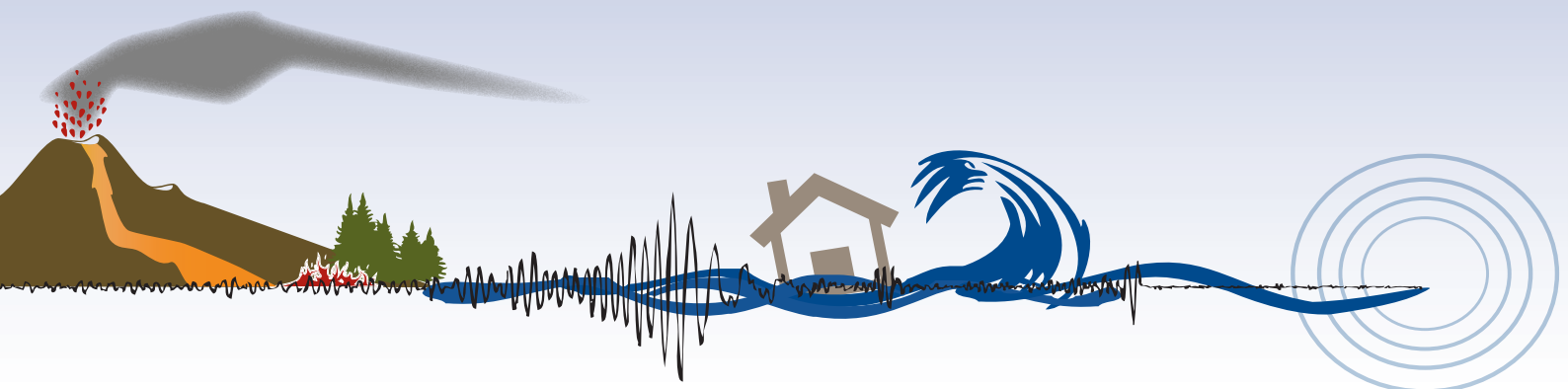




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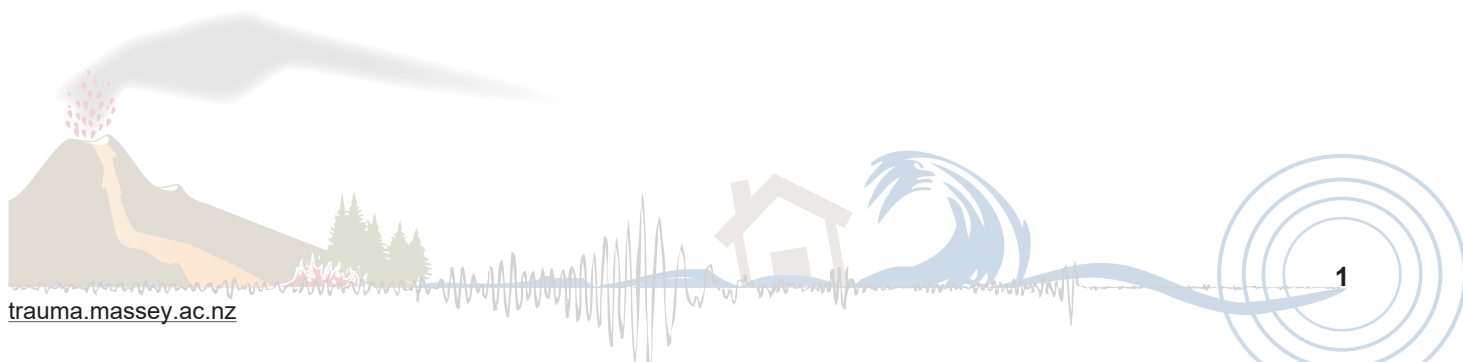
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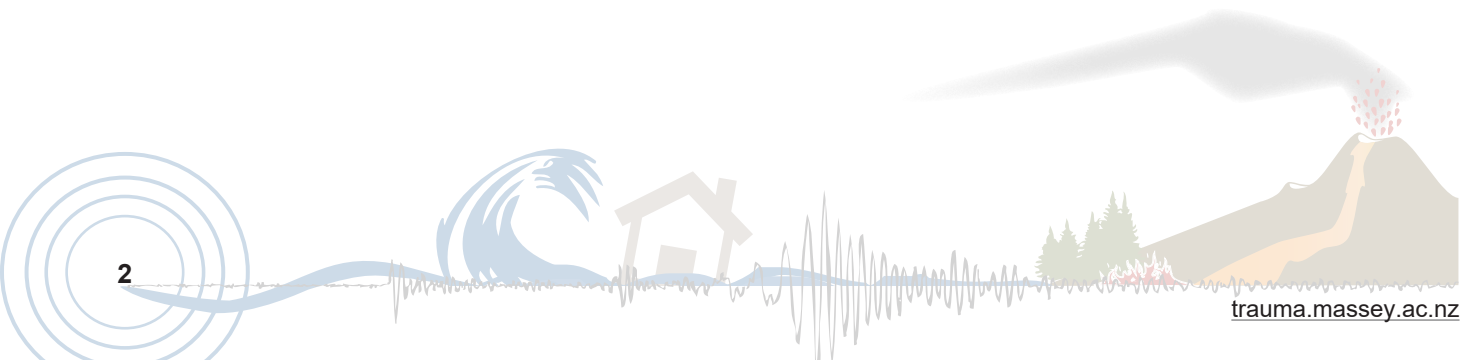
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“To Leave Something (meaningful) Behind”: Honouring the Late Professor Douglas Paton and his comprehensive meaningful DRR legacy

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To Leave Something Behind

Sean Rowe

*I cannot say that I know you well
 But you can't lie to me with all these books that you
 sell
 I'm not trying to follow you to the end of the world
 I'm just trying to leave something behind
 Words have come from men and mouse
 But I can't help thinking that I've heard the wrong
 crowd
 When all the water is gone my job will be too
 And I'm trying to leave something behind
 Oh money is free but love costs more than our bread
 And the ceiling is hard to reach
 Oh the future ahead is broken and red
 But I'm trying to leave something behind
 This whole world is a foreign land
 We swallow the moon but we don't know our own
 hand
 We're running with the case but we ain't got the gold
 Yet we're trying to leave something behind
 My friends I believe we are at the wrong fight
 And I cannot read what I did not write
 I've been to His house, but the master is gone*

*But I'd like to leave something behind
 There is a beast who has taken my blame
 You can put me to bed but you can't feel my pain
 When the machine has taken the soul from the man
 It's time to leave something behind
 Oh money is free but love costs more than our bread
 And the ceiling is hard to reach
 Oh the future ahead is already dead
 And I'm trying to leave something behind
 I got this feeling that I'm still at the shore
 And pockets don't know what it means to be poor
 I can get through the wall if you give me a door
 So I can leave something behind
 Oh wisdom is lost in the trees somewhere
 You're not going to find it in some mental gray hair
 It's locked up from those who hurry ahead
 And it's time to leave something behind
 Oh money is free but love costs more than our bread
 And the ceiling is hard to reach
 When my son is a man he will know what I meant
 I was just trying to leave something behind
 I was just trying to leave something behind*

Professor Douglas Paton



On the 24th of April 2023, the disaster sector lost one of its most influential leaders: Professor Douglas Paton. After “walking the talk” in the face of adversity right to the end, and healing several cancers for over 4 years, Douglas reclaimed his power and chose to pass over. As he wished, Douglas was at home surrounded in a circle and held by his mum, partner, sister, niece, and nephews listening to “Leaving Glen Affric”. Douglas passed over imbued with deepest love, content, fulfilled, and at peace. Humble as he was, Douglas’ wish was to “just fade away” - he only wanted to have a small private celebration of his life and farewell. Accordingly, his family and partner honoured and mourned Douglas following ancient Scottish traditions. For the Paton family, this poem “Epitaph On My Own Friend” by the national poet of Scotland Robert Burns is reflecting who Douglas was:

An honest man lies here at rest,
As e'er God with his image blest:
The friend of man, the friend of truth;
The friend of age, the guide of youth:
Few hearts like his, with virtue warm'd,
Few heads with knowledge so inform'd:
If there's another world, he lives in bliss;
If there is none, he made the best of this.

The family and his partner bid their final farewell to Douglas by listening to the song he wanted to leave with, “To Leave Something Behind” by Sean Rowe. As with everything with Douglas, this song choice was deeply thought through. The lyrics express that Douglas believed that the predominant Western superficial materialistic, mechanical, and individualistic culture prioritises financial gain over the health and wellbeing of humans and nature. They also reflect thoughts that the predominant Western culture is increasingly eroding knowledge and wisdom regarding the profound aspects of life including our own human nature, threatening the very existence of all life. Douglas felt the deep pain of the broken state humanity is in. In response, Douglas was interested in finding and understanding life’s deeper truth and wisdom and pursued this path with tenacity. Rather than leaving a mark that is about fame and tied to the material world, Douglas desired to contribute something that truly matters and has value – that enables and empowers humans in heartfelt and substantial ways to reclaim their soul and power. To accomplish such a legacy, he worked tremendously hard and sacrificed a lot to create and leave behind a body of knowledge and wisdom. Douglas wanted to offer people and communities, especially those living in less privileged circumstances, knowledges that enabled them to (re)build their individual and collective capabilities and

capacities to restore and ensure their health and safety in the face of an increasingly broken world. He hoped people would realise what really matters and shift their choices and subsequent actions accordingly.

There were so many diverse and wonderful facets to Douglas. He and his life were tremendously rich and deep. Most of all, Douglas was and always will be a deeply loved, respected, and appreciated son, partner, brother, uncle, great-uncle, friend, collaborator, colleague, and neighbour. Besides his Scottish name, he also has a Chinese name and a Yolŋu name. His Taiwanese collaborators named Douglas 羅, 錦福 - 羅 (Lwo): the four ethical principles of propriety, justice, honesty, and sense of shame; 錦 (Jin): brocade, brilliant, gorgeous, bright; and 福 (fu): happiness, good fortune, good luck, blessing, bliss. His Yolŋu (Australian Indigenous peoples living in East Arnhem Land) collaborators call Douglas their Yinḍi Bungawa (big boss). A Senior Elder adopted him and named him Bulmanydji (shark) Munugurr. Douglas truly lived an authentic, rich, and fulfilled life. He accomplished all his dreams, learnings, and purpose. He will continue to live on in our diverse rich memories as a loving and caring, humble, strong yet gentle, authentic, gracious, and loyal human being who lived with great integrity and sense of purpose.

Douglas contributed so much to humanity and our earth. Douglas was a brilliant, humble, committed, and wise scholar – researcher; educator; supervisor for numerous honours, masters, and 34 PhD students; mentor to many early and mid-career scholars; and advisor to a wealth of national and international business, professional, and philanthropical organisations. Douglas was not only humble, but liked to help the people he met to fly and thrive - he liked “to make soldiers believe and work to become generals”.

Douglas was able to see, understand, and be with complexity, uncertainty, processes, and contradictions. He could view issues from multiple perspectives and see relationships between them. He loved learning for the sake of learning. He was inherently curious, and loved inquiring and working out how things work. Douglas’ mind became over time an encyclopaedia of disaster risk reduction (DRR) and associated bodies of knowledge. His writing was skilfully crafted – logically-flowing and concise stories that took readers on a journey exploring what facilitates and what hinders us individually and collectively developing adaptive capabilities and capacities that ensure our safety, health, and growth.

Douglas worked extremely hard and with immense commitment to create this legacy.

Douglas grew up in Scotland. When he was only 5 years old, he proclaimed to his parents upon seeing the University of St. Andrews that he would study and work at this university and so he did, foreshadowing a life that was characterised by having dreams and working with great dedication, humility, and persistence towards fulfilling them. Being present a lot in nature and a deep thinker as he grew up resulted in Douglas studying first geology and then psychology at the University of St. Andrews. His inquiring into disasters meant that he could use both his passion for earth sciences and psychology, giving him a unique perspective that appreciates both the natural and the human world. In line with the strong behaviourist focus psychology had in the 1970s and 1980s, his research started with studying the behaviours of birds. For his honours project, Douglas studied the orientation mechanisms in the juvenile Southern puffin and possible relation to their sea-finding behaviour on the Isle of May (1976, supervisor: Dr. Robert Prescott). He went on to investigate the reactor responses given by great skuas who did not attack or escape after displaying in the club areas of breeding colonies on Noss, Hoy, and Fair Island for his PhD project at the University of Edinburgh (PhD supervisor: Dr Peter Caryl; Paton, 1986; Paton & Caryl, 1986).

In the next paragraphs, we have tried to give a chronological overview of Douglas' vast body of work to show how, over the course of his academic career, he systematically developed a rare comprehensive yet nuanced interdisciplinary understanding of DRR by researching and weaving together several key lines of inquiry. This overview also provides insights into how Douglas' thinking and understanding developed over time. Given that Douglas published his work in over 300 publications, it was impossible for us to provide all the references within the limits of this editorial. We also thought that including all the references would distract from the narrative. Thus, we hope that traversing Douglas' legacy inspires readers to explore Douglas' [Scopus](#), [GoogleScholar](#), and [ResearchGate](#) accounts as well as his [publication list](#).

The Early Years: From Investigating the Child as Helper to Psychological Influences on and Impacts of "Chronic Environmental Disasters"

Following completion of his PhD, Douglas' academic career started at the University of St. Andrews in the late 1980s. Using an integrative approach, he investigated

chronic childhood illness and the child as helper in overcoming illness, perspectives on gaming and simulation, and the psychological dynamics influencing disaster helpers and implications for counselling. In the 1990s, he recognised that disasters were persisting and coined the phrase "chronic environmental disasters". Through Douglas' formal training in psychology, he realised the importance of considering the social aspects of disasters, especially organisational and community aspects.

Douglas' early disaster research explored psychosocial influences on, and impacts of, disasters focusing on preparedness, incident response and crisis/emergency management, and recovery management. In particular, he focused on assessing the impact of disasters on disaster responders, helpers and relief workers (e.g., emergency services personnel, police, fire fighters, nurses), and families of these critical high-risk occupations and communities. He also explored how to train these cohorts to develop their capabilities and capacities to prepare for and recover from chronic exposure to work-related risk and psychological traumatic stress to enhance their mental health and wellbeing. Douglas researched these aspects from the perspective of high-risk occupations and communities, as well as the emergency management and organisational perspectives. The training and support he explored included pre- and post-event interventions such as education regarding managing traumatic stress and psychological trauma, debriefing, peer support, counselling and mental health services, human resource strategies, and integrating recovery resources and the recovery environment. In terms of emergency and community disaster management, Douglas increasingly explored and integrated psychological, social, cultural, religious, economic, and technical aspects, processes, and solutions. His work aimed at promoting psychosocial wellbeing and quality of life and increasing operational effectiveness.

Advancing Understanding of Long-term Processes Especially Building Adaptive Capabilities, Capacity, and Resilience

Starting in 1995, Douglas realised the importance of processes and adapting a long-term perspective and thus expanded his investigations – considering processes in addition to influencing variables. In particular, he explored building adaptive capabilities and resilience and assessing long-term impacts of disasters on critical occupations and communities. Whilst Douglas utilised organisational and community psychology theories and research for his work, around 1997 his awareness of the

importance of comprehensive emergency management and the value of the diverse social sciences started to emerge, laying the foundations for his work becoming first multidisciplinary and later transdisciplinary. During the 1990s, after moving from Scotland to Australia in 1991 and then Aotearoa New Zealand in 1996, Douglas' work became increasingly international and started to also consider the influence of culture. His move to New Zealand coincided with the end of the 1995-96 Ruapehu eruptions. The 2000 GSA paper on the 1945 and 1995-96 Ruapehu impacts by David Johnston, Bruce Houghton, Kevin Ronan, Vince Neall, and Douglas was the first geological hazard paper Douglas published.

About 2000, Douglas started to realise that whilst preparing, responding, and recovering are imperative to disaster resilience, it is important to take a proactive long-term approach that integrates risk, vulnerability, and resilience across diverse hazards and has at its core community development. He also investigated posttraumatic stress in high-risk professionals and their families and interventions to manage this stress and increase resilience by promoting social-cognitive capabilities (especially perceptions), growth, empowerment, team resilience, and environmental resilience. Douglas explored these aspects across volcanic eruptions, tsunamis, earthquakes, and bushfires.

Expanding to Comprehending Adaptive Post-traumatic Growth, Co-existence, Community Development, and Cross-cultural and All-hazard Approaches

Around 2005, Douglas increasingly realized the critical importance of humans to reduce disasters by learning to co-exist and live in harmony with nature rather than fighting against and exploiting nature. Accordingly, Douglas continued his research with high-risk professionals (especially police), emergency management, organisational resilience, and community resilience but started expanding his thinking from the predominant focus on the "dark" side of disasters to the "bright" side of disaster by focusing his research on adaptive and growth outcomes, posttraumatic growth in high-risk professions, community sustainability, developing adaptive capacity, and building capacity to live in co-existence with hazards and reducing the risk. Knowledge gained from moving from Scotland to Australia and New Zealand, experiencing diverse hazards and working with academics, students, and practitioners living in different countries and working with different hazards, led to Douglas developing

increasingly an appreciation of citizens and communities being at risk from multiple hazards and hazards sharing similarities. As a result, he realised the great value of preparing for diverse hazards simultaneously. Douglas also increasingly realized the critical influence of culture on all disaster phases and the great value of learning from diverse cultures. These two aspects led to Douglas being interested in and passionate about developing knowledge that holds across hazards and cultures. Consequently, he started engaging in an iterative cycle of developing-testing-refining disaster theories in many different countries to develop all-hazard and cross-cultural theories.

Gaining More Nuanced Understandings of Evolving of the Many Components of Capable and Adaptive Citizens, Communities, and Societies

Douglas dedicated the next 15 years to building upon, expanding, deepening, and integrating increasingly diverse aspects influencing DRR to develop and test increasingly comprehensive DRR models that are valid and applicable across hazards, phases of the disaster cycle, and cultures and societies. To do so, he increasingly used an inter- and transdisciplinary approach and employed diverse quantitative, qualitative, and mixed methods research designs. Douglas expanded disaster resilience to integrate individual, community, institutional, and environmental/ecological perspectives and community resilience to include individual, household, community, and societal aspects. Douglas identified the characteristics of a disaster-resilient society and explored the complexity of social and ecological resilience to hazards. His research covered tsunamis, bushfires, earthquakes, and typhoons as hazards in different countries including Australia, New Zealand, USA, Japan, Taiwan, Indonesia, Portugal, and Thailand. With regards to the research with colleagues in the USA, it was Douglas' ideas that allowed them and him to get a US National Science Foundation tsunami proposal funded, which involved work in six Pacific and Atlantic coastal states (Hawaii, Alaska, Washington state, Oregon, California, and North Carolina). Douglas also worked on better understanding and enhancing community development and engagement, man-made and natural tsunami warning systems, child and family resilience, the police resiliency stress shield, and culturally-competent health systems.

From 2010, Douglas worked on developing more nuanced understandings of all-hazard and cross-cultural perspectives, developing sustained resilience in high-risk environments, cultivating household and

community capacity, building community preparedness and resilience (especially for bushfires), and engaging communities from the ground up. He also worked on distilling lessons and learning from them, planning for resilience in incident command personnel and systems in hospitals, developing response and recovery capabilities, evaluating disaster education, engaging and empowering communities, communicating uncertain scientific advice, self-esteem and sense of mastery influencing preparedness, multi-agency community engagement during recovery, earthquake information and its influence on household preparedness, and decision-making under conditions of uncertainty. Douglas also developed and tested his all-hazards theory for disaster resilient communities and developed a model of household preparedness for earthquakes, an evidence-based framework for psychosocial recovery, a research framework for complex multi-team coordination in emergency management, a conceptual framework for responses to natural hazards focusing on risk interpretation and action, and an ecological theory of resilience and adaptive capacity. His work included mainly the Christchurch earthquakes, bushfires in Australia and Portugal, and volcanic eruptions in Hawaii. Douglas also engaged in Antarctic psychology research.

Starting to Weave Understandings and Knowledges with Transformative Learning to Sustainably Reduce Disaster Risks and Increase Quality of Life

From 2015 to 2022, Douglas continued to conduct research in all the strands he had worked on to develop comprehensive, nuanced, and multifaceted models, applying and using the Sendai Framework for Disaster Risk Reduction priorities and principles (United Nations Office for Disaster Risk Reduction [UNDRR], 2015). He increasingly became aware that humans developing the adaptive capabilities and capacities required to sustainably reduce the risk by living in harmonious relationships with nature necessitates transformative learning. Thus, he inquired into how to best accomplish these individual and collective sustainable transformations. This shift in awareness arose mainly from and led to Douglas working increasingly with Indigenous peoples in Taiwan, Australia, Aotearoa New Zealand, Pakistan, and Indonesia. These systematic in-depth qualitative research projects led to him realising the great value of learning from and with Indigenous worldviews, knowledges, and practices in different countries and collectivistic cultures and societies. His work increasingly integrated and linked environmental, spiritual, psychological, cultural, and social dimensions

across the scales (local to global) and phases of the disaster spiral (reducing the risk-preparing/getting ready-responding-recovering-rebuilding/regenerating-reducing the risk). Furthermore, Douglas increasingly started linking the phases of the disaster cycle. In all his work, he always made sure that he linked and built bridges between theory and practice by working with practitioners. He also detailed the implications of his work for practice applications including policies for developing the individual and collective adaptive capabilities and capacities of citizens/community members, first responders, organisations, and government. Douglas expanded research to Iran, Pakistan, Nepal, Myanmar, and Antarctica.

Leaving a Legacy: Weaving Together the Comprehensive Transdisciplinary Cross-cultural All-hazard DRR Theories Across the Disaster Cycle for Creating a Direction for the Future of DRR

In the last 3 years of his life, Douglas focused his publications on weaving together the various theories containing the large bodies of knowledges in the parallel strands he had worked on for 30 years to provide answers to the UNDRR (2015) Sendai Framework calls for DRR, identify critical gaps in knowledge, and recommend future research directions. He expressed the essence of this work in his last book (Paton, 2022) and in the publications in this special issue.

Douglas wrote his latest book *Advanced Introduction to Disaster Risk Reduction* (Paton, 2022) under extremely challenging circumstances. That he managed to complete the book is a miracle and testimony to him “walking his talk”. His aim was to contribute to creating a systematic foundation for DRR by “providing evidence-informed insights into understanding people’s (individual and collective) reticence to engage with DRR process and identifying how to reverse this trend and facilitate people’s active participation in DRR in ways that support realising the SFA goals” (Paton, 2022, p. 2). To this end, Douglas details in this book how the Sendai Framework can be put into action in practice to develop and implement cost-effective whole-of-society approaches that increase individual and collective adaptive capabilities and capacities that increase resilience. Utilizing the comprehensive knowledges he systematically built up with about 300 colleagues from around the world for over 30 years, and knowledges put forth by diverse disaster scholars, he offers a comprehensive discussion of the core areas of DRR. The book includes an overview of the Sendai Framework for DRR, disaster risk, the environmental context of DRR,

hazard characteristics and behaviours, anticipation, preparedness, international context of DRR and cross-cultural issues, DRR in response and recovery settings, assessing the effectiveness of DRR using cost-benefit and evaluation perspectives, transformative learning, capacity development, and building back better.

Douglas concludes this book – and his life-time work – emphasising the importance of “knowing DRR for the first time” (Paton, 2022, p. 136). That is, whilst he and we have substantially increased our understanding of DRR, with the world and our understanding of the world constantly changing, and with natural processes exponentially growing and becoming more damaging, it is critical that we stay open to transformative learning ourselves. In Douglas’ words: “developing ways to know DRR for the first time must become the norm” (Paton, 2022, p. 136). He offers some ideas for these explorations by discussing a socio-cultural-environmental framework, community development and DRR, transformative learning, transdisciplinary strategies, adaptive governance, cost-benefit analysis and evaluation, organisational continuity planning, learning and collaboration in international settings, and working together with Indigenous peoples.

The DRR knowledges Douglas shares integrate all hazards, all phases of the disaster spiral, cultural similarities and diversities, research-theory-practice including development and evaluation of DRR policies and programmes, individual to collective scales, individual and collective learning, and capability and capacity development. The wisdom offered goes beyond DRR – it is applicable and useful for transforming our cultures and societies at large in ways that ensure harmony and health.

The comprehensive DRR ecosystem Douglas created is especially valuable in a world in which we are individually and collectively increasingly lost and overwhelmed because most of us are stuck in formal operational thinking that prevents us from being open to, exploring, seeing, and understanding the big picture, complexity, visible and invisible aspects, and processes. Humanity can choose to use Douglas’ wisdom to reduce the risk of disasters, to empower and enable people to be safe, and to use the disasters as transformative opportunities to lift humanity to its next level of evolution as he intended. We researchers and practitioners can choose to use, build upon, and further expand his work individually and collectively to continuously “develop... ways to know DRR for the first time” to transform our culture and society (Paton, 2022, p. 136).

Leaving Behind an Extraordinary Wealth of Contributions and Wisdom for Reducing the Risk of Disasters

The late Douglas dedicated this book – his lifetime work and legacy – to his parents to express his eternal gratitude to them. He says, “They nurtured my love of learning, showed me how to apply knowledge with integrity, humility and compassion, and instilled in me the importance of never stopping asking questions” (Paton, 2022, p.iii). Douglas’ life and work, his extensive contributions to and empowerment of the many people who had the great fortune to know and interact with him, and the valuable legacy he leaves for humanity at large, are a demonstration that he embodied these qualities.

Douglas was truly a world class researcher, who is highly respected nationally and internationally. His professional career traversed many institutions and communities around the world. Douglas was a professor at several universities. When he passed over, he was an Adjunct Professor at the University of Canberra, a Research Fellow at the Joint Centre for Disaster Research, Massey University (Aotearoa New Zealand), and a Senior Research Fellow at the Bandung Resilience Development Initiative (Indonesia). In 2005-2006, he was the Australian delegate to the United Nations Educational, Scientific and Cultural Organization Education for Natural Disaster Preparedness in the Asia-Pacific. He was a member of the UNISDR (now UNDRR) RIA sub-committee (2012-2016) and served on the Psychosocial Advisory Committee for the Christchurch earthquake (2011-2013). In 2014 his role as a Technical Advisor on Risk Communication with the World Health Organization helped develop the community engagement programme for the Ebola response in Sierra Leone.

Douglas has been listed in the Stanford University/ Elsevier BV list of the top 2% most cited researchers worldwide in the last years. In 2021, 2022, and 2023, the Australian Research Review listed Douglas as the top Australian researcher in the Emergency Management/ DRR field of research. Douglas has an h-index of 50 on Scopus and 65 on ResearchGate. Douglas published 24 books and about 300 peer-reviewed papers and chapters with approximately 300 collaborators from across the world. Douglas founded this journal and has served as Editor of the *Australasian Journal of Disaster and Trauma Studies* (AJDTS), *Disaster Prevention and Management*, and the *International Journal of Mass Emergencies and Disasters*. He greatly contributed to several journal editorial boards, including the *International Journal of*

Environmental Research and Public Health, Disasters, and the International Journal of Disaster Risk Reduction.

Douglas leaves behind an extraordinary body of knowledge and wisdom that will be increasingly valuable for humanity as disasters and climate change continue to increase. The body of knowledge and wisdom he created is rare and unique in many respects. It is a comprehensive yet nuanced transdisciplinary DRR knowledge ecosystem that weaves together systematic quantitative and qualitative research findings from multiple disciplines and practice using high-level conceptual post-formal thinking into coherent and concise theories and publications. This DRR knowledge ecosystem considers and weaves together the influence of all the key aspects and dimensions that influence DRR and ultimately health, wellbeing, survival, and growth:

- all hazards – bushfires, volcanic eruptions, cyclones/typhoons, earthquakes, tsunamis, pandemics;
- all phases of the disaster cycle and how they interact over time in a spiral-like manner to either increase or decrease DRR – preparing/becoming ready/planning-responding-recovering-rebuilding-regenerating-preparing/becoming ready...;
- all key players – high-risk professions linked to hazards (especially police, nurses, emergency management personnel, firefighters, relief workers, responders, Antarctic expeditioners), adults, children, families, communities, organisations, and government;
- diverse aspects of individual (psychological, spiritual) and contextual (natural, built, cultural, social, religious/spiritual, technological, economic, political, media) dimensions or parts and how they interact over time (historical and future dimension);
- the individual and contextual dimensions within and across the diverse scales (families, households, communities, and organisations and governments at the local to global international scale) and how they interact over time;
- cultural similarities and diverse ways of being-knowing-doing that facilitates DRR – Aotearoa New Zealand, Australia, USA, Taiwan, Portugal, Indonesia, Japan, Thailand, Pakistan, Iran, Nepal, Ethiopia, Fiji, Netherlands, Nepal, Antarctica;
- the wisdom of ancient Western, Asian, and Indigenous ways of being-knowing-doing;
- how the parts and the systems learn and adapt, and how this learning and adapting can be facilitated to induce individual and collective transformative learning that sustainably (re)builds individual and collective

adaptive capabilities and capacity required for surviving and thriving; and

- offers evidence for diverse practical and cost-effective pathways for not only increasing DRR and all associated benefits but creating a more functional harmonious culture and society.

A Joined Legacy that Emerged from Mutually Benefiting Collaborations and that is Ensuring that Douglas' Legacy is Living on and Expanding

Douglas would be the first to emphasise that this extraordinary comprehensive DRR ecosystem is not his work alone but the outcomes of wonderful, enriching collaborations with about 300 researchers, practitioners, and public servants from around the world he was blessed to work with. Douglas interacted with, experienced, learned from, contributed to, developed, and touched a great variety of friends and colleagues around the world from a wealth of diverse walks of life (belief systems, countries, cultures, organisations). He always valued, allowed, empowered, and honoured unique and diverse ways of being-knowing-doing. Douglas was highly open and receptive to, and built upon and expanded, new and contradictory ideas. Douglas supported and brought people together to achieve their and his respective visions and aims, and to create and accomplish shared common goals. Only Douglas has the overview of these collaborations, but we thought he would have loved for us to concisely provide examples of how we collaborated to demonstrate the importance of the international and transdisciplinary nature of his collaborative approach, and to acknowledge and honour all the colleagues who collaborated with him throughout his career. Thus, we are offering brief snapshots of our personal experiences of collaborating with Douglas as exemplars:

John Violanti (Professor of Epidemiology and Environmental Health, USA):

Douglas and I first met in New Orleans at a conference on traumatic stress in 1990. We immediately became friends and collaborated in research over many years. Douglas and I wrote and edited many books and articles together. Douglas had keen sense of knowing; he grasped the problem of stress, trauma and recovery quickly in the law enforcement profession which we studied together most often. His understand of a profession he never worked in amazed me. The idea of CET stands out. I find it difficult to speak of Douglas as not here. To me, his spirit and caring for humankind will always be here. Somehow, his

loss was also my loss. I have little doubt that Douglas's contribution to humankind will forever be etched in time. He truly "left something behind". We developed the stress shield theory together, which provided a new first look at the development of resilience among police officers.

David Johnston (Distinguished Professor of Disaster Management and Director of the Joint Centre for Disaster Research, Aotearoa New Zealand):

Douglas joined Massey University in 1996, in the final year of my PhD. I had been studying the impacts of volcanic eruptions and was writing up my research when he joined the staff of the School of Psychology. Although not a formal supervisor he was a great mentor in my final stages and then began our friendship, partnership and fellowship. For the next 28 years we worked together on many projects. For a decade he was closely associated of our research programme at GNS Science, involved in the plotting to establish the Joint Centre of Disaster Research at Massey University and many other initiatives. We jointly supervised many PhD students, presented at many conferences and workshops and co-developed many research projects. Always available for a quick call or a lengthy discussion. Through Douglas I also met many others, for which I am grateful.

Chris Gregg (Professor Physical Volcanology & Risk Management, USA):

I first met Douglas shortly after beginning my doctoral studies in Geology & Geophysics at the University of Hawai'i in 2000. Douglas and David Johnston had recently published with my dissertation advisor (BF Houghton) on social and behavioural issues affecting responses to the 1995-96 explosive eruptions of Ruapehu volcano, Aotearoa New Zealand. These three and two other committee members provided me the opportunity to learn about Douglas' social cognitive approach to understanding and modelling human decision making in response to geological hazards. Douglas was influential in providing research guidance to me—a geologist learning to use social science research methods to better understand factors affecting decision making other than the characteristics of the hazards themselves. Our work together greatly expanded in the years following the 2004 earthquake and tsunami in south Asia. We went on to explore tsunami preparedness in south Asia and in the USA and its territories, which subsequently led to several US federal grants to translate research findings to risk reduction actions in these countries.

Petra Buergelt (Associate Professor – social sciences and health; Germany, Aotearoa New Zealand, Australia):

Douglas and I met at Massey University in New Zealand in 2000. Because of my qualitative research skills, he engaged me for various research studies regarding the psychosocial factors influencing individual and community tsunami and pandemic preparedness, and risk management for natural hazards. Over the ensuing years, we had regularly deeply insightful, critical, expansive and meandering conversations whilst we worked together on numerous joined projects and publications, and supervised many honours, MA and PhD students together. We complemented each other like yin and yang. For example, Douglas held a tremendous wealth of disaster and other knowledges, had the quantitative research skills, synergised vast amounts of knowledges and wrote concisely. I brought qualitative research skills, and new fresh perspectives (e.g., diverse holistic and critical philosophical paradigms, living in harmony with nature, transformative learning, ancient and Indigenous ways of being-knowing-doing) that fitted with and expanded his thinking in these areas. Together, we developed, expanded and applied the ecological risk management and capacity building model. In the last 10 years, we worked with Indigenous peoples in Taiwan and Australia, exploring together two-way transformative learning and other transformative pathways including ancient Western and/or Indigenous ways of being-knowing-doing, nature, arts, and governance for reducing the risk of disasters together, and with colleagues and PhD students. Douglas had the very special gift of creating a space in which one could be completely oneself and express oneself. He genuinely honoured everybody as a special person and saw everybody as holding vital knowledges. Douglas valued these knowledges, deeply listened and expanded these knowledges through dialogue. Often, he didn't even have to say much – already his presence was sufficient to reassure, strengthen, lift up and inspire to raise one's game. There is nobody like him; he was tremendously special - a highly valuable academic and human being.

Julia Becker (Associate Professor – social sciences, Aotearoa New Zealand):

I met Douglas as a Masters student at the University of Waikato, when I attended the first GNS Science Volcano Short Course. When I joined the GNS Social Science team Douglas was already a close associate. Like David I work with Douglas for the next two decades on topics related to preparedness and resilience. Douglas was

also my PhD supervisor, and was a supportive mentor, always interested in what my unique findings were, and how they contributed to theory. Douglas was fun to work with and always challenged me to think about aspects of disaster risk reduction I hadn't considered. As a wider team of researchers and practitioners we worked across many locations in New Zealand including Auckland, Hawkes Bay, Manawatū, and Canterbury.

Li-ju Jang (Associate Professor – social work, Pingtung, Taiwan):

I first met Douglas in person in 2007. However, I knew him in early 2004 through his articles on promoting wellbeing (1996) and disaster and community resilience (2001 & 2003). At that time, I was working on my dissertation proposal on the impact of the 921 Earthquake on survivors. In Douglas and colleagues' articles, I found the disaster resilience and post-traumatic growth I witnessed in Taiwan. My advisor, Dr. Walter LaMendola, encouraged me to email Douglas and discuss my observations with him. Douglas answered every question I had in great detail. We soon became pen pals and discussed disaster and community resilience through emails. Several months later, Douglas agreed to serve as my dissertation committee member. In 2007, I invited Douglas to lecture on disaster resilience at our university and introduced him to the research team in Taiwan. From then on, our cross-culture all hazards collaborative project began. Together, we visited the National Fire Agency and local fire stations in the affected areas to understand Taiwan's disaster rescue and relief system. We visited severely affected areas by the 921 Earthquake of 1999 and Typhoon Morakot of 2009. We visited and talked with disaster survivors, witnessed levels of disaster resilience of various ethnic groups in Taiwan, such as Indigenous and Hakka groups, and made friends with them. Those survivors taught us how to co-exist with disaster and live in harmony with nature. Douglas and I co-organized the "New Directions in Disaster Recovery and Reconstruction: Livelihoods, Resilience and Sustainability" conference in 2014 and the "Community-Based Disaster Risk Reduction and Recovery" conference in 2017. Thank you, Douglas, for your support and companionship on my academic journey.

Fantina Tedim (Professor – Human Geography, Portugal):

I started working with Douglas in 2006 when I was beginning my research on the social dimension of

wildfires. After meeting Petra at a conference in Brisbane, she introduced Douglas to my work and I received an email from Douglas. We started discussing community preparedness and resilience, and sharing ideas. In only one month, we finished a proposal of a research project on wildfire preparedness in Portugal, which was approved by the Portuguese Science Foundation (FCT). We only met in person when our project started. During Douglas' visits to Portugal we had amazing scientific discussions. He never made me feel uncomfortable because of my limited expression in the English language and knowledge on the topic. Our discussions were extremely interesting, challenging and so illuminating. Douglas listened to my ideas, supported me and motivated me to grow scientifically in a very gentle and never invasive way. He never demonstrated that he was such an internationally important scientist and never made me feel that I was far below him in terms of knowledge. We published a book together with the results of the project in Portuguese. This book remains an important piece of work with ideas capable of improving some aspects of fire management in Portugal. Douglas was the scientist who most influenced my scientific career and my time with him was always a wonderful journey under blue skies.

Emma Hudson-Doyle (Associate Professor – geophysics, natural hazards, communication, and disaster social sciences, Aotearoa New Zealand):

I first became interested in Douglas' work as I branched from the physical science of volcanic hazards and crisis response, into how we effectively communicate this science with decision-makers tasked with that response. Douglas developed a set of seminal studies from the Ruapehu 1995-1996 eruptions that mapped out the information flow between key agencies during the response. This work identified the crucial challenges of distributed team response during a natural hazard event, and led the way to a body of research exploring individual and team response performance, high risk environments, stress risk management and effective communication mechanisms. I was privileged to draw on Douglas's expertise when I entered this research area in 2010, and through his advice and co-authorship we embarked on numerous studies building on his early work: including reviewing the science advice response mechanisms of recent exercises to compare to his early work on Ruapehu, developing experimental scenario exercises to explore team decision making in response to uncertain scientific advice, exploring lessons for communicating forecast statements and people's understanding of time,

and most recently adapting his early shared mental models research to conduct a study exploring how scientists, decision-makers, and others conceptualise uncertainty. Throughout this journey, Douglas was always so generous in sharing his knowledge and his time, helping to shape ideas, and encouraging different directions and reflections. He supported colleagues and students with equal enthusiasm and kindness. It was always such a gift to receive his extensive comments on manuscript drafts. I still return to this legacy of comments, to revisit the many valuable insights he shared, and through them I find that Douglas is still steering my thinking and future directions. What a privilege that is.

We are all eternally grateful to Douglas. He made us fly higher than we thought we could fly, because he was, and he always will be, the gentle yet powerful wind beneath our wings. He has been and always will be influencing our work.

Douglas Passing Over: An Extreme Sense of Loss and Heartfelt Sadness Around the World

Because of Douglas being such a rare, wonderful human being and scholar, many people across the world felt and still feel an extreme sense of loss and heartfelt sadness after he left. They deeply grieve for, celebrate, and honour Douglas in meaningful and culturally appropriate ways as individuals and groups around the world. The following excerpts from some of the many condolence letters and online vales give representative insights from different angles into Douglas and his work:

Professor Dame Sally Mapstone DBE, FRSE (Principal and Vice-Chancellor University of St Andrews):

I am writing to express my sincere condolences, both personally and on behalf of everyone at the University of St Andrews. [...] Douglas enjoyed a phenomenally prolific and successful academic career that allowed him to improve the lives of so many, particularly those most vulnerable, across the world. His outstanding body of work will stand as his lasting legacy. [...] We are very glad to have counted Douglas as an alumnus and an Honorary Senior Lecturer of our University.

Editorial Board of the *Disasters Journal*:

*Douglas was a sage and insightful editorial advisor on *Disasters journal* from 2014 to 2022, reviewing papers on community resilience, volunteer responses, psychological well-being, disaster preparedness and*

recovery. He will be much missed by everyone on the journal's board, as well as the editorial staff.

Dr. Rey-Sheng Her (Deputy CEO of Tzu Chi Foundation; Associate, Harvard University FAS CAMLab; Associate Professor Tzu Chi University):

I had the privilege of knowing and working with Professor Douglas Paton for nearly a decade. [...] I was struck by his compassionate spirit, which is rare to find in the academic world. [...] His research was full of insights and compassion, reflecting his love for the world. Through his outstanding philanthropic research work, he will continue to shine a light on the world and inspire people to contribute their love to those who are suffering. On behalf of the Tzu Chi Foundation's millions of members, I extend my deepest condolences to Professor Douglas Paton's family, friends, and colleagues. He will be dearly missed but remembered as an exceptional scholar and a compassionate human.

John Richardson (Australian Red Cross and the Australian Institute for Disaster Resilience):

It was combining these 2 inquiries into natural processes [geology and psychology] that lead him to be a world leader in helping us understand how we need to understand the mind as the barrier and enabler to people getting prepared for, coping with and recovering from disaster events. He was really the first person to realize that it is the human brain that gets in the way of making decisions about getting prepared, and he was able to explain it in a way that we could all understand. We can't underestimate his impact and influence on how we go about the complex beasts of preparedness and resilience building. Not only in Australia, but globally. [...] He was a wonderful person who was very generous with his time to Australian Red Cross at the beginning of its preparedness journey in 2008. [...] We have been fortunate to have Douglas and his immense intellect guiding us along the way. We have lost a titan. RIP Douglas.

Natural Hazards Research Australia:

It is with sadness that Natural Hazards Research Australia received the news of the passing of Prof Douglas Paton in late April. Douglas was a friend to many in the natural hazards research space through his involvement in the both the Bushfire and Natural Hazards CRC and Bushfire CRC. [...] Douglas' insight, knowledge and mentorship will be greatly missed.

Rosalyn H. Shute, PhD (Adjunct Professor of Psychology, Flinders University, South Australia):

[...] his research focus shifted to disasters and risk management, a field in which he was a leading light for over 30 years. [...] Thanks to his work, the world is in a better place to prepare for and address disasters such as wildfires, tsunamis, floods and earthquakes.

To honour Douglas and to continue his critically important work, his family, partner, and closest collaborators created the “Professor Douglas Paton Legacy Fund”, which will finance three scholarships and awards they believe are aligned with Douglas’ interests and values. Douglas’s family and partner gifted NZ\$160,000 to start the fund. Massey University’s Joint Centre for Disaster Research (JCDR), which Douglas co-created and which houses the *Australasian Journal of Disaster and Trauma Studies* that Douglas established, will host the scholarships and awards. We will gather annually in person and online to award the scholarships and awards to honour and expand Douglas’ work. We invite you to donate to the “Professor Douglas Paton Legacy Fund” so we can support more students.

Professor Douglas Paton’s passing has been and still is immensely sad and painful for all of us who had the great honour, privilege, and joy to travel parts of his journey here on Earth with him. We all will miss Douglas terribly – and Douglas will live forever on in our hearts and minds, and live on through us. Douglas’ legacy will continue to impact people today and into the future.

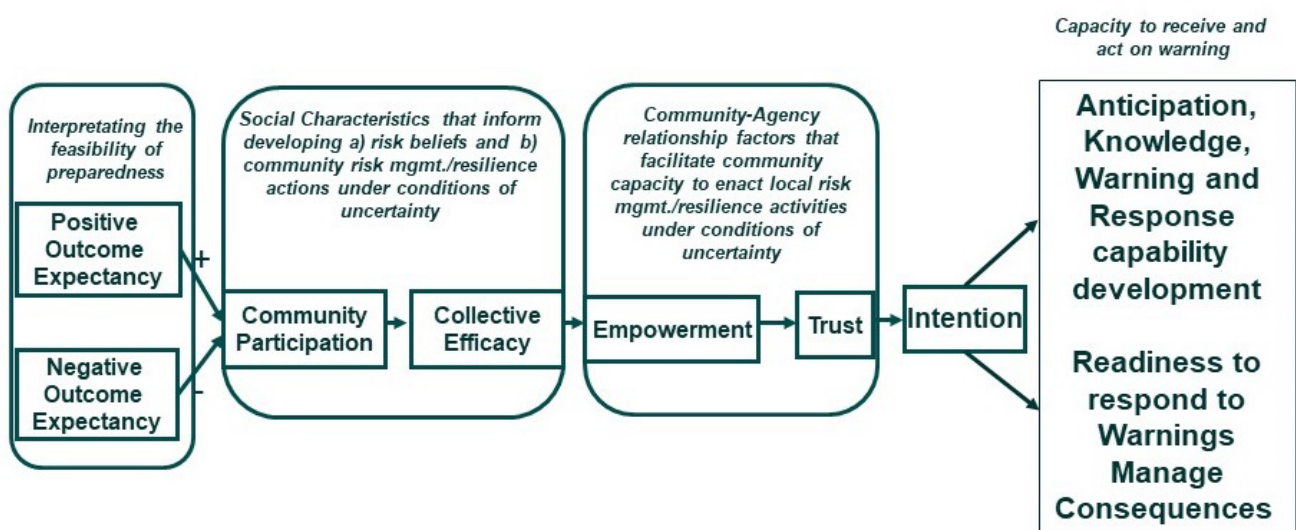
Introduction to This Special Issue: Community Resilience to Disaster - Community Engagement Theory and Beyond

When Douglas was diagnosed with cancer in 2019, we suggested for all of us to gather in monthly Zoom meetings to travel his challenging path together with him and keep his mind occupied with things he loved – investigating into and talking about DRR. Douglas graciously accepted. During one of these gatherings, we had the idea to create a special issue focusing on Douglas’ work to continue writing up research we had done collaboratively with Douglas and to further develop ideas. This special issue, especially our joined papers, is the outcome of this deeply challenging yet profound collaborative journey.

