Disasters and communities: vulnerability, resilience and preparedness

Douglas Paton and David Johnston

The authors

Douglas Paton is Associate Professor, School of Psychology, Massey University, Palmerston North, New Zealand.
David Johnston is with the Institute of Geological and Nuclear Sciences, Taupo, New Zealand.

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Abstract

With regard to their utility in predicting the adoption of household hazard preparations, traditional approaches to public education directed at increasing awareness and/or risk perception have proven ineffective. Discusses reasons why this may have occurred from public education, vulnerability analysis, and community resilience perspectives and outlines strategies for enhancing preparedness. Describes a model of resilience to hazard effects that has been tested in different communities and for different hazards (toxic waste, environmental degradation and volcanic hazards). Drawing upon the health education literature, introduces a model for promoting the adoption on preparatory behaviour. Discusses links between these models, and the need for their implementation within a community development framework.

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Introduction

Substantial funds are expended annually on risk communication programmes to promote natural hazard preparedness (e.g. storing food and water, fixing high furniture and hot water cylinders to walls, preparing a household evacuation plan). The adoption of these measures facilitates a capability for coping with the temporary disruption associated with hazard activity and with minimising damage and insurance costs. Despite these efforts, the level of preparedness within communities has fallen short of expectations (Lindell and Whitney, 2000), leaving households vulnerable to subsequent hazard effects. This paper discusses reasons why this may have occurred and outlines strategies for enhancing preparedness. It does so from public education, vulnerability analysis, and community resilience perspectives.

Public education

While considerable work has been directed to understanding how to construct effective risk messages (Nathe *et al.*, 1999), care must be taken with regard to assuming that the provision of information on hazards or risk will facilitate the adoption of preventive measures. The information-action link assumes that recipients automatically assimilate, comprehend and utilise information in forming and following action plans. This assumption is often unjustified.

For example, evaluation of a volcanic risk communication programme (Ballantyne *et al.*, 2000) revealed that providing hazard information resulted in some 28 per cent of respondents feeling less concerned about hazards. People inferred that the source of the information (local government) would take responsibility for managing both the hazard and their safety, reducing the likelihood of their both attending to risk messages and adopting recommendations. Problems of this nature can be attributed to other factors. Consistent with other instances of optimistic bias, Johnston *et al.* (1999) noted that individuals described themselves, compared with others in their community, as being better prepared to deal with volcanic hazard effects. By attributing better preparedness to self, relative to the community as a whole, individuals may accept the need for greater

preparedness, but perceive this as applying to others but not to themselves. If so, the likelihood of their attending to information or acting on warnings will be reduced.

Communication effectiveness can be influenced by beliefs regarding existing knowledge. Ballantyne et al. (2000) found that, while 41 per cent of respondents stated a belief in their ability to recite the information on what to do in the event of hazard activity contained in Yellow Pages, only 6 per cent could correctly recite it. If people over-estimate their existing knowledge, the likelihood of their attending to public information will be reduced. This observation also suggests that, while people may recognise the existence of information, this does not automatically mean that they will be able to recall and use it when required. It is important that the evaluation of message effectiveness in enhancing knowledge and preparedness should focus on assessing recall and behaviour.

Additional complications are introduced by differences in perceived vulnerability to hazard effects (Bishop et al., 2000; Millar et al., 1999). These authors found that risk perception, and support for collective mitigation initiatives, was driven less by hazard characteristics and more by their current implications for their livelihood (see Figure 1). This observation suggests that focusing communication on tangible factors (e.g. actions designed to protect economic integrity or safeguard livestock), rather than uncontrollable threats such as seismic activity or ash fall, will facilitate action. Diversity in the manner in which perceived risk is distributed throughout a community adds further complexity to the communication process and provides material upon which social amplification processes (Kasperson, 1992) can operate. This process can both reduce communication effectiveness and lessen the perceived credibility of emergency management, administrative and scientific agencies (Johnston and Paton, 1998).

