The development and use of Community Engagement Theory to inform readiness interventions for natural hazard events

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Abstract

Readiness or preparedness can help reduce the risk posed by future hazard events and allow for effective post-event response and recovery. Given the importance of readiness, a key question is, "How can readiness be facilitated?". Community Engagement Theory (CET), developed from over 20 years of research in and across several countries, can contribute to offering answers to this question. The theory suggests that if people believe their personal actions can mitigate risk (outcome expectancy), then they are more likely to engage with others to collectively identify and formulate their risk management needs and strategies (community participation and collective efficacy). The CET continues by proposing that if people perceive their needs as having been met through their relationship with civic agencies (empowerment), they are more likely to trust those agencies and the information they provide and use their information to make readiness decisions. The CET began its development in the city of Auckland in Aotearoa New Zealand and has been tested across diverse hazards with multi-cultural populations, in culturally diverse countries, and in both pre- and post- disaster contexts. Cross-cultural analyses suggest that CET constitutes a universal theory for understanding how to develop readiness irrespective of the hazard or country under consideration. Given its universality, the theory can be used to guide readiness interventions, with the proviso that these are adapted to allow for the specificities of different localities and cultural settings. This paper documents the work undertaken to create, refine, and apply the CET in national and international contexts and discusses its utility in developing natural hazard readiness, with a specific Aotearoa New Zealand focus.

Keywords: *Community Engagement Theory, readiness, preparedness, natural hazards, cross-cultural, cross-hazard*

In the early 2000s, a pre-post evaluation of a multi-agency, multi-media, regional volcanic hazard risk communication programme in Auckland, Aotearoa New Zealand, revealed that the programme had no effect on increasing public hazard preparedness (also known as readiness) (Ballantyne et al., 2000). This prompted the Auckland Regional Council (ARC) to invite the development of a model that could address impediments to preparedness and inform future preparedness policy, planning, and intervention in ways that could accommodate Auckland's hazard and cultural diversity. The model also needed to be scalable and applicable at neighbourhood, city, regional, and national levels of analysis. This work culminated in the development of Community Engagement Theory (CET). This paper documents the work undertaken to create, refine, and apply the CET in national and international contexts and discusses its utility in developing natural hazard readiness.

Preparedness strategies seek to proactively increase the likelihood that people, individually and collectively, will be able to *respond* to large-scale hazard events in *planned and functional* ways, rather than being forced to *react* to them in *ad hoc* ways (Paton et al., 2014). The Sendai Framework for Disaster Risk Reduction 2015-2030 provides a key basis for Disaster Risk Reduction (DRR) planning. Priority 4 of the framework highlights the need to plan for both structural and non-structural preparedness to ensure effective response and recovery

from hazardous events (United Nations Office for Disaster Risk Reduction [UNDRR], 2015). This capacity to respond and recover effectively is a function of the pre-event development of relevant knowledge, beliefs, and action capabilities. These capabilities can be grouped into several functional readiness categories (Lindell et al., 2009; Paton et al., 2014; Paton, Anderson et al., 2015; Russell et al., 1995). Examples of these groupings are summarized in Table 1. The dependent variables used in preparedness research generally involve a combination of several functional items.

An important question that must be answered if Priority 4 of the Sendai Framework is to be developed concerns accounting for differences in preparedness adoption. Several theories have been developed that seek to understand the reasons why people do and do not prepare and have been applied to predicting readiness across a range of events and hazardous circumstances (Paton, 2019). The major preparedness theories are summarized in Table 2, with 1-5 representing the main existing theories and 6 represented by Community Engagement Theory (CET – the focus of this paper). These theories predominantly have their basis in psychology, in an attempt to understand how people's understandings, beliefs, and attitudes interact, alongside external attributes, to influence preparedness behaviour. Each of these theories has garnered a body of empirical support and many have done so in ways that support their meeting the Sendai Framework Priority 4 criterion of having all-hazards applicability. For example, the

Protective Action Decision Model has considered influences on preparedness behaviour across hazards such as earthquake, hurricane, and tsunami. A common theme amongst theories 1-5 is their strong focus on a diversity of individual understandings, perceptions, beliefs, and attitudes as drivers of preparedness, with less focus on external influences of readiness. The empirical support available for each theory in Table 2 makes them comparably valid as tools capable of providing insights into differences in people's levels of readiness.

Given the pre-existing range of empirically supported theories available, why develop a new model? The answer derives from the fact that while theories 1-5 listed in Table 2 each tap into relevant (and different) predictors of preparedness, no one theory provided an exhaustive account of all possible relevant variables.

Following the identification from an evaluation survey that the Auckland programme had no effect on increasing public hazard preparedness (Ballantyne et al., 2000), qualitative interviews were undertaken. From analysis of the data (Paton, unpublished), it became evident that existing theories did not fully include all variables (such as community participation, empowerment, trust) capable of assessing the issues Auckland community groups identified as underlying their lack of preparedness action following the volcano hazard risk communication programme. To meet ARC goals of better volcano preparedness, a new model was needed. This model also needed to be empirically tested to ensure that

Table 1

Examples of Functional Preparedness/Readiness Categories

| Readiness Category	Illustrative Examples of Functional Preparedness/Readiness
Structural	Securing house to foundations, securing internal fixtures and fittings to limit/prevent loss and damage, creating a defensible space around the home, covering home ventilation openings to limit ember/volcanic ash incursion, elevating the ground floor to minimize flood inundation, etc.
Survival/Direct Action	Food/water for each household member for several days, portable radio/batteries, medications, essential documents, first aid kit/skills, etc.
Planning (Household, Family, and Personal)	Hazard consequence knowledge, household response/recovery planning including family members' roles, establishing contact processes for diverse circumstances and locations (e.g., parents at work, children at school), etc.
Psychological	Anticipating response/recovery stressors and loss of social support relationships, developing stress coping skills for parents, children, and others, etc.
Community/Capacity Building	Local group membership, participating in neighbourhood hazard planning meetings, skills/resources inventory development for response/recovery, planning to support vulnerable neighbours, etc.
Livelihood	Planning for loss/disruption to employment, work continuity (getting to work, working from new location/home), contributing to workplace continuity plans, business leaders facilitating/supporting household preparedness, etc.
Community-Agency	Anticipating/planning for relationships with businesses/NGOs/response agencies (e.g., govt. depts., insurance companies, tradespeople) in recovery settings, engaging with civic/scientific sources to obtain local information, etc.

Note. Adapted from Paton (2020).
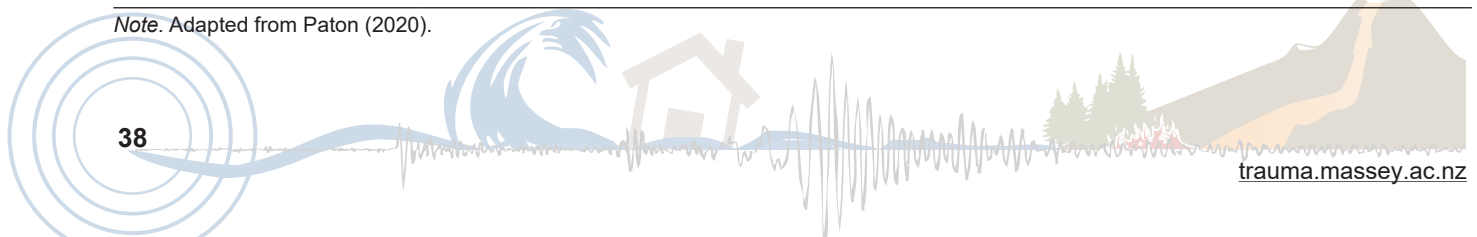
Table 2

Major Preparedness Theories and Their Indicative Sources of Variables and All-hazards Testing

Theory	Indicative Variables	All-hazards Testing
1. Health Belief Model	Susceptibility to threat, severity of the threat, perceived threat, personal costs and benefits, likelihood of taking action	Flooding, earthquake
2. Protection Motivation Theory	Risk perception, response efficacy, acceptance/personalizing of risk, self-efficacy, coping appraisal, protection motivation	Flooding, wildfire, earthquake
3. Person relative to Event	Threat and vulnerability appraisal, self-efficacy, outcome efficacy, coping appraisal, perceived resource availability, perceived event severity	Earthquake, tornado
4. Theory of Planned Behavior	Attitudes, subjective norms, perceived behavioural control	Earthquake, flooding, wildfire
5. Protective Action Decision Making	Source characteristics, message content, information access, receiver characteristics, social and environmental cues, exposure, attention, comprehension, threat perception, protective action perception (aligned to outcome expectancy), situational constraints and facilitators, protective response	Earthquake, hurricane, tsunami
6. Community Engagement Theory	Outcome expectancy, community participation, collective efficacy, sense of community, place attachment, affect, empowerment, trust	Flooding, earthquake, volcano, tsunami, wildfire, pandemic

Note. Multiple sources (Adhikari et al., 2018; Duval & Mulilis, 1999; Ejeta et al., 2016; Houts et al., 1984; Kerstholt et al., 2017; Lindell & Perry, 2012; Martin et al., 2007; McLennan et al., 2014; Mulilis et al., 2000, 2003; Terpstra & Lindell, 2013; Paton, 2013).

the CET can demonstrate comparable levels of utility to other preparedness theories. Hence, meeting the criteria for the model development work established by the ARC corresponded with a need to demonstrate that the emergent theory can make meaningful contributions to DRR readiness theory, planning, and intervention. This paper discusses the work undertaken to create, refine, and apply the CET across different hazards and in different countries. It opens with a discussion of the origins of the CET.

