

Chapter

LEARNING TO CO-EXIST WITH ENVIRONMENTAL HAZARDS: COMMUNITY AND SOCIETAL PERSPECTIVES AND STRATEGIES

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ABSTRACT

Interaction between human activity (e.g., population growth, social and infrastructure development) and environmental change (e.g., climate change) is resulting in societal risk from environmental hazards steadily increasing. Recognition of a more whole-of-society approach to risk management has resulted in a progressive shift from top-down mitigation and response strategies to those focusing on community-based disaster risk reduction (DRR). The latter increasingly emphasizes shared responsibility (between society and community) as a core platform for DRR. This chapter argues that realizing the benefits of this approach include changing how people and communities relate to their environment and its hazardous potential. It discusses a need for the prevailing community and societal environmental focus on the economic, livelihood and amenity values afforded them by their environment to be complemented by one that accommodates learning to co-exist with the hazardous characteristics of their environment. It will discuss how a challenge to this process is the uncertainty and complexity of hazardous circumstances. This chapter outlines the hazard and environmental (natural and built) sources of this uncertainty and its implications for developing DRR strategies that facilitate co-existence and adaptive capacity. The chapter then discusses the personal, community and community-agency relationships and competencies that influence the development of a sustained capacity to co-exist with

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hazards. The chapter concludes with offering suggestions for putting these ideas into practice.

INTRODUCTION

People have for millennia elected to live and develop in areas that allowed them to take advantage of resources and amenities provided by the more tumultuous natural phenomena that occur in their environment. For example, those living in the shadow of active volcanoes have been able to take advantage of the fertile soils that volcanic ash falls often create. Seismic activity has provided members of many societies with resources ranging from natural harbours to coastal and mountain scenery. Navigable rivers have long served to develop and sustain commerce, and those living near forests have had access to building and heating resources and the amenities that forested environments afford for people. However, these natural processes can become hazardous when, for example, ashfall and ballistic hazards from volcanic eruptions, and earthquakes, flooding and wildfire activity result in significant loss and disruptions to people, what people value and to the societal systems and functions upon which everyday life is dependent.

Thus, periodically, the same environments that provide people with resources, amenities and recreational opportunities can present communities and societal functions with atypical demands and consequences that they need to be able to anticipate, cope with, adapt to and recover from. Furthermore, these coping, adapting and recovery resources and processes may be required over prolonged periods of time.

While some environmental hazards, such as earthquakes, occur without warning and are generally perceived as acute events, this belies the reality of prolonged aftershock sequences that can leave community members to deal with environmental consequences from liquefaction hazards over periods of months to years (Paton, Johnston, Mamula-Seadon & Kenney, 2014). Other environmental hazards, such as drought and salinity, can have slower onset time but create environmental losses and degradation that people and communities need to adapt to and recover from over periods of years to decades (Bishop, Paton, Syme & Nancarrow, 2000).

This brief introduction describes how environmental hazards occur because a relationship between people and environment exists. Thus, whether by accident or design, people have to appreciate that if they are to fully realize the benefits their natural environment affords them, they must accept and accommodate its periodically hazardous aspects. That is, to learn to co-exist with their natural environment in ways that reconcile environmental costs and benefits in sustainable ways. This is not to say that people have not developed ways of relating to their environment. They have, but often in ways that either fail to recognize or downplay its hazardous elements and overstate the benefits environment affords its human inhabitants.

The developed world has increasingly conceptualized its relationship with the environment in anthropocentric terms. That is, people are seen as being separate from nature and natural environment is managed as an amenity or as an exploitable resource (Bell, Greene, Fisher & Baum, 2001). This anthropocentric view results in people's relationship with the environment being mediated by, for example, their livelihood, economic, political or lifestyle values.

Thus, for instance, people who value natural amenities are often attracted to living in areas with (aesthetic) natural and physical environmental features (Jakes et al. 2007; Loeffler & Steinicke 2007; Moss 2006). However, the anthropocentric beliefs that often underpin people's choices increase the likelihood of their neglecting to consider how their natural and urban land-use and infrastructure development choices (e.g., clear felling and farming practices that affect water table levels and groundwater quality and hasten soil degradation; ground pollution from waste disposal, industrial production and fertiliser run-off etc.) influence their risk from the source of the environmental resources they seek to exploit or enjoy (e.g., increased risk from wildfire hazards) (Harris et al. 2011; Hess et al. 2008; McDaniels et al. 2008; Moritz & Stephens 2008; Priyanka 2009).

In many cases, environmental risk is amplified by the fact that, at household and especially at a societal level, economic advantage and lifestyle preferences generally take precedence over people's anticipation of the degree to which the environmental risk they are exposed is directly attributable to their lifestyle and livelihood choices (which are amenable to change). Within such an anthropocentric context, ecological sustainability is something that arises more by chance than by sound judgment and planning on the part of people and the societies of which they are members (Berkes et al., 2003).

However, in societal contexts in which anthropocentric beliefs prevail, even when environmental risk and its sources are acknowledged, the strategies developed to mitigate the associated risk may be more or less effective. The effectiveness of any strategy in this context depends on the degree to which it accommodates how people conceptualize their relationship with their environment. This makes it important, when developing strategies, to consider how and to what extent it is possible to reconcile their content with people's beliefs, needs, expectations and goals. The diversity of the latter means that, even when the environmental issue and its mitigation or preparedness implications are well understood, it is not always easy to reconcile needs/beliefs and strategy.