Taken together, these findings, and those of others (e.g. Nathe, et al., 1999; Tonnes and Tilford, 1994), suggest that public policy approaches to hazard education may enjoy limited success in facilitating action. In the context of the above discussion, it is not surprising that the link between information provision and preparedness remains tenuous. Notwithstanding, the provision of information, and the capacity to do so effectively (Nathe et al., 1999), remain important. The above discussion highlights the importance of both developing communication strategies relative to the community context within which they will be implemented and accommodating the social psychological factors that influence whether people assimilate the information provided and can act upon its recommendations, should the need arise. One salient contextual factor concerns vulnerability.

Vulnerability

Identifying factors which influence vulnerability to loss and disruption from

Figure 1 A model of resilience to hazard effects
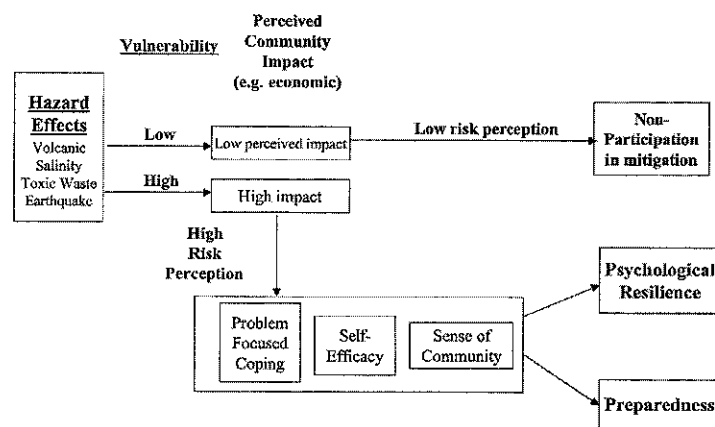
Source: Adapted from Bishop et al. (2000) and Millar et al. (1999)

hazard activity provides one mechanism for facilitating the development of risk communication and reduction strategies that target the needs of specific groups. Vulnerable groups have typically been defined with respect to demographic (e.g. age, ethnic minority status, poor education (Lindell and Whitney, 2000; Kaniasty and Norris, 1995)) and environmental (e.g. economic resource limitations, marginalised political status, and limited social network access (Bravo *et al.*, 1990; Omar and Alon, 1994; Schwarzer *et al.*, 1994) characteristics. While tackling vulnerability represents a worthwhile and important mitigation strategy within a social policy agenda, care should be exercised in its use.

If the above factors always acted to increase vulnerability, this would represent a viable strategy. However, this need not always be the case. For example, Millar *et al* (1999) found that older adults were less vulnerable than their younger counterparts. Similarly, Sagert (1989) and Schwarzer *et al.* (1994) found an association between ethnic minority status, age and poor educational status and empowerment that reduced vulnerability. While this issue requires additional attention, these studies indicate a need to consider the possibility that the same factor (e.g. age, ethnicity) can act to increase or decrease vulnerability depending on its contingent relationship with environmental and hazard characteristics.

In urban contexts, the task of developing effective communication strategies (i.e. those consistent with recipients' beliefs and designed to meet their needs and stimulate appropriate action) is rendered more complex by the diversity and distribution of vulnerable groups throughout a city (Paton *et al.*, 1999). As a consequence, the most cost-effective approach, the production and dissemination of general messages, is rendered less effective, because it assumes a level of community homogeneity (e.g. with regard to demographics, beliefs, resources etc.) that is unrealistic (Ballantyne *et al.*, 2000; Paton *et al.*, 1999). Developing effective messages, in this context, would require identifying individual and community vulnerability factors, defining relationships between them and hazard effects and then adapting information for each group. This would involve the complex task of translating it and presenting it in a manner that accommodates

the preconceptions of each group, rectifies any erroneous elements therein and in its final form, is consistent with the beliefs, needs and goals of each group. The research, practical and resource implications of this approach render it untenable.

To facilitate preparedness, an alternative approach is required. Researchers, planners and emergency managers must acknowledge heterogeneity in community characteristics and perceptual processes and develop models that accommodate contingent relationships between hazard effects and community, cultural, geographical and temporal factors within resilience models (Paton *et al.*, 1999).