The Origins of Community Engagement Theory

Despite utilizing the best available scientific and risk management knowledge available, evaluation of the ARC volcanic hazard public education programme revealed a failure to enhance people's preparedness (Ballantyne et al., 2000; Paton et al., 2000). Insights into why this occurred came from comments to open ended questions in evaluation surveys and primarily from interviews with representatives from 10 Auckland Community Boards and leaders of Auckland's Asian communities. Community Board representatives and leaders linked their lack of action to three related issues. The first issue was a lack of public engagement in programme development. The second issue was that recipients found it challenging to apply the programme content to their specific personal and local issues and needs (including Community Board views that the programme did not accommodate the socio-economic, demographic, historical, political, geographic, and social diversity that characterizes the Auckland region). The first and second issue led together to the third issue; they

reduced people's trust in the Council as the Council had developed the programme.

Community Board representatives argued that if programmes are to accommodate local issues and needs, provide opportunities for locally meaningful action, reduce people's uncertainty, and enhance citizens' trust in the civic sources that they rely on for DRR information and resources, they must be developed from public consultation and engagement. The ensuing process of theoretically operationalizing people's experiences and observations provided the foundation for developing CET. The development process of the CET was accompanied by further meetings with Community Board representatives and leaders to confirm the face validity of this conceptual model built around how concepts of active community engagement, empowerment, and trust influence readiness. Social trust was pivotal to this conceptualization.

Given the importance of trust in circumstances in which people are called upon to make decisions about future actions under conditions of uncertainty (Lion et al., 2002; Siegrist & Cvetkovich, 2000), the CET was developed around trust (Paton, 2008). Trust influences people's interpretation of the motives, competence, and credibility of the interpersonal relationships, group processes, and societal relationships they experience. Trust is especially important when people must make decisions about infrequent, diverse, challenging, and complex hazard phenomena about which they cannot readily find out themselves (Lion et al., 2002; Paton, 2008; Poortinga & Pidgeon, 2004; Rippl, 2002). This portrays trust as

playing a transactional role in DRR; its effectiveness derives from people's interpretation of the reciprocal and complementary relationships that exist between citizen and agency stakeholders. This transactional process was operationalized using the empowerment construct (Akpotor & Johnson, 2018; Conger & Kanungo, 1988; McCarthy & Freeman, 2008; Zimmerman, 2000), with trust posited as mediating the relationship between empowerment and readiness intentions/actions. An important caveat of applying empowerment is understanding the complementary contributions diverse social actors make to DRR processes.

On the societal and scientific agency side of the empowerment equation, CET suggests that contributions to preparedness outcomes arise from the knowledge, expertise, and resources that agencies develop and provide in fulfilling their risk management and scientific roles. From the citizen side of the equation (the contribution of people and their social network memberships, e.g., neighbourhood, community group), the CET posits that complementary citizen contributions to DRR derive from the capabilities and relationships people can draw on to articulate their understanding of their risk and then develop locally meaningful DRR strategies. The personal and social interpretive factors proposed by CET to assess this process were outcome expectancy, community participation, and collective efficacy.

The CET proposed that if citizens are to be motivated to engage with the readiness process, they must believe that they can take actions to positively affect their safety (Paton, 2008). Outcome expectancy describes people's interpretation of whether they expect that adopting recommended preparedness actions will result in the outcome of increasing their safety. If people do not believe that such a relationship can exist for them, they can form negative outcome expectancy (NOE) beliefs that reduce the likelihood of their preparing (Figure 1). If, however, people expect that actions can be taken to increase their safety outcomes, the emergent positive outcome expectancy (POE) beliefs motivate them to engage with the readiness process (Figure 1). However, believing that actions could be available to mitigate one's risk does not always equate with knowing what to do or how to do it. Consequently, advancing the readiness process is a function of people developing their understanding of their risk and their preparedness options. The CET suggests that these understandings could be accomplished through two social interpretive

processes, community participation and collective efficacy.

People's interpretation of environmental risk and their development of risk mitigation and preparedness options is an interpretive social process undertaken in social networks comprising others that people identify with and who share similar values, beliefs, and attitudes (Earle, 2004; Lion et al., 2002; Poortinga & Pidgeon, 2004). The importance of social interpretive processes was reiterated in Paton et al.'s (2005) finding that the most significant predictor of earthquake readiness was the frequency with which people talked about earthquakes and earthquake preparedness with others in their social networks. Hence, strong group-based relationships (e.g., social group memberships, workplace membership) and/or locational relationships (e.g., neighbourhood) represent sources of information from others who share one's values and expectations. The CET uses the "community participation" construct to assess the level of people's engagement in social networks that would provide them with access to socially comparable inputs into their risk interpretation discourse (Paton et al., 2005).

While community participation provides a measure of people's level of engagement in social contexts conducive to formulating meaningful risk beliefs, this may not be enough to articulate relevant action plans. To meet the latter need, the CET proposes that people's ability to develop meaningful DRR plans and actions is a function of, for example, the problem solving, planning, and implementation of activities they accumulated within social networks, with this being captured by the collective efficacy construct (Figure 1). The CET thus proposes that the interdependent roles of outcome expectancy, community participation, and collective efficacy provide the foundation for their playing complementary roles with civic agencies in DRR preparedness (empowerment and trust; Figure 1) in developing locally meaningful DRR outcomes (Paton, 2008; 2013). An illustrative example from testing the CET for earthquake readiness which highlights the importance of these aspects is depicted in Figure 1. This figure uses data sourced from a 2009 survey of Christchurch and wider Canterbury residents which was obtained prior to the 2010-11 Canterbury earthquake sequence (Becker, 2010).

Having discussed the origins and modus operandi of the CET process, the discussion now turns to research addressing ARC calls for the model to demonstrate all-hazards utility. This process takes on additional importance in relation to demonstrating that the CET can

Figure 1

A Stylized Representation of the CET Process and an Example of CET Testing for Earthquake, Pandemic, Tsunami, Volcanic, Flood, and Bushfire (Wildfire) Preparedness
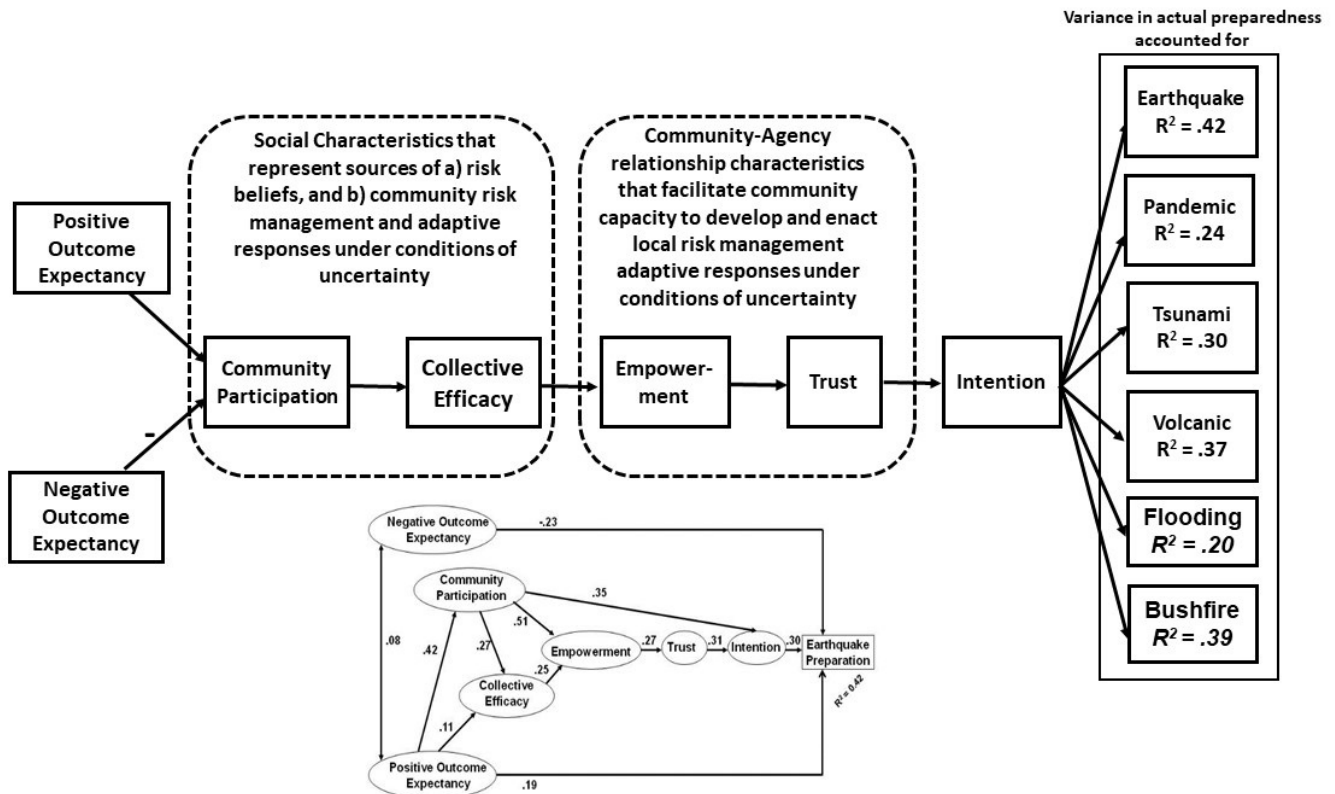
Note. The lower image depicts the results of a study in Aotearoa New Zealand in a pre-2011 earthquake context using data from a 2009 survey of Christchurch and Canterbury residents (data and analysis from Becker, 2010).

offer comparable levels of utility to other theories used in DRR contexts (refer to Table 2).