For example, when dealing with chronic environmental hazards such as salinity, the goals of environmental protection and personal protection can overlap. That is, livelihood (and sometimes lifestyle) and environmental sustainability, and thus hazard reduction and environmental protection, can be closely aligned. This reflects general acceptance of the fact that the economic viability of farming systems is reliant on environmental conditions. In contrast, with hazards sourced from forested environments (e.g., wildfire), environmental management strategies (e.g., controlled burning) may conflict with expectations derived from livelihood and lifestyle choices. In this context, it is possible to anticipate both support for (e.g., from those anxious about risk) or opposition to (e.g., those for whom being close to forests, who are concerned about impacts in flora and fauna, or are dependent on forest for resource or livelihoods) mitigation. Thus the balance of support and opposition will derive from the diverse mix of needs and interests prevailing within an (at-risk) community. However, even when support for a strategy exists, inappropriate, ill-timed or ineffective land management strategies (e.g., badly managed controlled burning, failure to undertake controlled burning, relying on economic measures to deal with salinity) can exacerbate rather than mitigate environmental risk because they can act to increase conflict with and reduce trust in risk and environment management agencies (e.g., Bishop et al., 2000; Paton & Tedim, 2013).

Understanding this diversity and its implications for the level of support or opposition to environmental risk management is particularly important when environmental strategies

require political and economic support over several years and/or where people are dependent on these same agencies (whom they may distrust as a result of prior dealings) to understand and manage the risk they face from complex, uncertain environmental hazards and from environmental change (Paton, 2008).

Whether the source is from natural hazards or more insidious, enduring environmental change, it is clear that mitigation and disaster risk reduction (DRR) and community adaptation strategies will become increasingly important. It is argued here that the effectiveness of such strategies will be increased if delivered in a climate of social-environmental co-existence that accommodates both the benefits the natural environment affords communities and their members and reconciles this with sustainable practices and a pre-emptive capacity to adapt and recover in those occasions when the environment becomes hazardous.

A need for the latter is only likely to increase given that it can be anticipated that the natural and environmental hazard risks faced by societies and their members is growing.

MANAGING NATURAL AND ENVIRONMENTAL RISK

The hazards events communities and countries will experience will become increasingly frequent, longer lasting and more severe in the future. Contributions to this risk will come from both social and environmental factors.

Even if, for example, the number and intensity of hazard events in an area were to remain the same, coincidental factors such as population growth, urban development and migration into and out of communities, to name but a few, all conspire to increase future risks.

As, for example, population growth and infrastructure development occurs, so too will the significance of the loss and disruption experienced if disaster strikes. Furthermore, the interaction between hazards and societies is occurring in places where considerable societal development has already occurred. Even if a decision to halt future development were made, a need to develop a capability to confront the consequences of hazard activity and environmental change is an important component in any plan designed to facilitate a sustainable societal capacity to co-exist with the potentially hazardous elements of its environment. It is also important to accommodate the fact that the sources of risk will themselves change.

Climate change will alter the hazard-scapes prevailing in many countries. This will have flow on effects in terms of increasing exposure to direct and indirect sources of risk from hazards of meteorological origins or influence hazards (e.g., storms, hurricanes/cyclones, forest fires etc.). It will also introduce sources of risk that will be new to some countries. This may result in areas which have previously enjoyed relatively benign relationships with certain aspects of their environment experiencing risk from new sources. For example, climate change has been implicated in the emergence of forest fire as a hazard in Taiwan (Chen & Chen, 2015). Environmental change is thus influencing the sources of hazard that need to be anticipated, and a degree of imagination may need to be brought to bear on how future risk is anticipated.

In areas susceptible to experiencing hazards from forest environments, for example, a direct relationship between climate change and wildfire risk (e.g., from changes in rainfall,

temperature, fuel growth etc.) makes anticipating increases in future fire events being more intense, more frequent and so on a relatively straightforward task. It is not, however, only environmental hazards with clear meteorological influences on their causes that may increase as a result of climate change. Hazards emanating from seismic activity could also increase. McGuire (2012) discusses how isostatic processes triggered by loss of large ice fields as a result of climate change could increase the potential for more earthquakes and tsunami hazards in future.

At the same time as discussing change (towards greater risk) in the hazard-scapes that can be anticipated, it could be argued that the social contribution to the risk equation, given the fact that humans are intrinsically adaptable (e.g., Burton, Diring & Smith, 2006), will be characterized by people adapting to this new environmental reality (even if nothing is done). While this may be the case, there are good grounds for not relying on this alone. For example, the time it takes for social adaptation (in people, infrastructure, social systems etc.) to occur will lag behind the environmental change and so create varying degrees of loss, distress and disruption (that could be avoided, mitigated or prepared for). Similarly, segments of societies will be unequally affected and will differ with respect to their capacity to adapt to a future that will be physically, socially, psychologically different (e.g., regarding environmental conditions) from the present (Adger et al., 2009; Paton & James, 2015). A planned approach is thus required.

