



## Examining the incorporation of small-scale recurring disasters in emergency management frameworks: Insights from Aotearoa – New Zealand

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### ABSTRACT

Risks pertaining to small-scale recurring disasters are generally not considered by emergency management policies. While their impacts are not immediately recognisable, their recurrent manifestation may result in cumulative as well as indirect impacts. Yet, small-scale recurring disasters both remain under-studied in disaster studies and are often not incorporated in disaster planning and policy. This paper contributes to filling this gap in knowledge by investigating the extent to which the emergency management framework of Aotearoa-New Zealand addresses small-scale recurring disasters through a targeted analysis of high-order policy documents. The findings confirm the incomplete reflection of risk identification related to small-scale recurring disasters in the documents analysed. The paper reaffirms that small-scale recurring disasters should be more explicitly integrated in disaster management policy regimes to eliminate the differences at the lower administrative levels of risk treatment. It also argues for the re-evaluation of short-term solutions (such as insurance coverage) that only improve recovery outcomes temporarily, and the consideration of long-term risk reduction policies for achieving more sustainable recovery outcomes.

### 1. Introduction

The world is being challenged by an unprecedented increase in the intensity and frequency of natural hazards due to global climate change. While we are seeing a lot of attention paid to large-scale extreme events (e.g., more intense bushfires and floods), small-scale disasters may also become more frequent as a result of climate change [1]. The importance of small-scale disasters has long been recognised in disaster literature dating back to the 1980s [2] in sociological, human-ecological and geographical perspectives. These include the works of Watts and Bohle, Bohle et al., Cannon [3–5]; and Wisner and Luce [6] which called for consideration of underlying factors of vulnerability to disasters. Such factors are important because they can potentially exacerbate the impact of small-scale recurring disasters in the local context [7]. The focus on small-scale disasters, however, lost traction in the decades that followed before regaining momentum around 2010 both by research (e.g., [8–10]), and practice [11]. Yet, some [1,2] argue that small-scale recurring disasters remain under-studied in disaster literature and, more importantly, fail to be effectively captured by emergency management policy and planning [10,12].

Despite limited empirical research in this area, there is evidence of the difference between the impacts resulting from intensive and exten-

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sive<sup>1</sup> disaster risk [13]. This calls for risks pertaining to different types of disasters to be separately analysed. However, in practice, small-scale recurring disasters tend to be treated through the emergency management regime as static disaster events. Additionally, emphasis is often given to tackle the immediately visible consequences through the application of short-term solutions rather than dealing with the root causes of disaster vulnerability and exposure [1,14].

Disaster literature has argued that recurrent and chronic disasters should be managed in new ways (such as assessment of vulnerabilities), and their associated risks should not be neglected during the pre-disaster stage [15]. Subsequent studies [1,16] described the importance of disaster risk reduction concerning small-scale recurring disasters as a means to reduce the cumulative impact attributed to the repetitive nature of these disasters. In particular Marulanda et al. [8], suggest that small-scale recurring disasters may obstruct the long-term sustainability of local communities because of their associated implications for economic, environmental and social processes. This calls for disaster management initiatives to pay greater attention to potential long-term recovery challenges posed by small-scale recurring disasters, by addressing the underlying risks communities may be exposed to in the first place [17]. However, literature reveals that small-scale recurring disaster policies remain ambiguous [2] despite the decades of research done in this area. Hence, it is important to investigate the extent to which small-scale recurring disasters are being incorporated into existing disaster management frameworks. This paper contributes to filling this gap in knowledge by investigating how risks related to small-scale recurring disasters are being appraised in Aotearoa-New Zealand's emergency management regime. Following this introduction, relevant literature on small-scale recurring disasters is reviewed. Next, the research methods and key themes guiding this study are explained. Based on findings, we discuss the implications for research and practice if small-scale recurring disasters are not fully considered in disaster management frameworks.

## 2. Small-scale recurring disasters and emergency management frameworks

There is a tendency for policies and corresponding disaster funding to focus on large-scale disasters with limited attention paid to small-scale ones [2]. A number of reasons are identified in the literature to explain this. First, such limited attention is probably influenced by the lack of a universally accepted definition in terms of both the scale and frequency of small-scale disasters, especially when those are recurrent [2,14]. Various terms such as everyday disasters, silent disasters, neglected disasters, invisible disasters [14], quotidian and chronic disasters [13] have been interchangeably used to describe small-scale recurring disasters.

Second, a number of studies [9,18,19] and organisations (The Global Network of Civil Society Organisations for Disaster Reduction [20]); have attempted to explain the scale component of small-scale disasters. Despite such attempts, in general, it is the magnitude of events - often associated with the number of deaths and larger financial impact, that receives most public attention and visibility [10]. Accordingly, two of the most popular international disaster loss databases consider different thresholds for a disaster event to be entered into their database, but without capturing the nuanced differences of small-scale recurring disasters. EM-DAT, an international database of natural and technological disasters maintained by the Centre for Research on the Epidemiology of Disasters (CRED), requires one of the following criteria to be fulfilled: 10 or more deaths, 100 or more people affected, or declaration by the

country of a state of emergency and/or an appeal for international assistance [21]. On the other hand, 'DesInventar' entries are not required to be enlisted based on thresholds [22]. If there are social losses, then an event is eligible for inclusion. It considers a broader spectrum of variables than EM-DAT, so that it can take into account a variety of spatial scales and break down 'small scale invisible disasters' into multiple, distinct types [23]. This terminology ambivalence and threshold inconsistency has implications for both scholarly research and practice.