The Importance and Challenge of All-Hazards Theorizing and Testing

Calls for theories to demonstrate "all-hazards" capability is an important DRR goal (Eiser et al., 2012; UNDRR, 2015). All-hazards capability generally refers to evidence of the ability of a theory to demonstrate its predictive utility when tested against several of the natural processes from which disaster can emanate (e.g., volcanic eruption versus tsunami). The value of demonstrating all-hazards DRR capability is especially important in countries such as Aotearoa New Zealand where preparedness work takes place against a backdrop of a diverse hazardscape. For the CET development process, the ARC selected two disaster-related processes for all-hazards testing: volcanic eruption and influenza pandemic preparedness (Paton, Buergelt et al., 2008; Paton, Parkes et al., 2008). These diverse processes serve to illustrate why all-hazards testing is important; if the content of the dependent variable (DV) in readiness research changes,

it becomes important to ensure that the utility of a theory is not compromised by such changes.

All-hazards testing of the CET: Volcanic versus pandemic preparedness. In Table 3, illustrative examples of items used to compile the DV in the Auckland volcanic and pandemic studies are summarized. While similarities are evident (e.g., regarding survival/emergency kit preparedness), differences in structural (e.g., built environment structural damage for volcanic ash falls versus no comparable structural issues for influenza), household and community planning, and information can be discerned. Given the differences these readiness items introduce to the DV used in researching preparedness, all-hazards testing becomes an important criterion for assessing the readiness credentials of a theory (see also Table 2).

The testing of the CET in volcanic and pandemic preparedness contexts supported its all-hazards credentials. Structural equation modelling analyses (see Paton, Parkes et al., 2008 and Paton, Smith et al., 2008 for details of the respective analyses) indicated a good fit for both the volcanic ($X^2 = 9.02$, *df* = 11, *p* = .62, RMSEA

Table 3

Comparison of Indicative Measures Used in Testing the CET Model for Volcanic and Pandemic Preparedness in Auckland

Volcanic	Pandemic
Structural	**Structural**
• Prevent ash from entering home/ gutters etc. • Removing ash from roofs, vehicles etc.	• None required
Emergency Kit	**Emergency Kit**
• Emergency water supplies (3 litres per person per day) for a week • Emergency food supplies • Radio/torch/batteries • Masks to prevent ash inhalation	• Water/food supplies etc. for quarantine, isolation/utilities rendered non-operational • Masks to prevent disease spread • Thermometer • Disinfectant/wipes • Hand washing/drying protocols • Sneezing protocols
Household Planning	**Household Planning**
• Plan covering family location, evacuation, relocation • Planning for changes to work location and practices • Medicines, valuables, documents ready for evacuation • Neighbourhood planning	• Planning for testing, quarantining, hospitalization, family sickness • Planning for isolation and keeping parents and children occupied • Planning for loss of income • Dealing with child stress and anxiety
Community Planning	**Community Planning**
• Attend neighbourhood/community meetings about eruption preparedness • Discuss consequences and planning needs in neighbourhood • Work with neighbours/social network members to develop collective plan	• Planning for school/child care closure • Home schooling • Neighbour support
Civic/Societal Relationships	**Civic/Societal Relationships**
• Attend Council/scientific meetings • Discuss issues with civic agency representatives • Discuss issues with employer re: working practices and arrangements and permanent changes in employment	• Discuss issues with health agencies • Discuss issues with employer re: working from home and on-site/business resumption • Flexible work planning • School closure and resumption planning
Information	**Information**
• Information in Yellow Pages phone book • Information on ash impacts on health and home • Council emergency management contact numbers	• Symptoms/care practices to protect other family members • Flu impacts on health and home life • Health agency contact numbers • Issues affecting young/elder family members

Note. Sources: Paton, Parkes et al. (2008) and Paton, Smith et al. (2008).

= .052, 90% .00 > .052, NFI = .98, *p*-value for Test of Close Fit (RMSEA < .05) = .94, GFI = .99) and pandemic (X^2 = 14.8, *p* = .32; RMSEA = .037; 90% confidence interval = .00 - .07; NFI = .97; GFI = .99; AGFI = .97) testing. Subsequent tests across earthquake, tsunami, and other hazards reinforced the all-hazards utility of the CET and supported it being included in the inventory of theories available for readiness research (Paton et al., 2009; Paton, Bajek et al., 2010).

The demonstration of all-hazards utility provided a stepping stone to the next challenge identified by the ARC; demonstrating the capability of CET to provide risk managers and planners with a public education framework. To advance public education, risk managers and planners need information on how a theory can be operationalized and evidence of its ability to generate meaningful changes in readiness. The ability of the CET to satisfy both criteria is discussed next.

Using CET to Inform, Evaluate, and Refine Readiness Education Programmes and Community Development Approaches

Developing and evaluating public DRR education programmes is a challenging process. A significant issue here, and one common in Aotearoa New Zealand and many other parts of the world, derives from the relatively long, uncertain, and unpredictable return periods characteristic of the natural processes people are being asked to prepare for (e.g., earthquakes). Unpredictable and potentially long return periods affect how people interpret their risk and their need to act.

For example, Paton et al. (2003) found that people's beliefs regarding when a future earthquake could occur moderated the conversion of intentions into preparedness actions. Those who believed an earthquake could occur in the "next 12 months" were more likely to prepare. In contrast, for those who expected the next earthquake to

occur more than 12 months in the future, the likelihood of preparing dropped significantly. Hence, beliefs regarding when a future hazardous event could occur affect people's motivation to engage with a public preparedness education programme independently of the content of the programme per se. Where possible, then, accommodating such influences in public education programmes is important. Programmes could develop messaging to stress the idea that events can happen anytime (Becker, Paton et al., 2013), regardless of any anticipated return periods. The effectiveness of this messaging could be evaluated over time, taking into account the context of people's beliefs about the imminence of an event happening.

Unpredictable return periods also create more fertile ground for factors such as unrealistic optimism and risk compensation biases, which affect people's motivation to prepare (Paton, 2019). Such aspects also introduce challenges to evaluation methodologies such as creating test and control groups and identifying realistic pre- and post-test timing schedules. While not completely eliminated, these issues are less problematic when evaluating annual and seasonally predictable natural processes (e.g., wildfire/bushfire, flood events).

Annually occurring events facilitate evaluation because people, households, and neighbourhoods should engage in preparedness activities at the same time every year. Wildfire preparedness provides a good example. For instance, if they are to be comprehensively prepared, residents in wildfire prone areas should conduct structural (e.g., maintaining a defensible space, clearing vegetation, securing gutters, eaves, and ventilation areas with fine wire), survival (e.g., stay or go planning), and social (e.g., developing neighbourhood plans, discussing needs with fire agencies) preparedness activities each year, and at the same time just prior to the commencement of the "fire season". This creates a preparedness context more conducive to systematic evaluation.

An example of such an evaluation can be found in the bushfire (wildfire) preparedness evaluation of the Bushfire-Ready Neighbourhoods (BRN) preparedness programme in Tasmania, Australia that was developed based on CET (Frandsen et al. 2012; Paton, Buergelt et al. 2008; Paton et al., 2013, 2017; Skinner, 2016). The evaluation study involved a pre- and post-test evaluation of data from six BRN communities and six control communities whose members did not receive the BRN programme but who received normal public education materials. The evaluation process consisted of a pre-intervention assessment of preparedness in all 12 communities in 2014 and a post-intervention assessment in the same communities 2 years later in 2016. Evaluation comprised qualitative research using community focus groups, supplemented by a short preparedness survey, to understand the attributes that enhanced preparedness and response (Skinner, 2016).