SOCIAL AND CULTURAL PREDISPOSITION FOR ENVIRONMENTAL CO-EXISTENCE

Environmental hazard activity is immutable and will increase in frequency, intensity and duration over time. It will also occur in locations where societal development has already occurred (e.g., population growth, migration into urban fringes and coastal areas, economic and infrastructure developments) and is increasing. Thus, managing societal-environmental fit in ways that reconcile risk mitigation and DRR with the progressive development of societal sustainability must include developing community and societal capacity for co-existing with periodically hazardous, but generally advantageous, environmental qualities and characteristics (Buergelt & Paton, 2014).

To determine what this entails, several things must be considered. The first concerns whether evidence exists to support the position that social-environmental co-existence does exist. If it does, a second question that arises concerns whether this translates into the adaptive capacities and strategies (e.g., support for mitigation measures and adoption of DRR strategies) that communities and societies can use to facilitate their adaptation and sustainable response to environmental hazard activity and change. If evidence for the above is forthcoming, it then becomes pertinent to consider whether such co-existence capability can be developed.

To advance the argument for social-environmental co-existence, it is first necessary to ascertain whether evidence of implicit cultural and social beliefs and actions supporting societal sustainability in hazardous circumstances exists. The answer to this question is yes.

Not surprisingly, this evidence comes from societies whose members face regular exposure to hazardous circumstances. For example, people in Taiwan have long-held cultural

beliefs regarding the importance of not fighting against or trying to beat nature, but rather living in harmony with (co-existing with) nature (Paton & Jang, 2013). In the Hakka communities studied, co-existence strategies evolved around farming practices that needed to be complemented by DRR activities that could accommodate periodic and significant disruption from typhoons.

While Paton and Jang discussed this in relation to it being a principle cultural belief among the Hakka people in Taiwan, this belief extends throughout China. The cultivation and maintenance of positive relations between people and the natural world is a belief that is intrinsic to Confucian ethics (Li, 2003). Evidence can also be found in other countries.

In Iran, Ostadtaghizadeh, Ardalan, Paton, Khankeh & Jabbari (submitted) conducted a qualitative analysis of people's views about the foundations of resilience to environmental hazard consequences. They found that people's ability to co-exist with the environment was identified as a fundamental aspect of a resilient society.

Co-existence beliefs can also be discerned in Japan. The Japanese concept of *kyozon* relates to learning to live with environmental disasters (Preston et al., 2014). Kitagawa (in press) discusses how communities situated around Sakuajima volcano consider both the nature and benefits of living in the shadow of a volcano and the importance of understanding eruptions in their DRR decision making.

The fact that risk arises from interaction between established human settlement (e.g., urban development, agriculture) and enduring natural systems (e.g., river systems, flood plains, forests) makes the relationship and interdependence between people and environment a significant one for the development of community-based disaster risk reduction. Before examining whether, how and to what extent a relationship between co-existence beliefs and adaptive capacity exists, this chapter first discusses what these adaptive capacities are.

ADAPTING TO HAZARD CONSEQUENCES: WHAT IS INVOLVED?

It has been argued that social-environmental sustainability is a function of prevailing levels of adaptive capacity that can operate in a context of the dynamic relationship between ecological systems and social systems (Adger, 2000; Berkes et al., 2003; Klein, Nicholls & Thomalla, 2003). This conceptualization is clearly well suited to issues relating to dynamic, chronic environmental hazards (e.g., salinity, air and ground pollution) that impact social systems on several levels and for prolonged (and even intergenerational) periods. However, recognition of the long-term positive and negative environmental (physical and social) implications of natural hazard (e.g., seismic, volcanic) activity makes it equally relevant for conceptualizing the response to natural hazards (e.g., Paton et al., 2014). Focusing on adaptation is further supported by the fact that, in natural hazards contexts, DRR strategies are designed to facilitate the development of adaptive capacity (Paton & McClure, 2013).

It is also important to appreciate that the source of adaptive capacities does not exist solely in people or in communities. Rather it reflects the complementary contributions made by people, communities and societal systems (Buergelt & Paton, 2014; Paton & Johnston, 2006; Walker, Holling, Carpenter & King, 2004). The question is then in what ways do people, communities and agencies contribute to adaptive capacity?

Some of the key predictors of adaptive capacity are summarized in Figure 1. This identifies how individual- (e.g., positive outcome expectancy, self-efficacy), community- (e.g., community participation, collective efficacy) level factors, and factors describing the quality of the relationships between community members and civic agencies (e.g., empowerment, trust) interact to predict the development of adaptive capacities (Paton & McClure, 2013). Self-efficacy, problem-focused coping, sense of community and place attachment have been identified as precursors to how community members cope with and adapt to environmental hazard (e.g., toxic waste and environmental degradation from salinity) impacts (Bachrach & Zautra, 1985; Bishop et al., 2000; Paton & Bishop, 1996). Self-efficacy facilitates the development of a sense of confidence in dealing with new situations, expanding the number of action plans developed to deal with environmental problems and encouraging persistence in applying them (Paton, 2003). The latter is particularly important in the context of dealing with chronic environmental hazards such as salinity where novel solutions are often required and where their application must be maintained over years or even decades. A belief in the power of collective action (collective efficacy) has been implicated in how people effectively confront environmental issues (Montada & Kals, 2000; Nordlund & Garvill, 2002; Paton et al., 2008). Understanding adaptive capacity and its predictors as a multi-level phenomenon is important in other respects.

