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What to do when the earth shakes? DCH or door frames: evaluating generalised risk minimisation guidance

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Introduction: What are the best, most effective protective action measures for people to take in a given context in order to minimise earthquake risks? Currently, experts and earthquake safety organisations offering risk minimisation communication do so in a generalised, one-size-fits-all approach, which can prove counterproductive. In this paper I address this question on the basis of research conducted in Nepal and Aotearoa/New Zealand.

Methods: This paper offers a critical discourse analysis of paradigm perspectives, knowledge apparatuses, narratives, and epistemic framings that dictate the trajectory of development and dissemination of Protective Action Measures (PAMs).

Results: During my field work in Nepal, I observed and heard through interviews and group discussions with several NGOs and organisations that during the 2015 Gorkha earthquakes, people were confused about what PAMs to take to minimise risks. Not only were people confused about what was the most suitable PAM to take during earthquakes, but were also perplexed about how to apply the guidance offered by organisations. Individuals and their families who tried to follow such guidance found that, as a result, they were faced with increased risks and the loss of more lives. Moreover, a Google Trends search revealed that in at least two major hazard events, people searched for outdated PAMs and advice, asking Google if this is what they should do.

Discussion: Risk communication methods, PAMs and risk minimisation guidance require a closer critical examination and evaluation on a context-by-context basis, rather than the generalised messaging currently adopted. Risk minimisation guidance and PAMs that are not context sensitive have the potential for increasing and creating newer risks rather than effectively minimising existing risks.

KEYWORDS

disaster risk reduction (DRR), protective action measures (PAMs), risk communication, duck, cover and hold (DCH), risk minimisation guidance

1 Introduction

“Duck, cover and hold” (DCH) is an example of an earthquake Protective Action Measure (PAM) and a heuristic that is widely recommended, universally accepted, and adopted as the best guidance to follow in the case of an earthquake. Large-scale earthquake drills, such as the International ShakeOut Days, aim to educate the public on appropriate action to take during

earthquakes by following instructions like “Drop, Cover and Hold” (SCEC, 2025). Generalisation for universal applicability (the assumption that a rule or heuristic can be applied universally across different contexts) could be problematic (Banks et al., 2020); therefore, the practical dimensions of this heuristic require deep critical scrutiny on a context-by-context basis and through a cross-disciplinary approach. Is DCH really a universally applicable PAM? Some cases indicate that it is not conducive to risk minimisation, e.g., the 2015 Gorkha Earthquakes (Ramkumar, 2022; Bolakhe, 2025). A decade ago, the devastating 2015 earthquakes had their epicentre in the Gorkha district of Nepal; the tremors and aftershocks had a major impact on more than 30 other districts, including the Kathmandu Valley. The disasters caused a staggering loss of lives numbering 8,969 officially, left 22,321 injured, and completely destroyed in excess of 602,592 homes. Over 60,000 people were left displaced, while the country’s economic losses were over US\$9 billion. However, there is an understanding that these earthquakes were not “the big one,” which had been and is still expected; there are fears that the next earthquake(s) will lead to higher fatalities and much further devastation (Bollinger et al., 2016). Therefore, the wide scale recommendations of DCH needs to be systematically reviewed on a case-by-case basis, taking contextual factors into account to ensure effective disaster risk reduction (DRR) especially in areas with potentially hazardous seismic risk levels.

Traditionally, disaster communication geared towards minimising risks is expected to be reproducible world-wide, often leading to a reproducibility crisis (Baker, 2016; Korbmacher et al., 2023) rather than effective risk minimisation. The epistemic claim that there can be a universal applicability of knowledge, guidance, processes, frameworks, and rules still predominates within disaster studies. Thus, there are significant issues arising from the universalisation and generalisation of risk minimisation advice and guidance, which manifest differently based on the context. Advocates for a universality of rules, norms, and guidelines designed at a global scale, propose that these could be used in any context that experiences the same geohazards like earthquakes and landslides (Milledge et al., 2019; Pollock and Wartman, 2020). I argue that this is not applicable in the domain of disaster studies, especially where rules, norms, and guidelines serve to inform people and assist dynamic and diverse groups of decision-makers in different contextual circumstances. Social, and political factors are always intertwined in any attempt to offer knowledge, education, or expertise for the benefit of society; thus, no single generalisation will be applicable in all DRR contexts. I therefore argue that if knowledge is to be used effectively, there is a need to generate and situate DRR knowledge and guidance for particular contexts.

I offer perspectives and insight from the application of Standpoint Theory (Harding, 1991) as a methodology and a cross-disciplinary tool for Disaster Studies to formulate a more inclusive approach. This not only applies a “new” method to traditional topics but involves the development of new areas of research, blending Standpoint Theory and building systems thinking. PAMs do not arise in a vacuum; rather they require the consideration of several factors prior to and during knowledge generation, dissemination, and implementation processes for effective DRR. I propose socio-political and cultural factors to be considered for various contexts, which may yield very different outcomes and unique, place-based concerns. This paper is thus part of a larger project where such factors are explored in greater depth

(Ramkumar, 2022) while this briefer paper focuses on highlighting the need to evaluate risk communication and guidance, such as PAMs, for effective DRR. Since there is little or no published information available evaluating and analysing current expert recommended PAMs and risk minimisation guidance, in this paper I offer a useful starting point for future DRR research.

Research, communication, and use are three key integrated knowledge components with significant interrelations and differing levels of interaction in the extensive processes of DRR. While the humanities can enhance the engagement with science and society to offer knowledge for use in practical contexts, this knowledge is not free from the socio-political and power constructs in which it is generated and disseminated. Further, research productivity and quality standards are measured with reference to disciplinary peer-review quality assessment processes, and the quantity and impact status of peer-reviewed publications (Buwalda et al., 2014). This system generates several biases, which I discuss and analyse.

Besides concerns with knowledge processes, one may be correspondingly concerned about the substantive assertions and assumptions of researchers within disaster studies. These clusters of substantive assertions and assumptions are referred to as paradigms. The major assertion of the more dominant hazard paradigm is that disasters are the results of extreme and rare natural events, and that due to an insufficiency in the risk perceptions of affected people, they fail to “adjust” to these events (Gaillard and Mercer, 2013; Mercer et al., 2009; Mercer, 2012; Baumann, 2020; Wisner, 1995; Chmutina et al., 2021; Gaillard, 2021). The vulnerability paradigm, in keeping with the “critical political ecology tradition” of geography, asserts otherwise. Its major assertion is that disasters first and foremost affect those who are marginalised within their everyday living contexts. Such marginalisation entails a major lack of resources, inadequate access to limited resources when available, and a lack of access to the means and forms of protection; all of these are readily available to others with more power (Wisner, 1995; Wisner et al., 2012b; Gaillard and Mercer, 2013; Mercer, 2010, 2012; Baumann, 2020; Kelman, 2018; Chmutina et al., 2021; Gaillard, 2021). While I focus on the vulnerability paradigm’s criticisms of the hazard-centric approach, I also critically evaluate both approaches to DRR and find that there are shared issues.

The current working definitions of “disaster” and related terminology within DRR are predominantly Western constructs (Bankoff and Hilhorst, 2009; Pelling and Dill, 2010; Gaillard, 2019, 2021). Thus, the current epistemology of DRR is problematic when applied to contexts other than the West. The processes of DRR knowledge generation and dissemination also assist in perpetuating some of the hazard paradigm’s core and most problematic tenets (Blaut, 1993) and are unable to account for other epistemologies of disaster and risk.

2 Methods

I base my research on mixed methods, interdisciplinary perspectives and application involving Geography, Philosophy, and Disaster Studies, data gathered through field work in Nepal and Aotearoa/NZ, case studies, structured and semi-structured or informal interviews, individual and group interviews, and Google Trends (Data Analytics) tools. I examine epistemic framings and

narratives within disaster studies and use deconstruction and discourse analysis as my main methods of reading, analysing, and writing. I use an epistemological postmodern methodology that challenges monolithic notions of universal knowledge and generalisations. I particularly look at inconsistencies and contradictions that are usually uninspected because they are part of the dominant social order. These are often latent and inherently part of the system, wherein differing parts are treated as having a singular, generalised, character, principle, or application.

Traditionally, within the field of philosophy, researchers rarely undertake any form of fieldwork, and thus philosophy may be considered a “field-less” discipline. My individual fieldwork components, therefore, were undertaken with the intention of gaining broader insights, increased social awareness, and working knowledge to offer novel, integrated, and relevant perspectives. While there are thus some cross-disciplinary limitations, the humanities can nevertheless enhance the engagement with science and society to offer knowledge for use in practical contexts. This knowledge, however, is not free from the socio-political contexts in which it is generated and disseminated.

