

Te whāriki o te wai

Mā te haumarū o ngā puna wai o Rākaihautū ka ora mo ake tonu

Science-Practice Roadshow 1: Summary perspectives from centralised entities and agencies

February 2022

Prepared by University of Waikato



Mā te haumarū o ngā puna wai
o Rākaihautū ka ora mo ake tonu

Increasing Flood Resilience
Across Aotearoa

Project summary

Mā te haumarū ō nga puna wai ō Rākaihautū ka ora mo ake tonu: Increasing flood resilience across Aotearoa.

This new five-year NIWA-led research programme will create the first comprehensive, nationally-consistent, flood inundation hazard and risk assessment for Aotearoa-New Zealand. The research will investigate flood exposure according to type of land use, as well as risk to buildings, infrastructure and networks, and long-term sustainability of flood schemes or defences.

The research will create a forum between science, iwi, policy-makers and stakeholders (*Te Whāriki ō Te Wai*). By bringing together river managers, iwi, government agencies, financial institutions and stakeholders, the researchers will ensure that the programme outputs are fit-for-purpose (useable, useful and used), explore adaptation options under changing climate conditions, and design new ways to make decisions, taking into account climate and socio-economic projections.

This will allow organisations to develop policies, processes and funding mechanisms to support a fair and transparent transition to a more flood-resilient country.

For more information on the programme, visit <https://niwa.co.nz/natural-hazards/research-projects/m%C4%81-te-haumarū-%C5%8D-te-wai-increasing-flood-resilience-across-aotearoa-0>

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1. Introduction

Flooding is Aotearoa-New Zealand's most frequent natural hazard, regularly damaging buildings and infrastructure networks, and causing months of disruption to communities and businesses (Hutchings et al. 2019). Also, floods have indirect, cascading, and more intangible impacts (Lawrence, Blackett, and Cradock-Henry 2020), such as the withdrawal of future investment or the emotional stress of recovery. Our country's flood risk is predicted to rise quickly due to the combination of climate change and rapid urban intensification (Ministry for the Environment and The Flood Risk Management and River Control Review Steering Group 2008).

Currently, there is no consistent approach to accurately determine flood risk on a national scale, nor how this may be changing as the climate warms. Instead, flooding risk assessments are done for individual catchments or locations, with the goal of managing and mitigating on the local scale. Local and regional governments vary widely in their capability and capacity to undertake this work (Ford, Berrang-Ford, and Berrang Ford 2011) and, thus, significant differences in data availability and modelling approaches mean that integration of results to gain a pan-region or nationwide picture has not been possible.

The *Mā te haumarū ō nga puna wai ō Rākaihautū ka ora mo ake tonu: Increasing flood resilience across Aotearoa* research programme commenced in October 2020 to develop a detailed nationwide model that could inform strategic and co-ordinated nationwide decision-making and regulations to support improved resilience to flood risk across the country. Utilising new methods and advances in computer processing and automation, the programme is developing a dynamic risk modelling framework that will assess flood hazard for every catchment in the country and under differing climate scenarios. The model will account for the risks to both built infrastructure and communities so that a fuller understanding of societal costs and impacts can be established. The model's utility for supporting decision-making will be investigated using an initial set of scenarios for environmental planning, policy settings and infrastructure investment options. Two overarching themes across all of the research - *Mātauranga Māori* and *Uncertainty* – are designed to utilise the diverse knowledge systems available to develop tools that are relevant for communities throughout Aotearoa-New Zealand, and to take into account and communicate more clearly flood risks.

Improved resilience to flooding across Aotearoa-New Zealand is a key outcome sought by the research programme, however it cannot be achieved by research alone. Instead, knowledge and information developed within the programme must be utilised by practitioners in their work to assist communities to plan for, manage, mitigate and avoid flood risks. New knowledge from the programme must be incorporated by practitioners into further tools, policy and decision-making frameworks. This knowledge translation however is not a straight forward process (Dilling and Lemos 2011). Cultural, behavioural and cognitive differences between those who produce and those who utilise knowledge mean that research outputs may not fit the requirements of their intended users, and thus, uptake of research outputs may be compromised. Conversely, strong engagement of knowledge users in the knowledge production process is known to increase the likelihood, and impact, of knowledge implementation.