Third, on the global scale, small-scale recurring hazard events are less likely to be considered as disasters [8,24]. This limits the global understanding about these events and curtails the prospects to further investigate them [13]. For example, there is limited understanding about at what point the level of exposure and vulnerability of places may determine the translation of small-scale hazard events into disasters [25,26]. Further, the lack of understanding of the social and economic costs that disrupt the lives of poor and marginalised communities also contributes towards the underestimation of small-scale recurring events [10]. Or, how weak local governance and poor planning issues may exacerbate the root causes of vulnerability, leaving communities and places more exposed to the effects of small-scale recurring disasters [13].

Last, the duration of small-scale events, and corresponding length of disruption they cause to communities, has been identified as a potential temporal factor that leads to their neglect in emergency management policy and planning [10]. It is not uncommon for some communities to be still experiencing the consequences of a previous small-scale disaster when a subsequent disaster occurs [2]. This makes it difficult to determine how much disruption, and for how long, a community experiences from each event.

In parallel, questions remain as to whether the risk component of small-scale recurring disasters are being adequately addressed by disaster management regimes [18]. In particular, the characteristics of the risks associated with small-scale recurring disasters are distinct [27], therefore requiring careful consideration by disaster risk assessments. For example, the United Nations International Strategy for Disaster Reduction (UNISDR) describes the risks embedded in small-scale recurring disasters as 'extensive risks', including risks associated with highly localised, repetitive, low or moderate hazard conditions leading to cumulative disaster impacts [28]. However, the threshold that determines the scale of extensive risks is left arbitrary [14,29], limiting the consistent use of the term.

The Global Assessment Report on Disaster Risk Reduction explains that extensive risks are a result of development related factors, which are both manageable and avoidable through the application of suitable disaster risk reduction measures [30]. A distinctive feature of risk pertaining to small-scale recurring disasters is its cumulative nature due to the continuous exposure of the affected communities [25]. Therefore, risk assessment methodologies should be customised to deal with small-scale recurring disasters in terms of cumulative, complex impacts. Risk assessments use both quantitative and qualitative methods to obtain a comprehensive description of what risks are and their causes [26]. The ISO31000<sup>2</sup> encourages scrutiny of cascading and cumulative effects in risk assessment and to recognise risk as an input for decision making [31]. This will help to curtail decisions being made based on common risk characteristics. In the disaster and emergency management literature, however, there is no single accepted definition of risk, with risk being generally described as a combination of hazard, exposure and vulnerability [32,33]. Additionally, as a general rule, risks associated with small-scale disasters are considered irrelevant [8].

<sup>1</sup> Intensive risk refers to high-severity major hazard events that result in catastrophic disaster impacts involving high mortality and asset loss; whereas extensive risk is associated with the high frequency low-severity hazard events that are often localised in nature leading to cumulative disaster impacts [28].

<sup>2</sup> ISO 31000 is a set of standards that relate to risk management codified by the International Organization for Standardization. Aotearoa-New Zealand has adopted ISO 31000 as its standard for risk assessment in the emergency management system [58].

Over the last few decades, global disaster risk reduction frameworks have recognised the application of disaster risk reduction (DRR) to addressing small-scale recurring disasters. For example, the Hyogo Framework for Action provided the wider dissemination of the DRR concept [34]. This was followed by the Sendai Framework for Disaster Risk Reduction (SFDRR) and marked a paradigm shift from reaction to disaster prevention. This means a shift from managing the disaster impact to managing and reducing the risks that create a disaster [35]. The SFDRR annotates that a better understanding of disaster risk and improvement of risk governance is necessary to reduce existing disaster risks. It advocates the promotion of DRR measures at the local level by decentralising, delegating, deconcentrating and empowering local authorities and communities [36].

At its onset, the SFDRR extends its application to small- and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or human-induced hazards as well as environmental, technological and biological hazards [36]. This suggests that the scale of the disaster would not determine the significance of that event for those affected [14]. While paragraph four of the SFDRR specifically states the term, small-scale recurring disasters and their impacts, it does not define the context in which the term 'small-scale' should be used. This ambiguity creates issues for its application, including challenges to reporting progress on the SFDRR's outcomes and goals [37]. In addition Zaidi [13], reports that indicators proposed by the SFDRR do not seem to sufficiently capture the indirect disaster impacts pronounced by extensive disaster risks. Importantly, without being systematically analysed, secondary and tertiary impacts resulting from potentially extensive risks of small-scale recurring disasters cannot be immediately captured and addressed by DRR policies [13].

Finally, the DRR concept is broadly applied to the development of policies and strategies (e.g., land use and urban development planning) aimed at reducing risks and vulnerabilities through the analysis of causal factors leading to disasters [28,34,38]. By considering small-scale recurring disasters, DRR approaches can have multiple benefits in the long-term. For example, the total cumulative impact of small-scale recurring disasters may be greater than large-scale events. Additionally, as their frequency and territorial spread increases, they may gradually develop into larger events. Hence, by reducing risks associated with small-scale recurring disasters, local disaster management strategies may be better prepared to deal with larger-scale disasters in the long run [39].

