

**A Review of New Zealand's Natural Hazards
Research 2000-2017: Informing a Regional Hazards
and Risk Management Roadmap and Agenda**

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CONTENTS

EXECUTIVE SUMMARY	ii
1.0 INTRODUCTION	1
2.0 PROJECT ACTIVITIES	3
2.1 THE RESEARCH FUNDING LANDSCAPE	3
2.2 LIKELY GAPS IN THE COMPENDIUM	8
2.3 ANALYSIS OF THE RESEARCH COMPILED	8
2.4 IDENTIFICATION OF RESEARCH GAPS	9
3.0 A NZ RESEARCH ROADMAP FOR MANAGEMENT OF NATURAL HAZARDS AND THE ROLE OF REGIONAL COUNCILS	11
3.1 RECOMMENDATIONS FOR THE RHRM SIG	11
4.0 CONCLUSIONS	13

FIGURES

Figure 2.1	Count of research publications (published peer-reviewed journal papers, book chapters and publicly-available commissioned reports), classified according to focus areas of the National Disaster Resilience Strategy (see Table 2.2).	5
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TABLES

Table 2.1	List of funders and entities undertaking natural hazards research in New Zealand.....	4
Table 2.2	Priorities and focus areas of the National Disaster Resilience Strategy (NDRS) under development.....	6
Table 2.3	Guidance on assignment of research results to focus areas of the NDRS	7

APPENDICES

A1.0	APPENDIX 1: DRAFT NATIONAL INDICATORS OF THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION	16
A2.0	APPENDIX 2: MAPPING DRAFT FOCUS AREAS OF THE NATIONAL DISASTER RISK STRATEGY TO DRAFT NATIONAL INDICATORS FROM THE SENDAI FRAMEWORK	18
A3.0	APPENDIX 3: - XLS SPREADSHEET OF REFERENCES COMPILED	19
A4.0	APPENDIX 4: CONCLUSIONS FROM LGNZ THINKPIECE (OCTOBER 2014) WITH COMMENTS FROM CURRENT REPORT AUTHORS (JULY 2017)	20
A5.0	APPENDIX 5: RECOMMENDATIONS FROM LGNZ THINKPIECE WITH COMMENTS FROM CURRENT REPORT AUTHORS (JULY 2017)	22

EXECUTIVE SUMMARY

This report responds to a request from the Regional Hazards and Risk Management (RHRM) Special Interest Group (SIG) to collate existing inventories of hazard-related research and to undertake some analysis of the inventory with respect to research gaps that could contribute to defining a research roadmap for the SIG. We have chosen to categorise the research in terms of the priorities of the developing National Disaster Resilience Strategy and note that the majority of past research has been centred on hazard identification. Risk modelling studies have often been focussed on individual sites, utilities, or urban areas and aspects of hazards and society have received some attention. Research relating to the governance of natural hazard risk management have received relatively little attention and research that has characterised or quantified resilience to natural hazards in New Zealand is in its infancy. To justify investment in risk reduction requires significant research into social and economic consequence modelling that is also in its infancy in New Zealand. Thus, significant additional opportunities for future research to improve natural hazard risk management and support for risk reduction have been identified, in addition to continued refinement of hazard quantification.

1.0 INTRODUCTION

In 2016 the Regional Council Research, Science and Technology Strategy addressed the needs of the local government sector with respect to hazard risk management. Priority 5 of the strategy addressed natural hazards and in the overarching Priority 1 the need for better science utilisation to support decision-making in regional councils was noted (<http://www.envirolink.govt.nz/assets/Uploads/RC-RST-Strategy-June-2016.pdf>). This document identified some key desired aspirations for management of natural hazard risk in the local government sector including:

- Overall need for better tools to address hazards, interpret 'risk', and reduce consequent societal risks.
- Ascertain the recommended resolution of topographic data for hazards identification and evaluation.
- Development of a single hazards information portal.
- Improve ecological outcomes of flood mitigation works.
- Understanding future geomorphological change to improve the long term outcomes of flood management decisions.

The 2016-2017 operating plan of the Strategy identified four goals to enhance better science utilisation in regional council decision making, namely:

- To provide timely, authoritative and respected direction to science research and funding.
- To catalyse and enhance science delivery.
- To facilitate science uptake.
- To ensure an ongoing RS&T strategy process.

From this Strategy and Operating Plan, the Regional Hazards and Risk Management (RHRM) Special Interest Group (SIG) has identified the urgency and importance of developing a well-informed and comprehensive natural hazards research roadmap and agenda for New Zealand. The SIG identified that the roadmap needs to go well beyond business as usual for any individual council, as it needs to take into account:

- The breadth of research projects being undertaken via multiple funding streams.
- The current work by MCDEM and partners on a National Disaster Resilience Strategy (NDRS) (which may itself require councils to undertake specific research, either as a direct consequence or to meet more general obligations for region-specific resilience enhancement).
- The current research programmes being funded through the Natural Hazards Research Platform, National Science Challenges and government funding to CRI's.
- Ad hoc research being pursued by individual councils.

Additional changes to legislation and guidance including the amendment to the Resource Management Act (RMA) has introduced (for the first time) an obligation upon all parties exercising functions under the RMA, to manage significant risks posed by natural hazards. The current situation is at best disjointed, there is a significant lack of awareness amongst key stakeholders, and above all the council/CDEM Group (i.e. the key end-users) voices have not been well articulated and heard. Also, work on a proposed National Policy Statement (NPS)

on natural hazards is currently being undertaken by MfE. The NPS is likely to identify key requirements for hazard and risk management, for which research is likely to be required, either at the national or regional scale.

