very few cases of looting have been documented following natural disasters, in contrast to civil disturbances (Quarantelli & Dynes 1970), but surveys continue to indicate that the public believes in the looting myth (Wenger et al. 1980). Both print and broadcast media personnel report on alleged looting incidences, on the steps being taken to prevent it, or, alternatively, on how 'unusual' it is for the community in question not to be preyed upon by looters (Fisher 1998). Beach discusses the different forms of exploitation that occur following a disaster, such as obtaining relief supplies and assistance under false pretences and how real or rumoured threats of supply shortage increases this kind of behaviour (Beach 1976).

Evacuation behaviour
Worth consideration is the influence of the popularly held myths of panic and looting on actual evacuation behaviour. Durkin (1985) investigates the immediate response of people in specific building types and the recovery of organisations occupying these different types of structures. Drabek (1992) considers issues of managerial authority in the evacuation behaviour of staff and the influence of looting fears on evacuation behaviour. Kugihara (2001) looks at the effects of aggressive behaviour and group size on collective escape in an emergency.

Theoretical explanations

Many theories have been advanced to explain such disaster-response patterns and behavioural types. Broadly speaking, three disciplines tend to dominate the generation of these theoretical explanations: psychology, sociology and economics.

Psychologists tend to consider that the main impetus of human behaviour results from people's cognitive perceptions which are formulated by human interaction, including that which is social and cultural (Dooley et al. 1992; Mileti & O'Brien 1992).

Sociologists, by contrast, emphasise that human reaction is more responsive to its cultural and socio-cultural contexts. Social institutions, such as family, religion, schools and the economic system, make it possible for people to respond and behave with some degree of predictability. That is, human behaviour develops within a social and cultural context which includes values, knowledge and beliefs that are learned, shared and taught (Palm 1990; Renn et al. 1992).

Economic theories propose that human response to disaster risks is influenced by economic resources: thus safety is a function of income and wealth. Poorer people are more vulnerable to environmental risks because they live in houses with fewer safety features, or in marginal locations in terms of environmental quality and other hazards (Mulwanda 1992).

These three theories may offer some plausible explanation of behavioural response or non-response to earthquake risk. However, in practice a combination of these theories may better explain human behaviour towards risk, especially in the natural environment (Palm & Hodgson 1993). Given that the psychological, social, cultural and economic are not discrete spheres and their influence on human behaviour are complex and varied, most of these theories have some degree of intersection. For example, there is agreement between economic and sociological positions that the differences in wealth between households results in lower socio-economic groups and underclasses being at greater risk with respect to natural and environmental hazards (Palm 1990; Vaughan 1993).

Other studies have explained response to risk in a different context. Dooley et al. emphasise the impacts of demographic variables on response to risk, by investigating the relationship between age, education, gender, length of residence, marital status, number of children, experience of a previous earthquake, owner/renter status and ethnicity on mitigatory actions (1992). They identified some statistical relationships between demographic variables and mitigatory measures, with the variables most significant in predicting greater mitigatory action including: being in marital-type relationships, having children within the household, and continued years of residence at the present address.

In addition, a large survey in the late 1970s revealed that disaster preparedness was linked indirectly but positively with age, education, prior experience of earthquake and having children in the households (Turner et al. 1986). However, some of these demographic variables can be regarded as proxy variables expressing aspects of economic, cultural and other theories of household behaviour. So far, no over-arching structure has been verified that integrates all these disparate findings.

Responses to risk

Some studies support the assumption that human response options at the time of an earthquake (staying in place, seeking protection, going to others, and so forth) varies with a person's physical situation and proximity to the earthquake's epicenter (Quarantelli 1996; Goltz et al. 1992). A person's selection of a response may also be influenced by others who are present at the time (Dynes 1993).

Few studies acknowledge the importance of describing human behaviour during and immediately after disasters. Few systematically describe this behaviour; nor has this behaviour been thoroughly examined within the social and physical context in which it occurs (Goltz et al. 1992; Quarantelli 1996). Earthquake related behaviour seems to dominate the area of these few studies.