A need for individuals and communities to play separate but complementary roles can be illustrated in relation to hazards like salinity. Salinity affects whole communities, but often in an inconsistent manner (Bishop et al., 2000; Paton, 1994). While salinity can affect whole catchments, the distribution of its consequences at any one time, and thus its social implications, reflect the influence of, for example, time since onset, the history of a property (e.g., regarding clear felling and planting practices over time), topography, and so on (Paton, 1994).

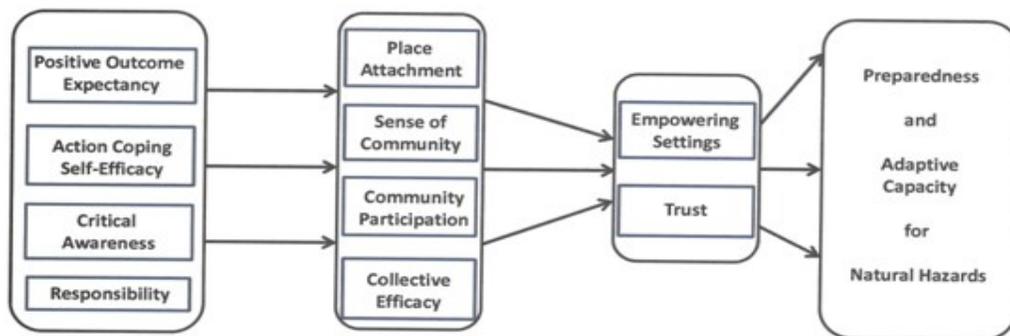


Figure 1. Summary of person, community, and community-agency relationship predictors of adaptive capacity (Adapted from Paton & McClure, 2013).

Uneven distribution of hazard consequences creates a patchwork of affected and unaffected properties within a catchment. The ensuing differential experience of problems and needs for action can create a climate of dysfunctional community conflict (Bishop et al., 2000; Paton & Bishop, 1996). Uneven distribution can create social contexts characterized by feelings of unfairness, anger, mistrust, and alienation. The resultant social fragmentation (e.g., deterioration of social ties and the breakdown of the social fabric that binds community members together) can erode collective adaptive capacity (Bishop et al., 2000; Paton, 1994;

Paton et al., 2014). The cumulative impacts of managing chronic hazards can result in the loss of community coping resources that may take several generations to reverse.

The above discussion suggests that, to understand adaptation to environmental hazards such as salinity, it is necessary to consider individual (e.g., to deal with patchy distribution that affects some properties but not others) and community (e.g., mitigation requires collective action within a catchment) capacity to adapt. Similar issues can be discussed for wildfire DRR. Individual householders need to manage their property. But if their neighbours and others in their community do not do likewise, the reduction in individual risk can be minimal. Integrating individual and collective capacities is a task that needs good knowledge of community dynamics, particularly with regard to differences in environmental attitudes (Paton & Buergelt, 2012). A comprehensive conceptualization of social-environmental adaptive capacity thus requires an integration of individual and community perspectives.

A multi-level analysis, in which interdependencies are understood acquires additional importance as a result of the roles that equity and fairness in environmental consultation play in influencing community risk acceptance), an important precursor of intrinsically motivated action (Syme, Bishop & Milich, 1992). Community engagement based on social justice principles increases community awareness of the trade-offs involved in environmental management decisions and in creating safer environments. A major influence on environmental management, and thus on perceived fairness, comes from government policy and decisions.

Despite their potential to influence DRR and the adaptive capacity (e.g., enhancing requirements in the built (via building codes) and natural environments (using risk assessments on public and private land, vegetation management)), governments (at local, state and national levels) often fail to realize this potential (Buergelt & Paton, 2014; Cottrell 2005; Harris et al. 2011; McCarthy 2007; Park & Miller 2006; Preston et al. 2009; Schouten & Callahan 2004). Local government could influence community members' exposure through designing and reinforcing legal precedents for new developments and land-use planning and use this to influence how people understand and relate to the beneficial and hazardous aspects of the environments they live in, use and rely on (Cottrell, 2005). While further discussion of this falls outside the scope of the present chapter, these issues are discussed here to introduce how losses in disasters often reflect deficiencies in the regulatory and legal frameworks that can support mitigation (e.g., local government not reinforcing laws), and lack of coordination and communication between local government and agencies at all levels (Kirkpatrick & Bryan 2007). What is particularly relevant in the context of the present chapter is the implications this lack of coordination has implications for community-government relationships.

Given the diversity, and often conflicting nature of the interests within a community (see above), conflict between citizens, government and risk and environmental management agencies regarding hazard management and sustainability can be anticipated. Conflict should not, however, be automatically dismissed as a bad thing. Indeed, it can, if its causes and social implications are understood and managed, contribute to increasing community adaptive capacity (Berkes et al., 2003; Paton & Bishop, 1996; Paton & Buergelt, 2012). In this respect, understanding the factors that influence these choices, and particularly those made in a context defined by competing needs, expectations and interests, becomes important. Constructive conflict is not the only community factor that contributes to adaptive capacity.

