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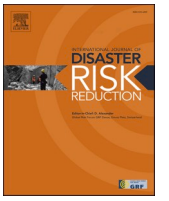

Framing resilience: Post-disaster communication in Aotearoa-New Zealand

Franca Angela Buelow [c,*], Ann Brower [a], Nicholas Cradock-Henry [b]

[a] School of Earth and Environment, University of Canterbury, Christchurch, New Zealand
[b] GNS Science, PO Box 30-368, Lower Hutt, 5040, New Zealand
[c] Leuphana University, Institute of Sustainability Governance (INSUGO), Universitätsallee 1, 21335 Lüneburg, Germany

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ABSTRACT

Realising resilience requires long-term, strategic transformation. However, this is often forestalled by immediate, often reactive, post-disaster needs. Here, we use Natural Language Processing to compare media coverage of Cyclone Gabrielle, a significant storm affecting Aotearoa New Zealand (A-NZ) from February 12–16, 2023, with A-NZ based research on the subject. The aim is to gain new insight into the ways in which disasters are framed post-event, and over longer time scales to compare immediate and consolidated concerns and insights. Results reveal contrasting frames: local and international media frames cyclone response in relation to tasks assigned to central and local governments, global climate change dynamics, emissions reductions, infrastructure, and overall economic development. Research frames resilience in terms of community and regional adaptation, classification, measurement, and assessment. Post-disaster media coverage tends to frame resilience around readiness and response rather than emphasizing pathways to future reduction and recovery, which are present in research but lack a focus on government, governance, and pathways. Both media and research portray community effects in positive terms. With changing frequency and severity of climate related extremes, reframing coverage and proactively shifting the discourse towards enabling transformations for climate-adapted futures may be necessary to better leverage the post-disaster period for change.

1. Introduction

Resilience has gained prominence and now plays a dominant role in shaping perspectives on disaster risk management and recovery [1]. Earlier conceptions saw resilience as the ability to bounce back, whereas nowadays, research views resilience in terms of nonlinear interaction across scales, recognising its socially constructed nature, and describing resilience "of what, to what" as well as "of what time and for whom" [2].

Viewed in normative terms, enhancing resilience enables communities, sectors, and enterprises to mitigate the direct and indirect effects of climate change, including the frequency and severity of extreme events, and their complex, cascading, and compounding impacts [3,4]. It describes properties of complex adaptive systems that enable flexibility, adaptability, and buffering to withstand shocks and stresses [5–7]. Resilience is built over time, developed through discourse and interaction [8]. Resilience is often viewed as an unfolding process triggered by disasters, involving adaptation and transformation [9].

* Corresponding author.
E-mail address: Franca.buelow@leuphana.de (F.A. Buelow).

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Resilience remains a contested concept in research, with debates about terminology, application, and implications [10–13]. Despite controversies, it is widely used in governance and planning, particularly in hazard management contexts [14,15]. Communication plays a vital role in resilience [16]; it is crucial for conveying the science and impacts of climate change, potential for adaptation, and building capacity for decision making in the face of uncertainty [17–19]. This includes conversations about potential co-benefits of climate actions, identifying protection needs, costs of adaptation and resilience measures, and risk tolerances [20]. Information and communication capacities have been found to enhance community resilience after disasters [21] and are crucial for sustainability planning [22]. Understanding the ways in which adaptation and resilience are framed and discussed following disasters, provides insight into the ways in which short-term, maladaptive outcomes are entrained in public discourse and foreclose conversations regarding the need for transformative shifts at sectoral, community and organisational levels [20,23–25].

Increasing resilience is particularly relevant for A-NZ, a small developed economy in the Pacific [26] with an extensive coastline, aging infrastructure and high dependence on agriculture and tourism [27,28]. Compound and cascading impacts of changing mean climate trends, such as ongoing sea-level rise, increases in air, freshwater and ocean temperatures, as well as extreme events, including high intensity rainfall events, drought, marine heatwaves [29] have significant economic, social and environmental impacts, and have been increasing in recent decades [30]. Internationally and in Aotearoa New Zealand, adaptation approaches have been slow to translate into robust action, leading to a widening gap between adaptation theory and on the ground implementation (Artega et al., 2023). Aotearoa New Zealand's Climate Change Commission sees a rapidly shrinking window to adapt and urges government to push proactive adaptation, particularly at community level [31]. A lack of implementation and risks of maladaptation underscore the relevance of enabling communities to adapt and become resilient.

We analyse news reporting following Cyclone Gabrielle that hit A-NZ between 12–16 February 2023 with a national state of emergency being declared on February 14, 2023 emergency – only the third such declaration in A-NZ's history. The storm left hundreds of thousands without power, led to the cancelation of flights, and has damaged roads, homes, and infrastructure. Cyclone Gabrielle encountered A-NZ as a powerful subtropical storm after transitioning from a tropical cyclone. Rainfall from the still-powerful storm began falling on 11 February and continued for several days. Accumulations in Hawke's Bay, North Island, exceeded 175 mm over a 24-h period from 13–14 February – more than three times the average amount typically seen during the entire month of February.

We compare the way researchers and journalists communicate resilience by contrasting two specialised, purpose-built corpora: 1) from 2000 news texts accessible through Factiva and published between 08.02.2023 and 30.03.2023, 2) from research output on resilience in A-NZ over the past 10 years, as found in Scopus. Using Natural Language Processing (NLP), we identify patterns in these two groups of texts using keyword and keyword in context analysis, frequency profiling, collocation network analysis and semantic tagging. We work with the software Antconc [32], WMatix5 ([33], 2003) and the #LancsBox software packages to analyse the data.

Our paper proceeds with a summary of post-disaster communication and framing, combining insights from three broad, interdisciplinary research fields: resilience studies, communication studies, and linguistic analysis. Speaking from an interdisciplinary perspective, our objective is to use linguistic analysis to outline how communication of resilience differs and to discuss effects of this. Next, we present our methods and data. Our results are split in a general overview of the data and specific searches. We build on the understanding of how discourses in media and research differ and discuss how those differences in styles might shapes post-disaster responses, and its implications for future events.

2. Communicating resilience: framing effects

Definitions of resilience tend to vary due to different interpretations across disciplines [12]. Termed a "slippery concept" ([34]: p.547), resilience finds resonance among policymakers and researchers, encouraging a dedication to enhancing resilience (ibid.). Viewed as a multi-layered and context-dependent framework for assessing the potential, process, and direction of change, involves vulnerability through increased adaptability is central to resilience [35].

Elements supporting resilience include trust, information sharing, public-private partnerships [36], effective governance, innovative approaches, reconstruction strategies, resource management, and addressing stakeholder expectations [37]. In disaster risk management research, insights emphasize the importance of robust social capital post-disasters, facilitating quick dissemination of information and assistance [2,38]. Furthermore, access to both formal and informal resources is essential for positive adaptation after disasters [39].

Our resilience assessment focuses on communication and information framing, which can have significant effects on post-disaster resilience [36]. Communication is crucial for grasping climate change and resilience as dynamic phenomena [40]. Recent evaluations highlight communication as a bridge between adaptation theory and practice (Artega et al., 2023). Discourse analyses, including media discourse, critical discourse, and comparative discourse analyses, help understand how communication shapes environmental perceptions [41]. The presentation of information, known as framing, affects cognitive and emotional responses, influencing policy opinions and adaptation intentions [42–44]. Framing effects are studied across various disciplines, including communication, management, and organizational research [45]. Framing is crucial as a linguistic instrument since it highlights specific aspects of a narrative, which can affect governance decisions regarding resilience [46]. The framing of a subject influences how facts, values, and interests are transformed into action, and determines who participates and which solutions are preferred [12]. Framing affects the definition, conceptualization, and perception of a concept to establish its significance for a phenomenon [47]. Framing of extreme events such as Cyclone Gabrielle can affect policy design in response to disasters [48, 49]. Public discourse's framing of such events can change or reinforce perceptions of the need to adapt and become more resilient at individual and policy levels [49].

There is a need for further research on the relationship between messages, framing, actions, and personal experiences regarding

climate change [50]. Crafting normalcy, affirming identity anchors, maintaining communication networks, using alternative logics, and emphasizing positive emotions are all communicative processes that have been discussed as contributors to resilience in immediate post-disaster communication [51]; which indicates an opportunity to capitalise on the narrow post-disaster window to catalyse effective change [52–54]. Communication can enhance preparedness for disasters, and intentions to act are affected by the framing of outcomes and actions [55], underscoring the relevance of framing for resilience. An extensive body of research analyses how disasters are framed, showcasing that snapshot analysis of media framing of significant disaster and extreme events can be helpful in outlining key links between media framing and disaster preparedness [56].