Acknowledging this context, the RHRM SIG commissioned the authors to undertake a project comprising seven tasks. Here, we report, in draft form, on tasks 1 and 2, and, in consultation with SIG members, expect to advance tasks 3, 4, and 5 during 2017. The tasks comprising the whole project are:

1. Collation of existing inventories of hazard-related research (eg Table 2 of LGNZ Thinkpiece) and research gaps already identified in literature and recorded discussions, updated to currency, and noting any documents or stocktakes that are now superseded. This inventory will draw on the knowledge and involvement in the research sector of the project leads, together with further enquiries.
2. Identification of additional opportunities for future research, including consideration of foreseeable new legislation requirements.
3. Consult with the Regional Hazards and Risk Management (RHRM) SIG members on findings above, seeking their input to identify and prioritise additional new research.
4. Collation of the above as a draft research roadmap.
5. Distribution of the draft roadmap to members of RHRM SIG for final comment and review.
6. Presentation by project leads at the next RHRM SIG workshop in early 2017 (with possible wider audience eg CDEM SIG members).
7. Distribution by RHRM SIG executive to potential research providers and funders eg MBIE, MCDEM, CRIs, and National Science Challenge management teams.

Many of the key documents and regulatory imperatives noted above are already calling for well-targeted research and knowledge transfer, without identifying the particular components of such a strategic roadmap. This review is intended to inform a carefully considered, well-reasoned statement of identified priorities for hazards research and monitoring in New Zealand. It is envisaged that the outcomes of a natural hazards research roadmap will be ongoing and will inform local, regional, and national decision-making around the management of natural hazards and risks, including within the natural/physical and the social/economic environments. They will also contribute to policy development and implementation that is evidence-based. The intended objective is more resilient communities and more broadly, reduced impacts on environments from natural hazards in New Zealand.

It is also expected that this roadmap should lead to more efficient investment and better return for funding of natural hazards research, particularly with respect to local government needs.

2.0 PROJECT ACTIVITIES

In undertaking this project, we have sought to compile and analyse research products that have been undertaken since 2000 across the breadth of natural hazards and of relevance to the Regional Council and CDEM sectors. These have been undertaken by a wide range of entities with support from various funders for both fundamental and applied natural hazard research in New Zealand.

2.1 THE RESEARCH FUNDING LANDSCAPE

It is widely acknowledged that the funding environment has become increasingly complicated, and the number of research entities undertaking the research has also grown rapidly since about 2012. We list the entities in Table 2.1, identify whether they have contributed to this compendium of research, and provide links to websites where more information on the scope and principal areas of research are listed.

Table 2.1 List of funders and entities undertaking natural hazards research in New Zealand

Research Entity	Solicited	Data Provided	Further Information
University of Auckland	Yes	No ¹	https://researchspace.auckland.ac.nz/
Massey University	Yes	No	http://www.massey.ac.nz/massey/research/library/archives
Victoria University of Wellington	Yes	No ²	http://www.victoria.ac.nz/its/staff-services/digitalresearch-catalogue/researcharchive
University of Canterbury	Yes	Partial ³	https://ir.canterbury.ac.nz/browse?type=dateissued
Lincoln University	No	No	https://researcharchive.lincoln.ac.nz/
University of Otago	Yes	No	https://ourarchive.otago.ac.nz/
GNS Science	Yes	Yes	https://www.gns.cri.nz/Home/Products/Databases/New-Zealand-Geoscience-Bibliography
NIWA	Yes	No	https://marlin.niwa.co.nz/
Earthquake Commission	Yes	Yes	https://www.eqc.govt.nz/what-we-do/eqc-research-programme
Natural Hazards Research Platform	Yes	Yes	https://www.naturalhazards.org.nz/NHRP/Publications
Resilience NSC ⁴	Yes	No	https://www.resiliencechallenge.nz/
Deep South NSC	No	No	http://www.deepsouthchallenge.co.nz/
Our Land & Water NSC	No	No	http://ourlandandwater.nz/
Building Better Homes Towns & Cities NSC	No	No	http://www.buildingbetter.nz/index.html
Pastoral Greenhouse Gas Research Consortium	No	No	http://www.pggrc.co.nz/
QuakeCore CRE ⁵	Yes	No	https://wiki.canterbury.ac.nz/display/QuakeCore/QuakeCoRE%3A+The+Centre+for+Earthquake+Resilience+Home
Royal Society of NZ Marsden Fund	No	No	https://royalsociety.org.nz/what-we-do/funds-and-opportunities/marsden
Regional CDEM groups	Yes	Yes	various

Notes:

¹ Research from UoA volcanologists compiled from Google Scholar via manual search by authors

² Research from VUW school of governance compiled by authors

³ Research from geological sciences and engineering departments provided

⁴ NSC is National Science Challenge funded by MBIE

⁵ CRE is Centre of Research Excellence funded by Tertiary Education Commission

As a basis for assessing gaps or deficiencies in the research portfolio in New Zealand since 2000, we have sought to compile and analyse research products across the breadth of natural hazards as made available and indicated in Table 2.1. More than 2400 articles were identified (Figure 2.1).