### 3. Methods

This paper adopts a targeted policy analysis of high-order documents to investigate the extent to which small-scale recurring disasters are being addressed by Aotearoa-New Zealand's emergency management regime. As a starting point, we searched the literature for a definition of small-scale recurring disasters that we could adopt in our research to define the spectrum of small-scale disasters. Although a commonly accepted definition is absent, we based our definition on Voss and Wagner's [9] work which considers small disasters as incidents that disrupt everyday routines and require adaptation and adjustment to social, cognitive, and material culture. They usually occur in the affected community and can be handled by the collaboration of local groups and stakeholders. For this study, we thus adopt a working definition for small-scale recurring disasters as 'events that impact a low number of people, have a risk level below the major and extreme threshold limits, or do not pose a threat to life. In this context, recurring events are those that occur at least two to three times during the past decade or at a greater frequency. Such events will often have relatively minor social, environmental, economic and cultural impacts as well as long-term cumulative impacts'.

To illustrate our analysis, we use Aotearoa-New Zealand as our case study. While the country is subject to frequent hydrological events such

as droughts and floods, and associated extensive financial losses [40–43], small floods occur more frequently than large floods [44]. These events, however, are underrepresented in cost estimates and studies which focus mainly on the direct insured flood losses [41], creating a knowledge gap. Additionally, Aotearoa-New Zealand has committed to the SFDRR, the Paris Agreement on Climate Change, and the Sustainable Development Goals which demonstrates its commitment to reducing and managing risks [45] thereby, making it a suitable case for analysis.

Aotearoa-New Zealand has been revising its policies and improving governance mechanisms to create a conducive environment for risk reduction and climate change adaptation to meet its international commitments [45]. The local legal mechanism which gives effect to the SFDRR in Aotearoa-New Zealand is mainly coordinated by the National Emergency Management Agency (NEMA) (formerly known as the Ministry of Civil Defence Emergency Management (MCDEM)). The primary statutory instrument giving effect to advocate the implementation of disaster recovery is the *Civil Defence Emergency Management (CDEM) Act*, which is framed around the 4R's: reduction, readiness, response and recovery [46].

The *CDEM Act* primarily aims to manage hazards, risks, and emergency response and recovery through the coordinated and integrated policy, planning and decision-making processes at the national and local level. It lays out the duties, functions and powers of central government emergency services, lifeline utilities and the general public [47]. The *CDEM Act* has statutory character and mandates both pre- and post-disaster event management [48], and is the primary element of the CDEM framework. The other constituents of the CDEM framework include plans and strategies, guidelines and technical standards and information and tools related to capability development. Under the *CDEM Act*, locally formed CDEM groups are tasked with the identification and understanding of hazards and risks affecting their local administrative areas. The CDEM groups formulate their respective group plans in accordance with the CDEM framework to fulfil its requirements.

#### 3.1. Data collection and analysis

Better understanding of disaster risks provides the basis for the entire DRR process [49]. This includes a clear understanding of how risks are being classified or scaled, and what kind of risk is being considered, or neglected, by risk reduction measures. Under the SFDRR, the DRR process aims to prevent new risks, reduce existing ones and strengthen overall disaster resilience. For this, it outlines four priorities for action: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience; and, (iv) Enhancing disaster preparedness for effective response, and to Build Back Better in recovery, rehabilitation and reconstruction. This paper aims to investigate how risks related to small-scale recurring disasters are being appraised in Aotearoa-New Zealand's emergency management regime. Therefore, our document analysis primarily focuses on the first priority of the SFDRR - understanding disaster risk. It is important to stress that our analysis only focuses on the national level policies and does not extend to specific procedures implemented at the local level by differing CDEM groups. To this end, three main themes guided the document analysis:

1. How is risk defined in Aotearoa-New Zealand's emergency management framework?
2. To what extent are risks associated with small-scale disasters considered?
3. To what extent is the recurrent aspect of disasters considered?

We selected thirteen key documents (see Table 1) to examine the above themes. Qualitative analysis software package NVivo was used for this. Based on ideas, themes and concepts found in the literature

**Table 1**  
Documents analysed.

Title	Year
Civil Defence Management Act (CDEM Act)	2002
Focus on Recovery: A Holistic Framework for Recovery in New Zealand	2005
NCDEM Plan Order	2015
CDEM National Capability Assessment Report	2015
The Guide to the National Civil Defence Emergency Management Plan	2015
Response Planning in CDEM: Director's Guideline for Civil Defence Emergency Management Groups	2015
Strategic Planning for Recovery - Director's Guideline for CDEM Groups	2017
CDEM Group Planning Director's Guidelines for Civil Defence Emergency Management Groups	2018
Recovery Preparedness and Management – Director's Guideline for Civil Defence Emergency Management Groups (A, B and C)	2019
National Disaster Resilience Strategy	2019
Draft Director's Guideline: Risk assessment guidance for Civil Defence Emergency Management (CDEM) Group planning	2021

[50], documents were searched for the following terms: 'small', 'small-scale', 'risk', 'extensive risk', 'recurrence', 'repeat', 'consecutive', 'acute', 'disaster', 'natural hazard', 'localised', 'continuous', 'cumulative', 'aggregate', 'disruption', 'threshold', and 'cascading'.

#### 4. Results

This section first reports on the findings related to definitions of risk observed in the documents analysed. This is followed by findings related to how documents incorporate risks associated with small-scale disasters and the recurrent aspect of disasters.