In studying disaster-related human behaviour, the US National Research Centre found that almost all pre-event, event, and post-event activities were centred on helping people rather than preserving property (Quarantelli 1988). How adults reacted was particularly influenced by whether they were alone or with other adults or children at the time of the disaster event. The presence of other people was a major factor in adaptive, protective responses of individuals. Males tended to assume active leadership roles when they were the only males present, and females tended to assume leadership roles in the presence of children. Male household heads with dependant children, in particular, tended to display well-suited and sheltering behaviour toward self and others. Overall, response behaviour was characterised as controlled and adaptive. Frenzied escape, hysteria, and emotional paralysis were extremely rare, if not entirely absent (Quarantelli 1988).

Similar conclusions were reached by Goltz and others (1992). Taking cover in a doorway, hall or under furniture during the earthquake was the modal response for those either at home (43 percent) or at work (40 percent), and pulling to the side of the road and stopping was the modal response for those who were driving (46) percent. Of those at home or at work, 20 percent reported remaining in place, whereas 18 percent of those at work and only 9 percent of those at home recalled going outside. Nearly half of those who went outside reported exiting by running. For those at home, protective behaviour increased with fear and for those in the presence of children, but not for those in the presence of other adults. Women sought protection more frequently than men. For those at work, taking cover was associated with higher expressed fear, and also being white and female, and being with others. Neither gender nor the presence of others were factors related to response while driving, and there were too few driving respondents to assess relationships with other salient demographic factors.

A brief overview of relevant literature reveals certain assumptions. Human response at the time of an earthquake (staying in place, seeking protection, going to others, and so forth) varies with the person's proximity to the earthquake's epicentre, and depends on the presence of others may also influence selection of a response (Goltz et al. 1992; Quarantelli 1988).

Specific behaviours

People respond to hazards and risk in different ways. Some people respond by undertaking mitigatory measures, while others ignore the risks. Although recent studies have addressed human behaviour towards natural hazards in developed countries, human response to environmental risk in less-developed countries is still largely unknown, and the regulation of environmental risk to ensure efficient and equitable outcomes merits further research (Alexander 1993). Results of existing studies reveal that despite knowledge, high levels of concerns and perceptions about hazards and vulnerability, people's response to environmental hazards may be biased or sub-optimal. A person may be aware of a hazards and know about mitigation measures, but still be constrained from appropriate action because of behavioural weakness and indecision, lack of money, community or social values, legal or bureaucratic impediments or a host of other factors (Palm & Hodgson 1993).

Perceptions are important factors influencing human reactions and response to hazards (Asgary & Willis 1997). In the United States, for example, the geographic pattern of insurance subscription is unrelated to relative geographic risk: households in areas subject to high degrees of ground shaking were no more likely to purchase insurance than those in less risky areas (Palm 1995). The strongest and most consistent predictor of earthquake insurance was perceived vulnerability: those who perceived that their homes were likely to experience earthquake damage were more likely to purchase earthquake insurance.

Specific Behaviours

Burton *et al.* (1978) suggest that in the context of natural hazards there are four patterns of response to risk:

- Denying behaviour
- Acceptance of loss behaviour
- Practical behaviour; and
- Extreme behaviour

Denying Behaviour is the pattern associated with individuals who try to deny the risks. Such people convince themselves that the particular risk does not include them, or will only affect others. Accordingly, they do not perceive the necessity of mitigatory measures. Denying behavioural adaptations to environmental risk may occur because of a feeling of fate, luck, chance, acts of God or denial of the existence of the hazard altogether. Where denying behaviour exists, a negative behavioural response to environmental risk will probably be displayed rather than positive mitigatory actions (Alexander 1993).

A second pattern of response is *Acceptance of Loss* behaviour, which includes individuals who are aware of a hazard and its related risks, but are behaviourally weak, in the sense that they resign to accepting the risk, have a fatalistic attitude to it or are uncommitted to actions to reduce risks. Such individuals tolerate the prospective loss without taking mitigatory measures. Their response is passive, although they may occasionally seek help. In the case of large natural hazard risks, this type of behavioural response is often widespread, mostly because individuals feel the event is random and beyond their control. In contrast, where respondents perceive the event to be voluntary and controllable, behavioural coping is preferred to emotional coping. Lehman and Taylor (1978) argue that people see natural disasters as inherently uncontrollable events and hence believe they are unable to reduce the risk; although Dooley *et al*. hypothesise that high earthquake concern increases mitigatory measures when preparatory behaviour is under the respondent's control (1992). Consequently, under acceptance of loss behaviour, individuals may deal with risks by managing emotional responses, rather than by undertaking mitigatory actions.