It was found from the analysis of the qualitative focus group data that the BRN interventions mapped onto particular CET variables. For example, positive outcome expectancy beliefs were developed by community members from comparable communities sharing stories about how preparedness had proven effective in their respective communities. These stories provided BRN group members with first-hand accounts of what could work from people they could identify with and who lived in similar circumstances to themselves. To empower community DRR and sustain trust in fire authorities, another component of the BRN programme included agency and community representatives collaborating to develop community-specific profiles and developing DRR activities specifically tailored to the needs, circumstances, and goals of members in each BRN community.

Strategies designed to enhance sense of community, community participation, and collective efficacy involved adopting strengths-based strategies (e.g., building on existing community capabilities to plan activities such as (fire-resistant) painting parties and defensible space clearing teams) and using community forums to support community engagement in planning (e.g., organizing support for more vulnerable residents). Positive outcome expectancy, community participation, and collective efficacy capacities were further developed by incorporating property fire safety assessments and local wildfire survival planning workshops. Other illustrative examples of BRN content are summarized in Figure 2 (Paton et al., 2017; Skinner, 2016).

As Figure 2 shows, compared with 2014 levels, the 2016 post-intervention data revealed increases in preparedness in members of BRN communities (Paton et al., 2017; Skinner, 2016). BRN community members were more likely than their control group (non-BRN) counterparts to develop detailed response plans and a sense of personal and social responsibility for both household and neighbourhood preparedness, including changes in structural preparedness such as developing defensible spaces and retrofitting homes with fire-resistant paint and cladding (Skinner, 2016). In contrast, members of the (non-BRN) control communities were less likely to prepare defensible spaces or develop

Figure 2

A Summary of the Relationship Between CET Variables, Illustrative Community Intervention Strategies, and Changes in Levels of Bushfire Preparedness
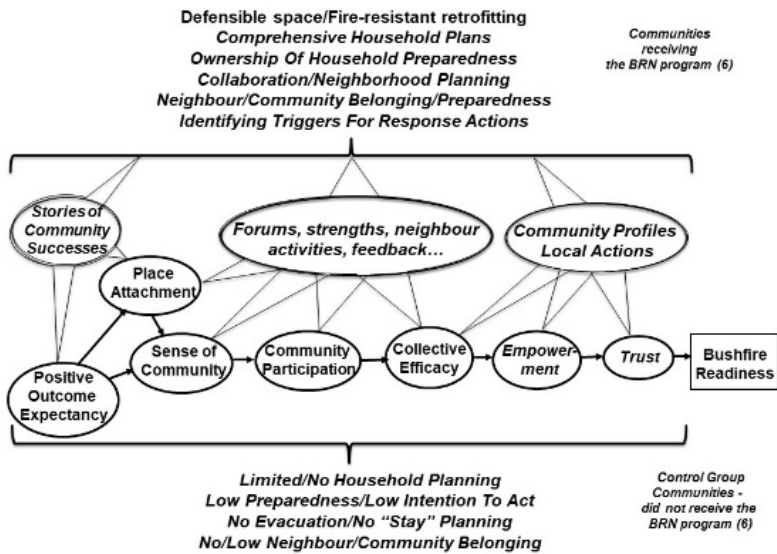
Note. Based on one intervention study in Tasmania (Adapted from Paton et al., 2017 and Skinner, 2016).

survival plans and demonstrated an overall lower sense of community (Skinner, 2016).

This independent evaluation illustrates how readiness theories can inform public education planning and implementation, and the great value of utilizing scientific knowledge for developing DRR education programmes. Long-term evaluation is needed to determine if the increases noted in the evaluation are maintained or even increased over time, despite likely changes in community membership and circumstances. These considerations regarding sustainability and evolving capabilities in response to changes introduce a need to consider adding activities such as maintaining and evolving preparedness and community succession planning processes (e.g., local leadership, action learning circles, and evaluation) to the list of functional preparedness strategies listed in Table 1. It is also important to consider evaluation in the context of uncertain return period events. Such evaluation work is underway.

In Aotearoa New Zealand, local Civil Defence Emergency Management (CDEM) groups have also been working on identifying and developing interventions based on the CET. Two examples include the Auckland CDEM people's panel evaluations which have investigated which CET attributes are strongest in their communities, and Wellington Region Emergency Management Office (WREMO) who have explored aligning CDEM planning processes and community resilience initiatives with the CET (Kay et al., 2019; Kwok et al., 2018).

Another example is Hawke's Bay CDEM which has employed activities to support CET facets (Becker, McBride et al., 2013; Becker et al., 2020). Since 1999, seven intervention and evaluation studies have been undertaken in the Hawke's Bay region of Aotearoa New Zealand to examine the ability of CET variables to guide readiness for volcanic, earthquake, and coastal hazards (Becker et al., 2012; Johnston et al., 1999; Johnston et al., 2003; McIvor & Paton, 2007; McIvor et al., 2009; Paton, Bajek et al., 2010; Paton, Frandsen et al., 2010; Paton & Johnston, 2008; Paton et al., 2001, 2005; Ronan et al., 2001). Results from these studies indicate low-to-moderate increases in the variables influencing preparedness and support the future development of intervention and evaluation studies (Becker, McBride et al., 2013).

The findings of the Hawke's Bay studies have been viewed sufficiently positively that the CDEM Group has sought to develop their public education interventions to focus on boosting the role of social attributes and capacities to enhance readiness. Relevant work began with a review and subsequent refinement of their educational programme in ways that aligned interventions with the CET framework (Becker, McBride et al., 2013). From this review, gaps were identified, particularly regarding community participation and engagement, and the process culminated in developing a suite of activities to operationalize CET variables including information sharing and knowledge co-creating strategies which focus on engaging the community as much as possible. These two-way learning activities entailed regular talks and workshops (e.g., Payne et al., 2020), working two-way with educational providers such as early childhood centres and schools, conducting exercises and drills (e.g., the ShakeOut earthquake drill and tsunami evacuation walk/hīkoi), and developing interactive online and social media resources. These interactive activities have led to developing a partnership approach to readiness, including collaborating via the East Coast Life at the Boundary initiative. This partnership includes a variety of personnel such as researchers, emergency management practitioners, and the public. Evaluation of the CET-based activities has been commissioned with a view to strengthening readiness evaluations and incorporating CET processes in a wider evaluation programme (Becker et al., 2020).

An important facet of this work more generally is the need to develop an inventory of strategies and activities that agencies and communities can use to operationalize CET variables. Such an inventory can also support evaluations to determine whether the strategies and activities are fulfilling their specific intervention goals (see Table 4 for examples). Such interventions could be implemented by emergency management agencies or linked in with existing initiatives undertaken by other departments or agencies (e.g., community development, emergency services, educational institutions, local and central government).

Ongoing evaluation plays an important role in determining whether interventions employed are successfully meeting their goals and whether and how the programmes need to be modified going forward. Hawke's Bay CDEM,

for example, carry out regular yearly evaluations of preparedness to see if informational, educational, and outreach interventions are effective (Becker et al., 2020). While annual evaluations are useful, quantitative survey-type evaluations could be undertaken at slightly longer timeframes (e.g., every 2-3 years) supported by qualitative evaluation in between those timeframes. The benefits of undertaking a mixed-methods approach to evaluation is that quantitative data can be captured about readiness in populations which can be measured over time, while qualitative data helps with understanding nuances about developing readiness in local contexts and in relation to unique characteristics in specific neighbourhoods, communities, and further afield. Such evaluations can also be useful in that they can feed

Table 4
Suggested Interventions Aimed at Prompting Readiness Outcomes for an Aotearoa New Zealand Context

Factor	Interventions
Increase positive outcome expectancy	Develop people's **self-efficacy** in their ability to undertake readiness actions: • Encourage people to personalise information about what they need to do in relation to their local circumstances • Provide practical information about "how to prepare" and why it is effective by illustrating links between hazard consequences and readiness actions • Start with easy to adopt items (e.g., emergency kits) and progressively introduce more complex/expensive items (e.g., house structural changes).
	Increase people's **positive outcome expectancy** that undertaking readiness activities will lead to a better post-disaster outcome:

	• Outline the complex nature of hazards, rather than focusing on damage and destruction and how readiness actions mitigate consequences and facilitate response and recovery, and use this to:
	  º Develop people's belief that mitigation for disasters can be effective, including by providing accounts from people who can attest to the benefits of readiness
	  º Show that losses are avoidable, and ways people can avoid loss
	  º Describe the immediate utility and/or benefits of mitigation (e.g., lower house maintenance costs, family safety).