Resilience

Although all hazard events are unique, and may differ dramatically from one another on several dimensions, the community response may possess sufficient similarity for this process to be modelled (Lindell and Whitney, 2000; Paton and Bishop, 1996; Tobin, 1999; Van den Eyde and Veno, 1999). An important issue here concerns the paradigm which underpins the conceptualisation of the problems to be understood and the strategies implemented to contain or resolve them. The orientation of work in this area has progressively moved from a deficit or loss paradigm, to one emphasising community resilience (Omar and Alon, 1994; Tobin, 1999; Van den Eyde and Veno, 1999; Violanti *et al.*, 2000). This alternative paradigm has been described using terms such as salutogenic/resilience (Antonovsky, 1993; Dunning, 1999; Tobin, 1999), competency (Cottrell, 1976), or strengths (Bravo *et al.*, 1990).

A common denominator between these conceptualisations of the response to adversity is an acceptance of communities as being capable of drawing upon internal resources and competencies to manage the demands, challenges and changes encountered. Further, several of these conceptualisations acknowledge the possibility that exposure to disaster and adversity can result in personal, community and professional growth and development (Bravo *et al.*, 1990; Holman and Silver, 1998; Kreps, 1984; Schwarzer *et al.*, 1994). While this shift, and the growing empirical evidence for positive outcomes, should not be used to

infer the elimination of community loss and disruption from disaster (Kaniasty and Norris, 1999), it is important to examine factors that promote resilience and growth and, as far as possible, seek to intervene in ways that facilitate resilience and growth rather than dependence and loss.

Community resilience can be described at several, interdependent levels. For example, the ability of a community to "bounce back" and recover using its own resources requires that attention be directed to safeguarding the physical integrity of the built environment and lifelines (e.g. building codes, retrofitting buildings), and ensuring economic, business and administrative continuity (including emergency management and social institutions). It also involves ensuring that community members have the resources, capacities and capabilities necessary to utilise these physical and economic resources in a manner that minimises disruption and facilitates growth.

With respect to the latter, promoting resilience (the ability to recoil effectively from adversity and enhancing the likelihood of exposure to adversity leading to growth) involves strategies that utilise both personal and environmental resources. Realising the benefits that can accrue for their use requires, first, a framework for modelling the factors that influence resilience.

Tobin (1999) described a composite model of resilience, one element of which concerned the psychological precursors of resilience. From a social and psychological perspective, resilience is a function of the operation of personal characteristics, the ability to impose a sense of coherence and meaning on atypical and adverse experiences, and the existence of community practices (e.g. supportive social networks) which mitigate adverse consequences and maximise potential for recovery and growth (Violanti et al., 2000). Testing the utility of this framework requires the identification of variables capable of predicting community resilience to hazard effects. Variables that fall into this category are "sense of community", "coping style", "self-efficacy" and "social support" (Figure 1).

Self-efficacy describes individuals' appraisal of what they are capable of performing, and influences people's receptivity to information and the likelihood of their acting to deal with hazard consequences (Bachrach and Zautra,

1985; Bishop et al., 2000; Bandura, 1997; Lyons, 1991; Yates et al., 1999). Sense of community (feelings of belonging and attachment for people and places) encourages involvement in community response following disaster and increases access to, and utilisation of, social networks. Individuals who perceive themselves as having no investment in their community may develop a level of detachment which, following a natural disaster, may trigger feelings of isolation, encourage learned helplessness, and heighten vulnerability (Bachrach and Zautra, 1985; Bishop et al., 2000). Sense of community also provides insight into the degree of community fragmentation and, consequently, the level of support likely to exist for collective intervention or mitigation strategies. Coping style influences how people respond to hazard effects. Problem-focused coping (confronting the stressor or problem) represents a mechanism for facilitating resilience. Emotion-focused (suppressing or denying emotional reactions without attempting to tackle the problem) coping strategies, on the other hand, tend to increase vulnerability (Bachrach and Zautra, 1985; Millar et al., 1999; Yates et al., 1999).