Stakeholders are key members of the *Mā te haumarū ō nga puna wai* programme's research team, representing views across central and local government, engineering, planning consultancies, emergency management, insurance and banking industries, and Te Rūnanga o Wairere (Banks Peninsula). To broaden the range of stakeholder perspectives, and to facilitate relationships across the programme, we have established a boundary organisation – *Te Whāriki ō Te Wai*. Boundary organisations (Guston 2001; Kirchhoff, Esselman, and Brown 2015) are forums that bridge between the two relatively different social worlds of knowledge producers (researchers/scientists) and users (practitioners/policy makers). These forums create and sustain legitimate space and collaboration for knowledge/information to be co-designed, co-produced and co-disseminated (Serrao-Neumann, Di Giulio, and Low Choy 2020). Within our programme, *Te Whāriki ō Te Wai* is responsible for organising and facilitating communication and collaboration activities – events (Science-Practice Roadshows), communications channels such as an electronic newsletter and website, and learning opportunities. Through this organisation, we are fostering trust, legitimacy and capacity for information use so that our research results will be usable, useful, and used.

This report summarises the discussion and perspectives shared at the first Science-Practice Roadshow held in October 2021.

2. Science-Practice Roadshow 1 – background

The first Roadshow hosted by *Te Whāriki o Te Wai* was held on the 28th October 2021, using an online conferencing platform. The Roadshow aimed to gain insights on how to best manage flood risks in Aotearoa from centrally organised entities – principally central government ministries and agencies, but also industry representative associations, NGOs and other organisations with national reach. Several members of regionally-focused organisations were also included to provide the perspective of what was currently happening in individual (better-resourced) regions and how this could inform a national approach to flood risk management. Roadshow 1 had 20 participants involved, both from within the research team and those invited to collaborate/contribute.

The overarching question guiding Roadshow 1 was:

How can this research programme contribute to improved flooding resilience in 2025 and beyond?

Roadshow 1 was designed to:

- Understand the expectations and requirements that entities with nationwide remits have of the research programme; and,
- Identify knowledge gaps and needs within and outside the research programme.

The agenda for the event was divided into two parts. Part 1 comprised a three-person Stakeholder Panel discussion. Part 2 comprised a workshoping session in which the participant group was divided into three and asked to consider one of three question areas: societal impacts, maximising usability of research outputs, and economic impacts.



3. Science-Practice Roadshow 1 – outputs

3.1 Part 1 – Stakeholder Panel Discussion

The purpose of this session was to set the nationwide-level context and get participants thinking about the desired future state for hazards management in New Zealand. The three speakers (across central and local government, and an industry association) were asked to deliver a short response to the two questions below:

Question 1: What are the benefits of a nationwide approach to flood risk management?

Question 2: What does success look like for improved flooding resilience in 2025 and beyond?

3.1.1 Outcomes from question 1: What are the benefits of a nationwide approach to flood risk management?

Four key messages can be extracted from panelists and general discussions around question 1, including (in no order of importance/priority): consistent approach to flood risk management, opportunity for collaboration, access to quality information and equity considerations. These are explained next.

Message 1) Need for a consistent approach to flood risk management

There was a consistent agreement between panelists that flood risk management in Aotearoa is fragmented and lacks consistency across the different regions. It was also noted that communities across the country are diverse in their needs and have different capacity to deal with flood risks and impacts. Based on these discussions, it was noted that a national level, consistent approach to flood risk management needs to:

- Take into consideration that communities are served very differently by current defences/support/available information and have different expectations;
- Have a standardised baseline approach, with consistent baseline data, methodological approaches, or information requirements; and,
- Offer a one-stop shop for quality flood risk information, using a common language that we all understand, that is suitable for disclosure standards, regulatory standards, planning, and managing (not eliminating) risk.