##### 4.1. Risk definition in Aotearoa-New Zealand's emergency management framework

In Aotearoa-New Zealand, the overarching consideration of risk is established based on an all hazards and all risks approach. The CDEM framework led by the *CDEM Act* implies that any hazard that could create a risk is being acknowledged and considered under the CDEM framework. In comparison with the academic literature that uses the term disaster, Aotearoa-New Zealand's legislation and policy use the term emergency when describing situations that threaten life or health, and require an immediate coordinated response [51]. Therefore, it appears that the CDEM context does not use the term disaster extensively, with the definition of disasters appearing in two of the documents reviewed as follows (please see Table 2).

The importance of risk management is emphasised in the CDEM National Capability Assessment Report ([52]; p. 5), which recommends managing risk rather than managing the disasters, and brings to attention to the need to build resilience: 'There is a need for CDEM to shift its attention away from managing disasters to managing risk, and building resilience within organisations and communities ... '.

**Table 2**  
Definitions of disaster in the CDEM framework.

Document	Definition of disaster
Focus on Recovery: A Holistic Framework for Recovery in New Zealand (2005)	<i>An event that causes significant loss or damage and that overwhelms the capability of the community to manage it. Such an event could require significant additional resources (p.24)</i>
National Disaster Resilience Strategy (2019)	<i>A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, social, cultural, economic and environmental losses and impacts (p.6)</i>

All documents reviewed touched upon the importance of addressing disaster risks. Notably, for the last two decades, the definition of risk, interpreted as the likelihood and consequences of a hazard, has remained the same (see Table 3). More recent documents, however, have started to expand on this definition by including aspects related to exposure, vulnerability and capacity of affected systems.

As the CDEM framework follows a comprehensive risk management approach, risk is also considered in each of the four phases of the disaster management cycle (i.e., the 4Rs). For example, the Response Planning in CDEM: Director's Guideline for Civil Defence Emergency Management Groups ([53]; p. 3) calls for the inclusion of risk identification into the response phase planning: 'Response planning does not have any direct responsibilities relating to reduction. However, planning activities can identify and quantify hazard risks.' This suggests that hazard scenarios that are being identified in the readiness and reduction phases are expected to be evaluated further during the response planning exercises. In particular, the Strategic Planning for Recovery Director's Guideline for CDEM Groups (2017) states that the recovery process should give adequate consideration to the reduction of risks (e.g., 'Reduce future exposure to hazards and their associate risks') ([54]; p. 2). This notion is also followed by the Recovery Preparedness and Management: Director's Guideline for Civil Defence Emergency Management Groups - Part A and Part (C) which further notes that 'understanding hazards, risks and consequences' are required in strategic planning for recovery ([55]; p. 4) and that 'linking recovery to risk reduction and resilience' ([87]; p. 23) is vital.

Though it is evident that the CDEM framework incorporates the notion of risk into the emergency management framework, it is vital to understand how risk is translated into risk treatment under this process. The Guide to National Civil Defence Emergency Management Plan [56] recommends AS/NZS ISO 31000,2009 risk management standard to be used as the basis for risk assessment and management in Aotearoa-New Zealand. This means that in the risk assessment process, once risks are identified, they are then quantified based on risk attributes or risk analysis. According to the CDEM Group Planning: Director's Guidelines for Civil Defence Emergency Management Groups ([57]; p. 19), risk analysis is the process where the 'components of risk – likelihood and consequence – are broken down, and different scenarios are explored'. The CDEM groups are mandated to analyse the hazard risks in their local area based on the likelihood and consequences of the events. They may further analyse these risks based on a detailed methodology weighting the seriousness, manageability and growth factors described in the guideline.

Interestingly, in Aotearoa-New Zealand, risk analysis is also carried out under different methodologies including RiskScape and other methods developed by some of the CDEM groups [57]. Therefore, it is difficult to determine the common gaps pertaining to the risk analysis methods under the CDEM framework. The existing methodology given in the CDEM Group Planning: Director's Guidelines for Civil Defence Emergency Management Groups recommends the consideration of different scenarios of the risks, risk interdependencies, and cumulative and cascading effects during the risk analysis stage [57]. Although such expla-

**Table 3**  
Definitions of risk in the CDEM framework.

Document	Definition of risk
CDEM Act (2002)	<i>The likelihood and consequences of a hazard (s 4)</i>
National Disaster Resilience Strategy (2019)	<i>The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined as a function of hazard, exposure, vulnerability and capacity (p.6)</i>
Draft for Risk Assessment: Guidance for CDEM Group Planning (2021)	<i>The likelihood and consequences of a hazard (p.7) To determine the likelihood and consequences for particular hazards, the basic components of risk must be understood, namely: Hazard component, Exposure component and Vulnerability component (p.7)</i>

nation is provided, it does not translate into implementation as the risk template given in the guideline only proposes the conventional likelihood and consequences risk analysis to assign a risk rating. This is unlikely to capture aspects related to cumulative and cascading relationships.

While there is no consistent risk assessment methodology in the CDEM framework, the (proposed) Draft for Risk Assessment: Guidance for CDEM Group Planning aims at introducing a more comprehensive, uniform risk assessment methodology. The guidance recommends the use of a wider stakeholder group for consultation of risks and provides a detailed risk assessment process. We examine that, although the proposed guidance applies the ‘all hazards’ notion of the *CDEM Act*, it does not provide further assessment of risks that are being managed under business-as-usual scenarios and creates a boundary to risk assessment. The section for group risk assessment thresholds in the Draft for Risk Assessment: Guidance for CDEM Group Planning states that hazards with lower risks may be excluded from detailed assessments [58].

