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

Science – Practice Roadshow 1

October 28th 2021

Via Zoom

Housekeeping

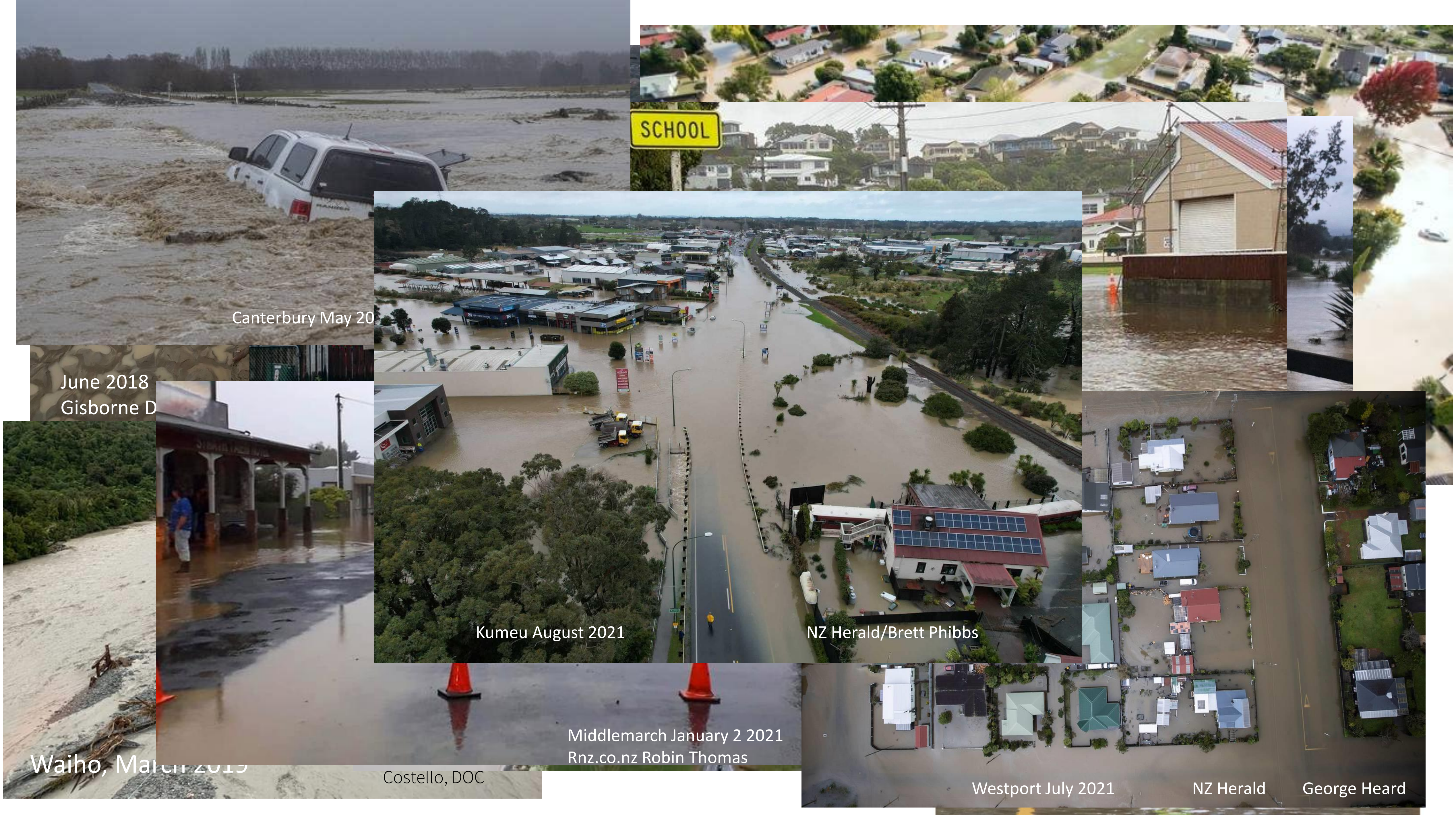
- Please keep yourself muted during the presentation
- “Side-by-side speaker’ view enables you to see the Powerpoint and the speaker
- To ask questions during the presentation, write into the ‘chat’; add name of speaker as first word, so that we can direct it to the right person
- There are short Q&A sessions at the end of each presentation block (around 11am and 11.40am); we will go through the questions then
- Technical issues – Belinda - 021 488 519/Belinda.sleight@waikato.ac.nz

Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:

Overview - Increasing flood resilience across Aotearoa

Roadshow Webinar

28 October 2021



Canterbury May 20

June 2018
Gisborne D

Waiho, Mar

Costello, DOC

Middlemarch January 2 2021
Rnz.co.nz Robin Thomas

Kumeu August 2021

NZ Herald/Brett Phibbs

Westport July 2021

NZ Herald

George Heard

CENTRAL


Source: iStock

- Legislation: RMA, CDEM Act, Building Act, Soil Conservation and Rivers Control Act
- MfE: Guidance for natural hazards
- NEMA: Emergency and post-emergency recovery phases
- MPI: Coordinate rural community after large floods
- Central Government: may provide money to councils to help after large floods
- DIA: Currently coordinating a Community Resilience Work Programme on flooding

REGIONAL

- Manage rivers and catchments, control land use
- Provide information on where flooding occurs
- Operate/maintain flood defence systems
- River flows, lake levels, previous floods
- Issue flood warnings