Message 2) Enabling collaboration

Panelists also saw the value of the research programme in creating opportunities for collaboration between organisations, government jurisdictions and regions to improve how flood risk is understood and managed in Aotearoa. In particular, it was stated that the programme:

- Can assist with establishing an overarching view of the increasing flood risks and the management options; and,
- Be used as a national platform so that flood risks can be more effectively and efficiently addressed at a national level as opposed to having individual regions working by themselves and then trying to share information/stitch together a nationally-consistent approach/view to flood risk management.

Message 3) Providing access to quality information

Participants noted that the programme can provide national-wide information in a way that is accessible to a range of stakeholders such as government agencies, banks and insurers. It was also noted the programme's important role in providing quality information for the people on the ground (e.g., landowners, house owners, council planners), especially to assist with day-to-day decisions that affected them.

Message 4) Ensuring Equity

It was emphasised that floods affect people differently and that communities have differing capacities to deal with flood risks and impacts. Panelists stressed that:

- Flood risks will be uneven and so will the capacity of communities, localities and regions to respond to them; and,
- It is paramount to ensure that communities across the country have equity regarding flood risk mitigation and avoidance measures, as well as appropriate support from authorities to better manage flood risks affecting them.

3.1.2 Outcomes from question 2: What does success look like for improved flooding resilience in 2025 and beyond?

Five key messages emerged from panelists and general discussions around question 2, including (in no order of importance/priority): criteria to measure success, access to quality information, equity issues, planning related matters and policy considerations. These are explained next.

Message 1) Assessment criteria to measure success

Panelists discussed the importance of having appropriate criteria that can be used to effectively measure strategies used to manage flood risk exposure. This is particularly important to ascertain whether risk exposure is reducing or increasing as a result of those strategies. These criteria could also be tailored to evaluate the outcomes of different options and approaches used to manage flood risks, including to provide learnings that can both inform the revision of the criteria themselves as well as the options and approaches evaluated.

Message 2) Access to quality information

The value of having good information and data available to guide decisions was noted. In particular, quality information and data need to be easily accessible and scalable to be useful to inform decisions at the community, local and regional levels.

Panelists also emphasised the importance for decision-making at all levels (government through to individual landowners) to be supported by information that is robust, accurate, consistent and understandable.

Message 3) Ensuring Equity

The issue related to equity permeated the discussions throughout the Roadshow sessions. As for achieving a successful future in improving flood resilience in Aotearoa, calls were made for flood risk to be managed equitably, and to lead to equitable solutions, no matter where people live in Aotearoa, and for renters and home owners alike.

Message 4) A flood resilient planning system

Planning systems worldwide have left a legacy of (urban) development along floodplains and low-lying areas. Aotearoa is no exception; so going into the future, participants noted the need for a planning regime that prevents development in high risk areas. This applies to all natural hazards risks and not only flooding. Importantly, avoiding developing in high risks areas should be part of a national direction on natural hazards, which also includes recovery issues and needs and not focused only on mitigating risks or avoidance actions.



Additionally, panelists saw the need for a framework to guide timely decisions regarding managed retreat before and after events, especially to ensure the robustness of decisions during time compression (e.g., disaster aftermath, areas affected by recurring events).

Message 5) Policy alignment to avoid trade-offs

The last key point highlighted by panelists related to need for policies to be consistent and aligned, especially to avoid similar situations in the future such as conflicting policy statements for intensified urban development vs. management of natural hazards. This also requires a joined-up institutional architecture for risk assessment across agencies and across the different hazards. Additionally, risk assessments used to inform policies need to consider the uncertainty of climate science and associated impacts so that those policies do not lead to maladaptation and exacerbation of impacts.



3.2 Part 2 - Summary of group discussions

The second part of the agenda focused on the challenges within stakeholders' work and how this programme can assist to overcome them. This included the identification of, and discussion about, knowledge/ information gaps within and outside the research programme to improve flood resilience in Aotearoa.

Participants were split into three groups, and each was given focal questions to guide discussions (see Box 1).

Box 1 – Group Discussions and Focal Questions

Group 1: Societal Impacts – improving community resilience

- What types of communities will be impacted by floods?
- What sort of impacts might we expect on those communities? (using a tangible-to-intangible continuum)

Group 2: Maximising usability - incorporating outputs into your work programmes

- What will you use this national-scale flood information for?
- How can we ensure the new knowledge created by this programme is incorporated into your work?
 - How frequently will data need to be updated?
 - How do we ensure that the maps have longevity beyond the programme?