#### 4.2. Risks associated with small-scale disasters

Risks associated with small-scale recurring disasters are referred to as extensive risks in most of the disaster literature [e.g., 13,29]. However, our word search query didn't find any matches in the documents analysed. Since the application of the term extensive risk may be implicit rather than explicit, we used alternative terms in place of extensive risk such as ‘small’, ‘small-scale’, ‘localised’ and ‘disruption’ in our search. The term ‘small’ did not appear in any of the documents, including the *CDEM Act* which does not specifically prescribe nor exclude its scope and applicability to disasters of a certain scale (see Table 4). The Act stipulates that it can be activated in emergency situations, including: (i) natural hazards events that may impact the safety of the public or property that cannot be managed with by emergency services; (ii) or otherwise requires a significant and coordinated response under the *CDEM Act* (part 1 s 4 *CDEM Act*, 2002, p. 9). The term ‘disruption’ has been cited in twelve out of the thirteen documents we reviewed. The term has been used primarily in the definition of emergency, and implies interruption. Nonetheless, the National Disaster Resilience Strategy provides a more direct interpretation of its meaning as outlined in Table 4. This draws an impending question as to whether small-scale recurring disasters are considered as emergencies or not in the *CDEM Act* as they may not meet the necessary criteria to be considered an emergency.

The only relevant citation pertaining to risks related to small-scale recurring disasters in the CDEM framework was found under the scenario types and their description in the Draft for Risk Assessment: Guidance for CDEM Group Planning [58]. It provides an example of a localised flood event requiring a co-ordinated response by the CDEM Group to be categorized under most likely/mid-range event. In addition, it establishes that frequently occurring events with ‘highly negligible consequences’ are to be managed ‘business-as-usual’ and are considered ‘day-to-day’ events. Appendix D of the Guideline, illustrates a range of different disaster consequence scenarios, including localised impacts. This helps the users to obtain a better understanding of disaster consequences and more appropriately rank disaster events with potential to capture small-scale recurring events. According to the National Disaster Resilience Strategy, disruption refers to events that would disrupt normal life, business, functions, processes, or operations, whether they are planned or unexpected, which can range from being nuisance events to small-scale events [59].

#### 4.3. Recurrence aspects of small-scale disasters

The term recurrence was highlighted in three of the documents analysed. None, however, linked recurrence to small-scale disasters or associated risks. On the other hand, cumulative and cascading impacts

**Table 4**  
Summary of results on terms related to small-scale.

Search term	Document	Extract example
Extensive risks	No results were found.	
Small-scale	Strategic Planning for Recovery Director's Guideline for CDEM Groups (2017)	<i>Support needed for a large-scale emergency is well beyond what would be needed for a small-scale locally managed recovery (p.28)</i> <i>Grouping hazards and risks according to their type, scale and likely consequences. This involves understanding all risks from those that cause small scale, frequent events through to the maximum credible event and possible multiple or cascading events if relevant. (p.21)</i>
Small-scale recurring disasters	Draft for Risk Assessment: Guidance for CDEM Group Planning (2021)	e.g., <i>Localised but disruptive rainstorm which results in flooding of an urban area to be categorized under Most likely/mid-range events (p.38)</i> <i>Frequently occurring events that are managed as a ‘business as usual’ or routine activity to be categorized under Day-to-day events (p.38)</i>
Localised	Draft for Risk Assessment: Guidance for CDEM Group Planning (2021)	<i>Community with a localised flood risk (p.18)</i>
Small	NCDEM Plan Order (2015) Strategic Planning for Recovery Director's Guideline for CDEM Groups (2017)	<i>Smaller-scale recoveries that require co-ordination at the CDEM Group level will be co-ordinated through the person responsible for recovery management for the CDEM Group (the CDEM Group Recovery Manager) and, where necessary, the establishment of a CDEM Group Recovery Office (p.97)</i> <i>The Civil Defence Emergency Management Amendment Act 2016 (Amendment Act 2016) amends the CDEM Act 2002 to strengthen this requirement, to help communities recover more efficiently and effectively from small to moderate scale emergencies (p.5)</i>
Disruption	<i>CDEM Act</i> (2002) National Disaster Resilience Strategy (2019)	<i>Emergency is a situation that is the result of any happening, whether natural or otherwise, including, without limitation, any explosion, earthquake, eruption, tsunami, land movement, flood, storm, tornado, cyclone, serious fire, leakage or spillage of any dangerous gas or substance, technological failure, infestation, plague, epidemic, failure of or disruption to an emergency service or a lifeline utility, or actual or imminent attack or warlike act (Part 1 s 4)</i> <i>An event that considerably interrupts normal life, business, functions, operations, or processes, whether anticipated or unanticipated (p.6)</i>

were addressed in several documents (see Table 5). Overall, documents captured how cumulative and cascading consequences are to be considered in DRR in a broad manner, without specifically relating them to small-scale recurring disasters. Additionally, the term ‘aggregate’ was primarily used to discuss the aggregation of risks of different hazards in risk assessment methodologies, again without linking it to small-scale recurrent disasters.