In reviewing the impact of Douglas’ work, the many interwoven strands of his inquiry throughout his life, and the knowledge he co-developed with researchers, practitioners, and communities, we finish this editorial with a review of one of the most impactful aspects of his work: the Community Engagement Theory (CET). The following overview of the evolution of the CET sets the scene for the papers in this special issue that start exploring, utilizing, and building upon important aspects Douglas’ work.

The original CET is depicted below (Figure 1). The origins of this model and a summary of the research that supports CET having all-hazards and cross-cultural utility can be found in the paper by Paton, Becker, Johnston,

Figure 1
The Original Community Engagement Theory



Buergelt, Tedim, and Jang, *The development and use of Community Engagement Theory (CET) to inform readiness interventions for natural hazard events*. The original conceptualization was intended to constitute a starting point for the progressive understanding of the relationship between adaptive capacities (represented by the independent variables) and resilience (represented in the dependent variable). The intervening years have witnessed the addition of several variables from both theoretical and empirical investigations. Some of the advancements are discussed below to illustrate previous approaches to evolving the CET. The contents of this special edition add to this developmental process.

Interpreting Risk

In its original conceptualization (see Figure 1 and Paton, Becker, Johnston, Buergelt, Tedim, & Jang paper in this issue for additional information), the CET describes the starting point of the preparedness process as one that comprises two preparedness cognitions: Positive Outcome Expectancy (POE) vs Negative Outcome Expectancy (NOE). These variables have been supported in several preparedness studies. The potential to include other variables in this component of CET emerged from Adhikari et al.'s (2018) work. Adhikari and colleagues introduced the potential benefits that accrue from theoretical integration; in this case, how Protection Motivation Theory and CET could be integrated. In their study, roles for risk perception and coping efficacy demonstrated a predictive capacity of preparedness in recovery settings in Nepal. Other work has demonstrated the utility of anxiety and affect in the CET as factors that influence people's motivation to prepare (Kerstholt et al., 2017). Work on people's thinking about highly unfamiliar hazards (e.g., tsunami risk in Australia) led to a need to develop a "risk rejection" variable to capture people's dismissal that the risk existed (Paton et al., 2010).

Social Construction of Risk and Preparedness

The development of the CET derived from work demonstrating that, when faced with uncertainty, people's risk beliefs and risk management choices and actions are socially constructed through interaction with "like-minded" social network members (community participation). This process facilitates the development of shared meaning about the uncertain events and circumstances people could experience in ways that facilitate developing socially constructed plans and actions (collective efficacy). Community participation and collective efficacy are not, however, the only variables that could be included in this component of the CET.

Other variables that could make relative, interrelated, and/or complementary contributions to how DRR beliefs develop and how they lead to the formation of action plans include critical awareness (Paton, 2022; Paton et al., 2005; Paton et al., 2006), social norms (McIvor & Paton, 2007), social responsibility (McIvor et al., 2009), sense of community (Paton, Buergelt et al., 2008), and place identity and attachment (Frandsen et al., 2012), to name a few. How these diverse variables could be accommodated calls for additional work on how the CET could be developed (Paton, 2019). Paton (2022) identifies gaps and offers ideas for further developing the CET.

The CET argued that these "social characteristics" could be instrumental in helping people construct the risk beliefs appropriate for their circumstances and commence the process of developing the hazard knowledges and capabilities required to manage their risk. However, the CET acknowledges that, given the complex and uncertain circumstances within which preparedness decisions are made, people remain reliant on, for example, risk management and scientific agencies for the information and resources needed to fully develop their preparedness. This led to the inclusion of the empowerment construct within CET. Empowerment played an important mediating role in the preparedness process.

Empowerment

Within the CET (Figure 1), empowerment played an important role in providing a mechanism that influenced community-agency relationships in ways that allow them to play complementary roles in the preparedness process, including it acting as a mechanism for enacting shared responsibility principles in DRR. The CET described how the quality of empowerment was a determinant of trust, with the latter acting as a measure of community capacity to respond to uncertain events and circumstances. There are several ways in which knowledge of the origins, development, and implementation of this central component of the theory could be developed and tested.

An important direction for this part of CET development would be exploring how community-based leadership facilitates inclusivity and actively engages their constituents in functional preparedness roles, and the complementary roles of local and national governance in leadership action (Paton, 2022; Paton & Buergelt, 2019). The special issue discusses such a transformative approach in the paper by Paton, Buergelt, Becker, Doyle, Jang, Johnston, and Tedim, *Transformative*

trust, empowerment, active participation, collective efficacy, outcome expectancy, place attachment, and sense of community. This work also identified other variables that play a role during recovery (e.g., inclusivity, leadership, governance, agency culture and competences, socio-environmental beliefs, stay-leave conflict, family dynamics). This provides options for future CET development. As introduced above, once its utility had been supported, the CET was intended to act as a framework and platform for expanding understanding of the complex individual and collective diverse influences on preparedness and recovery to gain the holistic and procedural understanding necessary for effectively reducing the risk of disasters. The papers in this edition of the *AJDTs* provide insights into how this goal might be pursued.

For example, Rudkevitch, Vallance, and Stewart’s paper entitled *Where’s the community in community resilience? A post-earthquake study in Kaikōura, Aotearoa New Zealand*, considers the CET in a recovery context. Their paper uses qualitative methods to examine collectives in Kaikōura, Aotearoa New Zealand following a M_w 7.8 earthquake to further understandings of what is meant by community in community resilience. They argue, based on their research, that the CET might continue to expand, to consider not only individuals, family, and community as concepts, but also “collectives” as a distinct component of community, given the importance that networks of collectives play in the recovery process.

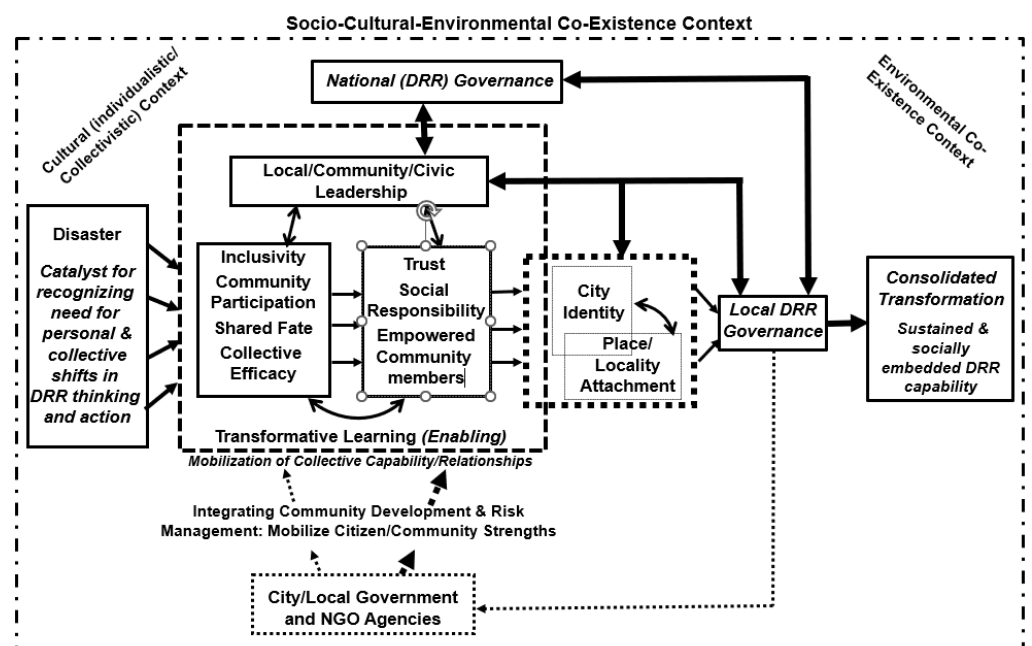
Another example comes from Taiwan by Jang et al., in the paper *Utilizing, testing, and expanding Community Engagement Theory: The Disaster Resilient Communities Project in Taiwan* (to be published at a later date). They undertook a local qualitative study in Pingtung County investigating how social services and leaders might build preparedness and resilience. The research results endorsed the existing CET variables as being important to the preparedness process, but also generates evidence for the DRR transformative

learning process model (see Figure 3) and the pivotal role of local community leaders in converting emergent learning to transformational learning (Paton, 2022). This paper also expands the model by providing insights into how community leaders mediate this conversion and the capabilities and conditions that enable community leaders to generate transformative learning. Important aspects related to leadership included the disaster experience and expertise leaders bring to the table, and the role of leaders in strengthening community cohesion and driving local solutions. Such qualitative studies can help with developing and expanding the CET further and improving practice.

The pivotal construct in the CET is empowerment. At the same time as community engagement theory was being developed to explore how select social capacities and capabilities influence preparedness behaviour another model, the stress shield model was being developed by Paton and Violanti to provide a framework for understanding stress management and stress resilience capability in members of high-risk professions likely to be involved in response to critical incidents and major disasters (e.g., protective and emergency services, police, medical professionals, volunteer search and rescue workers, prison officers, Antarctic expeditioners).

The late Professor Douglas Paton advances the most comprehensive version of the CET and various models that focus on specific aspects of CET in detail utilizing a wealth of research in *Advanced Introduction to Disaster Risk*

Figure 3
DRR Transformative Learning Process Model



Note. Figure source Paton (2022).

Reduction (2022). Throughout the book, but especially in the conclusion, he also elaborates on what he believes valuable future directions are.

CET and the Stress Shield Model (SSM)

The SSM provided a new first look at the development of resilience among police officers. The model followed Antonovsky’s definition of resilience, built on the view that a person’s resilience reflects the extent to which individuals and groups can call upon their psychological and physical resources and competencies in ways that allow them to render challenging events coherent, manageable, and meaningful. The model posits that police officers’ capacity to render challenging experiences meaningful, coherent, and manageable reflects the interaction of person, team, and organisational factors. The model calls for the accommodation of learning from past experiences to build resilience in ways that increase officer capacity to adapt to future risk and uncertainty and builds adaptive capacity to sustain police officer resilience.

While the CET and SSM were developed and applied in very different contexts (i.e., citizens, volunteer and professional responders), they shared a common foundation; both were developed around the pivotal constructs of empowerment and trust (Figure 4). Major points of departure between the two were the focus on the dependent or outcome variables being stress resilience/adaptive capacity/posttraumatic growth in high-risk professionals and on including organisational culture as a pivotal construct. Organisational culture represents a significant context in which empowerment

and trust is forged, enacted, and translated into adaptive beliefs, attitudes, and behaviours.

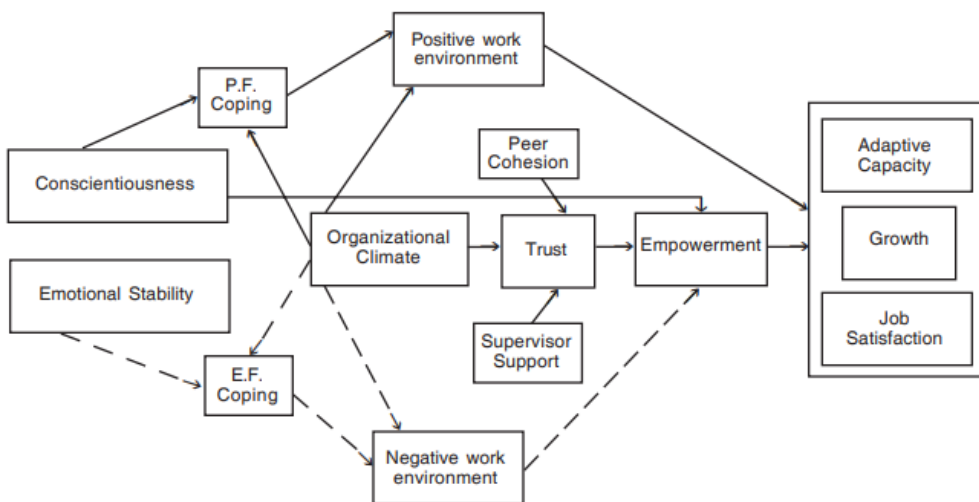
The development of the SSM was based on earlier empirical work (e.g., Burke & Paton, 2006a, b). The SSM has been subjected to a process of development (e.g., Paton, Violanti et al., 2008; Paton, Moss et al., 2017; Violanti & Paton, 2017). The resultant revised model (Paton, Moss et al., 2017) depicted in Figure 5 also affords a role for family relationships and processes and has a more developed team focus and a new inter-agency level of analysis. While the overall objective remained understanding precursors of stress resilience and growth, an intermediary has been introduced in terms of the need for analysis to explore how stress resilience and growth unfold over time as responders progressively navigate the alarm/mobilization, response, and reintegration phases of professional response (Figure 5).

Current research using the SSM to explore stress resilience in nurses working in disaster zones provides support for the conceptual model outlined in Figure 5. In particular, this work identified the benefits of including leadership characteristics and processes in developing stress resilience and adaptive capacity in disaster nursing settings (Scrymgeour et al., 2020). One paper in this edition offers ways to expand this conceptualization.

In *Truck drivers are also lay rescuers: A scoping review*, Andrews, Paganini, and Sweeney introduce the significant psychological impacts experienced by truck drivers who also often find themselves in situations where they need to play “lay rescuer” roles. They discuss the findings of

their qualitative scoping review of both published and grey literature on what is already known generally about the effects of being a “lay rescuer”. From the nine papers they reviewed, they conclude that truck driver lay rescuers experience symptoms similar to post-traumatic stress disorder, however few interventions are available to help with these symptoms. The discussion of their findings is used to frame interventions

Figure 4
 The Stress Shield Model



Note. Figure source Paton, Violanti et al. (2008).

and organisational policy changes that better ensure truck drivers receive the care they need.

Conclusion

We hope that this special issue will contribute to the legacy the late Professor Douglas Paton created being utilized and further expanded to contribute to not only alleviating the deep and growing pain we experience, but to (re) building our individual and collective adaptive capabilities and capacities. Only by (re)building our adaptive capabilities and capacities will we be able to utilize the transformative opportunities that the experiential crises offer us to restore our soul and power, and transform in ways that reestablish harmony and thus the health of all creatures, including us humans.

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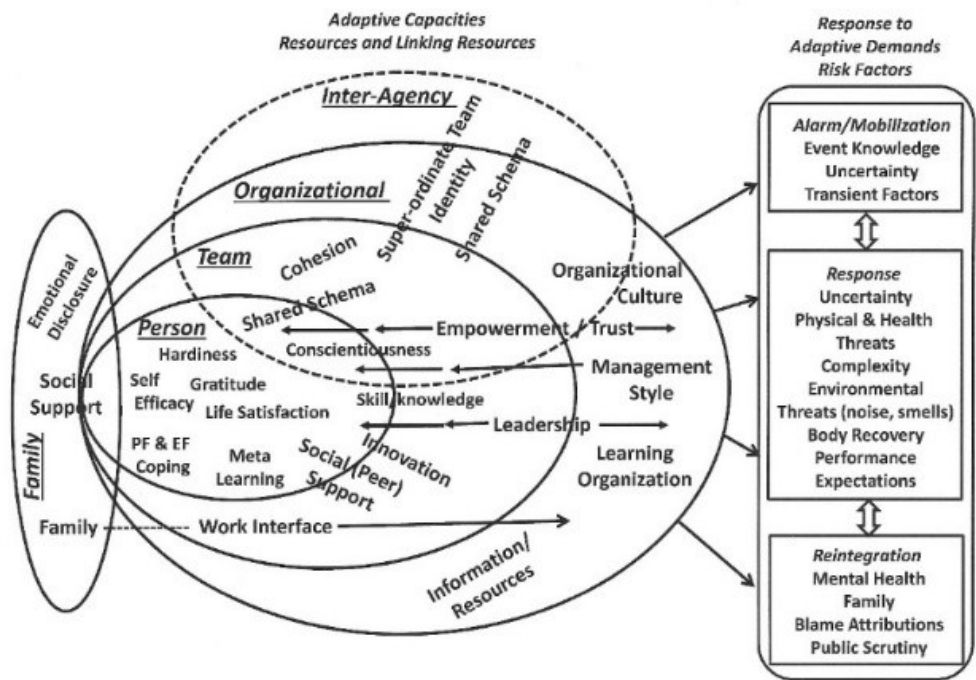
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Figure 5
The Revised Conceptualization of the Stress Shield Model



Note. Figure source Paton, Moss et al. (2017).

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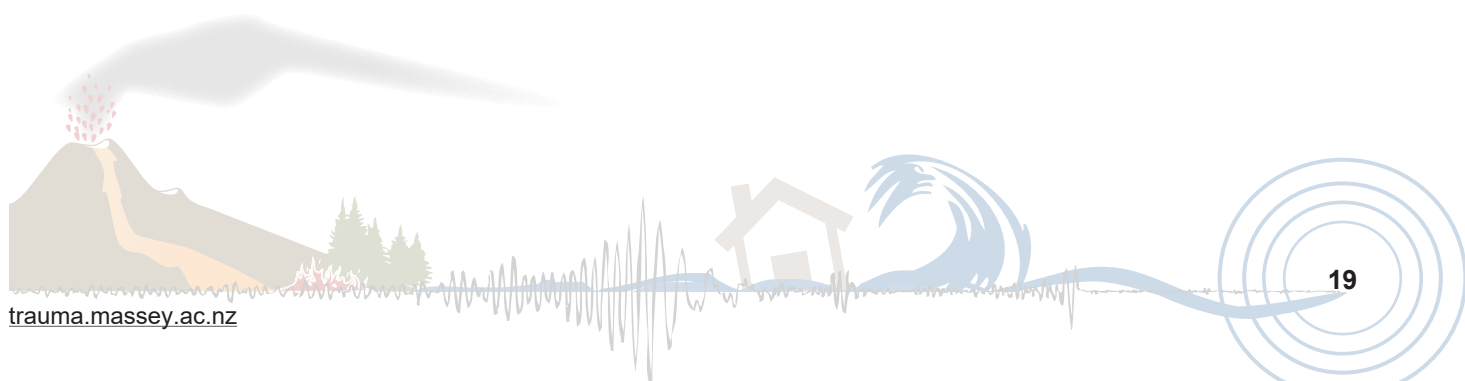
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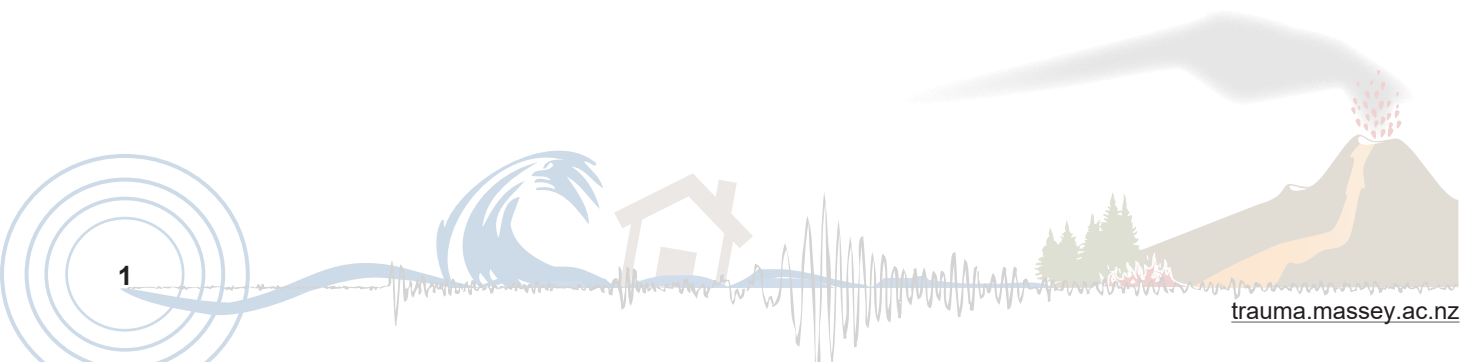
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Transformative approaches to disaster risk reduction: Social, societal, and environmental contributions to post-disaster capacity building

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Abstract

This paper discusses whether Community Engagement Theory (CET) could be augmented in ways that afford opportunities to develop a framework for understanding how emergent change and transformative learning can occur in disaster response and recovery settings. The foundation for doing so derives from appreciating that CET describes process theory that comprises variables representing adaptive capacities. That is, the presence of these capacities enables people to adapt to any set of circumstances, particularly when people are called upon to make decisions and to act during conditions of uncertainty. This approach builds on the potential for variables such as community participation, collective efficacy, and empowerment to provide a social context for people to formulate and enact strategies to support their recovery and to be able to do so when interacting with government, non-government, and business entities. However, based on a critical comparative analysis of relevant research into post-disaster emergent

and transformational shifts in community capacity, it is argued that the above variables need to be augmented. The paper discusses the rationale for including factors such as community leadership, governance, place attachment, and city identity in an augmented conceptual transdisciplinary transformative learning Disaster Risk Reduction (DRR) model. The function of this model is consistent with the Sendai Framework for DRR Priority 4, Building Back Better goal.

Keywords: *Disaster risk reduction, readiness, preparedness, capacity building, Community Engagement Theory, transformative learning*

The importance of using disaster experience to foster capacity development derives from exposure to (increasingly) frequent hazard events that occur against a backdrop of generally low prevailing levels of pre-disaster preparedness (Abunyewah et al., 2020; Baxter, 2019; Harries, 2008; United Nations Office for Disaster Risk Reduction [UNDRR], 2015; van Valkengoed & Steg, 2019). The work reported here develops a tentative model of emergent capacity development and transformative learning using cases where emergent and transformational learning have been observed but not systematically analysed. The goal of this paper is to critically analyse these previous studies and develop based on this comparative review an evidence-informed conceptual transdisciplinary transformative learning Disaster Risk Reduction (DRR) model that can serve as a source of research questions and hypotheses to support future capacity development and transformative DRR learning research and practice.

The logic underlying exploring a relationship between disaster experience and capacity development derives from postulating that disaster experience provides people with tangible experiences capable of challenging DRR thinking and preparedness decisions and prompting a rethinking of what being prepared for future disasters entails (Paton & Buergelt, 2019). However, an automatic link between disaster experience, transformation, and DRR capacity development cannot be assumed. For example, disaster experience can leave levels of preparedness unchanged (Comstock & Mallonee, 2005;

Dow & Cutter, 1998; Huang et al., 2016) or result in people reducing their levels of preparedness (Johnston et al., 1999; Meyer et al., 2014; Rincon et al., 2001). Notwithstanding, capacity development has been observed.

This paper compares studies in which enduring shifts in capacity change occurred with those studies in which short-term, but unsustainable, capacities emerged. This comparison enables us to tentatively identify how disaster experience interacts with the socio-cultural-environmental foundations of DRR beliefs, attitudes, relationships, and practices to facilitate transformational learning that culminates in sustained capacity development. This paper explores how such interactions can act as a catalyst for creating fundamental personal and collective shifts in how people perceive themselves and their world and how they relate to and act towards each other and to the environments they live in and rely on, and so create transformative learning outcomes (Buergelt & Paton, 2022; Mezirow, 2008; O'Sullivan et al., 2002; Paton & Buergelt, 2019; Pelling 2011).

According to O'Sullivan et al. (2002), transformative learning involves "experiencing a deep, structural shift in the basic premises of thought, feeling, and actions" and transformation entails "...a shift of consciousness that dramatically and permanently alters our way of being in the world" (p. xvii). The relevance of the latter for contemporary DRR can be traced to the fact that people's inaction is a major determinant of both their risk and their susceptibility to (avoidable) losses; dramatically altering their way of being in the world is important for ensuring their and other people's survival.

An important facet of O'Sullivan et al.'s (2002) argument is that transformative learning must occur across personal, community, and societal levels of analysis if it is to generate enduring outcomes. This position is consistent with recommendations for DRR capability development to adopt such a holistic approach (Buergelt & Paton, 2014; Twigg, 2015; UNDRR, 2015). This perspective thus becomes a criterion for determining if transformative learning has occurred; it must be novel, linked to collective disaster experience, encompass transformative learning across personal, community, and societal levels of analysis, and be institutionalised in ways that facilitate it being sustainable over time and against changes in the social context (e.g., migration, demographic diversity). We begin this exploratory journey by shining light onto why and how disasters create a space for transformation.

Disasters as Catalysts for Transformative Shifts in DRR Beliefs, Relationships, and Actions

This section of the paper is organised around five case studies that describe varying degrees of shifts in DRR beliefs, attitudes, and relationships in disaster-affected populations. It includes studies from New Zealand, Australia, Japan, Indonesia, and Taiwan. In doing so, this section covers a range of extreme natural events and the diverse cultural and social contexts in which they occurred in ways that meet the criteria for Build Back Better (BBB) programmes described in Priority 4 of the Sendai Framework for DRR (UNDRR, 2015).

In New Zealand, there were some 450 community-led response and recovery initiatives that emerged in the months following the 2010-11 Canterbury earthquakes (including the 22nd February, 2011, Christchurch earthquake). Of these, 231 were established in response to the earthquakes, 167 of them existed prior to the earthquakes, and details of the remaining 55 groups remain unclear (Carlton & Vallance, 2013). The discussion here focuses on the detailed analysis of five of these initiatives, in neighbourhoods that were selected for analysis by the then Ministry of Civil Defence & Emergency Management (MCDEM; now the National Emergency Management Agency) because they identified some interesting dynamics (i.e., four neighbourhoods that adapted well and one that did not). The analysis did not cover activities occurring in other neighbourhoods or communities and so describes only the processes developed in these five areas and their implications for understanding emergent change and transformative learning. The case selection was informed by MCDEM wanting independent analysis of those neighbourhoods to provide more rigorous insights into the recovery processes that occurred (Mamula-Seadon, 2018; Mamula-Seadon et al., 2012; Paton et al., 2014).

The Australian data were obtained from the analysis of Facebook posts collected over the entire response and early recovery phases of the Dunally wildfire in 2013 (Irons & Paton, 2017; Paton & Irons, 2016). In Japan, data used to support the arguments presented combined an analysis of historical accounts of community responses to the 1914 Taisho eruptions and of the contemporary influence of processes that developed following the 1914 eruption and the continued eruption activity at Sakurajima volcano (Kitagawa, 2015; Paton et al., 2013, Paton, Jang, et al., 2017). The Indonesian analyses draw on the development of the *smong* process on Simeulue Island (Kanamori et al., 2010; Sutton, Paton, Buergelt, Meilianda, et al., 2020; Sutton, Paton, Buergelt,

Sagala et al., 2020). The data from Taiwan were collected to capture recovery experiences following the 1999 Chi Chi earthquake and 2009's Typhoon Morakot (Paton, Jang, et al., 2015; Paton et al., 2016).

A common denominator across these studies was people's ability to recognise that their pre-existing DRR beliefs and practices, or lack thereof, contributed to the losses they experienced. It was also evident that this recognition, and the circumstances in which people found themselves, did result in either new ways of applying existing capabilities and/or the development of new ways of thinking and acting, some of which translated into new and enduring DRR capacities and capabilities. These different outcomes are described as repurposed, emergent, and transformative learning outcomes (Paton et al., 2022). The differences between these are discussed below. Before doing so, the paper first outlines the criteria applied to describing an outcome as transformative learning.

The criteria used here to differentiate transformative learning from other kinds of learning are as follows. Firstly, there must be a discernible link between a disaster and transformation and this link must be mediated by evidence that the roles of the diverse social actors involved in the disaster are instrumental in facilitating, enabling, and sustaining new ways of thinking and acting that culminate in new institutionalised and sustainable socio-structural processes. This reflects O'Sullivan et al.'s (2002) argument that transformative learning involves complementary beliefs and actions that encompass personal, community, and societal levels of analysis. In the examples discussed below, the existence of transformative socio-structural processes is evident in these processes being institutionalised, given specific names, and entailing processes for sustaining their roles well after the disaster that catalysed their origins has passed into history.

The above criteria differentiate transformative DRR learning from other changes that can be introduced into local and national DRR policies and practices after an event, but which are not adopted within the social and cultural fabric of the society or region. This line of argument does not negate the importance of emergent responses such as new processes developing or adding new components to existing relationships. However, for these new processes to persist and to fully realise the benefits of the BBB goals established by the Sendai Framework, attention needs to be focused on transformative learning that represents fundamentally new ways of thinking and acting shared by all key

stakeholders and that persist over time (Paton et al., 2022). Examples of these different outcomes will be provided below to clarify these distinctions.

The role of how *repurposing* and *emergent* outcomes enabled people's ability to respond to the disaster response and recovery challenges encountered is illustrated using analyses of people's accounts of their experience of disasters in New Zealand, Australia, and Taiwan (Irons & Paton, 2017; Paton, Jang, et al. 2015; Paton et al., 2014). Data for the New Zealand and Australian cases were collected during the recovery phases of the respective disasters. The data from Tung Shia in Taiwan were sourced 3 years post event but at a time when recovery was still underway. In all cases, people were consistent in agreeing that their pre-event preparedness was inadequate (particularly regarding their structural, psychological, and community preparedness). Another common denominator was agreement that their disaster experience acted as a catalyst for new DRR beliefs and actions.

In New Zealand, data were sourced from thematic analysis of life course focus groups with residents from five affected neighbourhoods in August 2011. This allowed the data to capture people's experiences from the February 2011 earthquake through to August 2011 and included the analysis of people's responses to the February earthquake, how they developed neighbourhood processes over time, and how their learning experiences influenced their response to major aftershocks in June 2011. This provided insights into what helped or hindered people's responses. Four focus groups described how their need for novel personal and collective responses following the 22 February 2011 earthquake derived from recognition of absence of formal assistance. The fifth group initially decided to wait for government response, with this hindering neighbourhood and leader development (Mamula-Seadon et al., 2012; Paton et al., 2014).

The analyses provided examples of how people's responses were supported by their *repurposing* of pre-existing knowledge and skills. For example, residents with trades and building skills would apply these in novel circumstances by helping neighbours repair their damaged homes. Participants also discussed how their pre-existing sense of social responsibility was repurposed into mobilizing social support activities within neighbourhood settings.

The data also furnished examples of emergent capacity building. For example, emergent capacity building

was evident in the development of family negotiation practices (Paton et al., 2014) that facilitated families making collective decisions. These decisions ranged from deciding to stay in Christchurch during aftershocks, to assisting local recovery activities, to developing planning processes to manage family resources and planning family entertainment, to providing a family stress management resource.

Emergent outcomes were also evident at the neighbourhood level. For example, neighbours collaborated to create a collective resource for managing local issues such as securing water resources, organizing repair crews, and supporting elderly neighbours and others in need (Paton et al., 2014). These emergent neighbourhood relationship-building activities fostered the emergence or strengthening of social capacities, including people's sense of (local) belonging, with these collective activities helping to build people's collective capacity to manage aftershock consequences and to provide social support resources to help manage stress. The effectiveness of the latter was heightened by the emergence of community leaders (McAllan et al., 2011; Paton et al., 2014). Emergent local leaders helped empower community action, helped manage conflict, encouraged social inclusivity in recovery tasks, and facilitated neighbourhood links with government agencies, NGOs, and businesses to facilitate access to relevant recovery resources.

The analysis of recovery experiences in Taiwan supported the New Zealand findings and introduced additional repurposing and emergent capabilities (Paton, Jang, et al., 2015). Thematic analysis of Taiwanese data following the "921", or Chi Chi, earthquake (Paton, Jang, et al., 2015) reiterated both the importance of community self-reliance in initial response settings in which government and external support was not available, and the key roles community leaders played in facilitating community self-reliance. However, while local leadership in New Zealand was an emergent resource, in Taiwan it represented a repurposed resource; it reflected how local community leaders played community management roles in everyday community life. Tung Shia residents discussed how (repurposed) spiritual beliefs reinforced their sense of purpose throughout their recovery, fostered their perseverance in recovery tasks over time, enabled the provision of social support and collective stress management, and sustained reciprocal support and belongingness over time (Paton, Jang, et al., 2015).

Taiwanese respondents identified devolved governance practices that established local reconstruction centres as

an emergent community-agency level capacity (Paton, Jang, et al., 2015; Paton et al., 2016). Additional insights into emergent processes came from analysis of social media response and recovery data of a Facebook page developed specifically to support recovery from a wildfire events in Australia in 2013 (Irons & Paton, 2017; Paton & Irons, 2016). This approach to data collection also afforded a way to acquire "real time" insights into resident's experiences in situ and over time.

An important emergent outcome here was the ability of this virtual community to increase the relevance, local meaningfulness, and timely delivery of information for diverse residents in ways that was meeting the needs of families with children and/or elderly residents (Irons & Paton, 2017). A related emergent outcome was the role that Facebook played in providing social support and developing an emergent sense of community that expanded to include those in the affected community and those outside the area who could help facilitate locally relevant self-help activities. Another emergent outcome was how the Facebook page functioned to integrate top-down (e.g., agency, NGO) and bottom-up (community-based) communication in ways that helped create a sense of "collective intelligence" across local and government stakeholders. The latter outcome was reinforced by the role that emergent community leaders played in coordinating recovery activities.

The discussion above illustrated how repurposing and emergent capacity development can enhance people's adaptability in complex and dynamic recovery settings. However, an issue here concerns the fact that in the New Zealand, Australian, and Taiwanese examples discussed above, the emergent processes dissipated once conditions stabilised. Hence, they do not satisfy the criteria for being labelled transformative learning outcomes. There are, however, other cases which satisfy these criteria. Examples from Japan (Kagoshima), Indonesia (Simeulue), and Taiwan (Ho-Ping) are used to illustrate transformative learning.

The 1914 Taisho eruption of Sakurajima volcano provided the impetus for civic leaders, scientists and community members in Kagoshima to engage in a transformative learning journey whose outcomes have persisted for over 100 years (Kitagawa, 2015; Paton et al., 2017). The process was triggered by the mayor's reflecting on his underestimating the value of local knowledge and experience. The transformative learning process was developed around a community engagement strategy founded on community development principles that was designed to regenerate trust in civic authorities

and to engage and empower citizen DRR. The process encouraged residents to a) take and exercise responsibility for their own safety (personal *agency*), b) engage in collective activities to enhance their being *knowledgeable* about volcanic hazards and how to respond to them, and c) accept the value of learning to co-exist with the natural volcanic environment (Paton et al., 2017). These processes culminated in citizens combining environmental co-existence beliefs (*kyozon*) and personal agency and knowledge within a *kyojo* (helping each other through cooperative commitment) framework to enable transformative DRR beliefs and practices that persist to the present day through social activities and festivals (Kitagawa, 2015). Another example of enduring transformation occurred on Simeulue (Indonesia).

In the aftermath of a significant tsunami in 1907, Simeulue islanders' reflection on the impact the tsunami created was a catalyst for transformation in islanders' relationship with tsunami events and resulted in their coining a new term to describe this transformative learning outcome: *smong* (Sutton, Paton, Buergelt, Meilianda, et al., 2020; Sutton, Paton, Buergelt, Sagala et al., 2020). *Smong* contains four elements: (a) Jika gempa kuat (If there is a strong earthquake), (b) Jika laut surut (If the sea recedes), (c) Lari ke gunung (Run to the mountains), and (d) Ngakk menunggu -lari saja! (Don't wait—just RUN!). Sutton and colleagues' research discussed how the social and collective maintenance of *smong* through the roles of community leaders and respected elders, especially grandmothers, created a transformative learning outcome that reconciled people's knowledge of tsunami precursors with their acceptance of their responsibility to act should these signs be detected. The DRR importance of *smong* was evident in the very low death toll on Simeulue compared with what happened on the Indonesian mainland during the 2004 Indian Ocean tsunami.

As in Kagoshima, the Simeulue experience provides another example of the hallmarks of transformative learning; collective reflection on a catastrophic disaster led local leaders, community elders, and citizens to collectively engage in a transformative learning process that resulted in the development of *smong* and new socially-embedded processes around *smong* which have persisted and remained effective for over 100 years. The next example of transformation originated in the Taiwanese township of Ho-Ping.

When Ho-Ping's residents found themselves isolated for several months following the "921" earthquake, they

had to develop new ways of organizing their recovery to compensate for their lack of pre-existing community DRR capability (Paton et al., 2016). The ensuing transformation combined community development activities with forging new relationships with NGOs and government agencies (cf. community participation, collective efficacy, empowerment, trust) to create an enduring "community consciousness" DRR capability. The socio-structural process, labelled as community consciousness, remained active in 2017 (the Chi Chi earthquake occurred in 1999).

A common denominator in the Kagoshima, Simeulue, and Ho-Ping cases was evidence of DRR processes that become entrenched in the socio-cultural-environmental fabric of the respective islands, cities, and townships. Furthermore, these transformational practices persisted over time. In contrast, the Christchurch, Dunnally, and Tung Shia cases demonstrated emergent social learning, but learning that was not institutionalised to carry these lessons forward. The contrasting emergent versus transformative learning affords opportunities to explore the transformative DRR learning process. What can be gleaned from such analyses is introduced in the next section.

The Social Context of Post-Disaster Transformative Learning

The occurrence of shifts in DRR beliefs, relationships, and actions was evident in all cases discussed (Kitagawa, 2015; Mamula-Seadon, 2018; Paton et al., 2014; Paton et al., 2017; Paton et al., 2016; Sutton, Paton, Buergelt, Meilianda, et al., 2020; Sutton, Paton, Buergelt, Sagala et al., 2020). The processes and outcomes reported included the development of social support practices, emergent neighbourhood response and recovery resources, and empowering relationships with NGOs and civic agencies (see also McAllan et al., 2011). However, a difference was evident between the Kagoshima, Simeulue, and Ho-Ping cases and those in Dunnally, Tung-Shia, and Christchurch regarding whether emergent change translated into transformational learning outcomes.

In Kagoshima, Simeulue, and Ho-Ping, emergent social capabilities were further transformed into sustained social-structural processes. In Dunnally, Tung-Shia, and Christchurch, this final consolidation did not occur, and the emergent processes dissipated over time. The exploration of what influences emerging capabilities transforming permanently commences with examining

whether an explanation could derive from differences in the social competencies that emerged.

In all cases, comparable social competencies emerged. The data indicates the emergence of several processes that map onto the community participation, social inclusivity/social justice, collective efficacy, empowerment and trust, sense of community, and place attachment constructs. These variables are recognised for their capacity to facilitate people’s ability to coherently construct meaning in uncertain, novel, and challenging conditions, formulate plans and implement solutions to cope with or adapt to novel and challenging conditions, and inspire action by connecting people and people to place (Abunywah et al., 2020; Baxter, 2019; Earle, 2004; Levac et al., 2012; Lion et al., 2002; McAllan et al., 2011; Monteil et al., 2020; Paton, 2019; Silver & Grek-Martin, 2015; van Valkengoed & Steg, 2019).

Because of this interpretive and mobilizing functionality, the social competencies that emerged are categorised here as core competencies involved in *enabling* transformative learning. That is, they facilitate, for example, the shared sense making capability and collaborative problem solving and planning competencies required to enable adaptation to or the development of novel approaches to dealing with challenge and change irrespective of its source. These enabling processes make the inclusion of the core competencies that enable transformative learning in a conceptual model of transformative DRR learning appropriate (see Figure 1). However, while providing a foundation for transformational learning, the core competencies do not predict it per se. It thus becomes pertinent to search for

those factors that enable transformative DRR learning to occur.

To explore the factors enabling transformative DRR learning, it becomes necessary to broaden the search for factors that could account for differences between cases regarding the emergence of sustained psychoecological-cultural-social-structural processes. One possibility lies with the relationship between local leadership and the social and environmental settings in which leaders operate.

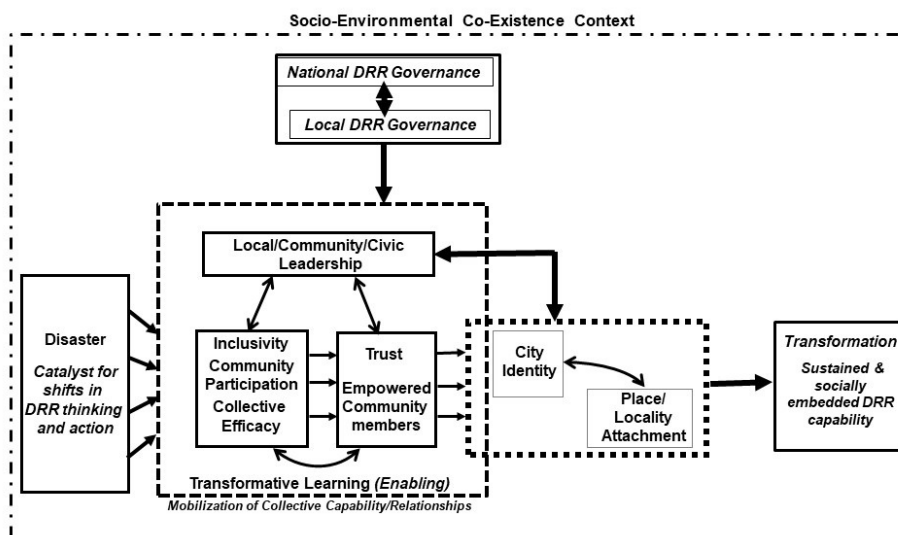
In all the studies discussed above, local leaders played key roles in mobilizing social competencies and facilitating their application to recovering and rebuilding activities in each location. Local leaders developed, for example, functional neighbourhood recovery groups and social support resources. However, evidence that leaders functioned in this way in all cases suggests that local leadership per se is not a transformation enabler. However, how circumstantial factors affected leader ability and opportunity may illuminate how this enabling process might work.

There is a body of DRR research identifying how certain environmental influences affect leadership tenure and impinge on leader capacity to facilitate the consolidation of transformative processes (Baxter, 2019; James & Paton, 2015; Thaler & Seebauer, 2019). Factors such as leaders having to terminate their roles early due to, for instance, exhaustion and need to attend to family and livelihood needs, and lack of leader succession planning affect leader tenure and thus their ability to consolidate learning outcomes over time (Baxter, 2019; McAllan

et al., 2011; Thaler & Seebauer, 2019). Given that time is required to consolidate emergent outcomes into sustainable social-structural systems and processes, a constraint on facilitating the latter outcome would arise if leaders were not available over the extended period required. To what extent and how could the time aspect help explain the differences in enabling consolidation of transformative outcomes as discussed above?

In Kagoshima, the Mayor’s leadership tenure extended well beyond the event itself, as did the roles of community leaders in Simeulue and Ho-Ping (Paton et al., 2015, 2016; Paton,

Figure 1
Summary of the DRR Transformative Learning Process



Jang et al., 2017; Sutton, Paton, Buergelt, Meilianda, et al., 2020). Their consequent availability over the longer term ensured the leadership continuity required to facilitate the consolidation of emergent outcomes into social-structural systems and processes. In contrast, in New Zealand and Australia, the tenure of community/neighbourhood leaders ended when the recovery process stabilised (Irons & Paton, 2017; Mamula-Seadon et al., 2012; McAllan et al., 2011; Paton et al., 2015; Paton et al., 2014). In New Zealand, there was some consistency in leadership expertise at a Mayoral level as one Christchurch Mayor was replaced by another with just as much experience in recovery, as their previous role had been a local Member of Parliament. However, despite this, the lack of longer-term incorporation of leadership at a neighbourhood level was evident. In the New Zealand and Australian cases this could have deprived neighbourhoods and communities of a key leader resource over the longer time frame required to facilitate consolidation. This finding makes it important to support a diversity of emerging leaders, ensure that they can provide ongoing leadership (e.g., long-term employment and funding), and identify and build up the capacity of people emerging as future leaders to enable them to facilitate the consolidation of transformative processes (McAllan et al., 2011). Attention to selecting and training local leaders must also be accommodated (McAllan et al., 2011; Thaler & Seebauer, 2019).

Leaders need intra-personal, inter-personal, and organisational skills to inspire, coordinate, and facilitate activities occurring at neighbourhood, locality, or community levels, especially building and maintaining trusting and effective relationships. Governance systems and policy frameworks used by NGOs, businesses, and government agencies need to support the cultivation of these processes and competencies (McAllan et al., 2011, Paton et al., 2015). This introduces another potential transformative learning enabler: how local leader engagement in governance influences the consolidation of social structural processes (McAllan et al., 2011; Pelling, 2011).

Governance and Transformative Learning

Countries that invest in governance policies, and the institutional structures and relationships to implement them, significantly enhance their DRR capabilities (UNDRR, 2020). The content and implementation of such processes play crucial roles in creating the social and societal scaffolding required to support community engagement in developing and applying both national and local DRR strategies (UNDRR, 2020). The introduction

of local governance to the present discussion provides additional insights into transformative learning and the social and societal consolidation of its outcomes.

A significant reason for including local DRR governance (and how it complements governance at national levels) in a conceptual model derives from the fact that large-scale disasters create impacts that are distributed, qualitatively and quantitatively, unevenly over the total area of impact; consequences can vary significantly from place to place depending on how hazard impacts interact with diverse socio-environmental circumstances. Local DRR governance processes are more likely to be responsive to such local-level variability and so are better suited to identifying and using the unique local resources and meeting the unique local needs that arise within different areas or localities.

Local governance has been identified as a driving force for developing the capacity of neighbourhood and community groups to create social and environmental change within their jurisdictions (Dhakal, 2012; Lyth et al, 2016; Middlemiss & Parrish, 2010). Effective local governance has the capacity to support diverse community members and organisations at the relevant scales to continuously co-create, co-enact, and co-evaluate new adaptive DRR systems and processes in response to the novel social and environmental conditions emerging during (local) disaster recovery and rebuilding.

Local governance processes are also more likely to develop in ways that facilitate developing shared responsibility in which citizens, civic agencies, and government continuously identify and contribute complementary knowledges, competencies, and resources regarding DRR (Aiken et al, 2017; Buergelt & Paton, 2022; UNDRR, 2020). Such approaches are better suited to functioning in ways that increase opportunities for adaptation and post-event holistic capacity-building including social-structural processes (Banwell et al, 2018; Mamula-Seadon, 2018; McNamara & Bugey, 2017; Middlemiss & Parrish, 2010; Paton, 2008, 2019; Sarzynski, 2015). Placing additional emphasis on local governance does not, however, negate the importance of national DRR governance (Figure 1). Because national DRR governance can, for example, facilitate passing on capability (i.e., enable adoption of DRR lessons in all jurisdictions, not just in those affected by a specific event), expedite the sourcing and distribution of resources needed at local levels, and support development through regulatory frameworks, it

remains important (Bajek et al., 2008; Bhandari et al., 2010).