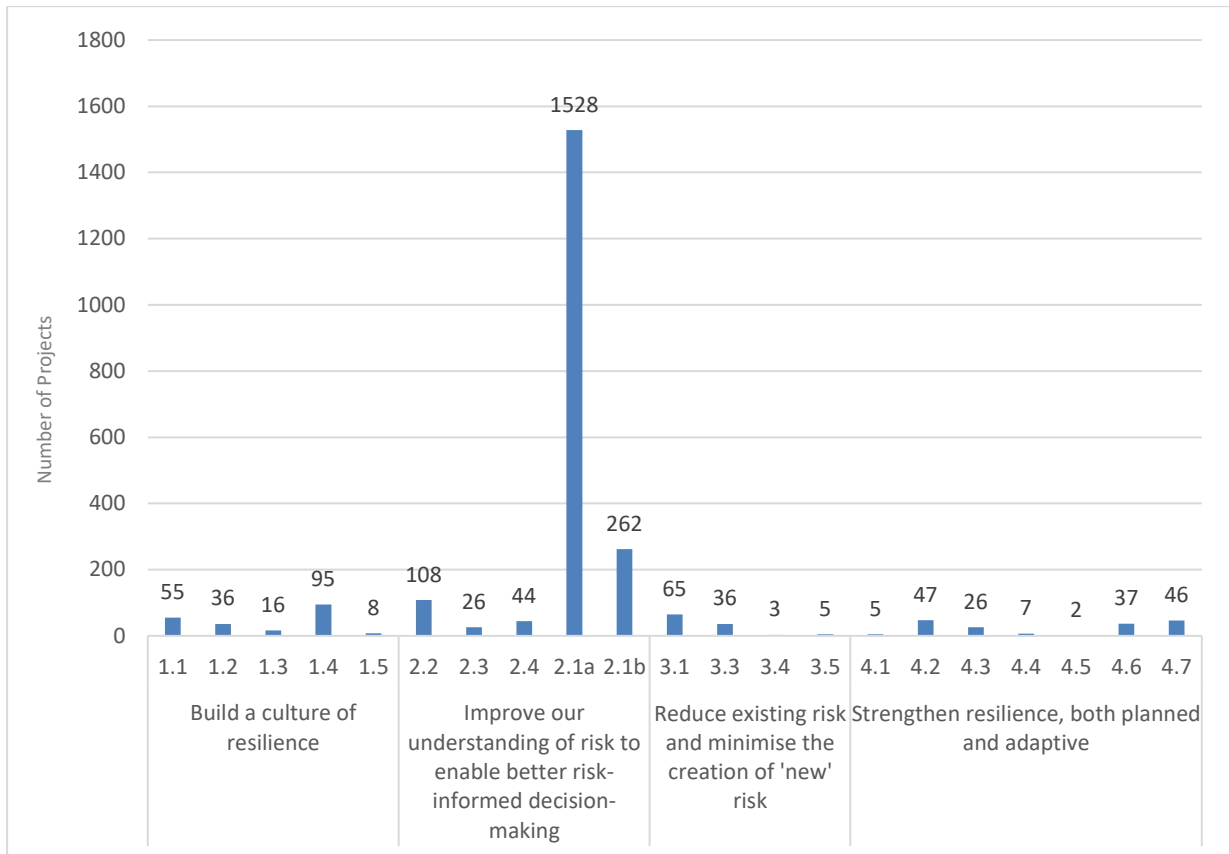


Figure 2.1 Count of research publications (published peer-reviewed journal papers, book chapters and publicly-available commissioned reports), classified according to focus areas of the National Disaster Resilience Strategy (see Table 2.2).

Table 2.2 Priorities and focus areas of the National Disaster Resilience Strategy (NDRS) under development

Priority 1	Build a culture of resilience
Focus area 1.1	Improve the governance of risk and resilience
Focus area 1.2	Integrate resilience principles into everyday processes
Focus area 1.3	Embrace our diversity and build our cultural capital
Focus area 1.4	Being 'future ready'
Focus area 1.5	Outreach and education
Priority 2	Improve our understanding of risk to enable better risk-informed decision-making
Focus area 2.1a*	Geological and weather hazards - data collection for disaster risk reduction and resilience
Focus area 2.1b*	Characterising the built environment
Focus area 2.2	Improve our risk assessment capability
Focus area 2.3	Communicate risk for improved risk literacy
Focus area 2.4	Tools and resources to support decision-making
Priority 3	Reduce existing risk and minimise the creation of 'new' risk
Focus area 3.1	Infrastructure protection, upgrading, and resilience
Focus area 3.2	Retreat and relocation
Focus area 3.3	Integrate climate change adaptation with hazard risk management
Focus area 3.4	Resilient development
Focus area 3.5	Risk financing, transfer and insurance
Priority 4	Strengthen resilience, both planned and adaptive
Focus area 4.1	Resilient homes
Focus area 4.2	Business and organisational resilience
Focus area 4.3	Community resilience
Focus area 4.4	City/district resilience
Focus area 4.5	The resilience role of government and national organisations
Focus area 4.6	Readiness for response
Focus area 4.7	Readiness for recovery

*Focus area 2.1 has been subdivided so that physical hazard characterisation can be distinguished from built environment hazard/damage

In compiling the research compendium, we have considered alternate ways of classifying the research. We have identified New Zealand's adherence to the Sendai Framework for Disaster Risk Reduction (SFDRR) (http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf) and the more recent initiative to develop a National Disaster Resilience Strategy (NDRS), both of which categorise natural hazard research into priority or focus areas, as a basis for the component topics. In Table 2.2 we list the 'near final' focus areas of the NDRS, which is still in progress. Appendix 1 contains a list of the priorities and topic areas of the draft indicators for reporting on the Sendai Framework, and Appendix 2 indicates how topics of these two frameworks relate. The NDRS takes a strong 'resilience' stance that is not always an ideal basis for classifying research, but the RHRM SIG advised that this would be the preferred basis for the classification.