Resilience and natural hazard reduction

The utility of a model is a function of its ability to account for differences in resilience, when assessed against a range of hazards and communities. With respect to their predictive utility, these variables have demonstrated their ability to predict resilience in community members exposed to three distinct hazards; toxic waste, salinity and volcanic hazard effects (Bachrach and Zautra, 1985; Bishop et al., 2000; Millar et al., 1999). By verifying the utility of these components against several hazards the predictive capability of the model is enhanced and its utility within an all-hazards management approach is strengthened. Further, the predictive capability of these variables, and their amenability to measurement, allow this model to be used to assess community resilience, monitor change, and provide a basis for evaluating the effectiveness of readiness strategies, irrespective of the hazardscape prevailing within a specific community.

Resilience and preparedness

In addition to playing a role in promoting an ability to resist and recover from natural hazard effects, these variables may influence hazard adjustment adoption. Bennett and Murphy (1997) described a model linking risk perception and risk reducing behaviour. While perception of a threat remains a pertinent precursor, the key factors are action-outcome expectancies (consideration of whether risk may be reduced) and self-efficacy (whether the required actions are within the capabilities of the individual) judgements. Because people make assumptions about the possible consequences of action before considering engaging in that behaviour, action-outcome expectancies precede efficacy judgements (Figure 2). The number and quality of action plans are strongly dependent on one's perceived competence and experience. Self-efficacy also determines the amount of effort and perseverance invested in risk reduction behaviours. Finally, this behaviour is more likely to be sustained if supported by the social and structural environment (Tobin, 1999). This suggests that the effectiveness of this model will be enhanced by integrating it with the community development process.

Resilience and community development

Studies of response to hazard effects by Bishop et al. (2000) and Millar et al. (1999) revealed not only that the above factors enhanced resilience, but also that their presence was correlated with the level of

Figure 2 A model of the risk perception-risk reduction behaviour process

Source: Adapted from Bennett and Murphy (1997)

involvement in community activities and functions (e.g. membership of clubs, social action groups). From this observation can be inferred the possibility that community risk can be reduced, even if community members are not engaged in risk reduction activities per se. The more people who are involved in community activities that engender a sense of community, efficacy and problem solving, the greater will be their resilience to adversity. While additional exploration of this issue is required, this observation opens up the possibility of hazard mitigation strategies being linked to community development and the supplementing of community development activities with specific hazard education and reduction initiatives.

Kieffer (1984) and Paton and Bishop (1996) described community empowerment strategies based on community participation, enhancing perceived control, facilitating community identification of problems, and developing strategies to solve or contain problems in ways consistent with the needs, systems and values of a specific community. To sustain empowerment, a consensus approach to decision making is recommended. Participation in identifying shared problems and developing and implementing solutions to them facilitates the development of problem-focused coping, a sense of community, and commitment to action. A focus on actively dealing with salient issues helps foster individual and collective efficacy. Hence, the key elements in this community empowerment model can be summarised in terms of the efficacy, coping, sense of community and support constructs outlined above.

Once a basis for empowerment is established, the next stage involves the identification of a community change agent, the involvement of community members to provide mutual support (contributing to the development of sense of community and social support), and opportunities to lobby social/political agencies (contributing to the development of efficacy and problem-focused coping). Collective efficacy may also be a good indicator of the level of co-operation and assistance available within a community and this, in turn, may constitute a measure of the likelihood of the success of mitigation strategies that require collective and co-ordinated action being adopted and implemented.
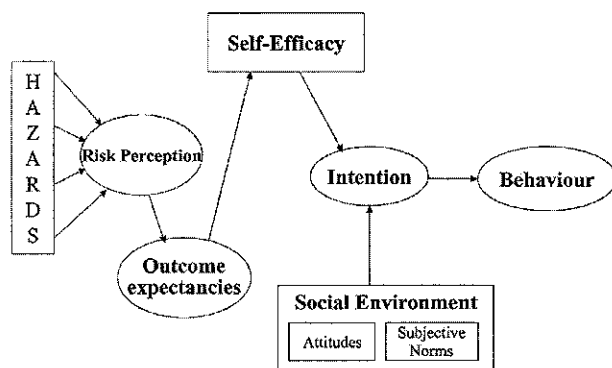
In relation to hazards education, this process can be supplemented by providing communities with hazard scenarios that describe the potential challenges, opportunities and threats faced by a community from hazard activity, and the development of strategies to capitalise on them, or to manage or contain them. The rarity of hazard phenomena suggests that the process should focus on integrating hazard education with community development and problem solving to deal with existing or contemporary problems, with a focus on opportunities for growth. These scenarios can be used to elicit their hazard perceptions, and the information and resource requirements necessary for their formulation and adoption of mitigation strategies, consistent with their beliefs, needs and goals, to capitalise on, contain or minimise demands. This approach makes it easier to accommodate the diversity and distribution of groups within a community by facilitating their access to appropriate information and through mobilising natural coping strategies rather than attempting to develop communication strategies to meet the needs of all possible groups. This process is also consistent with an all-hazards management framework. The emergency management role involves assimilating and co-ordinating the perspectives/needs derived from community consultation within a strategic context, and seeking, as far as possible, to provide the information and resources necessary to sustain empowerment, self-help and resilience. Emergency management agencies thus act as consultants to communities rather than directing the change process.