In Kagoshima, Simeulue, and Ho-Ping, local formal and informal leaders were the local mayor or highly respected community elders who accepted responsibilities for managing city or community affairs before, during, and after their respective disasters (James & Paton, 2015; Kitagawa, 2015; Paton et al., 2016). Hence, they held positions which included their having responsibility for developing and then enacting (local) community governance mechanisms that were responsive to local DRR needs. Consequently, it can be postulated that local formal and informal leaders engaging and being engaged in creating, enacting, and constantly refining local governance could have helped consolidate emergent DRR systems, processes, and capabilities in ways that embedded them within everyday social life.

In contrast, in New Zealand and Australia, residents adopting emergent community leadership roles did so only during the recovery stages of their respective events, did not hold formal civic leadership roles or responsibilities, and often found themselves in conflict with civic leaders (James & Paton, 2015; Mamula-Seadon, 2018; McAllan et al., 2011; Paton, Jang, et al., 2015; Thaler & Seebauer, 2019; UNDRR, 2020). The consequent disconnects between these local informal leaders and their lack of, or limited involvement in, formal governance development systems and processes limited their opportunities to inform the advancement of local governance in ways required to consolidate emergent social processes into enduring DRR beliefs and practices.

In Kagoshima, Simeulue, and Ho-Ping, local governance systems and processes emerged through bottom-up community engagement processes that facilitated diverse perspectives to be included and harnessed, leading to socially transformative outcomes (cf. O'Sullivan et al., 2002). In Australia, no local governance process emerged that could support consolidating the emergent social processes. In New Zealand, the national government did implement specific governance processes for the Christchurch event via the Canterbury Recovery Earthquake Authority (CERA) and the Canterbury Earthquake Recovery Act 2011. However, though the government had a local presence, their top-down governance systems and processes not only constrained but suppressed the consolidation of emergent informal social-structural systems and processes into formal local DRR social structural capabilities (Mamula-Seadon, 2018; Paton et al.,

2014). The problems inherent in circumstances where national processes undermine local processes has been documented in other studies (Cretney, 2018; Thaler & Seebauer, 2019). For example, Thaler and Seebauer (2019) found that top-down governance practices that limit civic involvement to playing support roles rather than enabling and strengthening local formal and informal leadership (e.g., through recognizing the need for bottom-up and top-down processes to play complementary roles) diminish the effectiveness of DRR governance. Thaler and Seebauer consequently advocate for more emphasis on citizen-driven governance initiatives that facilitate sustainable local capacity development. While the latter describes the processes operating in Kagoshima, Simeulue, and Ho-Ping, there was nothing comparable in Australia and New Zealand.

Hence, government and support agencies at different scales must empower and strengthen local formal and informal leadership by genuinely and continually giving up power and involving community stakeholders in co-creating, co-implementing, and co-evaluating local governance systems. Governance systems and processes must facilitate citizens and organisations sharing information two-way and making decisions in ways that harness diverse perspectives and resources and fulfil the needs and interests of everybody (Beunen et al, 2017; Paton & Buergelt, 2019; Sarzynski, 2015; Uittenbroak et al, 2019). However, this potential will only be realised if steps are taken to ensure genuine and authentic working together and to safeguard against public participation being relegated to playing tokenistic roles in the development and implementation of governance systems and processes (Beunen et al, 2017; Paton & Buergelt, 2019; Uittenbroak et al, 2019).

As a tentative starting point for accommodating such circumstances in a conceptual model, we propose here to include variables sourced from Community Engagement Theory, particularly collective efficacy, empowerment, and trust (Paton, 2008, 2013; Paton et al., 2013). Effective local participatory governance can be linked to community development strategies because this governance is capable of enabling the emergence of social competencies. Examples of these can be found elsewhere (Paton & Buergelt, 2019; Paton, Kerstholt, et al., 2017).

It is also important to progress beyond just describing this aspect of a conceptual transformative learning DRR process and consider how such complementary relationships could be created in practice to support this goal. One way of doing so involves including sociocracy

systems and principles in recovery governance planning. Sociocracy offers governance systems and processes that empower all DRR stakeholders in ways that enable socially just approaches to self-governance via collaboratively sharing knowledges, solving problems, and creating inclusive, consensual, mutually beneficial futures (Buck & Villines, 2017; Buergelt et al., 2020). These outcomes confer upon sociocracy a capability to facilitate the emergence of the “social justice” transformative principle advocated by O’Sullivan et al. (2002). Sociocratic processes can be implemented in parallel with existing governance structures, enabling smooth transitions towards governance mechanisms better suited to facilitating individual and collective transformations in intentional and gradual ways (Buck & Villines, 2017; Buergelt et al., 2020). Sociocracy systems and processes point towards new ways of operationalizing and evaluating inclusive governance systems and processes. These new ways could include the degree of existence of distribution of power among all members, circles and double links between circles, two-way communication flow between circles and members, consensus decision-making, and inclusion of all members and especially diverse members. New ways could also include the degree to which governance systems are harnessing diversity to generate innovative solutions, giving responsibility to each member and holding each member to account.

The implementation of these participatory governance systems and processes through which government agencies engage with disaster-affected communities also needs to be considered. This was evident in the Kagoshima case which illustrated how local government facilitated transformative learning. Governments are not, however, the only body external to a community involved in post-disaster settings. Acknowledgement of the role that government and humanitarian NGO agencies play in disaster recovery contexts makes it pertinent to consider how to ensure that their involvement complements and strengthens other transformative DRR capacity building initiatives, particularly those emerging within affected communities (Arneson et al., 2017; Paton & James, 2016). This consideration is especially important if this is accompanied by emphasizing accommodating the historical, cultural, social, economic, and political characteristics that affect both how communities engage with external agencies and how social learning occurs (Baxter, 2019; Buergelt & Paton, 2014).

The strengths-based approach to the capacity building holistic approach seeks to regenerate and connect

existing psychological, ecological, cultural, sociological, and spiritual resources into new, holistic, and sustainable capabilities for responding to future challenges and adversity (Buergelt & Paton, 2014; Buergelt et al., 2017; Kapucu & Liou, 2014; Matin et al., 2018; Mosel & Levine, 2014; Norris et al., 2008; Paton & James, 2016; Spialek & Houston, 2019). By using sociocratic governance and strengths-based approaches, government and NGO agencies can support post-disaster transformative DRR capacity building. Their role in this regard thus warrants inclusion in the conceptual model (Figure 1). Another source of transformative enablers reflects the role of city, neighbourhood/location (place), and natural environmental beliefs and relationships.

Environmental Context: City, Place, and Natural Settings

One potential transformative enabler is the city identity construct. The existence of research that links the effectiveness of city (local) governance with the quality of city identity (Ginteng et al, 2017; Healey, 2006; Kong, 2007; Peng et al, 2020) also indicates that it is pertinent to consider a role for city identity.

City identity. While regarded as an under-researched entity in studies of environmental hazards (Berking, 2012), the city is emerging as a construct with implications for understanding DRR capability development (Bhandari et al. 2010; Kitagawa, 2015). In Paton et al.’s (2014) study in Christchurch, several focus group members specifically identified the referent for their emergent spatial attachment as Christchurch city, reinforcing a need for exploring how city identity might inform how to conceptualise a transformative DRR process. As the recovery evolved, people’s spatial attachment to the city of Christchurch was also seen emerging in debates about the future of the Christchurch cathedral, the pop-up art in the City Centre, and some of the planning initiatives where the public were asked to suggest ideas for the city’s regeneration (e.g., “Share an Idea”) (Cretney, 2018). Further research on sense of place in the Christchurch context has highlighted its value in terms of recovery wellbeing (Prayag et al., 2021).

This position is reinforced by work identifying how city identity can act as a medium for facilitating the effectiveness of city (local) governance (see above) by facilitating place-based connections between people and events over time (Ginteng et al, 2017; Healey, 2006; Kong, 2007; Peng et al, 2020; Winstanley et al., 2015). So, how can city identity be defined and how might it motivate and/or sustain transformative DRR

processes? City identity arises from, for example, the city's distinctive visual elements such as architectural features and parklands and socio-cultural activities and festivals (Adams et al, 2009; Bhandari et al., 2010; Kong, 2007; Lynch, 1960). People's engagement with these elements over time leads to the emergence of communal experiences, beliefs, values, norms, and patterns of behaviour that influence how people, individually and collectively, interpret and respond to challenging environmental circumstances (Paasi, 2013).

From a transformative learning perspective, it can be postulated that city identity characteristics (e.g., architectural characteristics, festivals) influence people's sense of connectedness in ways that motivate commitment to act to build and sustain their city connections and development of emergent transformative capabilities (Bhandari et al., 2010). Hence, by virtue of its influence on fostering the emergence of a new collective culture (Paasi, 2013), there exist grounds for considering how city identity can emerge as a post-disaster transformative enabler. However, city identity is not the only spatial characteristic capable of motivating transformation. Place attachment and identity are also important.

The role that constructs of place attachment and place identity play in facilitating DRR is indicated in research using the CET (Frandsen et al., 2012; Paton et al., 2012; Paton et al., 2008) and in other studies (De Dominicis et al., 2015; Silver & Grek-Martin, 2015). Our discussion of the role of place attachment in transformative DRR commences by considering the relationship between city and place identities.

Place: Locational and neighbourhood influences.

Cities are environmentally complex and comprise locations that have varied relationships with their environment (e.g., river, coastal, topographic features) (Rademacher, 2015). Depending on one's location within a city, the hazards people experience will vary from one location/neighbourhood to another, as will people's sense of connectedness to their neighbourhood or locality/location.

Concepts of place attachment and identity can motivate people's engagement in collective community DRR actions (Bhandari et al., 2010; Frandsen et al., 2012; Monteil et al., 2020; Paton, 2019; Paton et al., 2008; Seebauer & Babicky, 2017; Silver & Grek-Martin, 2015). This view posits that people, individually and collectively, can be emotionally connected to place and source part of their identity from that place, making it valid to consider including multiple geographical/spatial levels of analysis,

with "place" becoming embedded features of a city, when conceptualizing how spatial connectedness influences adaptation and transformation.

The position adopted here portrays city and place attachment and identity as representing complementary locational influences on people's DRR thinking, with place attachment operating at the locality, home, or neighbourhood level and city identity as an overarching construct in which places are embedded (Bremmer et al, 2020; Devine-Wright, 2013; Healey, 2006). For city identity and place attachment/identity to be hypothesised as playing complementary roles in motivating adaptive and transformative responses, a mechanism linking them is needed (Bajek et al., 2008; Bhandari et al., 2010; Saunders & Becker, 2015). Consequently, including interdependent roles for city identity and place attachment/identity constructs in a tentative conceptual transformative DRR learning model is warranted (Figure 1). Another potential transformative enabler is people's relationship with the natural environment.

Socio-environmental relationships and co-existence.

Introducing a role for socio-environmental relationships in a conceptual model of transformative DRR acknowledges the importance of including an environmental dimension in DRR (Buergelt & Paton, 2014; Buergelt et al., 2017; Buergelt et al., 2022; O'Sullivan et al., 2002; Twigg, 2015). Evidence of transformative social-environmental learning was found in several study cases. Socio-ecological beliefs emerged as transformative outcomes in Kagoshima (e.g., the emergent *kyozon* construct encompassed the development of DRR practices that included learning to co-exist with an active volcano), Simeulue (e.g., *smong* stories and songs identifying the importance of understanding and being responsive to natural warning signs of tsunami), and Ho-Ping. However, comparable emergent beliefs were evident in neither the New Zealand nor the Australian cases. It is important to note that the New Zealand and Australian work discussed here comprised predominantly non-Indigenous people.

The inclusion of the Aboriginal and Torres Strait Islander or Māori populations, who traditionally embrace more ecocentric beliefs, could have provided a different perspective (Ali et al., 2021; Buergelt et al., 2017; Buergelt et al., 2022; Kenney et al., 2015; Tassell-Matamua et al., 2021). Without having undertaken this research there are some examples that highlight the potential of socio-ecological beliefs in transformative outcomes. For example, Māori communities' beliefs combined with experiences of earthquake response

and recovery following the Christchurch earthquake (along-side other subsequent disaster events) has likely prompted transformative social-environmental change in terms of better incorporation of Māori collaboration in DRR and emergency management processes (e.g., from national directives to local DRR) (Jayasinghe et al. 2020).

The development of more socio-environmental co-existence beliefs increases people's knowledge and understanding of nature, their relationship with nature, and environmental challenges, which can support developing adaptive capacities and strategies to safeguard oneself when the environment that confers lifestyle, amenity, and livelihood opportunities periodically turns hazardous. As evident in the application of the *kyozon* construct in Kagoshima, enhanced environmental knowledge can translate into increased adoption of pro-environmental DRR strategies (Charlesworth & Okereke, 2010; Buergelt & Paton, 2014; Paton, Buergelt, et al., 2015; Woodgate & Redclift, 1998). The pursuit of a socio-environmental contribution to transformative learning is warranted by it emerging as a component in this process (e.g., *kyozon* in Kagoshima).

Modelling Transformative DRR Learning

The various transformative DRR learning aspects, and their interactions, canvassed above are summarised in a conceptual transdisciplinary model of transformative DRR learning (see Figure 1). In this model, disaster experience is depicted as a catalyst for transformation. The relationship between disaster experience and transformation is first mediated by the emergence of several social and relationship competencies that support diverse community recovery processes (e.g., community participation, collective efficacy, empowerment). These competencies are described as enabling competencies to reflect their representing adaptive capacities that can support the development of diverse short-term recovery practices and potentially more substantive and enduring social-structural processes.

However, while these enabling adaptive capacities emerged in all case studies, in only some were they linked to the development of sustained social-structural processes. Factors proposed to account for the differences included governance and contextual influences on leader capability, such as local leader engagement in local governance processes, and cultural influences on the adaptive functioning of place attachment especially the degree of collectivistic characteristics. Thus, to account for differences between cases regarding the development of sustained social-

structural processes, the model proposes moderating roles for local leadership and national governance (Figure 1).

The relationship between enabling social systems and processes and the consolidation of transformative DRR processes is mediated by the nested relationship between city identity and place attachment/identity and local DRR governance. This relationship portrays key facets of the transformative learning process consolidating as comprising two interconnected sets of factors. The first set of factors includes those that motivate interest in developing more functional systems and structures in places people feel connected to (city identity and place attachment). The second set of factors entails those related to local participatory governance processes that enable sustaining the vision inherent in emergent processes and create the continuity required for consolidating processes in ways that ensure inter-generational transmission. As local leadership is fundamental to the latter, it is depicted as playing a moderating role in Figure 1. National governance is portrayed similarly to reflect how it can affect, for example, regulatory frameworks and resource procurement and distribution in ways that empower local action.

While the model gives centre stage to community enabling processes that derive from local initiative, it also accommodates the fact that government and NGO agency involvement to some degree will be inevitable, primarily through adopting strengths-based strategies designed to integrate community development and risk management strategies. While agency involvement is depicted as influencing community competence development and empowerment of affected community members, the heavier weight assigned to the arrows linking agency and community highlights the need to emphasise the empowering facet of this relationship. Key roles in this process are played by local leaders in engaged, inclusive, and competent communities being able to reconcile the relational and locational identities of their members, with transformation of emergent change into sustained capabilities being further influenced by complementary relationships between local and national governance frameworks.

The model acknowledges the fundamental socio-environmental co-existence context in which transformative DRR process are situated. The dashed line surrounding the enabling and consolidating processes is intended to signal it having an overarching role.

Limitations

There are several issues that qualify the findings presented. The inability to predict when and where a disaster will occur makes it generally challenging to conduct pre-event studies. The works discussed here are no exception. The fact that this introduces a tentative quality to the model presented and the rationale for its origin has, however, only limited implications for the goal of the paper to develop an exploratory conceptual model of transformative DRR learning by drawing on evidence derived from re-analysing several historical and contemporary studies undertaken by or involving the first author and supporting the model development process with relevant research. The rigour this integrative process brought to the re-analysis affords opportunities to use the conceptual model to guide future research questions and hypotheses, and to design practical capacity building intervention.

Despite the limitations resulting from the absence of pre-event comparative data in the contemporary studies of transformative learning in Ho-Ping, Christchurch, and Tasmania, several factors support the validity of the re-analysis. In Kagoshima, Simeulue, and Ho-Ping, the social-structural transformations discussed all emerged, and are acknowledged as such in historical and contemporary accounts, as a direct consequence of a specific event. Their social-structural characteristics are evident in their having persisted for over 100 years (in Kagoshima and Simeulue) and for some 10 years in Ho-Ping (at the time the research was undertaken). In each case the emergent transformation has been documented (see above).

In the Australian case, data were obtained from a Facebook page specifically set up to create a social (media) resource to plan for, manage, and support people's recovery. This was an emergent enabling resource, and one whose influence on social capacity building clearly emerged from the analysis (Irons & Paton, 2017). The analysis also showed that once recovery was stabilised this recourse was progressively used less and neither became nor triggered the emergence of an enduring social-structural process.

In the New Zealand case study, the analysis revealed that all respondents discussed how the beliefs, relationships, and actions discussed in this paper emerged because of their disaster and recovery experiences, providing evidence of transformative learning being linked to the experience of a specific disaster. This conclusion was

reinforced by the analysis of the interviews identifying how aftershock experiences contributed to the continued development of participants' social competencies, at least during the first 8 months of the recovery. It was also telling that one focus group comprised members of a pre-existing community group who discussed how neither their prior history as a group nor their having an established leader supported their ability to adapt. On the contrary, the analysis of the data from this focus group identified how they experienced enduring problems because of their group processes and leadership failing to provide the kinds of social recovery competencies identified by members of other focus groups (Mamula-Seadon et al., 2012; Paton et al., 2014). This finding adds further weight to concluding that the Christchurch data offers evidence of transformative capacity building arising as a direct consequence of how experiencing a disaster enabled and consolidated social-structural processes.

Conclusion

This paper offers a conceptual transdisciplinary transformative learning DRR model developed from a comparative review of studies of disaster-affected localities where emergent enabling socio-cultural processes were consolidated into enduring DRR capabilities. As stated at the beginning of our paper, we hope that our model can serve as a valuable starting point for further qualitative and quantitative research that further expands our model, sheds light onto specific dimensions of our model, and tests implicit and explicit hypotheses.

This model provides, for example, a starting point for systematically exploring and developing enduring individual and social transformative DRR learning. Investing in research into the nexus of DRR and transformation is becoming increasingly important in a world where a combination of limited DRR capability in the various disaster management phases and the escalating likelihood of societies and their citizens experiencing increasingly complex, repetitive, intense, and persistent natural hazard activity means that disasters will become too frequent facets of the lives of peoples around the world. The discussion here does not in any way negate the vital importance of facilitating pre-event DRR capability. However, pre-event strategies can be complemented by systematically facilitating how the transformative phoenix of DRR capability can rise from the ashes of increasingly prevalent disasters.

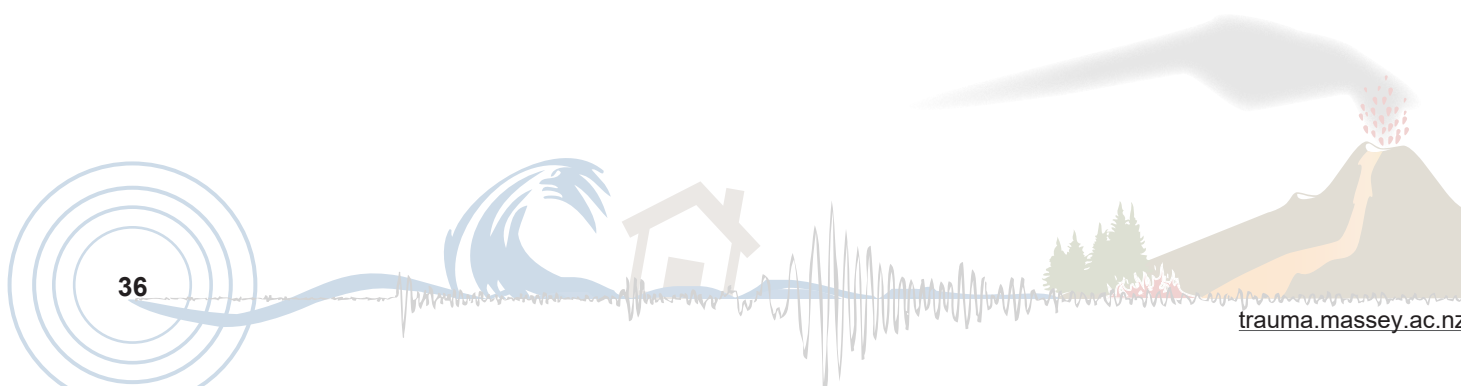
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The development and use of Community Engagement Theory to inform readiness interventions for natural hazard events

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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).

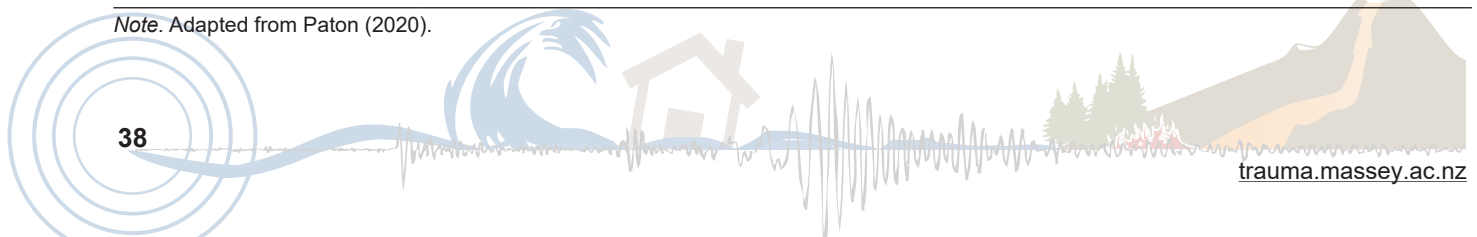


Table 2
Major Preparedness Theories and Their Indicative Sources of Variables and All-hazards Testing

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.

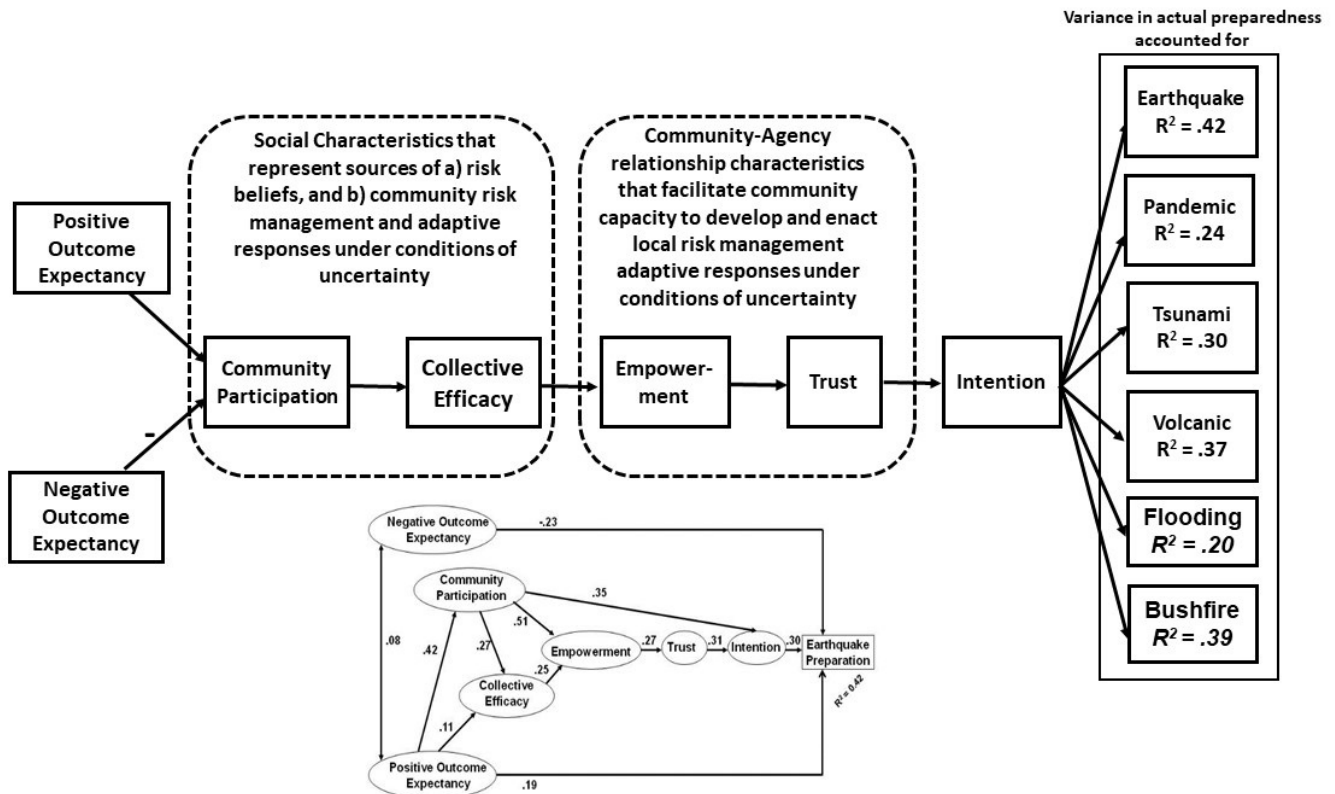
People's interpretation of environmental risk and their development of risk mitigation and preparedness options is an interpretive social process undertaken in social networks comprising others that people identify with and who share similar values, beliefs, and attitudes (Earle, 2004; Lion et al., 2002; 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
<p>Structural</p> <ul style="list-style-type: none"> • Prevent ash from entering home/ gutters etc. • Removing ash from roofs, vehicles etc. <p>Emergency Kit</p> <ul style="list-style-type: none"> • Emergency water supplies (3 litres per person per day) for a week • Emergency food supplies • Radio/torch/batteries • Masks to prevent ash inhalation <p>Household Planning</p> <ul style="list-style-type: none"> • Plan covering family location, evacuation, relocation • Planning for changes to work location and practices • Medicines, valuables, documents ready for evacuation • Neighbourhood planning <p>Community Planning</p> <ul style="list-style-type: none"> • Attend neighbourhood/community meetings about eruption preparedness • Discuss consequences and planning needs in neighbourhood • Work with neighbours/social network members to develop collective plan <p>Civic/Societal Relationships</p> <ul style="list-style-type: none"> • Attend Council/scientific meetings • Discuss issues with civic agency representatives • Discuss issues with employer re: working practices and arrangements and permanent changes in employment <p>Information</p> <ul style="list-style-type: none"> • Information in Yellow Pages phone book • Information on ash impacts on health and home • Council emergency management contact numbers 	<p>Structural</p> <ul style="list-style-type: none"> • None required <p>Emergency Kit</p> <ul style="list-style-type: none"> • 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 <p>Household Planning</p> <ul style="list-style-type: none"> • 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 <p>Community Planning</p> <ul style="list-style-type: none"> • Planning for school/child care closure • Home schooling • Neighbour support <p>Civic/Societal Relationships</p> <ul style="list-style-type: none"> • 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 <p>Information</p> <ul style="list-style-type: none"> • 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

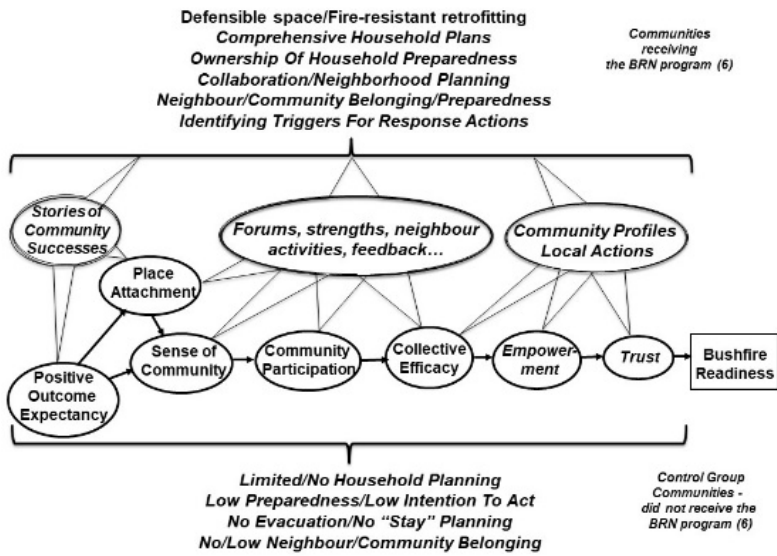
all 12 communities in 2014 and a post-intervention assessment in the same communities 2 years later in 2016. Evaluation comprised qualitative research using community focus groups, supplemented by a short preparedness survey, to understand the attributes that enhanced preparedness and response (Skinner, 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; Mclvor & Paton, 2007; Mclvor 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	<p>Develop people’s self-efficacy in their ability to undertake readiness actions:</p> <ul style="list-style-type: none"> • 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). <p>Increase people’s positive outcome expectancy that undertaking readiness activities will lead to a better post-disaster outcome:</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> ◦ 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 ◦ Show that losses are avoidable, and ways people can avoid loss ◦ Describe the immediate utility and/or benefits of mitigation (e.g., lower house maintenance costs, family safety).
Reduce negative outcome expectancy	<p>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</p> <p>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</p> <p>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).</p>
Increase community participation	<p>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).</p> <p>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).</p> <p>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.</p> <p>Ensure participation by current or future leaders by:</p> <ul style="list-style-type: none"> • 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	<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> • 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	<p>Empower people so they can call upon personal and external resources to deal with issues that arise. Suggestions include:</p> <ul style="list-style-type: none"> • 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. <p>Via planning, ensure people have access to resources that meet their needs for readiness and response/recovery, including:</p> <ul style="list-style-type: none"> • 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). <p>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.</p>

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 <i>Paton, Bajek et al. (2010)</i> <i>Paton, Anderson et al. (2015)</i>	Japan <i>Paton, Bajek et al. (2010)</i>	Taiwan <i>Jang et al. (2016)</i> Nepal <i>Adhikari et al. (2018)</i> Iran <i>Ranjbar et al. (2018)</i> <i>Ranjbar et al. (2021)</i>
Tsunami	USA <i>Paton et al. (2009)</i> Australia <i>Paton, Frandsen et al. (2010)</i>		
Volcanic	Aotearoa New Zealand <i>Paton, Smith et al. (2008)</i>	Japan <i>Paton, Okada et al. (2013)</i>	Indonesia <i>Sagala et al. (2009)</i>
Wildfire	Australia <i>Paton, Buergelt et al. (2008)</i> <i>Frandsen et al. (2012)</i>		Portugal <i>Paton, Frandsen et al. (2012)</i> <i>Paton, Tedim et al. (2012)</i> <i>Paton & Tedim (2013)</i>

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.

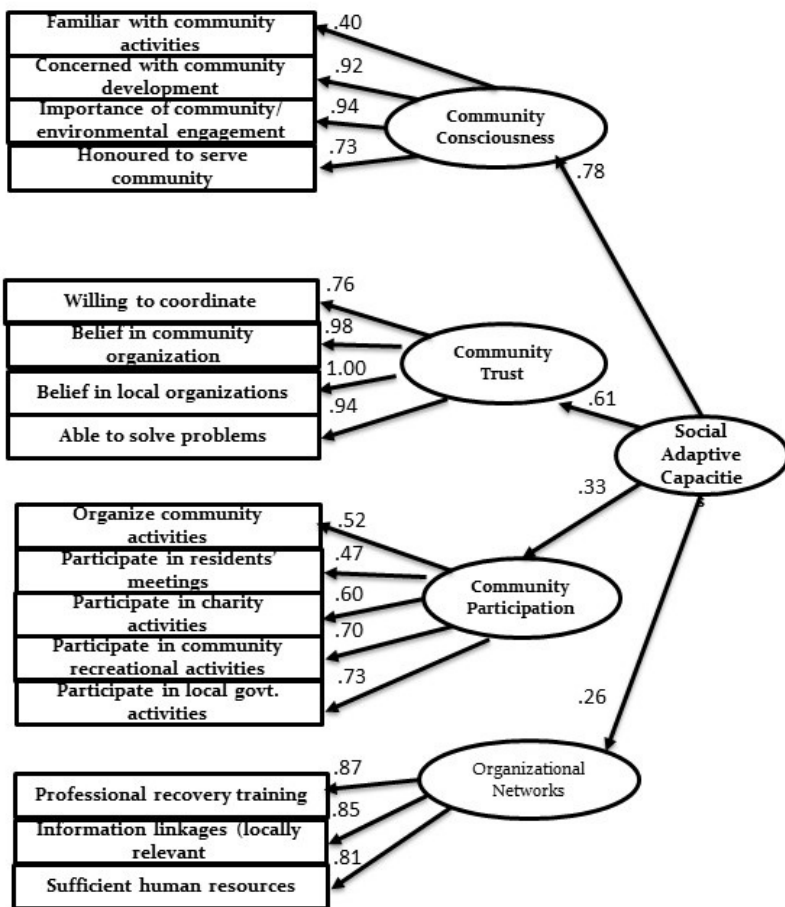
Evidence for cultural equivalence and all-hazard equivalence increases the confidence government agencies can have in being able to use the CET to support developing, testing/evaluating, and refining community engagement interventions in multi-cultural and multi-hazard countries like Aotearoa New Zealand 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.

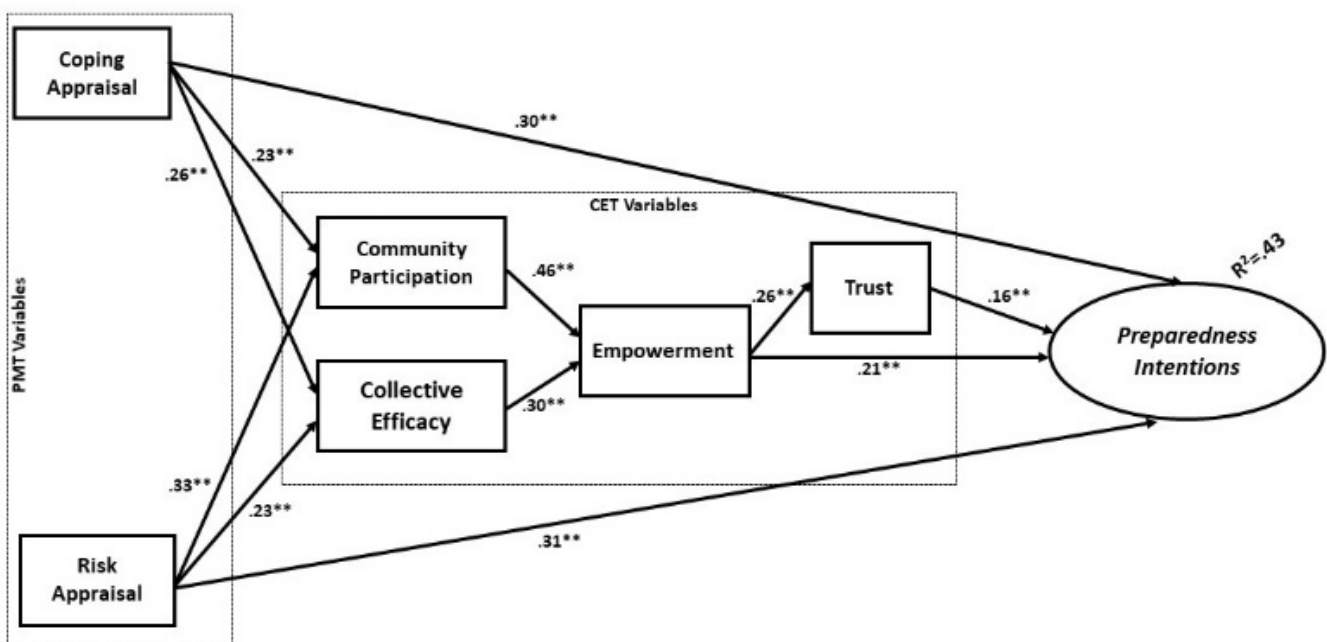
As with the models of readiness presented in Table 2, there is a vast array of research that exists which explains influences on resilience, response, and recovery processes (e.g. Aldrich, & Meyer, 2015; Berkes, 2007; Cutter et al., 2014; Johnson & Olshansky, 2017; Kobayashi, 2007; Norris et al., 2008). 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.

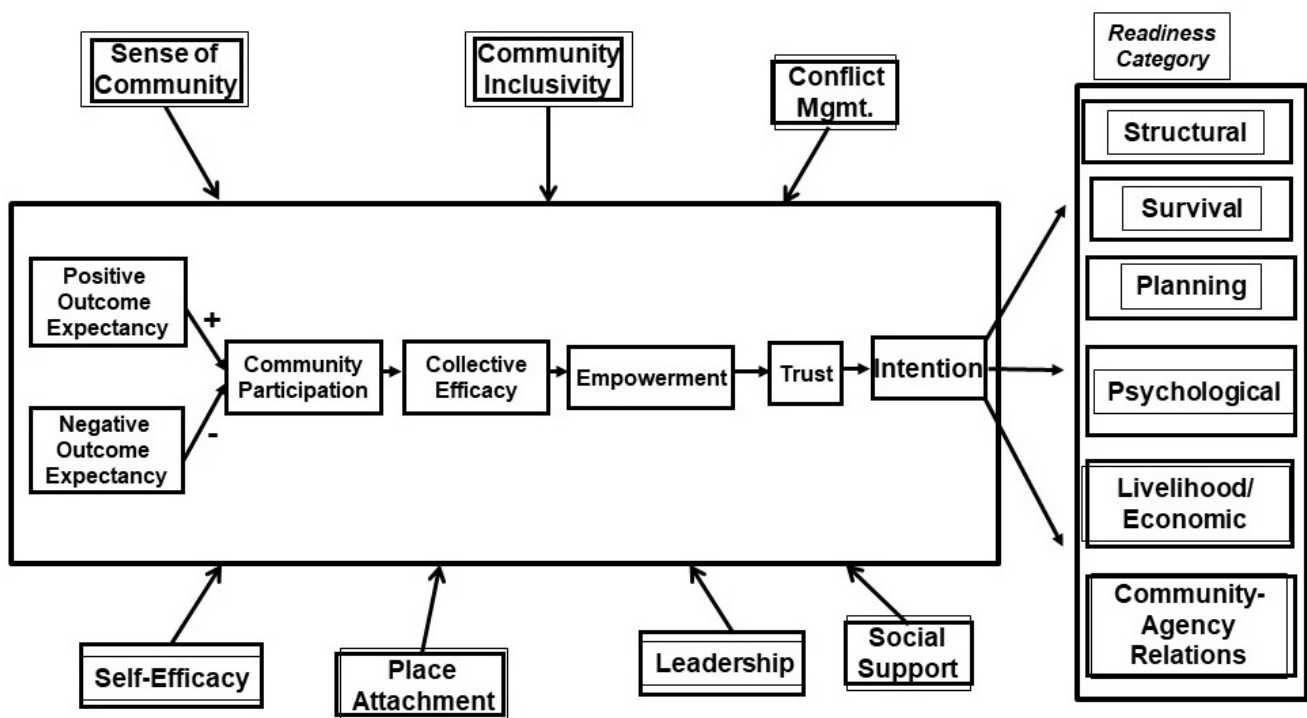
Other recovery-focused research, such as work in Christchurch, New Zealand, following the 2010-11 earthquakes, has contributed insights into variables that could be included to further evolve CET. Several examples from Christchurch highlight how recovery following disasters has been important for developing aspects of the CET. In the first example, the Ministry of Civil Defence & Emergency Management¹ 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

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

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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.

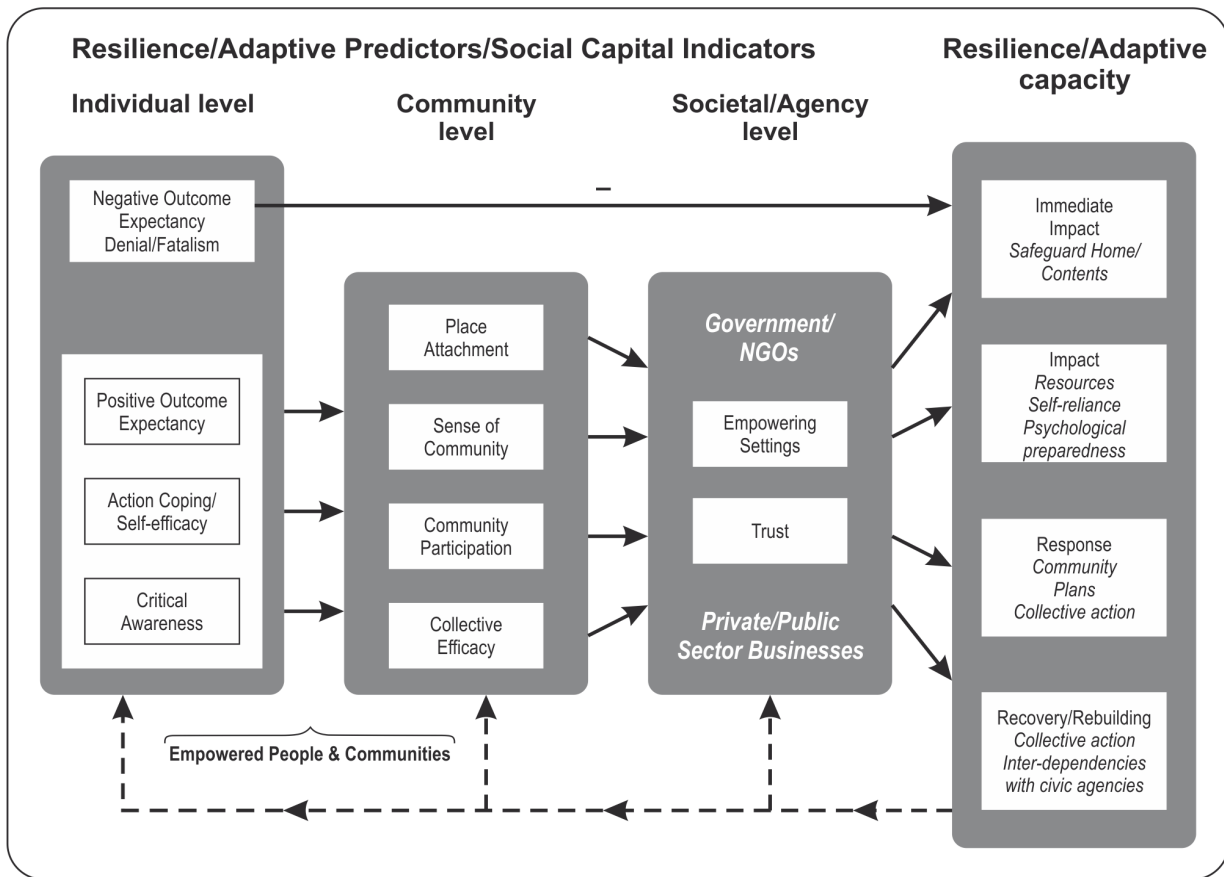
Future Theorizing to Further Evolve CET: Utilizing and Integrating Readiness Research Across the Scales, Disaster Cycle Phases, Hazards, and Cultures

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 through 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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Where's the community in community resilience? A post-earthquake study in Kaikōura, Aotearoa New Zealand

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Abstract

Theories about what communities are have been constantly evolving in response to considerations about the complex and multi-faceted processes that shape them. While this has led to conceptual refinement in some areas of research, debates about the nature of community are often overlooked when the term is paired with other concepts such as resilience. In such pairings, more discussion is evident over the meaning of resilience than the nature of community. Studies that focus on the resilience of a community risk neglecting the complex dynamics that shape them and, as a consequence, tend to underestimate how these processes influence resilience. Framed by Paton's (2006) model of adaptive capacity, in this paper we argue that a more nuanced understanding of community which acknowledges the web of formal and informal relationships is required. These relationships give rise to "collectives" which, in turn, are integral to a community's resilience because they bridge the gap between the individual and "the" community. This paper uses qualitative methods to examine collectives in Kaikōura, Aotearoa New Zealand following a Mw7.8 earthquake to further our understanding of what is meant by community in community resilience. By examining the meso/collective level, rather than the micro/individual or macro/community level of community, a more nuanced understanding of community resilience emerges.

Keywords: Community, resilience, disaster, collective, earthquake

Rebecca Solnit's (2009) book "A Paradise Built in Hell: The Extraordinary Communities that Arise in Disaster" brought attention to how communities are conceptualised following disaster: how they emerge, engage, and thrive during times of significant disruption, often with positive outcomes. The ability to positively respond to significant disruption is often described as *resilience*, which Holling (1973) influentially defined as the capacity "to absorb change and disturbance" (p. 14). When applied to social systems, Paton (2007) explains that resilience can be a community's ability to anticipate and adapt to changes that occur before, during, and after major events. *Community* resilience has gained momentum in understanding how "community members" respond to "change, uncertainty, unpredictability, and surprise" (Magis, 2010, p. 402). There is, however, a demonstrable difference between community members and communities; who are these "community members", how do they belong and why, and how do these members aggregate to "a" community? To address these questions, key characteristics of community identified throughout Paton's work such as sense of community, collective efficacy, trust, and empowerment will be used to examine community resilience in Kaikōura following a major disruptive event. This paper will introduce the concept of collectives as a meso-level in community resilience in relation to Paton's (2006) adaptive capacity model.

The North Canterbury region of the South Island of Aotearoa New Zealand experienced a destructive M_w 7.8 earthquake on 14 November 2016 at 00:02, causing some of the most complex surface level ruptures ever studied (Cesca et al., 2017; Shi et al., 2019). The earthquake drove the land approximately 8 metres vertically and shifted areas of land more than 10 metres horizontally (Cesca et al., 2017), exposing large sections of the coast that had previously been under water (Hamling et al., 2017). In its immediate aftermath, the earthquake destroyed transportation and communication infrastructure (Liu et al., 2017; Stevenson et al., 2017). The loss of tourism also severely impacted economic stability (McDonald et al., 2017).