Table 2.3 provides guidance as to which keywords have dictated the research classification in one or other of the 21 focus areas of the NDRS, and also alternate focus areas where the research may be listed where there is no clear-cut 'right answer'.

Table 2.3 Guidance on assignment of research results to focus areas of the NDRS

Topic or key word	Primary Focus Area	Other Focus Area
Governance	1.1	
Legislation	1.1	
Ethnic diversity	1.3	
Maori/Polynesian	1.3	
Land use planning	1.4	
Scenarios	1.4	
Planning	1.4	
Education, courses, public	1.5	
Geological hazards	2.1a	
Weather hazards	2.1a	3.3
Building damage characteristics	2.1b	3.1
Risk	2.2	
Communicating risk	2.3	1.5, 2.4
Communication	2.3	2.4
Tool, database	2.4	2.2
Bridges, Flood protection, pipes	3.1	
Networks	3.1	
Infrastructure	3.1	2.2b
Climate, climate change	3.3	
Sustainable (development)	3.4	
Insurance/Risk Transfer	3.5	
Funding resilience	4.1, 4.3, 4.4, 4.5	3.5
Resilience	depending on scale or focus could be 4.1, 4.3, 4.4, 4.5	
Tourism	4.2	
Response	4.6	
Response & Recovery	4.6	4.7
Recovery primarily	4.7	

2.2 LIKELY GAPS IN THE COMPENDIUM

While considered as generally representative, it is acknowledged that this compendium cannot be viewed as an exhaustive record of natural hazards research in New Zealand. The following have been identified as gaps, some of which may be worthy of further investigation:

- Consultants work for individual councils, unless it is listed in material supplied by CDEM groups.
- Commercially sensitive, site specific studies for private companies and institutions, such as projects undertaken for the major utility companies (power generation, gas network, road and rail network) and large industrial complexes have not been included, but reports on natural hazard assessment may be obtainable directly from the companies on request.
- Research undertaken for local government entities are included in the compendium, but not at the site specific scale where individual properties can be identified.
- Studies on the health impacts of natural hazards, such as research undertaken for the Health Research Council or for District Health Boards.
- Limited responses from universities means that gaps are likely in the representation of research being undertaken by departments other than physical sciences and engineering. Lists of the university bibliographic sources have been identified in **Table 2.1**.
- Many private sector companies undertake excellent risk management practices and business continuity planning. This work is rarely public-facing or publically available as it has commercially competitive aspects.

2.3 ANALYSIS OF THE RESEARCH COMPILED

The list of research (Appendix 3) as summarised in Figure 2.1 illustrates very uneven coverage across the focus areas of the NDRS, with much more research related to hazard identification than other focus areas. The current compilation is biased toward geological hazards as GNS Science provided data but NIWA did not. We also note that research regarding hazards in relation to the built environment is less than for geological and weather related hazards. This may be correct but we note that there was only a partial contribution from the Engineering school at University of Canterbury and no response from University of Auckland. Engineering research funded by the Natural Hazards Research Platform since 2009 is captured through that channel.

Aside from geological hazard studies and engineering, there are three other focus areas with approximately 100 research reports: being future-ready, in which land use planning research has been classified; research in risk and risk modelling; and infrastructure. Reports in the latter two tend to be applied studies for specific projects or facilities, while research in land use planning has emphasised the connections between land use and legislation, and land use and resilience (or sustainability).

A small pocket of excellent research into business resilience is largely being undertaken using case studies from the Canterbury Earthquake Sequence. This research has largely been undertaken by a single group, and although well-respected there is limited number of research groups investigating this topic.

It is also acknowledged that the whole topic area of 'resilience' on which the structure of the NDRS is based is a fairly recent phenomenon, and that research undertaken in the past 10-15 years may not have developed a momentum in this new paradigm or have been readily

classified into this topic area. In the old vernacular this may have been recognised as ‘readiness’ and classified here as ‘risk ready’ rather than ‘resilience’.

2.4 IDENTIFICATION OF RESEARCH GAPS

It is important to look beyond the simple counting opportunity that exists based on Figure 2.1. As noted above, there are likely to be significant gaps in the compendium of research we have assembled, particularly from the university and consultancy sectors. There are also likely to be significant gaps in research related to ‘resilience’ as some aspects of this research is in part funded through DHBs and the Health Research Council. Nevertheless, there is likely to be significant opportunity to ‘New Zealandise’ excellent overseas research on resilience.