The *Practical Behaviour* pattern of response includes those individuals who believe positive actions are possible and undertake mitigatory actions. Such people seek to mitigate through preparation. In the case of earthquake risk, their behavioural response is revealed by adopting such measures as securing property, holding regular family earthquake drills, storing necessities such as food, water and medical supplies securely, purchasing earthquake insurance (if available), choosing a stable site for the dwelling, adopting a relatively earthquake-resistant dwelling design, and making structural modifications in the home such as strengthening chimneys and removing cosmetic features which may be hazardous (Jackson 1981).

The fourth pattern of response to risk is the *Extreme Behaviour*, which includes people who undertake extreme actions to reduce risk. Some individuals purchase extra safety by specifying the construction of their dwelling to higher standards than required by building codes, even though structures conforming to the code should neither collapse nor suffer major structural damage in a severe earthquake. Other individuals exhibiting extreme risk-aversion may choose to live in places that are geologically less at risk from earthquakes.

3 Transport

Mobility and disaster research

There are two streams of research on transportation planning for disasters: the literature on modeling transportation systems in the disaster context, and the literature on quantifying transportation performance in accessibility terms (Chang 2003).[1] The Northridge and Kobe earthquakes are the most comprehensively researched.

The Kobe Earthquake, Japan 1995

Previous studies have focussed on other earthquakes of similar magnitude. For example, the Southern Hyogo Prefectural Earthquake, also know as "the Great Hanshin-Awaji Earthquake," struck the Japanese port city of Kobe. With a magnitude of 6.9, this earthquake lasted twenty seconds and resulted in 5,470 deaths and 33,000 injured (Chang 2003).

It was the first major quake to directly hit a Japanese urban area and inflicted unprecedented heavy damage in the Hanshin-Awaji region on such cities as Kobe, Awaji, Ashiya and Nishinomiya and their surrounding areas. Interruption of utility services, congested traffic conditions, and raised unemployment rate followed the earthquake (Chang 2003). Public utilities were widely affected: citywide power failure, 25% water failure, citywide telephone failure, 80% gas failure and reduced capacity of sewage facilities. Especially in areas where old wooden homes were concentrated, buildings collapsed and large-scale fires broke out.

As Sato and Spinks (1996) detail, all access to Kobe via highway and railway was blocked and all Kobe ports shut down to international shipping, and many container cargoes were diverted to other ports due to the severe damage sustained by the Port of Kobe. The gross production of Kobe decreased as well because many companies shifted their operations to facilities in other regions or decreased their production quantities here. The interruption of expressway services affected not only Kobe's own economy, but also that of the Japanese economy as a whole (Chang 2003).

The Northridge Earthquake, Los Angeles 1994

The Northridge earthquake occurred in the morning on January 17, 1994 in the city of Los Angeles, California. The earthquake was considered moderate, with a magnitude of 6.7, but was the most monetarily costly quake in United State history. Fifty-seven people were killed, and over 1,500 were seriously injured.

Damage occurred up to seventy-seven km away, with most damage in the west San Fernando Valley and the city of Santa Monica. Major freeway damage occurred up to thirty-two km from the epicentre. Nine bridges collapsed and eleven roads were closed (Gordon 1998).

Mobility, transportation news and recovery

On the coverage of transportation issues following the 1994 Northridge earthquake, Gould reports

[1] On commuting patterns immediately after the Kobe earthquake, see Sato and Spinks (1996); on comparisons with Northridge, see (Gordon et al. 1998)

that the mass media were a vital channel for travel information and they provided considerable information to the public about the safety of travel, alternative routes, and new available travel modes (1998). Using a methodology known as 'content analysis,' this study found that the broadcast media also presented considerable detail and imagery about devastation of the transportation system at large. In fact, Gould argues an alternative to the commercial mass media may be useful, since the implication from this research is that *a vital part of disaster recovery rests in the dissemination of balanced transportation news and stories* (1998).