A community that possesses the mechanisms for articulating issues, reconciling the diverse needs of its members, and representing its needs to the wider community (e.g., government agencies) is well placed to become a competent (adaptive) community (Eng & Parker, 1994). These competencies increase community empowerment and support the development of trusting relationships with government departments and other civic agencies. However, it must be noted that for the outcomes of this process to be of enduring benefit, the process must be managed in ways that sustain their existence over time, and within a context of changing community membership and interests (Paton & Bishop, 1996). That is, intergenerational equity must be included in conceptualizing the adaptive process.

The inclusion of community and community-agency factors in Figure 1 highlights the importance of community and government playing complementary roles (e.g., for wildfire hazards, government policy and practice can contribute by reducing environmental risk through controlled burns and people complement this by creating defensible spaces around their homes to reduce ember attack risk) in risk management. Pursuing this possibility and developing an organizational capacity to engage effectively with communities may require agencies to develop organizational cultural systems and processes that facilitate bottom-up, empowering interactions (Landy & Conte 2010).

The importance of developing bottom-up, empowering relationships between community and government can also be traced to the fact that the complex and infrequent nature of environmental hazards people may have to contend with increases their reliance on expert knowledge and resources. The atypical nature of the hazardous circumstances people need to anticipate means that, if they are to understand risk and be able to take responsibility for its management in ways that fit their local needs, expectations and capabilities, they need to engage with, for example, risk management and government agencies.

The degree to which community-government relationships facilitate community acceptance of information and action is a function of the quality of the relationship between them that is built up over time (Paton, 2008). Thus, levels of risk acceptance and people's willingness to take responsibility for acting is increased, and decisions to prepare more likely, if people believe that their relationship with government and civic agencies is fair and empowering (e.g., people's direct and indirect experience of government and civic agencies results in their being perceived as trustworthy, as consistently acting in the interest of community members etc.). This reiterates the importance of understanding how empowerment and trust influence support for or opposition to mitigation and DRR strategies (Figure1).

Having identified that social and cultural predispositions to co-existing with the hazardous elements of the environment do exist, it then becomes pertinent to ask if they translate into or influence the presence and use of factors known to act as precursors to adaptive capacity. The answer is a qualified yes.

SOCIAL-ECOLOGICAL CO-EXISTENCE, ADAPTIVE CAPACITY AND DRR STRATEGIES

Paton and Jang (2013) discuss examples of how environmental co-existence beliefs and behaviours developed in the Hakka people living in mountainous regions of Taiwan. The

Hakka Spirit describes a unique set of cultural beliefs and practices, that encompass “being able to hold on firmly despite extreme adversity” and to “keep on doing something without regard to one’s own strength” (Jang & Wang, 2009). It can be described in terms of constituent qualities such as frugality, diligence, self-reliance, responsibility, and persistence that combine to facilitate a capacity to thrive in the face of adversity that derive from social-environmental relationships.

The Hakka Spirit embodies several qualities that support the existence of culturally-embedded DRR capability. For example, frugality underpins the action of setting aside resources to deal with the disruption that accompanies hazard events. Qualities such as self-reliance and persistence are comparable to self-efficacy, and diligence contributes to environmental monitoring (Paton & Jang, 2013). Hakka predisposition towards collective approaches to problem solving contributes to the development of positive outcome expectancy beliefs through farming practices that evolved to limit the impact of typhoons (which strike several times a year) on people’s livelihoods. As soon as the typhoon has left Taiwan, farmers would work collectively on each other’s’ farms in rotation, to re-graft buds into fruit trees; with the outcome expectancy beliefs (regarding the effectiveness of collective actions in response to hazard consequences) developing from evidence that the grafted buds would recover and bear fruit. Paton and Jang also discussed how this outcome expectancy belief spilled over into Hakka people’s preparedness for earthquake consequences.

Analysis of the constituent components of the Hakka Spirit illustrates how social-cultural practices can support the development and use of other DRR predictors (Figure 1). Characteristics such reciprocal support practices and collaborative problem solving map onto the community participation and collective efficacy variables described above (Figure 1). Evidence for the ability of socially embedded collaboration, in the form of collective efficacy that had developed through everyday social activities, to influence disaster response also emerged in a study of how Thai coastal residents drew on this pre-existing social competency to assist their adapting to the consequences of the 2004 Indian Ocean tsunami (Paton & Tang, 2009).

Ostadtaghizadeh and colleagues (submitted) discussed how societal beliefs about environmental co-existence increased the likelihood that community members would take responsibility for their risk management and to participate in risk management activities. A belief in the importance of co-existing with the environment also underpinned what they called “disaster positivism” and the belief that when it occurred, a disaster was a catalyst for the creation of new systems.

In a study of societal co-existence with volcanic hazards, Kitagawa (in press) discusses how the cultural precept of *kenyaku* (frugal living) supports preparing for periods of environmental loss. Kitagawa goes on to discuss how another cultural concept, *kyojo*, supports DRR activities through its emphasis on collaboration, cooperation and commitment (cf. the Hakka Spirit and the community participation and collective efficacy elements discussed above - Figure 1). Thus, implicit beliefs in co-existing with the (hazardous) environment and social preparedness and response create a cultural predisposition to DRR.

Other examples of co-existence practices are evident in Kagoshima, Japan. The city of Kagoshima, because it receives ashfall and ballistic debris on some 113 days/year from its proximity to Sakurajima volcano, has developed building codes, ash removal practices and community attitudes and preparedness to enable continuity of societal functions during

volcanic episodes (Paton & Johnston, 2006). These are not the only culturally-embedded constructs that influence Japanese DRR.