Natural Language Processing has been used to analyse the significance of climate change relative to other concerns and identify key actors in public discourse [57], but it is underutilised in analyses of extreme weather events [58]. We apply NLP to gain insights into the framing of resilience immediately after a disaster and compared this with a research perspective to query how much of the presumably consolidated knowledge to a decade of research is reflected in prompt reactions. Understanding the ways in which resilience is framed and discussed following disasters such as intense rainfall, provides insight into the ways in which short-term, (mal)adaptive outcomes may be entrained in public discourse and foreclose conversations about the need for transformative shifts at sectoral, community and organisational levels [20,23–25].

3. Methods and materials

We use a comparative corpus analysis to explore resilience conceptualization post disaster in two discursive settings: media and research. The corpora totalled 1,602,293 running words (tokens) (Table 1).

3.1. Media corpus

Civil Defence Emergency Management (CDEM), the key national agency who coordinates and deals with disasters in A-NZ at local and regional levels, use a multi-channel approach to inform agencies, authorities, and/or the public about emergencies, including radio and television, websites, social media, apps, sirens[1] and other mediums. Comparing how different types of media are consumed by New Zealanders, TV and radio are generally the most prominent sources (NZ On Air, 2020).[2] Most trusted sources include TVNZ and stuff.co.nz (NZ On Air, 2020). Our sample includes online outlets of mainstream A-NZ media but does not include social media posts.

Building on a Factiva search, we examined media coverage following Cyclone Gabrielle, downloading items published from February to May 2023. The search specified that results needed to contain the terms *cyclone Gabrielle* and at least one of the following words *resilience, agriculture, climate change*, and *adaptation*. We included the search terms *climate change* and *adaptation* to pick up on any implicit coverage of resilience and included the search term *agriculture* to include a sectoral focus, since agriculture is prominent in the area affected by Gabrielle. This search produced 6622 results.

Natural disasters, like Cyclone Gabrielle, attract significant media attention, especially in the immediate aftermath [59]. To capture the initial framing and communication of the event, we focused on returns until the end of March, resulting in 2000 items sourced from radio, TV, web news, websites, and online news articles (see supplements for an overview of sources).

3.2. Research corpus

Over the last decade, there has been a considerable emphasis on resilience research in A-NZ, with several large research programs focused on long-term recovery, disaster risk management, and loss reduction [28]. Much of this research has focused on low-frequency, high-magnitude events including the 2010/11 Christchurch earthquakes, 2016 Kaikoura-Marlborough-Hurunui earthquakes, and damaging floods (2017, 2019). We analysed a research corpus of journal publications on resilience in A-NZ from the past decade, focusing on social science, environmental science, earth science, engineering, and psychology, again including broach search terms for resilience and including a focus on agriculture. This 10-year timeframe aimed to capture consolidated terminology and concept development in those subject areas. The search yielded 543 documents.

3.3. Procedures

We employed Antconc [32], WMatix5 [33], and #LancsBox [60–62] software for data analysis. The tools utilised included KWIC for concordance listings, GraphColl for collocation identification, Words for detailed frequency analysis of types, lemmas, and Parts of Speech (PoS), and the Plot tool for presenting concordance search results in a 'barcode' format. We analysed how our two corpora situate the terms "adapt*", "agricult*", "resilience", "transform*", "act*", "warm*", "community", "cyclone", "government", "change", "inform*", "network*", "vulnerab*", "recover*" and "māori" with additional contextualised queries around prominent themes/tokens in the corpora. These specify and add to the broader search terms we used to gather our data, and were selected based on the authors'

[1] This includes a Memorandum of Understanding between civil defence emergency management (CDEM) and radio and TV broadcasters will work together to tell people what they need to know to get through, see: Memoranda of Understanding (MoU) with radio and TV broadcasters » National Emergency Management Agency (civildefence.govt.nz).

[2] This can be detailed further into audience groups, and the report finds differences in media consumption by age, ethnicity, and income (NZ On Air, 2020).

Table 1
Overview of corpora.

Name	Language	Texts	Tokens	Additional information
Media corpus	English	1	1,455,037	Types: 49,830 Lemmas: 44,121
Research corpus	English	1	147,256	Types: 13,547 Lemmas: 12,590

resilience research in A-NZ [2,26,28]

We compared collocates, pairs of words that co-occur more frequently than expected by chance [63], using different statistics such as MI, log-likelihood tests, and logDice. Using #LancsBox, we analysed collocation networks, extended collocation graphs that show shared collocates and cross-associations between nodes.

Additionally, we conducted a frequency profiling comparison of corpora using WMatix5 [33]. Specifically, we compared the Scopus corpus with a one-million-word corpus of published general written British English, BE06. This analysis aimed to identify features with significantly different usage, such as word frequency, compared to the 'general' language found in reporting and media coverage [64].

4. Results

The following subsections introduce the results of our linguistic analysis, starting with a general overview of frequencies and observations we draw from these. This is followed by more specific searches for a more fine-grained comparison between the framing of resilience between the corpora.

4.1. General overview

Table 2 shows the top 10 absolute and relative frequencies of words in the two corpora, excluding stop words. Apart from the word *change*, there is little overlap between media and research corpus. As can be expected, the more consolidated decade of research outputs on resilience shows a clear focus on studying resilience (*study*, *research*) and suggest that the corpus is predominantly concerned with understanding how resilience can be affected (*management*) in the context of changes due to disasters (*earthquake*, *disaster*, *change*). The immediacy of Cyclone Gabrielle drives the key words in the media corpus, with a very clear focus on affectedness (*people*) and reasoning for why the event happened (*climate*).

Next, we looked at words that appear infrequently between the corpora, so-called negative keywords. The term resilience is comparatively less prominent in the media following Cyclone Gabrielle (904 appearances vs. 1611). The media corpus also lacks mentioning of *research*, *study*, or remarks on *frameworks, designs*, and *assessments* that might be used to outline pathways for responding to disasters that have been discussed in the scientific community studying A-NZ's disaster responses. We also find fewer mentions of *species*, *ecosystems*, and *biodiversity* in the media corpus, and see a dominance of built infrastructural terms (*transmission*, *roading*, etc.) over natural environmental effects of the cyclone. *Community* (in relative terms), *management* and *practice* were also comparatively less prominent in our media corpus please refer to an overview table in our supplements for details on negative keywords).

To compare the two corpora regarding the keyness of certain terms, we calculated over/under-use of search terms between them using the above mentioned frequency lists and log-likelihood statistics. Table 3 below shows that *climate*, *cyclone*, and *government* are used more in the media corpus than the research corpus.[3] This suggests there is a heightened awareness of climate change impacts in the immediate disaster context, while also suggesting the need for central authorities to address, respond and manage Cyclone Gabrielle. The comparison suggests that in the immediate reporting in the months after the event, resilience, change, adaptation and community are less relevant than they are in research texts about resilience building in A-NZ. Initial responses potentially revolve more around understanding what has happened and why.

4.2. Specific searches: concordances, collocations, and contexts

Table 4 gives an overview of collocates for search terms as well as our comments on those collocates in comparison (cf. supplements for data). Framing of resilience immediately post-disaster is very localised, shows a strong contextualisation of the events with global climate change, and calls for policy and governmental action. While the framing of topics in the media is very process and action focused, the framing in research systematises and classifies search terms vis-à-vis findings and events. The focus on government levels is similar, starting with local framings. Please find all statistics for the collocation analysis in our supplementary material.

We have run a series of collocation analyses to get a feeling for how the keywords we use to compare media and research framing are contextualised. Collocations indicate distinctive associative meaning making around the terms we look at. Collocates can be used to identify semantic prosody [65,66], the associative meaning arising from the collocates of a word. We were especially interested in the associations between *resilience*, *government*, and *community* and explored the respective differences across corpora around those terms further.[4]

[3] See supplementary material for more information.
[4] All collocation networks are visualised in our supplementary material.

Table 2
Comparison: Top 10 words in media and research corpus.

ID	Media	Abs. Frequency (Rel. Frequency)	Research	Abs. Frequency (Rel. Frequency)
1	cyclone	4666 (32.068)	resilience	1611 (109.401)
2	people	3763 (25.862)	study	475 (32.257)
3	gabrielle	3358 (23.078)	research	442 (30.016)
4	government	2889 (19.855)	community	430 (29.201)
5	climate	2707 (18.604)	earthquake	420 (28.522)
6	year	2458 (16.893)	management	419 (28.454)
7	change	2441 (16.776)	social	385 (26.145)
8	million	2296 (15.780)	change	349 (23.700)
9	auckland	2109 (14.494)	health	332 (22.546)
10	time	2086 (14.336)	disaster	329 (22.342)

Table 3
Frequency lists and log likelihood statistic reporting over/underuse of search terms between corpora.