Three clear conclusions have been identified from compiling more than 2400 references:

1. There has been a lot of good research into geological hazards, weather-related hazards and engineering, but much of the information is written for peers with similar technical understanding. Much of the literature could not be understood or used by other researchers, let alone decision-makers. There is an urgent need for the research to be ‘translated’ for a wider range of audiences.
2. There are very few review papers that seek to synthesise and provide a time-stamped ‘state of the topic’. Some topics have national hazard models (e.g. earthquake and tsunami) and periodic updates, but these are the exceptions; there are no national overviews of riverine flood, wind, or coastal erosion. Rainfall hazard is very much focussed on forecasting and early warning, so it is difficult to detect trends and whether increasing losses are due to severity or increasing exposure to the hazard. With respect to engineering research, there are even fewer examples of overviews for particular topic areas. There are very few reports that address the current state of practice, with the exception of reviews conducted on unreinforced masonry building and retrofit guidance, performance of non-structural building components, and improved geotechnical treatment of weak soils for residential foundations; all largely based on data from the Canterbury Earthquake Sequence.
3. The quantum of research undertaken on hazard is much greater than on risk or socio-economic aspects of natural hazard management (even considering the likely biased reporting). Modelling consequences of hazard events has, to date, usually been restricted to direct losses or impacts on insured assets, but increasingly it is recognised that the full impacts are much greater and there is a need to understand the wider indirect impacts on people, businesses and productivity. Interdependencies between and among businesses, communities and services are increasingly recognised as crucial ingredients to understanding impacts. A better understanding of the full impacts of events is needed to identify the cost-benefit of investments in disaster risk reduction (DRR).

The gaps or small quantum of research in so many of the NDRS focus areas signal the lack of an evidence base to guide or drive New Zealand’s adherence to the Sendai Framework (http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf), particularly in focus area 4. It is probable that the same deficiency may also apply to the other major international agreements that New Zealand signed in 2015 that seek to protect the future from the negative impacts of climate change (COP 21, Paris Climate Change Agreement http://unfccc.int/paris_agreement/items/9485.php) and the UN’s Sustainable Development Goals (<http://www.un.org/sustainabledevelopment/>).

These international agreements all focus on the future, whereas research in natural hazards is often retrospective. Research needs to be solutions-oriented as well to guide future risk management. The need for future focus applies across all of the Priorities of the NDRS:

- in risk governance and regulation,
- in hazard and risk assessment integrated with future weather and climate,
- in communication and understanding of future risk,
- in risk reduction where there is an urgent need to understand economic and social impacts of future events and the cost-effective mitigation options of those losses that could start to be undertaken now, and
- in resilience at all scales from the home to the nation.

3.0 A NZ RESEARCH ROADMAP FOR MANAGEMENT OF NATURAL HAZARDS AND THE ROLE OF REGIONAL COUNCILS

In the view of the authors, the five key elements of a well-informed and comprehensive natural hazards research roadmap and agenda for New Zealand require that the research is:

- forward looking
- joined-up across funding mechanisms
- connected to a joined-up user community dedicated to a systems approach to natural hazard risk management
- framed around social and economic prosperity, and sustainability (and the counter-factuals of this)
- connected to decision-makers' and regulators' needs for evidence.

To achieve these goals there needs to be a shift from researcher-push to user-pull, or at least a more effective 'meeting half way across the bridge'. Stakeholders of research need to understand the requirement for fundamental knowledge in all topic areas prior to the development of good advice; this applies from the truly underpinning science such as plate tectonics or why volcanoes occur where they do, all the way to social science, economics of DRR and governance. Equally, scientists need to appreciate the need for synthesis, translation, and 'white papers' (and to be funded as part of the research agenda) so that the research knowledge is 'useful, useable, and used'. These needs are articulated very well in the existing Regional Council Research, Science and Technology Strategy and associated workplan and the goals and plans for engagement between the local government and research sectors are robust.

However, concurrently, there is an increasing fragmentation of the science funding system at present with researchers spending more and more time writing proposals for contested funding. In parallel, the user community is increasingly baffled by 'who is doing what', such that many of the observations made by LGNZ in their 2014 paper either still apply or have worsened (see Appendix 4). It is possible that the relatively newly formed National Science Challenges, which were designed around major New Zealand issues and supposed to emphasise solutions, will make a significant difference but they have also adopted significant contestable processes such that it is difficult to guide the research system to particular user-defined goals.

3.1 RECOMMENDATIONS FOR THE RHRM SIG

While we suggest there is a need for rationalisation of the research arrangements for natural hazard risk management, there are some immediate steps that may improve the utility of the existing knowledge and research currently underway.

A glance through the research compendium (Appendix 3) will identify a very large number of individual projects about elements (either geographically or topic-wise) of what the RHRM SIG members need but with the absence of a synthesis. Based on an agreed set of national topics, the RHRM SIG could commission such reviews ensuring, through peer review, they were appropriate (fit for purpose) as a basis for decision making.

A second activity would be to identify research in topics that have significant local importance (but are written in such technical language that the user community cannot use the findings) and commission 'translation' into more useable forms. This could constitute a 'slow start' on

what is needed in an information portal advocated by the 2014 LGNZ paper and in the Regional Council Research, Science and Technology Strategy and could set the stage for a systematic translation exercise. New research commissioned by many of the funding entities are requiring 'plain English' summaries at least, but this could go further to require a commentary on how the research findings could be used.