During my field work in Nepal, I observed and heard through interviews and group discussions with several NGOs and organisations that during the 2015 Gorkha earthquakes, people were confused about what PAMs to take. I also took notes and photographs in the field wherever I saw signposting regarding PAMs and guidance during hazards (Figure 1) and evaluated some examples of risk communication. Further, I highlighted any research that aimed at evaluating the PAMs used in a given context, and which offered any insight into their effectiveness; this evaluative research was only available for the case of Aotearoa/NZ and unavailable for Nepal. All participants provided written informed consent to participate in this study. In this paper, I do not draw on all the interview material but only those group interviews and discussions which are appropriate and helpful. I conducted my fieldwork within the Sindhupalchok district in mountainous communities heavily affected by earthquakes and co-seismic landslides. I do not use these interviews directly in this paper, providing instead the anonymised insight specifically regarding PAMs. In this paper, I focus on 13 structured and semi-structured individual and group interviews consisting of first-hand accounts from personnel representing local organisations currently most active in terms of earthquake education and awareness, and from organisations that assist in various capacities during and after disasters. This also included meetings with various governmental organisations, boundary organisations, and NGOs involved with earthquake safety in Nepal, with headquarters based in Kathmandu.

I intended to return to Nepal for further fieldwork but in early 2020 those plans changed drastically because of the Covid pandemic, strict lockdowns, and travel bans/restrictions in place. Therefore, it was not possible to obtain more empirical evidence during the several lockdowns since, and my fieldwork was thereafter heavily impacted. This has resulted in limited but nevertheless relevant empirical evidence, which I use because of the context-sensitive practical examples that this fieldwork is able to offer, and have supplemented my arguments wherever possible. I then conducted desk-based research regarding PAMs, guidance and risk communication. I searched by using the Google Trends tool for areas where there was a prevalence in peoples' queries related to risk measures, and analysed whether there were any correlations in the peak searches with major

hazard events. The search terms used were “duck cover and hold earthquake” (blue) and “doorway earthquake” (yellow) for the time frames 1/1/2004 to 4/7/2022 (Figure 2) and 1/1/2014 to 30/11/2024 (Figure 3). There are limitations to using Google Trends, where searches for region-specific information resulted in the response that there is not enough data at hand. Nonetheless, it is beneficial to use the data that is available to offer some insight and contribution to the limited research on evaluation of PAMs. I also deconstructed and critically analysed the current approaches offering knowledge for use as PAMs. I therefore analysed and critiqued the discourse and underlying assumptions using an epistemological postmodern methodology (Hoggart, 2002) to further challenge monolithic notions of generalised universal knowledge and the dominant meta-narratives that structure and legitimise other narratives within the domain of disaster studies and for DRR, especially regarding PAMs.

Discourse analysis is a critical method that aims to show how certain narratives are produced, naturalised, and privileged over other marginalised, excluded, or silenced narratives and identities. Discourse refers to specific concepts and categorisations produced, reproduced, and transformed by practices through which physical and social realities are given meaning. Alternative and competing discourses are associated with different social groups and positions. As Pitsoe and Letseka (2013, p. 24) point out, for authors like Foucault: “discourse joins power and knowledge, and its power follows from our casual acceptance of the “reality with which we are presented.” Discourse, as a social construct, is created and perpetuated by those who have the power and means of communication.” This understanding of discourse, which joins power and knowledge, is useful in critically analysing DRR discourse by challenging DRR interpretations and underlying assumptions that are taken for granted; I unpack processes that lead to and reinforce these interpretations. Meaning making depends on what is explicitly asserted and implicitly assumed. “What is ‘said’ in a text always rests upon ‘unsaid’ assumptions” (Fairclough, 2003, p. 11). Social, political, and hegemonic factors are inextricably linked to any offering of DRR knowledge for societal use. Therefore, the knowledge generating, and dissemination processes involved in DRR ought to be examined, as these affect outcomes through real-world application; “at the very heart of studying the efforts to reduce disaster risks, is to understand how knowledge is feeding into policy processes” (Albris et al., 2020, p. 5).

3 Results

I analysed hazard-centric and vulnerability paradigm perspectives and found that both use generalisation for universal applicability of concepts, methodologies, and a dominant Western construction of DRR epistemology. Technocratic and hazard-centric approaches remain predominant despite more than 40 years of research and guidance from researchers and practitioners who have developed frameworks and tools from the vulnerability paradigm's perspective (Wisner et al., 1976; Waddell, 1977; Hewitt, 1983, 1995, 2007; Wisner, 1995; Bankoff and Hilhorst, 2009; Mercer et al., 2009; Mercer, 2012; Gaillard and Mercer, 2013; Weichselgartner and Kelman, 2015; Donovan, 2017; Baumann, 2020; Chmutina et al., 2021; Gaillard, 2021, 2022). In this paper I do not attempt to provide an exhaustive review of all methods and tools. Instead, I reviewed hazard and vulnerability

NSET Nepal Advise what to do and what not to do during earthquake

If you are indoors- STAY THERE and move only a few steps to the closest previously identified safe place in the room. DUCK, COVER, and HOLD ON. Get under a table and hang on to it. Protect your eyes and head. Get away from windows, heavy furniture or appliances that might fall on you. Get out of the kitchen, which is a very dangerous place. DO NOT run downstairs or rush outside while the building is shaking.

If you are outside- Get into the OPEN, away from buildings, power lines, trees, and anything else that might fall on you. If you are in the city, seek shelter under archways or doorways but do not enter the building. DO NOT try to walk through narrow roads or gullies.

If you are driving or in a vehicle- STOP SLOWLY. Move your car as far out of traffic (and buildings) as possible. DO NOT stop on or under a bridge, trees, light posts, power lines, or signs. STAY INSIDE your car until the shaking stops. Should you resume driving, watch for cracks in the roads, fallen buildings, stones or trees etc.

If you are in a mountainous area- WATCH OUT for falling rock, landslides, trees, and other debris that could be loosened by the earthquake.

In the Event of an Earthquake

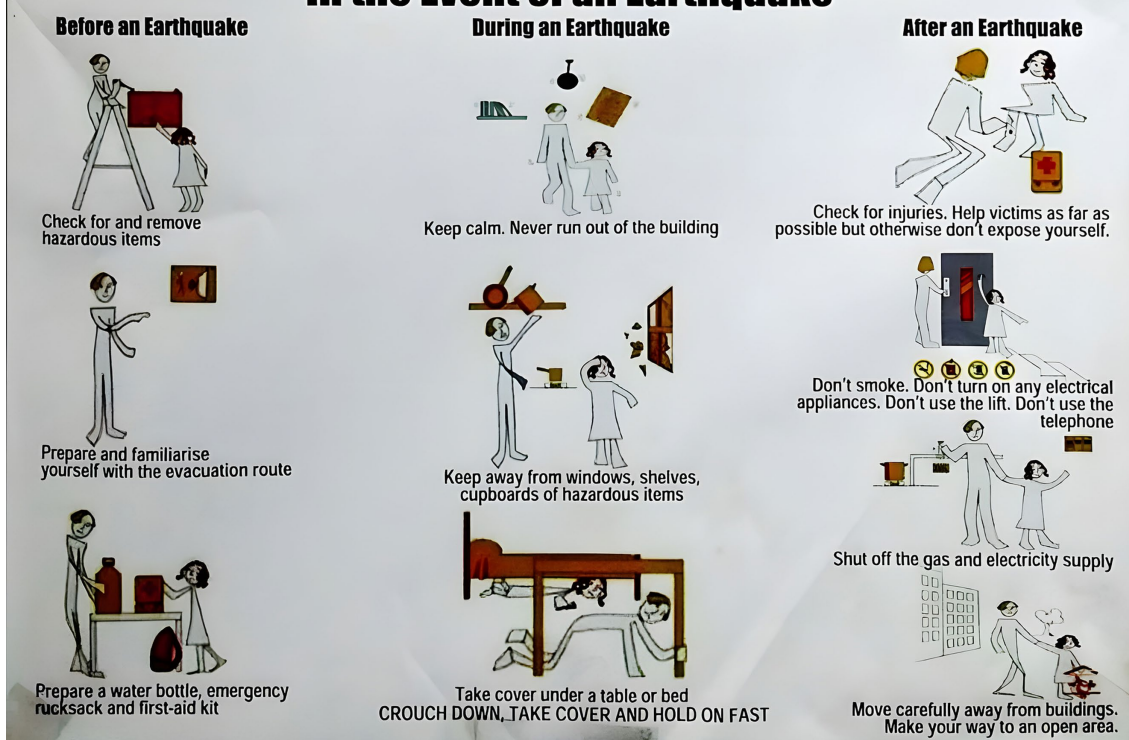


FIGURE 1

Advice for what to do during an earthquake by NSET Nepal (Photo credit: author, 2017).