Reduce negative outcome expectancy	Reduce negative outcome expectancy that disasters are too catastrophic and nothing can be done to make a difference by focusing on the realities of a disaster, rather than damage from an event being universal and total
	Show that the distribution of losses is not evenly spread, and how the distribution of losses relates to actions people can take in their homes
	Show that people have control over the consequences of hazard events (i.e., that the choices they make over mitigation can help them become more resilient).
Increase community participation	Identify diverse forums for **participation** that are appropriate to the local context, that can be used to develop readiness in communities. For example, new or existing community groups that may or may not be hazard-focused (e.g., schools). Likewise, consider a diversity of activities that might be held in these forums (e.g., hazard mapping exercises, community response planning, drills, door-knocking, emergency training, and developing training programmes).
	Increase critical awareness by encouraging thought and discussion amongst community members (e.g., via community members reviewing hazard scenarios, communities sharing experiences of disasters including how they coped, facilitate discussion and participation around activities to increase self- and collective efficacy and positive outcome expectancy).
	Include active problem solving (**action coping**) as part of community participation. Ensure participatory activities include a specific focus on defining problems related to hazards, and how the community might solve those problems.
	Ensure participation by current or future **leaders** by: • Involving community leaders in readiness and resilience activities • Identifying people in communities with general (e.g., management experience) and specific (e.g., skills such as building) leadership skills • Identifying people willing to assume leadership responsibility to support planning and plan implementation (including skills such as planning, problem solving, decision making, conflict management) • Considering issues such as succession planning (e.g., rotating leaders to deal with specific issues, minimizing burnout during response/recovery).

Factor	Interventions
Develop collective efficacy	Focus on developing **collective efficacy**, or the belief that community members "know how to work together to deal with issues that arise". Ensure participatory activities allow for collective participation; for example, the identification of neighbourhood impacts and consequences and how these could be dealt with within collaborative group settings.
	Build on people's **sense of community** and develop a norm of **social responsibility** to develop a shared understanding of the need to work together collectively. Suggestions for activities include: • Encourage a sense of belonging in the physical location through identifying, for example, local (e.g., heritage, symbols such as art deco architecture) and natural amenities to increase people's sense of emotional investment in their community • Identify hazard issues in terms of shared fate (it is everybody's problem) • Highlight that people are part of a larger, stable, dependable community • Identify interdependencies between people, groups, and agencies (e.g., need to be able to care for one another if cut off from resources, identifying more vulnerable members of the community and how their needs can be met) • Clearly identify and distinguish what agencies will do and identify how these differ from, but complement, what neighbourhood/community members can do collectively to contribute to community safety.
Empowerment	**Empower** people so they can call upon personal and external resources to deal with issues that arise. Suggestions include: • Building knowledge and skills though engaging with group, community, and neighbourhood members to discuss their information, resourcing, development, and training needs and develop strategies tailored to the needs of each group • Integrating resilience-based CDEM work with community development • Ensuring development at all levels (e.g., individual, community, societal) • Targeting at-risk groups for capacity building and community development • Working with existing groups and community leaders that have community influence • Enabling community-led risk reduction, rather than institution-led, through, for example, community-based emergency management groups • Considering what adaptive capacities might be needed in an emergent post-disaster context and addressing these pre-disaster.
	Via planning, ensure people have access to **resources** that meet their needs for readiness and response/recovery, including: • Personal resources (e.g., decision-making skills, practical skills, and psychological preparedness such as the ability to anticipate the anxiety and concerns that will arise in a disaster and how to manage or cope in such a situation) • Expertise (e.g., general agency support, provision of advice, facilitation, social support) • Physical resources (e.g., funding for activities, equipment, built environment needs).
	Build **trust** over time by ensuring people have positive (empowering) experiences with providers of information (i.e., ensure information is accurate, clear, and available from multiple sources and messages are consistent and help people deal with their local issues, concerns, and needs). Build trust around hazard mitigation expenditure and ensure a fair and just spread of hazard mitigation actions by maintaining community relationships and being responsive to (unique) community needs.

Note. Adapted from Becker et al. (2015).

valuable information about what influences preparedness into the CET for further refinement.

Having demonstrated empirical evidence for the CET having all-hazards and practical public education utility, attention now turns to the ARC requirement of ensuring the theory is applicable in socio-culturally diverse settings, which can be ascertained though testing how well CET applies across cultures.

Cross-cultural Testing of CET

While extreme natural events such as earthquakes occur worldwide, the socio-cultural contexts in which the disasters they create occur differ markedly. Such socio-cultural diversity also occurs not only across cultures and societies but within multicultural countries such as Aotearoa New Zealand, highlighting the critical importance of, and thus responding to, calls for testing the cultural equivalence of DRR theories (Eiser et al., 2012; UNDRR, 2015).

The strategy adopted to test the cultural applicability and thus utility of the CET focused on testing the CET in countries differing in their relative positions on the individualistic-collectivistic (I-C) cultural dimension (Table 5). The position on the I-C dimension influences many DRR factors in critical ways and thus has profound personal and social implications for assessing theory equivalence across cultures (Brislin 2000; Diener & Suh 2000; Matsumoto & Juang, 2013; Norenzayan & Heine 2005). Given the existence of differences in the cultural drivers of the kinds of personal and social beliefs and actions of interest in DRR theorizing, it is unwise at best and potentially harmful at worst to assume theory equivalence until relevant testing is undertaken.

Accordingly, the CET was tested in cultures identified as having relatively high, medium, and relatively low individualism on the Hofstede (2001) scoring scheme. A detailed rationale for focusing on the I-C dimension can be found in Paton, Okada et al., (2013) and information

about the specific aspects of theory equivalence testing is available from Paton (2020). Table 5 offers a summary of the quantitative studies undertaken as part of the cross-cultural CET testing process that have compared hazard readiness in countries whose citizens are exposed to comparable hazards (seismic, volcanic, and wildfire), but that sit at different points on the I-C dimension. Each of the studies have explored mostly the same variables, but with slight variations depending on the country context (e.g., New Zealand studies initially did not include collective efficacy as a variable, while this variable was usually included from the beginning for countries with more collectivism). Thus, the exact variables reported do vary slightly from study to study depending on what questions were asked.

Collectively, the studies summarized in Table 5 - carried out from 2008-2021, across four hazards and nine countries, ranging from relatively high individualistic to relatively collectivistic countries (three relatively high individualistic countries, one medium collectivistic, five relatively high collectivistic countries) - offer support for the cultural equivalence of the CET. These empirical findings validate that irrespective of the source of hazards or country under investigation, the more citizens believe that personal actions can reduce their risk (*positive outcome expectancy*), the more they can collectively formulate their risk management needs and strategies (*community participation* and *collective efficacy*), and the more they perceive their DRR needs and resources being met through their relationship with civic risk management

agencies (*empowerment*), the more likely they are to *trust* civic risk management agencies and the resources, assistance, and information they provide and use it to support making their readiness decisions.

The work discussed above focused on testing the original CET that was developed and tested in Western and relatively individualistic cultures (like Aotearoa New Zealand, Australia, USA) in Asian settings in which collectivistic cultural orientations prevail. To further enhance the rigour of the cross-cultural testing, a reverse approach was used that involved developing and testing a preparedness/readiness model in Asian and relatively collectivistic countries and then testing it in Western settings in which individualistic cultural orientations prevail.

Some work on this reverse process has begun following an opportunity that arose after the 921 earthquake in Taiwan in 1999. Following the 921 earthquake, Ho-Ping township was isolated and its inhabitants had to develop strategies to facilitate their recovery themselves (Liu & Lin, 2013). One outcome of this process was the development of a consolidated, community-based strategy that involved the development of new social-structural capabilities. Following a series of focus group sessions (*N* = 172) designed to gain insights into capacities utilized during recovery, a tentative list of scale items was developed based on systematic analysis of the focus group data. The scale items were then subjected to confirmatory factor analysis to develop a measurement tool (Liu & Lin, 2013; Paton et al., 2016). The confirmatory

Table 5

A Summary of the All-hazards and Cross-cultural Quantitative Testing of CET

Hazard	Relatively Low Individualistic Country	Medium Collectivistic Country	Relatively High Collectivistic Country
Earthquake	**Aotearoa New Zealand** *Paton, Bajek et al. (2010)* *Paton, Anderson et al. (2015)*	**Japan** *Paton, Bajek et al. (2010)*	**Taiwan** *Jang et al. (2016)* **Nepal** *Adhikari et al. (2018)* **Iran** *Ranjbar et al. (2018)* *Ranjbar et al. (2021)*
Tsunami	**USA** *Paton et al. (2009)* **Australia** *Paton, Frandsen et al. (2010)*		
Volcanic	**Aotearoa New Zealand** *Paton, Smith et al. (2008)*	**Japan** *Paton, Okada et al. (2013)*	**Indonesia** *Sagala et al. (2009)*
Wildfire	**Australia** *Paton, Buergelt et al. (2008)* *Frandsen et al. (2012)*		**Portugal** *Paton, Frandsen et al. (2012)* *Paton, Tedim et al. (2012)* *Paton & Tedim (2013)*

factor analysis found four key aspects that contributed to adaptive capacity during recovery, which are graphically depicted in Figure 3.