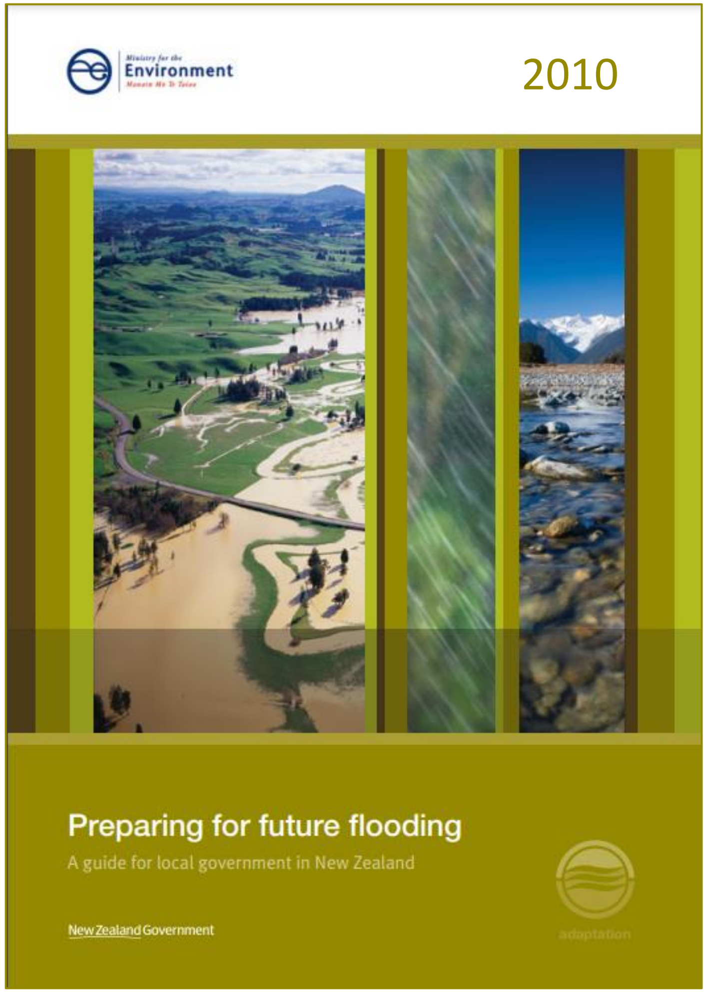
LOCAL

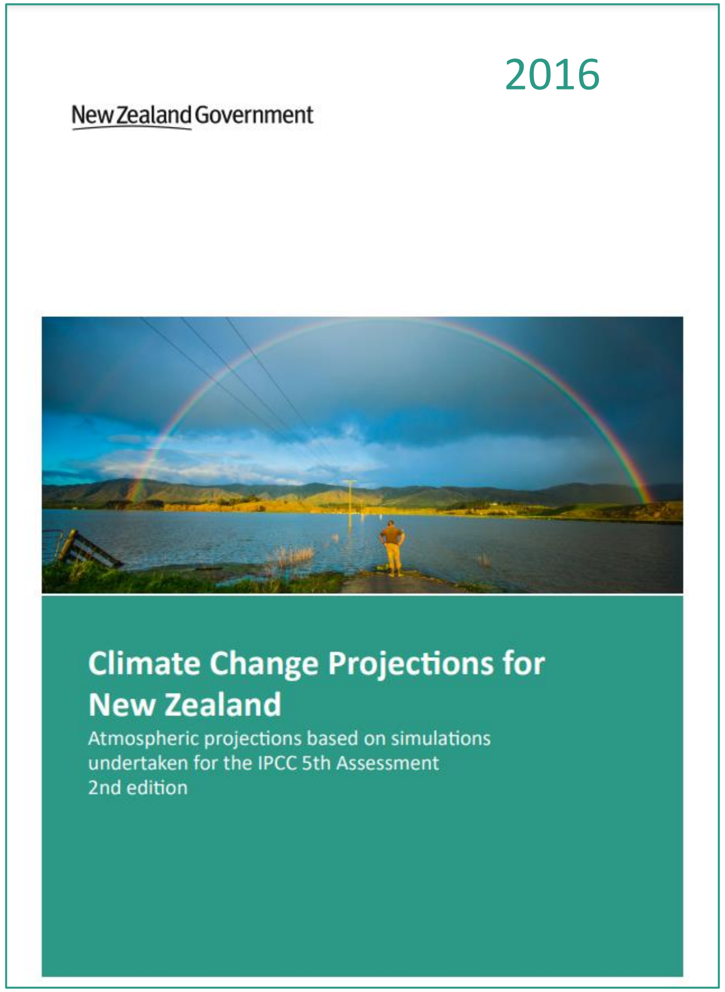
- Control building and effects of land use (e.g. Subdivisions, floor height etc)
- Provide flood information via Hazard Register or District/City Plan
- Coordinate with emergency services during events and assist in recovery

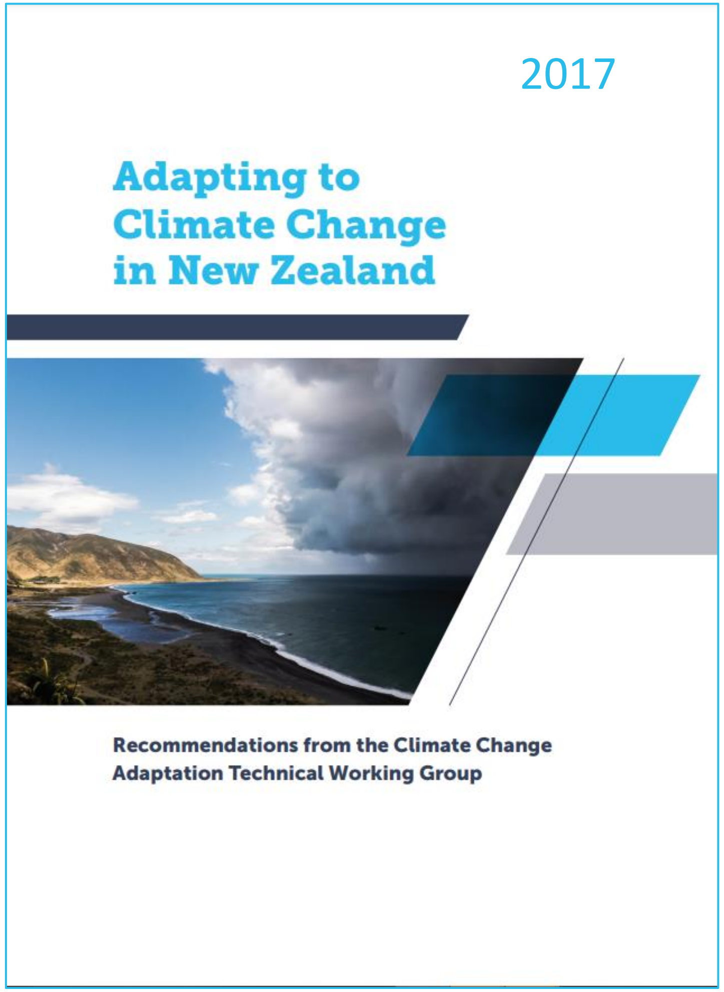
Review of Flood Management 2008, MfE

The current level of flood risk across New Zealand cannot be stated with any accuracy, and neither can the impact of climate change or variability be meaningfully predicted on the level of flood risk. In addition, there is no way to assess or collate comparable information around the country to make this level of analysis possible. As a result, understanding the potential flood risk requires:

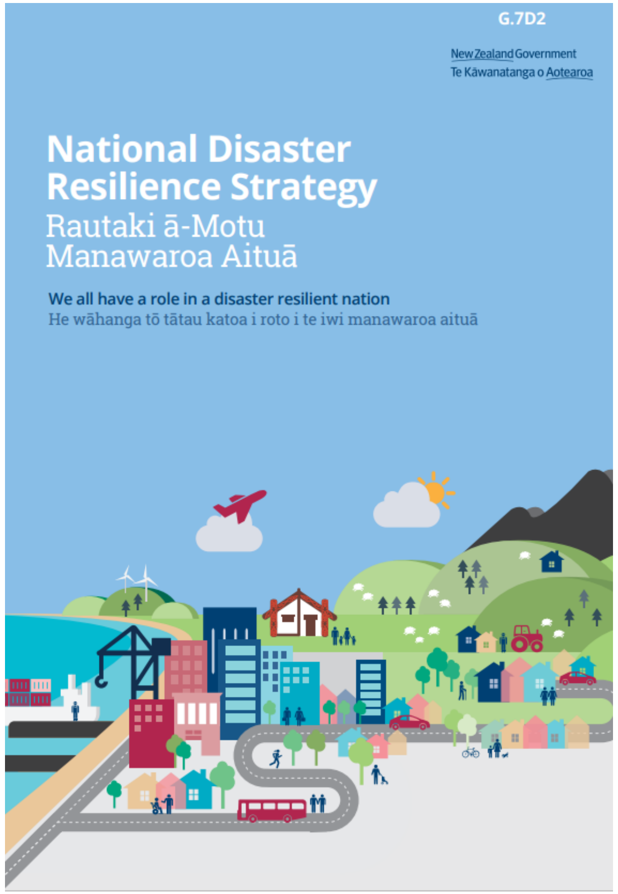
- broad-scale analysis using a consistent set of parameters and approaches so flood risk can be understood across the country and hot spots identified
- understanding climate change's future effects on weather patterns in different parts of the country
- determining and accounting for uncertainty in climate change and variability, hydrological, hydraulic and economic modelling analysis.