approaches to illustrate how they are manifest within DRR. Current approaches to earthquake DRR still follow technocratic and

hazard-centric approaches of acknowledgement of vulnerability, while omitting integration and socio-political “development” data, or

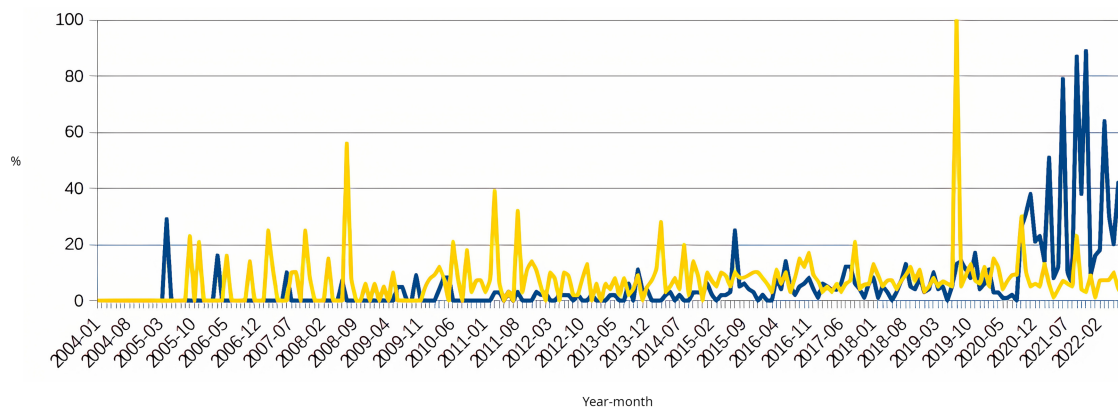


FIGURE 2

Google Trends results for “duck cover and hold earthquake” (blue) and “doorway earthquake (yellow).” Data ranges from 1/1/2004 to 4/7/2022. The y-axis represents relative interest in percentage. Two prominent peaks in “doorway” searches that overtake searches for DCH relate to two major hazards during this time.

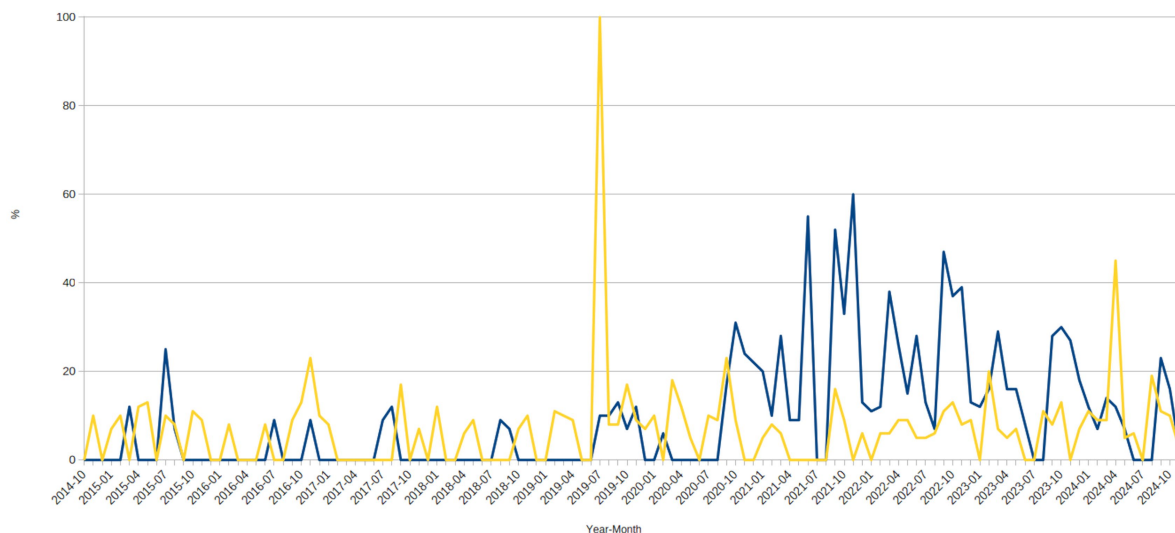


FIGURE 3

Google Trends results for “duck cover and hold earthquake” (blue) and “doorway earthquake (yellow).” Data ranges from 1/1/2014 to 30/11/2024. The y-axis represents relative interest in percentage. “Doorway earthquake” is still a prominent search with two further peaks.

co-production/hybrid forms of knowledge. Hazard-centric research (which asserts that disasters are the results of extreme, rare natural events, and that due to insufficiency in risk perceptions of affected people, they fail to “adjust” to these events) emphasises social culpability or blame rather than the environment within which decisions are taken, or the reasons due to underlying causes. “[R]esearch which focuses almost exclusively on the disaster end of the spectrum tends to increase emphases on the search for both social culpability or blame; description of the physical risks involved; and the emergency and short-term humanitarian response” (White et al., 2001, p. 85).

Instead of allocating blame to marginalised people because of their apparent insufficiency in risk perceptions, vulnerability paradigm perspectives have attempted to understand the underlying issues and combine forms of knowledge to collectively achieve DRR. Vulnerability perspectives attempt to shift the focus to people marginalised within

daily contexts. However, researchers and practitioners from within the vulnerability paradigm are also reflexively and critically assessing whether the paradigm is achieving its goals (Fiddian-Qasmiyeh, 2015, 2018, 2019; Gaillard, 2021).

3.1 Analysis of shared issues in hazard and vulnerability paradigm perspectives

Vulnerability proponents claim that disasters are social constructs; however, they also (like the technocratic proponents) resort to concepts, methodologies, and epistemologies that are taken as universal. Concepts like “disaster,” “vulnerability,” “resilience” and “risk” are used and applied in world-wide contexts, assuming they assist in understanding or knowing how varied cultures and societies make sense of “natural hazards.” This is antithetical to perspectives of

disasters as social constructs. Gaillard (2021) argues that part of the universalising issue stems from concepts like “disaster” being a Western invention; this is the common Western heritage of both paradigms.

Is there such a thing as a disaster? The answer is inherently subjective and contextual and it will be up to whoever dares to take our agenda forward to try to answer the question in their own unique context. Our contention, though, is that there may be no easy answer for the very reason that disaster, like any other concept in the Western world view, is an invention (Gaillard, 2021, p. 194).

The Western technocratic paradigm endorses power asymmetrically by endorsing the knowledge generation and dissemination processes, which sustain rather than challenge Western hegemony. The vulnerability paradigm endorses the very same processes, which are problematic. “Without critical reflection of such legacy, we risk creating knowledge that has no substance in the real world” (Yadav et al., 2022, p. 177). Universality was not the intended goal of the vulnerability paradigm, which began with the idea of moving away from Western scholarship, and in particular the technocratic paradigm, rather than replicating the same issues.

We were encouraged, therefore, to embark on an epistemological journey [...]. We were meant to challenge the hegemonic rules and values of Western science that were underpinning the whole transfer of knowledge and technology associated with the then dominant strategies to reduce the risk of disaster; strategies embedded within the broader neo-colonial relationships imposed by Western governments on the rest of the world (Comité d'Information Sahel, 1975; Copans, 1975; Said, 1978, in Gaillard, 2021, p. 44–45).

To re-align with some of the original goals, changes are required in current processes of knowledge generation, dissemination, and implementation. Without this re-alignment, both the vulnerability and technocratic perspectives fail to adequately address disasters as social constructs. Therefore, both paradigm perspectives currently reinforce predominant Western notions, which take different forms. The translation of scientifically produced knowledge into practicable action by policymakers and end-users is troublesome. Sometimes the knowledge produced is used to inform scientific or governmental policies, or in some rare instances, actually offered, albeit in its original specialist, academic language, for others to make sense of and possibly use through novel open-access publishing and the like. In disaster situations, the dilemmas inherent in the relationship between science and policy seem to be intensified. Disasters accelerate the policy domain's need for speed, which is contrasted by the science domain's need for time, reflection, and thoroughness. While policy changes, informed by scientific insights, might come about in the wake of disasters and emergencies, research suggests that this is not necessarily always the case (Birkland, 2006, in Albris et al., 2020, p. 5).