Search term	observed frequencies		expected frequencies		Over/under-use	Log Likelihood	normalised frequencies		%DIFF
	media	research	media	research			media	research	
climate	2707	231	2667.99	270.01	+	6.50	0.00186	0.00157	18.60
change	2488	349	2576.27	260.73	–	30.05	0.00171	0.00237	−27.85
cyclone	4666	4	4240.81	429.19	+	854.24	0.00321	0.00003	11705.48
government	2889	78	2694.32	272.68	+	207.85	0.00199	0.00053	274.85
resilience	904	1611	2283.86	231.14	–	4580.19	0.00062	0.01094	−94.32
community	1102	430	1391.20	140.80	–	446.54	0.00076	0.00292	−74.06
TOTAL	1455037	147256							
Degrees of Freedom =			1						
%DIFF Zero Frequency Adjustment =			1E-18						
Log Ratio Zero Frequency Adjustment =			0.5						

(Note that this is the adjustment for observed frequency before it is normalised).

In the media corpus, resilience is contextualised with *improvement,* and we see that *economic* developments and impacts are prominent in that context, indicating that resilience is thought of predominantly in terms of economic stability. A prominent connection is *resilience* and *work.* Upon our search to see what those associations of resilience work towards, we see collocations with *safer*, *smarter* and *stronger*. The past tense infliction of *we have* shows that the media corpus tends to refer to past efforts of building resilience.

Community in the media corpus is predominantly contextualised with formations – in groups, organisations, or boards. In the two months following the cyclone, we find links between *resilience* and *communities* in the media, where stories talk about *kaupapa* Māori, recognising the importance and positive effects of regional indigenous networks, marae and (community) leaders. We also find that *community* and *resilience* share the collocates *spirit*, *stories,* and *strength*, indicating a very positive and encouraging framing of resilience post-disaster (cf. supplementary material). We see community in *rural* areas, in the context of *iwi* and as something experienced and shared – *together*. Interestingly, community is also connected to the word *provider*, highlighting the acts of service performed by communities.

Immediate responses and framing post-disaster highlight the responsibility placed on governmental actors to lead recovery, adaptation processes, and resilience building. Collocates of *government* and *management* in our media corpus show how agencies and central government are placed at the centre of decision making around disaster responses, especially financially. This responsibility to act extends beyond the acute reaction to the cyclone and includes climate change effects and impacts. The severity of the event for agriculture, infrastructure, and communities are discussed most prominently in the media. Adaptation and actions are linked to global dynamics and framed as a political task, where policies, central government, and ministers help regions and sectors to accommodate. Resilience is discussed in the context of *communities*, *infrastructure*, and *future* developments. Interestingly, *transformation* appears in association with programmes and projects, as something to be delivered rather than experienced, sought out, or created.

We then looked at collocations for resilience in our research corpus. There is a focus on regional and organizational impacts and reactions; urban and social system dynamics appear more often in the research corpus than rural issues (cf. supplements for visualisations of networks). The research corpus exhibits fewer mentions of governmental topics than the media corpus. A collocation network focusing on *government* illustrates how research frames and analyses governmental tasks concerning resilience. While no direct nodes or collocations exist between *resilience* and *government*, we see potential indirect links through *hazards, sectoral tasks, reactions* (*economic, transport*), regional and local authorities' responses, and the presence of *community*. Additionally, differences emerge in the allocation of tasks and responsibilities for resilience policy and practices, with media associating it more with central government, while research examines it explicitly at lower governmental levels.

Using semantic tagging (WMatix5, [33]), we compare the Scopus corpus to BE06, a corpus of British English (cf. Table 5). The research corpus mentions governmental and political issues than general written and spoken English, indicating a potential lack of focus on such topics in journal publications.

Table 4
Collocates in Media and Research data, LR ordered, MI statistic, analysed with AntConc.

Search term	Media	Research	Comment
resilience	climate, build, building, community, improve, infrastructure, network, need, future, greater	community, disaster, social, ecosystem, building, psychological, ecological, knowledge, organizational, indicators	Media: focus on needs and causes, Research: focus on classification
adapt*	climate, change, resilience, mitigation, national, plan, need, bill, effects, act	Change, climate, management, capacity, reuse, planning, historical, buildings, adaptive, coping	Media: climate change adaptation and resilience as political task, Research: more general description and classifications
agricult*	minister, emissions, connor, damien, pastoral, horticulture, society, sector, hawke, reduce	urban, ecosystem, production, agricultural, adaptation, sustainable, farming, sustainability, dairy, agriculture	Media: national political focus, sector and regional coverage, Research: urban vs rural, change in farming and systems perspectives
transform*	plan, digital, opportunities, project, deliver, centre, equipment, taupō, easyjet, program	adaptation, historical, analogies, linked, inextricably	Media: planning perspective – in project/programme context –delivered rather than experienced, Research: comparative, progress and systems focused
act*	climate, cash, government, change, take, operating, net, management, national	human, physical, restoration, enzyme, groundwater, recommended, passive, recreational, desiccation, antimicrobial	Media: climate change and policy-management, Research: wider context and different issues
warm*	global, climate, ocean, sea, world, temperatures, seas, air, summer, planet	Global, climate, latitudes, ocean, acidification, spatially, drier, host	Media: global dynamics and impacts, Research: global dynamics and impact
community	support, local, groups, resilience, board, organisations, together, wider, community, business	community, disaster, recovery, composition, structure, māori, engagement, participation, leaders	Media: localised support structures with a focus on how to organize community, Research: systematic group analysis
cyclone	gabrielle, recovery, hit, Auckland, affected, floods, damage, tropical, flooding, words	tropical, new, osterman, aizen, debbie, april, prolonged, winston, fiji	Media: impact, Research: refers to cyclone winston
government	local, central, national, support, words, minister, labour, spending, response, announced	Local, central, trust, programmes, representatives, funded, diagnostic, britain	Media: local before central, monetary, and ideational focus, Research: local before central, contextualises roles and programmes
change	Climate, minister, impacts, weather, effects, events, real, shaw, human, action	Adaptation, environmental, land, use, change, ecosystem, global, impacts	Media: politicises and contextualises climate change, Research: change as adaptation and its implications
inform*	contained, solely, responsible, distributed, date, public, further, view, provide, provided	Limited, uk, trading, taylor, data, author, exchanges	Media: focus on how information is shared, Research: information as study context
network*	roading, transport, across, electricity, unison, resilience, road, resilient, state, power	resilience, infrastructure, water, road, transport, national, knowledge, networks, transportation, wastewater	Media: infrastructural inflections first then governmental reading, Research focus on infrastructure and knowledge systems
vulnerab*	areas, communities, flooding, infrastructure, flood, retreat, customers, managed, regions	resilience, social, system, hazard, youth, element, assessments, reality, oil, framing	Media: specific regional, local, community descriptions of vulnerability and reactions to manage it, Research: systematises vulnerability
recover*	cyclone, gabrielle, support, help, efforts, minister, government, demand, communities, response	Disaster, earthquake, community, response, recovery, post, following, canterbury	Media: support connected to governmental reactions first, community second, demand for governmental leadership, Research: community resonses and regionalised focus
māori	māori, language, name, pākehā, using, housing, kaha, kaupapa, freehold, landowners	māori, people, autonomy, kaupapa, human, indigenous, cultural, wharenui, families, retrofitting	Media: underscoring Māori capabilities and needs, Research: presenting unique insights to resilience
disrupt*	chain, supply, widespread, customers Travel, covid, chains, power, livestock, caused	infrastructure, damage, organisations, ongoing, translates, electricity, electrical	Media: impact on sectors, Research: infrastructure focus
impact*	cyclone, gabrielle, climate, change, weather, events, covid, communities, significant, severe, economic, areas	economic, earthquake, direct, volcanic, climate, indirect, natural, negative, hazard, assessments, substantial	Media: effect of severe event community perspective before economic and region-specific impacts, Research: classification of impacts, measurements/assessment

When calculating overused items between our reference corpus and the BE06 corpus (cf. Table 6), we see a tendency of research publications to focus on place-based evaluations of changes and effects for specific groups, particularly related to farming and health.

In summary, the analysis shows a clear distinction in the focus and perspective between media and research discussions on each topic. Media tends to provide more contextualised and immediate information, emphasizing the immediate impacts of the cyclone on communities and infrastructure including the need to act – primarily at central levels. Research delves deeper into systematic analysis and long-term implications, providing a systematic and in-depth exploration of diverse perspectives on resilience including social, psychological, and ecological aspects, contributing to a broader scholarly understanding of the concept. Both corpora connect resilience to climate change and adaptation but contextualise those connections differently. The immediate responses to the cyclone and disaster, reflected in the media, are directed at centralised reactions and focused on economic and infrastructural effects. Long-term perspectives, reflected in the research corpus, outline environmental effects, and take an integrated approach to outline pathways for transformative changes and adaptation to build resilience at different levels. Potentially reflecting the immediacy of the coverage analysed here, the media corpus lacks references to scientific findings, pathways and practices that could reactions to the cyclone.