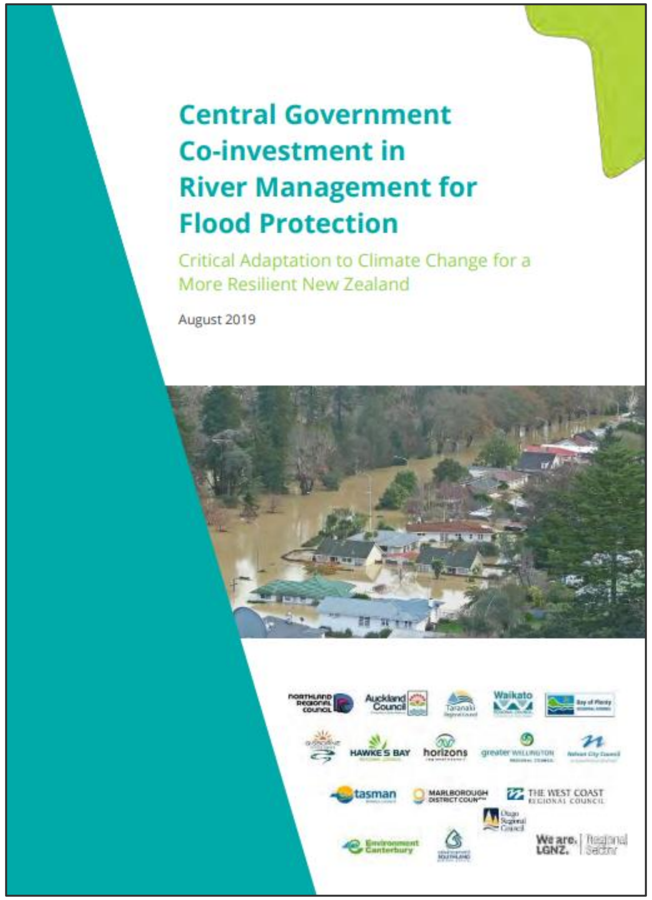

2010
Ministry for the Environment
Manatū Mō Te Taiao
Preparing for future flooding
A guide for local government in New Zealand
New Zealand Government
adaptation

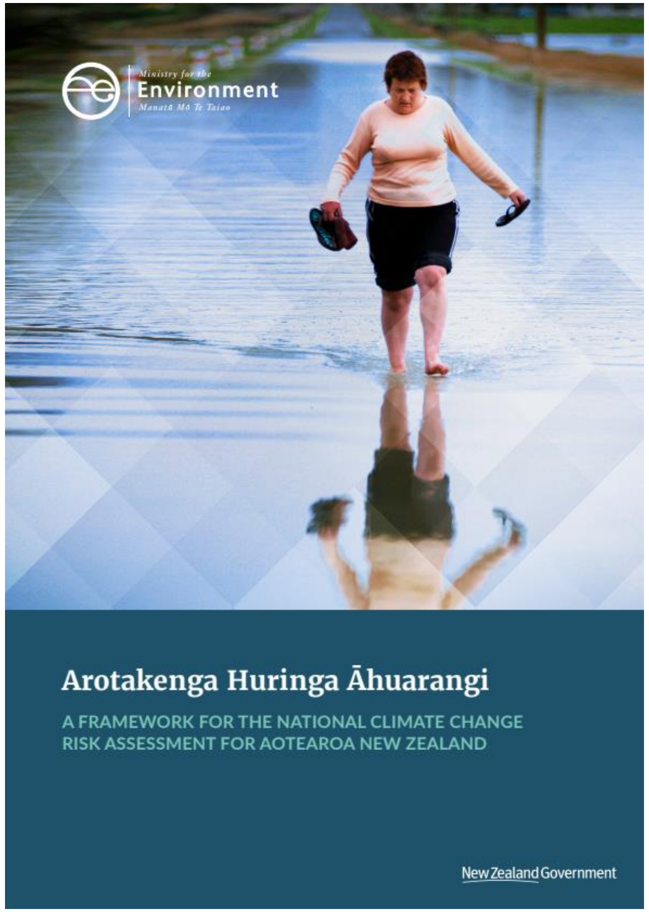

2016
New Zealand Government
Climate Change Projections for New Zealand
Atmospheric projections based on simulations undertaken for the IPCC 5th Assessment
2nd edition


2017
Adapting to Climate Change in New Zealand
Recommendations from the Climate Change Adaptation Technical Working Group

2019

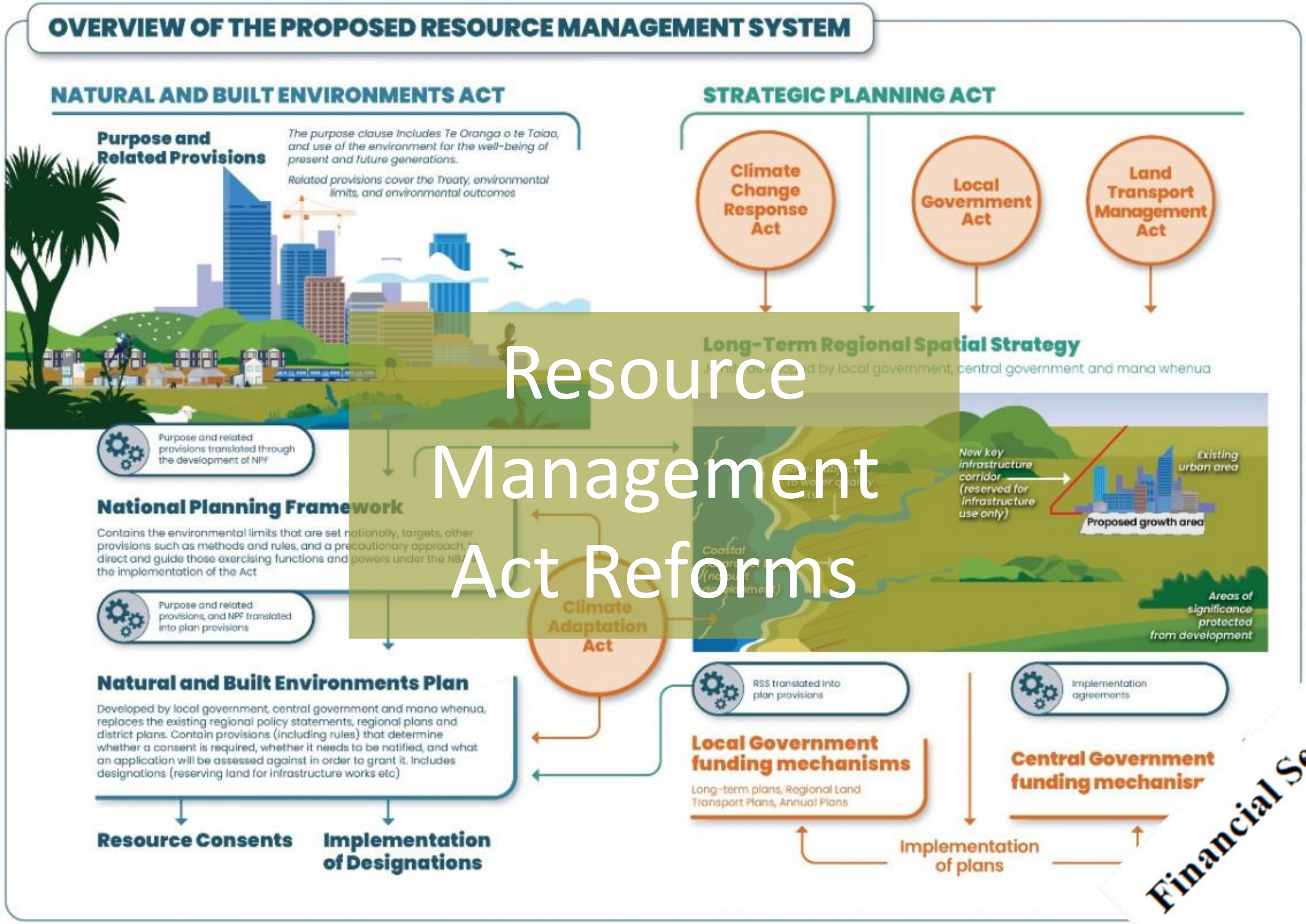

G.7D2
New Zealand Government
Te Kāwanatanga o Aotearoa
National Disaster Resilience Strategy
Rautaki ā-Motu Manawaroa Aituā
We all have a role in a disaster resilient nation
He wāhanga tō tātau katoa i roto i te iwi manawaroa aituā