Academic culture and processes, especially the “publish or perish” model of academic life is dispersed world-wide (Altbach, 2013). Emphasis is placed on having several English publications in endorsed journals (Alexander et al., 2021). Moreover, research is expected to be widely reproducible, and is frowned upon if not, which leads to a reproducibility crisis - the belief that because something cannot be replicated worldwide it must be wrong (Baker, 2016). This is a

misconception for context-sensitive fields with socio-political, cultural and geographic variety (Korbmacher et al., 2023).

In the Western research model, to consider other forms of knowledge as real, worthy of being heard and appreciated, the requirement is usually that it needs to come from another similarly qualified expert in the field, through peer-reviewed publications (Alexander et al., 2021). Otherwise, the source of that knowledge becomes questionable, often disregarded, and is unable to be academically referenced according to the current system of knowledge production (Wisner, 1995; Gaillard and Mercer, 2013; Albris et al., 2020; Gaillard, 2019, 2021).

The issues of terminology go beyond definitional inquiries requiring reflexive understanding of knowledge and power structures within DRR; “the hegemony of Western knowledge in disaster studies supports normative and standardised DRR policies and actions, which in many instances fail to consider the diverse realities of very different local contexts around the world” (Gaillard, 2022, p. 2). The current working definitions of disaster and DRR are a predominantly Western construct (Bankoff and Hilhorst, 2009; Pelling and Dill, 2010; Kelman, 2018; Gaillard, 2019, 2021, 2022). However, research from the perspective of the vulnerability paradigm was meant to enable local scholars to lead research within their own countries (Lewis, 1979), or research driven by local people through genuine participatory research outside the academic environment (Wisner et al., 1977; Gaillard, 2019). I endorse this initiative of enabling local scholars to lead research within their own countries in order to produce context-sensitive knowledge from within their own standpoints (Gaillard and Peek, 2019). An urban dweller has a very different perspective on risk and PAMs as compared to residents of the mountainous regions. While offering universal guidance for everyone might be a simpler solution it does not mean that universal guidance would be the best alternative for effective DRR. Rather, a perspective that incorporates local perspectives and standpoints has the capacity to be more just, as well as potentially generating PAMs that are more embedded in the local practices and culture, which can be tested for effectiveness.

Standpoint theory is a people-centred approach that from the very beginning considers contextual elements and power dynamics, arguing that marginalised perspectives bring unique knowledge (Harding, 1991). Marginalised perspectives may provide insights about local practices and environmental circumstances that are first-hand and undistorted. The other social classes' standpoints about, e.g., rural mountainous regions, local knowledge, and people are distorted because they can only imagine or assume what the circumstances for mountainous communities must be like (interviews, 2017 in Ramkumar, 2022). Unless there are open channels of dialogue where each stakeholder's contributions are valued, marginalised standpoints rarely take the form of testimony or spoken assertions, because marginalised perspectives are not given the space to be expressed formally, or when expressed informally, are rarely valued. Much of local people's involvement in the processes of generation and implementation of PAMs happens only at the very end when some information from a top-down technocratic process may reach them.

4 Discussion

Current DRR approaches to knowledge generation, dissemination, and implementation still rigidly stick to “top-down” production

methods (Wisner, 1995; Bankoff and Hilhorst, 2009; Mercer et al., 2009; Mercer, 2012; Gaillard and Mercer, 2013; Weichselgartner and Kelman, 2015; Donovan, 2017; Baumann, 2020; Chmutina et al., 2021; Gaillard, 2021, 2022), with many case studies that can be cited of unfortunate attempts to offer knowledge that have had the opposite effect when socio-political and cultural factors and other perspectives have been ignored. DRR knowledge production that includes scientific, social, and cultural knowledge remains challenging, particularly in operationalisation at the science-policy-practice interface (Gaillard and Mercer, 2013; Weichselgartner and Pigeon, 2015). Weichselgartner and Pigeon (2015, p. 115), among others, suggest that the next steps in DRR require “a shift in focus from the production of risk information per se towards co-produced risk knowledge that is understandable and actionable by different kinds of users.” Risk perception is influenced by social interactions through which we form the beliefs that play a large role in the meaning-making process and in interpreting information about ourselves and the world around us. Preparedness beliefs align with what people believe preparedness means, how personal understandings of disaster impact and affect one, and how one might deal with disasters (Becker et al., 2013, 2024; Solberg et al., 2010). When risk perception is low due to optimistic bias, where people believe that an event is unlikely to occur, or the resulting impacts will not actually affect them, then people are not as inclined to prepare for disasters (Becker et al., 2013). Optimistic bias affects people’s beliefs in that they hope disasters will not happen and are thus unlikely to prepare. Beliefs, such as helplessness due to a lack of control, also influence people’s thinking and can also often lead to non-preparedness. When individuals feel that there is nothing that they can do about natural hazards, they locate the locus of control externally in relation to themselves. “A belief that they had no control over what nature can do was reflected by some in saying that events such as earthquakes were an ‘Act of God’, ‘We are in the lap of the gods’, are at the whim of ‘mother nature’, or that ‘We are at the mercy’ of hazard events” (Becker et al., 2013, p. 1714–15). According to Becker et al. (2013, p. 1718), “[m]ost interviewees did actually think that it was important to undertake a degree of preparedness, but this belief did not necessarily lead directly to adjustment adoption because of interaction with other beliefs or contextual factors.” DRR advice, instructions and guidance have varying degrees of impact on the listeners and end-users, affecting what information they gather, retain, and choose to act on (Albarracin and Hart, 2011). Context-sensitive delivery mechanisms are thus vital for proper dissemination of DRR knowledge. The current DRR narrative, a predominantly Western construct, cannot account for different understandings of risk; there are fundamentally different interpretations, evaluations, interests and values between scientists, policymakers, experts, and laypersons. While different epistemologies and ontologies of risk exist, these are seldom heard of, researched, or incorporated into current DRR literature and practice (Ramkumar, 2022, 2025).

4.1 Epistemological, institutional, and strategic gaps in disaster risk reduction

Practitioners in the field, NGOs, and experienced others working on the ground with communities have been advocating for people directly affected by disasters to have a more substantial involvement within the DRR processes of policy development and actions implementation. While this push for a community-based DRR has

gained some attention over the last few decades, Gaillard and Mercer (2013, p. 93) reinforce the words of Long and Long (1992) by reiterating that the field of DRR is “a battlefield of knowledge and action.” Often, during the clashes between knowledge and action factors, the outcomes derived are of poor quality, resulting in intangible reduction of risks. Unfortunately, the most vulnerable people, who are thus impacted directly by these outcomes, endure the greatest losses. “The escalating occurrence of disasters also reflects an inability to bridge the gap between local and scientific knowledge, and bottom-up and top-down actions in DRR” (Gaillard and Mercer, 2013, p. 94). This extant prominent gap hampers attempts at achieving DRR.

[The inability to bridge the gap] is clearly evident in the dominant top-down, homogenizing DRR strategies utilizing global scientific knowledge on hazards and vulnerability, on the one hand, and the context-specific nature of local knowledge and community-based actions on the other hand (Wisner et al., 2012b). Such a gap in the scale of actions and knowledge is considered a major obstacle for reducing disaster risk in a sustainable manner and on a large scale (Wisner, 1995 in Gaillard and Mercer, 2013, p. 94).

In Table 1, Albris et al. (2020) outline three types of gaps, namely epistemological, strategic, and institutional, which appear in the contexts of knowledge transfer, disaster expertise, and risk awareness. Briefly, these challenges for the DRR science-policy interface are as follows. Albris et al. (2020) identify an epistemological gap between scientists and policymakers who do not share the same views on the types of knowledge they promote as valuable. This extends and evolves further into a strategic gap if there is a lack of communication and cooperation between scientists and policymakers. The institutional gap consists of different organisational barriers that function like invisible red tape, preventing closer, deeper, and improved engagement and integration; “[T]he turn to [DRR] warrants an increased focus on vulnerability and on resilience, but it is less clear what forms of expertise are demanded of professionals in public institutions to lift the challenge of reducing risks” (Albris et al., 2020, p. 10).