Bajek and colleagues (2008) discuss how Chonaikai (a unique Japanese form of community governance) and the Jishubo (autonomous neighbourhood-based organization for disaster prevention) organised within their jurisdictions describe a culturally specific mechanism that facilitates citizen participation in disaster mitigation. Chonaikai have been implicated in playing a role in another culture-specific mechanism (Bhandari, Okada, Yokomatsu & Ikeo, 2010). Bhandari et al. (2010) discuss how the Danjiri Matsuri ritual in Kishiwada City, Osaka, can have a positive influence on earthquake preparedness. Participation in the Danjiri Matsuri ritual enhanced neighbourhood relations and sense of community, increased social capital and trust in Chonaikai, with these underpinning observed increases in hazard awareness and capacity for self-reliance for earthquake hazards.

These Japanese examples further illustrate how factors implicated as DRR predictors (community participation, sense of community, empowerment, trust – see Figure 1) can be forged and sustained through culture specific processes that build on a sense of co-existence with the environment. It is thus possible, when a need to regularly and frequently deal with environmental hazard consequences for people and communities to develop innovative ways of facilitating their ability to co-exist with hazard activity. However, it should be noted that any argument linking co-existence beliefs and the development and maintenance of DRR and adaptive capacities must remain tentative until systematic analyses of these relationships is undertaken. The evidence discussed here warrants the pursuit of this line of inquiry.

One reason put forward above for why social-cultural predispositions towards environmental co-existence could exist was the frequency of experience of hazard events and high prevailing levels of risk. For example, Kagoshima experiences ashfall and ballistic material from the volcano, on average, every third day. There are, however, not many places that face challenges comparable to those prevailing in Kagoshima. Consequently, in communities and locations where hazard activity and consequences are less frequent, a more challenging risk management environment can be anticipated. One challenge emerges in the form of identifying what influences the likelihood of people engaging with their environment in ways comparable to that described in the above studies. It is to a discussion of factors that might influence the development of co-existence beliefs and practices in locations characterized by infrequent hazard events that this chapter now turns.

SOCIAL AND PSYCHOLOGICAL INFLUENCES ON SOCIAL-ENVIRONMENTAL ENGAGEMENT

Early life experience has been implicated as a predictor of positive environmental relationships. Engagement in environmental activities during childhood and adolescence, and growing up in family contexts characterised by positive attitudes towards environment and increase one's sense of environmental identification (Chawla, 1999; Legault & Pelletier, 2000; Maiteny, 2002). A sense of environmental identification contributes to positive environmental relationships (and possibly to the development of co-existence beliefs). While developmental approaches are difficult to emulate in risk management settings, these observations highlight the importance of including environmental education in schools. There

are, however, more proximate influences on the nature and quality of people's environmental relationships.

There is a clear interaction between where people live, their exposure to the environment in that area and their attachment to place. This exposure may come from passive or active participation in natural settings or from living in or near peri-urban areas. People's relationship to their environment and their adaptive capacity is influenced by place attachment and sense of community (Roberts, 1998; Vaske, & Kobrin, 2001; Vorkin & Riese, 2001). How might this relationship be fostered?

Vaske and Kobrin (2001) demonstrated an empirical relationship between place attachment and support for ecological sustainability, with place identity (e.g., the relationship between lifestyle preferences and the environment within which one lives) mediating this relationship (see also Frandsen, Paton, Sakariassen & Killalea et al., 2012). Of interest was finding that talking with others (in community/neighbourhood contexts) about environmental issues was an important consequence arising for people's sense of place attachment. From a DRR perspective, this is important. Talking about hazard and environmental issues in community settings is a significant predictor of hazard preparedness (Paton et al, 2008), increasing the potential for place attachment to constitute a predictor of adaptive capacity.

A sense of place attachment can facilitate coping and adaptation (Frandsen et al., 2012; Low & Altman, 1992; Paton et al., 2014) and community development in the recovery phase (Ostadtaghizadeh et al., submitted). Roberts (1998) argued that acceptance of the importance of a reciprocal relationship between person and environment contributes to the development and maintenance of sense of place (which reflects the kind of co-existence relationship being argued for here). Community attachment is a process with bonds evolving over time through the day-to-day involvement in a residential setting. That is, sense of place is influenced by the perception of the inter-dependence between personal benefits (e.g., satisfaction of personal needs) and the environment within which they are satisfied. Forming emotional bonds to places as well as to other people enhances one's sense of "embeddedness" (co-existence with?) people and place (Hummon, 1992; Low & Altman, 1992; Nonami et al., 2002). A sense of emotional investment in a place could provide people with an impetus to prepare for hazards in order to protect salient facets of a place one values (Paton, Kelly, Buergelt, & Doherty, 2006). Both place attachment and sense of community have been identified as contexts for the social construction of risk and levels of community hazard preparedness (Frandsen et al., 2012; Hannigan, 2006; Lupton, 1999; Lupton & Tulloch, 2002; Paton et al., 2008; Paton et al., 2014; Tierney, 1999).