Group 3: Economic impacts – supporting decision-making

- How can this research support decision making for fair and equitable outcomes (e.g., prioritise funding allocation)?
- What information and tools are needed for supporting discussion on costly and contested issues that have potentially low public and political acceptability (e.g., retreat from flood-prone land)?
- What key information and tools are currently used to make investment decisions for flood risk management? What are their pros and cons? How can this programme improve the approach?

Four overarching themes were identified from the discussions held across the three groups, and plenary wrap-up. These included (in no order of importance/priority): the need to recognise the diversity of communities and their vulnerability to floods; easy access to decision-support tools and information; review of current policies; and, better understanding of economic impacts. These are explained next.

Overarching theme 1: Recognising the diversity of our communities and their vulnerability to floods

A key theme discussed by participants was the diversity of communities across the country, including their varied vulnerability to floods and tolerance to flood risks. Participants emphasised that most vulnerable and marginalised people tend to consider themselves to be resilient to floods. This is often supported by a combination of existing protection measures (e.g., flood walls) and a pragmatic mindset that drives the recovery process to return some level of normalcy to their lives. Nevertheless, people dislike living in a house/place in which they have previously experienced flooding, and this may indicate that they have a 'zero' tolerance to flooding.

Additionally, perceptions of risk and losses differ for people, and change over time. In particular, people tend to over-estimate their acceptance of risk but this acceptance rapidly decreases when a flood event occurs. Importantly, agencies responsible for flood risk management need to be aware of this when engaging with communities at risk to devise the best support possible to respond to and recover from floods, including the consideration of retreating options from flood prone areas. Adding to this, participants also thought it was critical to define what impacts are tolerable and intolerable to individuals, communities and governance so as to establish a baseline for mitigation and management efforts.

It was also noted the existence of many different issues, perspectives, experiences and living situations (e.g., urban, rural isolation, Māori traditional land, transient, homeless) within our communities. These aspects combine to give a plethora of experiences, meaning and assumptions about the real and perceived impacts of flooding which differs across communities and individual households/landowners. Such disparity in situations and capacities needs to be considered in all work deployed to mitigate and manage flood risk and hazard to ensure socially just and equitable outcomes. It also highlights the need for support for the most vulnerable members of our communities to be prioritised.

Finally, participants also noted that research outputs need to reflect the intrinsic aspects of Aotearoa-New Zealand that make us different to other countries. In particular, outputs must incorporate Māori knowledge, views and approaches, as these are relevant to our society.

Overarching theme 2: Access to decision support tools at all levels

Participants identified three key areas where access to decision support tools need to be improved and/or further developed, including institutional and community levels as well as building our knowledge base. At institutional level, it was thought to be an ideal situation if Aotearoa had a baseline flood model/map enabling all regions to have access to a rational, reliable and consistent methodology for decision-making regarding flood risk and management. In particular, participants stressed the need for new risk assessment methodologies which can better capture societal impacts, especially for vulnerable people and the diversity of impacts based on individual circumstances. To some extent, the EQC's portal (currently being developed) can support this as it will have risks/hazards information that further complements the hazard readiness information and resources provided on their website. Thus, the portal may be a good 'home' for public access of research outputs, especially flood risk maps.

To help support communities to make better decisions about how they manage flood risks affecting their own land/property, research outputs (e.g., maps, decision support tools) should be formatted in a way that they are easy to understand and useable. For example, rural people and Māori landowners may face making land use decisions about land to which they have been connected for many years and generations; thereby, they need access to the best information possible when making those decisions. Additionally, research outputs should enable consistent and equitable recovery support across the board, so that, for example, small communities don't miss out in favour of more populated areas when support and investment for flood risk management becomes available.

Furthermore, to increase the likelihood of research outputs being adopted by a range of professional groups and sectors (e.g., planners, architects, river managers), researchers will need to work with them develop user guides on how to use the research outputs. The strong preference is for research outputs that form a dynamic system, rather than a static map. The system should be updated regularly as new information becomes available and, ideally, the system would take into account the potential impacts of multiple hazards (e.g., flooding and sea level rise and storm surge).