The four factors are: community consciousness (consisting of community beliefs in their capacity to respond and strengthening community-environmental relations), community participation, trust, and organizational networks (cf. empowered community and empowering civic settings; empowerment) (Paton et al., 2016). The identification of these four factors provides evidence of the importance of functional social relationships, empowering relationships with civic authorities, and stronger socio-environmental relationships as adaptive capacities. That is, these findings demonstrate the existence of community-developed processes in a relatively collectivistic culture that are comparable to those in the CET. That these processes emerged from the

community independent of researcher input is important (Liu & Lin, 2013) and warrants future work testing the utility of these measures as predictors of readiness and/ or response and recovery capability in Western, more culturally-individualistic cultures.

Evidence for cultural equivalence and all-hazard equivalence increases the confidence government agencies can have in being able to use the CET to support developing, testing/evaluating, and refining community engagement interventions in multi-cultural and multi-hazard countries like Aotearoa New Zealand and Australia. The consistency of CET across cultures also facilitates opportunities for international research collaboration and more effective knowledge creation and sharing, provides preparedness-response-recovery planning frameworks for international humanitarian aid organizations, and enhances opportunities for countries with limited resources available to conduct preparedness research and intervention planning to draw on international experience and knowledge systems to facilitate their DRR development and intervention.

Future work can take this issue on board to further expand CET by exploring the culture specific processes that need to be considered when developing comprehensive DRR strategies in diverse countries and in multi-cultural countries. In Aotearoa New Zealand, for instance, practical intervention strategies must consider how socio-cultural processes in members of different cultural groups influence the nature of the intervention strategies developed, with specific attention given to Māori worldview and context (Kenney 2016, Kenney & Phibbs 2015, Kenney et al. 2015, Phibbs et al. 2015). Specifically, the Aotearoa New Zealand National Disaster Resilience Strategy Rautaki ā-Motu Manawaroa Aituā, released in April 2019, is a framework recognising the culture-specific and critical importance of indigenous Māori worldviews generally including whakaoranga, the Māori-Crown relationship.

The following section explores how the post-disaster response and recovery

Figure 3

Summary of Confirmatory Factor Analysis of the Development of a Social Capital Measure from the Taiya Tribe, Ho-Ping Village, Taiwan
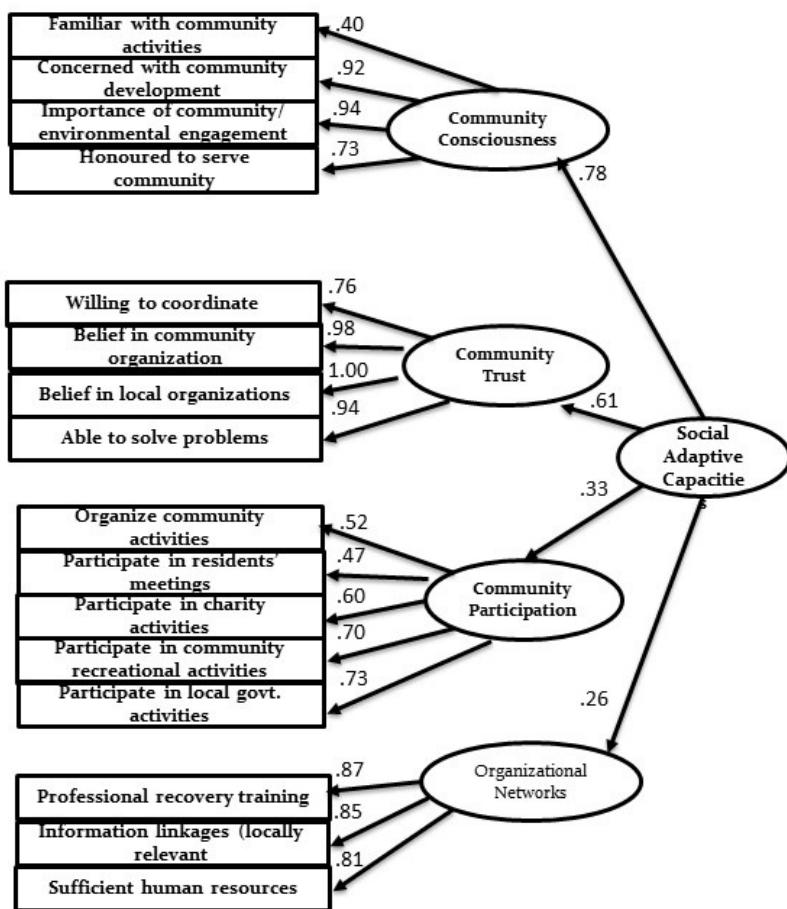
$\chi 2 = 157.01$, df = 100, p=0.137; $\chi 2$/df = 1.57; RMSEA=0.046, NFI = 0.91, CFI=0.965, GFI/ AGFI=0.897/0.86). N = 172.

Note. Adapted from Liu and Lin (2013) and Paton et al. (2016).

context has contributed to our understanding of readiness and to the development of the CET.

Developing CET Within the Response and Recovery Phases Context

While most CET research has focused on pre-event readiness to enhance response and recovery, more recent studies have turned this around and sought to explore how CET can learn from post-disaster response and recovery situations to inform readiness. This includes learning what and how individual and collectivistic adaptive capabilities and capacities are facilitating response and recovery after disasters, to suggest what other variables need to be included in the CET. The attributes represented by these variables can then be developed in communities prior to an event, so they are more resilient in the face of adversity.

As with the models of readiness presented in Table 2, there is a vast array of research that exists which explains influences on resilience, response, and recovery processes (e.g. Aldrich, & Meyer, 2015; Berkes, 2007; Cutter et al., 2014; Johnson & Olshansky, 2017; Kobayashi, 2007; Norris et al., 2008). These are not explored in detail in this paper, but it is noted that similarities exist between findings from these pieces of work and the CET, whereby certain variables are highlighted as important. For example, Aldrich's body of work focuses on the importance of social capital in

recovery, which is also something that is highlighted in the context of the following studies discussed here with regard to CET.

In terms of response and recovery research specific to the CET, studies were conducted in Aotearoa New Zealand following the 2011 Christchurch earthquake (Paton et al., 2014) and in other countries such as Taiwan (Paton, Okada et al., 2015; Paton et al., 2016) and Nepal (Adhikari et al., 2018). Some recovery-focused research has expanded CET by integrating it with other preparedness theories stated in Table 2. Research in Nepal, for instance, has illustrated that expanding CET with Protection Motivation Theory (PMT; Rogers, 1983) variables has led to a better understanding of how adaptive capabilities developed during response to emergent recovery issues can facilitate preparing for future extreme natural events.

In Nepal, Adhikari et al. (2018) investigated post-earthquake recovery preparedness by integrating the CET with PMT. The variables added from PMT – risk appraisal and coping appraisal – have had mixed success in predicting preparedness (Becker, Paton et al., 2013; Paton et al., 2005). One reason for this is that by assessing the relationship between these variables in the absence of disaster experience, both variables may account for significant levels of variance in preparedness. However, in a disaster context people are well aware of their risk and are in a better position

Figure 4
The Results of Testing a Combined CET/PMT Model on Predicting Preparedness Intentions During the Recovery from the 2015 Nepal Earthquake
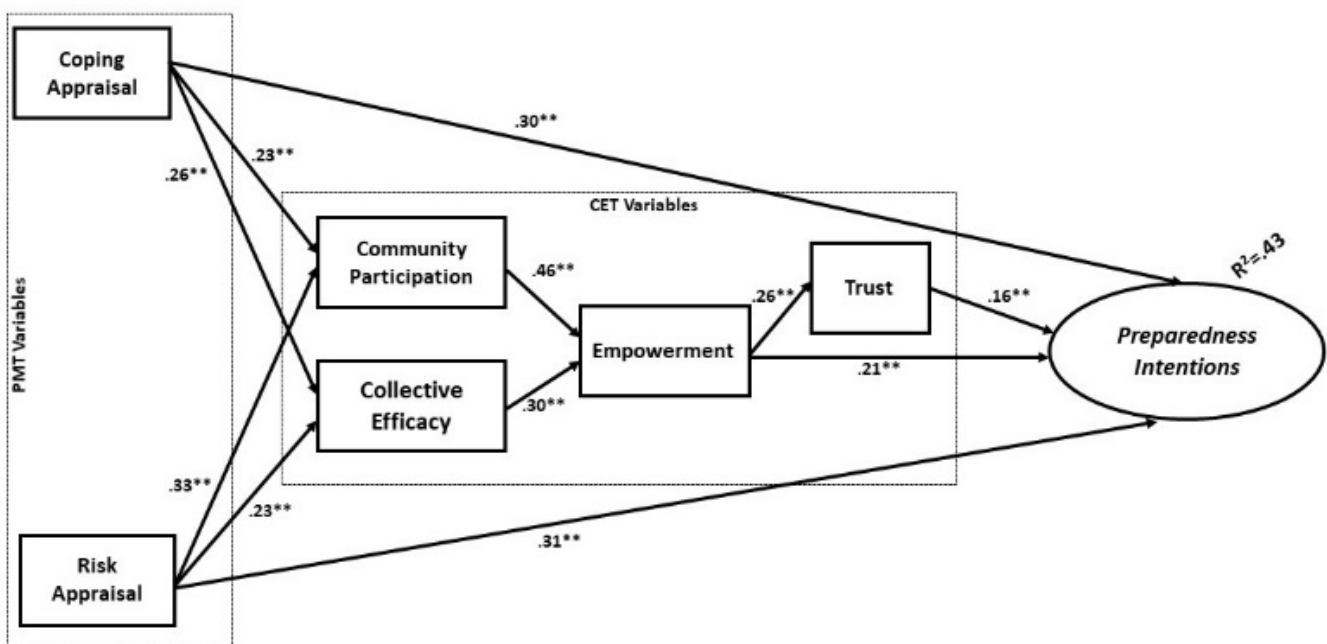
Note. Adapted from Adhikari et al. (2018).

to appraise the extent to which their coping is helping their response. This work is summarized in Figure 4. This finding provides a rationale for including these variables in an expanded version of CET. Adhikari et al.'s work successfully demonstrated that this pairing of theories was effective and provides a foundation for future theory development through theory integration. CET having cultural equivalence suggests that these lessons can be applied to other countries.