Thus, community members' sense of attachment is a social-environmental resource capable of contributing to the development of sustained community adaptive capacity and is, accordingly, a resource that can be used to facilitate the enactment of DRR strategies to confront the consequences of environmental hazard events. If community members share feelings of geographic attachment, then they may be more likely to develop social networks that see them participating in communal activities, which might extend to sharing information about hazard preparation, and assisting and supporting each other in protective activities (Forrest & Kearns, 2001; Paton et al., 2008). A relationship between levels of interaction with neighbors and attachment to the community (sense of community and place attachment) has been linked to people being more motivated to protect salient facets of the environment where they live (Forrest & Kearns, 2001; Low & Altman, 1992; Morrison, 2003). What about those not so attached?

A prominent influence on the quality of environmental engagement is the degree of meaningfulness in people's experiences in natural environment. This can result in strong environmental preferences being incorporated within the sense of self (Bixler et al., 2002). This may represent a precursor to developing environmental co-existence beliefs, practices and behaviors that support the sustained development of positive environmental relationships. The development of a comprehensive understanding of factors influencing social environmental relationships also needs to consider those who do not experience meaningful environmental relations.

People are more likely to adopt behaviour that reconciles social and environmental needs if they perceive information on the causes of environmental threats as personally relevant (Folke et al., 2003; Frewer, 2001; Lubell, 2002; Paton, 2008; Seguin, Pelletier & Hunsley, 1999; Spash, 2002). This behaviour is mediated by the attitudes people form, with these attitudes influencing the enduring ways in which people interpret and make choices about how to relate to and interact with the environment. The presence of an attitude does not, however, automatically lead to action.

Environmental attitudes can be differentiated with regard to whether they are symbolic in nature or represent more fundamental or more salient beliefs. Symbolic environmental attitudes (e.g., that reflect short term fads or social desirability) typically predict token action (Jurin & Fortner, 2002; Lubell, 2002). For example, recycling but not changing behavior to reduce the need to recycle (Bell et al., 2001). In contrast, attitudes that attain high personal salience (e.g., attitude to clear-felling because it has long term implications for lifestyle or safety) are more likely to lead to people lending support to/and or acting in ways that lead to sustainable outcomes (Bamberg, 2003; Nordlund & Garvill, 2002; Paton et al., 2008; Steinheder et al., 1999).

Prevailing environmental attitudes are more likely to be enacted if people understand the risk (its sources, what can be done to manage the risk) and they possess a capacity to respond to the (specific) demands posed by conservation requirements (Corral-Verdugo, 2002; Drori & Yuchtman-Yaar, 2002; Paton et al., 2008; Spash, 2002). People must believe that personal action can make a difference (outcome expectancy) and that they have the ability (self- and collective efficacy) to put recommended actions into practice (Paton & McClure, 2013; Pelletier, 2002). These beliefs increase intrinsic motivation and personal responsibility for action. These, in turn, increase the likelihood of people searching for information about environmental risk and the strategies they can use to effectively mitigate their risk.

The likelihood of these attitudes and beliefs achieving sustainable outcomes is greater if they are developed and sustained through social interaction within communities whose members share a common, super-ordinate goal (Eigner, 2001; McFarlane & Boxall, 2003; Paton & Buergelt, 2012). Common or super-ordinate goals could relate to hazard mitigation or environmental opportunities.

For example, it is possible to speculate that the social-cultural predisposition towards environmental co-existence discussed above may reflect, at least in part, a superordinate goal derived from people's recognition of the shared fate from experience of hazard events and prevailing high levels of risk with the environment they cohabit and share with others. While this remains tentative until it is systematically tested, this possibility is alluded to in some of the above studies (e.g., Kitagawa, in press). The key is that a super-ordinate goal is one that is likely to be perceived as affecting all or a majority of people in an area. Determining what such a goal is is something that requires careful analysis and planning in each locality (e.g., to

accommodate the specific mix of needs, expectations, goals and capabilities present). Generally, it is something that a public good. That is, it reconciles strategic actions with social justice beliefs. The importance of having a super-ordinate goal derives from a need to ensure that the issue is salient enough to mobilize collective action (Paton & Buergelt, 2012).

Support for environmental sustainability has also been identified as emanating from the degree of consistency between environmental attitudes and peoples' wider beliefs (e.g., social justice and equity in regard to the costs and benefits of environmental activities and their distribution throughout society) and by beliefs that environmental protection did not threaten jobs, limit personal freedom or harm the economy (Buergelt & Paton, 2014; Gunderson, 2003; Maiteny, 2002; Lubell, 2002; Paton et al., 2008).

Fully realizing the potential of these social environmental interdependencies requires that all stakeholders are engaged in DRR planning and implementation to ensure that diverse activities at the various dimensions and scales complement one another (Buergelt & Paton, 2014; Priyanka 2009; Stevens et al. 2010). The extent and the quality of cooperation depend on three key variables: social trust (Bonfield, 2009; Basolo et al. 2009; Earle 2004; Niemeyer et al. 2005), responsibility (Jakes et al. 2007) and commitment to the community (Harte et al. 2009). Trust between stakeholders is crucial if they are to play complementary roles and share responsibility for defining and resolving shared problems.