Participants also acknowledged the paucity of data available on the impact of floods on communities. For example, while this may be difficult to gain as communities can be highly transient, better data are required to support the wellbeing of marginalised, vulnerable communities during and after flood events.

Overarching theme 3: Policy review and changes

A range of discussion points highlighted the need for policy review and changes to improve flood risk management and achieve flood resilience in Aotearoa across scales. For example, participants suggested the creation of a Flood Risk Act to set out rules and responsibilities across the country, specify a baseline service level to be provided, manage expectations, and clarify what entity leads each aspect. Such an Act could provide a sound base for regional/local actions and jurisdictions.

Additionally, the planning system needs to consider resilience to flooding and other hazards when planning new developments/ communities. It also needs to embed redundancy in infrastructure funding and provision such as designing multiple access ways for a suburb to enable multiple evacuation options from hazardous areas as opposed to having only one access road. Land use planning also needs to be more proactive, and take a resilient approach to avoiding flood risk. These include avoiding the building of defensive structures (such as stop banks) that can create residual risk which is difficult to plan for or mitigate.

At a regional level, regional policy implementation needs to be expedited to address dynamic, changing risks such as those linked to climate change. Additionally, a total catchment approach to flood risk management and funding flood resilience would help to address issues proactively, rather than responding to individual aspects of the catchment without considering the bigger picture (possible cause and effect scenarios throughout the catchment).

There is also a need to focus on communities instead of individuals to help ensure that everyone is better served by flood mitigation and management initiatives and measures. In particular, the cultural significance of places and sites (e.g., locations of historical events, marae and urupā) should be considered when assessing the value of assets at risk of flooding. Assessments also need to go beyond (money) economic impacts and include the cultural and social values of assets.

Finally, communications about service standards or baseline measures should follow clear statements so as to better manage expectations regarding available services and assistance to communities affected. There is also a need to clearly establish a hierarchy of flood maps, and how those are to be used by differing jurisdictions. For example, some regions currently have their own high-resolution flood risk maps, developed in collaboration with experts. Hence, research outputs should be seen as being complementary to these existing maps to avoid generating conflicting information to decision makers and communities.

Overarching theme 4: Better understanding of economic impacts on [differing] communities, regions and places

Participants highlighted the need to better understand what the economic impacts of floods actually are considering the range of communities, regions and places across Aotearoa also vary. It was noted that social and economic impacts are coupled and experienced together. For example, loss of infrastructure causes stress, and potentially cascades to further (economic) losses and societal impacts. When assessing the effect of a flood event, a single focus on economic impacts, or a strict separation of economic and societal impacts, doesn't consider the inter-relatedness or cascading nature of these impacts, and this is likely to result in under-estimation of true costs.

The justification for funding of flood protection measures, including cost-benefits analyses, needs to account for the value of ecosystem services, the public amenity provided by stop banks (e.g., as cycle paths), and other 'indirect' benefits of these structures. Additionally, the long term impact of decisions should be considered so that the economic costs and benefits that accrue to (future) residents are accounted for. Hence, there is a need for a consistent methodology for capturing direct and indirect (societal) impacts. Because this information incorporates experiences and perceptions, it can be difficult to collect and analyse. Hence, agreed-upon methodologies are required to improve the robustness and veracity of the analyses, particularly from the view point of decision-makers relying on these data.

There are also challenges regarding how intergenerational impacts – past, present and future- are costed and accounted for. These are likely to be substantial, and may assist in the justification of funding for major mitigation or avoidance strategies. These issues and the above carry technical aspects that may be difficult to explain to the general public, therefore, stories and narratives could be developed and used to communicate the social and economic costs of flooding to help community members to better understand the likely impacts affecting them.

4. Conclusion

The first Science-Practice Roadshow enabled the research team to gain an appreciation of the information requirements of a range of entities whose activities touch upon flooding hazard and risk on a nationwide scale. Knowledge gaps and needs within and outside the research programme were identified, and potential solutions discussed. Overlaying all contributions to this discussion, however, was a marked aspiration for greater transparency, fairness and equity when it comes to improving flood risk management across the country. Participants indicated that it is these values that underlie the need for a nationwide framework, so that all communities across Aotearoa are more resilient to flooding through a combination of supportive policy settings and services, and individual and community-level engagement and action.