Since the earthquake occurred, there has been significant research on the physical systems but, in terms of the social sciences or *community* resilience, studies tended to focus on tourism aspects (Fountain

& Cradock-Henry, 2020; Wilson & Simmons, 2018), socio-ecological systems (Cradock-Henry et al., 2019), and psychological and economic processes (Fang et al., 2020; Kwazu & Chang-Richards, 2022; Neeraj et al., 2021). The social consequences for local “community members” have gone relatively underexplored. What was missing – and the gap our research sought to address – were the implications of the short- and long-term effects of the earthquake on residents *collectively*. Rather than considering how “the” community responds as an amalgamated whole, this paper highlights the importance of adopting a more nuanced understanding of *community* to consider how multiple collectives *within* community responded to the event. In doing so, we also note a shift in focus from outcomes (such as resilience) to the processes that promote or impede those outcomes.

In February 2017 a workshop was co-organised by Aotearoa New Zealand research institutions and collaboratives – QuakeCoRE, the Natural Hazards Research Platform, and Resilience to Nature’s Challenges – to identify gaps in disaster research that could be explored in Kaikōura. It was identified that the potential importance of “creating and empowering locally led recovery initiatives” (Hatton et al., 2017, p. 87) following the earthquake could provide a useful tool to better understand *community* resilience. However, there were also pre-existing initiatives in Kaikōura that contributed to the recovery efforts. This paper draws on Paton’s (2006) model of adaptive capacity as we present our findings of locally-led initiatives (collectives) to consider the processes within community that contribute to and hinder resilience.

Community

Whether through intimate, familial connections or as organisations with a shared special interest (Aitken, 2009), humans work together in groups (Delanty, 2003). Community definitions emerged roughly a century ago and focused on how people interacted with one another. Tönnies considered how people interacted, as close interpersonal connections reflected in community (*gemeinschaft*) and special interest organisations that emerge from society (*gesellschaft*). Regardless of their composition or purpose, both terms exist as a form of *groupness*. A contemporary of Tönnies, Durkheim also established early definitions of community. However, unlike Tönnies, Durkheim focussed on the composition of community, either as united through shared/collective identities or through unique/individual expertise. Both of Durkheim’s forms of community were rooted in the

idea that the “parts” (people) were not as important as the “irreducible whole” community; (Cohen, 1985, p. 23). Focusing less on community as a “whole”, Weber unpacked the role of the individual in community. However, rather than considering the “wishes, needs, and behaviours” of *the* individual, Weber considered how individuals *collectively* considered the “wishes, needs, and behaviours of others” (Day, 2006, p. 4). Combined, these three early theorists of community set the groundwork for contemporary understandings of how people interact as a group, or *collective*.

More recently, scholars have critiqued early definitions of community as being focused on a bounded, one-dimensional, and static entity (Titz et al., 2018; Winterton et al., 2014). This can be seen in Tönnies, Durkheim, and Weber’s work on community as a “whole”. In the last 100 years there has been significant evolution and variation of the term “community”; though imperative, acknowledging its complexity as both a theory and an entity can be daunting. Day (2006) argued that without recognising the intricacies of community and the complexity that emerges from how the characteristics of it interact, its overuse all too often “signifies something vague and ill-defined” (p. 2). Moving away from early definitions of community as a single bounded entity and acknowledging the dynamic characteristics within allows for increased consideration of the social complexities and processes that emerge from identity and interaction in community (Titz et al., 2018).

Räsänen et al. (2020) identified three types of communities often found in community resilience work: place-based communities, interaction-based communities, and communities of practice and interest. Place-based community theories can be useful to consider people, places, and organisations (Räsänen et al., 2020), yet these types of community do not consider the complex processes that exist between these characteristics. Interrogating the processes, interaction-based communities focus on how people engage with one another in everyday life (Day, 2006; Gilchrist, 2019). Finally, communities of practice and interest draw people together to engage in a common goal (Wenger, 2011) and can be comprised of workplaces, school groups, and hobby associations. These contemporary interpretations of community expand on early interpretations by moving beyond the micro- (individual) level and the macro- (community) level to consider the meso- (collective) level within *community*. However, the complex interactions *between* the groups must also be taken into account.

Understanding the complicated web of characteristics and social complexities that make up community offers a glimpse into how a community functions in day-to-day life as well as during times of uncertainty. Characteristics can often be considered as the visible or tangible aspects of community. Buildings, people, and groups are often the markers for place-based communities; however, these types of communities often follow closely in line with early definitions of community in being too rigid (Räsänen et al., 2020; Titz et al., 2018; Winterton et al., 2014). Therefore, it is necessary to go beyond the identifiable characteristics of community to consider the less tangible aspects. The characteristics that are more difficult to distinguish or examine include practices, interests, trust, power, social connections, inclusion/exclusion, and (in)equality (Barrett, 2015; Liepins, 2000a, 2000b). Despite being more complex than physical places, people, and groups, these other characteristics, once acknowledged, can strengthen and enrich the community mosaic. Additionally, these complex characteristics can offer insight into realising the social complexities within community and how they are constantly shifting and in a state of flux, especially during times of heightened unpredictability or change.

The social complexities that exist in community can be explored through everyday life (Perkins & Thorns, 2012; Sztompka, 2002). Everyday life can emerge from the interactions that people engage in on a regular basis such as attending work, school, or regularly scheduled recreational activities (Sztompka, 2008). There may be slight variations in everyday life, but there is a general expectation that things will remain relatively routine. Ways to assess everyday life can emerge from the same characteristics that are identified in types of communities such as place, interactions, and practices. Yet, in community resilience research, it is often the place-based community that is explored in-depth rather than the interactions and practices that enable resilience. Collectives, as they operate in everyday life and bring people together for various reasons, can provide a window through which to explore how the *interactions* and *practices* within community contribute to resilience.

While the processes of everyday life may seem stagnant or repetitive, the process of engaging in everyday life demonstrates how community is constantly shifting (Sztompka, 2002). The casual connections people have with one another through their interactions in everyday life builds a togetherness that binds people to a “community” (Gilchrist, 2019). Identifying these connections at a meso- (collective) level, rather than micro (individual)

or macro (community), can help to interrogate how collectives can be drawn on as a resource during times of uncertainty. A large disruption such as a disaster or significant environmental event disrupts the status quo of the “community”. Therefore, understanding the unique characteristics and social complexities at the meso-level and how these shift following a major event can contribute to a more nuanced understanding of *community* resilience at the macro-level.

Community Resilience

Much like community, community resilience has undergone a significant transformation in theory since its inception. Srivastava (2017) proposed that:

Eventually, the community, be it rural or urban, must respond to disasters as one entity. It is true that individual resilience plays a role, however, it is the resilience of the community as a whole that determines the capacity of a community to regain social and economic functioning (p. 29).

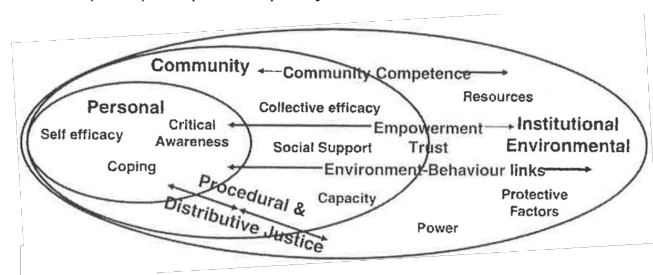
However, this assumption of community existing as a singular entity mimics issues with defining community and does not correlate with the above conceptualisations of community as being made up of numerous interconnected characteristics and social complexities. Furthermore, the above definition moves away from Magis’ (2010) early definition of community resilience, described as the ability of communities to respond to the challenges and changes brought on by disasters by drawing upon existing resources (Paton & Johnston, 2001; Paton et al., 2006). Social capital is often considered to be a useful resource in understanding social dynamics of community resilience (Aldrich & Meyer, 2015; Uekusa et al., 2020; Vallance & Rudkevitch, 2021) and it sits within the wider capitals framework approach to community resilience (Callaghan & Colton, 2008; Wilson, 2012). While social capital can be a useful resilience indicator for individuals, organisations, and levels of decision making, how characteristics of community can influence and be influenced by collectives should also be considered.

Previous research has considered multiple approaches to community resilience; this paper continues this reasoning by focussing on the heterogenous characteristics and interactions within them, but from a meso-level. Community can no longer be seen as homogenous in disaster research and practice. Exploring the features of community can help to determine how resilient it can be (Berkes & Ross, 2012; Paton & Johnston, 2001), rather than whether it is resilient or not. Paton (2017) highlights the important influence individuals and collectives can

have on community resilience. Through their conscious decisions, people can determine the resilience and recovery outcomes following a disaster – whether these outcomes are positive, negative, or a blend of both (Paton, 2017). Yet, the level of influence people have on community resilience is determined by the status of the characteristics within the community.

Emerging from a collection of works on disaster resilience, Paton (2006) developed a model of adaptive capacity (Figure 1) that considers the individual, community, and institutional/environmental levels of resilience. Paton's model demonstrates that within the three levels there are characteristics such as factors, linkages, and resources that influence adaptive capacity. Understanding the complexity between the levels and how the characteristics influence community resilience at different stages, including impact, response, and recovery, is a key aspect in adaptive capacity (Paton, 2006).

Figure 1
Paton's (2006) Adaptive Capacity Model



Paton (2017) argued that the multiple ways people can respond to and manage environmental events is determined through their various interactions and is influenced by multiple factors including where the event is, who is involved, and when it occurs. Yet, the *how* and *why* of these interactions should also be taken into account; collectives and their ability to contribute to and influence decision making can reveal insight into these processes. The numerous ways people can be involved in community resilience can be attributed to a “shared (and complementary) responsibility” (Paton, 2017, p. 10), a concept that is not dissimilar to the notion of *collectives*. Paton (2007) identified the important role empowerment can have on community members, and that when their ideas are supported by decision makers it builds trust between them. It was also identified that engaging with local community groups can help build empowerment in preparing for and responding to disasters (Paton, 2007). This raises important questions about the qualities and characteristics of these community groups

(i.e., collectives) that sit between the individual and the community. The aim of this paper is to outline how collectives contribute to resilience and adaptive capacity. Collectives act as a conduit between the micro- (individual) level and the macro- (community) level and contribute to the development of the characteristics identified by Paton.

Collectives

Essentially, collectives are individuals coming together as a group with a direct intention or common purpose such as faith-based organisations, weekly “stich ‘n’ bitch” meetings, working groups, sports clubs, government departments, NGOs, steering committees, and event planning committees (Gilchrist, 2019; Mann et al., 2021; Marquet, 2015; Rudkevitch, 2022; Scherzer et al., 2020; Sztompka, 2008; Wenger, 2011). Understanding how collectives operate and interact can provide greater insight into what community is. Collectives both constitute and emerge as a property of community; without them, larger aggregations (e.g., communities, societies) would not exist. Therefore, to understand *community* resilience then *collectives* must be examined. We draw upon fieldwork conducted in Kaikōura after the 2016 earthquake to explore the role and contribution of collectives in community resilience.

Kaikōura Context

Kaikōura is the second smallest district in Aotearoa New Zealand by population, with 3,912 residents (Stats NZ Tatauranga Aotearoa, 2017). The area has been occupied by Māori for approximately 800 years; the tribal council is Te Rūnanga o Kaikōura and the hapu is Ngāti Kuri (Kaikōura District Council, 2017; Te Rūnanga o Ngāi Tahu, 2020). Settled by Europeans in the 1830s for whaling, Kaikōura (*kai*-food and *kōura*-crayfish) has long had a connection to the sea. Primary industries such as agriculture and fisheries emerged as important industries in Kaikōura (McAloon et al., 1998); both were impacted by the earthquake. Yet the ocean has also provided significant economic stability in the form of tourism, as visitors come from around the world to engage in nature-based tourism experiences such as whale, dolphin, and seal viewing and adventure tours (Moore et al., 1998).

When the earthquake struck, thousands of tourists as well as locals became trapped in the district due to significant slips cutting off all roads in and out of Kaikōura. After an extensive rescue effort to evacuate tourists, elderly, and injured, the residents remained to rebuild and recover from the devastating earthquake (Stevenson et

al., 2017). While the road repairs were quickly underway, the economic impacts proved to be substantial. Inaccessibility, harbour damage, and destruction of seal habitats meant there was an estimated \$21 million loss in domestic and international tourism spending in Kaikōura (McDonald et al., 2017; Simmons et al., 2017; Stevenson et al., 2017). However, these losses were cushioned through the increase in revenue from an influx of workers contributing to the North Canterbury Transport Infrastructure Recovery (McDonald et al., 2017).

In order to better manage the recovery efforts in Kaikōura, a Social Earthquake Task Group (SETG) was formed to guide the community recovery, with the first meeting held on 22 November 2016 (Kaikōura District Council, 2017). Key focus areas for SETG included health and wellbeing, elderly support, housing, community facilities, and promoting a greater sense of community through interaction (Kaikōura District Council, 2017). The other task groups focussed on the natural and built environment, the economy, and the future (Kaikōura District Council, 2017). While the other task groups were equally important, this research sits firmly within the Community Recovery Programme, represented by SETG. Even more specifically, this research closely examines the “encouraging positive community interaction” opportunity set out in the Reimagine Kaikōura Recovery Plan (Kaikōura District Council, 2017). To evaluate the success of the opportunity, the Kaikōura District Council (KDC) highlighted key areas to monitor:

- 1) a strong sense of community;
- 2) strong community participation and a thriving volunteer sector; and
- 3) the number and range of activities provides for the diversity of the community including arts, culture, recreational, sporting, and social activities.

These three areas are explored in this paper through the identification and assessment of collectives in Kaikōura. The first key area to be monitored is strongly rooted in Paton’s (2006) model of resilience as sense of community. The two other key areas to monitor can offer units of evaluation as collectives were used in this work to examine community resilience. When combined and evaluated, collectives can reveal both the unique characteristics of community as well as social complexities. Assessing how collectives are influenced by four of Paton’s identified resources in community resilience can reveal whether the three key areas to monitor were achieved, but also what they can reveal about *community* following a major environmental event.

Method

This research used a case study approach with exploratory inquiry and abductive reasoning. Qualitative methods, such as participant observation and interviews, were utilised to collect data. The data collection process began in July 2018 with document analysis, followed by interviews and participant observation commencing in September 2018 after receiving ethics approval from the Lincoln University Human Ethics Committee.

Case Study

Case study research often examines a phenomenon in a “real-life context” (Scholz & Tietje, 2002, p. 9) using a single unit analysis or multiple units of analysis to understand that phenomenon (Payne & Payne, 2004; Yin, 2014). This research considered multiple collectives within Kaikōura. Due to the nature of this research being focused on *community* it seemed pertinent to engage in a case study approach where Kaikōura is the case study, the collectives are the units of analysis, and the *community* resilience process is the phenomenon. As this research aimed to explore the phenomenon of community resilience from the inside-out, exploratory inquiry was used to assess broad concepts before eventually narrowing around themes (Stebbins, 2001; Wellington & Szczerbinski, 2007). This approach can be equated to a process of discovery where researchers “must intentionally put themselves in a position to make discoveries” (Stebbins, 2001, p. 4). Given that the research was focussed on discovering the facets of community in everyday life and during unexpected times, exploratory inquiry was appropriate.

Data Collection

Document analysis, semi-structured interviews, and participant observation were the methods used in this research. Document analysis of media articles, websites, and newsletters was initially used to establish which collectives would be examined in this research. As interviews were undertaken it was discovered that the initial collectives identified through document analysis needed to shift due to some collectives no longer existing and others emerging. Rather than focussing heavily on *community* collectives it was found that the research needed to shift to look at some collectives that were initiated by the local government. The types of collectives examined in this paper included community gatherings such as dinners and gardens, environmental stewardship projects, and volunteer groups. Many of the collectives existed prior to the earthquake, although some emerged

following the earthquake. It was common for key contacts in collectives to be listed on the documents, which enabled a short list of initial interviewees. From there, snowball sampling provided additional participants up to a total of 22. Most participants were involved in some capacity in the collectives that were examined, either as the head of a collective, or a participant in a collective, or were involved in local government as an elected official or employee. The semi-structured interviews were centred around how collectives operated prior to, during, and after the earthquake and how that impacted their perceptions of community following the earthquake. Some of the themes that were examined in the interviews were the individual's involvement in the collective, how the earthquake may have changed the collective, and what the future expectations were for the collective. Participant observation included attendance at some of the organised activities and events put on by collectives as well as attendance at wider community activities such as earthquake anniversary efforts that were not directly related to the collectives but were linked to the earthquake recovery efforts. The purpose in attending the events was to capture how the locals engaged in the community, both within collectives and outside of them.

Abductive Reasoning

Abductive reasoning was employed to assess the data. Abductive reasoning formulates a new way of thinking that emerges from the act of discovery or an attempt to disprove previously accepted theories (Hanson, 1958; Reichertz, 2011, 2013). Often abductive reasoning is undertaken by first assessing theory and then using experiential and observable data to reassess the theory (Reichertz, 2013). In the research onset, literature and document analysis were used to investigate and assess current understandings of community resilience. Following on from the primary assessment, fieldwork was completed and analysed. Both theories and observations were assessed independently and then compared.

Results

The Role of Collectives in “Community” Resilience

Through the analysis of the literature and interviews, a complex conceptualisation of community emerged. Paton and Johnston (2001) outlined how active participation by community members in community activities and events can promote increased resilience, regardless of whether these activities and events are directly related to disaster risk reduction. Understanding characteristics within the groups that community members engage in

can offer a unique perspective on *community* resilience. However, how community members interact with decision makers and vice versa can influence the development and existence of trust and empowerment, and in turn influence how they can enact collective efficacy (Paton et al., 2017). Paton et al. (2017) also explain, however, that these qualities of community are unlikely to be affected by the “mainstream risk management process” (p. 134) and that they can only be influenced through community development and engagement strategies. It can be determined, as will be demonstrated below, that unless sense of community, collective efficacy, trust, and empowerment can be fostered through the risk management and recovery process then community resilience may diminish.

Sense of community

Understanding sense of community can lend insight into “how [community] becomes a resource for people, particularly in times of stress” (Pooley et al., 2006, p. 165) and how it can be drawn on to encourage action during times of uncertainty. Norris et al. (2008) highlighted the important role a strong sense of community had on forming community resilience. Furthermore, having a strong sense of community prior to an event can allow for swifter recovery as those social connections are pre-existing (Chamlee-Wright & Storr, 2011). These strong connections were often discussed by local residents, both in connection with the environment and to each other.

One participant recounted how:

[The] community is a tight community. It is very self-protective. There is a lot of connections. Family connections. School connections. Everyone is intertwined one way or another. When you come to this community it kind of doesn't take that long to get intertwined if you really want to get yourself involved.

Another local community member stated that:

Community is sharing. That's basically it. Give and take. Share. Friendship. Support. Solidarity. Coming together. Working together for a common goal. There's lots of examples of that here. They have events here that bring the community together.

These two participants felt a strong sense of community that emerged from connections between people and general reciprocity of resources, both tangible and intangible. However, this was not the case for all participants. One participant explained that:

The community is as fractured as it has ever been. Our Rūnanga isn't working with our council. Our schools are not working with our community. Our businesses are all... some of them are struggling. We need to actually stop, get our house in order and actually try to move on together collaboratively because we are not doing it right now.

In comparing the comments made by participants it emerged that while some community members believed there was a strong sense of community, others felt the disconnection was too strong between collectives, which negatively impacted the sense of community. But not everyone was considered to be a part of "the" community. When discussing the new leadership team at the council that was brought in following the earthquake, one participant explained that:

My personal opinion is that there are too many people that are not connected with our community and the team leadership of the council. They are just not connected. They just don't have any idea what our community is about.

Another community member stated that "We seem to have a lot of people with hidden agendas on council too, which I don't think helps". These two quotes represent how some community members did not consider the senior leadership team at KDC to be part of "the" community and there was some frustration directed towards council regarding the diminished sense of community in Kaikōura. This disconnection between collectives and senior leadership at KDC impacted the potential for collective efficacy.

Collective efficacy

For Mannarini and Fedi (2009), sense of community emerges from social/civic participation such as volunteering, involvement in community programming, and people coming together to protect their neighbourhood. The idea of social/civic participation is not dissimilar to collective efficacy. Collective efficacy can be defined as a "sense of collective competence shared among individuals when allocating, coordinating, and integrating their resources in a successful concerted response to specific situational demands" (Zaccaro et al., 1995, p. 309). In a sense, collective efficacy can be broken down to consider how people work together to effect community change, a concept that has been assessed previously in community resilience research (Kwok et al., 2016; Rapaport et al., 2018; Sherrieb et al., 2010; Tidball et al., 2010). Collective efficacy was demonstrated in the creation and continuation of social/civic participation in

Kaikōura prior to and following the earthquake, such as through the engagement in collectives, collaborative events, and cross-organisation co-operation. Within collectives, efficacy emerged as individuals connected with one another through routine engagement and interaction. The more people engaged with one another, the stronger the connections, further enabling collective efficacy. Being able to organise as a collective prior to the earthquake allowed collectives to organise effectively following the event. As one collective's leader explained:

When you're looking at community groups or community post-earthquake, I think for us we've been connected all the way through, and it is not just because we have a building to act out of, it is actually about our holistic space.

While this participant identified that they were able to have high levels of collective efficacy in terms of organising their collective, it was noted that this was not the case for the "whole" community. They then went on to explain that:

Whether it is pre- or post-earthquake, although I can see little bubbles of the community interacting a lot and being more engaged than they ever have been in the last probably decade, there is still people struggling. There still isn't a community voice into the higher-level decision making.

In terms of collectives collaborating, one participant said "I still don't think that [organisations] are all working towards one vision. But I do think we are working together more than we ever had. So that is kind of a step in the right direction". Despite collectives as singular organisations being able to contribute a great deal of resources to building strong social/civic participation through volunteering, community programming, and developing the neighbourhood/town, this did not translate to having strong efficacy in cross-collective collaboration or higher-level decision making. Difficulties in creating cross-collective efficacy could be attributed to low levels of trust.

Trust

Trust can be built from community members being involved in the decision making for risk assessment and management. High levels of trust can prevent emergency management advisors being blamed for issues arising from disaster planning (Paton et al., 2006). However, following the earthquake in Kaikōura there was diminished trust due to staffing changes at the KDC. As stated by a community member and KDC employee:

The fact that the council [employees were] . . . so new we didn't have that well of trust and the kind of [social] credit. . . If you have worked with someone for a long time there's ups and downs and you acknowledge them but when you just met someone. . . it just wasn't there, the staff loyalty.

The low levels of trust in the incoming senior staff within council following the earthquake led to disconnection in the overall recovery efforts and planning. However, low levels of trust were not permanent. Feelings of distrust were able to be reversed when KDC actively listened to and worked with local collectives to avoid the closure of a building out of which many collectives operated. This building was set to be moth-balled by KDC, but collectives came together to rally against its closure. This meant that the collectives went through a submission phase, raised funding to fix the building, and developed mitigation solutions. Through the process of the collectives working with KDC the general tone went from "we don't trust the council" to "hey let's work with them and see if we can get a partnership" (Participant). This demonstrates that while there may have been low levels of trust following the earthquake, it did not extend across all collectives and was not permanent.

Contrastingly, one department within council helped to bridge connections and build trust between collectives and the wider council through their ongoing support of community members and collectives. As a community member and KDC employee recounted "I think that we have represented council really well. In some instances we've brought the community closer to the council as opposed to what they were before because of their belief in the lack of support from council". Furthermore, by creating a group of dedicated volunteers, this department was able to work closely with the community members on the ground. Building a dedicated team that was focused on working *with* the local community and collectives helped to build strong levels of trust. Collaboration between KDC and collectives proved to be a strong contributor to high levels of trust.

Not only was collaboration important in building trust between KDC and collectives, it was also important to build trust between collectives. Yet, the collaboration between collectives did not always come easy. In Kaikōura, collaboration across collectives seemed to be a struggle as a member of a collective stated that:

It is interesting because we've tried lots of collaborative things and the message [that] keep[s] coming back- really clearly- and particularly from [another collective]

is that there is just not enough trust. I guess to build trust it's time. It's relationships. It's being reliable. It's being consistent. It's doing what you say. It's all these things that build trust.

According to this participant, the trust might have existed between their collective and others previously, but it had deteriorated over time. Building strong collaboration through participation, practice, knowledge sharing, and learning is an important aspect of resilience and adaptive capacity (Folke et al, 2003), but if these are not fostered through empowering collectives to work together resilience can diminish.

Empowerment

Ineffective collaboration and diminished trust can help or hinder a collective's power in decision making and community resilience. Special interest groups can be formed with the intention of accessing power and especially political means (Johnson, 1995). Power can be influenced through levels of (dis)trust that result from varying levels of recovery (Barrett, 2015). Yet, for those who are not part of an impacted "community", such as external advisors, it can become difficult to identify "who has the authority to define who is, or may become, a member of a given 'community' and who will be left out" (Titz, 2018, p. 18). As a result, attempts to empower "the" community run the risk of misidentifying who should be contributing to the decision-making process. By misidentifying key players it can result in distrust and decreased efficacy. One participant explained that the council was:

Not employing people who are there to help you and get back to normalcy. They are there to put roadblocks in the way . . . It just adds to the strain and the stress of the people that are trying to come out of the shock. It is a big disconnect. There is a total lack of historical knowledge. There is a lack of understanding of cultural values of the Rūnanga. There is certainly a disconnect between the council and the Rūnanga and there used to be a huge connection between those organisations.

Another community member commented that:

I am not sure a lot of groups know who the leadership team are and what their jobs are. I don't know whether they know that they don't live here on the weekends. I think that they don't know about that. Because I don't think that our leadership go out into the community to be involved for our community to get to know them. But a lot of the decisions . . . don't make sense a lot of the time.

This demonstrates that while there were shifts within the council to improve resilience and recovery in Kaikōura following the earthquake, there was a significant disconnect in empowering the collectives that should have been involved.

Yet, despite the disconnection between KDC and the collectives, there was still some hope that there might be opportunities for increased empowerment coming from within the community. One community member stated that:

My hope is that it will at least be better than it was, and I think it will be. My gut feeling is I think it will be. But I think it will be because there's going to be some new people within the community starting to really shine and they will bring with them some new ways of communicating.

Increasing empowerment by the community for the community was an important aspect that emerged from the interviews. For instance, there needed to be "community consultation to see what [locals] see the Kaikōura community as" and while it is important for KDC to be involved, "it really has to have that buy-in from the whole community of where they see it going". Yet there were barriers to this:

Individually, people are really passionate but it's often passionate in a minority voice and you've got lots of people that are just . . . eventually against everything. Whereas you are getting more frustration from people who want to see [it] develop. Who want to see that come through. That's why it is important to find avenues for them to have a voice because they won't come out and necessarily do it on their own. But if they have a way to speak up and be a part of the conversation, that is really important. I think it's probably a minority that speaks up most of the time than the larger voice.

Building empowerment within Kaikōura was a strong desire for many in the community as they engaged in collectives. However, the ability for them to engage in decision making was hindered, despite the collectives already existing as strong pillars of social/civic efficacy through their ongoing involvement in community activities and events. Due to collectives' deep understanding of community needs through their ongoing work, had they been brought to the table as partners in decision making and been able to provide increased communication on recovery in Kaikōura it may have helped build stronger trust and therefore better outcomes through empowerment.

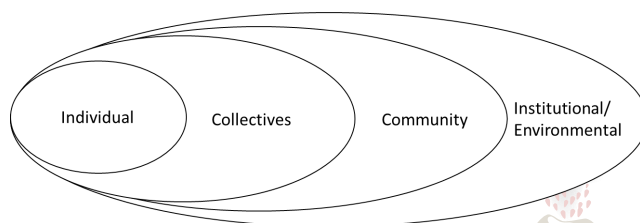
Discussion

This paper explored Paton's (2006) model of adaptive capacity which considers the various levels of community and the resources needed to facilitate adaptation, in the context of recovery following the 2016 Kaikōura earthquake. Paton's model considers the individual, community, and institutional/environmental (societal) levels relevant to resilience. The model attempts to outline many of the characteristics of adaptive capacity in community resilience, yet because the model considers community at the macro "high level", it does not unpack a more nuanced, meso-level of resilience. Therefore, in this research we chose select characteristics of community resilience identified by Paton to interrogate the role of collectives in community resilience for Kaikōura. By narrowing the focus more specifically on collectives, a more nuanced meso-level image of community resilience can emerge. It should also be noted that while it has been identified that community *is* complex, attempting to examine *every* aspect of community overcomplicates it. Therefore, it is important to consider certain characteristics that can exist between the individual and the community.

We propose that there is another level that must be considered *within* community: the meso- (collective) level. The model presented in Figure 2 draws on Paton's (2006) early adaptive capacity model to provide an alternative version in considering *community* resilience. Within the model, three levels exist: micro (individual), meso (collective), and macro (community). Oftentimes in community resilience research, it is either the micro- or macro-level that is considered; however, our findings have shown that there are constraints around the extent to which individuals can be involved in "community" resilience, despite their willingness and commitment, that emerges from examining the meso-level.

The findings from this research show that while the characteristics at the meso-level influenced resilience, this was not always in a positive way. For instance, due to differing senses of community, the community was not

Figure 2
Levels of Resilience



Note. Adapted from Paton (2006)

working together as effectively as possible in recovery. Similarly, despite there being pockets of collective efficacy in Kaikōura, this was not always done in conjunction with other collectives. Trust and empowerment were also diminished as a result of decision makers not working alongside the collectives which hampered the collectives' ability to engage in collaborative recovery.

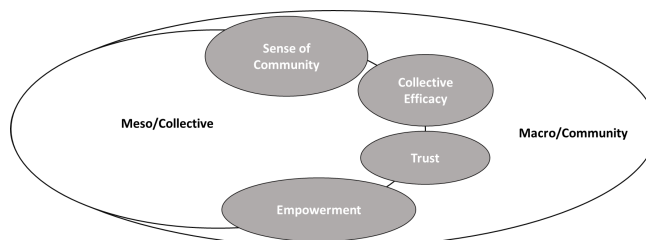
This research demonstrated that the desire and ability to promote collective efficacy does not always translate into a "likelihood of the success of mitigation strategies" (Paton & Johnston 2001, p. 274). There are varying levels of influence that are constantly shifting and contributing to how resilient a community can be, not only across the individual, community, and society levels, but within the collective level as well. This speaks to Vallance's (2011) observations of recovery after the Canterbury earthquake sequence of 2010-12 which highlighted the need to "interrogate the assumption that recovery agencies and officials are both willing and able to engage communities who are themselves willing and able to be engaged in accordance with recovery best practice" (p. 19).

Recent readings of community recognise their complex and dynamic composition. While resilience literature is useful, it often fails to adequately recognise this complexity. Various models have been proposed to add some nuance to the idea of resilience, with Paton proposing that there are a multitude of characteristics that can influence resilience. However, Paton's model in its attempt to cover all aspects of community resilience risks not critically evaluating the role of the meso- (collective) level in community resilience.

While Paton's work promotes attention towards characteristics of community, our results suggest a need to look at collectives rather than individuals (too micro) or communities (too macro) to fully appreciate characteristics such as sense of community, collective efficacy, trust, and empowerment. The examination of community at the meso-level allows us to see how these characteristics are unevenly distributed, sometimes aligned and sometimes in conflict. Our work contributes to explaining how and why these fractures within the community can slow recoveries and undermine resilience.

Based on the above model and the findings presented in this paper, we propose characteristics are in a state of perpetual flux and therefore exist at varying stages of effectiveness, both positive and negative. To address these fluctuations in resilience, Figure 3 demonstrates how the characteristics within collectives shift overall

Figure 3
Shifting Characteristics at the Meso/Collective Level



community resilience. In our model, sense of community, collective efficacy, trust, and empowerment span both the meso- and macro- level as these characteristics emerge from the meso-level yet influence the macro-level.

The model in Figure 3 provides a general representation, however it should be noted that there are multiple collectives within a community that will have their own fluctuating characteristics and therefore will exhibit their own influence on community resilience. Understanding the messiness of resilience that exists within the meso-level can lend greater insight into how researchers and practitioners approach community resilience work. Not only will the examination of collectives identify the possibilities that can arise during times of uncertainty, it may also assist with identifying potential gaps in how the community functions in everyday life and during times of uncertainty.

Conclusion

By examining a diverse range of collectives a dense mosaic of community emerges. Formed from a sense of community, contributing to collective efficacy, grown through trust, and impacted by empowerment, *community* resilience exists as a complex web of processes that are constantly shifting, as highlighted by Paton (2006). However, what also emerged in our research was an understanding that social recovery is not relegated to these aspects of community. Rather, through the examination of collectives, we discovered that while it may appear that community is a bustling patchwork of volunteers and activities, there are influencing factors that may promote or impede positive outcomes. This paper has revealed a picture of a shifting sense of community, collective efficacy, trust, and empowerment in everyday life following a major environmental event. Consequently, we suggest that amendments can be made to Paton's (2006) model, namely the addition of a layer between "individual" and "community" that reflects the role that *collectives* have to play in the process of

community resilience at a meso-level, as reflected in Figure 3.

The case study presented in this paper illustrates that community resilience needs to consider more fully the dynamic complexities of the meso-level of community. Only by recognising its complex nature can we deliver on the potential of recovery and resilience, while also avoiding the harm rendered by ignoring conflict between collectives and with decision makers. In a practical sense, bridging connections across collectives that consider the social complexity before an earthquake, while important, is not the only solution. Maintaining these connections following an event and building on the characteristics through multiple collectives will help create stronger community resilience both in recovery and into the future.

Authors' Note

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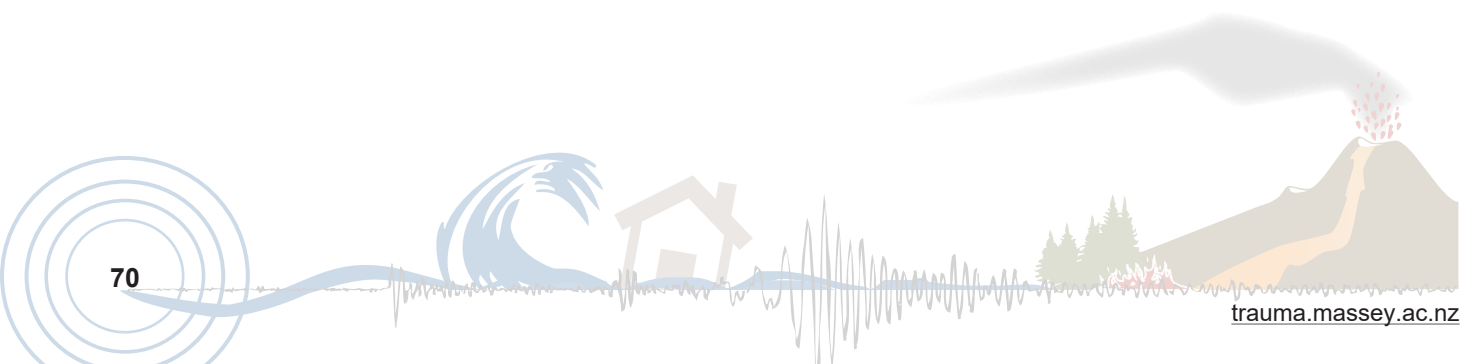
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Wildfire communication from municipalities to communities in Portugal: An exploratory analysis

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Abstract

Enhancing preparedness that enables people and communities to effectively anticipate, respond to, and recover from the impacts of a wildfire requires interactive communication. The purpose of this research is to understand how municipalities are communicating with communities regarding wildfires. Municipalities represent the lowest level of governance in Portugal and their responsibility for wildfire risk communication is fixed by law. In addition, this paper evaluates the influence of experience with extreme wildfires on communication processes. An online questionnaire was sent to 275 Portugal mainland municipalities (the official number of municipalities is 278, but three municipalities were not considered because they are entirely urban areas without wildland). One hundred and one municipalities participated in the survey (37% response rate). The survey identified the predominant use of one-way communication, lack of continuity of communication activities, and lack of purpose and content of the awareness-raising activities. The main difficulty municipalities encountered was the lack of interest from several target groups, which was mainly

due to them continuing to use ineffective communication and not engaging citizens in the process. Considering the contact between municipalities and their citizens, a more interactive role in the wildfire communication process by using two-way communication exchanges is advocated to enhance preparedness and avoid casualties and losses.

Keywords: *Risk communication, emergency communication, post-fire communication, Portugal, wildfire*

In 2017, Portugal experienced its most tragic wildfire season ever recorded with 117 fatalities, 116 civilians and one firefighter. Sixty-six of these were in a single event, the Pedrógão Grande fire (San-Miguel-Ayanz et al., 2020). This event with a rate of spread of 15.2 kilometres per hour and a maximum calculated intensity of about 60,000 kilowatts per metre (kWm^{-1} ; Comissão Técnica Independente [CTI], 2017) reached a Category 6 in the fire classification by Tedim et al. (2018). About 1,108 buildings burned (Viegas et al., 2017). Four months later, seven complex wildfires broke out, reaching extreme intensity values (e.g., $100,000 \text{ kWm}^{-1}$ at the Sertã fire), killing 51 people and affecting 1,712 buildings and 768 businesses (Ribeiro et al., 2020). In both fires, the high number of casualties mainly occurred when people were trying to escape by car without knowing where to go or if that was the best decision. This may have been associated with a lack of information about the characteristics of extreme wildfire behaviour (Tedim, Leone et al., 2020) and the preparedness of people to cope with such events (Johnston et al., 2019; Mackie et al., 2013; McLennan, 2014; McLennan et al., 2011, 2015). This observation highlights the importance of developing and implementing effective, targeted wildfire preparedness strategies.

Preparedness can be defined as the “knowledge and capacities developed by governments... organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters” (United Nations Office for Disaster Risk Reduction [UNDRR], 2016, p. 21). Preparedness should not be grounded in bits of information transferred from the sender to the recipient and disseminated in a unidirectional or generalist manner (Paton et al., 2008).

It requires the development of interpersonal relationships between community members and between them and the fire agencies' personnel who manage the risk communication programmes to enhance awareness and change behaviours through information exchange that takes into account local context, knowledge, values, people's needs, and specific local barriers (McCaffrey, 2015; Paton, Tedim et al., 2012). These aspects, however, may not be considered in organizational risk communication. The latter is often driven by the so-called knowledge deficit model (Arneson et al., 2017; Simis et al., 2016); agencies assume that public reticence to prepare can be ameliorated by giving them more information. While information is important, it is only one facet of the preparedness process. Other aspects include, for example, how people impose meaning on their risk and interpret their needs, with these processes then determining the information people need to make preparedness and response plans and decisions (Paton, 2022). These issues make it important to understand the information exchange process occurring between agency and community stakeholders.

Information exchange, where both sender and recipient interact in order to develop a common frame to enable locally-meaningful understanding of the wildfire problem and how to cope with it, is labelled as wildfire communication. It is a complex continuous task that should be based on an interactive process that develops the ability of the recipients to interpret and use information to formulate their responses (Paton, 2008). It should take into account the local context and provide timely, accurate, and useful information in a reliable and honest manner to diverse stakeholders. This introduces a need for those responsible for wildfire communication to build trust and credibility in a reciprocal information exchange process (Paton & Irons, 2016; Paton, Tedim et al., 2012; Rohrmann, 1992, 1998; Steelman & McCaffrey, 2013). It is also important to consider the various risk management stages in which tailored reciprocal information exchange processes are required.

Specific reciprocal wildfire communication and information exchange should be developed to cover stages occurring before, during, and after the wildfire. Each of these stages differ regarding their respective contents and goals. Before a fire outbreak, information exchange must: i) enhance risk perception and facilitate risk reduction by helping citizens avoid negligent behaviours to decrease the number of unwanted fire ignitions, informing about the legislation requirements related to fuel management in the forests and creation of a defensible space around

the houses, and enhancing citizens' preparedness to cope with wildfires of different intensities and avoid casualties, including preparedness to evacuate; and ii) keep the community informed on fire weather and fire danger ratings when any fire will likely be fast-moving and difficult or even impossible to control (Covello, 1992; Hampel, 2006; Sellnow et al., 2009). In Portugal, there is information about the fire weather index available on the Portuguese Institute for Sea and Atmosphere website (Instituto Português do Mar e da Atmosfera; IPMA) which is available at the municipal scale to all citizens, but it is not an early wildfire warning.

After a wildfire outbreak, emergency management includes a significant and important communication component for communities (Fearn-Banks, 2016; Lin et al., 2016; Reynolds & Seeger, 2005; Sellnow & Seeger, 2021), namely early warning to support people to take actions related to evacuation or to staying and defending their assets (Whittaker et al., 2017; Wilkinson et al., 2016). Post-fire communication is developed after the extinction of the fire. It is important for a good recovery (Madianou et al., 2015; Yeo et al., 2020), including for issues of social justice in accessing recovery and resilience funding programmes. Communication before, during, and after a wildfire should be considered distinct processes with different scopes of intervention, but in a continuous and integrated way (Reynolds & Seeger, 2005; Seeger, 2006).

In the National Plan of Defense of Forest Against Fires (established in 2006, Resolution of the Ministers Council no. 65/2006 and now expired), an annual National Awareness Plan of Defense of Forest Against Fires was foreseen, but it was only in 2017 that the first one appeared. It defined the following main objectives:

- i) Change attitudes, reduce risk behaviours and the number of ignitions;
- ii) Disseminate rules and good practices in forest and protected areas when crossing, visiting, and using them;
- iii) Disseminate restrictions in force during periods of high fire risk;
- iv) Increase knowledge of greater fire danger situations;
- v) Enhance citizens' relationship with forests;
- vi) Raise awareness on prevention and self-protection measures;
- vii) Contribute to the reduction of risky behaviour and to the compliance with legal norms in the practice of burning for pasture renewal; and

viii) Raise awareness of the environmental, social, and economic value of forests.

In these annual plans, which were published only in 2017, 2018, and 2019, the enhancement of preparedness was not a priority. The municipalities, through the Technical Forestry or Municipal Civil Protection staff, are among the actors with responsibilities in the implementation of these measures. Considering the responsibilities attributed by the current legislative body (e.g., Decree-law no. 82/2021, Sistema de Gestão Integrada de Fogos Rurais no Território Continental, in Portuguese; Integrated Rural Fires Management System of Portugal Mainland, in English) to municipalities for awareness raising campaigns, the purpose of this research is to evaluate and characterize how Portuguese municipalities communicate with communities regarding wildfire risk and emergency phases and to identify whether and how recent experience with extreme wildfires events (EWE, i.e., pyro convective events that exceed the control capacity and are characterized by high intensity, high rate of spread, prolific or massive spotting activity; Tedim et al., 2018; Tedim, Leone et al., 2020) influences the municipalities' communication processes and information exchanges. The research questions are the following:

- i) Do the ways in which municipalities communicate with communities in Portugal promote information exchange required to reduce wildfire risk and enhance preparedness?
- ii) How does the recent experience of past extreme wildfire events influence and improve the risk communication process developed by the municipalities?

This research does not include the post-wildfire communication that is related to the return to normality and the start of recovery and restoration processes, which requires another type of approach not only centred in the municipalities.

Materials and Methods

The literature review did not identify survey tools that could be used to assess wildfire communication from municipalities (the lowest level of local government in Portugal) to communities. Thus, we constructed an ad hoc questionnaire based on existing scientific knowledge and adapted to the Portuguese wildfire and cultural context. The questionnaire is composed of 10 open-ended questions and 11 closed-ended questions (see Appendix 1). Simple language was used as suggested by two members of the technical staff of two municipalities

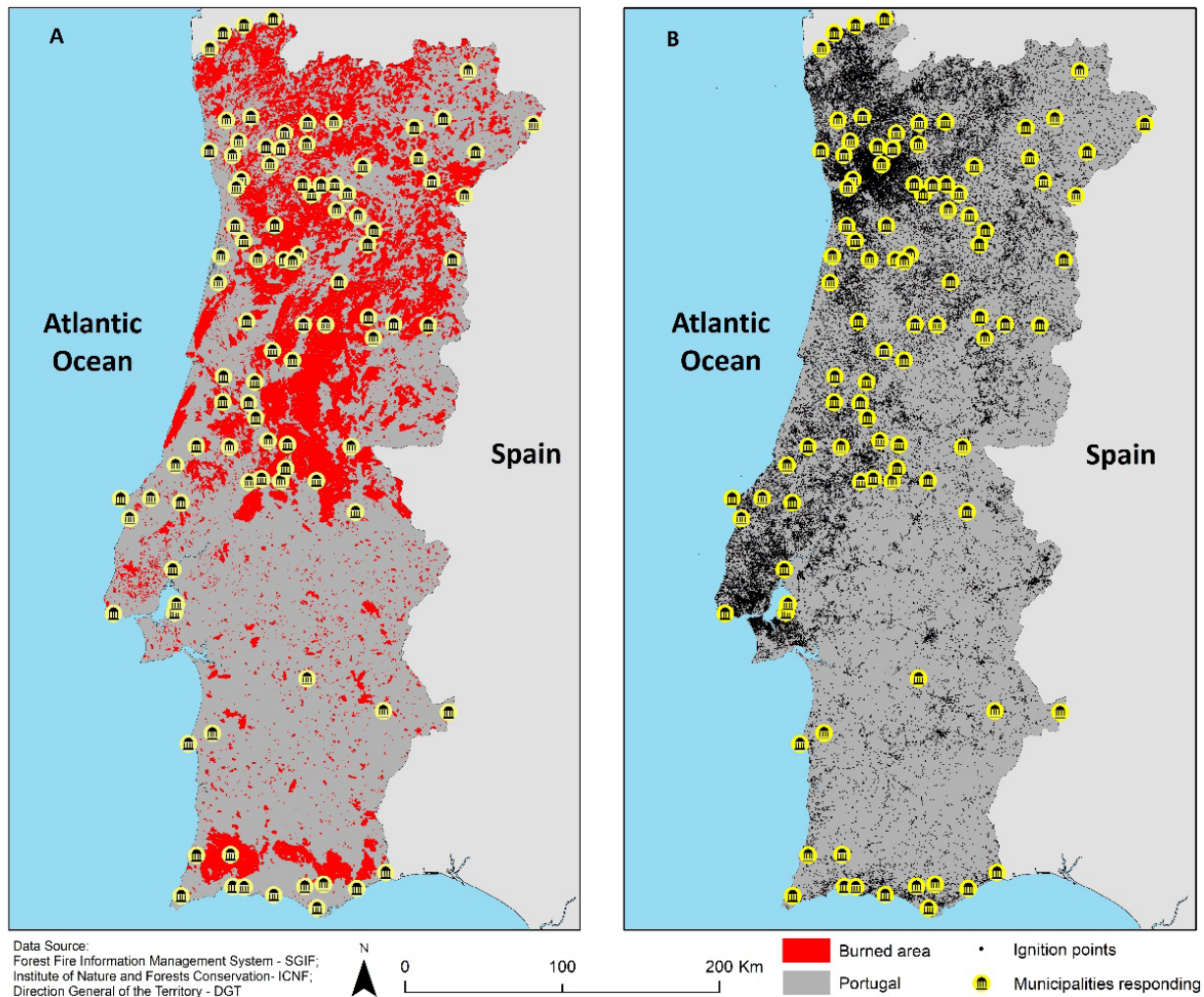
who reviewed and validated the questionnaire, which may additionally be used to assess wildfire communication from other fire agencies to citizens.