A third activity that may provide focus to delivery of natural hazards research for national benefit may emerge from the requirements under the revisions to the Resource Management Act, passed in May 2017. It is possible that hazard knowledge will at least be taken forward into risk models that can inform improved land use planning, and perhaps highlight managed retreat as an appropriate action if consequences of future events are deemed intolerable. In similar vein, attention is turning to the long term ability of current infrastructure to fulfil expected service delivery levels under the pressures of changing demographic, growth and decline in population in parts of New Zealand, and future events. Modelling tools such as RiskScape (https://www.mssanz.org.au/MODSIM07/papers/26_s32/RegionalRiskSpace_s32_Reese_.pdf) and MERIT (<https://www.naturalhazards.org.nz/NHRP/Hazard-themes/Societal-Resilience/EoRI>) can, with increasing clarity, paint a picture of future damage and consequences and explore cost and benefit of investment in DRR or other measures such as managed retreat, risk transfer, or acceptance of the consequences because they are deemed to be 'tolerable'.

On the wider topic of reform in the natural hazards research domain (as an example) seeking to provide a more robust evidence base for natural hazards risk management in New Zealand, the voice from the local government sector alongside other like-minded users will add weight to, or initiate a call for, reform. Already the Crown Research Institutes (CRIs) are subject to an annual 'letter of expectation' from their Minister. This is an example of an existing mechanism that could reshape the delivery of science in the national interest, provided there is funding to achieve the outputs. Currently there is an effective reduction in the ability of CRIs to deliver more or different outputs, as there are no adjustments for inflation in available funding in core areas of responsibility. The university sector is rather more difficult to direct as to research topics and the mechanisms for reporting the research are at the discretion of the individual researchers. A strong driver of research in the university sector is the criteria for Performance-Based Research Funding (PBRF) which emphasises publication in high citation peer journals.

4.0 CONCLUSIONS

In this project we have compiled a partial list of New Zealand natural hazards research reports since 2000 that have been funded by an increasing plethora of mechanisms. The compendium has more than 2400 entries. It is more complete for geological hazards than any other topic. This partly results from data not being received from several research agencies, partly because some applied research has been completed under confidentiality especially in the risk area, and partly because research undertaken in National Science Challenges other than the 'Resilience' challenge, and in health research, which may all bear upon resilience, have not been canvassed.

Analysis of the compendium identifies many pieces of individual research, but few examples of synthesis and review with the user community in mind. In addition, much of the research reporting is too technical for the user community to use. We observe that the research is often reflective of past events and there are few examples of future-focussed research that the user community needs.

In the past 5 years there has been a rapid increase in the number of funding mechanisms for natural hazard research, all of which have a significant component of contest. This has served to confuse the funders, the researchers and the user community with overlapping activities, funded projects and too much time spent by the researchers writing proposals for modest amounts of funding. The result has been disengagement with the user community despite calls for closer engagement. The Local Government sector could be a powerful voice, with others in the user community, for a review of the confusion.

Acknowledging the challenges to clarify 'who funds and who researches what', the RHRM SIG could identify priority topics where a New Zealand review is needed and commission this work. The RHRM SIG could also identify key topic areas where existing research results cannot be utilised because of the highly technical nature of the reporting. This approach may size the challenge of 'translating' existing knowledge into useable knowledge, and be the start of the information portal highlighted in the 2014 LGNZ paper.

There are many research gaps or weaknesses that can be interpreted from the research compendium. Some, such as research on resilience at different scales, may be populated as this new research topic matures. Others, such as the need for using quantitative tools to look into cost benefit analysis of actions to reduce the risk of future disasters or the application of other risk management procedures, is crucial where major natural hazards events can threaten social and economic prosperity.

APPENDICES

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A1.0 APPENDIX 1: DRAFT NATIONAL INDICATORS OF THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION

Priority 1 Understanding Disaster Risk

- 1.1 hazard identification – geological and weather-related
- 1.2 hazard identification in engineered structures*
- 1.3 risk assessment
- 1.4 social and economic impact
- 1.5 geospatial databases
- 1.6 real time access to data
- 1.7 risk understanding in user communities
- 1.8 traditional/indigenous knowledge
- 1.9 new technologies
- 1.10 '4R's' understanding in education and among the public

Priority 2 Strengthening Disaster Risk Governance

- 2.1 mainstreaming DRR in governance
- 2.2 national and local DRR strategies
- 2.3 technical, financial & administrative DRM capacity – national and local
- 2.4 compliance with regulation
- 2.5 periodic national assessment
- 2.6 effectiveness of regulation
- 2.7 national institutional frameworks
- 2.8 enabling local govt, civil society & private enterprise for DRM
- 2.9 political/parliamentary engagement
- 2.10 retreat or relocation policy with respect to risk

Priority 3 Investing in DRR for Resilience

- 3.1 resourcing DRR at all levels of administration
- 3.2 mechanism for risk transfer/treatment of residual risk
- 3.3 disaster resilient public & private investments – structural, non-structural and functional
- 3.4 protection of cultural and heritage
- 3.5 disaster risk resilience in the workplace
- 3.6 mainstreaming risk-based landuse policy and implementation in urban & rural
- 3.7 retrofit and rehabilitation to improve resilience – structural and non-structural
- 3.8 resilience of national health system
- 3.9 social policy enhancements for DRM
- 3.10 DRR considerations in national financial and fiscal instruments
- 3.11 sustainable use and management of the environment with respect to DRR
- 3.12 business and supply chain resilience
- 3.13 protection of livelihoods in rural sector
- 3.14 DRM in tourism