Overarching messages from the discussions

Our focal questions were designed to elicit responses in areas that the research team felt were important, and distinct, contributors to the programme's eventual success. However, despite the differing focus of these questions, the responses from each participant group overlapped considerably in content and tone. Commonly emerging themes included equity, national consistency, and an inability to separate tangible and intangible impacts (these often being interconnected and experienced simultaneously).

In particular, participants spoke of:

- The need for flexibility: Impacts are not perceived or experienced equally by individuals and communities, so flexibility must be retained within hazard planning, management and mitigation, and these should be tailored where possible to suit the aspirations and needs of community members.
- That equity of access and outcomes is key: Whilst flexibility is valued (above), designing mitigations and responses require a baseline for what is tolerable vs. intolerable; from that, agencies have a clear rationale for determining what assets, services, and approaches are needed to maintain or deliver *at least* that level of mitigation or response for everyone.
- One reliable source of information is preferred: Ideally, a single framework is the basis for decision-making. If there is more than one model or information source, misunderstandings or conflict should be avoided through a clear and agreed hierarchy of authority, and clear communication about such hierarchy. Quality is key, including a clear baseline or minimum requirements to generate robust and reliable information.
- Access to data and information is a democratic right: It is expected that the new knowledge created in this project will be available to multiple user types (e.g., different professions), as well as individuals and communities. Provided information needs to be understandable and delivered via relevant channels, so that individuals, communities and organisations are able to be better informed and engaged in decision-making.

What have we learned from this event? What do we need to focus on or alter in the programme so that the needs of these stakeholders are met?

Overall, the perspectives of these stakeholders indicated that our research was well focused to meet their needs. However, there were several aspects of our proposed research outputs (tools and information) that will require more consideration and tailoring in order to optimise their use. These include:

- Ensuring that the information and tools are available to the public (e.g., private landowners) in relevant formats; this will enable people to make their own decisions/inform the choices they can make.
- Championing clear, relevant communication about all aspects of flooding, and its management. This includes user guides for tools tailored for differing professions, and equipping stakeholders to communicate with their communities about risk, options and impacts.
- Māori interests and aspirations must be reflected in our outputs; many iwi and hapū are in the position to make decisions about their land and assets and thus, relevant mātauranga should be incorporated into tools and procedures (the research team should support this, and help facilitate it where possible).
- Developing systems for updating the model into the future, and also for how it interacts with other models (e.g., for other hazards), so that it is a dynamic, depicting a wholistic system rather than a static model.



Photo credit: Lana Young, NIWA

5. Next steps

The event reported in this document is the first of a series of Science-Practice Roadshows planned throughout the research programme's duration (two per year for next four years). Whilst this event invited contributions from entities of nationwide remit, subsequent Roadshows will have different foci so that the research team are interacting with the breadth of stakeholder types and the research is well-informed as the programme evolves. For example, in earlier years, the main aim is to facilitate knowledge sharing and an appreciation of the differing world views of stakeholders, whilst in later years the events will support activities such as co-development of the framework to support decisions (major output) and crafting communications (user guides, policy advice, etc) that support its use.

Our next steps will include engaging with regional perspectives – in particular to understand the breadth/continuum of capability and capacity and how the programme will address or account for these differences. Previous discussions with several regional councils and territorial authorities indicate a willingness for greater collaboration that will assist all regions to be better informed; our nationwide framework should be the underlying mechanism for this sharing and collaboration.

Further consideration is also needed to determine how the research will be useful beyond the duration of the research programme itself – what entity will take ownership of and responsibility for the framework, how can the underlying model be updated as new data is gained, and what ongoing communication is required to ensure the framework continues to support greater resilience to flooding risk and hazard into the future. Necessarily, this consideration includes thinking about the future role of the boundary organisation.

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Te whāriki o te wai

Mā te haumarū o nga puna wai o Rākaihautū ka ora mo ake tonu

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