Another way to analyse the institutional gap is to assess it in terms of its direct and indirect consequences. The governmental focus on international-level institutions and treaties, along with the growing emphasis placed on local-level community-based actions, creates institutional lacunas, which tends to hollow out the role of the government and national-level involvement from the DRR landscape. This can be seen often, as governments mobilise the narrative of “community resilience” as a means to forgo their overall responsibility for DRR, transferring this to the communities themselves (Pelling, 2011; Brasset et al., 2013; Bulley, 2013; Evans and Reid, 2013; Joseph, 2013; Chandler, 2013, 2014a, 2014b; Pugh, 2014). There is a need to be cautious when utilizing the concept of resilience. Bulley (2013, p. 271–2) questions why poverty and inequality are entirely absent from the community resilience agenda and offers an explanation: “Because this would require local and central government spending and policies targeting ‘equity in hazard vulnerability, focusing on poorer areas’ of the community.” Since this is not the focus, in an ironic twist, the governance of community through resilience “ends up necessitating the disastrous circumstances it ostensibly secures against.”

A promotion of the discourse of (community) resilience is often used as a form of neo-liberal governmentality (Evans and Reid, 2013; Joseph, 2013; Chandler, 2014a, 2014b) and has thus become an “increasingly dominant mode of Western intervention in the global

TABLE 1 An analysis of three issues with respect to the science-policy interface for DRR (Albris et al., 2020, p. 7).

Context	Gaps		
	Epistemological	Institutional	Strategic
Knowledge transfer	The transfer of knowledge is a messy process, as science must rest on a basis of uncertainty, making it hard to provide clear-cut policy recommendations	Institutional structures that can facilitate transfer of knowledge from science to policy, and vice versa, are often non-existent or ineffective	Due to lack of common strategic visions, knowledge transfer tends to take place within sectors rather than across them, and in an <i>ad hoc</i> rather than systematised manner
Disaster expertise	Disaster experts are needed to act as mediators of science for policy in both policy and academic domains	There is a lack of platform and arenas in which discussions and exchange of best practices can occur between scientists, practitioners and policymakers	While international frameworks focus on capacity building, risk educating, and cross-sectoral training, there is a lack of efforts to invest long term at the national and local levels
Risk awareness	The need for specialised terminology underpinning scientific inquiry hinders communication with the policy domain and the public	Scientists are but one group in a multitude of different stakeholders that compete for funding and the attention of policymakers	A lack of communication and identification of needs between the scientific domain and the general public

South” (Pugh, 2014, p. 314). Chandler (2013) asserts that resilience discourse facilitates the evasion of Western responsibility for the outcomes of Western interventions, which problematise local practices and understandings as productive of risks and a hindrance to progress. Brassett et al. (2013) concur, highlighting that resilience shifts responsibilities of risk management to the individual.

Note how the new form of words used [...] is ‘community resilience’ as well as ‘responsibility’ in the broader domain of disaster management. The danger is that local participation becomes a low-cost way for the state, and the elites it represents, to off-load the duty of care and cost of social protection onto risk bearers themselves. So, while these phrases sound innocent enough, their misuse can produce either co-optation, or an excuse for benign neglect by the state, or both. ‘Community participation’ is subject to the same distortion and misuse (Wisner, 2020, p. 244).

Communities on their own cannot ensure DRR over long and sustained periods. They require assistance from national and local governments in order to become enabled in a more enduring manner. “Indeed, the accessibility of necessary resources to those most vulnerable is often dependent on actors and forces which lie outside a community” (Gaillard and Mercer, 2013, p. 97). Communities require assistance in a sustained manner, with a longer-term focus, rather than a sole reliance on disaster aid after a major disaster event, which also may not reach some of the most affected.

4.2 Protective action measures and campaigns

PAMs are used for DRR to signal appropriate action that should be taken during events like earthquakes. “Duck, cover and hold” (DCH) is an example of an earthquake PAM that is widely recommended, universally accepted, and adopted as the best guidance to follow in the case of an earthquake. As I argue, generalisation for universal applicability (the assumption that rules can be applied universally across different contexts) can be problematic; therefore, the practical dimensions of this DRR heuristic require deep critical scrutiny on a context-by-context basis.

Since I am interested in the contexts of Nepal and Aotearoa/NZ, which both endorse DCH, I examine the mechanisms in place (if any) that act as a set of checks and balances to gauge the usefulness, relevance, practicality and/or effectiveness of the PAM. Currently, although it is endorsed in Nepal, there is no literature available measuring or analysing the (un)suitability of DCH; therefore I commence with the available literature in the Aotearoa/NZ context before offering some perspectives on DCH in Nepal.

A public earthquake drill, Whakahaumarū Aotearoa/NZ, was organised in 2012 and 2015 (every 3 years).¹ McBride et al. (2019) specifically examine and define results of observational studies carried out after Aotearoa/NZ’s drills, and consciously shift their examination’s focus and research, exploring a range of barriers to drill performance by using qualitative analysis and specified questioning. Their article specifically examines whether people took the prevalently accepted recommendation to DCH. In their view, “protective action campaigns have merits in that they provide people with actions they can do to increase their chances of survival in a major earthquake or other threat” (McBride et al., 2019, p. 7).

McBride et al. (2019) see the value of PAMs through the idea of “positive outcome expectancy,” whereby the belief in an increase in survival chances as a result of specific actions means that people are “more likely to undertake [such] action” (2019, p. 7). The ShakeOut drill’s messages were extremely consistent in Aotearoa/NZ, across regional and local councils. “The consistency of messages is a key ingredient of successful communication of public education information” (McBride et al., 2019, p. 4). In Aotearoa/NZ’s 2012 drill organisational partnerships consisted of major public service organisations that formed a committee coordinated by the Ministry of Civil Defence and Emergency Management (MCDEM), The Ministry of Health, Transportation, Education, Defence, Internal Affairs, Police, and Fire Services. In Aotearoa/NZ the drills attempt to aid in the development of procedural knowledge required in performing DCH. Procedural knowledge here refers to knowledge

1 Thereafter, in 2018, there was a concerted effort to have annual national ShakeOut Drills and practise tsunami hīkoi (evacuation walks) for coastal areas; see <https://getready.govt.nz/involved/shakeout/>

that underlies the physical performance of actions rather than a conceptual form of knowledge. “For the ShakeOut drills, participants are encouraged to “drop,” and then find “cover,” (e.g., specifically under strong tables/desks) and ‘hold’ onto the furniture” (McBride et al., 2019, p. 1). The ShakeOut’s focus is on protective action; there may be elements of preparedness messaging (a focus of prior campaigns), but it aims to train people to take specific PAMs, like performing DCH during earthquake drills, to prepare for what to do in real earthquakes (McBride et al., 2019). Other campaigns were held in addition to the ShakeOut in 2012. “Get Ready, Get Thru,” another effort the MCDEM managed in 2006, similarly aligned with the ShakeOut’s key messages. The “Get Ready, Get Thru” campaign was social marketing-based and focused on television commercials, in addition to a website, brochures and emergency planning support for households. Other preparedness campaigns included the “Happens.nz” website (which now redirects to getready.govt.nz), guiding households with suggestions like food, water, and emergency supplies storage. The ShakeOut drill encourages wide participation of community groups, governmental agencies, and businesses. Participants are asked to sign up online and are informed of an appointed time to DCH, while ceasing other activities. Although drills have large groups of registered participants, it is worth noting that registration does not imply participation (Becker et al., 2024) to the fullest intended extent, as there are some barriers to drill performance for certain groups of people. Some regional and local councils considered much caution in holding the drills, particularly for the Waitaha (Canterbury) region, which was highly impacted by the earthquakes and where their devastating effects were still vivid in the minds of local people. The caution stemmed from the trauma experienced and possible triggers that could be set off during a life-like stimulation that so closely resembles the real-life earthquake scenario (Interviews, 2019 in Ramkumar, 2022).

Crucially, however, our analysis found that across all participants, regardless of having participated in the drill or not, people were more likely to report the correct action to take in an earthquake when the hypothetical scenario was based inside (51.6% correct), than when it was based outside (14.1%). This difference points to a potential education gap in the knowledge of those surveyed [...]. These results highlight the important role of ShakeOut in teaching about earthquake response behaviour in varied contexts (i.e., walking outside or driving). (Vinnell et al., 2020, p. 6).