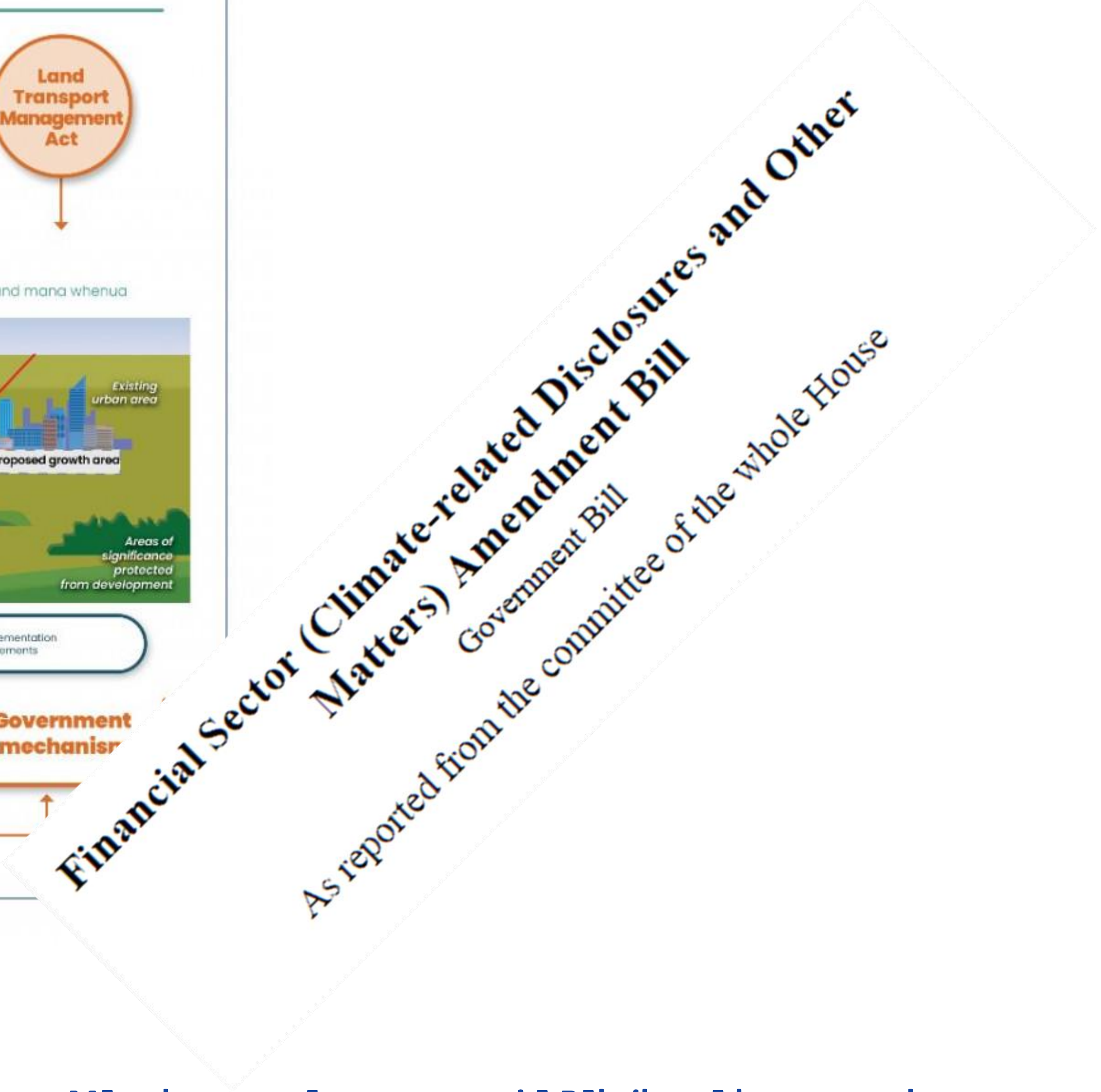

Central Government Co-investment in River Management for Flood Protection
Critical Adaptation to Climate Change for a More Resilient New Zealand
August 2019


Ministry for the Environment
Manatū Mō Te Taiao
Arotakenga Huringa Āhuarangi
A FRAMEWORK FOR THE NATIONAL CLIMATE CHANGE RISK ASSESSMENT FOR AOTEAROA NEW ZEALAND
New Zealand Government

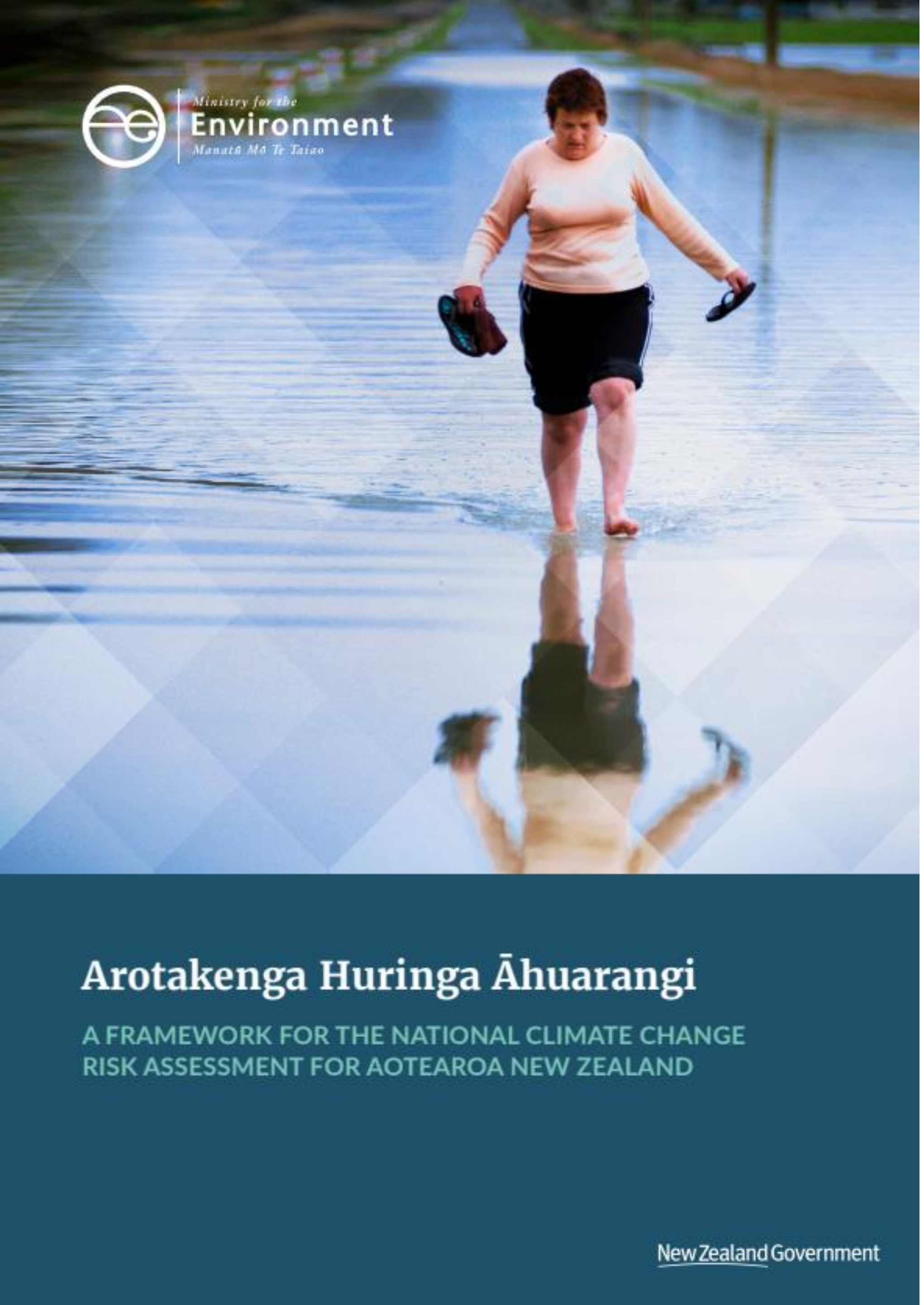
Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