Other recovery-focused research, such as work in Christchurch, New Zealand, following the 2010-11 earthquakes, has contributed insights into variables that could be included to further evolve CET. Several examples from Christchurch highlight how recovery following disasters has been important for developing aspects of the CET. In the first example, the Ministry of Civil Defence & Emergency Management[1] funded research with several neighbourhoods seriously affected by the 2011 earthquake. The systematic analysis of interviews with residents about their response and recovery experiences provided insights into factors influencing people's ability to cope with and adapt to atypical circumstances in which they found themselves. This study afforded an opportunity to examine whether

1   Now the National Emergency Management Agency

people's accounts of what helped them mapped onto the variables included in the CET. For example, interviews showed that beliefs related to positive outcome expectancy were not prominent (Paton et al., 2014). The study also identified additional variables that could be incorporated into the future development of CET, including community leadership, community inclusivity, conflict management, social support, self-efficacy, and place attachment (Figure 5). Such variables only became evident in the context of the response and recovery to the Christchurch earthquake, highlighting the importance of considering both how readiness is enacted in, and how it contributes to, outcomes during and after extreme natural events in the context of other disaster cycle phases, especially response and recovery.

For the second example, the 2011 Christchurch earthquake afforded opportunities to reconceptualise the readiness process (Paton et al., 2014; Paton, Anderson et al., 2015; Paton, Jang et al., 2015). As introduced earlier, readiness can be described as a suite of functional categories (Table 1). These readiness categories are often integrated into a single readiness measure. However, doing so may complicate research into predictor mechanisms as research suggests that predictor variables may differ between the functional

Figure 5

Variables that Could be Added to Develop the CET Based on Factors Identified in Focus Group and Individual Interviews with Christchurch Residents
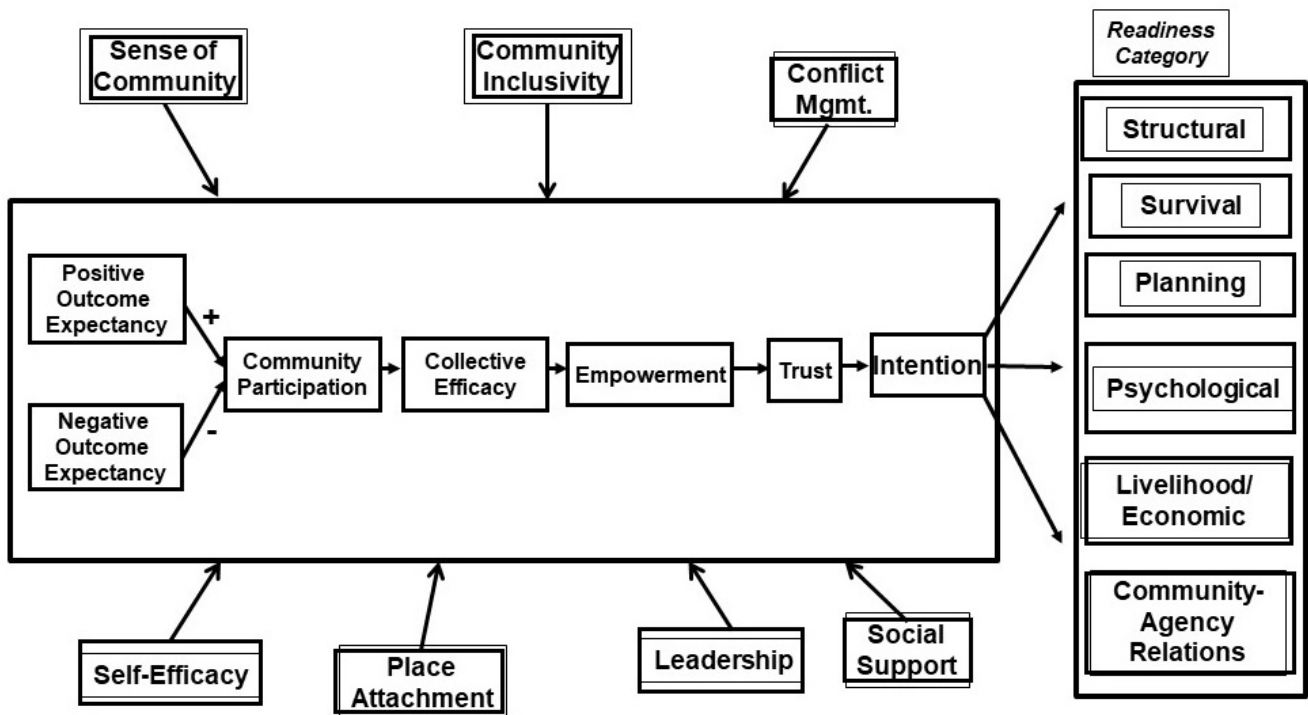
Note. Developed from Paton et al. (2014).

categories listed in Table 1 (Paton, Anderson et al., 2015; Paton et al., 2017).

For example, survival preparedness activities (e.g., storing food/water) place low demands on skill and time (e.g., purchasing water containers and filling them). Consequently, few personal or social capabilities are required to undertake them, making it unclear what this means for their theoretical prediction. It could be argued that person-level variables (e.g., self-efficacy) could represent a good predictor of survival readiness, with few other variables needing to be invoked. In contrast, decisions about structural preparedness create greater demands on assessment, information acquisition, and skills, and increase the need to engage with representatives of civic authorities, builders, and so on regarding complex construction and regulatory issues (Miranda et al., 2023). Similarly, people's effectiveness in developing and implementing neighbourhood support and response plans could be influenced by several social competencies (e.g., committing time to working with others, attending meetings, voicing concerns and opinions, dealing with conflict, representing needs to external agencies). Consequently, it could be hypothesised that variables such as community participation and collective efficacy would take on additional prominence as predictors of community relationship readiness. Finally, regarding community-agency readiness and the quality of people's relationships with civic and scientific agencies, empowerment and trust could be proposed as being key predictor variables.

Tentative support for a need to explore the antecedents of each functional category (Table 1) was provided by Paton, Anderson et al. (2015), finding that functional categories were predicted by different sets of antecedents. The analysis of predictor-functional preparedness category outcomes in a sample of Cantabrians after the 2011 earthquake revealed that the best predictors of *survival readiness* were critical awareness, community participation, earthquake beliefs, and negative outcome expectancy. For *community readiness*, empowerment, collective efficacy, community participation, and negative outcome expectancy were the best predictors. For *community-agency readiness*, trust, critical awareness, and positive outcome expectancy prevailed. The finding that different variables predict different functional categories suggest that it would be of value to explore the development of "matrix-based" approaches to preparedness modelling (Paton, 2019; Paton, Anderson et al., 2015). While remaining tentative until further work is undertaken, these findings suggest that subsequent

research should consider the need for theories to be tested more specifically to the development needs posed by each functional readiness category.

Future Theorizing to Further Evolve CET: Utilizing and Integrating Readiness Research Across the Scales, Disaster Cycle Phases, Hazards, and Cultures

By pulling together readiness research regarding individual, community, and social scales from both pre-, during, and post-disaster contexts across hazards and cultures, it is possible to develop an inventory of readiness variables that can be used as a framework for future theorizing based on CET (e.g., Paton, 2019, 2020). Such an inventory is depicted in Figure 6, which summarises the key CET variables discussed previously in this paper that are relevant across cultures. The omission of some variables from Figure 6, where they appear in other previously discussed research examples, is largely because they are context dependent and may be important in some cases but not others. The ones shown here appear to be among the most universal across cultures so far. Rather than starting from zero, research can further build upon the knowledge created by CET thus far, by using CET for foundational roots, and then assess which CET variables hold for specific hazards and cultures. This would allow for the identification of hazard- and culture-specific CET branches that are relevant and useful to different cultures (e.g., similar to Adhikari et al., 2018). For example, place attachment has had mixed success in predicting preparedness. It proved to be a strong predictor in bushfire (wildfire) studies, but not in volcanic studies (Paton, Buergelt et al., 2008; Paton, Smith et al., 2008). One reason for this variation is that forested environments are often the basis for people's selection of where to live; their sense of attachment to forested place thus becoming a more salient aspect of their preparedness decisions. CET model development might also benefit from combining aspects from other models, in a way similar to what Adhikari et al. (2018) did by integrating the CET with PMT.