Governmental themes feature prominently in media coverage post-disaster but are less prominent in research publications, revealing an evidence gap in journal articles regarding governance, policy, and management options. Positive portrayals of community

Table 5
Over/underuse of terminology between the research corpus and BE06 (British English), focus on governmental issues. See supplementary material for additional information.

O1	%1	O2	%2	Use	Log-likelihood value (LL)	% Diff	Item (group)
12	0.04	2280	0.25	–	85.50	−84.65	Warfare, defence, and the army; weapons
14	0.04	1815	0.20	–	53.44	−77.50	Politics
4	0.01	674	0.07	–	23.66	−82.69	Unethical
11	0.03	1037	0.11	–	22.73	−69.06	Crime
7	0.02	609	0.07	–	12.15	−66.48	Ethical
1	0.00	136	0.01	–	4.15	−78.55	Lawful
77	0.24	2798	0.30	–	3.89	−19.74	Law and order
101	0.32	3523	0.38	–	3.33	−16.39	Government
1	0.00	49	0.01	–	0.31	−40.48	Non-governmental
8	0.03	239	0.03	–	0.00	−2.37	General

O1 is the observed frequency in Scopus. O2 is the observed frequency in BE06. %1 and %2 values show relative frequencies in the texts. + indicates overuse in O1 relative to O2, - indicates underuse in O1 relative to O2 The table is sorted on log-likelihood (LL) value.

Table 6
Overuse of terminology between the research corpus and BE06 (see supplementary material for full table).

O1	%1	O2	%2	Use	Log-likelihood value (LL)	% Diff	Item (group)
386	1.21	451	0.05	+	1505.11	2396.22	Tough/strong
2159	6.77	25030	2.69	+	1317.74	151.57	Unmatched
289	0.91	482	0.05	+	981.57	1648.73	Green issues
415	1.30	2460	0.26	+	619.96	392.02	Geographical terms
482	1.51	4121	0.44	+	474.97	241.13	Change
361	1.13	2862	0.31	+	392.05	267.88	Investigate, examine, test, search
124	0.39	245	0.03	+	390.26	1376.14	Healthy
179	0.56	673	0.07	+	388.98	675.73	Farming & Horticulture
315	0.99	2302	0.25	+	377.13	299.10	Mental object: Means, method
457	1.43	4734	0.51	+	339.37	181.55	Belonging to a group
471	1.48	5249	0.56	+	308.87	161.71	Cause&Effect/Connection
405	1.27	4238	0.46	+	295.80	178.72	Places

O1 is the observed frequency in Scopus. O2 is the observed frequency in BE06. %1 and %2 values show relative frequencies in the texts. + indicates overuse in O1 relative to O2, - indicates underuse in O1 relative to O2 The table is sorted on log-likelihood (LL) value.

reactions are evident in both media coverage and the research corpus.

5. Discussion

Disaster risk reduction is a work in progress [67] where vulnerable moments can inspire considerations of alternatives [68], and provide an opportunity to leverage action and investment towards doing things differently [53]. Conversely, disasters can also lock us into time and place, where we rely on status-quo thinking and short-termism, reinforcing pre-existing inequality and path dependencies [69,70]. Post-disaster, short-term decision-making competes with long-term pathways [20,71]. It is unsurprising therefore to find that the media tends to emphasize readiness and response in its portrayal of resilience, rather than focusing on strategies for reducing future disasters or recovery methods. Similarly, the more complex, structured, and contextual understanding of resilience present in academic research is expected. However, there is a noticeable gap in the depth of resilience descriptions and its portrayal in the media, along with a mismatch in the emphasis on government actions as key drivers for resilience development. The way resilience is framed (for example, social-ecological resilience versus disaster resilience or community resilience) by principal actors can establish agendas, organize decision-making processes, and affect the choice of interventions and policies [12]. Therefore, framing transcends mere discourse; it has tangible effects on the management of these systems and, ultimately, on the ability to either adapt or undergo transformation in the face of climate change [12]. In this section, we explore the potential impacts of the observed framing on post-disaster resilience, and offer some practical recommendations for bridging the gap between media narratives and research insights.

The two corpora differ in their respective importance of government reactions to disaster. While media highlights the lack of readiness and emphasizes the urgent need for immediate government responses in terms of financial aid, scientific publications on resilience in A-NZ show comparatively little mention of governance, policy, and management options. This emphasizes an important evidence gap in journal publications. The definition of resilience significantly influences how the governance of socio-ecological systems can adapt to change and uncertainty [12]. In their analysis of social-ecological resilience in the context of governance decisions, Clement et al. [12] find deficiencies in research comprehending social-ecological resilience and its fundamental role within interconnected systems of humans and nature. One potential reason are the multiple facets and disciplinary discussion of resilience, which pose a challenge for discussions of the governance of socio-ecological systems [72]. However, broadening the integration of resilience and governance is crucial for enhancing responses to environmental shifts and guiding socio-ecological systems toward more

favourable outcomes in the Anthropocene [12]. Our findings reiterate the importance of further aligning the research themes in future analysis of resilience.

The high representation of governmental topics in media suggests the importance for all levels of government to have action plans in place that help them fill their role, accompany citizens in their reactions, enable adaptation, and enhance the potential for transformation. Coverage of policies and government post-disaster affects the agenda for policy change [73]. In A-NZ, the government provides guidance on adaptation through the independent Climate Change Commission which is enacted through the National Adaptation Plan and implemented by local and regional authorities, often as part of hazards and risk management [20]. The ability to adapt and increase resilience is dependent on institutional changes and policies (ibid.), underscoring the relevance of coordinated policies that foster local alliances.

A-NZ's first National Climate Change Risk Assessment [74], identified the potential for maladaptation and poorly suited decision-making frameworks as the primary governance risks, assigning them the highest consequence ratings. In response, the 2022 National Adaptation Plan proposed strategies to address these risks, acknowledging that the responsibility for managing these risks and costs cannot solely rest on the central government [75]. Instead, it emphasizes the necessity for local and community-level enforcement, underlining the importance of proactive individual and community efforts in building resilience [31,75].

This approach aligns with the shift towards decentralizing authority and resources for enhancing local-level disaster risk resilience initiated by the Hyogo Framework for Action 2005–2015 [76]. The significance of local-level responses and community engagement in disaster risk management is further supported by research and international frameworks, advocating for a people-centered approach in the reconstruction and recovery process [77]. This approach encourages communities to actively participate in their recovery and rebuild efforts, and to rethink existing structures collectively [18,78–80].

The transition to the Sendai Framework for Disaster Risk Reduction (2015–2030) marks a significant shift from the Hyogo Framework's reactive measures to a more proactive stance focused on disaster prevention and risk reduction [81]. However, media analysis suggests that the government's actions—or lack thereof—may not fully embody this proactive approach, potentially undermining public confidence in their ability to effectively manage disasters and foster resilience [73]. This situation underscores the need for a comprehensive and inclusive approach to disaster risk management that not only anticipates risks but also empowers local communities to lead their resilience efforts.

The media corpus framing of government responsibilities co-occurred with calls for investment, often pointing to the disconnect between adaptation needs, responses, and policy and funding instruments. A-NZ needs to repair and replace infrastructure in A-NZ, and increase funds for climate risk reduction, post-disaster improvement, compensation, and community resilience [20,74]. Rebuilding infrastructure is crucial for community resilience, aiding efficient coordination (Aldrich, 2012). While the central government has greater fiscal capacity, it faces political and economic constraints to maintain low debt and expenditure [74]. This is reflected in the media corpus, which outlines the need to improve adaptation in both scale and scope to build resilience and avoid maladaptation [82].

How actors navigate adaptation has implications for social and cultural outcomes [20]. Recent experience of extreme events increases adaptation likelihood, shaping climate change perceptions, particularly for those with strong pre-existing beliefs [44,83]. This is especially true when events are attributed to climate change [84], which is a connection drawn in the media corpus. Framing disasters such as Cyclone Gabrielle in a way that attributes any damage solely to climate change can be misleading as it hides pre-existing place-specific vulnerabilities and their socio-political causes [48]. Research in other contexts shows how the framing of the connection between disasters and climate change affect policy [85, 48]. Where Cyclone Gabrielle is described in the context of climate change in the media, it is mostly to outline the responsibility of government, giving precedence to centralise solutions. Centralisation in reaction to localised/regionalised problems dismisses community's capacity to initiate risk reduction [67]. Community responses can at times be more efficient and effective in their capacity for adaptation, learning and/or transformation [86]. Preparing for future climate-related hazards requires a shared understanding of the future, creative solutions, and enhanced communication between stakeholders across all scales of governance, and between policy and practice [87–89].