The development of the 2015 ShakeOut was markedly more “social” than the one held in 2012, using social media platforms like Twitter and Facebook, and media influencers. Aotearoa/NZ-based celebrities, including Sir Peter Jackson (director of *The Lord of the Rings* Trilogy, filmed in Aotearoa/NZ) were highlighted as participants in a YouTube video campaign; videos also aired on national television as commercials. By publicity standards a highly marketed event, it nevertheless drew similar numbers of participants as in 2012, when a single YouTube video was created, in which Dr. Kelvin Berryman, a renowned local geologist, explained why Aotearoa/NZ is “so shaky” (McBride et al., 2019). Why is it that more social media marketing did not convince more people of the importance of participation in drills? Tools like social media channels are only a part of the risk communication process.

The notion of risk communication as a process is too often overshadowed by a singular focus on products such as apps, maps, graphs, games, posters and posts on social media. These can be important tools, but they should have a clear purpose, rooted in a wider strategy that nurtures inclusive, informed and ongoing conversations that support decision-making over time (UNDRR, 2022, p. 126).

Definitions calling for a more inclusive and interactive risk communication process between individuals, groups, and institutions were published 30 years ago (US National Research Council, 1989). However, most risk communication initiatives currently remain top-down and poorly evaluated (UNDRR, 2022).

Consider, in this light, the advice to remain under doorframes and the transition to DCH. Prior to the popularisation of the DCH advice, people were advised to get into a doorway/under a door frame (USGS, 2009). “For example, official advice to stand in doorways has historically been given in NZ, while other countries with less stringent or less earthquake-focused building codes do encourage immediate exit of buildings” (Vinnell et al., 2022, p. 6). In unreinforced masonry structures and adobe homes, the door frame was sometimes the only thing left standing in the aftermath of an earthquake. This was based largely on old photographs of doorways still standing in otherwise collapsed buildings (Andrews, 2018). Therefore, it was thought that safety could be found by standing in doorways. However, in modern homes, doorways are not stronger than the rest of the house and houses usually have swinging doors that can cause injuries. Thus, since about 2009, standing in doorways is no longer recommended, being outdated and offering insufficient protection (USGS, 2009). However, the Waikirikiri (Darfield) Earthquake happened at 4:00 am, and most injuries were caused by people getting out of bed and moving to doorways/frames (Johnston et al., 2014).

Moreover, Subedi et al., 2020 and Subedi and Hetényi (2021, p. 11) still recommend this for the context of Nepal: “if one is on a higher floor, it is better to hide under a strong table or doorframe.” Without research and testing in local contexts, the suitability of such advice for effective DRR in Nepal remains unclear. In a study conducted by Whitney et al. (2004) in Southern California, a context with modern homes, most respondents were still under the strong impression that door frames could offer protection. This indicates that protective action messaging, especially concerning the (un)safety of doorways, was not yet updated or sufficiently communicated to the public until about 5 years later. According to Horspool et al.’s (2020), analysis of the 2016 Kaikōura earthquake in Aotearoa/NZ, those injured by taking cover in a doorway/frame amounted to 10%. My Google Trends comparison between the queries “duck cover and hold earthquake” and “doorway earthquake”² (Figure 2) shows concerning results. World-wide,³ English speakers with internet access were still seemingly under the impression that doorways could offer protection, based on their search history. It appears that on average, interest in both queries has been roughly comparable until as recently as 2020,

2 <https://trends.google.com/trends/explore?date=all&q=duck%20cover%20and%20hold%20earthquake&q=doorway>

3 There are limitations to using Google Trends. Searches for region-specific information resulted in the response that there is not enough data at hand.

when the DCH query then overtakes the doorway query. This suggests that people were (or could still be, as [Figure 3](#) indicates) under the impression that standing in a doorway might be an effective earthquake PAM, despite the emphasis put on campaigns advising the use of DCH.

The most popular instance for the search “doorway earthquake” in July 2019 correlates to two earthquake events: the Ridgecrest sequence, Southern California, US, and Batanes sequence, Itbayat, Philippines. Since drills recommending DCH have been held in Southern California since 2008, it is noteworthy that more than a decade later in 2019, people in California were still searching “earthquake doorway” in such a large percentage. This correlates with the findings of [Adams et al. \(2017\)](#) and [Kano et al. \(2009\)](#) wherein both surveys found that people in California remained misinformed, believing that the doorway is the safest place inside buildings. [Adams et al. \(2017, p. 1\)](#) assert that, despite many years of educational campaigns people have not “completely processed what actions are most important to take during an earthquake.” This is, according to [Kano et al. \(2009, p. 17\)](#) because “numerous, uncoordinated programs makes it difficult for the public to identify clear and consistent messages on which they can act.” DCH, which is the almost universal advice given by experts currently, was not as popular historically, nor was it considered something to do in every environment or context to ensure safety (Interviews, 2019 in [Ramkumar, 2022](#); [McBride et al., 2019](#)). Internationally, DCH messaging was only increasingly used after the first Great California ShakeOut in 2008.

From 2001 to 2008 in Aotearoa/NZ, DCH was not mentioned, let alone highly recommended in published literature or pamphlets of recommended activity and preparedness messaging (Interviews, 2019 in [Ramkumar, 2022](#); [McBride et al., 2019](#)). Only after 2008 did DCH gain popularity and become a widely suggested earthquake PAM in Aotearoa/NZ. People did not perform the DCH PAM in 2010 and 2011 earthquakes in Aotearoa/NZ because it had not yet been popularised, which “aligns with the findings that people in Christchurch who were recorded on closed circuit television (CCTV) footage during the 2010 Darfield and 2011 Christchurch earthquakes did not undertake the DCH action. This suggests DCH information had not been made widely available” ([McBride et al., 2019, p. 4](#)). Current campaigns, like the Happens NZ, have now incorporated DCH. This campaign addresses people’s “optimism bias” – i.e., when people comprehend and expect that a large-scale disaster could affect them but also believe that they will have no issues, and would survive the event, even in cases where no precautions or prior preparatory actions were taken (Interviews, 2019 in [Ramkumar, 2022](#); [McBride et al., 2019](#)).

Further research in Aotearoa/NZ has evaluated the usefulness of DCH after its promotion through the Shakeout campaigns and examined whether its actual performance might be achievable. A series of tests prove that situations during the course of an earthquake may inhibit the performance of DCH. [Lambie et al. \(2017\)](#) found that few people took PAMs. In particular, only 1.3% dropped, and 26% held on to something, which is similar to the findings of [Lindell et al. \(2016\)](#), where only 7.2% took cover during the Christchurch earthquake. “Full actions may not be entirely achievable, depending on the peak ground acceleration (PGA) after the earthquake and shaking intensity felt during an earthquake and further found that it was difficult for people to stand or to move in 0.5 g or greater shaking” ([McBride et al., 2019, p. 4](#)). Research is needed to establish how long it actually takes to get into the DCH position and to determine whether actions can be completed in a high PGA earthquake with

prolonged shaking. [Porter and Jones \(2018\)](#) found that in their sample (size: 525) composed of a diverse group of people (in terms of gender, race, and ages), most took between 5 and 15 s from start to finish to DCH entirely. This study was conducted on participants in a non-shaking environment where DCH was practised in response to a fictional earthquake early warning message.

During earthquakes, there is little or no evidence that demonstrates that people hold the DCH position for the entirety of the shaking. [Lambie et al. \(2017\)](#) found that in the Darfield and Christchurch earthquakes, most people did not start in the DCH position, and if they did, they did not stay for all of the shaking ([McBride et al., 2019, p. 6](#)).

Moreover, behavioural studies from surveys and analysis of closed-circuit TV footage in Aotearoa/NZ revealed that during earthquakes, the most common action was freezing, and <20% of people used the recommended DCH in the 2016 earthquake, while no one performed DCH in the footage from the Christchurch earthquake ([Horspool et al., 2020](#); [Vinnell et al., 2022](#)). One of the most common reasons for not using DCH is prioritising other actions. [Vinnell et al. \(2022, p. 6\)](#) report on some actions that were likely “intended to protect the individual including going outside, standing in doorways, or following building procedures. Some of these actions are likely influenced by conflicting messaging.” [Vinnell et al. \(2020\)](#) recommend that future drills should address the issues and gaps currently observed in public knowledge and action.