Resource Management Act Reforms





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



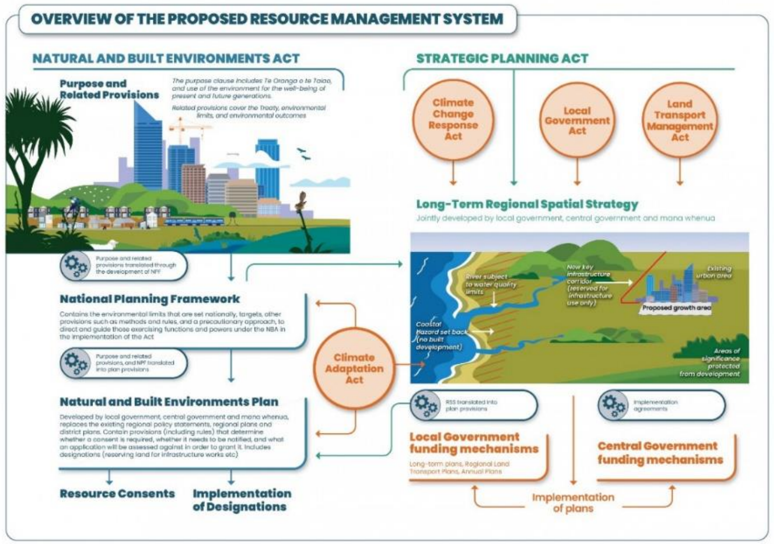
National Climate Change Risk Assessment

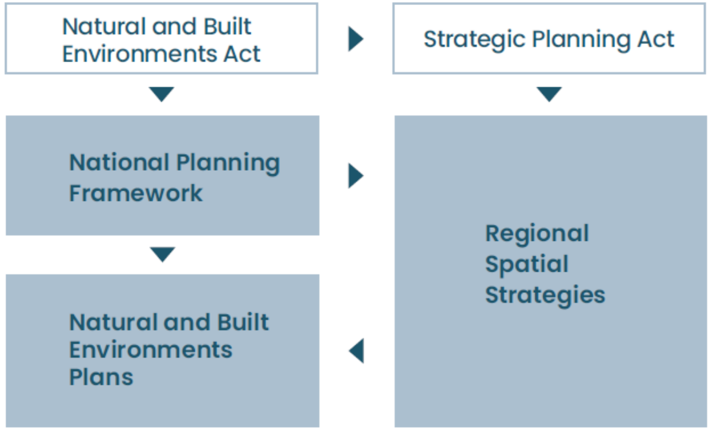
- Climate Change Response (Zero Carbon) Amendment Act 2019 requires a risk assessment at least every six years.
- To be carried out by Climate Change Commission
- National Adaptation plan outlining how to respond to risks
- developed by Government together with local government, iwi/Māori and others

Resource Management System

- Increase efficiency and reduce complexity

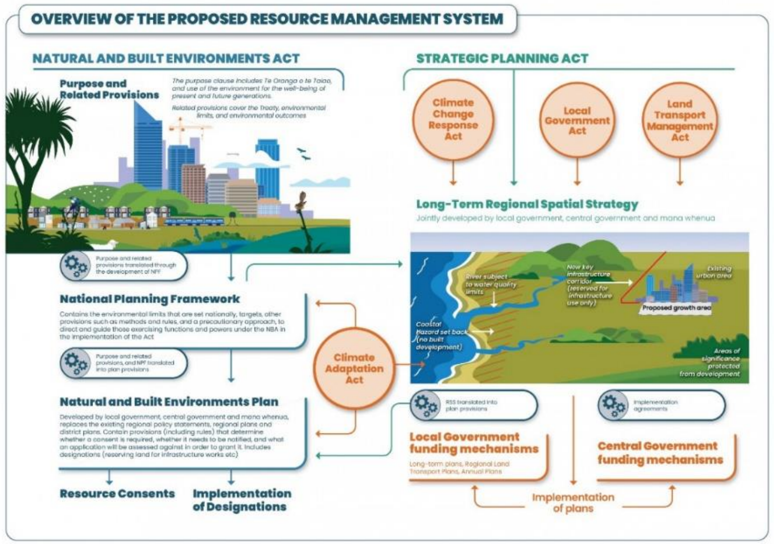
  Increased central direction and tools: centralised digital tools and platforms including national data sets, standardised methods and models e.g., natural hazard data

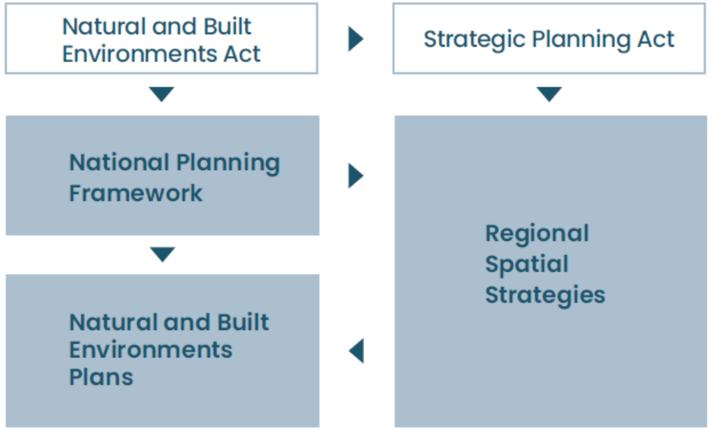




Natural and Built Environment Act

- Environmental Outcomes: Resilience to natural hazards and climate change improved
- National Planning Framework must include natural hazards and climate change.