## 5. Discussion

Marulanda et al. [8] note that risks pertaining to small-scale recurring disasters are not considered as relevant, although their implications are significant. Extensive disaster risks characterise early signs of disaster risk accumulation [60]. Their aggregation could possibly result in large scale disasters [9]. However, emergency management policies do not seem to address small-scale recurring disasters adequately. The results of our analysis provided evidence of this gap in the national emergency management policy of Aotearoa-New Zealand. The main legislative instruments (*CDEM Act*, 2002; National Disaster Resilience

**Table 5**  
Expand  
Summary of results for cumulative and cascading terms.

Search term	Document	Extract example
Cumulative/Cascading	NCDEM Plan Order 2015)	<i>Take a precautionary approach to managing hazards and risks where there is scientific or technical uncertainty about a hazard or risk; or potential for cumulative or cascading risks to arise (p. 69).</i>
	CDEM National Capability Assessment Report (2015)	<i>Over time, this data has attempted to provide evidence for nimble adaptation of interventions to help people recover from the ongoing and cumulative effects of recovery (p.33). Rarely does the Coordinating Executive Group have a collective oversight of this cumulative risk reduction (p.33).</i>
	The Guide to National Civil Defence Emergency Management Plan (2015)	<i>Take a precautionary approach to managing hazards and risks where there is scientific or technical uncertainty about a hazard or risk; or potential for cumulative or cascading risks to arise (17 Reduction p.2). Hazardscape means the net result of natural and man-made hazards and the risks they pose cumulatively across a given area (appendix 2 p.5).</i>
	Strategic Planning for Recovery Director's Guideline for CDEM Groups (2017)	<i>Cumulative and Cascading Consequences The speed at which recovery progresses in one environment will influence recovery in other environments. Therefore to understand all the consequences on the community, consequences in one environment should not be considered in isolation (p.24).</i>
	CDEM Group Planning: Director's Guidelines for Civil Defence Emergency Management Groups (2018)	<i>Risk analysis Interdependencies of risks, and how risks may become cumulative and cascading, should also be considered (p.19).</i>
	Recovery Preparedness and Management: Director's Guideline for Civil Defence Emergency Management Groups - Part A (2019)	<i>Cumulative consequences occur when individual impacts to a single component of an environment combine to form a significantly larger consequence than the individual impacts on their own. This may occur over time. Cascading consequences occur when consequences in one environment have a flow-on effect or consequence in another environment or location. Cascading consequences can be positive or negative (p.59).</i>
	Recovery Preparedness and Management: Director's Guideline for Civil Defence Emergency Management Groups - Part C (2019)	<i>Cascading consequences need to be considered to ensure the recovery is being holistic and inclusive, and not increasing the impact of the emergency (p.24)</i>

Strategy 2019; NCDEM Plan) do not provide specific attention to the risks pertaining to small-scale recurring disasters.

According to the SFDRR, disaster risk management policies and practices should be developed based on all disaster dimensions such as

vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment ([36]; p. 14). Risk assessment is a process that supports the understanding of the risks [61]. Although the SFDRR states its applicability to small-scale disasters, it remains silent about the extensive disaster risk in its guidance for risk assessment. This may have had a flow-on effect in influencing the emergency management framework in Aotearoa-New Zealand and elsewhere.

In the emergency management system, risk assessment methodologies are created to rank the risks in order to develop risk reduction strategies and policies and to allocate resources needed [32]. Risk assessment systems comprise quantitative and qualitative methods and different emergency management authorities adopt different methodologies. Risk assessment is an extremely complex process as it requires detailed understanding of many factors [32]. In general, emergency management systems use the two dimensional risk matrix (combining hazard frequency and disaster consequences), which assumes that the probabilities and consequences are well understood and measurable ([32]; p. 4). However, Gordy [60] notes that extensive risks are not sufficiently included in the disaster risk assessments. We observe that the critical elements of extensive risks (cumulative and indirect) are not commonly integrated to be evaluated in the risk assessment methodologies under the emergency management regime although there are some exceptions at the local level depending on their capacities.

The impacts of small-scale recurring disasters do not tend to appear in the short run. This creates a need for new methods to be used so as to capture the cumulative effects existing methodologies are leaving out. Current risk assessment methodologies mostly interpret the present vulnerabilities and capacities rather than interpreting their root causes, promoting the development of short-term policy solutions rather than sustainable disaster reduction measures [1]. Further, the risk assessment methods quite often do not account for the indirect losses that small-scale recurring disasters are associated with [60]. Liu et al. [62] pointed out that the accuracy of risk assessment methodologies in capturing small-scale disasters might decrease when compared with the large and medium spatial scale events. Subsequently, small-scale recurring disasters are not being captured and may go unnoticed by the authorities concerned. As a result, these hazard events are not addressed by DRR approaches. In the long run, this may allow these risks to aggregate and potentially lead to more severe impacts [60].

The manifestations of risk, exposure and vulnerability factors are highly contextual [63,64]. The threshold for small-scale recurring disasters may vary from community to community depending on their level of risk acceptance, risk perception as well as their adaptability. Participatory DRR, which is an integral part of decentralized DRR governance system [65] could be used for decision-making in the risk assessment exercise to minimise this adverse impact. For example, where communities help set the risk thresholds, informed by local knowledge and their experiences in confronting the adverse events.