In addition to this, not everyone felt catered for in the 2012 and 2015 ShakeOut; this is highlighted as a problem for drill participation (Interviews, 2019 in [Ramkumar, 2022](#)). [Tipler et al. \(2016\)](#) suggest that future messaging should include needs-specific training, encouraging people with disability and fragilities to learn, practise, and use a tailor-made PAM. If tailored messages with instructive pictograms were provided, a greater number of people with disabilities may participate. Currently, on the official website of the ShakeOut there is no specific advice and instructions offered that cater for people with disabilities who would like to participate in the drills, although the Get Ready website does offer advice on preparation for earthquakes for people with disabilities. The Royal Aotearoa/NZ Foundation of the Blind has a guide for people with sight impairment (made available through the Get Ready website).

In the current epistemic framing, in which expert-generated PAMs are developed, PAMs are used as a heuristic signalling appropriate action to take during earthquakes. DCH is widely recommended, universally accepted, and adopted as the best guidance to follow in the case of an earthquake. Generalisation for universal applicability can be problematic; therefore, the practical dimensions of this DRR heuristic require further research and understanding of impacts on a context-by-context basis. In the Aotearoa/NZ context, which endorses DCH, DCH messaging only became popular after 2008. Before the shift to DCH messaging, taking “shelter in doorways” was popular, although this is no longer recommended. Nevertheless, this advice is still offered as a PAM in the context of Nepal, and English speakers worldwide seem to still have the impression that doorways may offer protection during an earthquake event. This means that beyond the testing for suitability required for PAMs in different contexts, protective action messaging requires further research and understanding to improve and achieve effective DRR communication.

4.3 Evaluation on the recommendation of DCH within Nepal

Since no prior literature was available on evaluation of risk minimisation guidance in Nepal, I sought out what types of education, advice and guidance was currently in use. I used group and individual interviews to ascertain whether any prior evaluations were formally or informally done, or if there were any plans to review PAMs and messaging in the future.

4.3.1 Factors that impact the implementation and performance of PAMs

The Kathmandu Valley Earthquake Risk Management Project (KVERMP) was implemented by National Society for Earthquake Technology (NSET) in 1997–99 in collaboration with GeoHazards International, the Asian Disaster Preparedness Centre, and the US Office of Foreign Disaster Assistance. The KVERMP included the development of a school earthquake safety programme (SESP), NSET's "most successful program" (Dixit et al., 2013, interviews, 2017 in Ramkumar, 2022; Dixit et al., 2018, p. 21) for making schools safer, creating earthquake awareness, and DRR. The programme began with seismic retrofitting of school buildings, and/or earthquake-resistant reconstruction. However, materials for retrofitting are not readily available in Nepal: "On all pilot retrofitting sites, the highest proportion of costs was for materials that could not be sourced locally, such as cement, steel bars, GI wire, CGI sheets, and paint [...] materials came to more than 60% of the overall construction costs" (NSSP, Learning Brief, 3). Although costs may be a barrier to the import and use of materials to retrofit buildings, nevertheless during the Gorkha earthquakes people were made aware of the safety of several retrofitted schools that were able to withstand the shaking. These examples also served an educational purpose as communities took shelter in retrofitted school buildings during the earthquakes and in the days after, rather than staying in other non-retrofitted structures affected by the earthquake. Some buildings are visibly hazardous and vulnerable to damage in earthquakes (NSET Vulnerability Tour, 2017 in Ramkumar, 2022) where building designs do not comply with national building codes (NBC) or safety standards. Arendt et al. (2017, p. S174) report: "In 2013 and 2014, NSET assessed more than 100 buildings and found that masonry buildings were typically noncompliant. They observed that significant numbers of architects and engineers did not understand earthquake-resistant design or the NBC. Some of the hesitancy to embrace the NBC may be the result of perceptions that the cost of incorporating seismic standards in new construction is excessive. NSET has acted to counteract this perception by making it known that the cost increment is small and worthwhile." Moreover, in 2022, the Japan International Cooperation Agency (JICA) did a similar assessment survey and found that in some areas, such as concrete strength, the compliance rate to the NBC was only 2% (NBCC JICA Project, 2022).

An example of NSET's initiative for DRR education is the shake-table demonstration performed with local people in different areas. Shake-tables demonstrate how construction risk-reduction techniques help buildings withstand earthquake forces. Two identical buildings, one built using earthquake-resistant techniques and one without, are exposed to forces that buildings endure during earthquakes: the weaker building collapses. This raises awareness about safe building construction. Education at government schools undergoes crippling transformations

during disasters and post-disaster uncertainty. Under normal conditions, children from outlying communities travel great distances to attend school for a few hours and must travel the great distance again after (field observations, field notes, interviews 2017 in Ramkumar, 2022). Education in hill tribes/ethnic clans often comes largely from other children (Burbank, 1995). Tuladhar et al. (2014, p. 204) analysis shows that most students do not have adequate knowledge of disasters or mitigation methods: "Although 94% of the questioned students have experienced a disaster, [...] They do not think that disaster readiness behaviours and disaster adaptation are important tools for DRR [...] Likewise, they are not aware of associated or secondary disasters that usually follow a major disaster." Sometimes when there is awareness, the ability to do something about it can also be problematic. "Schools are eager to make their buildings safer – but technical expertise is hard to come by" (NSSP, 2018, p. 4). In response to the shortage of technical experts, NSET has offered mason training for earthquake-resistant construction, and several programmes for enhancement of emergency response.

NSET has set up annual Earthquake Safety Days (ESDs), community-level disaster preparedness and planning, and collaboration with community and private radio stations to propagate earthquake safety messages (NSET Group Interviews, 2017 in Ramkumar, 2022). In interviews with Omkala Khanal (2017 in Ramkumar, 2022), NSET's social development officer responsible for dissemination of knowledge to communities, it was revealed that messages for earthquake safety were being conveyed through cartoons, local song, and through dance compositions that resonated with certain groups. During the ESDs, guidance like DCH is taught as the primary PAM that should be taken in event of earthquakes; this is also taught within schools (interviews, 2017 in Ramkumar, 2022). However, according to interviews and field reports (2017 in Ramkumar, 2022), universally well-recognised PAMs like DCH proved counterproductive within the context of Nepal during the 2015 Gorkha earthquakes. At that time, people were under the mistaken impression that it was safer to run into buildings to DCH rather than stay outside, away from hazardous buildings, resulting in an avoidable loss of lives.

Although NBC exist, they are seldom used in construction, thus leading to highly unstable buildings that cannot withstand shaking during earthquakes (Awale, 2022; Maharjan, 2022). "More worrisome is that whatever has been rebuilt in Kathmandu Valley mostly flout building codes and permits. The Gongabu neighbourhood saw 160 deaths in 2015, most of them were crushed under illegally built concrete structures. Most of those high rises have been rebuilt using the same faulty techniques" (Awale, 2022, online). During a NSET group interview (2017 in Ramkumar, 2022), a senior official responded to questions about DCH and its effectiveness for the context of Nepal by frankly acknowledging that "we have never done any checks/tests to ascertain if DCH was the proper PAM to take with our types of buildings" (Interview N8, Nepal, 2017 in Ramkumar, 2022).

Subedi et al. (2020) have led efforts to promote earthquake education in schools and in a short space of time (approximately 2 years) have established the Seismology at School in Nepal programme. The framework has been implemented in 22 schools (out of more than 100 that submitted a request form to participate) where the Nepal School Seismology Network (NSSN) was established. The authors have found that schools play a vital role in imparting

common values and culture, and students were very interested to learn about earthquake science but lacked the basic initial knowledge to start the process. Educational activities involve students, teachers, and communities. Educators gave positive feedback on the workshops and “after the conference; a school principal expressed his gratitude because we were more worried about their earthquake safety than they were” (Subedi et al., 2020, p. 10). During the workshops’ open ask-me-anything session, experts who were presenting received queries for clarifying terms and concepts, but also questions like: “Which discipline studies the relationship between Hinduism and earthquakes?” (Subedi et al., 2020, p. 9), which prompted insightful discussions. This effort is an example of research led by local researchers and supported by foreign experts, which enabled effective and substantial collaboration on the project and reduced the time required for the overall research work and steps for actions. “An excellent knowledge of the region’s geography and social relations, as well as communications skills were required [...]. The non-Nepali co-authors of this work believe that foreigners alone would have had no chance to start and implement this project due to a lack of sufficient local contacts and knowledge of Nepali society” (Subedi et al., 2020, p. 6). The educational materials used across the NSSN are based on international seismology initiatives, mostly from “developed” contexts—UK, US, EU, and Australia—and expert suggestions and experiences. The authors claim the materials are adapted for Nepali school systems and language. The flyers produced for dissemination and awareness are adopted from the original, designed by the Earthquake Education Center, Switzerland and translated into Nepali. Bolakhe (2025) describes more recent initiatives by Subedi.