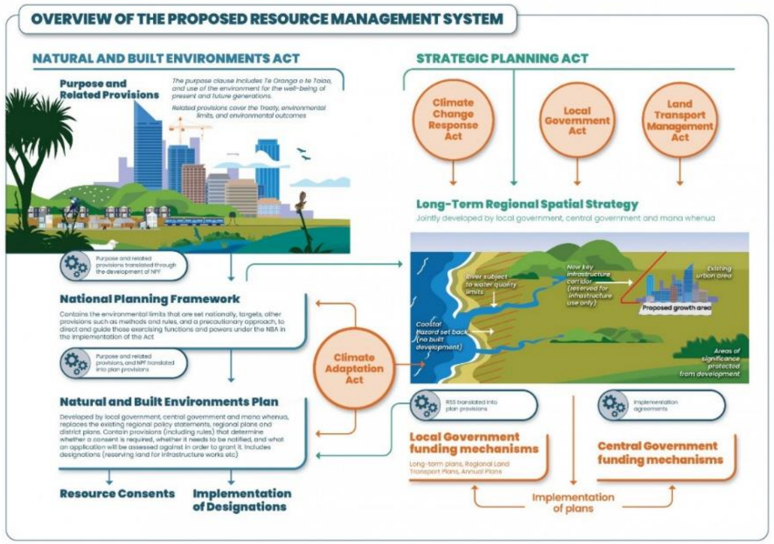


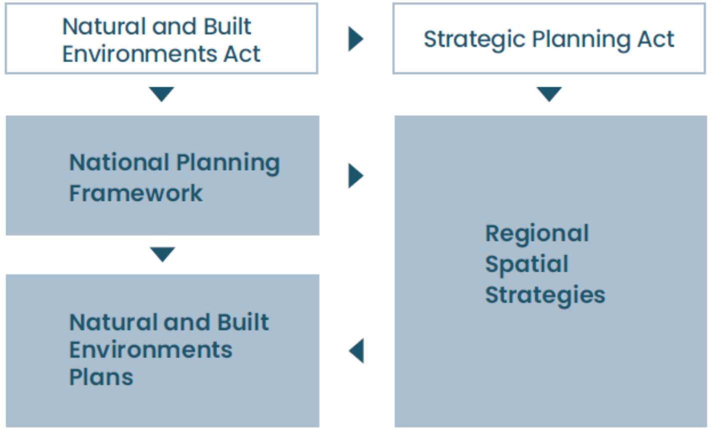


Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

Strategic Planning Act

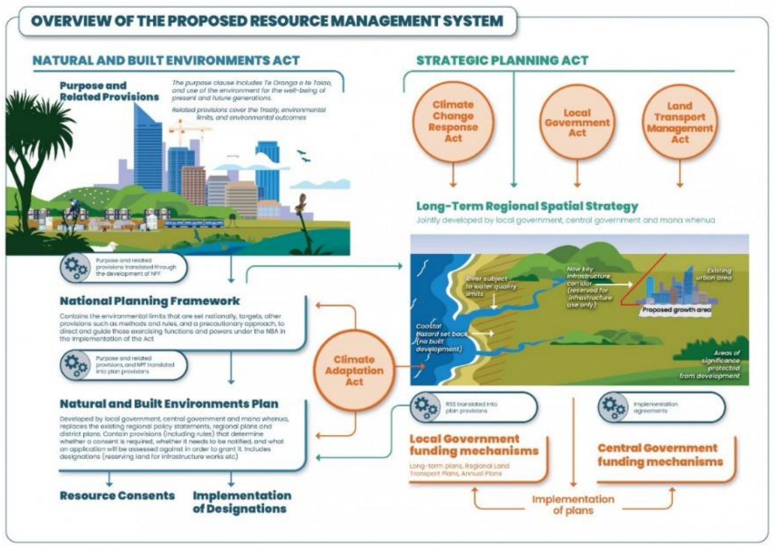
- Local & central government, iwi, hapū and Māori, to take a joined-up strategic vision of the future.
- Regional Spatial Strategies will:
- Support climate change mitigation and adaptation, and natural hazard risk reduction.
- Informed by robust information and evidence, proportionate to the level of detail required.

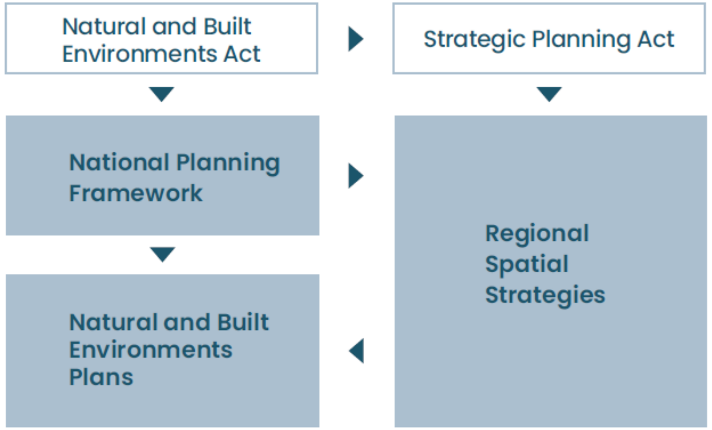




Climate Adaptation Act

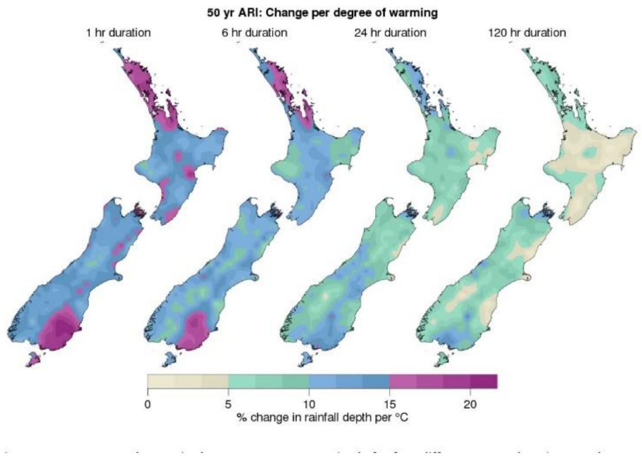
- Managed retreat:
- Enable people to relocate assets, activities, and taonga away from hazardous locations (where climate change or natural hazard risks are so severe withdrawal preferred option)

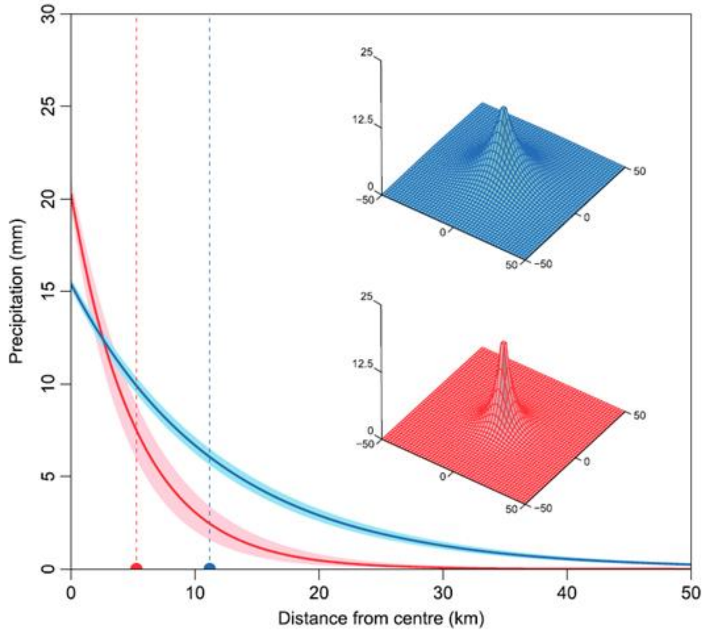




Climate Change

- We live in a changing climate
- As temperatures increase, short intense rainfall events will become more frequent and ‘spikier’
- These will be especially problematic in urban areas
- Sea level rise exacerbates flooding in low-lying coastal regions (reduced drainage, increased groundwater level)
- We need to understand how these changes affect our flood hazard





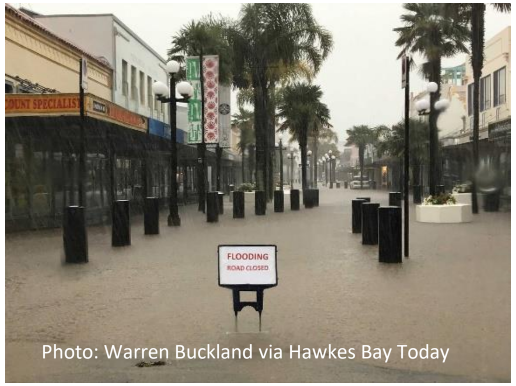
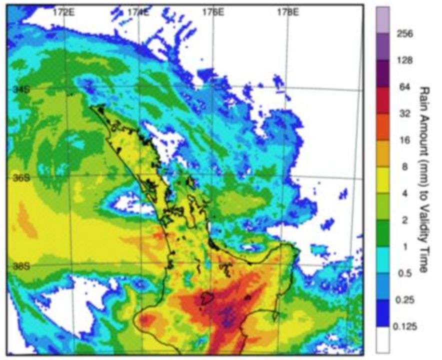
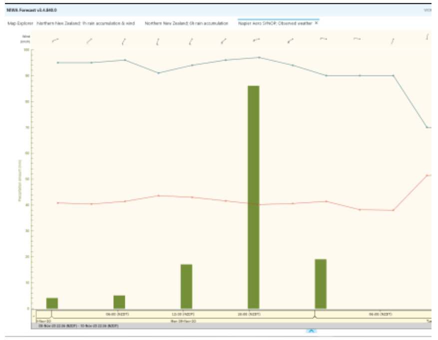