We identified that the existing two-dimensional CDEM risk assessment system in Aotearoa-New Zealand does not capture the risks of small-scale recurring disasters. Whilst the CDEM framework acknowledges the importance of cumulative and cascading risks, it does not suggest a methodology for how this can be achieved. This gap can be minimised to a certain extent if the proposed Draft for Risk Assessment: Guidance for CDEM Group Planning is fully implemented, because of its multiple implications such as the introduction of a consistent risk analysis tool, inclusion of broader examination of different disaster consequences and wider community participation. However, even the proposed guideline does not provide a methodology to capture cumulative and cascading impacts sufficiently. In addition, the limitation imposed on lower-level risks and some hazards (that do not need coordination or multi-agency response) by eliminating the requirement for full assessments may leave small-scale recurring disasters out altogether. Small-scale recurring disasters may be considered under the 'business-as-usual' threshold in the proposed risk assessment guidelines, thus per-

petuating the status quo. Importantly, disaster risk assessments and declaration of threshold limits are linked to funding arrangements [65]. As providers of disaster risk reduction goods and services [66], governments find it challenging to choose (a) which events to focus on, (b) what severity and frequency to plan for, and (c) what investments to make [67]. These decisions are related to the distribution of resources that some [68] see as underlying issues of a political economy nature, and potentially exacerbate the root causes of vulnerability of underprivileged communities. Declaring threshold limits in disaster policies requires the allocation of human, technical, and financial resources for activities such as emergency response and recovery as DRM policy frameworks and national policy instruments facilitate the necessary resources for implementation [69]. Consequently, in many contexts, these events exceed the funding capacities of both households and local authorities to respond to a larger number of repeated disaster events [12]. This may prevent them from including all small-scale disasters frequently affecting their communities into policies.

The Disaster Risk Reduction in New Zealand: Status Report [70] links the implementation of relevant disaster management strategies to local risk assessments. Hence, if small-scale recurring disasters are not identified in the threshold limits used for funding, they may be neglected from DRR measures and become a burden to affected communities. However, in the wake of predictable and recurring events, there is a clear case for a paradigm shift to occur – that is, an effort needs to be made to put more resources in place before an event occur so as to deal with the risk effectively, prepare for it and better handle the immediate impacts [12]. In their study, Moftakhari et al. [88] show that responding too early to a disaster can waste important resources and undermine public trust, whereas responding too late might also result in financial losses that could have been avoided as well as loss of public confidence in government. Their research suggests that it is crucial to develop tools which can assist policy-makers in determining whether low-cost incidents can aggregate into high-cost impacts, even though it can be difficult to decide at which point to invest heavily in prevention or response.

Small-scale recurring disasters are deeply embedded in the social system of the affected communities [14]. These communities opt to adopt different coping mechanisms through their repeated experiences. However, literature explains that with the reappearance of the small-scale disasters, the coping mechanisms traditionally practiced by the communities may start to erode [71]. Social networks may start to disappear, consequently pushing the affected communities to adopt adverse coping mechanisms. Therefore, the perception of community adaptation to recurring events through long-term practices may need further validation and examination through future studies.

Communities experiencing recurrent disasters may have greater knowledge about the hazard events than decision-makers and experts. Therefore, they tend to adopt a variety of distinctive mitigation measures [72], however these may not be supportive towards DRR [73]. In the short run, when communities face small-scale recurring disasters, they often opt for short-term resilience strategies such as insurance and rebuilding. Nevertheless, in the long run, as these small-scale recurring disasters recur, short-term adaptive strategies become insufficient and eventually, long-term sustainable practices are required [74].

We identified that in Aotearoa-New Zealand the insurance system is being used as a popular mechanism to address small-scale recurring disasters. The *Earthquake Commission Act* introduced a publicly funded insurance mechanism operated through the Earthquake Commission (EQC) to provide funds for disaster recovery. EQC provides insurance coverage to property owners who own a current private insurance policy. Some recovery managers acknowledge that sufficient level of insurance support for effective recovery is available, which is rather difficult to achieve by the risk reduction and resilience strategies [52]. This shows the extent to which insurance mechanisms are well absorbed as a short-term resilience strategy to tackle small-scale disasters.

In contrast, scholars [74] suggest that sustainable recovery from a natural hazard event must ensure the reduction of existing risks, and manage new risks. In this context, it is vital to evaluate how these insurance related mechanisms help reduce risks and losses in the longer run, especially for communities that may be affected by recurring events. Saunders and Becker [74] explain that the insurance scheme in Aotearoa-New Zealand does not correspond to a risk-based pricing system, which otherwise encourages disaster risk reduction investments. In addition, the indemnity principle allows insurance to replace what is only lost, impeding property betterment/improvements which could help dealing with the next disaster [75]. Glavovic et al. [76] show that a flooded house which requires elevating to reduce future flooding, will only receive an insurance pay-out to reinstate the building presenting a lost opportunity for risk reduction. Such risk reduction activities need to be borne by the affected policyholder who might be vulnerable from facing cumulative events. There is an ongoing debate that insurance practices may discourage application of risk reduction measures [77]. According to Saunders and Becker [74]; insurance covers typically provide short-term resilience; they promote 'bounce-back' resilience, rather than building back better in the recovery stage. Further, the risk of subsequent disasters is usually factored in to rise insurance premiums, potentially making it unaffordable for some over time. Therefore, the differences between the short-term resilience measures adopted by the communities and long-term sustainability principles need to be considered carefully [74].