In addition to promoting the competence and resilience of community members, the adoption of a growth-oriented strategy may provide a context conducive to sustaining resilience over time, an important issue given the rarity of hazard activity. For example, a deficit or loss paradigm leads to strategies where community members are urged to spend money on strengthening or altering their house or building to reduce losses from earthquake hazards. From a growth perspective, the focus would be on investing in structural alterations to increase the capital value of property, increase its resale value, or reduce insurance costs. The focus is on demonstrating the personal and community benefits that accrue from engaging in certain

risk reducing activities. Similarly, this approach would advocate focusing on the value of local amenities and the environment and the development of strategies directed to maintaining perceived quality of life in relation to hazard activity.

Maintaining empowerment, and, consequently, the competencies that underpin resilience to adversity, will involve consolidating collective efficacy, coping capabilities and support into a sense of community identity and belonging. This will foster and sustain an ability to respond to adversity in a manner that minimises loss and disruption and promotes growth. This can be more readily accomplished through projects and activities that sustain community participation in problem solving. This is particularly important if community action initially revolved around a specific hazard event.

Conclusion

The effectiveness of traditional approaches to public hazard education is reduced by a failure to accommodate the community and social psychological factors that facilitate the relationship between risk perception and risk reduction behaviour. Risk management should seek to promote resilience and preparedness through a mix of strategies involving communication, managing vulnerability, and facilitating resilience and growth. Empirical studies of communities exposed to toxic waste, salinity, volcanic and earthquake hazards (Bishop et al., 2000; Lindell and Whitney, 2000; Millar et al., 1999) suggest that efficacy, problem-focused coping, and sense of community facilitate resilience to adversity.

These studies support the fact that this model of resilience has explanatory power that transcends the specific characteristics of the community or hazard per se. Consequently, it can be used to predict resilience, monitor intervention effectiveness and community change (towards greater resilience) within an all-hazards management framework. To accommodate community diversity, hazard education programmes designed from this model should be integrated with community development initiatives to increase resilience, facilitate

self-help capabilities, and reduce reliance on external response and recovery resources.

On a methodological level, the complex relationship between hazard effects and community characteristics can only be examined systematically using longitudinal methodology and research and intervention designs capable of managing complex change data (Paton and Smith, 1995). Further work is required to explore the complex relationship between risk perception and preparedness. The model discussed here represents an appropriate starting-point, but additional work is required to identify other variables (e.g. perceived responsibility, trust) capable of moderating the adoption of preparations. These variables must be identified and their role within the model examined.

Community resilience should be conceptualised and managed in a contingent rather than a prescriptive manner. Understanding the nature of these contingent relationships has implications for managing the allocation of finite resources and for designing risk reduction and communication strategies. By ensuring that these strategies are developed and delivered within a resilience/growth framework, community disruption can be minimised, the potential for recovery and growth optimised, and community development strategies can be more readily integrated with engineering, lifeline, public policy and emergency management initiatives.

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