Between November 2020 and April 2021, the survey was conducted by transmitting via email the link for the online questionnaire to 275 out of the 278 municipalities existing in mainland Portugal. Municipalities are administrative units, divided into sub-administrative units, called *freguesias* (parishes). Each municipality and each *freguesia* have their own council; the *freguesias*' council responsibilities are rather reduced compared to the municipality. The municipalities of Porto, Lisbon, and São João da Madeira were excluded because they are urban areas without wildlands and therefore there are no wildfires.

Before transmitting the questionnaire, the 275 municipalities were contacted by phone to explain the goal of the research and obtain the email address of the technical staff to be contacted (often a member of the Technical Forestry Department or Civil Protection Department). Due to the initial low response rate (4%), unresponsive municipalities were re-contacted by phone as many as four times. The containment measures related to the COVID-19 pandemic may partially explain the difficulties and delay in replying to the questionnaire by municipalities. Thus, 101 responses (37% of the municipalities) were obtained, covering the most wildfire-hazardous regions of Portugal (see Figure 1). The response rate is acceptable; email response rates are commonly 25% to 30% without follow-up and reinforcements (Yun & Trumbg, 2006), and municipalities are not obligated to reply to questionnaires sent by universities or research institutions. For the survey analysis, we used basic descriptive statistics. Some quotes are presented to show the explanations of the respondents and support our interpretations.

To evaluate whether previous experience of extreme wildfires increases a municipality's focus on wildfire communication, the 101 responding municipalities were split into two groups: those with experience of extreme wildfire (27 municipalities) and those with no recent experience (74 municipalities). Responding municipalities affected by extreme wildfires were identified by taking into account the occurrence of wildfires and the area affected by them for the years 2013, 2016, 2017, 2018, and 2019, in which events with extreme characteristics were recorded. Differences in responses between the two groups were evaluated by comparing the following parameters: meetings in the *freguesias*' councils, door-to-door actions, interest in the programmes "Safe Village"

Figure 1
Location of the Municipalities that Replied to the Questionnaire in Relation to the Burned Area (A) and Ignitions Points (B) in the Period 2001 to 2019



Note. The density of replies is higher in Central, North, and Algarve Regions, heavily affected by extreme wildfires in the most recent times.

and “Safe People” (created by the Resolution of Minister Council no 157-A/2017 to enhance the safety of people in case of a wildfire), self-protection actions, and search for information by municipality staff.

Results

Wildfire Risk Communication: Type and Source of Information and Target Groups

Only 74 municipalities replied correctly to the question: “What information is provided to the municipality for fire risk awareness to the communities?” The most frequent information used by municipalities to support their actions in communication to citizens is related to: i) wildfire risk, mentioned in 45 (60.8%) of the replies; ii) fire weather warnings, considered in 26 (35.1%) replies; iii) how to use fire when burning agricultural and forestry residues (7 mentions, 9.5%); iv) self-protection measures (3

mentions, 4.0%); v) information about the official national campaign “Portugal Calls” (3 mentions, 4.0%); vi) special alerts (3 mentions, 4.0%); and vii) information on the national programmes “Safe Village” and “Safe People”(2 mentions, 2.7%).

The main source of wildfire information (Table S1) is the National Authority of Emergency and Civil Protection (ANEPC); 83 out of 101 municipalities declared that they directly receive information from that organization, 17 municipalities (16.9%) based their action solely on the information sent by this same source, and 53 municipalities (52.5%) declared that they receive information from other institutions (e.g. the Institute for Nature Conservation and Forests [Instituto da Conservação da Natureza e das Florestas; ICNF], IPMA, firefighters, Municipal Civil Protection Service [the Department of the municipality that directly receives the information from ANEPC], and the Agency for Integrated

Management of Rural Fires [Agência para a Gestão Integrada de Fogos Rurais; AGIF]). In 55 municipalities (54.5%), the technical staff looked for other information beyond that officially received, mainly using the websites of the public agencies already mentioned. Only one of the respondents directly contacted experts from a research institution.

Most of the respondents (91, 90.1%) expressed satisfaction with the information received for awareness-raising actions, and only 10% would like to have more material (e.g., videos, presentations, pamphlets, and posters, also in English to be used for tourists) and more data and knowledge on fire behaviour. One municipality suggested creating a video “which clearly exemplifies the behaviour that citizens should adopt in order to minimize the impact of fires. In this same movie, it should be important to see fire behaviour according to driving factors (fuel load and type, weather conditions, topography among others)” (Municipality A).

One of the respondents would like to receive better training on how to correctly and safely behave in case of a wildfire, but recognized difficulties in the implementation of the information because of ageing and low income of the population. A respondent from Municipality B highlighted that: “There is a lack of information on self-protection, and what is worse is how to do it in territories with ageing population, with people without economic capacity and who live in the middle of the forest. A lot of things are missing, especially the integrated vision that is so important in inland territories”.

The main target groups for awareness-raising campaigns are the general public (mentioned by 95 municipalities, 94.1%), school age children (69, 68.3%), farmers (64, 64.3%), and landowners and wood producers (63, 62.4%). Hunters (29, 28.7%) and shepherds (29, 28.7%), followed by immigrants (16, 15.9%) and tourists (14, 13.9%), are rarely considered priority groups.

Characteristics of the Wildfire Communication Process

Communication channels. Respondents predominantly reported the use of passive means to disseminate information and create wildfire awareness (see Table 1). The most common method of communication used by the municipalities was the Municipal Council website (94 mentions, 93.1%) (Table 1). The use of local radio (mentioned 50 times, 49.5%) to disseminate wildfire information is worth noting as local radio stations are usually considered outclassed by other more modern forms of communication such as social media. Similar

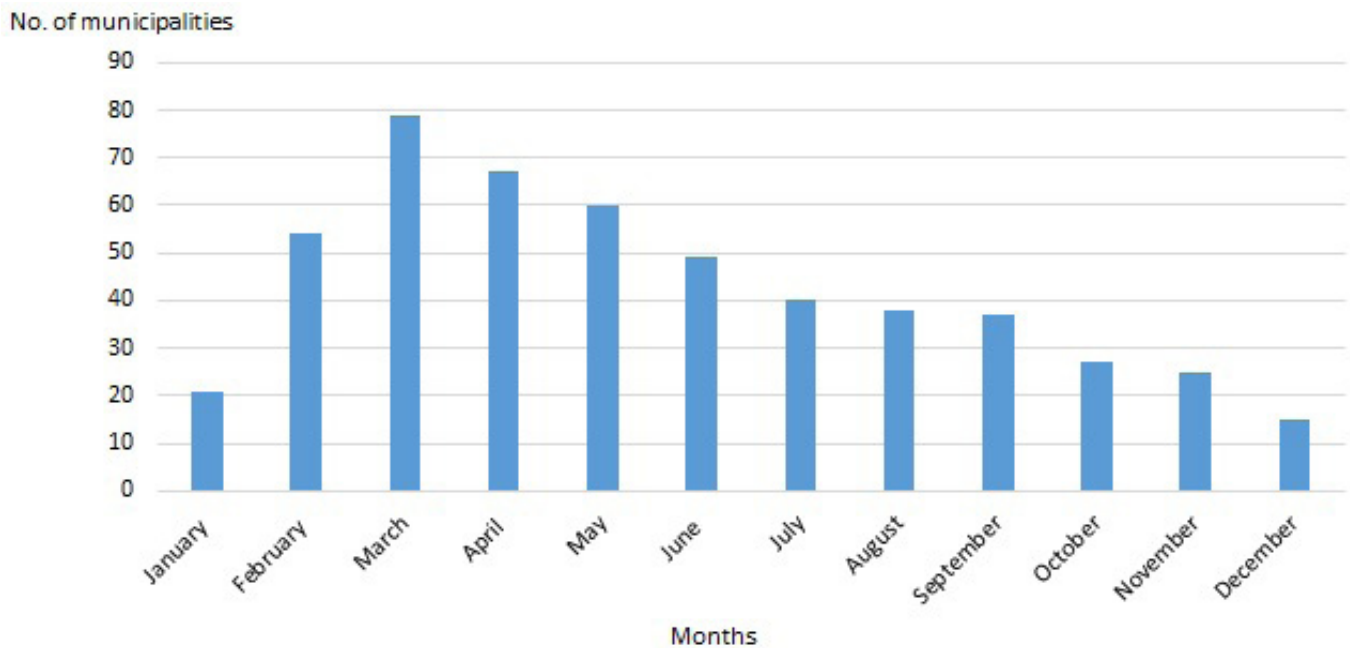
to meteorological warnings, radio stations are among the preferred communication channels used in risk communication. In rural areas where people are older, the radio may still have an important role in disseminating information. The use of municipality social media accounts (mainly Facebook) was less important (mentioned in 23 responses, 22.8%).

Table 1
Communication Channels Used by Municipalities to Disseminate Information

Channel	No. of Municipalities	%
Website of the municipal council	94	93.1
Face-to-face or phone contact with the Technical Forestry Department/Civil Protection Department	86	85.1
Posters	69	68.3
Local media (radio and press)	50	49.5
Meetings at the freguesias' council	31	30.6
Emails	28	27.7
Municipality social networks (Facebook, Twitter)	23	22.7
Flyers	19	18.8
Talks in social centres, cafés, fairs, churches, and markets	19	18.8
Door-to-door actions	12	11.8
Meetings at schools	12	11.8
Implementation of the programmes “Safe Village” and “Safe People”	5	4.9
Awareness actions on special dates (e.g., World Arbor Day)	3	2.9
Reading warnings in churches	3	2.9
Simulation and training	2	1.9
SMS	1	0.9

Municipalities implemented diverse face-to-face actions like meetings at the freguesias' council, attending fairs and markets, door-to-door actions, demonstrations, and drills. However, the most frequently mentioned was the interaction (face-to-face or by phone) of citizens with the Forestry or Civil Protection technical staff in the municipality's council (mentioned by 84 municipalities, 83.2%), when citizens needed permission to burn or clear fields or clarification on rules and procedures. Municipalities implemented different types of initiatives using different channels to disseminate information to communities. About 33.7% of municipalities implemented four different ways of communicating, while 23.8% used three. Only 17.8% of the municipalities carried out five

Figure 2
Number of Municipalities that Implemented Activities of Awareness-raising by Month



or six different actions, whereas 24.7% carried out just one or two actions.

Communication content. Most of the information disseminated by the municipalities is related to fuel management and vegetation clearing actions around houses and settlements (mentioned by 47 municipalities; 46.5%) and the use of fire (mentioned by 46 municipalities, 45.6%) (Table S2). The compliance with the current legislation in force was mentioned by 21 municipalities (20.7%), followed by self-protection measures (17 municipalities; 16.8%). The restrictions of the use of fire during summer or on days with very high risk was mentioned by 10 municipalities (9.9%). Seven (6.9%) municipalities disseminated information about forest preservation and another seven about daily fire risk.

Frequency of awareness-raising actions. Awareness-raising actions are mostly seasonal, as only 11 municipalities (10.9%) developed activities throughout the year (Figure 2). Most commonly, municipalities (30, 29.7%) implemented actions mainly in March, April, and May (i.e., before summer). Just 4.0% of the municipalities developed communication activities only in one month of the year, generally April or May. In 8.9% of the cases, it is less than once a year, which means that some municipalities do not implement these kinds of actions every year. About 15.0% of the municipalities explicitly stated that communication frequency is irregular, as they only develop actions when a warning or alert is issued to

the community, when the high level of fire risk requires it, or when there is a request to do so. These actions can address the same target groups, but not necessarily the same group of people (e.g., same students in different school years).

Collaboration between municipalities and other agencies related with fire. Most of the municipalities (85; 84.2%) develop awareness-raising campaigns in collaboration with other organizations (Table S3). The most frequently mentioned agency is National Guard (79 municipalities, 78.2%), followed by firefighters' voluntary teams (mentioned by 32 municipalities, 31.7%); forestry associations and ICNF were mentioned 10 times each (10.0%). The high number of collaborations with the National Guard is explained by its institutional task and commitment to raising citizens' awareness established by the legal framework (previously the decree-law no. 124/2006 and currently the decree-law no. 82/2021).

Difficulties faced by municipalities in the communication process. Almost all the municipalities (97%) face constraints in developing awareness-raising campaigns. The most frequent ones are the lack of human and financial resources and the difficulty to adapt the campaigns to the local characteristics (Table S4). Other problems are related to the lack of interest from citizens, attributable to people's mindset and age but also to the content of the actions and messages as quoted by Municipality C:

“There is a profound lack of interest in the information that is transmitted. The information that is transmitted is always the same related with the use of fire and the rules for cleaning the fuel management strips. Paired with the lack of fuel management, the interest of the authorities is only related with the increase of revenue from fines. The repetitive information year after year, the the fact that when there are fires the fighting forces are not always able to respond to all the needs, makes it very difficult to transmit information even when it is of real interest to people. They are completely discredited”.

Involvement of municipalities in emergency communication. During wildfires, in addition to the communication between operatives on the ground, there is a need to communicate with the population, to help them to cope and decide what to do (e.g., to stay and defend or to evacuate) to minimize impacts and avoid the occurrence of disasters. However, only 42.5% of the municipalities stated that there were communications with the population during past wildfires.

Regarding the content of communication, only three municipalities mentioned issuing early warnings (2.9%). Another three municipalities (2.9%) declared not having experienced fires with high intensity, thus, they did not need to communicate with the population during a fire; one municipality (0.9%) did not know how to communicate about how to cope with an intense wildfire.

During wildfires, the freguesias’ presidents have very active roles in communicating with citizens and responding to the needs of the population (Table 2). Social networks were mentioned 16 times (37.2%) and the website of the municipal council was mentioned 8 times (18.6%). Other municipalities highlighted the

Table 2
Channels of Communication During a Wildfire

Channels	Number of responses	%
Freguesia’s president	20	46.5
Social networks	16	37.2
Website of the municipal council	8	18.6
Face-to-face contacts	7	16.2
Local radio	6	13.9
Security officer from the programmes “Safe Village” and “Safe People”	5	11.6
Volunteers	1	2.3
Directive Body of Common Lands	1	2.3
Local actors	1	2.3
App	1	2.3
SMS	1	2.3

use of local radio stations and direct contact with the population to attend to their needs, followed by the Local Safety Officer (a citizen living in a village that joined the “Safe Village” and “Safe People” programmes who has the mission to transmit warnings to the population, organize the evacuation of the village if needed, and raise awareness among the population), the volunteer firefighters, local associations, and the Common Lands Directive Body. The use of apps and SMS to share information during wildfires was also mentioned.

Wildfire communication for tourists. All the 101 municipalities have tourist activity, but only 64 of them reported concerns for tourists’ wildfire risk awareness (63.4%). Of these, only 30 (29.7%) mentioned actions specifically directed to this target group.

The main actions specifically developed for tourists are: i) dissemination of posters and leaflets in different languages namely in the tourist offices; ii) awareness-raising actions to tourist offices, B&B, and rural farm accommodations to provide them knowledge to inform tourists about the safety measures to be taken in case of a wildfire; iii) prohibiting entering wilderness areas on high fire danger days; iv) patrolling in places of concentrated tourism; v) trail maintenance (cleaning and signposting); and vi) contact with campers who usually concentrate on the forest perimeter, to advise the non-use of fire on high fire danger days (Table 3). Some municipalities with a low presence of tourist activities did not conduct fire prevention and preparation activities directed specifically to tourists. In these cases, the municipalities arguably consider such activity not strictly necessary, so they disregard it.

Whereas 64 municipalities (63.4%) demonstrated concern about the safety of tourists before wildfires occur,

Table 3
Number of Municipalities by the Type of Communication Action Targeted to Tourists

Type of Action	Number	%
Multilingual posters and leaflets	12	40.0
Raising the awareness of tourism agents	7	23.3
Prohibition of activities in wilderness on high fire danger days	5	16.6
Patrolling in places of concentrated tourism	3	10.0
Trail maintenance (cleaning and signposting)	3	10.0
Contact with campers	2	6.6

Note. Percentages refer to the subsample (n = 30) of municipalities who reported communicating to tourists.

more municipalities (88, 87.1%) were concerned about the safety of tourists during a wildfire. The remaining 13 (12.9%) expressed no concerns or assumed that tourists' safety could not be ensured during a wildfire due to local reasons such as the lack of a strategy focused on tourists, lack of attention on this issue, and absence of tourists within some municipalities. In one case it was stated that the "security of the tourists must always be considered before the fire" (Municipality B). During a wildfire, the main actions reported were the evacuation of tourists and the prohibition of activities such as approaching the fire to take selfies and parking of cars on roads near the fire event.

The influence of past wildfire experience on communication activities. In this section, the sample is split into two groups: a) municipalities with extreme wildfires experience ($n = 27$) concentrated in the centre region of Portugal, and b) municipalities without it ($n = 74$).

No relevant differences between the two groups were found (Table 4), although the programmes "Safe Village" and "Safe People" and the implementation of self-protection actions exhibit slightly higher values in the group with past experience of extreme wildfire events (EWEs). Both likely represent a reaction to the 2017 wildfire disasters, which left Portuguese society shocked at the deadly consequences.

The technician staff in both groups (59% and 54%, respectively) conducted a high number of searches for information. This can be considered a good indicator of a growing awareness of the need for wildfire-related information. Similarly, the programmes "Safe Villages" and "Safe People" seem more appreciated (the value of the ratio between groups is 2.75) by municipalities that have already experienced EWEs and thus put high expectations on the programmes of adaptation and mitigation to avoid future losses. In any case, the low number of municipalities concerned with the programmes

Table 4
Influence of Experience of EWEs on Wildfire Risk Communication

Selected item	a) Experience of EWEs ($n = 27$)	b) No experience of EWEs ($n = 74$)	a/b
Meetings in the freguesia's council	33% (9)	31% (23)	1.06
Door-to-door actions	15% (4)	18% (13)	0.83
"Safe Village" and "Safe People" programmes	11% (3)	4% (3)	2.75
Self-protection actions	22% (6)	15% (11)	1.47
Technician search for information	59% (16)	54% (40)	1.09

indicates that they have a scarce appeal (arguably for lack of funding, human resources, and interest from the local communities).

Discussion

Wildfire Communication from Municipalities to Communities in the Portuguese Legal Framework

The use of the term communication is very limited in Portuguese hazards legislation. The decree-law no. 2/2019 establishes that, independently of the type of hazard, communication is the act of informing the National Authority of Emergency and Civil Protection about the imminence of occurrence of a process or phenomenon with potential to create damage, by the institutions that make observations, measurement, and continuous assessment of hazards as well as the act of dissemination of early warnings. It is not a way to improve wildfire knowledge, understand people's needs, enhance citizens' skills, reinforce pro-active practices, or overall to enhance awareness-raising activities.

In the current National Plan of Integrated Rural Fire Management 20-30 (PNGIFR 20-30; Resolution of Ministers Council no 45-A/2020), which reflects the official wildfire management policy until 2030, general guidelines for communication are presented without a clear implementation plan (NB: a plan is in preparation). In a context where EWEs are expected to be more frequent and intense, maximizing the importance of stronger and more interactive communication to improve citizens' awareness and preparedness should be a first priority in PNGIFR 20-30.

Weaknesses in Wildfire Communication from Municipalities to Communities

The dominance of passive means of communication.

The activities developed by the municipalities are not aligned with the current scientific knowledge (Cole & Murphy, 2014; Cooper et al., 2020; Johnston & Taylor, 2018; Spialek et al., 2021), because they are still mainly based on dissemination of information using passive methods (e.g., flyers), without engaging citizens and understanding the social context. Passive and unidirectional communication is dominant because it is easier and requires little engagement with citizens' difficulties and needs. Even in the activities that imply some interaction, such as door-to-door contact, the attitude of the municipalities' staff is more oriented toward disseminating information and explaining legal commitments to people, with minimal effort

focused on understanding people's needs, difficulties, and capabilities for wildfire risk reduction and safety enhancement. Hence, it will be necessary to improve the current model of municipalities' communication to citizens in two domains: i) improving the content of the messages to enhance citizens' preparedness to cope with wildfires (e.g., to stay at home and defend it or to evacuate safely), and ii) adopting more interactive communication processes to engage communities. Moving beyond the current model is crucial to prepare people to avoid casualties because many of the rural communities' inhabitants want to protect their properties and prefer to stay and defend them.

Difficulties faced by municipalities: The perceived lack of interest of the citizens. The municipalities that participated in this research have different practices and experiences with awareness-raising campaigns, which can be explained by differences in the local fire regimes, wildfire causes, and how the wildfire problem is approached by the municipalities' political and technical bodies. For instance, the programmes "Safe Village" and "Safe People" are implemented in only 56 of the municipalities participating in our research, and even then with distinctive expression and development. In addition, the lack of human and financial resources clearly limits the number and type of awareness-raising actions that several municipalities can carry out.

The municipalities perceived a lack of interest from the citizens in the communication process before wildfire outbreaks, explained firstly by the repetitive content of the messages, which are quite often "about the use of fire and the rules for cleaning the fuel management strips, and fines, that people already know" (quote from Municipality A). Secondly, municipalities do not respond to the real needs of citizens and do not offer adequate assistance when a fire occurs. These issues reflect a failure to understand the dynamics of people's relationship with wildfire risk. In addition to the constraints on people's interest introduced above, risk research has identified several factors that affect people's engagement in preparedness programmes and which are inappropriately dismissed by civic authorities as indicators of community complacency. Factors that can limit motivation to engage in preparedness include unrealistic optimism, risk compensation, negative outcome expectancy, social disengagement, anxiety, denial, over-confidence, and distrust (Paton, 2022). Strategies to overcome these factors are documented and available to support communication strategies based on community engagement and development principles

(Paton, 2022). It is also important that communication strategies are locally meaningful.

A good and expert communicator changes attitudes and behaviours by helping people understand the threat, make decisions, and take actions; a communicator should pay attention to the local dynamics and does not give generic and decontextualized information (Marsen, 2020). However, the procedures remain dictated by a top-down approach that gives little opportunity and support to municipalities in adaptive management. This approach is reductive as wildfires should be seen as complex socio-ecological processes (Essen et al., 2022; Tedim, McCaffrey et al., 2020) which represent a wicked problem influenced by multiple, dynamic, and complex contexts that require a holistic and integrated view to select the best communication practices. Communication must be adapted to each context, because the information required to address needs vary from place to place (Cooper et al., 2020; Mileti & Sorensen, 1990; Paton et al., 2014; Seeger, 2006; Steelman & McCaffrey, 2013; Venette, 2007).

Research using Community Engagement Theory (CET) in Portugal (Paton, Frandsen et al., 2012; Paton, Tedim et al., 2012) provides an empirically supported framework for developing community-engagement based communication strategies in Portugal. Importantly, an evaluation of a CET-based community development approach has demonstrated its ability to significantly increase levels of wildfire preparedness (Paton, 2022; Paton et al., 2017). The strategies used included:

- community members developing risk profiles to develop tailored, localized risk management strategies that empowered community members and built trust;
- building on community strengths;
- community meetings to formulate preparedness strategies and to plan their implementation, including regular opportunities for feedback and programme refinement to enhance place attachment;
- community participation and collective efficacy; and
- circulating stories of successes in other communities to bolster positive outcome expectancy (Paton, 2022).

Lack of continuity of communication activities. In the actions developed by the municipalities a marked seasonality, irregularity, and a lack of continuity are observed, in contrast with the exigency of prevention which should be a continuous and evolutionary process. The initiative to enhance preparedness of citizens should not be reduced to occasional actions. The same can be said in relation to people's safety, emergency behaviour, and evacuation procedures which demand deep

knowledge, continuous training, and drills to develop capabilities and promptness.

Communication during an emergency. During an emergency there is a huge information need that is crucial for the success of suppression activities, focused on hard and fast actions for reducing and containing damage, but also to support citizens in making the best decisions to cope with a wildfire. The most critical role of communication to communities is thus to quickly respond with accurate and timely information, including providing people with real-time information on fire behaviour (e.g., precise location, intensity, size, and direction of spread), therefore making them aware of the type of fire that could be expected and the level of threat it may present to people and assets.

During a wildfire, people try desperately to obtain information from official and/or informal sources including family, friends, community members, computer applications, and websites. The experience of the tragic 2017 wildfires shows that communication failed completely; many people were caught off guard by fires with unprecedented characteristics and tried by themselves to cope in the best possible way. We advocate that municipalities should make accurate information available to their citizens; messages must be easily understood by the public, and this entails using everyday language and distributing information through multiple communication channels (Taylor et al., 2007). However, attention should also be paid to remove the barriers at individual, community, and agency levels that affect the communication process (Bharosa et al., 2009). A cost-effective approach to doing so involves using dedicated social media strategies (Irons & Paton, 2017; Paton & Irons, 2016). These authors used a Facebook-based strategy to support wildfire recovery. The key element in the effectiveness of this approach rested on developing a social media resource specifically for the affected community and it having a dedicated leader. Key outcomes were the development of reciprocal communication within the community and between the community and civic response agencies and the development of social exchange processes that enable the emergence of social support relationships, sense of community, and better mapping of recovery plans and resources to community needs (Irons & Paton, 2017). This section identified several issues with prevailing communication practices and identified the existence of evidence-supported (from Portuguese research) strategies that could be adopted by the municipalities.

Limitations and Implications of the Research

The main limitation of this exploratory research is related to the number of responses and the purposive reduction of open-ended questions to maximize survey completion. Several explanations provided by open-ended questions would have been interesting but were not obtained and we made the decision not to follow-up with further contact to obtain additional explanations due to recruitment difficulties. These were mainly related to the fact that the questionnaire was proposed by a research institution rather than the state. At the same time though, the questionnaire was validated as a research tool and can therefore confidently be applied to evaluate the wildfire communication process in other contexts.

The communication process for communities is currently based on a top-down approach and needs to be better adapted using a bottom-up approach that more comprehensively addresses needs, capacities, and barriers of local communities. The results of this research and the discussions on the individual points make it clear that the complex reality of managing wildfire cannot be limited to the action of extinguishing the flames. In the complex social and ecological reality in which they occur, many collateral aspects play a relevant role in contributing to the efficiency of the system. Communication is undoubtedly among these aspects, and this paper highlights how, in the context of Portugal, it currently makes limited contributions to the final result and is clearly in need of modifications and changes in both content and process.

Conclusion

This paper presents the first research on wildfire communication from municipalities to communities in Portugal. The research findings show that the communication process from local government to communities does not currently promote information exchange to reduce wildfire risk and enhance preparedness. Communication is scarcely associated with wildfire risk reduction, emergency management, or post-fire recovery; consequently, it has only a modest role in the general effort to contain and control not only the number of ignitions and burned areas, but also the casualties, losses, and damage caused by the wildfires that regularly disrupt the country.

The differentiated pattern of responses to the questionnaire reveals a high heterogeneity of understanding wildfire risk communication goals and procedures by the municipalities and suggests that wildfire communication

activities with citizens have not been prioritized by municipalities in Portugal. Instead, communications that promote wildfire risk awareness and enhance preparedness are very limited in Portugal, therefore requiring attention and consequent improvements.

Our research findings highlight an evident lack of strategy to transform available information into a communication tool for the defence against wildfires of territories and their inhabitants. Wildfire risk communication for communities is rare, incoherent, and basically ineffectual at creating a generalized awareness of wildfire risk in individual citizens and across communities. There is a marked seasonality, irregularity, and lack of continuity in the communication developed by municipalities, in contrast with the exigency of prevention and preparedness. The municipalities mainly try to follow the procedures dictated by ANEPC and ICNF to ensure timely compliance with the legal framework. The current top-down suppression centred policy based on static regulations does not favour the engagement of municipalities in ways that go beyond the current procedures, because they have no authority or voice in the policy-making process. However, as has been demonstrated, many municipalities have the perception that the information they receive is insufficient, with staff seeking more information on their own, mainly from the websites of the most important Portuguese institutions.

Despite an increasingly complex and uncertain environment, the interaction of municipalities with academic experts to improve knowledge and practices seems limited. As a result, Portugal remains unprepared to face the challenge of increasingly frequent extreme wildfire. There are clear opportunities for collaboration between research institutions and municipalities to co-produce actionable information and effective communication processes.

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Appendices

Appendix 1

Questionnaire

1. Identification of the municipality
2. What information is provided to the municipality for fire risk awareness to the communities?
 - 2.1. Who provides this information?
 - 2.2. How does it reach the municipality?
 - a) Sent directly by IPMA
 - b) Sent directly by ANEPC
 - c) Sent directly by ICNF
 - d) The technician searches directly on the IPMA site
 - e) The technician searches directly on the ANEPC site
 - f) The technician searches directly on the ICNF site
 - g) Other
3. What type of awareness-raising actions does the municipality develop?
4. Who are the awareness and education actions aimed at?
 - a) Farmers
 - b) Hunters
 - c) Shepherds
 - d) School population
 - e) Tourists
 - f) Forest owners and producers
 - g) General Population
 - h) Emigrants
 - i) Other
5. At what time of the year are the actions carried out?

a) January	e) May	i) September
b) February	f) June	j) October
c) March	g) July	k) November
d) April	h) August	l) December
6. How often do you organise awareness raising activities for the same group in a year?
 - a) Less than once a year
 - b) Once a year
 - c) Twice a year
 - d) 3 times a year
 - e) 4 times a year
 - f) Other
7. Which channels do you usually use to disseminate information?
 - a) Local radio
 - b) Distribution of flyers via the post office
 - c) City Council Website
 - d) Display of posters
 - e) Door-to-door interaction with the population
 - f) Interaction with the population in Technical Forestry Office / Civil Protection Office)
 - g) Other

8. In the awareness actions developed by the Municipality, the Parish Councils are collaborating?
- Yes
 - No
- 8.1. Do the Parish Councils develop awareness-raising actions other than those programmed by municipality?
- Yes
 - No
9. What difficulties have you experienced in making the campaigns operational?
- Lack of financial resources
 - Lack of human resources
 - Lack of receptiveness of institutions (e.g. schools; farmers' associations)
 - Lack of receptivity from the residents
 - Difficulty in adapting the campaign to local realities
 - Others
10. Are there other entities involved in the awareness campaigns in the municipality?
- Yes
 - No
- 10.1. If yes, please indicate which ones and how they are articulated?
11. What information do you favour in your awareness-raising actions?
12. In case of fire, do you inform the population about the evolution of the fire so that they can take the appropriate protection measures?
- Yes
 - No
- 12.1. If yes, how do they do it?
13. Do you have all the necessary information to carry out the awareness campaigns?
- Yes
 - No
- 13.1. If you answered no, what kind of information would you like to have?
14. What types of tourism does your municipality offer?
15. If tourism is an important activity in your municipality, is there any attention from the municipality to ensure the safety of tourists in the face of fire risk?
16. In case of fire, how do you communicate with tourists to ensure their safety?

Appendix 2

Supplementary Tables

Table S1

Origin of the Information that Municipalities use to Communicate with Citizens

Information directly received from public agencies	Municipal technicians consult public agencies' websites	Municipal technicians contact research institutions	Number
ANEPC			17
ANEPC; ICNF			16
ANEPC	IPMA		12
ANEPC; ICNF	IPMA		10
	IPMA		5
ANEPC; ICNF	ANEPC; ICNF; IPMA		5
ANEPC; ICNF; IPMA			4
ICNF			4
ANEPC; ICNF	IPMA; ICNF		4
ANEPC	ICNF; IPMA		3
ICNF	IPMA		2
ICNF	ANEPC; ICNF; IPMA		2
ANEPC	ANEPC; IPMA		2
ANEPC; ICNF	ICNF		2
ANEPC; IPMA			1
	ICNF		1
ANEPC; ICNF; Firefighters; Municipal Civil Protection Service	IPMA		1
IPMA	ICNF		1
ANEPC; ICNF	ANEPC; ICNF		1
ANEPC	Municipal Civil Protection Service		1
ANEPC; ICNF; IPMA	ANEPC; ICNF; IPMA		1
ICNF; IPMA	ICNF; IPMA		1
ICNF; AGIF	ICNF		1
ANEPC; IPMA	ANEPC; ICNF; IPMA	University of Lisbon-IST	1
ANEPC; IPMA	IPMA		1
ANEPC	ANEPC; ICNF		1
No valid response			1

Table S2

The Information Transmitted by Municipalities in Risk Communication

Type of information	Number of municipalities which provide the information
Fuel management	47
Fire use	46
Law enforcement and penalties	21
Self-protection measures	17
Restrictions in the critical period	10
Forest preservation	7
Daily fire risk	7
Use of machines	2
Emergence phone number	1
Not valid response	21

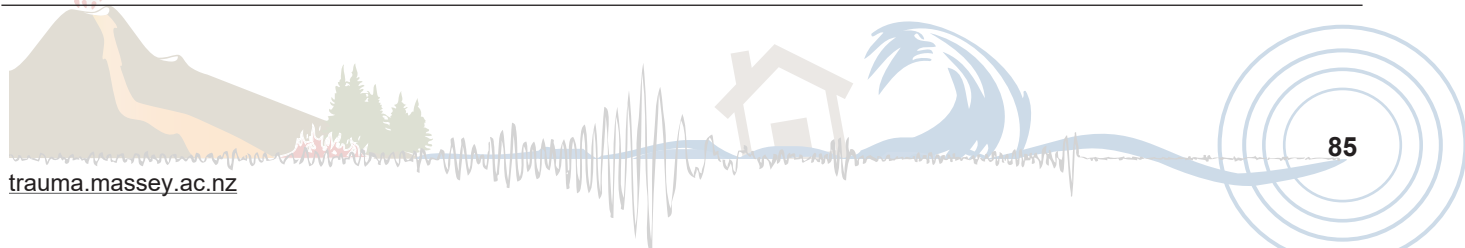
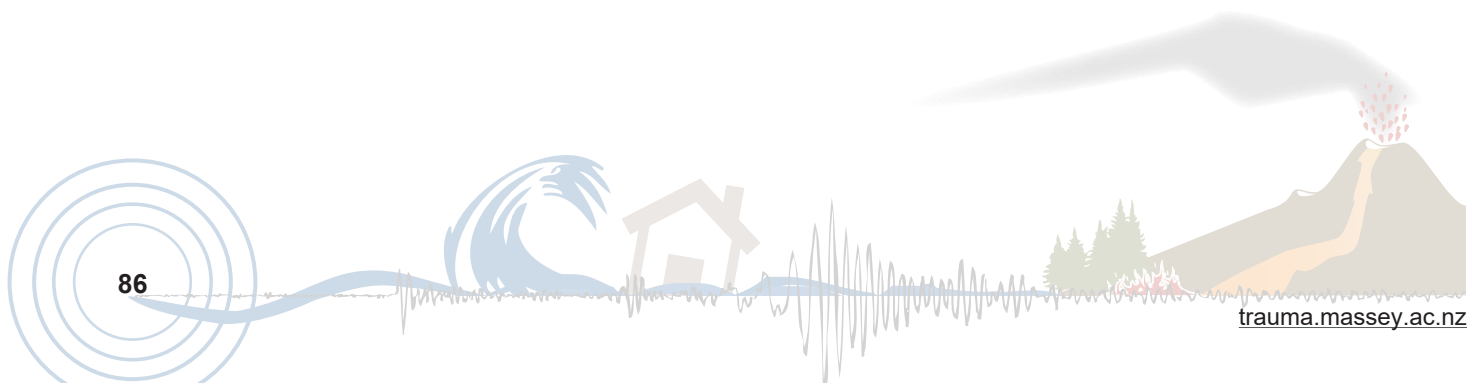


Table S3
Collaboration Profile Between Municipalities and Other Institutions

Institutions	Number
National Guard	27
National Guard; Firefighters	16
National Guard; Forestry Association	6
National Guard; ICNF; Firefighters	5
National Guard; Public Safety Police; Firefighters	3
National Guard; ANEPC; ICNF	3
National Guard; Firefighters; Forest rangers	3
National Guard; Forestry Association; Forest rangers	3
National Guard; Local organisation	2
National Guard; Public Safety Police	2
National Guard; ANEPC	2
Firefighters	2
National Guard; Municipal police	1
Forestry Association	1
National Guard; Municipal Police; Firefighters	1
National Guard; ANEPC; Public Safety Police; ICNF	1
Public Safety Police, ICNF; Forestry Association	1
National Guard; Firefighters; ICNF; AGIF	1
Local Security Officer	1
National Guard; Firefighters; Forest rangers; ICNF	1
National Guard; ICNF	1
ANEPC	1

Table S4
Difficulties in the Implementation and Success of Wildfire Communication

Difficulties	Number
Lack of interest of citizens	29
Lack of human resources	14
Lack of human resources; Lack of interest of citizens	11
Lack of financial support; Lack of interest of citizens	5
Lack of financial support; Lack of human resources; Lack of interest of citizens	5
Inadequate information	4
Lack of interest of citizens; Inadequate information	4
Lack of financial support; Lack of receptiveness of the institutions; Lack of interest of citizens	3
Lack of financial support; Lack of human resources	3
Lack of receptiveness of the institutions; Lack of interest of citizens	3
Lack of receptiveness of the institutions	3
Lack of financial support; Lack of human resources; Lack of interest of citizens; Inadequate information	1
Lack of human resources; Lack of interest of citizens; Inadequate information	1
Lack of human resources; Inadequate information	1
Lack of human resources; Lack of time	1
Lack of financial Support	1
Lack of human resources; Lack of investment in awareness-raising	1
Lack of financial support; Lack of receptiveness of the institutions	1
Lack of human resources; Lack of receptiveness of the institutions	1
Lack of financial support; Lack of human resources; Lack of interest of citizens; Inadequate information	1
Redundant and oppressive actions	1
No weaknesses or difficulties	3



Truck drivers are also lay rescuers: A scoping review

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Abstract

A recent comprehensive investigation by Comcare (2021) has elucidated the real and severe mental health problems suffered by truck drivers on Australian roads, reporting that 36.7% of all Australian truck drivers experience moderate to severe psychological complaints, including suicidality. Reasons for such poor mental health included unrealistic demands, lack of respect, and compromised support systems. The current paper, however, argues that a largely hidden but common role of “lay rescuer” is also a significant contributing factor to the mental health decline in truck drivers in Australia. Unfortunately, the prevalence, impact, and best practice intervention strategies for this occurrence is unknown in the literature. This paper therefore aimed to highlight this hidden role of truck drivers with a qualitative scoping review of both published and grey literature, on what is already known generally about the effects of being a lay rescuer on the untrained bystander. Nine relevant papers were found, reviewed, and summarised. Conclusions drawn were that bystanders who become lay rescuers commonly experience symptoms similar to post traumatic stress disorder, and largely do not receive any formal mental health interventions to help cope with the resultant symptoms, weeks or months after the incident. This represents initial evidence that the lay rescuer role for Australian truck drivers may also contribute to their poor mental health. Interventions and organisational policy changes should ensure truck drivers who are also lay rescuers receive the care they need. Research limitations and future recommendations are discussed.

Keywords: *Truck driver, lay rescuer, PTSD, scoping review*

Truck drivers have been identified as one of the most at-risk occupations (behind defence force members) for mental health complications in Australia (SafeWorkAustralia, 2021). Given that the heavy vehicle trucking industry is increasingly vital for the prosperity of Australia (with 77% of the freight in Australia being conveyed via the road system; Australian Bureau of Statistics, 2020), these findings prompted a recent large-scale study by Comcare (2021) exploring the current status of mental health issue severity and prevalence in Australian truck drivers. Up to 36.7% of all truck drivers in the study experienced moderate to severe psychological distress, including depression, stress, post traumatic stress disorder (PTSD), and suicide (OzHelp Foundation, 2020), resulting in an average of 61 days per year lost due to needing time off work, compared to the average 48 days for all industries (Australian Government, 2022). Reported factors responsible for this high rate of psychological distress in this population include unrealistic job demands, lack of respect and recognition, compromised support systems, “macho male” mentality, regret, and isolation (Comcare, 2021).

These results, coupled with the growing realisation of the mental health crisis facing Australian truck drivers (Hosier, 2020), has prompted timely mental health and wellbeing programmes including Healthy Heads Trucks & Sheds (2021) and FleetComplete (2021) to increase the trauma resilience of this population. These programmes are reportedly prioritising education, increased mental health awareness, changing organisational policies, prevention, early intervention, and return to work strategies aimed at improving the mental health and resilience of the Australian transport industry. The efficacy of these programmes from an individual and organisational frame of reference is yet to be reported.

Road Traffic Incidents

Within the media and industry associations however, there are indications of further “hidden” reasons for the prevalence of moderate to severe mental health complaints in truck drivers. A media article published by Australasian Transport News (ATN, 2019) hinted at the significant and growing prevalence of truck drivers taking part and being first at the scene of a road traffic incident. OzHelp Foundation (2020) added to this,

identifying traffic hazards, traffic accidents, and other motorists driving into trucks to suicide (also known as suicide by truck, or SBT; McKay, 2019; National Road Safety Partnership Program, 2019; Radun et al., 2020) as significant contributing factors for poor mental health for these truck drivers. Finally, Worthington (2019) and Radun et al. (2020) add that truck drivers involved with SBTs have reported guilt, flashbacks, depression, and anxiety (including PTSD), which are exacerbated when media reports assume the truck driver is at fault for the road traffic incident.

Unfortunately, a review of the main journal databases did not find any original research reporting on the mental health effects on truck drivers of being the first at the scene of a road traffic incident, nor the recommended intervention for this population.

Research Aims

It is argued in this current paper that the timely intervention initiatives led by Healthy Heads Trucks & Sheds (2021) and FleetComplete (2021) will only be partially successful, if this “hidden” issue of truck drivers often being part of road accidents and/or being first at the scene at road accidents is not formally recognised as a contributing factor to the increasing poor mental health of this population.

Given that the transport industry has been identified as a high-risk industry (SafeWork Australia, 2021) and remains crucial to the prosperity of Australia (Australian Bureau of Statistics, 2020), a scoping review was conducted to explore the following questions:

- What are the psychological sequelae (such as guilt, flashbacks, depression, or PTSD) on any untrained persons (known as active bystanders, immediate responders, or rescuers) who witness or are involved in a trauma incident such as a traffic accident?
- What are the intervention techniques available for this population? and
- What is the effectiveness of these interventions?

Answers to these questions may hint at the effects of being part and/or first on scene at a significant and/or fatal motor vehicle accident for the Australian truck driver.

It is hoped that the results of this scoping review will stimulate further empirical investigations aimed at creating a more accurate understanding of the prevalence of road accidents and its psychological effects on truck drivers and an understanding of what is best practice for intervention programmes for this population,

as well as stimulating policy changes to allow support and interventions for truck drivers who have been first on scene at significant and/or fatal motor vehicle accidents.

Method

Review Method

Given this is believed to be the first review in this topic area, it was argued that a scoping review is the best synthesis method (Munn et al., 2018). A scoping review was chosen over other synthesis methods as it allows both qualitative and quantitative research articles to be included, as well as articles of lesser evidence quality (i.e., grey literature and public information). In so doing, it is hoped the review will reflect a comprehensive and robust summary of all types and grades of knowledge that is relevant to the questions.

Search Strategy

Given the topic is believed to be the first of its kind, a comprehensive search strategy by topic and year only was adopted, not limiting the search by sample, research type, or other filters as is recommended in standardised search strategies such as PICO (Patient/population, Intervention, Comparison, Outcome; Caldwell et al., 2012) or SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research type; Cooke et al., 2012). The search included the following databases and open access literature and grey literature: Google, Google Scholar, ProQuest, PsycNET, ScienceDirect, Directory of Open Access Journals (DOAJ), PLoS ONE, Social Science Research Network (SSRN), Open Grey, and Grey Literature Report.

A combination of the following search terms, limited to the years 2011 to 2021, were entered: “(immediate or lay or active) and (responder or rescuer or bystander) and (mental or distress) and (coping or intervention or treatment or post-intervention)”. Further, resources with the following terms were excluded: first, education, and role.

Inclusion/Exclusion Criteria

Inclusion criteria included being published in English and published between 2011 and 2021. Exclusion criteria included if “responder” included first responders in their definition, and if “bystanders” were passive (observers only).

Initially, a total of 261 papers were identified as satisfying the above search inclusion criteria (see Figure 1). Initial reviewing of the titles of these papers identified that 247

papers were not applicable due to not being relevant (e.g., reporting on trained responders). This left 14 papers for further review. A further paper by Barry et al. (2019) was excluded as it reported on the effects of volunteer first responders (who thus had received prior training and support). Three further papers, although relevant to the topic, were excluded as they did not report on psychological sequelae or interventions following an incident (refer Ashkenazi & Hunt, 2019; Harris et al., 2020; Khorram-Manesh et al., 2020). Finally, a paper by Feinstein and Storm (2017) was excluded due to its reporting on the psychological effects on journalists who had *witnessed* trauma rather than being active in the reported incident (related to the refugee crisis). A total of nine papers were identified as applicable to the current review and appraised for quality as the next step.