In our study, it was evident that in Aotearoa-New Zealand the top-down policy link for small-scale recurring disasters was missing. This absence may lead to impromptu and obscure practices in the local disaster governance system, which is the focal point for small-scale disasters. Inconsistency in approaches across New Zealand makes it harder to ensure that people are receiving the same level of care across the country, and for the national agency and other groups to support responses [78]. Lassa [79] explains that the recurring nature of disasters and the lack of DRR capacity make it even more difficult for local governments to develop and implement DRR policies. The lack of high-order policy directives creates new challenges as well as exacerbating existing challenges for local governments. Financial scarcity at the local level is a particular challenge [65,80]. The Disaster Risk Reduction in New Zealand: Status Report already notes the struggle local governments are facing to acquire funds to implement risk reduction measures at the local level. The local financing system which follows a property-based rating system constantly has budget constraints in sparsely populated areas due to the low rating base. For example Le Masurier et al. [81], explain that the recovery at Matatā (small-medium scale township flooding) was heavily dependent on the Central Government funding although it was a localised event impacting only a small geographical area. This was due to the fact that the local government had insufficient funds for recovery as the council had only a small number of ratepayers. Local governments are under pressure to rationalise their investments against their recurrent expenditure and other functions, such as safe land development, which may constitute a tension between the revenue and DRR [82]. Hence, allowing local governments to tackle these issues without sufficient top level policy directives may exacerbate vulnerability to small-scale recurring disasters.

DRR implementation varies across lower administrative levels due to resource and technical capacity [65]. This creates constraints to carry out risk assessments [65]. In Aotearoa-New Zealand even though standards on risk assessments are made available, many local authorities carry out different methodologies depending on their capacities, resources and perceptions of risk [70]. This allows most capacitated local authorities to develop comprehensive assessments, while low capacitated ones develop somewhat insubstantial assessments. Finally, this leads to different risk assessment results and DRR implementation across the country. Clear top-down policy directives would ensure greater national consistency.

## 6. Conclusion

The paper examined the extent to which small-scale recurring disasters are recognised in the emergency management framework in Aotearoa-New Zealand. We analysed 13 documents in the CDEM framework including legislation, plans, strategies and guidelines. Our results provided evidence that the current emergency management framework does not have clear provision for small-scale recurring disasters. We identified that: i) the two-dimensional risk assessment methodologies did not integrate the characteristics (cumulative and indirect) of small-scale recurring disasters sufficiently; ii) adaptation of short-term solutions for recovery may be prioritised as opposed to long-term solutions; and, iii) several on-the-ground implications for local level authorities in the absence of higher-level policy directives.

Risk assessment is the main tool used in emergency management frameworks to identify risks that need to be treated [83]. If these tools do not incorporate elements to capture different types of risks, such risks will remain neglected. Small-scale recurring disasters are highly localised events that possess different characteristics such as cumulative and indirect impacts. Although the risk assessment methodologies endorse the importance of these effects, in reality the conventional two-dimensional risk analysis methodologies do not seem to capture risks with these events sufficiently. As a result, small-scale recurring disasters remain unnoticed and their risks are tackled as a normal circumstance under a business-as-usual scenario.

Currently, small-scale recurring disasters may be discounted by risk assessments, but they remain important to those who are directly affected [14]. Affected communities can become exhausted by the repetitive confrontations and have misconceptions that the impacts of these events are unavoidable [60]. These lead them to adopt short-term recovery solutions. Through our study, we identified that insurance payout is a prominent short-term recovery response from these events. Although short-term recovery is important to return to functional levels quickly, the repetition of events may deplete the community's resilience. Therefore, it is necessary to move beyond the traditional risk management exercises (which rely on structural mitigation, disaster relief, warning and evacuation) and emphasise the importance of utilising land-use planning mechanisms to reduce the adverse impacts of natural hazard events [76]. Furthermore, the insurance mechanism should be re-visited to consider the development of tailored solutions for small-scale recurring disaster events.

International disaster management frameworks do not pay explicit attention to the risks of small-scale recurring disasters [84]. Our study confirmed that this could have a flow-on effect on the national level DRR frameworks, which pursue more or less the same approaches promoted by such international bodies. As a result, the high order level (national) policy guidelines and strategies tend to remain ambiguous leaving it to local level authorities to adapt to their own situations. This results in different levels of DRR applications across a country.

Underestimation by the risk assessments and lack of policy recognition are coupled with other short-comings such as political and economic considerations [84] at the local level, meaning that small-scale recurring events are not being identified for risk treatment. Here we concur with Wisner et al. [85] that the combination of top-down and bottom-up actions are necessary to support the effectiveness of DRR.

Small-scale recurring disasters should be considered as a representation of initial risk accumulation and treated as a matter of primary importance ([60]; p. 40). As this requires the development of new methods to capture the long-term cumulative impacts of these risks, they should be integrated into disaster risk assessment methodologies as a starting point. National level policy guidance should inform and provide guidance to the local authorities on how to address these events. Further, local authorities should be cognisant that small-scale recurring disasters are events that are not unavoidable and re-consider their resilience strategies.

In agreement with Moftakhari et al.'s [88] argument, we suggest that the thresholds for responding to small-scale recurring disaster events need to be pre-determined, based on numerous factors to the best extent possible, including known community vulnerability issues such as limited adaptive capacity, levels of risk acceptance as well as institutional capacity to deal with such events. Such arrangements will support the promotion of community resilience [86] to repeated small-scale events and help reduce aggravating them into larger losses.

## Uncited reference

[87].

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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