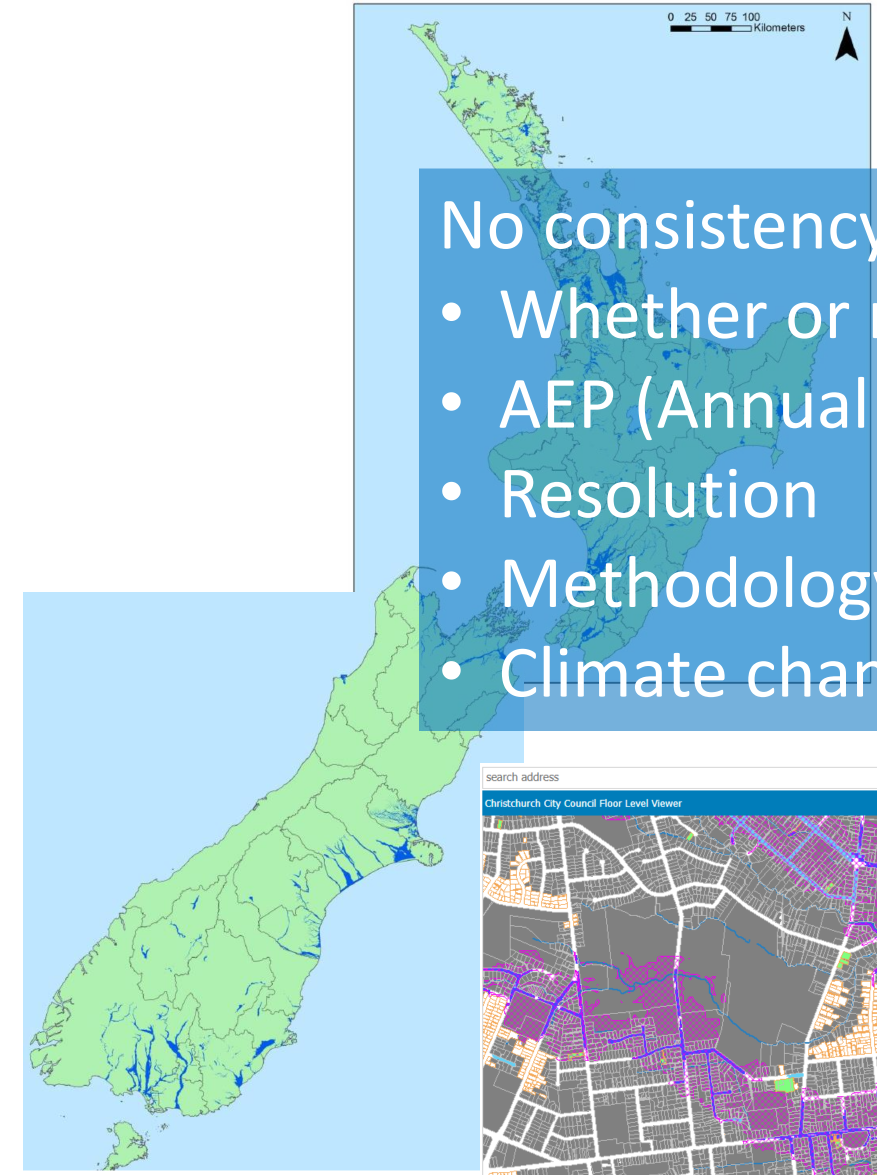
Photo: Warren Buckland via Hawkes Bay Today

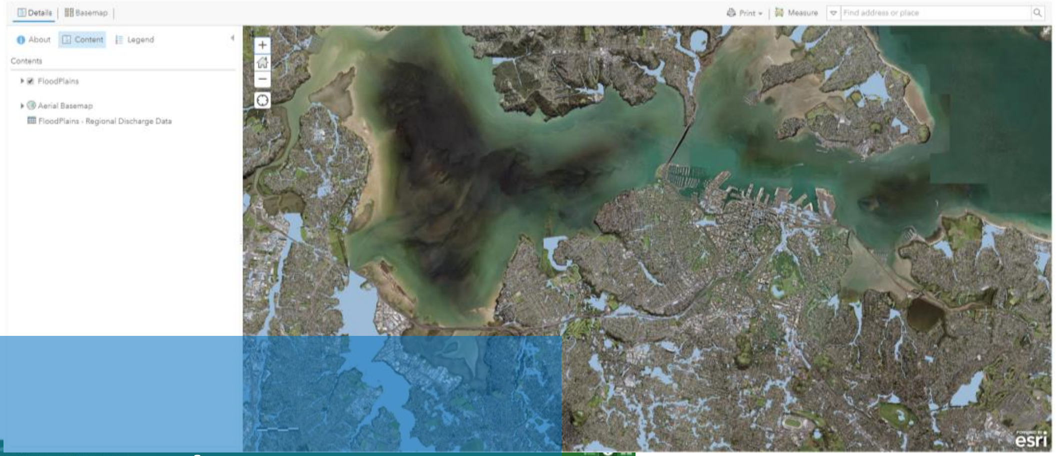


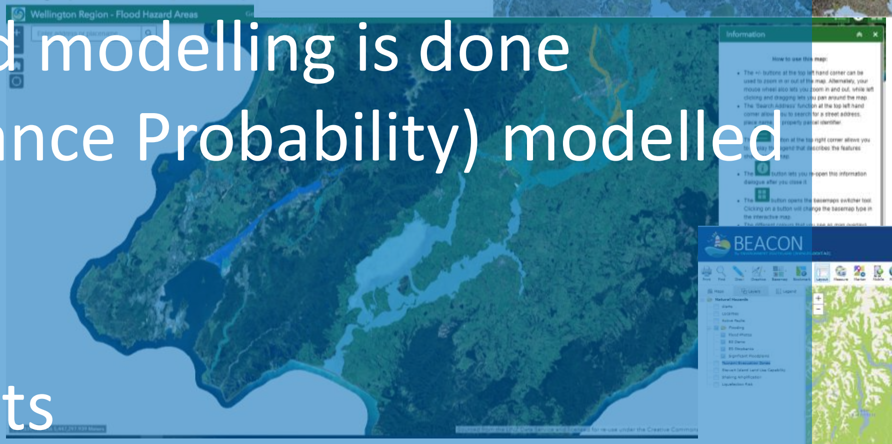


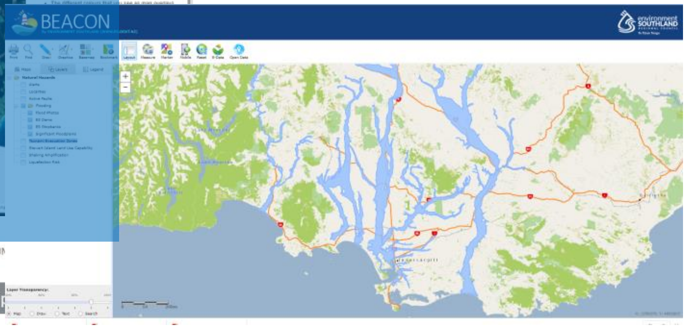
Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