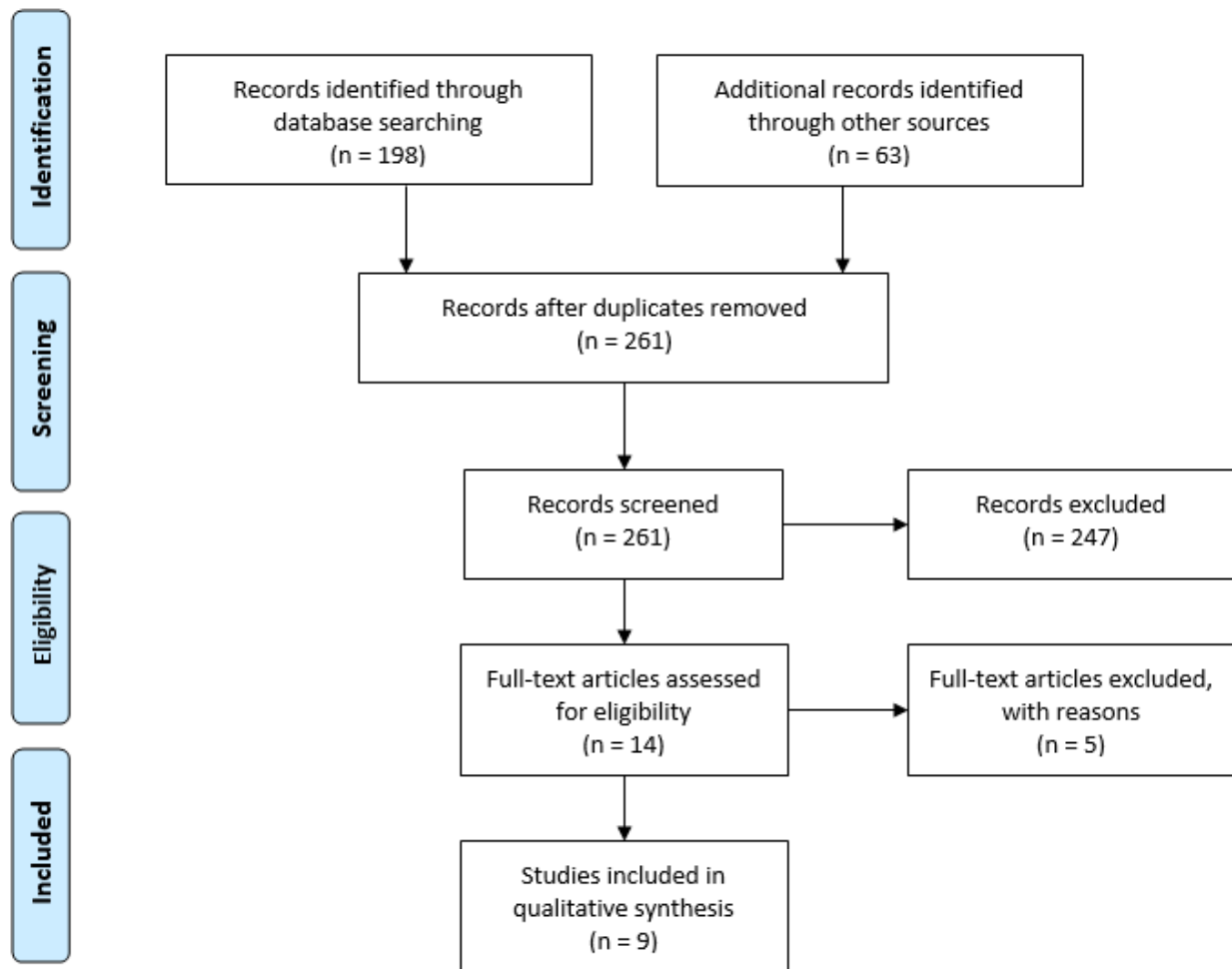
Quality Assessment

These final nine papers were appraised using several standardised appraisal checklists in order to assess the

credibility of the found sources. For original research papers, the Critical Appraisal Skills Program (CASP, 2018) was adopted. For systematic reviews, the Scottish Intercollegiate Guidelines Network (SIGN) Methodology Checklist 1 (Shea et al., 2007) was adopted. Finally for grey literature, the Guide to Appraising Grey Literature (GAGL; Public Health Ontario, 2015) was used.

The CASP requires reviewers to appraise the quality of empirical qualitative papers, responding to 10 questions with “yes”, “no”, or “can’t tell”. For this report, “yes” was attributed a score of “+1”, “no” was attributed “-1”, and “can’t tell” was attributed “0”. A paper that was “yes” for all 10 answers could be appraised at “+10”. Conversely, a paper that was “no” for all 10 answers could be appraised at “-10”. The higher the score, the higher the quality of the paper being appraised. An example appraisal question within the CASP is “Is a qualitative methodology appropriate?”

Figure 1
 Flow Diagram of Search Strategy



Note. Based on PRISMA (Moher et al., 2009) recommendations.

The SIGN requires reviewers to provide an overall assessment of the methodological quality of a review paper (based on a consideration of 12 questions) as high quality (++), acceptable (+), low quality (-), and unacceptable. Those rated as unacceptable were not included in the current review. An example appraisal question within the SIGN is “At least two people should have selected studies”.

Finally, the GAGL asks the reviewer to assess each piece of grey literature on four questions, answered “yes” or “no”. Similar to the CASP, no quantitative scoring key is provided. For this review, a “yes” answer was attributed “+1” and a “no” answer was attributed “-1”. These results were summed to arrive at a total score. A paper that received a score of “+4” would be one that had been appraised as high quality in the grey literature area. An example appraisal question within the GAGL is “Are references included?”

For each checklist, two of the authors (KA and CP) independently appraised each surviving resource with standard questions assessing for validity, reliability, and relevance. This procedure was followed by a meeting between authors to further discuss any incongruent ratings and arrive at an agreed overall rating. Results are presented in Table 1 below.

Positionality Statements

Andrews is a researcher employed at the University of the Sunshine Coast, Australia. Andrews has a background in psychology and counselling. She identifies as an Australian cisgendered female, living in an urban coastal region of eastern Australia. She is not involved in the transport industry and is not affiliated with any organisation involved with the transport industry.

Paganini is an adjunct researcher at the University of the Sunshine Coast Australia, with a strong background in clinical psychology. She identifies as an Australian cisgendered female, living in an urban region of southern Australia. She is not involved in the transport industry and her role was to review the paper and assess the sources used in the paper for validity, reliability, and relevance.

Finally, Sweeney is a trained counsellor and coach in private practice, situated in an urban coastal region of eastern Australia, and identifies as a cisgendered Australian male. Sweeney has a long history in the transport industry. His role in this project was to check for the validity of research finding, ensuring interpretations reflected the experience and interest of the population on which it is reporting.

Results

A summary of each source is provided in Table 2 below. Key findings from each source are tabled according to the three initial research questions: (1) What are the psychological consequences on untrained persons who witness or are involved in a trauma incident, (2) what are the interventions currently available for lay rescuers, and (3) what is the effectiveness of these interventions.

Summary of the Reviewed Sources

Regarding the first research question, eight of the nine papers reported on significant anxiety and distress symptomatology, including flashbacks, insomnia, social avoidance, and increased arousal. These papers also reported on persistent feelings of guilt and a desire to learn if their efforts were enough, as well as learning of the victim’s eventual outcome. Finally, three of the papers reported the lay rescuers desire to debrief with someone about the incident (such as a mental health professional).

Table 1
Summary of CASP, SIGN, and GAGL Appraisal Protocols by Authors KA and CP

Citation	Type	CASP		SIGN		GAGL		Overall Rating
		KA	CP	KA	CP	KA	CP	
Brinkrolf et al. (2020)	Peer Reviewed Original Article	9	8					8.5
Chen et al. (2020)	Peer Reviewed Original Article	10	10					10
Hall et al. (2013)	Peer Reviewed Original Article	10	9					9.5
Mathiesen et al. (2016)	Peer Reviewed Original Article	9	8					8.5
Mausz et al. (2018)	Peer Reviewed Commentary Article	10	9					9.5
Kragh et al. (2019)	Peer Reviewed Systematic Review			++	++			++
Snobelen et al. (2018)	Professional Association Peer Reviewed Journal Commentary Article					4	4	4
Hernon (2021)	Website					1	1	1
Catch Training (2015)	Training Manual					2	2	2

Table 2
Summary of Each Source Found According to Three Points of Interest

Citation	Type of Resource	Quality Assessment Result	(1) Psychological Consequence	(2) Intervention techniques	(3) Effectiveness of these techniques
Chen et al. (2020)	Peer Reviewed Original Article	10	Psychological stress, Flashbacks, Anxiety, Worry, Relief when learning of victim outcome	Post-incident debriefing	Improved ability to cope with emotional reactions
Hall et al. (2013)	Peer Reviewed Original Article	9.5	Distress and discomfort which impacts on daily activities (including driving immediately after incident) Desire to “talk to someone” but this was not offered	Nil	Nil
Mausz et al. (2018)	Peer Reviewed Original Article	9.5	Intrusive memories, Flashbacks, Sleep Disturbance, Social Avoidance, Guilt	Nil	Nil
Kragh et al. (2019)	Peer Reviewed Systematic Review	++	Stress-related symptoms (persistence and degree remain unknown)	Nil	Nil
Brinkrolf et al. (2020)	Peer Reviewed Original Article	8.5	Intrusive recollections, Flashbacks, Increased arousal, Anxiety Severe and recurring feelings of guilt (lessened if reassured at the scene of incident)	Nil	Nil
Mathiesen et al. (2016)	Peer Reviewed Original Article	8.5	Nightmares, Insomnia Weight changes, Unfocused, Intrusive memories, Anxiety, Feeling isolated, Self criticism, Feelings of relief when learning of victim outcome, Desire to talk to a professional, Desire for reassurance that their efforts were enough	Nil	Nil
Snobelen et al. (2018)	Professional Association Peer Reviewed Journal Commentary Article	4	Mental trauma	Suggests a 3 stage lay responder support model (LRSM)	Unknown Observations are that this post-intervention model assists coping with emotional reactions and cognitive perceptions
Hernon (2021)	Website	1	Traumatised	Suggests the same as that offered to first responders	Nil
Catch Training (2015)	Training Manual	2	PTSD	Suggests talking to friend, co-worker, or trained counsellor, Engaging in self care, De-briefing	Nil

Regarding the second research question, only four of the nine reviewed papers commented in this area, two of which received low quality ratings (Catch Training, 2015; Hernon, 2021). Chen et al. (2020) detailed that post-incident debriefing is effective for this population to cope in the aftermath of the incident, and Snobelen et al. (2018) suggests a three stage lay responder support model (LRSM) which has only anecdotal evidence of its effectiveness at this point in time. Finally, the training manual by Catch Training (2015) recommend debriefing

or talking to a trained counsellor, as well as engaging in self-care strategies.

Finally, regarding the third research question, only one paper (Chen et al. 2020) reported on the efficacy of an intervention strategy (post-incident debriefing). Chen et al. (2020) summarised that lay rescuers who had the opportunity to debrief after the event reported increased ability to cope with the emotional reactions and reduced psychological impact.

Ontology of the “time period” and the “first at scene helper”. Prior to discussing these results in the discussion, two key phenomena were found not to have ontological consensus in the literature. The first is the period of time between the crisis event and the arrival of the first helper, and the second is the term used to identify those who are first at scene. Regarding the first phenomenon, Ashkenazi and Hunt (2010) use the term “silent response gap” (p. 2) to refer to that time between the crisis event and when the trained first responders arrive. Khorram-Manesh et al. (2020) prefer the term “critical therapeutic window” (p. 1,310), and Hernon (2021) coins the term “disaster gap” to refer to this window of time. The current authors prefer to refer to this window of time as the “critical therapeutic window” as this captures the critical nature of this period of time for help.

The second phenomenon, regarding the term used to identify the first helper, defines this population as “an untrained individual that is unwittingly ‘thrust’ into disaster response due to being at the scene at the time of the incident” (Harris et al. 2018, p. 2), “an individual having provided CPR with no professional obligations in the incident” (Mathiesen et al., 2016, p. 2), “persons who fill a critical silent gap before trained professionals arrive” (Ashkenazi & Hunt, 2019, p. 1), and “on scene, immediately responding, victimised rescuer in an undefined time period that we need to give attention to” (Hernon, 2021). A number of terms have been used to denote those populations defined above, including “bystander” (Brinkrolf et al. 2020; Chen et al., 2020; Hall et al., 2013; Mausz et al., 2018), “immediate responder” (Ashkenazi & Hunt, 2019; Harris et al., 2020; Hernon, 2021; Khorram-Manesh et al., 2020), “lay rescuer” (Chen et al, 2020; Mathiesen et al., 2016; Mausz et al., 2018; Snobelen et al., 2018), “lay responder” (Snobelen et al., 2018), and “citizen responder” (Kragh et al., 2019). The current authors recommend the use of the term “lay rescuer” as this term does not include “responder”, which can infer having some training in the area of disaster response, and does not include the term “bystander”, which can infer being an “observer” only. Finally, it is argued that the term “lay rescuer” reflects the earlier definitions which identify this population as being “untrained”, “unwittingly thrust into the role”, and present during the “therapeutic window”. Thus, this paper will refer to this population as “lay rescuer” going forward, and consider this population as untrained individuals who provide help to those involved in a significant incident during the critical therapeutic window, before first responders arrive.

Discussion

In response to growing awareness of the poor mental health of truck drivers, there has been recent interest and research in the causality, prevalence, severity, and best practice interventions for truck drivers’ mental health challenges (Comcare, 2021). However, we argued in this paper that a further cause of psychological distress in truck drivers (involvement and/or first at the scene in significant and/or fatal road accident) continues to remain hidden, rendering the consequent psychological effects unknown and unresearched. For this reason, the current scoping review aimed to find what is currently known about the phenomenon of being “first at scene” at an incident (such as a road traffic incident) generally and the psychological complications following such an event, what are the interventions for this population, and the reported effectiveness of these interventions. It is hoped that the answers to these questions will help to better understand the probable impacts of being “first at scene” at road traffic incidents for truck drivers, and the current interventions available that are effective in providing post-intervention to truck drivers who have been or will be impacted following their lay rescuer experience.

Psychological Consequences of Being a Truck Driver as Lay Rescuer

The reviewed papers indicated the common psychological consequences of being a lay rescuer included anxiety, distress, flashbacks, insomnia, social avoidance, increased arousal, guilt, a desire to learn if their efforts were enough, and a desire to debrief after the experience (Brinkrolf et al., 2020; Catch Training, 2015; Chen et al., 2020; Hall et al., 2013; Hernon, 2021; Kragh et al., 2019; Mathiesen et al., 2016; Mausz et al., 2018; Snobelen et al., 2018). This list of symptoms is almost identical to the list of symptoms from Comcare (2021), OzHelp Foundation (2020), Worthington (2019), and Radun et al. (2020) as those suffered by nearly 37% of all truck drivers, with the exception of the final two (desire to learn if their efforts were enough, and a desire to debrief about the incident soon after). It is worth noting that these symptoms are also listed in the DSM5 diagnostic category of PTSD (American Psychological Association, 2013).

Given that the Australasian Transport News (ATN, 2019) hinted at a growing prevalence of truck drivers being first at the scene of a road traffic incident, it is possible that these psychological symptoms reported by truck drivers may also be the result of having to undertake a lay rescuer role. However, given that this role is under-

reported (ATN, 2019; McKay, 2019; Radun et al., 2020; Worthington, 2019), the truck driver as lay rescuer population is thus not being recognised and therefore addressed.

Current Interventions Available for the Truck Driver as Lay Rescuer

The reviewed papers indicated that the only interventions that are currently offered to those who are distressed following a lay rescuer experience include post-incident debriefing (Chen et al., 2020) or a 3-stage lay responder support model (Snobelen et al., 2018). Other, less robust sources (Catch Training, 2015; Hemon, 2021) reiterate the importance of post-incident debriefing, counselling, and self-care strategies. These review findings are promising since post-incident debriefing is one of the many strategies currently offered to distressed truck drivers by the programmes endorsed by Healthy Heads Trucks & Sheds (2021) and FleetComplete (2021) reviewed earlier. This indicates that existing programmes may be effective for intervention strategies related to the role of truck driver as lay rescuer as well, as long as the role of lay rescuer is recognised and included as an incident triggering referral to the above programmes.

Effectiveness of Interventions for Truck Driver as Lay Rescuer Distress

Concerningly, the current scoping review uncovered only one article reporting on the effectiveness of an intervention (post-incident debriefing) for lay rescuer distress (Chen et al., 2020). Post-incident debriefing resulted in an increased ability to cope with ongoing emotional reactions following the incident and reduced psychological impact. Although limited, this result indicates that current interventions offered to the truck driver for distress, via Healthy Heads Trucks & Sheds (2021) and FleetComplete (2021), are potentially effective for the treatment of lay rescuer distress in truck drivers as well, so long as the role of lay rescuer is formally recognised and addressed in these programmes.

Truck Drivers as Lay Rescuers: A Summary

To summarise, this scoping review has identified that psychological consequences of being a lay rescuer (including anxiety, distress, flashbacks, insomnia, social avoidance, increased arousal, guilt, a desire to learn of their efforts were enough, and a desire to debrief after the experience) are almost identical to the commonly reported symptoms of psychological distress in truck drivers. Thus, it is likely that these symptoms for truck drivers may also be the result of an unrecognised but

common role of *lay rescuer*, in which truck drivers are increasingly involved (ATN, 2019; OzHelp Foundation, 2020). Encouragingly, this scoping review has uncovered evidence that a common intervention method currently offered to truck drivers (debriefing) has also been shown to be effective in the treatment of distress as a result of being a lay rescuer in an incident.

Limitations and Recommendations

The conclusions drawn in this paper need to be considered alongside the study limitations. These include the limited number of papers found in this area of lay rescuers and psychological effects. Only one study was found that reported on the efficacy of post-intervention debriefing for lay rescuers. Further, two of the sources included from the grey literature search were low in quality ratings, and thus their findings should be cautiously interpreted.

As a result of these collated findings, there are priority recommendations that need attention. Firstly, truck drivers' own lay rescuer experiences need to be investigated. This includes a better understanding of prevalence, what the truck driver as lay rescuer does during the critical therapeutic window, and what assistance the truck driver as lay rescuer is currently offered once the first responders are on scene. Finally, a fuller understanding of any interventions that are currently offered to the truck driver in the days following the lay rescuer incident is needed.

The results of the above investigations should inform the current post-intervention programmes offered to truck drivers (e.g., Healthy Heads Trucks & Sheds and FleetComplete) so that the lay rescuer role is formally recognised and thus directly addressed within these programmes. Further, outcome research into the effectiveness of these programmes in the treatment of truck drivers who have been lay rescuers in a road traffic incident is urgently needed. Finally, the results of the above research should inform the heavy vehicle transport industry, ensuring these findings are reflected in occupational policies related to the events that trigger interventions offered to truck drivers.

Implications

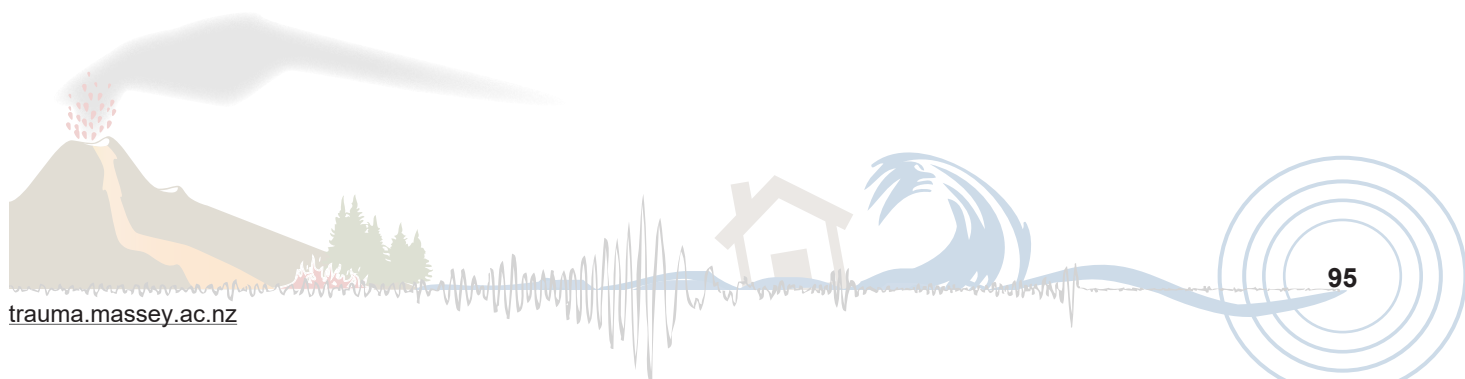
Truck drivers are vital for the ongoing prosperity of Australia (Australian Bureau of Statistics, 2020), yet this population is also one of the most at risk for mental health complications (SafeWorkAustralia, 2021). This has prompted large scale investigations into the prevalence and severity of mental health problems in

truck drivers (Comcare, 2021). However, this scoping review has highlighted that distress as a result of being a lay rescuer is not a well-known or researched incident contributing to truck driver distress. Thus, more needs to be known about the prevalence of truck drivers at incidents, their role as lay rescuers, their needs post-incident, and whether their response to these incidents exacerbates existing mental health problems or prompts development. Furthermore, this review highlights that there are limited generalist interventions currently outlined in the published literature. Ultimately, the role of lay rescuer needs to be recognised for the truck driver, so interventions can be targeted. By doing so, an opportunity to increase the trauma resilience of this workforce is possible.

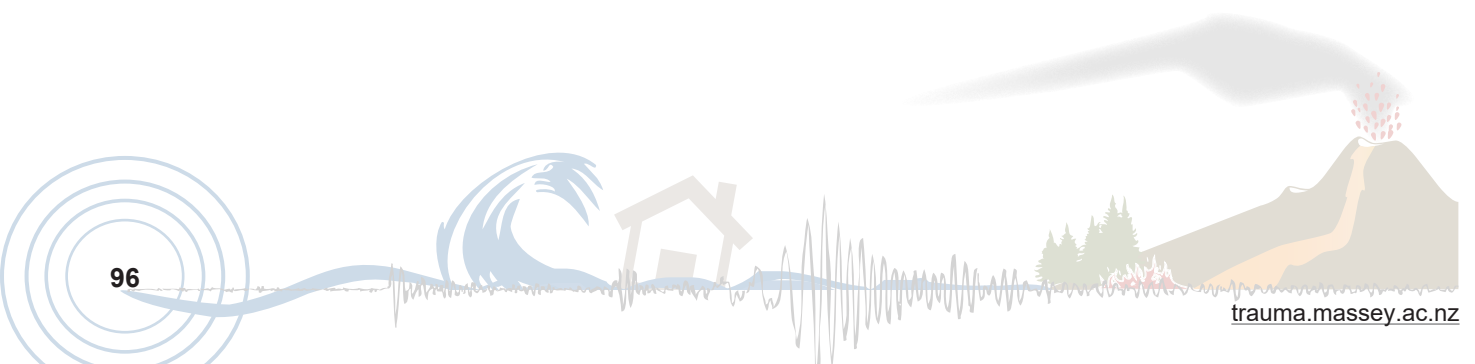
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Publications, conferences, and grants: Douglas Paton PhD.

This publication list documents Douglas' impressive contribution to the field of disaster risk reduction. Please see the Editorial of this Special Issue for the story of his life and career.

URL: https://trauma.massey.ac.nz/issues/2024-1/AJDTs_28_1_Paton_Publications.pdf

Advisory Roles

- 2000: Auckland Regional Council, New Zealand. Committee member, Development of public hazard education strategy
- 2000: Ministry for Civil Defence & Emergency, New Zealand. Invited contributor, Development of national social science research strategy
- 2000: Earthquake Commission, New Zealand. Invited contributor, Development of national natural hazards research policy
- 2002: US National Institute for Disaster Psychology & Terrorism, Stanford University. Invited contribution to the development of national terrorism research policy.
- 2003: Bushfire CRC. Invited contribution to develop social science research plan
- 2004: Ministry of Civil Defence & Emergency, New Zealand. Committee member, Development of national community resilience model
- 2004: US General Accounting Office, Washington DC.. Invited member of panel to advise on the development of national policy on disaster business continuity planning.
- 2004: Geoscience Australia. Invited member of working party to develop a national policy on disaster vulnerability assessment.
- 2004: Emergency Management Australia. Invited member of working party to scope the need for a national flood management policy.
- 2004: Auckland Regional Council, New Zealand. Member of working party to establish a community resilience measuring and monitoring framework (CDEMG Project 8).
- 2005: UNESCO. Australian representative on the UNESCO Education for Natural Disaster Preparedness in the Asia-Pacific program.
- 2005: NATO. Member of working party developing European strategy for community resilience for natural and terrorist hazards.
- 2005: Auckland District Health Board, Advisor on developing integrated emergency management response to pandemics.
- 2005: Cities on Volcanoes Commission (International Association of Volcanology and Chemistry of the Earth's Interior). Chief psychological advisor.
- 2005: New Zealand Ministry of Civil Defence and Emergency Management. Member of International Peer Review Group, National Tsunami Preparedness Strategy.
- 2005: SMUL (Emergency Management) in Saxony (Dresden, Germany). Development of community preparedness programs for flooding hazards.
- 2006: Directorate of High Security Discrete Units, UK Prison Service. Advisor, strategic planning for staff resilience in high security prisons.
- 2006: Defence Science and Technology Organization, Australia. Invited member of working party: Development

of a national resilience strategy for terrorist and natural hazards in Australia.

- 2006: Ministry of Health (New Zealand) and Auckland District Health Board (New Zealand). Program evaluator, national pandemic training exercises.
- 2007: Ministry of Health and Auckland District Health Board (New Zealand). Program evaluator, national pandemic training exercises.
- 2007: Auckland District Health Board (New Zealand). Advisor on training program development, Incident Management Team (Pandemic and natural hazard management).
- 2008: Advisory Committee, United States Government Accountability Office, Developing Disaster Resilience Strategy for US Congress.
- 2008: National Mental Health Disaster Response Taskforce (Australia), Member of Expert Working Group.
- 2008: Department of Prime Minister and Cabinet. Development of community resilience component of National Counter Terrorism strategy.
- 2008: Australian Bureau of Statistics. Member of working party to develop the Directory of National Data Items and Questions for Evaluation of Household Preparedness workshop
- 2009: Principal Scientific Advisor, Cooperative Research Centre: Fire - Environment and Society
- 2009: APS Disaster Preparedness and Response Advisory Group.
- 2011: Member of Research Interpretation and Action working group for the Integrated Research on Disaster Risk program of the United Nations International Strategy for Disaster Reduction (UNISDR) (2011-14).
- 2011: Psychosocial Recovery Advisory Committee, Christchurch Earthquake (2011-13). 2011: Member of the Civil Society, Citizenship and Third Sector Research Group at the Australian National University, Canberra (continuing).
- 2012: Technical Advisor, Risk Communication. World Health Organization (2012-2018). 2014: Member of the Stakeholder Advisory Board (SAB) of European Commission funded TACTIC (Tools, methods and training for communities and society to better prepare for a crisis) Program.
- 2014: Research Fellow, Bandung Resilience Initiative. Bandung, Indonesia 2018: Expert Advisor, Community Resilience. World Health Organization
- 2022: Expert Advisor, Tzu Chi Foundation. Enabling community transformative learning and capacity development in humanitarian aid settings.

Authored/Edited Books

- Paton, D. (1992) *Dealing with Traumatic Incidents in the Workplace*. Gull Publishing, Queensland, Australia.
- Paton, D. (1994) *Dealing with Traumatic Incidents in the Workplace*. (Second Edition) Gull Publishing, Queensland, Australia.
- Paton, D. (1997) *Dealing with Traumatic Incidents in the Workplace*. (Third Edition) Gull Publishing, Queensland, Australia.
- Paton, D. (2022) *Disaster Risk Reduction*. Cheltenham: Edward Elgar Publishers.

- Paton, D. & Brown, R. (1991) *Lifespan Health Psychology: Nursing problems and interventions*. London, Harper Collins.
- Paton, D., Buergelt, P.T., McCaffrey, S. & Tedim, F. (2015) *Wildfire Hazards, Risks and Disasters*. London: Elsevier.
- Paton, D. & Johnston, D.M. (2006) *Disaster Resilience: An integrated approach*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Johnston, D.M. (Eds) (2017). *Disaster Resilience: An integrated approach* (2nd Ed). Springfield, Ill., Charles C. Thomas.
- Paton, D. & Long, N. (1996) *Psychological Aspects of Disaster: Impact, Coping, and Intervention*. Palmerston North, Dunmore Press.
- Paton, D. & McClure, J. (2013) *Preparing for Disaster: Building household and community capacity*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Sagala, S. (2018) *Disaster Risk Reduction in Indonesia: Environmental, social and cultural perspectives*. Springfield, Ill., Charles C. Thomas.
- Paton, D. and Violanti, J. (1996) *Traumatic Stress in Critical Occupations: Recognition, consequences and treatment*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Violanti, J. (2012) *Working in High-Risk Environments: Developing sustained resilience*. Springfield, Ill., Charles C. Thomas.
- Paton, D., Violanti, J.M. & Smith, L.M. (2003) *Promoting Capabilities to Manage posttraumatic stress: Perspectives on resilience*. Springfield, Ill., Charles C. Thomas.
- Paton, D., Violanti, J., Dunning, C. & Smith, L.M. (2004) *Managing traumatic stress risk: A proactive approach*. Springfield, Ill., Charles C. Thomas.
- Paton, D., Violanti, J.M., Burke, K. & Gherke, A. (2009). *Traumatic Stress in Police Officers: A career length assessment from recruitment to retirement*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Tedim, F. (2012) *Wildfire and community: Facilitating preparedness and resilience*. Springfield, Ill: Charles C. Thomas.
- James, H. & Paton, D. (2016) *The Consequences of Disasters: Demographic, Planning and Policy implications*. Springfield, Ill., Charles C. Thomas.
- Tedim, F. & Paton, D. (2012) *A Dimensao Humana dos Incendios Florestais. Estratégias Criativas*: Porto, Portugal.
- Gow, K. & Paton, D. (2008) *The Phoenix of Natural Disasters: Community resilience*. New York: Nova Science Publishers.
- Violanti, J.M. & Paton, D. (1999) *Police Trauma: Psychological Aftermath of Civilian Combat*. Springfield, Ill., Charles C. Thomas.
- Violanti, J.M., Paton, D. & Dunning, C. (2000) *Posttraumatic Stress Intervention: Challenges, Issues and Perspectives*. Springfield, Ill., Charles C. Thomas.
- Violanti, J.M. & Paton, D. (2006) *Who Gets PTSD? Issues of Vulnerability to Posttraumatic stress*. Springfield, Ill., Charles C. Thomas.
- 羅錦福 (Douglas Paton)、何日生 (Rey-Sheng Her)、張麗珠 (Li-ju Jang). (Eds.) (2018). *降低社區災害風險與災後復原 (Community-Based Disaster Risk reduction and Recovery): Integrating community development and risk management*。花蓮 (Hualien, Taiwan): 財團法人佛教慈濟慈善事業基金會 (Buddhist Compassion Relief Tzu Chi Foundation). ISBN: 9789869476430

Contributed Book Chapters

- Paton, D. (1996) *Crisis and stress management: Integrating individual and organisational responses*. In W. Fisher (ed) *Health and well-being in a changing working environment*. Brisbane, Australian Academic Press.
- Paton, D. (1996) *Traumatic stress in the emergency services: Training, response capability and psychological well-being*. In W. Fisher (ed) *Health and well-being in a changing working environment*. Brisbane, Australian Academic Press.
- Paton, D. (1996) *Traumatic stress in critical occupations: An introduction*. In Paton, D. and Violanti, J. (eds) *Traumatic Stress in Critical Occupations: Recognition, consequences and treatment*. Springfield, Ill., Charles C. Thomas.
- Paton, D. (1996) *Responding to international needs: Critical occupations as disaster relief agencies*. In Paton, D. and Violanti, J. (eds) *Traumatic Stress in Critical Occupations: Recognition, consequences and treatment*. Springfield, Ill., Charles C. Thomas.
- Paton, D. (1996) *Traumatic stress in critical occupations: Current status and future issues*. In Paton, D. and Violanti, J. (eds) *Traumatic Stress in Critical Occupations: Recognition, consequences and treatment*. Springfield, Ill., Charles C. Thomas.
- Paton, D. (1996) *Training relief workers for disaster work*. In D. Paton and N. Long (eds) *Psychological Aspects of Disaster: Impact, Coping, and Intervention*. Palmerston North, Dunmore Press.
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- Paton, D. (1996) *Disaster and Crisis Management: An organisational perspective*. In D. Paton and N. Long (eds) *Psychological Aspects of Disaster: Impact, Coping, and Intervention*. Palmerston North, Dunmore Press.
- Paton, D. (1996) *Working overseas: Disaster demands and the well-being of relief workers*. In D. Paton and N. Long (eds) *Psychological Aspects of Disaster: Impact, Coping, and Intervention*. Palmerston North, Dunmore Press.
- Paton, D. (1996) *Ruapehu and beyond: Issues in the management of community impact and recovery*. In D.M. Johnston and D.E. Riley (eds) *Ruapehu '95*. Institute of Geological and Nuclear Sciences, Lower Hutt, New Zealand.
- Paton, D. (1997) *Community disaster management: Integrating psychological, social, economic and technical solutions*. In G. Habermann (ed) *Looking Back, Moving Forward: Fifty years of New Zealand Psychology*. Wellington, New Zealand Psychological Society.
- Paton, D. (2000) *Emergency Planning: Community development and community resilience*. In Auckland Regional Council, *Towards Community Resilience: Public education strategy for emergency management agencies in the Auckland Region*. Auckland, New Zealand: Auckland Regional Council.
- Paton, D. (2005) *Critical Incidents and Police Officer Stress*. In H. Copes (Ed) *Policing and Stress*. Upper Saddle River, NJ: Prentice-Hall.
- Paton, D. (2006) *Posttraumatic growth in emergency professionals*. In L. Calhoun and R. Tedeschi (eds) *Handbook of Posttraumatic Growth: Research and Practice*. Mahwah, NJ: Lawrence Erlbaum Assoc.
- Paton, D. (2006) *Disaster Resilience: Building capacity to co-exist with natural hazards and their consequences*. In

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- Paton (2006) Disaster Resilience: Integrating individual, community, institutional and environmental perspectives. In D. Paton & D. Johnston (Eds), *Disaster Resilience: An integrated approach*. Springfield, Ill., Charles C. Thomas.
- Paton, D. (2008) Community Resilience: Integrating Individual, Community and Societal Perspectives. In K. Gow and D. Paton (Eds) *The Phoenix of Natural Disasters: Community resilience*. New York: Nova Science Publishers.
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- Paton, D. (2012) Facilitating community readiness for forest fire: Lessons from Portugal and Australia. In F. Tedim (Ed) "Revisitar 25 Anos De História Na Serra Do Marão: Memórias E Desafios", Câmara Municipal de Amarante, Amarante.
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- Paton, D. (2013) Health and Medical Response Scenarios. In K. Bradley Penuel, Matt Statler, and Ryan Hagen (Eds) *Encyclopaedia of Crisis Management*. (pp. 459-464), Thousand Oaks, CA: Sage.
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- Paton, D. & Auld, T. (2006) Resilience in Emergency Management: Managing the flood. In D. Paton & D. Johnston (Eds), *Disaster Resilience: An integrated approach*. Springfield, Ill., Charles C. Thomas.
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- Paton, D., Buergelt, P.T., Her, R-S., Jang, L-j., Lai, R-L., Tseng, Y-L. & Wu, R-S. and Sagala, S. (2022) Regenerating Socio-Cultural Capacities and Capabilities in Disaster Recovery Settings: Repurposing, emergent and transformative processes. In T. McGee and E. Penning-Rowsell (Eds), *Handbook of Environmental Hazards and Society*. (pp. 442-457). London: Routledge. DOI: 10.4324/9780367856584
- Paton, D., Buergelt, P.T., McCaffrey, S. & Tedim, F. (2015) Wildfires: International Perspectives on Their Social-Ecological Implications. In D. Paton, S. McCaffrey, F. Tedim, & P.T. Buergelt (Eds). *Wildfire Hazards, Risks and Disasters*. London: Elsevier.
- Paton, D. Buergelt, P., Pavavalung, E., Clark, K., Jang, L-j., & Kuo, G. (2022). All Singing from the Same Song Sheet: DRR and the Visual and Performing Arts. In H. James, R. Shaw, V. Sharma and A. Lukasiewicz (Eds.), *Disaster Risk Reduction in Asia Pacific Governance, Education and Capacity*. (pp. 123-146) Singapore; Springer.
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- Paton, D., Frandsen, M & Tedim, F (2012) Prevenção dos incêndios florestais Facilitar o envolvimento da comunidade. In F. Tedim & D. Paton, (Eds) *A Dimensao Humana dos Incendios Florestais. Estratégias Criativas*: Porto, Portugal.
- Paton, D. & Gow, K. (2008) Rising from the Ashes: Empowering the Phoenix. In K. Gow and D. Paton (Eds) *The Phoenix of Natural Disasters: Community resilience*. New York: Nova Science Publishers.
- Paton, D. & Gregg, C.E (2013) Coping Capacity and Response Capability. In K. Bradley Penuel, Matt Statler, and Ryan Hagen (Eds) *Encyclopedia of Crisis Management*. (pp. 177- 181), Thousand Oaks, CA: Sage.

- Paton, D. & Gregg, C.E (2013) Mental Models. In K. Bradley Penuel, Matt Statler, and Ryan Hagen (Eds) *Encyclopedia of Crisis Management*. (pp. 612-614), Thousand Oaks, CA: Sage.
- Paton, D. & Hannan, G. (2004) Risk factors in emergency responders. In D. Paton, J. Violanti, C. Dunning & L. Smith (Eds) *Managing traumatic stress risk: A proactive approach*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Hill, R. (2006) Managing Company Risk and Resilience through Business Continuity Management. In D.Paton & D. Johnston (Eds), *Disaster Resilience: An integrated approach*. Springfield, Ill., Charles C. Thomas.
- Paton, D., Jackson, D. & Johnston, P. (2003) Work attitudes and values. In M. O'Driscoll, P. Taylor, and T. Kalliath (eds) *Organisational Psychology in Australia and New Zealand*. Melbourne: Oxford University Press.
- Paton, D. & James, H. (2016) Identifying New Directions in Post-Disaster Livelihood, Resilience and Sustainability in Asia. In H. James & D. Paton. *The Consequences of Asian Disasters: Demographic, Planning and Policy implications*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Jang, L. (2011) Disaster Resilience: Exploring All-hazards and Cross Cultural Perspectives. In D. Miller and J. Rivera (Eds), *Community Disaster Recovery and Resiliency: Exploring Global Opportunities and Challenges*. London: Taylor & Francis
- Paton, D. & Jang, L. (2013) Increasing Community Potential to Manage Earthquake Impacts: The role of social and cultural factors. In K. I. Konstantinou (Ed) *Earthquakes: Triggers, Environmental Impact and Potential Hazards*. New York: Nova Publishers.
- Paton, D., Jang, L-j. & Irons, M. (2015) Building Capacity to Adapt to the Consequences of Disaster: Linking Disaster Recovery and Disaster Risk Reduction. In D. Brown (Ed) *Capacity Building: Planning, Programs and Prospects*. New York: Nova Scientific Publishers. pp. 85-114
- Paton, D., Jang, L-J., Kitigawa, K., Mamula-Seadon, L. & Sun, Y. (2017) Coping with and Adapting to Natural Hazard Consequences: Cross cultural perspectives. In D. Paton and D.M. Johnston (Eds). *Disaster Resilience: An integrated approach* (2nd Ed). (pp. 236-254) Springfield, Ill., Charles C. Thomas.
- Paton, D., Jang, L-J., & Liu, L-W. (2016) Long Term Community Recovery: Lessons from earthquake and typhoon experiences in Taiwan. In H. James & D. Paton (Eds). *The Consequences of Asian Disasters: Demographic, Planning and Policy implications*. Springfield, Ill., Charles C. Thomas.
- Paton, D. & Jang, L-J (2016) Earthquake Readiness and Recovery: An Asia-Pacific perspective. In S. D'Amico (Ed) *Earthquakes and their Impact on Societies*. London: Springer.
- Paton, D., Johal, S. & Johnston, D. (2015) Community Recovery Following Earthquake Disasters. In M. Beer, I.A. Kougioumtzoglou, E. Patelli & I. Siu-Kui Au (Eds) *Encyclopedia of Earthquake Engineering*. Berlin. Springer.
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- Paton, D., Johnston, D. & Heron, D. (2000) Integrated Risk Assessment – Wellington City Phase III: Social Impact. Institute of Geological & Nuclear Sciences Limited Science Report 2000/46. 29 p.
- Paton, D., Johnston, D. & Johgens, R. (2003) Napier City Council Hazard Analysis Research project. Part 2: Social vulnerability. Institute of Geological and Nuclear Sciences Science Report 2003/76, Upper Hutt, New Zealand. 75p.
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- Becker, J.; McBride, S.; Paton, D. (2013) Improving community resilience in the Hawke's Bay: A review of resilience research, and current public education, communication, and resilience strategies, *GNS Science Report 2012/38*. 72 p.
- Paton, D., Mamula-Seadon, L., & Selway, K. (2013) Community Resilience in Christchurch: Adaptive responses and capacities during earthquake recovery. *GNS Science Report 2013/37*. 24p.
- Paton, D. (2014) *Disaster Management for Community Workers*. Taipei, Taiwan: Ministry of Health and Welfare.

Conference Presentations

- Paton, D. (1977) The sea-finding behaviour of the puffin (*Fratercula arctica*). Scottish Animal Behaviour Conference. University of St. Andrews.
- Paton, D. (1978) The conflict hypothesis as an exploratory concept in animal communication. Zoology Research Conference. Edinburgh University.
- Paton, D. (1978) Game theory and animal communication. Scottish Animal Behaviour Conference, University of Glasgow.
- Paton, D. (1979) The interaction between display and non-display factors in avian communication. Scottish Animal Behaviour Conference. University of Stirling.
- Paton, D. (1980) The displays of *Catheracta skua*: The conflict theory refuted? Zoology Research Conference. Edinburgh University.
- Paton, D. & Caryl, P. (1981) What really goes on in agonistic interactions? International Ethological Conference, University of Oxford.

1989

- Paton, D. (1989) Disasters and Helpers: The Armenian Experience. International Health Psychology Conference. UWCC, Cardiff. (Invited contribution to a symposium on psychological aspects of disasters).
- Paton, D. (1989) Stress in rescue workers following a disaster. Invited paper, Strathclyde Police Conference: The Lockerbie air disaster. Police Headquarters, Glasgow.
- Paton, D., & Shute, R. (1989) A Systems Approach to Chronic Illness Management. International Health Psychology Conference, UWCC, Cardiff.

1990

- Paton, D. (1990) Disasters and Helpers: Identifying the training needs of search and rescue workers. Invited paper - British Psychological Society, Annual General Meeting, University of Edinburgh.
- Paton, D. (1990) Recent disasters: implications for intervention. Invited paper - 6th Conference of the International Society for Traumatic Stress Studies, New Orleans, October 26-30.
- Paton, D. (1990) Major Incident Stress in firefighters. Invited paper - Symposium on stress in the emergency services. BPS London Conference, December 18th 1990.
- Paton, D. (1990) Disasters and Helpers: Is special training necessary? Occupational Psychology Conference, Bowness-on-Windermere, January 1990.
- Paton, D. (1990) Disasters and stress: Identifying the training needs of search and rescue workers. 1st International Congress on Behavioural Medicine, Uppsala, Sweden, June.
- Paton, D. (1990) Disasters and helpers: some directions for future research. BPS Scottish Branch Conference, September 1990.
- Paton, D. & Mitchell, M. (1990) Disaster stress: coping with extraordinary events. BPS Scottish Branch Conference, September 1990.

Paton, D. & Shute, R. (1990) The management of chronic illness - towards a systems approach. 1st International Congress on Behavioural Medicine, Uppsala, Sweden. June.

Shute, R. and Paton, D. (1990) Developing developmental psychology. BPS Scottish Branch Conference, September 1990.

1991

Paton, D. (1991) Assessment of work-related trauma: Methodological issues and implications for organisational strategies. Invited paper: International Society for Traumatic Stress Studies, 7th Annual Conference, Washington, D.C.

Paton, D. (1991) Future trends in human resource development. Department of Education, Employment and Training, Staff Development Conference, Fremantle, Western Australia.

Paton, D. (1991) Disaster Stress: the impact of orphanage relief work in Romania. Australian Psychological Society, Annual Conference. Adelaide

Paton, D. (1991) Disaster Stress: the impact of orphanage relief work in Romania.

International Society for Traumatic Stress Studies, 7th Annual Conference, Washington D.C.

Paton, D. (1991) Critical incident stress in emergency response personnel. International Society for Traumatic Stress Studies, 7th Annual Conference, Washington, D.C.

1992

Paton, D. (1992) Disasters and Police personnel. 8th Annual meeting of the International Society for Traumatic Stress Studies. Los Angeles, October 22 - 25, 1992.

Paton, D. (1992) School based trauma: Preparation and support for staff. School Psychologists Association. 3rd Annual Conference. WACA. 25th September 1992.

Bishop, B., & Paton, D. (1992) Public involvement and coping with chronic environmental disasters. 27th Annual Conference of the Australian Psychological Society. University of New England, Armidale, N.S.W. 30th September 1992.

1993

Paton, D. (1993) Psychological Trauma in the Workplace: Planning to meet the needs of individuals and organisations. Invited paper: Psychology Week Conference 1993. University of Western Australia. 15th March.