Immediately after the Northridge earthquake, nearly eighty percent of people said they used broadcast media – television and radio – as their most important source of information at the time (Bourque 1997). Smith, who is a journalist, studied media coverage following the Loma Prieta earthquake. He observed that the frequency of video footage about transportation damages was shown disproportionately relative to other damages. Using content analysis, he described "excess" attention paid to the collapse of the 1-880 freeway and the Bay Bridge (see Smith, pages 124-127). His inference is that these transportation landmarks were chosen 'symbols' of the overall devastation. Smith suggests that transportation visuals in the news are more interesting to television producers and provide a dramatic symbol of the crisis at large. He asserts that transportation damage can become a visual image for overall damage (Smith 1992).

We do not know how the prevalence or use of these visual images influenced individual travel decisions, but communication research has found that initial images are so potent that they will be recalled even when there is conflicting information supplied at a later time (Wenger 1980). One possible outcome is that constant repetition leads people to overestimate the extent of the damages. Wenger has dubbed this outcome the 'Dresden Syndrome,' since media users come to believe that entire communities have been wiped out, rather than just discrete areas (1980).

In the context of the Northridge earthquake, suggests Gould, the media coverage may have led commuters to anticipate heavy damage throughout Los Angeles freeways (1998). This may have reduced trip-taking, and there is evidence that many travel trips were curtailed over the first few weeks (Yee et al. 1995). However, Gould continues, people may have also not been taking trips because they were busy at home with the cleanup and aftermath of the earthquake. A different outcome from the extensive coverage is that it focussed the attention of both the public and the policymakers on the need to provide massive resources for infrastructure repair. Smith claims that attention by the news media can accelerate aid from non-affected governance sectors who first learn about the magnitude of damage from television (Smith 1992). After the Northridge earthquake, it took four to six weeks for road travel to stabilise and during that time, the recovery of the transportation network stayed on the media agenda while other concerns, like emergency shelter, medical care and food, were resolved within weeks (Boarnet 1998, p.70).

Other studies infer that news coverage has impact on individual travel decisions, where footage and information helps restore public confidence and balances negative imagery. Both of these outcomes are likely since mass media coverage serves many functions including the regeneration of the community (Walters & Hornig 1993).

Studies done by Commuter Transportation Services found that one half of all commuters in Los Angeles and eighty-percent of commuters in the earthquake zone made some adjustment to their travel immediately after the event, but most changes were temporary. Adjustments were mainly to routes selected and time of departure. Post event rehabilitation, many commuters continued with the use of alternate routes on arteries paralleling the freeways that they 'discovered' following the earthquake, and one-quarter of the new commuter riders introduced to rail after the event have continued to use this service following the restoration of other transport options (Boarnet 1998).

The US Bureau of Transportation Statistics (BTS) recognised that the Northridge earthquake and its aftermath provided a laboratory to examine travel behaviour, and the reliability of the transportation system, and the impact of transportation disruptions on businesses and the regional economy.

Supported by local universities, they initiated studies of travel behaviour and economic relationships revealed by responses to earthquakes (Boarnet 1998).

Post-natural hazards, substantial economic losses are due to business interruptions that follow transportation damage. In his study of business losses, transportation damage and the Northridge earthquake, Boarnet surveyed manufacturing, retail and wholesale firms to assess the role that transportation disruptions played in business losses. Of the firms that reported any earthquake loss, forty-three percent stated that some portion of their business loss was due to transportation damage, with manufacturing firms appearing to be less affected than retail or wholesale firms (Boarnet 1998, p.56). Boarnet also notes that there is an apparent lack of any relationship between distance from the transportation damage and business losses (Boarnet 1998, p.61).

Boarnet concludes that although the Northridge earthquake was “a relatively moderate event,” transportation damage appears to be approximately as important as other sources of loss, including structural damage and other lifeline disruptions (1998).