Priority 4 Disaster Preparedness & effective Response and Build Back Better

- 4.1 periodic review of preparedness and contingency
- 4.2 people-centred multi-hazard forecasting & early warning
- 4.3 critical infrastructure resilience
- 4.4 public service/response agency resourcing for response and recovery
- 4.5 community or civil defence centres for response
- 4.6 workforce training in preparedness and response
- 4.7 use of volunteers in response and recovery
- 4.8 response planning and pre-event recovery planning
- 4.9 exercises and evacuation drills
- 4.10 trans-institutional cooperation
- 4.11 DRM in recovery and rehabilitation
- 4.12 integrated disaster database – structural and social (casualties, health etc)
- 4.13 psychosocial support in recovery
- 4.14 international cooperation in disaster relief and initial recovery

*1.2 is a subdivision of the original indicator 1.1 to distinguish between physical hazards and hazard in the built environment

A2.0 APPENDIX 2: MAPPING DRAFT FOCUS AREAS OF THE NATIONAL DISASTER RISK STRATEGY TO DRAFT NATIONAL INDICATORS FROM THE SENDAI FRAMEWORK

Proposed National Disaster Resilience Strategy focus areas		Draft Sendai Reporting Framework Indicators (see Appendix A)
Priority 1	Build a culture of resilience	
Focus area 1.1	Improve the governance of risk and resilience	2.1, 2.2, 2.4, 2.5, 2.6, 2.8, 2.9, 3.9, 4.10
Focus area 1.2	Integrate resilience principles into everyday processes	3.1, check 3.9,
Focus area 1.3	Embrace our diversity and build our cultural capital	1.8, 3.4,
Focus area 1.4	Being 'future ready'	3.2, 3.3, 4.1,
Focus area 1.5	Outreach and education	1.10
Priority 2	Improve our understanding of risk to enable better risk- informed decision-making	
Focus area 2.1a*	Geological and weather hazards - data collection for disaster Risk reduction and resilience	1.1
Focus area 2.1b*	Characterising the built environment	1.2
Focus area 2.2	Improve our risk assessment capability	1.4, 1.8, 2.3 (DRM technical),
Focus area 2.3	Communicate risk for improved risk literacy	1.7, check 1.10, 4.2,
Focus area 2.4	Tools and resources to support decision-making	1.5, 1.6, 4.2 (context), 4.12
Priority 3	Reduce existing risk and minimise the creation of 'new' risk	
Focus area 3.1	Infrastructure protection, upgrading, and resilience	3.7, 4.3,
Focus area 3.2	Retreat and relocation	2.10,
Focus area 3.3	Integrate climate change adaptation with hazard risk management	3.11 (context),
Focus area 3.4	Resilient development	2.4 for land use, 3.6, 3.11 (context),
Focus area 3.5	Risk financing, transfer and insurance	2.3 for financial, 3.2, 3.10,
Priority 4	Strengthen resilience, both planned and adaptive	
Focus area 4.1	Resilient homes	1.4 (context), 3.13 (context),
Focus area 4.2	Business and organisational resilience	1.4 (context), 3.5, 3.8 (context), 3.12, 3.13 (context), 3.14
Focus area 4.3	Community resilience	1.4 (context), 3.13 (context),
Focus area 4.4	City/district resilience	1.4 (context),
Focus area 4.5	The resilience role of government and national organisations	2.2 (context), 2.5, 2.7, 4.4
Focus area 4.6	Readiness for response	4.5, 4.6, 4.7, 4.8, 4.14
Focus area 4.7	Readiness for recovery	4.7, 4.8, 4.11

Focus area 2.1 has been subdivided so that physical hazard characterisation can be distinguished from built environment hazard/damage.

A3.0 APPENDIX 3: - XLS SPREADSHEET OF REFERENCES COMPILED



Appendix_3.pdf

A4.0 APPENDIX 4: CONCLUSIONS FROM LGNZ THINKPIECE (OCTOBER 2014) WITH COMMENTS FROM CURRENT REPORT AUTHORS (JULY 2017)

In natural hazards terms, New Zealand is a risky place. That is not going to change, and may get worse, both because of increasing population growth and development in vulnerable areas and because climate change may affect the frequency and severity of climate related hazards.

New Zealand has a well-developed CDEM system that aims to integrate the full range of risk management activity in a single coordinated system. Working within that system local government has, over a period of many years, successfully implemented a range of planning and operational responses delivering its statutory responsibilities and building more resilient communities.

However, managing risks associated with natural hazards is a seriously challenging business. Property rights and associated legal issues, information and knowledge gaps and the inevitable difficulty of keeping enough people focused, aligned and imbued with a sense of urgency often pose impediments to better and more effective outcomes.

What is very clear is the need for greater sharing of expertise, building of capacity, and alignment of thought across the local and central government sectors and beyond to the wider public and private sector players with roles to play.

That broad conclusion is reached because it is clear from the soundings taken as part of the preparation of this report that, despite a solid and sensible framework being in place and the numerous examples of good practice that can be found across local government, several major issues persist:

- a. There is little national ownership of risk reduction. The overwhelming emphasis at the national level is on the readiness, response and recovery dimensions of CDEM. This is problematic since there are statutory functions requiring risk reduction efforts across several players and functional activities. Practical and cost effective management of natural hazards means achieving the optimal allocation of effort across all four “R’s” – something that will vary by natural hazard and by place.