Paton, D. (1993) Psychological Trauma in the Workplace: Planning to meet individual and organisational needs. Invited paper: Australasian Society for Traumatic Stress Studies Conference. Adelaide, South Australia. 23 - 25 April.

Paton, D. (1993) Managing critical incidents within tertiary education. TAFE Counsellors' Conference. Claremont Conference Centre, Edith Cowan University. 18th - 19th November.

Paton, D. (1993) International Disasters: Issues in the training and preparation of relief workers. Australasian Society for Traumatic Stress Studies. Annual Conference. Adelaide, South Australia. 23 - 25 April.

Pollock, C. & Paton, D. (1993) Identifying the factors underlying the sustained use of homeworking. Australian Computer Society Conference. Fremantle. 26th March.

1994

Pollock, C., Paton, D. & Smith, G. (1994) A preliminary study of factors influencing organisations' decisions to

implement homeworking. The 12th Triennial Congress of the International Ergonomics Association, Toronto, Canada, August 15-19, 1994.

1995

Paton, D. (1995) Environmental disaster and mental health: Conceptualising community impact and intervention. Australasian Society for Traumatic Stress Studies/Australasian Critical Incident Stress Association Conference. Hobart, 5th - 8th March 1995.

Paton, D. (1995) Disaster relief work: Schemata, response capability and psychological well-being. Australasian Society for Traumatic Stress Studies/Australasian Critical Incident Stress Association Conference. Hobart, 5th - 8th March 1995.

Paton, D. (1995) Traumatic stress in the workplace and organisational support. Department of Occupational Health and Safety (Western Australia). Occupational Safety and Health Week '95 Conference. Perth. 28th August.

Paton, D. & McCormack, A. (1995) Addiction to trauma: Implications for high risk professionals. British Psychological Society Conference, Crieff Hydro, Scotland, November 24-26.

Paton, D. & Smith, L. (1995) Work related trauma: Methodological and assessment issues. Australasian Society for Traumatic Stress Studies/Australasian Critical Incident Stress Association Conference. Hobart, 5th - 8th March 1995.

Paton, D. & Stephens, C. (1995) Social Support for Work Related Trauma: social and organisational influences on effectiveness. 11th Annual Conference, International Society for Traumatic Stress Studies, Boston, USA.

1996

Paton, D. (1996) Crisis and stress management: Integrating individual and organisational responses. '96 National Occupational Stress Conference. Australian Psychological Society/Comcare Australia. Sheraton Brisbane Hotel and Towers, Brisbane, 11 -12th March 1996.

Paton, D. (1996) Traumatic stress in the emergency services: Training, response capability, and psychological well-being. '96 National Occupational Stress Conference. Australian Psychological Society/Comcare Australia. Sheraton Brisbane Hotel and Towers, Brisbane, 11 -12th March 1996.

Paton, D. (1996) Disaster relief work overseas: The impact of orphanage relief work in Romania. First European Conference on Traumatic Stress in Emergency Services, Peacekeeping Operations, and Humanitarian Aid Organisations. Trent RHA/ESTSS. University of Sheffield, 17 - 26th March 1996.

Paton, D. (1996) Debriefing and recovery from traumatic stress in emergency services personnel. First European Conference on Traumatic Stress in Emergency Services, Peacekeeping Operations, and Humanitarian Aid Organisations. Trent RHA/ESTSS. University of Sheffield, 17 - 26th March 1996.

Paton, D. (1996) Stress in disaster responders: Training, response capability, and psychological well-being. First European Conference on Traumatic Stress in Emergency Services, Peacekeeping Operations, and Humanitarian Aid Organisations. Trent RHA/ESTSS. University of Sheffield, 17 - 26th March 1996.

Paton, D. (1996) Personal strategies for dealing with traumatic incidents in nursing. New Zealand Theatre Nurses Conference, Palmerston North. 5th July.

Paton, D. (1996) Promoting recovery from psychological trauma: Integrating recovery resources and the recovery

- environment. The British Psychological Society, Scottish Branch Conference. Crieff, 22 - 24 November 1996.
- Paton, D. (1996) Beyond psychological debriefing: Developing an integrated approach to recovery from occupational trauma. 12th Annual Meeting: The International Society for Traumatic Stress Studies. San Francisco, November 9 - 13, 1996.
- Bell, J., & Paton, D. (1996) Chronic stress and illness in older adults. Seventeenth Annual Neuroscience Colloquium of Western Australia. November 21 - 22. Fremantle, Western Australia.
- 1997**
- Paton, D. (1997) Community disaster management: Integrating psychological, social, economic and technical solutions. New Zealand Psychological Society Annual Conference, Massey University, Palmerston North. (Invited symposium chair - Psychological Aspects of Disaster)
- Paton, D. & Smith, L. (1997) A structural re-assessment of the Impact of Event Scale: The influence of occupational and cultural contexts. New Zealand Psychological Society Annual Conference, Massey University, Palmerston North.
- Paton, D. & Smith, L. (1997) Work-related psychological trauma: Promoting quality of life in high risk professions. British Psychological Society Scottish Conference. Pitlochry Hydro, Scotland. 21 - 23 November 1997.
- Paton, D. & Smith, L. (1997) Methodological issues in the study of stress in disaster relief workers. New Zealand Psychological Society Annual Conference, Massey University, Palmerston North.
- Paton, D. & Violanti, J. (1997) Long term exposure to traumatic demands in police officers: Behavioural addiction and its management. New Zealand Psychological Society Annual Conference, Massey University, Palmerston North.
- Paton, D. & Wilson, F. (1997) Cognition and Organisational Strategy: Knitting them together. New Zealand Psychological Society Annual Conference, Massey University, Palmerston North.
- Collins, D., Paton, D. & Brooke, J. (1997) Student stress and burnout. New Zealand Psychological Society Annual Conference, Massey University, Palmerston North.
- Houghton, B.F., Johnston, D.M.; Neall, V.E., Ronan, K.R., & Paton, D. (1997) Managing volcanic crises: Lessons from Ruapehu in 1995/96. New Zealand Geophysical Society: Geophysical Symposium - Natural Hazards in New Zealand. Victoria University of Wellington, New Zealand, 28 - 29 August 1997.
- 1998**
- Paton, D. (1998) Disaster stress: Implications for police management. NZ Police Inspectors Conference. Porirua, New Zealand.
- Paton, D. (1998) Preparing for disaster response: A management perspective. Volcanoes and Society: Planning for a volcanic crisis in New Zealand. IGNS, Wairakei.
- Paton, D., Johnston, D.M. & Houghton, B.F. (1998) Organisational response to a volcanic eruption in New Zealand: Organisational dynamics of integrated emergency management. Cities on Volcano International Meeting. Rome and Naples.
- Paton, D., Johnston, D.M. & Houghton, B.F. (1998) Organisational response to a volcanic eruption in New Zealand: Organisational dynamics of integrated emergency management. Natural hazards Management Workshop. Christchurch.
- Paton, D., Smith, L.M., Johnston, D., & Houghton, B. (1998). Organisations and volcanoes: Issues erupting in the organisational psychology of integrated emergency management. International Work Psychology Conference. Sheffield, UK.
- Paton, D., Smith, L.M., Stephens, C.V., Violanti, J., & Long, N. (1998). Chronic Exposure to Traumatic Incidents: Exploring its implications before, during and after employment in high risk professions. International Work Psychology Conference. Sheffield, UK.
- Huddleston, L., Stephens, C., Paton, D. & Miller, I. (1998). Occupational Stress and the transition to operational duties in New Zealand police officers. New Zealand Psychological Society Conference. Wellington, New Zealand.
- Johnston, D. & Paton, D. (1998) Social amplification of risk: Transient end-points. Conference - Risk Assessment of Environmental End Points, University of Auckland.
- Smith, L.M. & Paton, D. (1998) The work environment and traumatic stress reactions: Implications for high risk professionals. International Work Psychology Conference. Sheffield, UK.
- 1999**
- Paton, D. (1999) Responding to disaster: Managing incident command stress. Keynote address. The Conference of the Australasian Critical Incident Stress Association, 17-19 September, 1999, Adelaide, South Australia.
- Paton, D. (1999) Work-related traumatic stress: Human resource strategies for managing trauma and promoting resilience. Keynote address. The Conference of the Australasian Critical Incident Stress Association, 17-19 September, 1999, Adelaide, South Australia.
- Paton, D. & Johnston, D. (1999) Organisational Response to a Volcanic Eruption: Observations and implications for integrated emergency management. Australian Disaster Conference, Canberra, November 1-3.
- Paton, D., Flin, R. & Johnston, D. (1999) Responding to Disaster: Managing incident command stress. Australian Disaster Conference, Canberra, November 1-3.
- Paton, D. & Wilson, F. (1999) Rivalry and competition in knitwear producers. New Zealand Strategic Management Society Conference, Palmerston North.
- Eranen, L., Millar, M., & Paton, D., (1999) Organisational Recovery from Disaster: Traumatic Response within Voluntary Disaster Workers. European Society for Traumatic Stress Studies Conference, Istanbul, Turkey. June.
- Johnston, D., Paton, D., Gough, J., Dowrick, D., Daly, M., Baddon, L., Battistich, T., and Wood, I. (1999) Auckland volcanic risk project: Gaining a better understanding of the implications of a volcanic eruption at the Auckland Volcanic Field. Natural Hazards and Climate Change: Joint Conference of the New Zealand Geophysical Society and the Meteorological society of New Zealand, Wellington, 1-3 September.
- Kozuch, M. Johnston, D., Paton, D., Gough, J., Dowrick, D., Daly, M., Baddon, L., Battistich, T., & Wood, I. (1999) Auckland volcanic risk project: Gaining a better understanding of the implications of a volcanic eruption at the Auckland Volcanic Field. SOPAC: South Pacific Applied Geoscience Commission, Governing Council, Annual

- Session, Nadi, Fiji, 23 - 29 October, 1999. SCIENCE, TECHNOLOGY AND RESOURCES NETWORK (STAR)
- Millar, M., Paton, D., & Johnston, D. (1999) Community Vulnerability to Volcanic hazard Consequences. Australian Disaster Conference, Canberra, November 1-3.
- Ronan, K., Paton, D., Johnston, D., and Houghton, B. (1999) Hazard Readiness and Recovery: A multidisciplinary perspective. Workshop sponsored by the National Science and Technology Programme for Hazards Mitigation. Taipei, Taiwan, July.
- Smith, M., Orner, R. & Paton, D. (1999) Joint exercise evaluation. The Conference of the Australasian Critical Incident Stress Association, 17-19 September, 1999, Adelaide, South Australia.
- Tompkins, S., Wolley, C., & Paton, D. (1999) A study of how both individual and organisational factors combine to produce important risk and protective factors for developing Secondary Traumatic Stress Disorder in psychologists. New Zealand Psychological Society, Annual Conference, September 1-5, Dunedin.
- 2000**
- Paton, D. (2000) Disasters and Communities: Resilience, information and preparedness.
- Earthquakes and Society Conference. Institute of Geological and Nuclear Sciences. Lower Hutt, New Zealand, 28 February - 3 March.
- Paton, D. (2000) Resilience, hazard education and community development. Natural Hazards Management Conference, Napier, New Zealand, 16-17 August.
- Paton, D. (2000) Risk perception, risk communication and preparedness for natural hazard effects. Volcanoes and Society: Planning for a volcanic crisis in New Zealand Conference. Wairakei Research Centre, New Zealand, 16-18 October.
- Paton, D. (2000) Managing volcanic hazard consequences: Communication and decision making. Planning for a volcanic crisis in New Zealand Conference. Wairakei Research Centre, New Zealand, 16-18 October.
- Paton, D., Flin, R., & Johnston, D. Responding to Disaster: Managing incident command stress. Natural Hazards Management Conference, Napier, New Zealand, 16-17 August.
- Paton, D., Millar, M., & Johnston, D. (2000) Community Impact of Volcanic Eruption: Long term psychological vulnerability to hazard effects. Third World conference for the International Society for the International Society for Traumatic Stress Studies, Carlton Crest, Melbourne, March 16-19.
- Paton, D., Smith, L., Violanti, J., & Eranen, L. (2000) Resilience, vulnerability and risk management. An emergency management perspective. Natural Hazards Management Conference, Napier, New Zealand, 16-17 August.
- Paton, D., Smith, L.M., Violanti, J.M., Eränen, L., & Long, N. (2000) Posttrauma Intervention: Risk, vulnerability and resilience. Health and Risk Conference, University of Oxford, UK., 16-17 July.
- Paton, D., Violanti, J., Smith, L.M., Long, N., & Stephens, C. (2000) Chronic Exposure to Traumatic Incidents: Implications before during and after employment in high risk professions. Third World conference for the International Society for the International Society for Traumatic Stress Studies, Carlton Crest, Melbourne, March 16-19.
- Eranen, L., Millar, M., and Paton, D. (2000) Organisational Recovery from Disaster: Traumatic response with voluntary disaster workers. Third World conference for the International Society for the International Society for Traumatic Stress Studies, Carlton Crest, Melbourne, March 16-19.
- Huddleston, L., Paton, D., Stephens, C., Miller, I and Black, J. (2000) Trauma and Psychological Health: A longitudinal investigation in police officers. Third World conference for the International Society for the International Society for Traumatic Stress Studies, Carlton Crest, Melbourne, March 16-19.
- Johnston, D., Paton, D., Bebbington, M., Lai, C-D, & Houghton, B. (2000) Volcanic Hazard Perception: Comparative shifts in knowledge and risk. Third World conference for the International Society for the International Society for Traumatic Stress Studies, Carlton Crest, Melbourne, March 16-19.
- Johnston, D., Paton, D., Gough, J., Dowrick, D., Daly, M., Baddon, L., Batistich, T., & Wood, I. (2000) Auckland Volcanic Risk Project: Gaining a better understanding of the implications of a volcanic eruption at the Auckland Volcanic Field. Natural Hazards Management Conference, Napier, New Zealand, 16-17 August.
- Ronan, K., Paton, D., Johnston, D., Houghton, B. & Long, N. Volcanic hazards and societal risk: A multidisciplinary approach Health and Risk Conference, University of Oxford, UK., 16-17 July.
- Tompkins, S., Woolley, C., and Paton, D. (2000) Secondary Traumatic Stress in Psychologists: The influence of individual and organisational factors. Third World conference for the International Society for the International Society for Traumatic Stress Studies, Carlton Crest, Melbourne, March 16-19.
- 2001**
- Paton, D., Allen, D., Johnston, D., & Houghton, B. (2001) Volcanic crisis information and decision management. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- Paton, D., Flin, R. & Johnston, D. (2001) Responding to disaster: Managing incident command stress. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- Paton, D., Johnston, D., & Daly, M. (2001) Mapping social vulnerability: Facilitating the mental health response to volcanic hazards in Auckland. European Traumatic Stress Conference. Edinburgh, UK, May 25-29.
- Paton, D., Johnston, D., & Houghton, B. (2001) Organisational response to a volcanic eruption: Observations and implications for integrated emergency management. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- Paton, D., Johnston, D., Smith, L. & Allen, D. (2001) Responding to hazard effects: Promoting resilience and adjustment adoption. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- Paton, D., Smith, L.M., Violanti, J., & Eranen, L. (2001) Risk management and resilience: Managing traumatic stress reactions. European Traumatic Stress Conference. Edinburgh, UK, May 25-29.
- Paton, D., Smith, L., Violanti, J. & Eranen, L. (2001) Resilience, vulnerability and risk management: An emergency management perspective. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- Gregg, C.E., Houghton, B.F., Johnston, D.M., Paton, D., & Swanson, D.A. (2001) Perception of lava flow hazards and

- risk at Mauna Loa and Hualalai volcanoes, Kona, Hawaii. American Geophysical Union Conference, San Francisco, California, 10-14 December.
- Johnston, D., Driedger, C., Houghton, B., Ronan, K., & Paton, D. (2001) A hazard education assessment in four communities around Mt. Ranier, Washington USA. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- Johnston, D., Paton, D., Gough, J., Dowrick, D., Daly, M., Baddon, L., Batistich, T., & Wood, I. (2001). Understanding the implications of a volcanic eruption at the Auckland Volcanic Field. Cities on Volcanoes Conference, Auckland, New Zealand, 12–16 February.
- Johnston, D. Ronan, K. & Paton, D. (2001) Preparedness for earthquake hazards: A comparison of two communities, New Zealand Earthquake Engineering Conference, Wairakei, New Zealand, 12 March.
- Johnston, D., Scott, B., Houghton, B., & Paton, D. (2001) Management of caldera unrest in New Zealand. Cities on Volcanoes Conference, Auckland, New Zealand, 12 –16 February.
- MacLeod, M. & Paton, D. (2001) Victims, violent crime and the criminal justice system: An integrated model of recovery. . European Traumatic Stress Conference. Edinburgh, UK, May 25-29.
- 2002**
- Paton, D. (2002) Stress in Emergency Response: A risk management approach. Keynote Address. Inaugural Conference, National Centre for Disaster Psychology and Terrorism, Stanford University, October 3-6.
- Paton, D. (2002) Community Hazard Education: Promoting resilience & preparedness. Ministry for Emergency Management Public Education Conference. Porirua, Royal New Zealand Police College, 12-15 February.
- Paton, D. (2002) Emergency Teams. Ministry for Emergency Management Crisis and Decision Making Conference, Porirua, Royal New Zealand Police College, 15-17 April. .
- Paton, D. (2002) Emergency decision making. Ministry for Emergency Management Crisis and Decision Making Conference, Porirua, Royal New Zealand Police College, 15-17 April.
- Paton, D. (2002) Developing individual resilience. Ministry for Emergency Management Crisis and Decision Making Conference, Porirua, Royal New Zealand Police College, 15- 17 April.
- Paton, D. (2002) Promoting and sustaining community resilience and preparedness. Ministry for Emergency Management Recovery management Conference, Porirua, Royal New Zealand Police College, 21-23 May.
- Paton, D. & Jackson, D. (2002) Using assessment centres to develop emergency response capabilities. Paper presented at the 5th New Zealand Natural Hazards Conference, Te Papa, Wellington, 14-15 August.
- Paton, D. & Johnston, D. (2002) Risk – Perception versus reality. Hazards And Society: Planning for an Earthquake Crisis in New Zealand. Conference. Institute of Geological and Nuclear Sciences, Gracefield, 23-24 May.
- Paton, D., Smith, L., Johnston, D., Johnston, M., & Ronan, K. (2002) Responding to hazard effects: Promoting household resilience and preparedness. Paper presented at the 5th New Zealand Natural Hazards Conference, Te Papa, Wellington, 14-15 August.
- Paton, D., Smith, L., Violanti, J. and Eranen, L. (2002) Risk management: Application to disaster stress. Paper presented at the 5th New Zealand Natural Hazards Conference, Te Papa, Wellington, 14-15 August.
- Eranen, L., Paton, D. & Millar, M. (2002) Recovery from disaster: The role of organizational factors on traumatic stress in volunteer rescue workers. Paper presented at the 5th New Zealand Natural Hazards Conference, Te Papa, Wellington, 14-15 August.
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- Johnston, D., Houghton, B., Ronan, K. & Paton, D. (2002) A hazard education assessment in four communities around Mt. Ranier. Montagne Pelee, 1902 – 2002: Explosive volcanism in Subduction Zones, San Pierre, Martinique, May 12 –16.
- O’Leary, M. & Paton, D. (2002) Future directions in crisis management and decision making. Ministry for Emergency Management Crisis and Decision Making Conference, Porirua, Royal New Zealand Police College, 15-17 April. .
- 2003**
- Paton, D. (2003) Traumatic Stress Risk Management: Modelling resilience and vulnerability. 10th Annual Conference of the Australasian Society for Traumatic Stress Studies, 31st March – 3rd April, Hobart, Tasmania, Australia.
- Paton, D. (2003) Stress risk in emergency response: Promoting resilience and adaptation. 5th Australia Industrial and Organisational Psychology Conference, Melbourne, 26-29 June.
- Paton, D. (2003) Assessing community vulnerability. Invited paper, Australian Disaster Conference, Pre-conference Workshop, W4, Development of a National Risk Assessment Framework, Tuesday, 9th September.
- Paton, D. (2003) Disaster preparedness: The role of the organisational psychologist. New Zealand Psychological Society Conference. Embracing Change: Future directions of psychology in Aotearoa/New Zealand. 30th August – 3rd September.
- Paton, D. (2003) Managing critical incident stress: A risk management approach. ACISA Conference. Melbourne, 3-5 October.
- Paton, D. & Jackson, D (2003) Emergency management training using assessment centres. Australian Disaster Conference, Canberra, 10-12 September.
- Paton, D., Huddleston, L., & Stephens, C. (2003) The interaction between traumatic stress and organisational demands on police officers traumatic stress and posttraumatic growth. 10th Annual Conference of the Australasian Society for Traumatic Stress Studies, 31 March – 3rd April, Hobart, Tasmania, Australia.
- Paton, D. & MacLeod, D. (2003) Victims of Violence: A social cognitive model of recovery, 10th Annual Conference of the Australasian Society for Traumatic Stress Studies, 31st March – 3rd April, Hobart, Tasmania, Australia.
- Paton, D., Smith, L., Johnston, D., Johnston, M. & Ronan, K. (2003) Responding to earthquake hazards: Promoting household resilience and preparedness. 7th Pacific Conference on Earthquake Engineering, 13-15 February, University of Canterbury, Christchurch, New Zealand.
- Paton, D., Smith, L., & Johnston, D. (2003) When good intentions turn bad: Promoting disaster preparedness.

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- Paton, D., Smith, L.M., Johnston, D., Johnston, M. & Ronan, K. (2003) Earthquake preparedness: A social-cognitive perspective. New Zealand Psychological Society Conference. Embracing Change: Future directions of psychology in Aotearoa/New Zealand. 30th August – 3rd September.
- Finnis, K., White, J., Johnston, D. & Paton, D. (2003) Community preparedness around Mt. Taranaki, New Zealand. Cities on Volcanoes Conference, Hilo, Hawai'i, USA, July 14-18.
- Gregg, C., Houghton, B., Paton, D., Swanson, D.A., & Johnston, D. (2003) Emergency response to lava flows from Mauna Loa and Hualalai volcanoes in Kona communities, Hawai'i. Cities on Volcanoes Conference, Hilo, Hawai'i, USA, July 14-18.
- Gregg, C., Paton, D. & Johnston, D. (2003) Resilience of Hawaiian coastal communities to tsunami and volcanic hazards. Cities on Volcanoes Conference, Hilo, Hawai'i, USA, July 14-18.
- Gregg, C., Houghton, B., Johnston, D., Paton, D., & Swanson, D.A. (2003) The perception of volcanic risk in Kona communities from Mauna Loa and Hualalai volcanoes, Hawai'i. Cities on Volcanoes Conference, Hilo, Hawai'i, USA, July 14-18.
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- Huddleston, L., Stephens, C. & Paton, D. (2003) A longitudinal study of the impact of traumatic and organisational experiences on the health of New Zealand police recruits. New Zealand Psychological Society Conference. Embracing Change: Future directions of psychology in Aotearoa/New Zealand. 30th August – 3rd September.
- Johnston, D., Kerr, J., Paton, D., Ronan, K. & Houghton, B. (2003) Improving societies' preparedness for future volcanic eruptions. Cities on Volcanoes Conference, Hilo, Hawai'i, USA, July 14-18.
- Johnston, D., Kerr, J., Paton, D., Ronan, K., Finnis, K. Gray, W. & Bell, R. (2003) Natural hazard reduction: Integrating geological and social perspectives. New Zealand Psychological Society Conference. Embracing Change: Future directions of psychology in Aotearoa/New Zealand. 30th August – 3rd September.
- Rohrman, B. & Paton, D. (2003) Understanding risk. Bushfire research and social science conference. Bureau of Meteorology, Melbourne, 11-12 August 2003.
- 2004**
- Paton, D. (2004) Preparing for Disaster: Integrating risk, resilience and vulnerability perspectives. Emergency Management Conference 2004. Melbourne: Emergency Services Foundation Melbourne, Victoria.
- Paton, D. (2004) Hazard Reduction and Readiness Planning: Integrating risk, resilience and vulnerability perspectives. 2004 ANCOLD/ NZSOLD Conference, Grand Hyatt, Melbourne, 14-18th November.
- Paton, D. & Whealin, J. (2004) Managing Disaster Stress Risk: Promoting resilience and adaptation. American Psychological Association Conference, Honolulu, Hawai'i, July, 27- 30.
- Paton, D. & Anderson-Berry, L. (2004) Responding to technological and natural hazards: Planning for operational management. 6th New Zealand Natural Hazards Conference: From Science to Practice, Tauranga, 10-11th August.
- Paton, D., Smith, L.M., & Johnston, D. (2004) Earthquake preparedness: Modelling the process and identifying strategies. 6th New Zealand Natural Hazards Conference: From Science to Practice, Tauranga, 10-11th August.
- Paton, D., Gregg, C., & Johnston, D. & Houghton, B.F. (2004) Modelling Natural Hazard preparedness: Evidence from earthquake and tsunami studies. American Geophysical Union, Honolulu, Hawai'i, 16-20 July.
- Paton, D., Gregg, C.E., Houghton, B.F., Swanson, D.A., & Johnston, D.M. (2004) Community preparedness for lava flows from Mauna Loa and Hualalai volcanoes, Kona, Hawai'i. 17th Australian Geological Convention, Hobart 8-13 Feb 2004.
- Paton, D. & Johnston, D. (2004) Volcanic Hazards: Understanding risk and promoting community preparedness. 17th Australian Geological Convention, Hobart 8-13 Feb 2004.
- Paton, D., Johnston, D., & Leonard, G. (2004) Community experience of an extreme weather event: Implications for risk perception and household preparedness. International Conference on Storms, Brisbane, July, 4-9.
- Paton, D. & McFarlane, C. (2004) Risk and Resilience in Humanitarian Aid. American Psychological Association Conference, Honolulu, Hawai'i, July, 27-30.
- Gregg, C.E, Paton, D, Houghton, B.F., Swanson, D.A., & Johnston, D.M. (2004) Community preparedness for lava flow hazards: The role of knowledge, perception and history. 6th New Zealand Natural Hazards Conference: From Science to Practice, Tauranga, 10-11th August.
- Gregg, C.E, Paton, D, Houghton, B.F., Swanson, D.A., & Johnston, D.M. (2004) Lava flow hazards: How knowledge, perception and history affects community preparedness. American Geophysical Union, Honolulu, Hawai'i, August 17th..
- Johnston, D., Leonard, G., Walton, M., Paton, D., Ronan, K, Gray, W., Bell, R. & Kelman, I. (2004). Socio-economic impacts of the June 2002 'weather bomb' and the February 2004 storms in New Zealand: challenges in developing an integrated assessment methodology. International Conference on Storms, Brisbane, July, 4-9.
- Johnston, D., Nairn, I., Leonard, G., Walton, M., Paton, D., Ronan, K. & Martin, R. (2004) Recovery issues resulting from a long-duration, Kaharoa-type eruption on present day New Zealand. New Zealand Ministry of Civil Defence and Emergency Management Recovery Conference, New Zealand.
- 2005**
- Paton, D. (2005) Community Resilience: Integrating Hazard Management and Community Engagement. International Conference on Engaging Communities, Brisbane, Australia, 14- 17th August.
- Paton, D. (2005) Managing natural and terrorist: Modelling preparedness and resilience. NATO International workshop on resilience. The Impact of terrorism on the public – developing an agenda for future research on resilience. University of Kent in Canterbury, UK. 24-26th February.
- Paton, D. & Bürgelt, P.(2005) Living with bushfire risk: Residents' accounts of their bushfire preparedness behaviour. Australasian Fire Authorities Council & Bushfire CRC Innovation and Technology Conference, Auckland, New Zealand, 5-7th October.

- Paton, D., Gregg, C., Johnston, D., Bürgelt, P., & Houghton, B. (2005) Preparing for Tsunami: Community Issues and Engagement. International Conference on Engaging Communities, Brisbane, Australia, 14-17th August.
- Burke, K.J., Paton, D., & Shakespeare-Finch, J. (2005) Adjusting to life on the beat: A longitudinal investigation of adaptation in the police profession – preliminary findings. Paper presented at the Scientific Conference of the Australasian Society for Behavioural Health and Medicine: Behaviour and Health: Evidence to Practice. Melbourne, 10-12th February.
- Gregg, C., Houghton, B., Lachman, B., Lachman, J., Wongbusarakum, S., Paton, D. & Johnston, D. (2005) Factors affecting behavioral response to natural warning signs of tsunami: The case study of the 12-26-04 earthquake.
- McClure, J, Johnston, D. & Paton, D. (2005) Individual's response to natural hazard events. Wairapa Earthquake Symposium, Wellington, New Zealand, 8-10 September.
- 2006**
- Leonard, G.S., Johnston, D.M. Paton, D., & Christianson, A. (2006) Developing effective volcanic warning systems: Lahar warnings at Ruapehu, New Zealand. Paper presented at the Fourth Cities on Volcanoes Conference, Quito, Ecuador, 23-27 January 2006.
- Leonard, G.S., Johnston, D.M. and Paton, D., 2006. Effective all-hazard warning system development and community resilience: Results from ongoing multi-hazard research in New Zealand, USA and Australia. United Nations International Strategy for Disaster Reduction International Conference on Early Warnings III, 27-29 March 2006, Bonn, Germany.
- Paton, D., Daly, M., Parkes, B., & Myburgh, D. (2006) Measuring community resilience in Auckland, New Zealand. Paper presented at the Fourth Cities on Volcanoes Conference, Quito, Ecuador, 23-27 January 2006.
- Peters, V., Johnston, D., Wilson, C., Leonard, G., Cole, J. & Paton, D. (2006) Volcanic risk management and evacuation planning for Auckland Volcanic Field, New Zealand. Paper presented at the Fourth Cities on Volcanoes Conference, Quito, Ecuador, 23-27 January 2006.
- Burke, K.J., Paton, D., Shakespeare-Finch, J., & Ryan, M. (2006) Adjusting to life on the beat: Investigating adaptation to the police profession. Paper presented at the 19th Annual Conference, The Australian & New Zealand Society of Criminology. Criminology and Human Rights, Hobart, Australia, 7th – 9th February.
- Burke, K.J., Paton, D., Shakespeare-Finch, J., & Ryan, M. (2006) Characterising the resilient officer: The process of adjustment to the police profession. Paper presented at the 19th Annual Conference, The Australian & New Zealand Society of Criminology. Criminology and Human Rights, Hobart, Australia, 7th – 9th February.
- Houghton, B., Gregg, C., Gill, D.A., Paton, D., Ritchie, L.A., & Johnston, D.M. (2006) Modelling tsunami preparedness and effectiveness of warnings in USA. European Geosciences Union General Assembly, Vienna, 2-7 April.
- Paton, D. & Burke, K.J. (2006) Victims of violent crime: Social cognitive aspects of adaptation and recovery. Paper presented at the 19th Annual Conference, The Australian & New Zealand Society of Criminology. Criminology and Human Rights, Hobart, Australia, 7th – 9th February.
- Paton, D. & Bürgelt, P.T. (2006) Social-ecological vulnerability: factors facilitating co- existence with bushfire hazards. IGU Commission on Population and Vulnerability and Asia Pacific Migration Research Network (APMRN), IGU2006 Brisbane Conference, 3-7 July 2006
- Norris K, Paton D, Thompson T, Ayton J. (2006) Expeditioner And Family Reintegration: Comparing Ship-Based And Air-Based Personnel Movement. Paper presented at the SCAR XXIX Antarctic Open Science Conference-Human Health and Well Being, 11th – 14th July 2006, Hobart, Australia.
- Paton, D. (2006) To prepare or not prepare: That is the question for those living with bushfire risk. Paper presented at The Joint AFAC/IFCAA Bushfire CRC Conference, 10th – 13th August, Melbourne, Australia.
- Towers, B., Paton, D., & Ronan, K. (2006) Educating Children About Bushfire Risk and Mitigation. Paper presented at The Joint AFAC/IFCAA Bushfire CRC Conference, 10th – 13th August, Melbourne, Australia.
- Prior, T., Paton, D., & Cottrell, A. (2006) Community responses to bushfire threat: risk perception and preparedness. Paper presented at The Joint AFAC/IFCAA Bushfire CRC Conference, 10th – 13th August, Melbourne, Australia.
- 2007**
- Becker, J, Johnston, D., Paton, D., & Ronan, K. (2007) Creating hazard-resilient communities: Understanding how people make meaning of hazard information and how this influences preparedness. Paper presented at the Australasian Natural Hazards Conference, Brisbane, 2-3 July.
- Paton, D. (2007) Modelling Resilience: Community, family and institutional perspectives. Paper presented at the 3rd Societal planning for Natural Hazards Conference. University of Canterbury, Christchurch, New Zealand. 20th – 21st February.
- Paton, D. (2007) Facilitating readiness for natural hazards: The role of social trust. Paper presented at the Australasian Natural Hazards Conference, Brisbane, 2-3 July.
- Paton, D., Daly, M., Parkes, B. Williams, S. & Johnston, D. (2007) Measuring community resilience in Auckland, New Zealand. Paper presented at the Australasian Natural Hazards Conference, Brisbane, 2-3 July.
- Paton, D., Pedrosa, F., Bürgelt, P. & Prior, T. (2007) Promoting community bushfire preparedness: Australian and Portuguese perspectives. Paper presented at the Australasian Natural Hazards Conference, Brisbane, 2-3 July.
- Pischief, K., Johnston, D., Leonard, G., Houghton, B. & Paton, D. (2007) Towards tsunami- resilient communities in Australia and New Zealand. Paper presented at the Australasian Natural Hazards Conference, Brisbane, 2-3 July.
- Towers, B., Paton, D. & Ronan, K (2007) Bushfire Risk Perception: A Developmental Perspective. Paper presented at the Australasian Natural Hazards Conference, Brisbane, 2- 3 July.
- Prior, T., Paton, D., & Cottrell, A. (2007) Decisions, decisions, decisions. Plotting a course towards bushfire preparedness. Paper presented at the Joint AFAC/Bushfire CRC Conference, Hobart, 5-9 September.
- Langer, E.R., Kelly, L. Paton, D. & Volkes, R. (2007) Wildland fires and community recovery in New Zealand: a research beginning. International Association of Wildland Fire: Human Dimensions of Wildland Fire Conference. Boulder, Colorado, 22nd – 26th October.
- Pedrosa, F.T & Paton, D. (2007) Wildfire education and community preparedness: new evidence from Australia

and Portugal. International Association of Wildland Fire: Human Dimensions of Wildland Fire Conference. Boulder, Colorado, 22nd – 26th October.

Gregg, C.E., Houghton, B.F., Wongbusarakum, S., Paton, D., Lachman, R., Lachman, J.L., & Johnston, D.M. (2007). Tsunami warning systems: Lessons from Thailand 2004-2007. Geological Society of America Conference. Denver, Colorado,

Larin, P., Houghton, B.F., Gregg, C.E., Gill, D.A., Ritchie, L.A., Meinhold, S., Horan, J., Paton, D., & Johnston, D.M. (2007) Tsunami awareness and preparedness in coastal communities in the USA. Geological Society of America Conference. Denver, Colorado.

2008

Paton, D., Bürgelt, P., & Prior, T. (2008) Living with bushfire risk: social and environmental influences on preparedness. IAG Conference, Hobart, 30th June – 3rd July.

Paton, D., Bürgelt, P., & Prior, T. (2008) Environmental influences on community bushfire preparedness. 2nd Australasian Natural Hazards Management Conference. Te Papa, Wellington, New Zealand. 28-31 July.

Paton, D., & Violanti, J. (2008) Disaster, terrorism and emergency responder resilience: The stress shield model. 2nd Australasian Natural Hazards Management Conference. Te Papa, Wellington, New Zealand. 28-31 July.

Prior, T. & Paton, D. (2008) What's the context? Situational community characteristics and the effectiveness of bushfire risk communication. IAG Conference, Hobart, 30th June – 3rd July.

Towers, B. & Paton, D. (2008) Children's perceptions of bushfire risk: implications for education. IAG Conference, Hobart, 30th June – 3rd July.

Towers, B. & Paton, D. (2008) You can't stop it: The child's mental model of disaster mitigation. 2nd Australasian Natural Hazards Management Conference. Te Papa, Wellington, New Zealand. 28-31 July.

Becker, J., Johnston, D., Paton, D., & Ronan, K. (2008) Increasing community resilience to disasters: Understanding how individuals make meaning of hazard information and how this relates to preparing for hazards. 2nd Australasian Natural Hazards Management Conference. Te Papa, Wellington, New Zealand. 28-31 July.

McIvor, D., Paton, D. & Johnston, D. (2008) Modelling community resilience: A means-end chain theory analysis of hazard cognitions and preparedness. 2nd Australasian Natural Hazards Management Conference. Te Papa, Wellington, New Zealand. 28-31 July.

Copping, A., Shakespeare-Finch, J., & Paton, D. (2008) Modelling the experience of trauma in a white-Australian sample. 43rd Annual APS Conference, Hobart, 23-27 September.

Copping, A., Shakespeare-Finch, J., & Paton, D. (2008). *Negotiating the post life-crisis journey*. Paper presented at the Annual Convention of the American Psychological Association

Norris, K., Paton, D., & Ayton, J. (2008) The long cold night: Comparing expeditioner and partner experiences during Antarctic absences. 43rd Annual APS Conference, Hobart, 23- 27 September.

2009

Paton, D. (2009) Community Sustainability and Natural Hazard Resilience: All-Hazard and Cross-Cultural Issues in Disaster Resilience. 5th International Conference on Environmental,

Cultural, Economic and Social Sustainability. University of Technology, Mauritius. 5-9th January 2009.

Paton, D. (2009) Exploring the Important Connotations and Contents of Disaster Prevention Literacy: How to determine them? 2nd International Conference on Education for Disaster Prevention. Douliou, Taiwan. May 14-15th.

Gregg, C.E., Houghton, B.F. & Paton, D. (2009) Human Decision Making in Response to Volcanic Hazards and Risk Communication. Paper presented at the XI Reunion Internacional Volcan De Colima, University of Colima, Colima, Mexico, 2-6th February.

Becker, J.S., Johnston, D.M., Paton, D., Ronan, K. 2009. *Community Resilience to Earthquakes: Understanding How Individuals Make Meaning of Hazard information, and How This Relates to Preparing For Hazards*. Proceedings of the 2006 New Zealand Society for Earthquake Engineering Conference, 3-5 April, Christchurch, New Zealand, Paper No. 4.

Johnston, D.M., Becker, J.S., Saunders, W., Wright, K., Coomer, M., Leonard, G.S., Paton, D. 2009. *Surviving Future Disasters in New Zealand*. 2009 New Zealand Society for Earthquake Engineering Conference, 3-5 April, Christchurch, New Zealand, Paper No. 2, 5p.

Houghton, B.F., Gregg, C.E., Larin, P.N., Johnston, D.M., Paton, D., Gill, D.A., and Ritchie, L.A. (2009). Public attitudes and perceptions of tsunamis and warning systems in Oregon and Washington: the case study of ocean shores and seaside. 2009 Portland GSA Annual Meeting (18-21 October 2009) Portland, Oregon.

Bürgelt, P, Paton, D. & Johnston, D.M. (2009) Creating sustained influenza pandemic preparedness: Psychosocial Processes and Factors Influencing Individual and Community Preparedness. New Zealand Psychological Society Conference, Palmerston North, 27-30 August.

Becker, J., Johnston, D.M., Paton, D., & Ronan, K. (2009) How do Individuals Make Meaning of Hazard Information, and How Does This Relate to Preparing For Hazards? New Zealand Psychological Society Conference, Palmerston North, 27-30 August.

2010

Paton, D. (2010) Psychological Rehabilitation Planning for Disaster Survivors. International Symposium on Disaster Medicine, Kaohsiung, Taiwan, 29th August. (Keynote Address)

Becker, J., Johnston, D., Paton, D. & Ronan, K. (2010) Understanding how individuals make meaning of hazard and preparedness information. Paper presented at the 4th Australasian Natural Hazards Conference. Wellington, New Zealand. 10th – 13th August.

Paton, D., Frandsen, M. & Johnston, D. (2010) Confronting an unfamiliar hazard: Tsunami preparedness in Tasmania. Paper presented at the 4th Australasian Natural Hazards Conference. Wellington, New Zealand. 10th – 13th August.

Paton, D. & Okada, N. (2010) Community adaptation to earthquake hazards: A cross-cultural comparison of New Zealand and Japan. Paper presented at the 4th Australasian Natural Hazards Conference. Wellington, New Zealand. 10th – 13th August.

Paton, D., Tedim, F., Bürgelt, P. & Johnston, D. (2010) Safe as houses: Adapting to living with earthquake and wildfire hazards. Paper presented at the 4th Australasian Natural Hazards Conference. Wellington, New Zealand. 10th – 13th August.

2011

- Paton, D. (2011) Community Preparedness for Natural Hazards: Cross-cultural and cultural perspectives. Paper presented at the Integrated Research on Disaster Risk Conference 2011. Beijing, China, 31st October – 3rd November.
- Paton, D. (2011) Facilitating community readiness for forest fire: Lessons from Portugal and Australia. Paper presented at the Seminario Revisitar 25 Anos de Historia Na Serra Do Marao: Memorias e Desafios, 7-8th January 2011, Amarante, Portugal.
- Paton, D. (2011) Defining, identifying and assessing the characteristics of a resilient community. Paper presented at the Enhancing Sustained Resilience to Natural Risks: The imperative of changing the paradigm conference. Vieira do Minho, Portugal, 8-9 June.
- Paton, D. (2011) Effective Risk Management: The importance of community engagement, empowerment and community development. Paper presented at the Enhancing Sustained Resilience to Natural Risks: The imperative of changing the paradigm conference. Vieira do Minho, Portugal, 8-9 June.
- Bürgelt, P.T., Paton, D., Johnston, D., & Johal, S. (2011) Pandemic Preparation: Contributing to Healthy Citizens and Communities. 8th Annual Scientific Conference of the Australasian Society For Behavioural Health And Medicine (ASBHM). Rydges Hotel, Christchurch, New Zealand, February 9-11.
- Doyle, E; Johnston, D.M.; McClure, J., & Paton, D (2011) Communicating Science Advice and Probabilities to Emergency Managers. Paper presented at the XXV IUGG General Assembly: Earth on the Edge: Science for a sustainable planet. 28 June - 7 July 2011, Melbourne, Australia.
- Doyle, E; Johnston, D.M., & Paton, D (2011) Investigating science advice, emergency management and decision making in the laboratory. Paper presented at the XXV IUGG General Assembly: Earth on the Edge: Science for a sustainable planet. 28 June - 7 July 2011, Melbourne, Australia.
- Doyle, E; Johnston, D.M.; McClure, J., & Paton, D (2011) The communication of uncertain scientific advice during natural hazard events. Paper presented at the NZ Psychological Society Annual Conference 2011: Peoples, places, paradigms: Hapori, Wahi, Anga Tauira: Rere a Tipunga. 20-23 August 2011, Queenstown, New Zealand.
- Johnston, D., Leonard, G., Doyle, E., Becker, J., Paton, D., Ronan, K., Houghton, B., Gregg, C., Cronin, S., Wilson, T., (2011) The role of multidisciplinary research and collaboration for improving the resilience of communities to volcanic risk. Paper presented at the The 1st Workshop of Asia-Pacific Region Global Earthquake and Volcanic Eruption Risk Management (G-EVER1). 14th-15th March, 2011, Tsukuba, Japan.
- Johnston, D., Becker, J., Coomer, M., Cronin, S., Daly, M., Doyle, E., Glassey, B., Houghton, R., Hughes, M., Johal, S., Paton, D. (2011) Exploring elements of an effective recovery process. Paper presented at the Ninth Pacific Conference on Earthquake Engineering: Building an Earthquake-Resilient Society. 14th-16th April, 2011, Auckland, New Zealand.
- Johnston, D.M., Leonard, G., Hudson-Doyle, E., Becker, J., Paton, D. et al. (2011) The Role of Multidisciplinary Research and Collaboration for Improving the Resilience of Communities to Natural Hazards. Paper presented at the Integrated Research on Disaster Risk Conference 2011. Beijing, China, 31st October – 3rd November.

- Johnston, David, J. Becker, M. Coomer, S. Cronin, M. Daly, E. Doyle, S. Glassey, B. Glavovic, R. Houghton, M. Hughes, S. Johal, S. Jolly, G. Leonard, L. Patterson, P. Peace, W. Sanders, K. Stuart, R. Tarrant, H. Taylor, I. de l'Erte, L. Timar, R. Tuohy, K. Wright, D. Paton, S. Reese, K. Ronan, and T. Wilson. 2011. "Exploring Elements of an Effective Recovery Process." In *Proceedings of the Ninth Pacific Conference on Earthquake Engineering*, convened by Quincy Ma and Jason Ingham. Auckland, New Zealand: NZSEE.