Conclusions and Recommendations

This paper discussed the origins and evolution of the CET across scales, hazards, cultures, and disaster phases. Coming from the disciplinary approach of psychology, the need for the specific development of CET arose from gaps in the ability of existing theories to capture issues raised by residents of diverse community groups in Auckland, Aotearoa New Zealand, regarding

Figure 6
Readiness Variables Derived from Testing in All-hazards Contexts
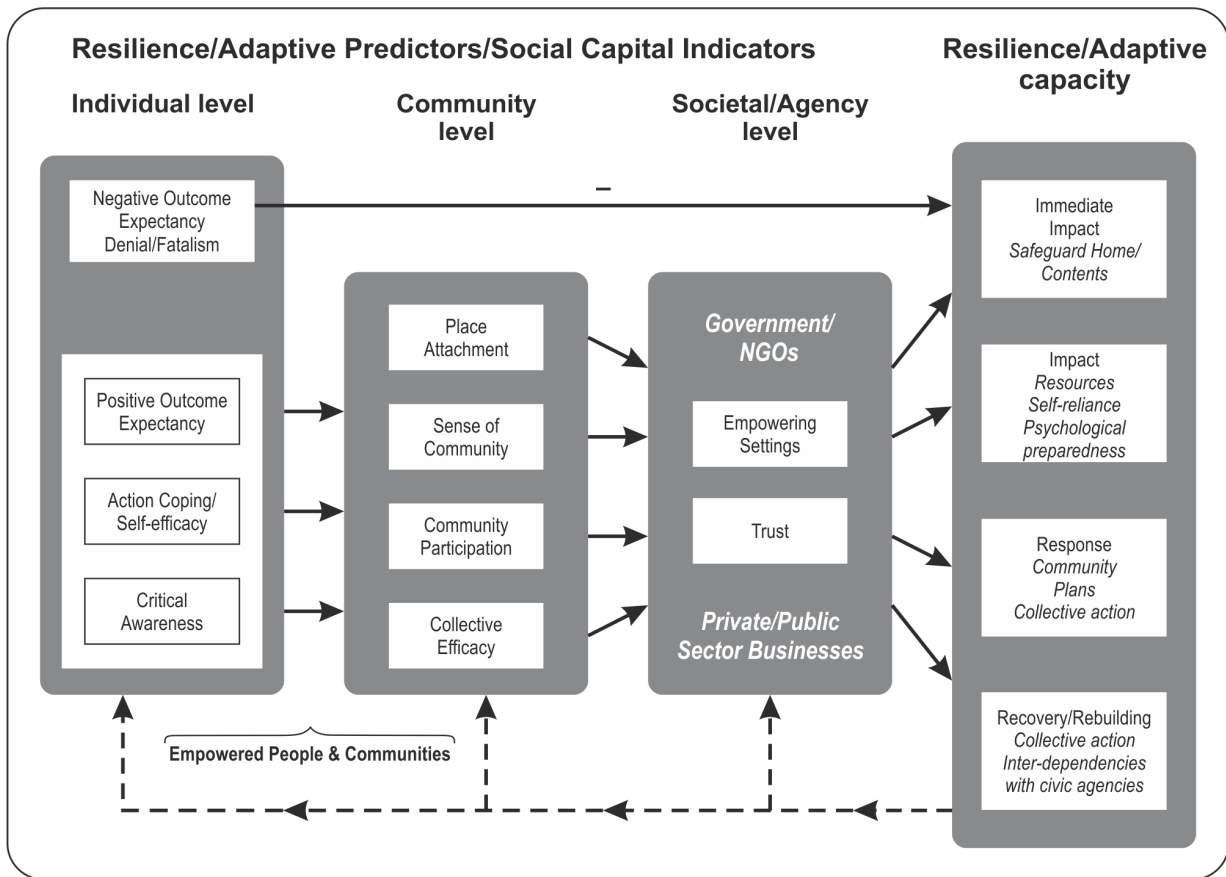
Note. Source: Paton (2019) and Becker, McBride et al. (2013).

the ineffectiveness of a volcanic risk communication programme on preparedness behaviour. The CET attempts to improve upon our understanding of the wide range of perceptions, beliefs, and attitudes influencing preparedness behaviour focused on in other models (e.g. Duval & Mulilis, 1999; Lindell & Perry, 2012; Mulilis et al., 2000; Mulilis et al., 2003; Terpstra & Lindell, 2013) to refine key variables, better understand the interaction between these variables, and better define the role of external influences in the preparedness process (such as community participation, empowerment, and trust). The theory highlights that if people believe their personal actions can mitigate risk (outcome expectancy), they are more likely to engage with others to collectively identify and formulate their risk management needs and strategies (community participation and collective efficacy). The CET also suggests that if people perceive their needs as having been met through their relationship with civic agencies (empowerment), they are more likely to trust civic agencies and the information they provide and use their information to make readiness decisions.

Many variables within the theory align with previous research, for example the importance of outcome expectancy beliefs in the preparedness process (e.g., Duval & Mulilis 1999; Mulilis et al., 2000; Mulilis et al., 2003; Lindell & Perry, 2012), the importance of community participation (e.g., Rawsthorne et al., 2023), and how empowerment can build trust (e.g., Akpotor & Johnson, 2018; Conger & Kanungo, 1988). However, the CET has contributed to identifying more about the nature of these variables and the interactions between them. For example, negative outcome expectancy and positive outcome expectancy follow different processes, with NOE directly hindering preparedness actions via beliefs such as fatalism and POE fostered though community participation, empowerment, and collective efficacy to achieve preparedness (Paton, Bajek et al., 2010. Further, the CET distinguishes that collective efficacy plays an important role both in individualistic and collectivistic cultures but via different mediating pathways (Paton, Bajek et al., 2010).

The testing of the CET, and the subsequent demonstration of its efficacy across diverse hazards and cultures,

has supported the CET meeting the criteria of having all-hazards and multi-cultural utility. Demonstrating all-hazard and multi-cultural applicability of CET is important for multi-cultural countries that experience diverse hazards like Aotearoa New Zealand. Validating the CET in all-hazard and multi-cultural contexts provides an evidence-supported approach to DRR readiness planning and intervention. Other work, such as the preliminary development of a social adaptive capacity model in Taiwan that builds upon CET, could further expand understanding of similarities and differences across cultures. Additional work can also be directed to explore how culture in general (e.g., the CET variables and their relationships) and culture-specific factors (i.e., beliefs, practices, and relationships in specific cultures) can play complementary roles in theory and intervention development. Some preliminary work regarding the CET in this context can be found in Paton (2020).

The research discussed in this paper supports that CET has utility and value for developing and assessing preparedness for specific hazards and across hazards as well as in specific countries. However, it is also important that work is undertaken to further evolve the theory; CET should not be seen as an end in itself but as a useful starting point which then needs constant evolving to adapt to the constant changes occurring to stay useful. That is, CET needs to be an evolving theory.

While all the theories listed in Table 2 have demonstrated their empirical utility, the fact that they each tap into diverse antecedents of readiness behaviour raises the question whether it would be of value to integrate these theories to further advance understanding of preparedness. Adhikari et al.'s (2018) work demonstrated that preparedness theories can be integrated and the value of doing so. The paper also discussed the value for further theory development that can be derived from the systematic exploration and analysis of disaster survivors' accounts of the competencies, beliefs, and relationships that helped or hindered their ability to respond to and recover from their disaster experience. The paper further draws attention to the value of reviewing and further refining the research approaches, to further develop and then test/evaluate preparedness models to support the ongoing evolution of preparedness theorizing.

Research on the CET has helped unpack universally important attributes for developing readiness for hazard events. The theory can be used to guide readiness interventions, with the proviso that these are adapted to be specific to different cultural settings. In the Christchurch earthquake recovery context, for example,

interviews showed that beliefs related to positive outcome expectancy were not prominent. This finding is in contrast with other countries, such as Taiwan, where outcome expectancy beliefs are entrenched in the socio-cultural environment. For Aotearoa New Zealand then, culture-specific aspects identified by CET research point to the need for more focused interventions on outcome expectancy to help people understand that undertaking readiness activities will lead to a better post-disaster outcome. This intervention should be conducted in conjunction with complementary initiatives that support participation, collective efficacy, and empowerment. Any Aotearoa New Zealand-focused approach would also need to consider local cultural nuances, including attitudes and beliefs that influence people's involvement in readiness activities, and in contexts relevant to Māori. Other countries will need to take a different approach than Aotearoa New Zealand and apply the CET to their own culture to ensure tailor-made interventions are developed to enhance readiness within local cultural contexts.

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