4 Recovery

An extreme geophysical event, such an earthquake, would not constitute a 'disaster' unless it affected vulnerable human communities (Albala- Bertrand 1993).

'Disaster' and 'recovery'

Quarantelli (1970 p.328) provides useful observations on ideas of 'disaster:' Disaster is one of the many 'sponge' concepts within the English language. When it is used, it often refers to different things. Initially, we can distinguish four different meanings of the term. (1) Disaster often refers to the disaster *agent* – i.e., a hurricane, an earthquake, a fire. (2) Disaster also refers to the *physical impact* which the agent has – i.e., the resulting property damage and the loss of life. The other two meanings are more psychological and sociological. (3)Disaster can mean the *evaluation* of the physical event. In other words, evidences of the physical damage are evaluated as being disastrous. The same event, however, may be defined differently by different individuals and by different communities. (4) Finally, disaster can mean *social disruption* created by the physical event. Social organisation at many different levels – family, neighbourhood, or community – may be disrupted.

Like disaster, 'recovery' can mean several things. Indeed, "what is often called the 'recovery' process after a disaster is development. This is, the recovery process is a process in which the population improves its level of adaptation to its environment and also lowers its future vulnerabilities" (Dynes 1993, p.177).

Moreover, emergency response and recovery is not a linear process; decisions that are made during the emergency phase will affect the recovery process (Durham et al. 1993, pp. 30). For example, as Gould argues, a vital part of disaster recovery rests in the dissemination of balanced transportation news and stories, since the mass media are a "vital channel" for travel information, and in the case of the Northridge earthquake, they provided considerable information to the public about the safety of travel, alternative routes and new travel modes (Gould 1998). Media coverage of disasters during the first forty-eight hours of coverage are frequently studied by media researchers because of its critical importance (for example, Walters & Hornig 1993; for example, Wenger 1980).

Planning

In "Disaster Reduction: the importance of adequate assumptions about social organisation," Dynes argues that the success of efforts to reduce disaster by emergency planning depends on the adequacy of understanding the social dimension (Dynes 1993). This is no easy task when "the dominant worldwide planning model for emergency response is what can be called the 'military' model…predicated on the notion that disasters create 'chaos,' and such chaos can only be eliminated by establishing 'command and control.' It is based on the assumption that military organisation can deal effectively with threat, and civilian organisations cannot" (Dynes 1993, p.183).

In fact, as the above studies indicate, there seems to be considerable universality in response to disaster. Flight behaviour is rare among disaster victims and often search and rescue is carried out by survivors, neighbours, and others, not by formal groups. Emergency needs generally are met by the victims and survivors themselves, in cooperation with kin and community groups, not by governmental aid (Dynes 1993).

Some argue that disaster planning should be generic, rather than agent specific, especially in

respect to more human, social aspects of disasters. Whatever the specific agent, the same general activities are usually undertaken: warning, evacuation, sheltering, feeding, search and rescue, handling of the dead and injured, the mobilsation of resources, communication among organisations, public information, and so on (Quarantelli 1991). The importance of a generic approach, argues Quarantelli, may be less so for engineering and technical solutions to specific techniques of mitigation. However, mitigation is the *social* attempt to reduce the occurrence of a disaster, to reduce the vulnerability of certain populations, and to more equitably distribute the costs within the society (Quarantelli 1991).

Nonetheless, as Dynes again points out, planning is only as good as understandings of human behaviour, and there are common assumptions about behaviour that continually impede adequate planning efforts (Dynes 1993). For example, because it is widely assumed that people panic with a knowledge of threat, warnings are withheld so that realistic protection actions cannot be take. It is assumed that disasters make people helpless; therefore planning assumes government agencies must care for dependent people.

5 Comment

The United States Department of Transportation sponsored several studies of the 1994 Northridge earthquake. This study estimated that 39% of Northridge earthquake-related business losses were due to the disruptions in the transportation system. Overall, their survey results suggest that transportation damage played an important role in business losses following the earthquake (Bureau of Transportation Statistics 1998).