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- Johnston, D., Orchiston, C., Weaver, C., McBride, S., Paton, D., McClure, J. & Wilson, T. (2012). "Low risk does not equal no risk": Barriers to earthquake risk reduction in low seismic hazard areas. Extended abstracts for the New Zealand Earthquake Engineering Conference, April 13-15th, Christchurch, New Zealand.
- Becker, J., Johnston, D., Paton, D., Ronan, K. Use of Earthquake Information by Individuals and how this influences Preparedness. *Proceedings of the 6th Australasian Natural Hazards Management Conference*, Christchurch, New Zealand 21-22 August 2012, 41.
- Johal, S., Collins, S., Chambers, R., Gardner, D., Glavovic, B., Johnston, D., Johnston, L., Huggins, T.J., Karanci, A.N., de Terte, I., Mooney, M.F., Paton, D. Supporting Psychosocial Recovery from Disasters: How an Advisory Group can help increase Capacity. *Proceedings of the 6th Australasian Natural Hazards Management Conference*, Christchurch, New Zealand 21-22 August 2012, 18.
- Leonard, G.S., Johnston, D.M., Keys, H., Paton, D., Hughes, N. The Challenge of Making Rapid Response Early Warning Effective: A Decade of Lahar Warning Research at Ruapehu Ski Areas, New Zealand. *Proceedings of the 6th Australasian Natural Hazards Management Conference*, Christchurch, New Zealand 21-22 August 2012, 21-22.
- Norris, K., Paton, D., & Ayton, J. (2012). *Expeditioner and partner responses to critical incidents in Antarctica*. Poster session presented at the 32nd meeting of the SCAR Open Science Conference, Portland, Oregon.
- Johnston, D., Orchiston, C., Weaver, C., Becker, J., McBride, S., Paton, D., McClure, J., & Wilson, T. (2012). "Low risk does not equal no risk": understanding barriers to risk-reduction in low seismic hazard zones. Poster presentation, *Southern Californian Earthquake Conference (SCEC)*, Palm Springs, 9-12th September, 2012.
- Kenney, C., Johnston, D., Paton, D., Reid, J. and Phibbs, S. (2012). *Addressing Risk and Resilience: An analysis of Maori communities and cultural technologies in response to the Christchurch earthquakes*. In the proceedings of the 4th International Disaster and Risk Conference IDCR Davos - "Integrative Risk Management in a Changing World – Pathways to a Resilient Society." Global Risk Forum/ UNESCO 26 August- 30th August, Davos, Switzerland.
- Paton, D (2012) Keynote Paper. Disaster Resilient Communities: Personal, community, societal and cultural influences. The Third Conference of the International Society for Integrated Disaster Risk Management. Beijing, China, September 6-9.
- 2013**
- Abbas, O.T., Gholamreza, M., Hamidreza, K., Paton, D. & Ardalan, A. (2013) Emergency Response Capacity Building in Taxi Drivers: A Community Resilience Best Practice in Iran. International Conference on Building Resilience. Heritage Ahungalla, Sri Lanka, 17th – 19th September.

Paton, D., Frandsen, M., & Middleton, P. (2013) Promoting community bushfire readiness using a community engagement approach. Poster presentation, AFAC/BCRC Conference, Melbourne, September 25th.

Irons, M., Paton, D., Scott, J., Martin, A. & Lester, L. (2013) The role of social media and crowdsourcing in facilitating spontaneous volunteerism and community-led crisis communication, response and recovery in an emergency: a case study of the Tasmanian 2013 Bushfires. Paper presented at the AFAC/BCRC Conference, Melbourne, September 25th

Paton, D., Jang, L-j., Liu, L_W (2013) Long Term Community Recovery: Lessons from earthquake and typhoon experiences in Taiwan. Paper presented at the International Conference on the Demography of Disasters: Implications for future policy on development and resilience. ANU, Canberra, 18-20th September.

Alexander, B., Paton, D. & Clark, K. (2013) Good Vibrations in Risk Communications: How Music Can Be Used To Engage People In Disaster Risk Reduction. Paper presented at the International Society for Disaster Risk Management. Northumbria University, Newcastle upon Tyne, UK, 4-6 September.

Gray, L., MacDonald, C., Mackie, B., Paton, D., Johnston, D., & Baker, M. (2013, August). Lessons not to be sneezed at: H1N1 Media campaigns in New Zealand and community preparedness. Oral presentation at the Best Investments for Health World Conference on Health Promotion, International Union of Health Promotion & Education, Pattaya, Thailand.

Paton, D. (2013) Disaster Education for Professional Helpers. Invited paper presented to the Lessons from Typhoon Morakot Conference. Kaohsiung Medical University, 25-26 October 2013.

Paton, D. (2013) Disaster Prevention, Preparedness, Response, Resilience, and the Community Role. Invited Paper presented at The 9th APRU Symposium on Multi-Hazards Around the Pacific Rim. National Taiwan University, 28-29 October 2013.

2014

Paton, D. (2014) Systemic Community Resilience: From recovery to readiness. Paper presented at the 8th Asia Pacific Program for Senior National Security Officers, Singapore, 6-12th April.

Paton, D. (2014) Invited Keynote Address. Building Sustained Community Resilience: Learning from recovery to build community capacity. Keynote address presented at the New Directions in Disaster Recovery and Reconstruction: Livelihoods, Resilience and Sustainability Conference, Pingtung, Taiwan, June 9-12.

Ostad Taghi Zadeh, A., Ardalan, A., Masoumi, G., Paton, D., Khankeh, H., & Mahdi, A., (2014) Community Based Emergency Management: A Practice from Iran. GRF IDRC 2014, Davos, Switzerland, 24-28 August.

2015

Buergelt, P. T., Paton, D., Campbell, C. A., James, H., Rosenman, L., & Cottrell, A. (2015, May). *Hazardscapes, whole-of-community approaches and transformation: The potential mandate of critical qualitative inquiry*. Paper presented at the 11th International Congress of Qualitative Inquiry, University of Illinois, Urbana, USA.

2018

Paton, D., Buergelt, P.T., Pavavalung, E., Clark, K., Jang, L-j. & Kuo, G. (2018) All Singing from the Same Song Sheet: DRR and the Visual and Performing Arts. Paper presented at the APRU Risk, Resilience and Reconstruction: Science And Governance For Effective Disaster Risk Reduction and Recovery in Australia, Asia and The Pacific Conference. Australian National University, Canberra, 22-24 October.

Buergelt, P.T. & Paton, D. (2018) A Key Approach to Effective DRR: Transforming Western worldviews towards Indigenous worldviews. Paper presented at the APRU Risk, Resilience and Reconstruction: Science And Governance For Effective Disaster Risk Reduction and Recovery in Australia, Asia and The Pacific Conference. Australian National University, Canberra, 22-24 October.

Rossiter, K., Paton, D. & Buergelt, P.T. (2018) Social Media: A Valuable String in the DRR Governance Bow throughout the DRR Cycle. Paper presented at the APRU Risk, Resilience and Reconstruction: Science And Governance For Effective Disaster Risk Reduction and Recovery in Australia, Asia and The Pacific Conference. Australian National University, Canberra, 22-24 October.

Sutton, S., Buergelt, P.T., Paton, D. & Sagala, S. (2018) True, but trivial?: The value of grass- roots cultural local stories and songs as effective DRR strategy. Paper presented at the APRU Risk, Resilience and Reconstruction: Science And Governance For Effective Disaster Risk Reduction and Recovery in Australia, Asia and The Pacific Conference. Australian National University, Canberra, 22-24 October.

2020

Buergelt, P.T., Maypilama, E.L., Lin, C-J., Kaaviana, A., Sithole, B., Ali, T. & Paton, D. (2020) Disasters as transformative opportunities: Indigenous Australian, Taiwanese & Zimbabwean communities recovering and rebuilding stronger. Seminar workshop presented to the ANU Disaster Risk Science Institute, Canberra, Australia, August 12th.

2021

Buergelt, P.T., Maypilama, E.L., Gundjarranbuy, R., Yungirra, D., Dhamarrandji, S., Paton, D. Ali, T & Smith, J. (2021) Indigenous remote community Galiwin'ku: Reviving and taking back power after the cyclone. Presented at the Showcasing Yolngu (NT) Research Workshop. 26th May 2021, University of Canberra, Canberra, Australia

Paton, D (2021) Resilient Communities and Social Sustainability. Invited Paper Presented to the *Building Paths to Sustainability with Visionary Leaders: Social Action by Design* Conference. Taipei, Taiwan. 22 – 24 April.

Buergelt, P. T, Maypilama, E. L., Bukulatjpi, D. Y., Gundjarranbuy, R., Dhamarrandji, S., Ali, T., Paton, D. & Smith, J. (2021, August). Genuinely working two-way with Indigenous communities utilizing both Indigenous and Western worldviews, knowledges and practices. Panel presented at the Developing Northern Australia Conference, Darwin Convention Centre, Northern Territory, Australia. 16-18 August. <https://astmanagement.eventsair.com/QuickEventWebsitePortal/2021-developing-northern-australia-conference/program/Agenda>

Doyle, E.H., Harrison, S., Hill, S., Williams, M., Paton, D., Bostrom, A. & Becker, J. (2021). Eliciting mental models to understand how different individuals affected by disaster risk understand science, and scientific uncertainty. European Meteorological Society, Annual Meeting 2021, Online, 3–10 September 2021. EMS Annual Meeting Abstracts, Vol. 18, EMS2021-126, 2021, <https://doi.org/10.5194/ems2021-126>

Hudson-Doyle, E., Harrison, S., Hill, S., Williams, M., Paton, D., Bostrom, A., and Becker, J.: Eliciting mental models to understand how different individuals affected by disaster risk understand science, and scientific uncertainty, EMS Annual Meeting 2021, online, 6–10 Sep 2021, EMS2021-126, <https://doi.org/10.5194/ems2021-126>, 2021.

2022

Maypilama, L., Yungirra, D., Buergetl, P., Gundjarranbuy, R., Bayon, J., James, J., Paton, D., Beddgood, R., Smith, J., Sutton, S., and Poulson, D. (2022) Waka Ngurrkanhayngu: Regenerating the existence of life. Paper presented to the Climate Change Adaptation and Resilience Research Network: Enabling interdisciplinary research conference. University of Canberra, June 2nd.

Academic Seminars And Presentations To Professional & Community Groups

1989

Paton, D. (1989) Bounded rationality and decision making in education management. Education Department, Strathclyde Regional Council.

Paton, D. (1989) Disasters and Helpers: identification of training needs following the Armenian disaster. Department of Psychology, Curtin University, Perth, Western Australia.

Paton, D. (1989) Identifying the psychological training needs of search and rescue personnel. Department of Psychology, University of St. Andrews.

Paton, D. (1989) Burnout: identifying causes and remedies. Teaching, Learning and Assessment Group Seminar Series, University of St. Andrews.

1990

Paton, D. (1990) Stress in Community Nursing: what can be done about it? Edinburgh, Lothian Health Board.

Paton, D. (1990) Team building in education management. Education Department, Strathclyde Regional Council.

Paton, D. (1990) Disaster stress: the implication for relief workers and their families. Social Science Research Centre, University of St. Andrews.

Paton, D. (1990) Disaster Research: the Scottish dimension. Department of Management Seminar Paper, University of St. Andrews.

1991

Paton, D. (1991) The development of health and illness concepts: implications for health practitioners. Curtin University, Centre for Advanced Studies in Health Sciences.

Paton, D. (1991) Disaster research: The Scottish Dimension. Curtin University, Department of Psychology.

Paton, D. (1991) Disaster stress: Helping the Helpers. Flinders University, Discipline of Psychology

Paton, D. (1991) Occupational Trauma: causes and consequences: Flinders University, Clinical Group, Discipline of Psychology

Paton, D. (1991) Disaster stress: Helping the helpers. University of Adelaide, Department of Psychology.

Paton, D. (1991) International disaster relief work: the psychological context. University of Western Australia, Department of Psychology.

Paton, D. (1991) Work-related trauma: Management and support issues. Pat Thomas Memorial Community House, Mandurah, W.A.

1992

Paton, D. (1992) Planning for workers needs in a disaster. National Association for Loss and Grief Workshop Series. State Emergency Service Headquarters, May 19th 1992.

Paton, D. and Richards, J. (1992) Work-related stress and trauma. Inter-Church Trade and Industry Ministry Seminar. Alcoa Headquarters. 21st and 22nd May 1992.

Paton, D. (1992) Causes and consequences of traumatic stress. Curtin Business Seminar. Technology Park, 30th April 1992.

Paton, D. and Hatton, S. (1992) Traumatic stress management in education. School Principals - Swanbourne District Education Office. 1st April 1992.

Paton, D. and Richards, J. (1992) Managing Trauma: Psychological and organisational issues. Senior School Psychologists, Ministry of Education, W.A. 12th February 1992.

1993

Paton, D. (1993) Organisational interventions for managing trauma in the workplace. Special Education Service. New Plymouth, New Zealand. 13th January.

Paton, D. (1993) International disaster relief work: Training and support for rescue workers. Departmental seminar. Dept. of Psychology, Murdoch University. 18th March.

Paton, D. (1993) Occupational stress within the education system: implementing management strategies. Swanbourne District Education Office, Ministry of Education, Western . 20th May 1993.

Paton, D. (1993) An introduction to critical incident and PTSD counselling. Access (EAP) Bunbury. 11th June 1993.

Paton, D. (1993) Psychological trauma in the workplace. Access Programs Seminar. Admiral Motor Inn, Bunbury. 11th June 1993.

Paton, D. (1993) Psychological Trauma in the workplace. Centrecare Marriage and Family Service. Perth. August 3rd, 1993.

Paton, D. (1993) Peer support: its role in managing traumatic stress. Lothian and Borders Fire Brigade, Edinburgh, Scotland. 28th June 1993

Paton, D. (1993) Critical incidents: strategies for preparing high risk groups. Salisbury Health Authority, Salisbury, England. 8th July 1993.

Paton, D. and Richards, J. (1993) Work-related psychological trauma. Research Centre for Applied Psychology, School of Psychology, Curtin University. Research Seminar. October 11th - 12th.

1994

Paton, D. (1994) The Psychology of Emergency Management. Woodside Petroleum Seminar. WACA, Perth, WA, February 24th.

Paton, D. (1994) Critical Incident Response. Disability Services Commission Management seminar. Perth, WA, March 10th.

Paton, D. (1994) Evaluating the effectiveness of response capability and its impact on the psychological well-being of disaster relief workers. Department of Psychology, Massey University, Palmerston North, New Zealand.

Paton, D. (1994) Managing occupational stress within a health and safety framework. Industrial Foundation for Accident Prevention. Perth. October 14th.

1995

Paton, D. and Stephens, C. (1995) Social Support for Work Related Trauma: Social and organisational influences on effectiveness. School of Psychology, Curtin University, Perth, WA.

Paton, D. (1995) Debriefing, social support, and recovery from trauma. Department of Psychology, Victoria University of Wellington, Wellington, New Zealand, July 21st.

Paton, D. (1995) Evaluating the provision of mental health services: Professional, psychological and ethical issues. Department of Bioethics, Otago University, Dunedin, New Zealand, July 24th.

Paton, D. (1995) Intervention and support strategies for managing traumatic stress in the workplace. Occupational Health and Safety Seminar Series. HBF Centre for Occupational Health and Safety, Perth. September 11th.

Paton, D. (1995) Schema theory as a basis for training program design: Its application to disaster relief work. Department of Management, University of St. Andrews, Scotland, UK. November 10th.

Paton, D. (1995) Strategies for managing job demands in the workplace. Ergonomics Society of Australia. Perth, November 22nd.

1996

Paton, D. (1996) Managing work-related psychological trauma: An organisational psychology of response and recovery. Department of Psychology, Edinburgh University, UK. 13 November.

1997

Smith, L.M. and Paton, D. (1997) A structural re-assessment of the Impact of Event Scale: The influence of occupational and cultural contexts. School of Psychology, Curtin University, Western Australia.

Paton, D. (1997) Disaster Stress: Preparation and Support for Disaster Workers. Palmerston North City Council, Emergency Management Department. Palmerston North, New Zealand. 7th October.

Paton, D. (1997) Organisations And Disasters: Strategies For Crisis And Trauma Management. Paper presented to the Department of Management, University of St. Andrews, Scotland. 19th November.

Paton, D. (1997) Planning to respond to a volcanic eruption. Workshop. Volcanoes and Society: Planning for a volcanic crisis in New Zealand. IGNS, Wairakei Research Centre, Taupo.

1998

Paton, D. (1998) Vulnerability to volcanic crises: Social indices. Volcanic Crisis Management Workshop, Auckland regional Council.

Paton, D. (1998) Operational aspects of integrated emergency management. Volcanoes and Society: Planning for a volcanic crisis in New Zealand. IGNS, Wairakei Research Centre, Taupo.

1999

Paton, D. (1999) Mapping Social Vulnerability to Volcanic hazard Effects. Auckland Regional Council, Emergency Management Office, Auckland, 18 February.

Paton, D. (1999) Communicating Scientific Information to Management and Community Groups. Institute of Geological and Nuclear sciences. Wairakei Research Centre, 14 April.

Paton, D. (1999) A Strategic Perspective on Integrated Emergency Management. Ministry of Emergency Management/Institute of Geological and Nuclear Sciences. Wairakei Research Centre, 29 July.

Paton, D. (1999) Community and Management Issues in Responding to Tsunami Threat in the Bay of Plenty. Environment Bay of Plenty (Regional Council), 20 August.

Paton, D. (1999) Posttrauma intervention in the workplace: Risk, vulnerability and resilience. School of Psychology, Griffiths University, Brisbane, Queensland, Australia.

Paton, D. (1999) Community resilience and vulnerability to natural hazard effects. Wellington City Council, Emergency Management Office, 7 December.

Paton, D. (1999) Community resilience to earthquake hazards in Hawkes Bay. Hawkes Bay Regional Council, Emergency Management Office, Napier. 14 December.

2000

Paton, D. (2000) Decision Making in Crisis Situations. Emergency Management Controllers Forum. Auckland Regional Council, 7th September.

Paton, D. (2000) Risk Perception, Risk Communication and Preparedness for Natural Hazard Effects. University of Auckland, School of Environmental and Marine Sciences. October 13.

Paton, D. (2000) Risk Communication: How do we get people to understand emergency management messages and then respond appropriately. Ministry for Emergency Management Public Information Managers Course (EM08), Porirua, Royal New Zealand Police College, 14-16 November.

Paton, D. and Smith, L.M. (2000) Posttrauma intervention in the workplace: Risk, vulnerability and resilience. School of Psychology, Curtin University, Perth, Western Australia, 9 March.

Paton, D. and Smith, L.M. (2000) Posttrauma intervention in the workplace: Risk, vulnerability and resilience. Massey University, New Zealand, School of Psychology Seminar Series, 28 April.

Paton, D., Smith, L.M. and Johnston, D. (2000) Volcanic hazards: Risk Perception and Preparedness. School of Psychology, Curtin University, Perth, Western Australia, 29 November.

2001

Paton, D. (2001) Natural Hazards, Community Resilience and Preparedness. School of Psychology, Massey University, Palmerston North. April. 16

Paton, D. (2001) Information and decision management for volcanic hazards. Dept. of Geology and Geophysics, University of Hawaii (Manoa), 2 April.

Paton, D. (2001) Disaster Stress: Risk, vulnerability and resilience. Manawatu District Council, Emergency Management Department, August 17th.

Paton, D., Smith, L. & Johnston, D. (2001) Responding to hazard effects: Promoting resilience and preparedness.

- School of Psychology, Massey University, Albany Campus, Auckland. 1st August.
- Paton, D. (2001) Hazard readiness: Promoting resilience and preparedness. Dept. of Geology and Geophysics, University of Hawaii (Manoa), September 26.
- Paton, D. and Johnston, D. (2001) Community resilience. Taupo Social Science Forum. Wairakei Research Centre, Taupo, 16 August.
- Paton, D. (2001) Measuring community resilience. Natural Hazards Research Centre, Dept. of Geological sciences, University of Canterbury, Christchurch. 18 October.
- Paton, D. (2001) Cognition and organizational strategy: Knitting them together. School of Psychology, Curtin University, Western Australia, 30 October.
- Paton, D. (2001) Preparing people for earthquakes: Developing community resilience. Rotary Club, Blenheim, 11 December.
- Paton, D. (2001) Measuring Community Resilience to Natural Hazards. National Institute of Water and Atmospheric Research, Wellington, 18th December.
- 2002**
- Paton, D. (2002) Preparing for hazard impacts. School of Psychology, University of Tasmania, February 9.
- Paton, D. (2002) Critical Incident Stress in Emergency Responders: Developing resilience. School of psychology, Curtin University, Perth, Western Australia, 2 May.
- Paton, D. (2002) Minties: Their role in promoting resilience to traumatic events. Massey University, Albany Campus, September 4th.
- 2003**
- Paton, D. (2003) Disaster Stress Management: Risk, resilience & vulnerability. Departmental Seminar, School of Psychology, University of Tasmania, 2nd April.
- Paton, D. (2003) Preparing for volcanoes, earthquakes and bushfires: A psychological perspective. Departmental Seminar, School of Psychology, University of Tasmania, 1st August.
- Paton, D. (2003) Modelling risk, resilience, and vulnerability to natural hazards in urban contexts. Auckland Regional Council, 14th October.
- Paton, D. (2003) Applying risk management principles to critical incident stress management. ACISA South Australia, SAMFS Headquarters, 28th November.
- Paton, D. (2003) The role of hazard assessment in peer support work. South Australian Fire Service, Peer Support Group, SAMFS Headquarters, 28th November.
- 2004**
- Paton, D. (2004) Conceptualising disaster resilience: A multi-level approach. Auckland Regional Council Emergency Management Coordinating Executive Group. Auckland, New Zealand, 17th February.
- Paton, D. (2004) Volcanological Hazards: Social impacts and Preparedness. Departmental Seminar, School of Geology, University of Tasmania, April 12th.
- Paton, D. (2004) Risk management: The interaction of hazard, resilience and vulnerability. Auckland Regional Council Emergency Management Office Seminar. 17th February.
- Paton, D. (2004) Managing societal impacts of volcanic eruptions. Geoscience Australia, Canberra, 2nd June.
- Paton, D. (2004) Measuring the impact of natural hazards on communities. Geoscience Australia Workshop - Developing a national framework of socio-economic vulnerability to natural hazards: Drawing on research to contribute to new programs and policy development, June 3-4 2004, Canberra.
- Paton, D. (2004) Social psychological influences on understanding natural hazard information. Centre for Disaster Studies, James Cook University, Townsville, July 2nd.
- Paton, D. (2004) Making an 'ash' of themselves: Why don't people prepare for volcanic hazards? University of Tasmania, School of Psychology Public Seminar, November 5th.
- Paton, D. (2004) Volcanological Hazards: Promoting community understanding & action. Geological Society of Australia, Tasmanian Branch Seminar, Hobart, CODES, July 29th.
- Paton, D. (2004) Hazards, Resilient Communities and Planning. School of People, Environment and Planning, Massey University, Palmerston North, New Zealand, August 2nd.
- Paton, D. (2004) Effectiveness of Public Education. Flood Management in Australia: A National workshop. Emergency Management Australia Institute, 15 – 16 July 2004
- Paton, D. (2004) Community preparedness. Emergency Management Australia, Mt. Macedon, 16th November.
- 2005**
- Paton, D. (2005) Traumatic stress management: Risk, resilience and vulnerability. Priority One Counsellors Workshop. Brisbane, 7-8th March.
- Paton, D. (2005) Incident Management Team for pandemics: Understanding the information and decision making environment. Auckland District Health Board, Auckland, New Zealand. May 30th
- Paton, D. (2005) Conceptualising resilience to volcanic hazards in Auckland. Auckland Regional Council Emergency Management Coordinating Executive Group. Auckland, New Zealand, 31st May.
- Paton, D. (2005) Risk communication for bushfire hazards. Australasian Fire Authorities Council, Community Safety Strategy Group. Melbourne, September 22nd.
- 2007**
- Paton, D. (2007) Traumatic Stress Management: Risk, resilience & vulnerability. South Australian Metropolitan Fire Service. Adelaide, 31st August.
- Paton, D. (2007) Critical Incident Stress Resilience: The organizational role. South Australian Metropolitan Fire Service, Executive Management Group. Adelaide. 31st August.
- Paton, D. (2007) Critical Incident Stress Management: Resilience. South Australian Metropolitan Fire Service, Peer Support Workshop, Brokunga, 17th-18th November.
- Paton, D. (2007) Disaster Resilience: Some community & organizational perspectives. Ministry of Civil Defense and Emergency Management, Wellington, NZ, 12th February.
- Paton, D. (2007) Incident Management Team: Future Directions and Capabilities. Auckland District Health Board. 24th October.
- Paton, D., Bürgelt, P.T., & Johnston, D. (2007) Identifying Pandemic Attitudes & Beliefs to Increase Resilience. Ministry of Civil Defense and Emergency Management, Wellington, NZ, 4th December.

- Paton, D. (2007) Developing Cross-Cultural Understanding of Natural Hazard Resilience. Tunghai University, Taichung City, Taiwan. 17th December.
- Paton, D. (2007) Conceptualizing & developing an all-hazards model of natural hazard resilience. Chung Shan Medical University, Taichung City, Taiwan. 19th December.
- Paton, D. (2007) Hazard Education Strategies in New Zealand and Australia. National Fire Agency, Ministry of the Interior, Taipei, Taiwan. 20th December.

2010

- Paton, D. (2010) Facilitating adaptation and resilience in disaster survivors. Seminar presented at Chung Shang Medical University, Wednesday 1st September.
- Paton, D. (2010) Post-Disaster Mental Health: Student Support. Seminar presented at Chung Shang Medical University, Wednesday 1st September.
- Paton, D. (2010) Traumatic Stress Management in Disaster Responders: Risk, resilience & vulnerability. Seminar presented at Chung Shang Medical University, Wednesday 1st September.

2011

- Paton, D. (2011) Preparing for hazardous circumstances: Building adaptive capacity. Paper presented at the Red Cross Australia Conference. Melbourne, May 18-20.
- Paton, D. (2011) Engaging urban communities in Australia in disaster preparedness. Paper presented at the Red Cross Australia Conference. Melbourne, May 18-20.
- Paton, D. (2011) Preparing for Hazardous Circumstances: Developing adaptive capacity. Masterclass presentation. School of Psychology, University of Western Australia, September 2nd. Perth.
- Paton, D. (2011) Adapting to Living with Natural Hazards: Integrating household, community and societal influences. Departmental Seminar, School of Psychology, University of Western Australia, September 2nd. Perth.
- Paton, D. (2011) Post-disaster community reconstruction planning in New Zealand and Australia. Seminar presented at the School of Sociology, Kaohsiung Medical University, Kaohsiung, Taiwan, 4th November 2011.
- Paton, D. (2011) Integrating Psychosocial Recovery and Developing Community Resilience to Natural hazard Consequences. Seminar presented at the Department of Sociology and Social Work, National Pingtung University of Science and Technology, Pingtung, Taiwan, 8th November 2011.
- Paton, D. (2011) Community and Volunteer Roles in Disaster Response and recovery. Seminar presented at the School of Social Work, Chung Shan Medical University, Taichung, Taiwan, 10th November, 2011.

2013

- Paton, D. (2013) Disaster Education in the Asia-Pacific Region. Seminar paper presented to Department of Social Work, National Pingtung University of Science and Technology, Pingtung, Taiwan. June 5th.
- Paton, D. (2013) Recovery and Reconstruction following large scale disasters: Examples from New Zealand & Japan. Seminar paper presented to Department of Social Work, National Pingtung University of Science and Technology, Pingtung, Taiwan. June 6th.

- Paton, D. (2013) Using peer support programs to manage stress in disaster workers. Seminar paper presented to Kaohsiung Medical University, Kaohsiung, Taiwan. June 7th.
- Paton, D. (2013) Social Worker Role in Disaster Prevention, Recovery and Reconstruction. Seminar paper presented to Department of Social Work, National Pingtung University of Science and Technology, Pingtung, Taiwan. November 7th.
- Paton, D. (2013) Facilitating adaptation and resilience in disaster survivors. Seminar paper presented to Department of Social Work, National Pingtung University of Science and Technology, Pingtung, Taiwan. November 8th.

2014

- Paton, D. (2014) Positive Mental Health in Disaster Survivors. Paper presented at the Demystifying Mental Illness: The Community Approach conference. Darwin, 29th June.
- Paton, D. (2014) Teamwork in a multi-agency disaster response environment. Paper presented at the Department of Social Work, NPUST, Taiwan, 6th June.
- Paton, D. (2014) Using scenario analysis to develop community response and recovery plans and interventions. Paper presented at the Department of Social Work, NPUST, Taiwan, 7th June.

2015

- Paton, D. (2015) Forest Fire Preparedness. Paper presented to the Department of Forestry, National Pingtung University of Science and Technology. Taiwan. June 8th.
- Paton, D. (2015) Environmental co-existence: Implications for hazard and environmental management. Paper presented to the Department of Forestry, National Pingtung University of Science and Technology. Taiwan. June 11th.

2018

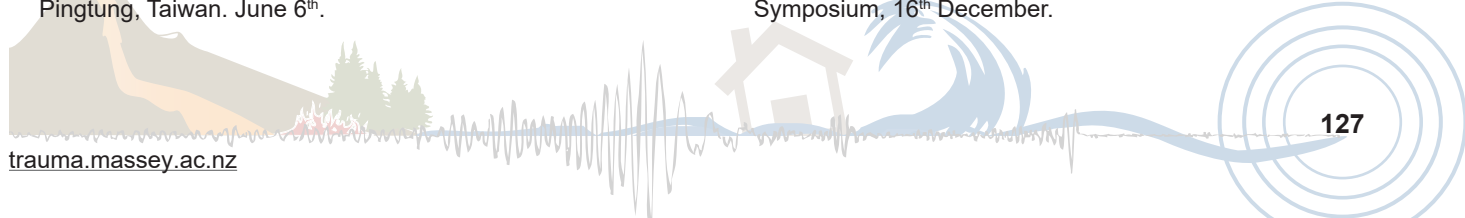
- Paton, D. (2018) Putting Sendai into Practice: Applying preparedness theory in Taiwan. Seminar presentation to Department of Social Work, National Pingtung University of Science and Technology. September 11th.

2020

- Buergelt, P.T., Maypilama, E.L., Lin, C-J., Kaaviana, A., Sithole, B., Ali, T. & Paton, D. (2020) Disasters as transformative opportunities: Indigenous Australian, Taiwanese & Zimbabwian communities recovering and rebuilding stronger. Seminar workshop presented to the ANU Disaster Risk Science Institute, Canberra, Australia, August 12th.

2021

- Buergelt, P.T., Maypilama, E.L., Gundjarranbuy, R., Yunggirrŋa, D., Dhamarrandji, S., Paton, D., Ali, T & Smith, J. (2021) Indigenous remote community Galiwin'ku: Reviving and taking back power after the cyclone. Presented at the Showcasing Yolŋu (NT) Research Workshop. 26th May 2021, University of Canberra, Canberra, Australia
- Buergelt, P., Maypilama, Lăwurrpa, Bukulatjpi, Yunggirrŋa Dorothy, Gundjarranbuy, Rosemary, Dhamarrandji, Stephen, Paton, D., Smith, J. & Ali, T. (2021) Indigenous and Western peoples engaging in two-way learning about natural and social disasters: Rebirthing our internal power. University of Canberra, 2021 Indigenous Research Symposium, 16th December.



2022

- Paton, D. (2022) Disaster Risk Reduction: Preparedness, recovery and development. Paper presented to the College of Health and Human Sciences, CDU. 17th June, 2022.
- Paton, D. (2022) Understanding Psychological Perspectives on Disaster Preparedness. Paper presented to the Faculty of Psychology, Universitas Gadjah Mada, Indonesia, 20th May 2022.

Editorial & Reviewing Responsibilities

Past Editorship

- Australasian Journal of Disaster and Trauma Studies (Founding Editor)
- Disaster Prevention and Management
- International Journal of Mass Emergencies and Disasters.

Guest Editor

- International Journal of Disaster Risk Reduction
- 2014: Guest Editor special edition on Christchurch earthquake.

Editorial Board membership

- Australasian Journal of Disaster and Trauma Studies
- Disasters
- International Journal of Psychology
- International Journal of Disaster Risk Reduction.
- Disaster Communication
- International Journal of Environmental Research and Health

Research and Research Consulting Grants

- 1988: \$1000. British Petroleum. Study of stress in international disaster search and rescue personnel.
- 1989: \$15,500. Scottish Home and Health Department. Funding for one year project on stress and burnout in community nurses.
- 1990: \$195,000. Economic and Social Research Council. Managerial cognition in the Scottish Knitwear Industry. (with H. Thomas, J. Porac, and F. Wilson).
- 1990: \$2,600. University of St. Andrews. Funding for study of stress in Academic and Academic-Related staff within the University.
- 1990: \$78,000. Lothian and Borders Fire Brigade and Curtin University. Investigate of major incident and traumatic stress in firefighters in Scotland, Nigeria, and Japan.
- 1991: \$4,100. University of St. Andrews, Department of Management, Research Committee. Cognition and strategy formulation in Shetland knitwear producers (with F. Wilson).
- 1991: \$32,500. West Australian Fire Brigade. Critical incident stress in firefighters (with R. Cacioppe).
- 1991: \$5,000 Curtin University Small Grants Scheme. Critical incident stress in community service field officers. (with J. Richards).
- 1991: \$10,300. Commonwealth Scientific and Industrial Research Organisation. Community perceptions of environmental degradation (salinity): implications for disaster planning. (with G. Syme and B. Bishop).

- 1991: \$24,100. Curtin University, Academic Council. The relationship between human resource practices and quality of working life.
- 1991: \$2,600. Curtin University, School of Psychology. Seeding grant to investigate trauma in student nurses entering intensive care and casualty departments.
- 1992: \$14,000. Authority for Intellectually Handicapped Persons, Western Australia. Traumatic stress in work with profoundly intellectually handicapped persons.
- 1992: \$2,600. Curtin University, School of Psychology. Seeding grant to investigate business perceptions of organisational psychologists as industrial training providers.
- 1992: \$39,000. Lothian Regional Council, Scotland. The role of organisational referents as determinants of perceived fairness in promotion systems in the Fire Brigade (with F. Wilson).
- 1993: \$14,000. Australian Research Council. Identifying the factors underlying the unstained use of homeworking using information and telecommunications technology. (with C. Pollock).
- 1994: \$16,900. Australian Research Council. Assessing chronic stress in the chronically ill elderly. (with J. Bell).
- 1994: \$9,750. Curtin University of Technology, School of Psychology. Seeding grant to investigate the relationship between social support and well-being during pregnancy (with J. Piek).
- 1995: \$9,000. Disability Services Commission/Quantum Research Funding. Assessment of the role of supervisory attitudes on organisational trauma impact.
- 1997: \$12,000. Job demands in professional and volunteer emergency managers. New Zealand Civil Defence.
- 1997: \$10,000. Massey University Research Fund. The role of social and organisational characteristics as determinants of well-being in the New Zealand Police.
- 1998 \$810,000. Hazards and Society: Community and organisational impacts of volcanic hazards. Fund for Research in Science and Technology/Public Good Science Fund. (with D. Johnston, B. Houghton, B. Scott, M. Kozuch, and K. Ronan).
- 1998: \$65,000. Risk assessment of Auckland volcanic field: Integrating physical, social and economic perspectives. Auckland Regional Council (with D. Johnston and J. Gough).
- 1999: \$4,500. Fast response to New Zealand Disasters. Institute of Geological and Nuclear Sciences (with K. Ronan).
- 1999: \$10,000. Hazard Awareness and Community Preparedness. Auckland Regional Council (with D. Johnston and M. Kozuch).
- 1999: \$90,000. Community vulnerability and resilience to earthquake hazards in the Hawkes Bay: Fund for Research in Science and Technology/Non-Specific Operating Fund (with D. Johnston and K. Ronan).
- 2000: \$3,000. Pilot Study. Community response to flooding in Queenstown: A salutogenic approach. Institute of Geological and Nuclear Sciences (with D. Johnston).
- 2000: \$65,000. Planning for community response to earthquakes: Integrating vulnerability analysis and Geographic Information Systems. Wellington City Council, New Zealand (with D. Johnston).
- 2000: \$60,000. Developing a model of community resilience to natural hazard consequences. Fund for Research in

- Science and Technology/Non-Specific Operating Fund (with D. Johnston and J. Becker).
- 2000: \$10,000. Inter-agency and business group relationships and their implications for the development of integrated emergency management operation. Auckland City Council.
- 2000: \$10,000. Survey data management for the Taupo "VAST" Project. Taupo District Council (with D. Johnston, J. Becker, and C. Stewart).
- 2000: \$80,000. Public Good Science Fund, New Zealand. Modelling community resilience for managing natural hazard consequences.
- 2001: \$10,000. University of Hawaii. Identifying predictors of volcanic hazard preparedness in communities in Hawaii.
- 2001: \$48,535. Developing a model to predict the adoption of natural hazard risk reduction and preparatory adjustments. Earthquake Commission, New Zealand.
- 2001: \$50,000. Integrating natural hazard education with community development. Auckland City Council, New Zealand.
- 2001: \$20,000. National Institute of Water and Atmospheric Research. Community perceptions of flooding hazards in the lower North Island, New Zealand. (with D. Johnston, and C. Stewart).
- 2001: \$22,500. Washington State Government (US). Modelling community responses to tsunami hazards in Washington State. (with D. Johnston and J. Becker).
- 2002: \$9,400. Auckland City Council. Ethnic perspectives on participation in local affairs. 2002: \$15,000. Napier City Council. Integrating hazard and social vulnerability indicators (with D. Johnston and P. Woods).
- 2003: \$95,000, Sea Grant Coastal Research Fund. Resilience of Hawaiian communities to coastal hazards. (with B. Houghton and M. Hammnett).
- 2004: \$29,500. Preparing for the worst: Bush fire preparedness in urban environments. CSIRO/Utas (IRGS). (with G. Kelly and M. Doherty).
- 2004: \$98,000. Social trust and community resilience to natural hazards. Public Good Science Fund, New Zealand.
- 2004: \$20,000. Scoping review and research strategy development: Bushfire Co-operative Research Centre.
- 2005: \$90,000. Factors affecting behavioral response to natural warning signs of tsunami: the case study of the December 26, 2004 earthquake. National Science Foundation (US). (with B. Houghton, C. Gregg, R. Lachman and D. Johnston)
- 2005: \$250,000. Risk communication and warnings for bushfire hazards. Bushfire Cooperative Research Centre.
- 2005: \$25,000. Modelling community resilience for volcanic hazards. Auckland Regional Council, New Zealand.
- 2005: \$732,000. Tsunami Hazards: Social cognitive modelling of preparedness and effectiveness of warnings. National Science Foundation (US) (with B. Houghton, C. Gregg, D. Gill, and D. Johnston).
- 2006: \$58,300. Modelling community resilience: A multi-level approach to assessment and capacity building. Emergency Management Australia (with A. Cottrell and L. Smith).
- 2006: \$45,000. Means-chain theory analysis of natural hazard preparedness. Earthquake Commission, New Zealand.
- 2006: \$25,000. Identifying factors contributing to resilience to an Avian Flu pandemic. Auckland Regional Council, New Zealand.
- 2007: \$30,000. Articulating community beliefs about avian flu and flu preparedness. Ministry of Civil Defence and Emergency Management, New Zealand (with D. Johnston and P. Buergett).
- 2007: \$5,000. Developing collaborative natural hazard research in Taiwan and Australia. National Science Council, Taiwan.
- 2008: \$198,000 The Social Dimensions of Forest Fire: Identifying Contributors to sustainable, integrated management. Fundacao para a Ciencia e a Tecnologia, Portugal (with F. Tedim).
- 2008: \$20,000. Community preparedness for tsunami hazards in Australia. Emergency Management Australia.
- 2009: \$62,780. Bushfire resilient communities: Understanding community and agency engagement (extension of Effective Risk Communication – Warnings). Bushfire Cooperative Research Centre, Australia.
- 2009: \$34,000. A cross-cultural comparison of earthquake preparedness models in Taiwan and New Zealand. National Science Council, Taiwan (with L-j Jang).
- 2010: \$140,600. Dynamics of an effective risk communication campaign for Influenza A (H1N1). Health Research Council, New Zealand (with D. Johnston, S. Johal, C. Cunningham & M. Baker)
- 2010: \$60,500. A developmental perspective on disaster prevention. National Science Council, Taiwan (with L-j Jang).
- 2010: \$84,000. Psychological Preparedness for Bushfires: Social context and resource perspectives on warning processes. Bushfire Cooperative Research Centre, Australia.
- 2011: \$780,000. Organising for Effective Incident Management. Bushfire Cooperative Research Centre, Australia.
- 2012: \$211,779. Demographic consequences of Asian disasters: family dynamics, social capital and migration patterns. ARC Discovery. (with Helen James, H. Hosseini-Chavoshi, M. Manning, C. Pelling, M. Abbasi Shavazi, and D. Siew-Ean).
- 2012: \$40,000. Emergency Management Decision-Making Exercises for Natural Hazards. Public Good Science Fund, New Zealand.
- 2013: \$197,618. Aboriginal wildfire evacuation partnership. Social Sciences and Humanities Research Council of Canada (March 2013-March 2016). (with Tara McGee, Larry Fremont, Robert McAlpine, Carla Dee Bellanger, Fran Byers, Amy Christianson, Wadieh Yacoub, David Diabo, Wojciech Drobina, Douglas Paton)
- 2013: \$40,000. Modelling community preparedness and resilience. Public Good Science Fund, New Zealand.
- 2014: \$122,235. Community Resilience Building Pilot. Regional Growth Fund: Resilient Community Program. (with Matt Dorfstaeter, David Johnston and Pauleen Bennet).
- 2014: \$30,300. Community understanding of the tsunami risk and warnings systems in Australian communities. Bushfire and Natural Hazard Cooperative Research Centre. (with David Johnston)
- 2014: \$12,000. Comparative analysis of disaster recovery in Australian and Japan. Australian Government, New Columbo Plan.
- 2016: \$330,000. Prevenir e preparar a sociedade par eventos extremos de fogo: o desafio de ver "a floresta" e não somente as "árvores" - Prevent and prepare society for extreme fire events: the challenge of seeing the "forest" and not just the "trees." Portuguese Science Foundation. (with F. Tedim).

- 2016: \$19,729. Young Onset Dementia: Carers' needs and their quality of life. CDU Early Career Research Funding. (with S.D.V Prasada).
2016. \$24,000. Reimagining science across visual arts using space nanotechnology. LEBA/CDU Internal Grant Scheme (with I. Michaloudis, P. Shaw and N. V. Khahn). 2017: \$40,000. Developing DRR programs in New Zealand. Public Good Science Fund. New Zealand.
- 2017: \$770,000. Scenario planning for remote community risk management in northern Australia (with Russell-Smith, J., Edwards, A., Sangha, K. Yates, C., Lynch, D. & Evans, J.) Bushfire and Natural Hazard CRC.
- 2017: \$10,000. Exploring the impact of environmental risk factors on Indigenous outdoor worker's health to develop work place guidelines in the NT. Rainmaker Research Fund.
- 2017: \$10,000. Arts-Related Disaster Risk Reduction: Australian-Taiwanese Indigenous Artist's Cultural Knowledge & Skills Exchange and Creations. Rainmaker Research Fund.
- 2018: \$8,500.00. Assessing quality of life in disaster survivors following long-term resettlement. Tzu Chi Foundation, Taiwan.
- 2018: \$26,300. Tzu Chi Disaster Response Framework: Facilitating transformative change in disaster-affected communities. Tzu Chi Foundation, Taiwan
- 2018: \$75,000.00. Using Arts to Heal, Reduce the Risk of Disasters and Adapt to Climate Change: Australian-Taiwanese Indigenous Cultural Knowledge and Skills Exchange and Creation. Institute of Advanced Studies Rainmaker Readiness Grant, Australia
- 2020: \$322,235 Supporting mental health through building resilience during and after bushfires: lessons from the 2019-20 bushfires in southern NSW and the ACT. National Health and Medical Research Council (Medical Research Future Fund (MRFF) EPCDR Bushfire Impact Research Grant). (Co-Researchers: Jacki Schirmer, Petra Buergelt, Theophile Niyonsenga).
- 2020: AU\$414,426 (NT\$8,475,000). Ministry of Science and Technology (MOST), Taiwan. 防救災社會服務人力的培訓與公私部門協同合作機制的建構 (Training of Disaster Prevention Social Service Manpower and Construction of Public-Private Sector Collaboration Mechanism). Co Researchers: 張麗珠 (Li-Ju Jang), 陳武宗 (Wu Tsung Chen), 林珍珍 (Jen Jen Lin), 葉一隆 (Yi-Lung Yeh), Douglas Paton, 謝文中 (Wen- Tsung Shieh), 鄭怡玲 (Yi-Ling Cheng) Duration: May 2020-April 2023
- 2022: \$219,771 Australian Institute of Aboriginal and Torres Strait Islander Studies, "Waka Ngurrkanhayngu: Regenerating the existence of life": Reducing the risk of natural & social disasters - reviving & strengthening Indigenous law, culture and governance in remote Indigenous communities" Elaine L̄awurrpa Maypilama Bukulatjpi, Ross Mandi Wunungmurra, Yungirr̄na Dorothy Bukulatjpi, Evelyn Djotja, Tanya Yurranydjilil, Joanne Gemulunuy, Petra Buergelt, Douglas Paton, James Smith, Tahir Ali, Rowan Bedggood and Duncan Poulson.
- 2022: \$10,400. Massey University Research Fund (MURF). Understanding the diversity in mental models of scientific uncertainty for natural hazards: Considering the lay public, scientists, and decision-makers. Emma Hudson-Doyle, Julia Becker, Stephen Hill, Douglas Paton, Matt Williams, Ann Bostrom, Jessica Thompson
- 2022: \$50,000. Developing Psychological Resilience to the Impact of Drought. North Western Australia and Northern Territory Innovation Hub. (with Mitchell Byrne, Daniel Bressington & Carol Keane)

Instructions for Authors

This journal has been established to provide a resource for the Australasian region (New Zealand, Australia and the Pacific), and as such we prioritise and seek contributions from Australasia. We will occasionally consider contributions from other parts of the globe but only if the articles cover issues directly relevant to an Australasian readership.

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Well written English manuscripts of NOT MORE THAN 10,000 words will be considered for publication.

The format and style of the article, including referencing, must follow current American Psychological Association (APA style) conventions.

Authors are requested to supply an abstract of no more than 300 words when submitting an article. The abstract should be a condensed, accurate representation of the rationale, methodology, significant results, conclusions and recommendations contained within the article.

Authors should also provide 4 - 5 keywords that clearly describe the subject matter of the article. Other options for manuscript formats are provided at <http://trauma.massey.ac.nz/info/submissions.html>.

TABLES, FIGURES AND GRAPHICS:

Each table and figure should possess a brief title and a concise description of its content and should be included in full at the end of a manuscript.

Care should be taken to ensure that tables and figures will be viewable within the limitations of web browsers. Tables and figure numbers and titles should also be inserted into the manuscript text at an appropriate position.

Other pictures or other graphics required for the article should be attached as separate files.

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