4.4 In favour of contextualised protective action measures

Some people in Nepal are currently taught at school level (and beyond in ESDs) that DCH is the most suitable PAM to take in case of an earthquake; however, there are no qualifying stipulations or contextual guidance, for example “DCH if one is unable to go outside,” etc. Testing of PAMs is necessary to ascertain what the most suitable and effective context-sensitive PAMs are, and thereafter, educational messaging for DRR needs to change accordingly. It should not be assumed that people would automatically have the required situational awareness for application of PAMs, especially as these are high-stakes contexts where decision-making is done under pressure and time constraints. Therefore, prior testing and training are an invaluable part of the larger DRR knowledge processes for eventually recommending PAMs and knowledge for use. Lack of awareness or removal of situationally influencing factors from the outset of research without duly considering and deliberating on the impact of effects can prove disastrous during the stages of dissemination – and fatal during real-time application while facing life-threatening risks. Testing may not render PAMs completely error-free in their practical application, but the margin of error can be reduced. As detailed above, during my fieldwork I learned of tragic examples of PAMs that had adversely affected people during the Gorkha earthquakes, where dissemination of contextually inappropriate “assistive” knowledge had caused more fatalities. “In school programmes children are taught to DCH but many buildings

are non-engineered” (NSET interview, 2017; Cf. Arendt et al., 2017; NBCC JICA Project, 2022). Although simple guidance like DCH has only gained popularity in recent years, the overall effectiveness of the measure has not been critically analysed in most cases where it is encouraged. I gave accounts of cases within Nepal where DCH has proved counteractive, because although building codes exist, they are seldom used in construction, leading to highly unstable buildings that cannot withstand shaking during earthquakes. Thus, if people are outside during an earthquake, it is perhaps contextually advisable to stay outside, further away from buildings. Tragically, during the earthquakes, people who were originally outside ran into unsafe buildings to perform the DCH PAM, resulting in more lives lost in building collapse.

What researchers and experts may assume and perceive as unproblematic may actually be problematic and a cause for concern with local people who would act on expert assertions. Expert assertions, especially within the DRR domain, tend to have lasting impressions on people and shape their perceptions of suitable PAMs, as evidenced by peoples queries in Figures 2, 3. I also discuss how outdated expert advice like sheltering under a doorway was currently recommended in Nepali educational programmes (Subedi et al., 2020; Subedi and Hetényi, 2021) without testing for effectiveness as a PAM. While I appreciate DRR educational efforts like Subedi et al. (2020), I have argued against knowledge generated for “developed” contexts being taught in a “developing” context like Nepal without first testing for contextual suitability, DRR effectiveness, and having local inclusion. Moreover, it would be preferable to begin co-producing context-sensitive educational materials and PAMs for the various contexts within Nepal by initially taking into account the in-country situational, cultural, and socio-political factors rather than employing the “adopt and adapt approach,” which proves unsuitable in the case of PAMs like DCH. For future research, a thorough evaluation and critical analysis are required for the context of Nepal to ascertain if current guidance and recommendations are suitable and effective for DRR, preferably before dissemination to avoid confusion and to enable consistent communication and risk minimisation messaging.

Furthermore, during my fieldwork (2017) I noted (Figure 1) that NSET advice for what to do in the case of an earthquake also recommended seeking shelter in “archways or doorways.” More concerning is that this advice is offered to people who are already outside and contradicts the advice to get out into the open, away from buildings and anything else that might fall on a person (Rapaport and Ashkenazi, 2019; Goltz et al., 2020). Moreover, the advice to never run out of a building during an earthquake event (Figure 1) requires further critical evaluation and testing, especially as NBCs are not widely implemented, which results in building and infrastructure hazards. This advice is contrary to current expert advice for countries where the NBCs are not usually followed/implemented (*ibid*).

Through fieldwork, I was able to ascertain that there were issues of concern with some of the current recommendations and PAMs in Nepal, such as, to seek shelter in doorways, archways or to use doorframes, and DCH without any contextual caveats. However, I was unable to return to Nepal to conduct further research due to the pandemic’s stringent travel restrictions. Conducting online fieldwork was not an option for rural mountainous contexts in Nepal, nevertheless, I offered a desk-based analysis of rural insights and knowledge in the larger project (Ramkumar, 2022).

5 Conclusion

Currently, PAMs like DCH are recommended for Nepali people across the entire country to perform in order to minimise their risks during earthquakes. Current research indicates that in countries with ineffective or poorly implemented building codes, the chances of being injured in building collapse are higher than being injured while trying to move during shaking. Therefore, the expert advice offered for these contexts often recommends exiting buildings as quickly as possible (Rapaport and Ashkenazi, 2019; Goltz et al., 2020; Vinnell et al., 2022).

From the generalised and universal perspective, both sets of PAMs (DCH and staying outside away from buildings) do not seem to have any inherent issues or flaws and are robust and sound risk minimisation guidance. However, this appears to be the case only if the context in which the PAMs are going to be used/applied is not taken into account. When context is taken into account for the application of suitable PAMs, one has to consider factors like the percentage or rate of earthquake-safe building code implementation, the materials used in the construction of buildings and structures in general, and the performance of buildings (in earthquakes) in various contextualised settings (urban, mountainous village, terai region). The under-consideration or omission of contextually situated factors, such as building codes, code implementation rates, etc. may make a larger number of PAMs seem problem-free, possible alternatives, and good recommendations by way of risk guidance. Given that the goals of PAMs are to achieve the minimisation of risks and fewer fatalities rather than positing a number of probable alternatives, a context-sensitive approach for DRR is preferable to one that is universalistic. Moreover, both sets of PAMs should be researched further, assessed, and tested rigorously before being offered as contextualised PAMs.

This testing should be carried out with contextual sensitivity and an understanding of fundamental aspects of the local peoples' ontology/ies. People should be allowed to participate in DRR efforts on their terms, representative of who they are, rather than "force-fitting" into a Western framing of reality that has no meaning to non-Westerners. My proposal for participation based on Standpoint theory is that local agents should be given a meaningful, contributive place to offer input in the construction, testing, and implementation of PAMs for DRR. Western experts would also remain as participants, but not in their present roles of unilateral control of the DRR process. Discussions and conversations regarding the development of PAMs require local experts who lead the projects in partnership with Western experts. Local experts can also be social scientists who might have knowledge of working with different social groups, and thereby include the local communities' voices in the discussion phase of the process. Local knowledge would still need to be tested for safety, current applicability, and a reduction in any margins of error. Any knowledge to be disseminated for use in high-stakes contexts should be tested with participants to understand and ascertain its usefulness, safety, and impacts.

In the examination of standard decision models and rational theories, I found shortcomings in addressing hazard and risk contexts, particularly when attempting to apply generalised heuristics with high margins of error to high-stakes contexts (Ramkumar, 2022). To effectively apply DRR knowledge in the form of heuristics, decision-making contexts should include considerations of diverse backgrounds and geography, including cultural diversity, social variation, and

political dimensions. However, current formulations do not directly account for these factors in decision-making environments. Instead, generalisation is the favoured approach to have a single heuristic that can be widely or universally applied. Nevertheless, applied case studies show how more than a single heuristic is often required, and further rigorous thought and decision-making processes are needed for functioning beyond the single-generalised heuristic usage in decision-making contexts (Banks et al., 2020). Generalisation for universal applicability is not the best option for DRR efforts that require context-sensitive application.

Moreover, people in areas of exposure to relevant earthquake safety messaging and public communication seem unsure of the best PAM to take during an earthquake. Whether disaster communication is reaching its intended goals, especially protective guidance and measures remains unclear. Most risk communication initiatives currently remain top-down and poorly evaluated.

Societies consist of individuals with diverse backgrounds and unique living contexts, therefore the idea of a generalised, universal applicability of knowledge to any disaster context where people are involved requires critical evaluation. Generalisation for universal applicability, especially with regard to PAMs, is antithetical to the awareness of disasters as social constructs, indicating that the practical applicability of PAMs in DRR contexts requires critical analysis. If PAMs are meant to be used and make an impact by reaching their goals of minimising disaster risks for people, then this knowledge must be contextualised and co-produced with local persons and for local contexts, rather than the abstract, impersonal universal.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was obtained for the study on human participants from Durham University's Ethical Research Approval Committee. The study was conducted in accordance with the local legislation and institutional requirements. All participants provided written informed consent to participate in this study.

Author contributions

SR: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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