Comment: The work on the National Disaster Resilience Strategy being led by MCDEM is developing as a ‘New Zealand Inc’ strategy involving engagement with a wide range of national, regional and local actors, including the private sector, researchers and public groups. Whether the ‘community’ ownership of this strategy is successful and will lead to national ownership of risk reduction is yet to be seen. In parallel, bi-annual reporting arrangements to UNISDR on the Sendai Framework based upon the work of a ‘national platform’ may catalyse the ownership of risk reduction as national policy. Success will depend on governance and leadership from local, regional and national actors as much as anything.

- b. While a variety of risk reduction activity is occurring (mostly at regional and territorial levels), it has little strategic leadership in terms of a clear direction and collective agreement on principles and practices. Further, there is a lack of clarity about where responsibility for natural hazard risk reduction lies. Given the challenging policy issues that exist, this is likely to be leading to sub optimal outcomes.

Comment: See comments above. A ‘national platform’ under the auspices of DPMC, reaching into the inner workings of government is needed before significant progress at the strategic and governance level is likely.

- c. There is little or no monitoring of hazard risk outcomes or the effectiveness of risk reduction measures taken by management agencies. It is, therefore, difficult to assess system performance or confirm the proposition set out in 2 above.

Comment: An opportunity exists through reporting against Sendai Framework indicators to benchmark and then assess progress against key performance indicators. Again, to be effective this relies on a robustly functioning national platform with all agencies and actors involved.

- d. There is not a consistent basis to make risk management decisions. There are various risk assessment methodologies, no standards of acceptable risk and as a consequence wide variation in practice. In general, there is a low level of quantified risk assessment.

Comment: Discussion and a business case for a Local Government Risk Agency through 2015 and 2016 was aimed, in part, at addressing improved asset risk management in the local government sector. This is currently stalled, and overall the conclusion from the 2014 report remains correct.

- e. Information on hazards to inform management action is dispersed across many agencies. Hazards managers are faced with an array of guidance on different aspects of hazard management (not necessarily coherent in its entirety).

Comment: See discussion and conclusions in the main body of this report. Conclusion remains fundamentally correct.

- f. The public often relies on incomplete (and sometimes inaccurate) information about natural hazards when making significant investment and risk management decisions.

Comment: Authors agree that this situation remains despite additional funding for research. Improved communication via GeoNet is a model for wider application, but resources (funding and skilled people) are not available.

- g. Finally, the context within which we try to manage natural hazards risk continues to change but that is not always taken into account. In particular, the outlook for climate-driven natural hazards risk is not necessarily understood nor appropriately accounted for in national, regional or local risk and response assessments and decisions.

Comment: While climate change impacts are not accounted for in risk management there has been a significant shift from 2014 to the present, with widespread acknowledgement that the treatment of natural hazards and climate change impacts must be part of integrated risk management.

A5.0 APPENDIX 5: RECOMMENDATIONS FROM LGNZ THINKPIECE WITH COMMENTS FROM CURRENT REPORT AUTHORS (JULY 2017)

That Local Government New Zealand:

- a. Note the conclusions relating to the strategic issues associated with natural hazards management identified as items a to g.
- b. In order to further define issue identification and develop effective and targeted responses to those issues, it is recommended that Local Government New Zealand advocate on behalf of the local government sector for the following:

1. Natural hazards and community resilience strategy:

A pan-sector natural hazards management initiative to set clear strategic direction on key practice issues (on a hazard by hazard basis) and the appropriate policy response to hazard management generally; and the appropriate place for local discretion and community specific responses and national consistency in natural hazards management. Importantly, the process and any output should be collectively developed across local and central government and the broader hazards management sector. This should be nationally led and supported, but not nationally imposed.

Comment: The National Disaster Resilience Strategy currently in formulation addresses this recommendation.

2. Natural hazards policy platform:

A mechanism to research and resolve natural hazards policy issues. This may take the form of a natural hazards policy platform as a parallel structure to the existing natural hazards research platform. Such a mechanism would inform research needs and promote policy innovation on an on-going basis, using expertise from across the natural hazards management sector.

Comment: There is potential for this to progress under the national platform for the Sendai Framework if all agencies are willing to participate. Improved governance and national policy are recognised as key indicators for disaster risk reduction. The NPS on natural hazards being advanced by MfE could reinforce the need for a natural hazards policy platform. The amendment to the RMA signals a risk-based approach to land use planning and this brings the potential for all hazards to be addressed on a uniform risk basis.

3. Single information portal:

An enhanced and more integrated approach to making natural hazards information available. Bringing together existing natural hazards management guidance material for practitioners should drive greater alignment of thinking. Making information on the nature and location of natural hazards more accessible for the public (at either the national or regional level and including national datasets such as LiDAR), should aim to overcome existing issues with information quality and dissemination, and assist people to make better individual risk management decisions.

Comment: See conclusions in the main body of the report. While a single portal of natural hazards information is an admirable goal, there is a huge need for translation of the research into formats and language appropriate for the user community, and synthesis of major topic areas into useful overviews or 'white papers' before the research makes significant progress towards a portal that (in

the terminology of UNISDR) is 'useful, useable, and used'. Currently there is little or no funding for the 'translation of research' by skilled 'translators'.



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