Media coverage underreports information labelled as scientific, as well as practices and pathways. This is not uncommon, as news media generally showcase narrow and limited facets of climate change knowledge [90]. However, to leverage scientific insights, mediatisation of news need to align newsworthiness with news effects [90]. Some suggestions on how to do that have been made linking behavioural, neurophysiological, and linguistic studies [90–93]. For example, analysis of communication effects shows that effective communication around climate change requires messages that emphasize risk, highlight short-term impacts, and focus on local solutions, among other techniques [94]. Oulahen et al. [95] find people favor the notion of "enhancing resilience" rather than "minimizing vulnerability", and that the idea of resilience as creative transformation is significantly preferred to viewing resilience as merely resistance or recovery. Additionally, affective responses towards climate change have been consistently found to be strong predictors of risk perceptions, mitigation behaviour, adaptation behaviour, policy support, and technology acceptance [92]. We know that communication that recognizes the relevance of hope and positive change stories impacts on behaviour [96–98].

Localised community reactions are generally covered using a positive framing in the media following Cyclone Gabrielle. Such stories receive less coverage – perhaps because of the short timeframe we study. While it might be too early to look for stories centered around recovery, incorporating positive narratives around community-level responses could inform recovery processes and influence policy design and processes in reaction to, and in preparation for, disasters. Mindful communication incorporating media corpus stories about strength/resilience can foster localized responses to dynamic disaster situations [99]. Such stories can also highlight when, where and how individuals could change in response to a disaster. The perceived capability to act on a risk have been found to have a positive effect on resilience [44, 100]. Individuals' initial perceptions of risk, as well as their interpretation of disastrous event and their outcomes, can be influenced by local ecological knowledge and intergenerational memory specific to a place [101].

Furthermore, individuals who engage in disaster communication are more likely to feel a sense of belonging and perceive their community as more resilient [102]. Elaborating when, where, and how communities, local networks, and individuals react and respond, and what is needed to recover apart from central government reactions can act at multiple levers of change at the individual and system-level, engender agency, and open safe political spaces to imagine different futures [103]. Additionally, communication around practices, pathways, and experiences in dealing with disaster have flow-on effects beyond affected areas, allowing a wider distribution of resilience knowledge [87].

Our study does not explore how media information is perceived, understanding the effect of framing on individuals along with monitoring and analysing post-cyclone behavior, could provide additional, nuanced insights into framing effects post disasters. Insights provided by Freihardt and Buchs [104] showcase that framing effects on disaster risk reduction depend on preferences that people hold. We also know that framing affects policy support [105], but have evidence that showcases the need to recognize multiple sources of resilience [106], which might feed into a more nuanced, specialised framing of resilience depending on context, region, and intention. Future research could investigate preferences, attitudes and values in relation to preparedness for future extreme events together with different framings of resilience actions and test the relevance of experience with extreme events such as cyclone Gabrielle.

Finally, there is a need to better understand and contribute to closing the gap between media narratives of disaster risk and resilience, and the ways in which these and related concept are understood and operationalised in research. In practical terms, this means working across socially constructed boundaries. Such boundary work is well recognised in the science-policy literature, where it is used to describe the process of different actors and perspectives engaging in different ways to support evidence-based decision making [107]. Through the use of co-creation methodologies, scientists, policy-makers and practitioners resolve differences, gain new perspectives, and exchange evidence [108]. Similarly, there is an opportunity to engage media in the co-creation effort. From an epistemic perspective—the news is a form of knowledge about the world—and here too, concepts of boundary work and co-creation can serve as useful tools [109]. For example, local journalism plays a vital institutional and social role during and after a disaster, focusing on the needs and stories of affected persons and communities, and providing an intimate, and detailed knowledge of place, that may not be captured through (inter)national perspectives [110]. For researchers, it may means speaking the language of the public, simplifying jargon, and focusing on the human impacts of their research and its implications, in a clear, concise way. It means helping to frame a positive story, to motivate action. This could involve workshops or briefings, to explain research directly, or pre-event press releases, that proactively contribute to understanding potential impacts, consequences and opportunities. Joint workshops with scientists, can help equip journalists with the skills to understand risk and resilience concepts, and empower them to translate scientific findings accurately and engagingly, without sacrificing nuance or the excitement of discovery. Such efforts, particularly at the local level, can enhance credibility, and contribute to overcoming disinformation [111]

6. Conclusions

A-NZ must continually adapt to ongoing environmental changes. Our analysis of post-Cyclone Gabrielle communication reveals disparities between resilience researchers' priorities and how media portrays disasters in A-NZ. The contrast exposes differences in scale emphasis (local vs. national), reaction dynamics (community vs. central government), and issue framing. The disproportionate focus on government funding and responses in media coverage establishes expectations for centralized, top-down approaches to future disasters. This might neglect opportunities to empower individuals and communities for transformative transitions post-disaster. Effective adaptation can mitigate risks and realize opportunities, while maladaptation risks worsening vulnerabilities and leading to undesirable outcomes. Recognising the impact of media coverage, addressing framing gaps in (mal)adaptation and resilience, and reframing coverage to enhance agency and efficacy are crucial for proactive discourse shifts toward climate-adapted futures.

CRediT authorship contribution statement

Franca Angela Buelow: Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Ann Brower:** Writing – review & editing, Supervision. **Nicholas Cradock-Henry:** Writing – review & editing, Validation, Supervision.

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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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During the preparation of this work the author(s) used chatGPT to check for clarity in their wording. After using this tool/service,

the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijdrr.2024.105167.

Data availability

Raw text files for both corpora can be downloaded from the supplementary materials.