As Ostadtaghizadeh et al. (submitted) point out, the foundation for shared responsibility and commitment to people and place (sense of community, place identity, place attachment etc.) in DRR contexts is societal and cultural beliefs about co-existing with the environment. Participation and commitment, in turn, facilitates building shared perspectives; reconciling diverse needs, goals, and actions; building trust between stakeholders. Creating this in a context in which there is shared acceptance of the need for DRR to derive from co-existing with the environment can create the sense of shared fate (environmental hazards affect all sectors of society as the society is embedded in its environment) and the development of the kind of superordinate context in which shared responsibility for DRR can develop. In this context, trust is the glue that binds people and communities together in ways that create cohesive and comprehensive DRR environmental risk management capabilities.

The final issue to be considered here concerns the possibility that environmental engagement itself can act as a catalyst for the development of the competencies and relationships implicated in DRR and adaptive capacity. If this link exists, it would justify the integration of natural hazard and environmental risk management (Paton & Johnston, 2001).

NATURAL ENVIRONMENT AS A SOURCE OF ADAPTIVE CAPACITY

There is a growing body of evidence attesting to the ability of local biophysical landscapes (e.g., common spaces, community gardens) to act as catalysts for social interaction, community participation and wellbeing (Faber Taylor & Kuo 2006; Moritz & Stephens 2008; Reyes 2010) and for preparedness decisions at individual and community levels (Brenkert-Smith et al. 2006; Buergelt & Paton, 2014; Jakes et al. 2007). The degree of natural features (e.g., grassy areas, trees, shrubs) surrounding residential living areas are positively related to the residents' sense of community and the quality of interaction between residents. Capitalizing on this fact can help consolidate the degree of locational community

required to support DRR activities and to accommodate the spatial characteristics of hazard event consequences (Paton & McClure, 2013). The latter potential is further supported by the link between residential green spaces and, for example, crime reduction and community safety (Kuo, Sullivan, Coley, & Brunson, 1998; Kuo & Sullivan, 2001).

Other studies have identified how environmental engagement promotes, protects and restores subjective wellbeing (Conn, 1998; Day, 1998; Eigner, 2001; Kaplan, 1984, Kellert, 1997; Knapp & Poff, 2001). The relationship between environmental experience and wellbeing may reflect a direct, restorative capacity of natural environment to reduce stress, anxiety and aggression, and to restore energy and health (Hartig, Mang & Evans, 1991; Hartig, Kaiser & Bowler, 2001). Exposure to natural environment, even if only indirectly in the form of watching videos, can enhance positive affect and reduce physiological arousal (e.g., lower blood pressure, muscle tension) (Parsons, Tassinary, Ulrich, Hebl, & Grossman-Alexander, 1998; Ulrich et al., 1991). Nature can compensate for the fatigue and exhaustion associated with dealing with adverse experiences through the sense of fascination it evokes and the opportunities it provides for personal reflection (Kaplan, 1995).

The significance of creating urban opportunities to experience natural environment and encouraging environmental engagement is heightened by its capacity to act as a context in which DRR and social adaptive resources, characteristics and competencies are developed and more likely to be put into practice (Buergelt & Paton, 2014).

Several studies have documented how environmental engagement facilitates development and maintenance of the competencies that predict adaptive capacity (Conn, 1998; Eigner, 2001; Feral, 1998). Feral discussed how environmental experience promoted personal development in the form of enhanced self-esteem, perceptual skills and self-efficacy. A link between environmental engagement and the enhancement of self-efficacy and control beliefs has also been reported (Eigner, 2001; Hwang, Kim & Jeng, 2000; Propst & Koesler, 1998; Riechard & Peterson, 1998). Faber et al. (2006) demonstrated that interaction with neighbours in local natural spaces increased sense of community and self-efficacy, both of which have been identified as DRR predictors.

Collectively, these works raise the possibility that creating green spaces and facilitating environmental engagement can assist the development of DRR capability by enhancing people's sense of locational community and the competencies that predict adaptive capacity (Figure 1). The creation of a sense of locational community is important for pursuing the goal of developing a super-ordinate hazard mitigation context that underpins people's receptivity to taking shared responsibility for risk management within their communities and neighborhoods.

CONCLUSION

Given predictions of growing risk from natural hazards and environmental change to all sectors of society in societies worldwide, developing societal risk mitigation strategies and the adaptive capacities of all sectors of society (people, community, agency etc.) is crucial. This chapter discussed how strategies based on reciprocal (co-existence) relationship between people and environment could play a role in this regard. By identifying the factors and processes that facilitate this, it is possible to use this knowledge to provide a framework for

DRR strategies that increase community capacity to anticipate, cope with, adapt to, recover from, and learn through practices derived from co-existing with their natural environment. This is especially so for communities that find themselves having to respond and adapt to the complex, prolonged physical, social and psychological consequences and demands posed by exposure to natural hazards and chronic environmental hazards (e.g., salinity, air pollution, soil degradation etc.).

This chapter discussed evidence suggesting that societies and their members can learn to co-exist with their environment in ways that allow them to profit from its beneficence and to cope with and adapt to its more hazardous characteristics. This arises because engagement with the natural environment can act as a catalyst for people developing and/or maintaining a sense of locational community in which shared responsibility is more likely to grow and in which the adaptive competencies (e.g., self and collective efficacy, place attachment) that underpin effective DRR are developed and sustained. By pursuing this line of inquiry it becomes possible to anticipate that community and societal capacity to deal with hazardous and challenging natural and environmental hazard events and consequences that are only likely to become more frequent in the future can be developed by facilitating and supporting social-environmental co-existence.

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