Other studies have considered the potential loss of road and highway transportation after a hypothetical earthquake (Chang 2003; Clarke 1998). A considerable amount of research has focussed on the seismic vulnerability of bridges and highways (Ballantyne et al. 2002). Professional and scientific studies on issues of travel behaviour in response to natural disasters is underdeveloped in New Zealand.

As other studies have indicated, after a natural hazard the resiliency of the transportation system, travel behaviour, and the impact of the transportation disruptions on business and the regional are context-specific. It is difficult to model with foresight and to estimate the outcome of future disasters by studying past disasters. In the New Zealand context, Clarke's study on the hypothetical economic effect of a 1998 Wellington earthquake based on an analysis of the 1931 Napier earthquake (1998). Also, on likely earthquake scenarios in the Wellington region, Prentice (2005) is informative.

Contemporary research on travel behaviour responses to natural disaster is relatively scarce. While there is extensive literature on travel behaviour, for the most part this literature deals with everyday conditions, not with atypical and extreme events. This report argues that issues of transport and demand for information are areas of importance in relation to community resilience and disaster recovery. Perhaps future research might examine more closely how individuals differ in their ability to adapt to major transportation disruptions, and how that information can be used to limit the consequences of large-scale transportation damage.

Social recovery facilitates economic recovery, and economic recovery facilitates social recovery. A significant part of social recovery is the return of individuals to work. Critical to individuals returning to work is the process of their employer company returning to business-as-usual. In the relevant literature, there is a lack of context-specific focus on the fact that the relationship between economic recovery and social recovery is an interactive one. In New Zealand, the 2002 Civil Defence and Emergency Management Act aims to build resilience first. An effect of the Act is that the onus is on businesses to ensure continuity of supply. We know from overseas studies that post natural hazards, substantial economic losses are due to business interruptions that follow transportation damage (Boarnet 1998). It is hoped that by considering travel behaviour and the impact of transportation disruptions on businesses and the regional economy, we come closer to understanding the interactive processes of social and economic recovery.

Bibliography

Aguirre, B., Wenger, D. E., & Vigo, G. (1998). A test for the emergent norm theory of collective behavior. *Sociological Forum, 13*, 301-320.

Albala- Bertrand, J. (1993). *Political Economy of Large Natural Disasters*. Oxford: Clarendon.

Alexander, D. (1993). *Natural Disasters*. London: UCL Press.

Asgary, A., & Willis, K. G. (1997). Household behavior in response to earthquake risk. *Disasters, 21* (4), 354-365.

Ballantyne, D., Peierrepiekarz, M., & Chang, S. E. (2002). *Seismic Vulnerability assessment of the Seattle-Tacoma Highway corridor using HAZUS.* Paper presented at the Third National Seismic Conference and Workshop on Bridges and Highways, Buffalo, NY.

Beach, H. D. (1976). Social Problems in Disaster. In *Management of Human Behavior in Disaster* (pp. 47-68). Ottawa: Department of National Health and Welfare.

Boarnet, M. (1998). Business Losses, Transportation Damage, and the Northridge Earthquake. *Journal of Transportation and Statistics, 1* (2), 49-64.

Bourque, L. B. (1997). *Community Response to the January 17, 1994, Northridge Earthquake, Final Report to the National Science Foundation* (No. CMS-9411982).

Burton, I., Kates, R., & White, G. (1978). *The Environment as Hazards*. New York: Oxford University Press.

Chang, S. E. (2003). Transportation planning for disasters: an accessibility approach. *Environment and Planning, 35* (6), 1051-1072.

Clarke, L. (2002). Panic: myth or reality? *Contexts*, 21-26.

Clarke, M. (1998). *The Economic Effects of a 1998 Wellington Earthquake* (No. 98/17). Wellington: NZ Institute of Economic Research (INC.).

Cornwell, B., & Linders, A. (2002). The myth of 'moral panic:' an alternative account of LSD prohibition. *Deviant Behavior, 23* (4), 307-330.

Dooley, D., Catalano, R., Mishra, S., & Serxner, S. (1992). Earthquake Preparedness: Predictions in a Community Survey. *Journal of Applied Psychology, 22* (6), 451-470.