References

[1] D.J. Parker, Disaster resilience – a challenged science, Environ. Hazards 19 (1) (2020) 1–9, https://doi.org/10.1080/17477891.2019.1694857.
[2] N.A. Cradock-Henry, F. Buelow, J. Fountain, Social–ecological inventory in a postdisaster context: the 2016 Kaikōura earthquake, Aotearoa-New Zealand, Ecol. Soc. 24 (3) (2019) 9.
[3] C. Coetzee, N.D. Van, E. Raju, Disaster resilience and complex adaptive systems theory, Disaster Prev. Manag. 25 (2016) 196–211, https://doi.org/10.1108/DPM-07-2015-0153.
[4] N.P. Simpson, K.J. Mach, A. Constable, J. Hess, R. Hogarth, M. Howden, J. Lawrence, R.J. Lempert, V. Muccione, B. Mackey, M.G. New, B. O'Neill, F. Otto, H.-O. Pörtner, A. Reisinger, D. Roberts, D.N. Schmidt, S. Seneviratne, S. Strongin, M. van Aalst, E. Totin, C.H. Trisos, A framework for complex climate change risk assessment, One Earth 4 (2021) 489–501, https://doi.org/10.1016/j.oneear.2021.03.005.
[5] P. Aldunce, R. Bórquez, C. Adler, G. Blanco, R. Garreaud, Unpacking resilience for adaptation: incorporating practitioners' experiences through a transdisciplinary approach to the case of drought in Chile, Sustainability 8 (2016) 905, https://doi.org/10.3390/su8090905.
[6] C. Folke, S. Carpenter, B. Walker, M. Scheffer, T. Chapin, J. Rockström, Resilience thinking: integrating resilience, adaptability and transformability, Ecol. Soc. 15 (2010), https://doi.org/10.5751/ES-03610-150420.
[7] B.H. Walker, N. Abel, J.M. Anderies, P. Ryan, et al., Resilience, adaptability, and transformability in the goulburn-broken catchment, Australia, Ecol. Soc. 14 (2009) 12.
[8] M. Ungar, Qualitative contributions to resilience research, Qual. Soc. Work 2 (1) (2003) 85–102, https://doi.org/10.1177/1473325003002001123.
[9] S.R. Wilson, K. Kuang, E.A. Hintz, P.M. Buzzanell, Developing and validating the communication resilience processes scale, J. Commun. 71 (3) (2021) 478–513, https://doi.org/10.1093/joc/jqab013.
[10] L. Olsson, A. Jerneck, H. Thoren, J. Persson, D. O'Byrne, Why resilience is unappealing to social science: theoretical and empirical investigations of the scientific use of resilience, Sci. Adv. 1 (2015) e1400217, https://doi.org/10.1126/sciadv.1400217.
[11] P. Rogers, The etymology and genealogy of a contested concept, in: D. Chandler, J. Coaffee (Eds.), The Routledge Handbook of International Resilience, Routledge, London, 2016, pp. 9–15, 2016.
[12] S. Clement, J. Jozaei, M. Mitchell, C.R. Allen, A.S. Garmestani, How resilience is framed matters for governance of coastal social-ecological systems, Environmental Policy and Governance 34 (1) (2023) 65–76, https://doi.org/10.1002/eet.2056.
[13] C. Kuhlicke, M. Madruga de Brito, B. Bartkowski, W. Botzen, C. Doğulu, S. Han, P. Hudson, A. Nuray Karanci, C.J. Klassert, D. Otto, A. Scolobig, T. Moreno Soares, S. Rufat, Spinning in circles? A systematic review on the role of theory in social vulnerability, resilience and adaptation research, Global Environ. Change 80 (2023) 102672, https://doi.org/10.1016/j.gloenvcha.2023.102672.
[14] P. Rogers, J.J. Bohland, J. Lawrence, Resilience and values: global perspectives on the values and worldviews underpinning the resilience concept, Polit. Geogr. 83 (2020) 102280, https://doi.org/10.1016/j.polgeo.2020.102280.
[15] J. Lanlan, M.N.I. Sarker, I. Ali, R.B.R. Firdaus, M.A. Hossin, Vulnerability and resilience in the context of natural hazards: a critical conceptual analysis, Environ. Dev. Sustain. (2023), https://doi.org/10.1007/s10668-023-03440-5.
[16] F.H. Norris, S.P. Stevens, B. Pfefferbaum, K.F. Wyche, R.L. Pfefferbaum, Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness, Am J Community Psychol. Mar 41 (1–2) (2008) 127–150, https://doi.org/10.1007/s10464-007-9156-6. PMID: 18157631.
[17] C.R. Allen, H. Birgé, D.G. Angeler, C.A. Arnold, Tony, B.C. Chaffin, D. DeCaro, A.S. Garmestani, L.H. Gunderson, Uncertainty and trade-offs in resilience assessments, in: Practical Panarchy for Adaptive Water Governance, Springer, Cham, 2018, pp. 243–268, https://doi.org/10.1007/978-3-319-72472-0_15.
[18] B. Avendano-Uribe, H. Lukosch, M. Milke, Playing with uncertainty: facilitating community-based resilience building, Urban Plan 7 (2022), https://doi.org/10.17645/up.v7i2.5098.
[19] M. Welsh, Resilience and responsibility: governing uncertainty in a complex world, Geogr. J. 180 (2014) 15–26, https://doi.org/10.1111/geoj.12012.
[20] J. Lawrence, A. Wreford, P. Blackett, D. Hall, A. Woodward, S. Awatere, M.E. Livingston, C. Macinnis-Ng, S. Walker, J. Fountain, M.J. Costello, A.-G.E. Ausseil, M.S. Watt, S.M. Dean, N.A. Cradock-Henry, C. Zammit, T.L. Milfont, Climate Change Adaptation through an Integrative Lens in Aotearoa New Zealand, Journal of the Royal Society of New Zealand, 2023, https://doi.org/10.1080/03036758.2023.2236033.
[21] R. Genç, The importance of communication in sustainability & sustainable strategies, Procedia Manuf. 8 (2017) 511–516, https://doi.org/10.1016/J.PROMFG.2017.02.065.
[22] A. Pangallo, L. Zibarras, R. Lewis, P.E. Flaxman, Resilience through the lens of interactionism: a systematic review, Psychol. Assess. 27 (1) (2015) 1–20, https://doi.org/10.1037/PAS0000024.
[23] M.J. Colloff, R. Gorddard, N. Abel, B. Locatelli, C. Wyborn, J.R.A. Butler, S. Lavorel, L. van Kerkhoff, S. Meharg, C. Múnera-Roldán, E. Bruley, G. Fedele, R. M. Wise, M. Dunlop, Adapting transformation and transforming adaptation to climate change using a pathways approach, Environ. Sci. Pol. 124 (2021) 163–174, https://doi.org/10.1016/j.envsci.2021.06.014.
[24] I. Fazey, P. Moug, S. Allen, K. Beckmann, D. Blackwood, M. Bonaventura, K. Burnett, M. Danson, R. Falconer, A.S. Gagnon, R. Harkness, A. Hodgson, L. Holm, K.N. Irvine, R. Low, C. Lyon, A. Moss, C. Moran, L. Naylor, K. O'Brien, S. Russell, S. Skerratt, J. Rao-Williams, R. Wolstenholme, Transformation in a changing climate: a research agenda, Clim. Dev. 10 (2018) 197–217, https://doi.org/10.1080/17565529.2017.1301864.
[25] R.W. Kates, W.R. Travis, T.J. Wilbanks, Transformational adaptation when incremental adaptations to climate change are insufficient, Proc. Natl. Acad. Sci. 109 (2012) 7156–7161, https://doi.org/10.1073/pnas.1115521109.
[26] D. Wither, C. Orchiston, N. Cradock-Henry, E. Nel, Advancing practical applications of resilience in Aotearoa-New Zealand, Ecol. Soc. 26 (2021), https://doi.org/10.5751/ES-12409-260301.
[27] A.J. Davies, C. Zorn, T.M. Wilson, L.M. Wotherspoon, S. Beaven, T.R.H. Davies, M.W. Hughes, Infrastructure failure propagations and recovery strategies from an alpine fault earthquake scenario: establishing feedback loops between integrated modelling and participatory processes for disaster impact reduction, Bull. N. Z. Soc. Earthq. Eng. 54 (2021) 15.
[28] S. Spector, N.A. Cradock-Henry, S. Beaven, C. Orchiston, Characterising rural resilience in Aotearoa-New Zealand: a systematic review, Reg. Environ. Change 19 (2019) 543–557, https://doi.org/10.1007/s10113-018-1418-3.
[29] J. Lawrence, B. Mackey, F. Chiew, M.J. Costello, K. Hennessy, N. Lansbury, U.B. Nidumolu, G. Pecl, L. Rickards, N. Tapper, et al., Australasia, in: H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, et al. (Eds.), Climate Change 2022: Impacts,

Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, 2022, pp. 1581–1688. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter11.pdf.
[30] D.J. Frame, S.M. Rosier, I. Noy, L.J. Harrington, T. Carey-Smith, S.N. Sparrow, D.A. Stone, S.M. Dean, Climate change attribution and the economic costs of extreme weather events: a study on damages from extreme rainfall and drought, Clim. Change (2020), https://doi.org/10.1007/s10584-020-02729-y.
[31] R. Carr, Letter to hon james shaw: consultation on draft national adaptation plan. Available online: advice on the draft national adaptation plan » climate change commission. climatecommission.govt.nz, 2022. (Accessed 18 November 2023) last accessed.
[32] L. Anthony, AntConc, Waseda University, Tokyo, Japan, 2022 [Computer Software], Version 4.2.0. https://www.laurenceanthony.net/software.
[33] P. Rayson, From key words to key semantic domains, Int. J. Corpus Linguist. 13 (4) (2008) 519–549, https://doi.org/10.1075/ijcl.13.4.06ray.
[34] M.D. Morecroft, H.Q.P. Crick, S.J. Duffield, N.A. Macgregor, Resilience to Climate Change: translating principles into practice, J. Appl. Ecol. 49 (2012) 547.
[35] F.A. Buelow, A. Brower, Structural adaptation triggers in the CAP: regional implementation 2007–2013 in the east midlands, England, Case Studies in the Environment 23 7 (1) (2023) 2003039, https://doi.org/10.1525/cse.2023.2003039.
[36] D.M. Abramson, L.M. Grattan, B. Mayer, C.E. Colten, F.A. Arosemena, A. Bedimo-Rung, M. Lichtveld, The resilience activation framework: a conceptual model of how access to social resources promotes adaptation and rapid recovery in post-disaster settings, J. Behav. Health Serv. Res. 42 (1) (2015) 42–57, https://doi.org/10.1007/s11414-014-9410-2. PMID: 24870399; PMCID: PMC4247807.
[37] S.H. Charles, A.Y. Chang-Richards, T.W. Yiu, A systematic review of factors affecting post-disaster reconstruction projects resilience, International Journal of Disaster Resilience in the Built Environment 13 (1) (2022) 113–132, https://doi.org/10.1108/IJDRBE-10-2020-0109.
[38] G. O'Brien, P. O'Keefe, Z. Gadema, J. Swords, Approaching disaster management through social learning, Disaster Prev. Manag. 19 (4) (2010) 498–508.
[39] P. Aldunce, R. Beilin, J. Handmer, M. Howden, Framing disaster resilience: the implications of the diverse conceptualisations of "bouncing back", Disaster Prev. Manag. 23 (3) (2014) 252–270, https://doi.org/10.1108/DPM-07-2013-0130.
[40] A. Hansen, Communication, media and environment: towards reconnecting research on the production, content and social implications of environmental communication, Int. Commun. Gaz. 73 (1–2) (2011) 7–25, https://doi.org/10.1177/1748048510386739.
[41] A. Hansen, D. Machin, Media and Communication Research Methods, second ed., Red Globe Press, London, 2019, p. 314. ISBN: 978-1-137-52824-7.
[42] R. Bartosch, Framing Framing: Aliens, Animals, and Anthropological Différance across Media, 2019, pp. 121–136, https://doi.org/10.1007/978-3-030-33300-3_6.
[43] J. Cornelissen, M.D. Werner, Putting framing in perspective: a review of framing and frame analysis across the management and organizational literature, Acad. Manag. Ann. 8 (1) (2014) 181–235, https://doi.org/10.1080/19416520.2014.875669.
[44] F. Buelow, N.A. Cradock-Henry, What you sow is what you reap? (Dis-)Incentives for adaptation intentions in farming, Sustainability 10 (2018) 1133.
[45] S.D. Reese, The framing project: a bridging model for media research revisited, J. Commun. 57 (1) (2007) 148–154, https://doi.org/10.1111/J.1460-2466.2006.00334.X.
[46] S. Clement, Governing the Anthropocene: Novel Ecosystems, Transformation, and Environmental Policy, Palgrave Macmilan, 2021, https://doi.org/10.1007/978-3-030-60350-2.
[47] L.L. Putnam, M. Holmer, Framing, reframing, and issue development, in: L.L. Putnam, M.E. Roloff (Eds.), Communication and Negotiation, Sage Publications, Inc., Thousand Oaks, California, 1992, pp. 128–155.
[48] M. Lahsen, J. Ribot, Politics of attributing extreme events and disasters to climate change, Wiley Interdisciplinary Reviews: Clim. Change 13 (1) (2022) e750, https://doi.org/10.1002/wcc.750.
[49] E.L. Bohensky, A.M. Leitch, Framing the flood: a media analysis of themes of resilience in the 2011 Brisbane flood, Reg. Environ. Change 14 (2014) 475–488, https://doi.org/10.1007/s10113-013-0438-2.
[50] K. Sambrook, E. Konstantinidis, S. Russell, Y. Okan, The role of personal experience and prior beliefs in shaping climate change perceptions: a narrative review, Front. Psychol. 12 (2021) 669911, https://doi.org/10.3389/fpsyg.2021.669911.
[51] P.M. Buzzanell, Resilience: talking, resisting, and imagining new normalcies into being, J. Commun. 60 (1) (2010) 1–14, https://doi.org/10.1111/J.1460-2466.2009.01469.X.
[52] J. Birkmann, P. Buckle, J. Jaeger, M. Pelling, N. Setiadi, M. Garschagen, N. Fernando, J. Kropp, Extreme events and disasters: a window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters, Nat. Hazards 55 (2010) 637–655, https://doi.org/10.1007/s11069-008-9319-2.
[53] K. Brundiers, H.C. Eakin, Leveraging post-disaster windows of opportunities for change towards sustainability: a framework, Sustainability 10 (2018) 1390, https://doi.org/10.3390/su10051390.
[54] Å. Davidsson, Disasters as an opportunity for improved environmental conditions, Int. J. Disaster Risk Reduct. 48 (2020) 101590, https://doi.org/10.1016/j.ijdrr.2020.101590.
[55] J. McClure, C.G. Sibley, Framing effects on disaster preparation: is negative framing more effective? Australas. J. Disaster Trauma Stud. 18 (2) (2011) 187–199.
[56] D. Parida, S. Moses, K. Rubayet Rahaman, Analysing media framing of cyclone Amphan: implications for risk communication and disaster preparedness, Int. J. Disaster Risk Reduc. 59 (2021) 102272, https://doi.org/10.1016/j.ijdrr.2021.102272.
[57] M.S. Schäfer, V. Hase, Computational methods for the analysis of climate change communication: towards an integrative and reflexive approach, WIREs Climate Change 14 (2) (2023) e806, https://doi.org/10.1002/wcc.806.
[58] A. Tounsi, M. Temimi, A systematic review of natural language processing applications for hydrometeorological hazards assessment, Nat. Hazards 116 (2023) 2819–2870, https://doi.org/10.1007/s11069-023-05842-0.
[59] A. Rafeeq, S. Jiang, Breaking news of disasters: how Stuff.co.nz and NZHerald.co.nz used Facebook and Twitter in the 2016 Kaikoura earthquake coverage in New Zealand, Cogent Social Sciences 6 (2020) 1, https://doi.org/10.1080/23311886.2020.1731121.
[60] V. Brezina, T. McEnery, S. Wattam, Collocations in context: a new perspective on collocation networks, Int. J. Corpus Linguist. 20 (2) (2015) 139–173.
[61] V. Brezina, M. Timperley, T. McEnery, #LancsBox 4.x [software]. Available at: http://corpora.lancs.ac.uk/lancsbox, 2018.
[62] V. Brezina, P. Weill-Tessier, T. McEnery, #LancsBox 5.x and 6.x [software]. Available at: http://corpora.lancs.ac.uk/lancsbox, 2020.
[63] M. Gillings, G. Mautner, P. Baker, Corpus-Assisted Discourse Studies, Cambridge University Press. Cambridge Elements in Corpus Linguistics, 2023, https://doi.org/10.1017/9781009168144.
[64] P. Rayson, R. Garside, Comparing corpora using frequency profiling. In Proceedings of the Workshop on Comparing Corpora, Held in Conjunction with the 38th Annual Meeting of the Association for Computational Linguistics (ACL 2000), 2000, pp. 1–6, 1-8 October 2000, Hong Kong.
[65] B. Louw, Irony in the text or insincerity in the writer? The diagnostic potential of semantic prosodies, in: M. Baker, G. Francis, E. Tognini-Bonelli (Eds.), Text and Technology: in Honour of John Sinclair, John Benjamins, 1993, pp. 157–176.
[66] A. Partington, "Utterly content in each other's company": semantic prosody and semantic preference, Int. J. Corpus Linguist. 9 (2004) 131–156.
[67] S. Lambert, Indigenous Disaster Planning – reflections on recent conferences, Lincoln Planning Review 5 (1–2) (2013) 60–61.
[68] B. McGreavy, Resilience as discourse, Environmental Communication 10 (1) (2016) 104–121, https://doi.org/10.1080/17524032.2015.1014390.
[69] N. Abel, R. Wise, M. Colloff, B. Walker, J. Butler, P. Ryan, C. Norman, A. Langston, J. Anderies, R. Gorddard, M. Dunlop, D. O'Connell, Building resilient pathways to transformation when "no one is in charge": insights from Australia's Murray-Darling Basin, Ecol. Soc. 21 (2016), https://doi.org/10.5751/ES-08422-210223.
[70] A. Bertana, B. Clark, T.M. Benney, C. Quackenbush, Beyond maladaptation: structural barriers to successful adaptation, Environ. Sociol 8 (2022) 448–458, https://doi.org/10.1080/23251042.2022.2068224.
[71] N.A. Cradock-Henry, B. Frame, Balancing scales: enhancing local applications of adaptation pathways, Environ. Sci. Pol. 121 (2021) 42–48, https://doi.org/10.1016/j.envsci.2021.04.001.
[72] C.R. Allen, D.G. Angeler, B.C. Chaffin, D. Twidwell, A. Garmestani, Resilience reconciled, Nat. Sustain. 2 (2019) 898–900, https://doi.org/10.1038/s41893-019-0401-4.