Drabek, T. E. (1992). Variations in Disaster Evacuation Behavior - Public Responses versus Private-Sector Executive Decision-Making Processes. *Disasters, 16* (2), 104-118.

Durkin, M. (1985). Behavior of Building Occupants in Earthquakes. *Earthquake Spectra, 1* (2), 271-283.

Dynes, R. R. (1993). Disaster Reduction: The Importance of Adequate Assumptions about Social Organization. *Sociological Spectrum, 13*, 175-192.

Feinberg, W., & Johnson, N. (1995). FIRESCAP: A Computer Simulation Model of Reaction to a Fire Alarm. *Journal of Mathematical Sociology, 20* (247-269).

Fisher, H. W. (1998). *Response to Disaster-Fact Versus Fiction & Its Perpetuation-The Sociology of Disaster.* Lanham, MD: University Press of America Inc.

Fritz, C., & Mathewson, J. H. (1957). *Convergence Behavior in Disasters A Problem in Social Control* (Special report prepared for the Committee on Disaster Studies No. 9). Washington, D.C.: National Academy of Sciences.

Glenn, C. M. (1979). Natural Disasters and Human Behavior. *Psychology: A Journal of Human Behavior, 16* (2), 23-36.

Goltz, J. D., Russell, L. A., & Bourque, L. B. (1992). Initial behavioural response to a rapid onset disaster: a case study of the October 1, 1987 Whittier Narrows earthquake. *International Journal of Mass Emergencies and Disasters, 10* (1), 43-69.

Goode, E., & Ben-Yehuda, N. (1994). *Moral Panic: The Social Construction of Deviance*. Cambridge, MA: Blackwell.

Gordon, P., Richardson, H., & Davis, B. (1998). Transport-Related Impacts of the Northridge Earthquake. *Journal of Transportation and Statistics, 1* (2), 21-36.

Gould, J. (1998). An assessment of transportation issues under exceptional conditions: the case of the mass media and the Northridge earthquake. *Journal of Transportation and Statistics, 1* (2), 65-74.

Hayes-Bautista, D. E., Schink, W. O., & Hayes-Bautista, M. (1993). Latinos and the 1992 Los-Angeles Riots - A Behavioral-Sciences Perspective. *Hispanic Journal Of Behavioral Sciences, 15* (4), 427-448.

Heide, E. a. d. (2004). Common misconceptions about disasters: panic, the 'disaster syndrome' and looting. In M. O'Leary (Ed.), *The First 71 Hours: A Community Approach to Disaster Preparedness* (pp. 340-380). Lincoln, NE: iUniverse Publishing.

Jackson, E. (1981). Response to Earthquake Hazards. *Environment and Behaviour, 13* (4), 387-416.

Johnson, N., Feinberg, W., & Johnston, D. (1994). MicroStructure and Panic: The Impact of Social Bonds on Individual Action in Collective Flight from the Beverly Hills Supper Club Fire. In *Disasters, Collective Behavior, and Social Organization* (pp. 168-189). Newark, London, Cranbury, NJ: University of Delaware Press, Associated University Presses.

Keating, J. (1982). The Myth of Panic. In J. Keating (Ed.), *Hotel Fires, Behind the Headlines*. Quincy, MA: National Fire Protection Association.

Kugihara, N. (2001). Effects of aggressive behavior and group size on collective escape in an emergency: A test between a social identity model and deindividuation theory. *British Journal of Social Psychology, 40* (4), 575-598.

Lehman, D. R., & Taylor, S. E. (1978). Date with an Earthquake: Coping with a Probable, Unpredictable Disaster. *Personality and Social Psychology Bulletin, 13* (4), 546-555.

Mileti, D. S., & O'Brien, P. W. (1992). Warnings During Disaster: Normalising Communicated Risk. *Social Problems, 39* (1), 40-57.

Mulwanda, M. (1992). Active Participants or Passive Observers. *Urban Studies, 29* (1), 89-97.

Palm, R. I. (1990). *Natural Hazards: An Integrative Framework for Research and Planning*. Baltimore: John Hopkins University Press.