[73] T. Jamieson, D.A. Van Belle, Resilience-focused journalism: the motivations, tactics, and impact of the Los Angeles times coverage of earthquake risk, Environmental Communication 17 (2) (2023) 157–171, https://doi.org/10.1080/17524032.2019.1674895.
[74] MfE, Ministry for the Environment, National Climate Change Risk Assessment for Aotearoa New Zealand: Main Report – Arotakenga Tūraru Mō Te Huringa Āhuarangi O Āotearoa: Pūrongo Whakatōpū, Ministry for the Environment, Wellington, 2020.
[75] MfE, Ministry for the Environment, Draft national adaptation plan. Wellington: ministry for the EnvironmentNational adaptation plan 2022, Online: Draft-national-adaptation-plan.pdf (environment.govt.nz) (2022). (Accessed 12 January 2023).
[76] United Nations International Strategy for Disaster Reduction (UNISDR), Hyogo Framework for Action 2005-2015: building the resilience of nations and communities to disasters, Retrieved from, http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-frameworkfor-action-english.pd, 2005.
[77] S. Morelli, V. Pazzi, O. Nardini, S. Bonati, Framing disaster risk perception and vulnerability in social media communication: a literature review, Sustainability 14 (15) (2022) 9148, https://doi.org/10.3390/su14159148.
[78] L. Faulkner, K. Brown, T. Quinn, Analyzing community resilience as an emergent property of dynamic social-ecological systems, Ecol. Soc. 23 (2018), https://doi.org/10.5751/ES-09784-230124.
[79] P.R. Payne, W.H. Kaye-Blake, K.A. Stirrat, R.A. Ellison, M.J. Smith, M. Brown, Identifying resilience dimensions and thresholds: evidence from four rural communities in New Zealand, Resilience 7 (2019) 149–171, https://doi.org/10.1080/21693293.2018.1545339.
[80] T. Tanner, D. Lewis, D. Wrathall, R. Bronen, N. Cradock-Henry, S. Huq, C. Lawless, R. Nawrotzki, V. Prasad, M.A. Rahman, R. Alaniz, K. King, K. McNamara, M. Nadiruzzaman, S. Henly-Shepard, F. Thomalla, Livelihood resilience in the face of climate change, Nat. Clim. Change 5 (2015) 23–26, https://doi.org/10.1038/nclimate2431.
[81] United Nations International Strategy for Disaster Reduction (UNISDR), Sendai Framework for Disaster Risk Reduction 2015-30, United Nations, New York, 2015.
[82] D. Reckien, A.K. Magnan, C. Singh, et al., Navigating the continuum between adaptation and maladaptation, Nat. Clim. Chang. 13 (2023) 907–918, https://doi.org/10.1038/s41558-023-01774-6.
[83] M. Bergquist, A. Nilsson, P.W. Schultz, Experiencing a severe weather event increases concern about climate change, Front. Psychol. 10 (2019) 220, https://doi.org/10.3389/fpsyg.2019.00220.
[84] C.A. Ogunbode, C. Demski, S.B. Capstick, R. Gennaro, Attribution matters: revisiting the link between extreme weather experience and climate change mitigation responses, Glob. Environ Change 54 (2019) 31–39, https://doi.org/10.1016/j.gloenvcha.2018.11.005.
[85] P. Imperatore, F. Frazzetta, Narratives of extreme weather events as a field of conflict: a media comparison between the Emilia Romagna and Marche floods, Italian Political Science 18 (3) (2024) 316–337.
[86] J. Fountain, N.A. Cradock-Henry, F. Buelow, H. Rennie, Agri-food tourism, rural resilience and recovery in a post disaster context: insights and evidence from Kaikōura-Hurunui, Aotearoa-New Zealand, Tourism Anal. 26 (2–3) (2021) 135–149, https://doi.org/10.3727/108354221X16079839951420.
[87] A. Holmes, L. McEwen, How to exchange stories of local flood resilience from flood rich areas to the flooded areas of the future, Environmental Communication 14 (5) (2020) 597–613, https://doi.org/10.1080/17524032.2019.1697325.
[88] W. Hynes, B. Trump, P. Love, I. Linkov, Bouncing forward: a resilience approach to dealing with COVID-19 and future systemic shocks, Environ. Syst. Decis. 40 (2020) 174–184, https://doi.org/10.1007/s10669-020-09776-x.
[89] A.F. Van Loon, I. Lester-Moseley, M. Rohse, P. Jones, R. Day, Creative practice as a tool to build resilience to natural hazards in the Global South, Geosci. Commun. 3 (2020) 453–474, https://doi.org/10.5194/gc-3-453-2020.
[90] M.-E. Perga, P. Sarrasin, J. Steinberger, S.N. Lane, F. Butera, The climate change research that makes the front page: is it fit to engage societal action? Global Environ. Change 80 (2023) 102675 https://doi.org/10.1016/j.gloenvcha.2023.102675.
[91] S.M. Constantino, G. Sparkman, G.T. Kraft-Todd, C. Bicchieri, D. Centola, B. Shell-Duncan, S. Vogt, E.U. Weber, Scaling up change: a critical review and practical guide to harnessing social norms for climate action, Psychol. Sci. Publ. Interest 23 (2) (2022) 50–97, https://doi.org/10.1177/15291006221105279.
[92] T. Brosch, Affect and emotions as drivers of climate change perception and action: a review, Current opinion in behavioral sciences (2021), https://doi.org/10.1016/J.COBEHA.2021.02.001.
[93] R. Alexander, O.R. Aragón, J. Bookwala, N. Cherbuin, J.M. Gatt, I.J. Kahrilas, N. Kästner, A. Lawrence, L. Lowe, R.G. Morrison, S.C. Mueller, R. Nusslock, C. Papadelis, K.L. Polnaszek, S.H. Richter, R.L. Silton, C. Styliadis, The neuroscience of positive emotions and affect: implications for cultivating happiness and wellbeing, Neurosci. Biobehav. Rev. 121 (2021) 220–249, https://doi.org/10.1016/j.neubiorev.2020.12.002.
[94] K. Wågsæther, G. Ziervogel, Bridging the communication gap: an Explortation of the climate science – water management interface, Environment 53 (3) (2011) 32–44, https://doi.org/10.1080/00139157.2011.570647.
[95] G. Oulahen, C. Randall, C. Nguyen, C. Mitchell, Public perceptions of resilience and vulnerability concepts for adaptation, Prof. Geogr. 76 (1) (2024) 13–23, https://doi.org/10.1080/00330124.2023.2250415.
[96] E.U. Weber, S.M. Constantino, All hearts and minds on deck: hope motivates climate action by linking the present and the future, Emotion Review 15 (4) (2023) 293–297, https://doi.org/10.1177/17540739231195534.
[97] N. Geiger, K. Gasper, J.K. Swim, J. Fraser, Untangling the components of hope: increasing pathways (not agency) explains the success of an intervention that increases educators' climate change discussions, J. Environ. Psychol. 66 (2019) 101366, https://doi.org/10.1016/j.jenvp.2019.101366.
[98] N. Geiger, J.K. Swim, K. Gasper, J. Fraser, K. Flinner, How Do I Feel when I Think about Taking Action? Hope and Boredom, Not Anxiety and Helplessness, Predict Intentions to Take Climate, vol. 76, 2021 101649, https://doi.org/10.1016/j.jenvp.2021.101649.
[99] W. Finnegan, 'It's beautiful, living without fear that the world will end soon' – digital storytelling, climate futures, and young people in the UK and Ireland, Child Geogr. 21 (5) (2022) 898–913, https://doi.org/10.1080/14733285.2022.2153329.
[100] C. Sutcliffe, I. Holman, D. Goodwin, G. Salmoral, L. Pardthaisong, S. Visessri, C. Ekkawatpanit, D. Rey, Which factors determine adaptation to drought amongst farmers in Northern Thailand? Investigating farmers' appraisals of risk and adaptation and their exposure to drought information communications as determinants of their adaptive responses, Mitig. Adapt. Strategies Glob. Change 29 (2024) 6, https://doi.org/10.1007/s11027-023-10099-w.
[101] K.A. Lynch, D.M. Abramson, A.A. Merdjanoff, The influence of risk perception on disaster recovery: a case study of New Jersey families impacted by hurricane sandy, Int. J. Disaster Risk Reduc. 100 (2024) 104220, https://doi.org/10.1016/j.ijdrr.2023.104220.
[102] M.L. Spialek, J.B. Houston, The influence of citizen disaster communication on perceptions of neighborhood belonging and community resilience, J. Appl. Commun. Res. 47 (1) (2019) 1–23, https://doi.org/10.1080/00909882.2018.1544718.
[103] A. Siodmok, Introducing a 'government as a system' toolkit. Policy lab blog (6 March 2020). https://openpolicy.blog.gov.uk/2020/03/06/introducing-a-government-as-a-system-toolkit/, 2020. (Accessed 12 January 2024) (last accessed.
[104] J. Freihardt, R. Buchs, Framing effects in disaster risk communication: the case of coastal erosion in the United States, Environ. Hazards 23 (3) (2023) 287–305, https://doi.org/10.1080/17477891.2023.2280691.
[105] S. Meerow, F.G. Neuner, Positively resilience? How framing local action affects public opinion, Urban Aff. Rev. 57 (1) (2020), https://doi.org/10.1177/1078087420905655.
[106] W.N. Adger, K. Brown, D.R. Nelson, F. Berkes, H. Eakin, C. Folke, K. Galvin, L. Gunderson, M. Goulden, K. O'Brien, J. Ruitenbeek, E.L. Tompkins, Resilience implications of policy responses to climate change, WIREs Clim Change 2 (2011) 757–766, https://doi.org/10.1002/wcc.133.
[107] L.M. Andrews, S. Munaretto, H.L.P. Mees, P.P.J. Driessen, Conceptualising boundary work activities to enhance credible, salient and legitimate knowledge in sustainability transdisciplinary research projects, Environ. Sci. Pol. 155 (2024) 103722, https://doi.org/10.1016/j.envsci.2024.103722.
[108] R.P. Bixler, E. Yang, S.M. Richter, M. Coudert, Boundary crossing for urban community resilience: a social vulnerability and multi-hazard approach in Austin, Texas, USA, Int. J. Disaster Risk Reduc. 66 (2021) 102613, https://doi.org/10.1016/j.ijdrr.2021.102613.

[109] M. Carlson, Boundary work, in: The International Encyclopedia of Journalism Studies, John Wiley & Sons, Ltd, 2018, pp. 1–6, https://doi.org/10.1002/9781118841570.iejs0035.
[110] G. Buoncompagni, Media and natural disasters: organising storytelling in the age of climate change, Journalism and Media 5 (2024) 614–625, https://doi.org/10.3390/journalmedia5020041.
[111] D.W. Cash, P.G. Belloy, Salience, credibility and legitimacy in a rapidly shifting world of knowledge and action, Sustainability 12 (2020) 7376, https://doi.org/10.3390/su12187376.