Palm, R. I. (1995). *Earthquake Insurance: a Longitudinal Study of California Homeowners*. Boulder, CO.: Westview Press.

Palm, R. I., & Hodgson, M. (1993). Natural Hazards in Puerto Rico. *The Geographical Review, 83* (3), 280-289.

Prentice, D. (2005). *Two earthquake damage scenarios for the Wellington region*. Wellington, New Zealand: Opus International Consultants Limited, Wellington Office.

Quarantelli, E. (1981). *Panic Behavior in Fire Situations: Finding and a Model from the English Language Literature*: University of Delaware Disaster Research Center.

Quarantelli, E., & Dynes, R. (1970). Property Norms and Looting: Their Patterns in Community Crisis. *Phylon, 31*, 168-182.

Quarantelli, E. L. (1970). Introduction Special issue on organizational and group behaviour in disaster. *American Behavioral Scientist, 13* (3), 325-330.

Quarantelli, E. L. (1988). The NORC research on the Arkansas tornado: A fountainhead study. *International Journal of Mass Emergencies and Disasters, 6* (3), 283-310.

Quarantelli, E. L. (1991). Disaster Response: Generic or Agent-Specific. In A. K. a. M. Munasinghe (Ed.), *Managing Natural Disasters and the Environment* (pp. 97-105). Washington, DC: The World Bank.

Quarantelli, E. L. (1996). Basic themes derived from survey findings on human behavior in the Mexico City earthquake. *International Sociology, 11* (4), 481-499.

Renn, O., Burns, W., Kasperson, J., & Slovic, O. (1992). The Social Amplication of Risk: Theoretical Foundations and Empirical Applications. *Journal of Social Issues, 48* (4), 137-114.

Sato, K., & Spinks, W. (1996). Commuter and Work Pattern Changes after the Great Hanshin Earthquake: Policy Implications for Greater Tokyo, *Western Regional Science Association*. Napa, CA.

Sime, J. (1983). Affiliative Behavior during Escape to Building Exits. *Journal of Environmental Psychology, 3*, 24-41.

Smith, C. (1992). A Prediction Comes True: the 1989 "World Series" Earthquake. In *Media and Apocalypse* (pp. 115-144). Westport, CT: Greenwood Press.

Smith, K. J., & Belgrave, L. L. (2003). Collective Behavior: after Hurricane Andrew. In J. Henslin (Ed.), *Down to Earth Sociology* (12 ed., pp. 513-523). New York: Free Press.

Thapa, B., Graefe, A. R., & Absher, J. D. (2002). Information Needs and Search Behaviours: A Comparative Study of Ethnic Groups in the Angeles and San Bernardino National Forests, California. *Leisure Sciences, 24* (1), 89-107.

Tong, D., & Canter, D. (1985). The Decision to Evacuate: A Study of Motivations which Contribute to Evacuation in the Event of Fire. *Fire Safety Journal, 9*, 257-265.

Turner, R., Nigg, J., & Paz, D. (1986). *Waiting for Disaster: Earthquake Watch in California*. Berkeley: University of California Press.

Vaughan, E. (1993). Individual and Cultural Differences in Adoption to Environmental Risks. *American Psychologist, 48* (6), 673-680.

Walters, L. M., & Hornig, S. (1993). Faces In the News - network television-news coverage of Hurricane Hugo and the Loma-Prieta earthquake. *Journal of Broadcasting & Electronic Media, 37* (2), 219-232.

Wenger, D., James, T., & Faupel, C. (1980). *Disaster Beliefs and Emergency Planning*. Newark, Delaware.: University of Delaware.

Wenger, D. E. (1975). It's a matter of myths: an empirical examination of individual insight into disaster response. *Mass Emergencies, 1*, 33-46.

Wenger, D. E. (1980). A few empirical observations concerning the relationship between mass media and disaster knowledge: a research report, *Disasters and Mass Media: Committee on Disasters and the Mass Media Workshop*. Washington Dc: National Academy of Sciences.

Yee, A., Leung, S., & Wesemann, L. (1995). The 1994 Northridge Earthquake: A Transportation Impact Overview. *Transportation Research* (462), 7-15.