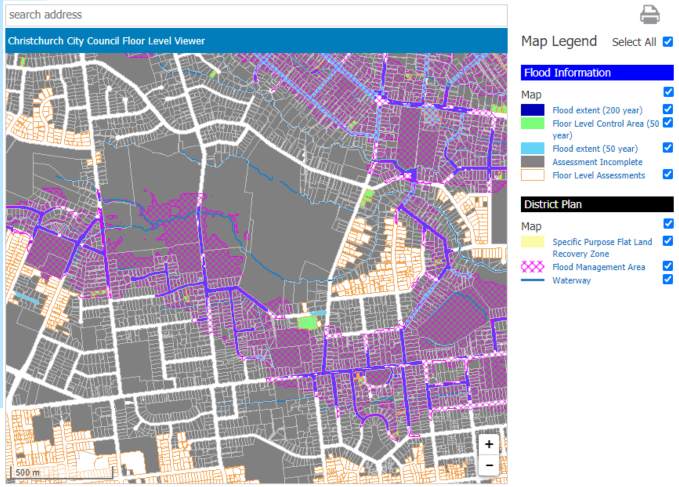
What is already available?

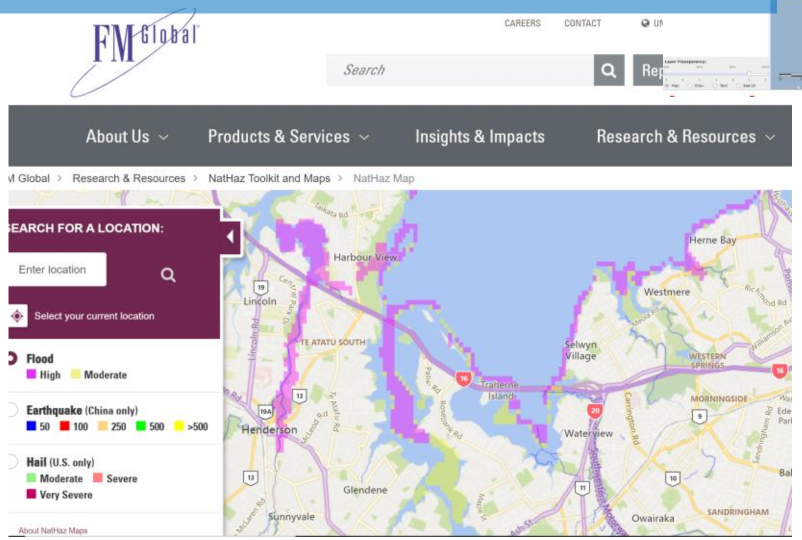












No consistency in terms of:

- Whether or not flood modelling is done
- AEP (Annual Exceedance Probability) modelled
- Resolution
- Methodology
- Climate change effects

Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
5-year MBIE Endeavour Research Programme
to increase flood resilience in Aotearoa

Produce an updateable nationally-consistent flood inundation hazard and risk assessment for current conditions and future scenarios under climate change.

Create a forum between science, iwi, policy-makers and stake-holders to ensure desired outcomes

Why?

National screening tool:

- Identify where the flood hazard/risk are high – especially in rural areas where there may not currently be information.
- Identify where the flood hazard/risk may increase under climate change.
- Work with local and central government, iwi, stake-holders to determine how to use this information to increase resilience

Research partners:

NIWA
Taihoro Nukurangi

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Toitū Te Whenua
Land Information New Zealand

Maiora Wekepiri Consultancy

UC
UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

wsp

Manaaki Whenua
Landcare Research

Deliberate
Discuss.Understand.Act.

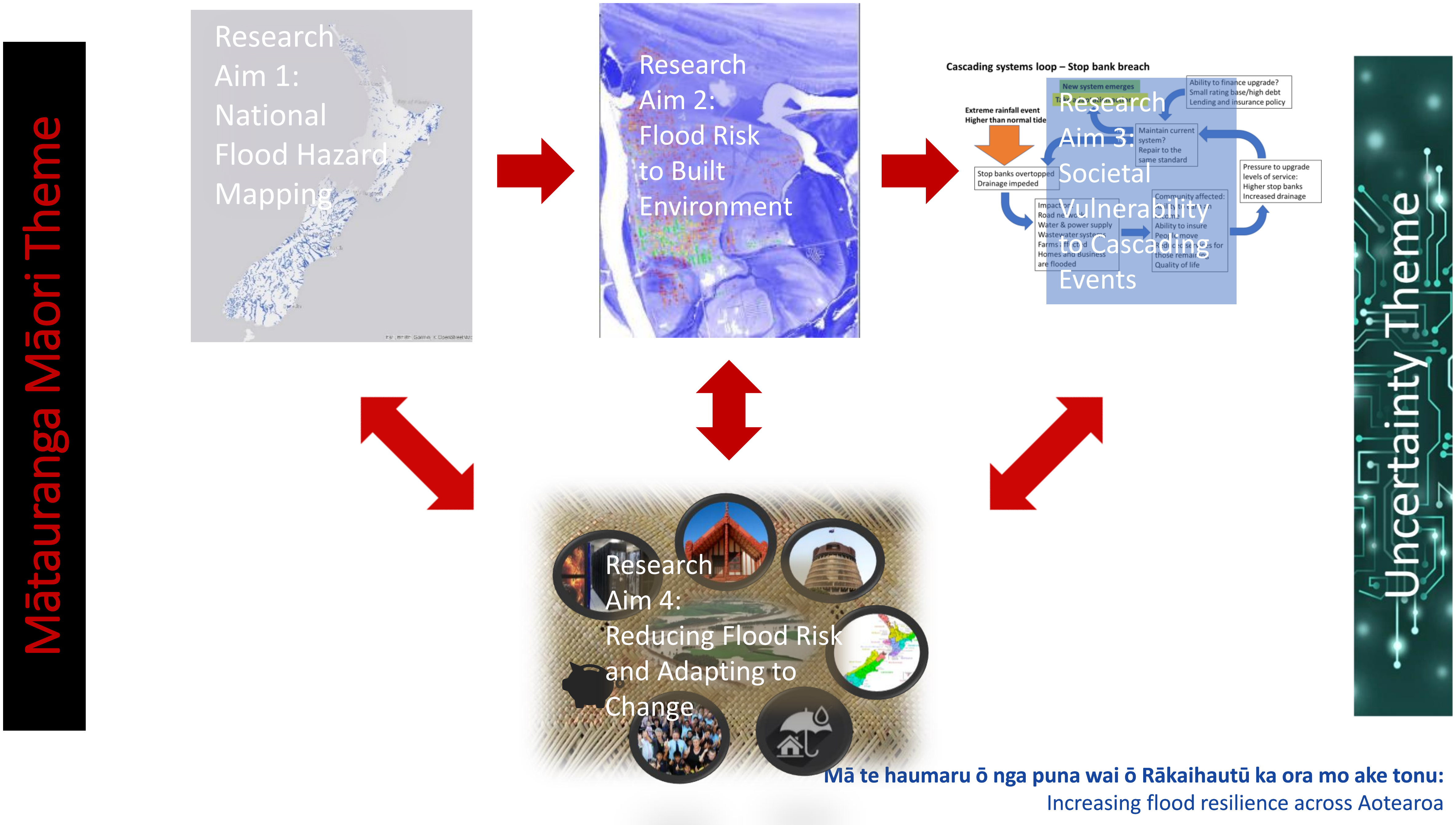
neo
NEO LEAF GLOBAL

Weather Radar New Zealand

UNIVERSITY OF SASKATCHEWAN

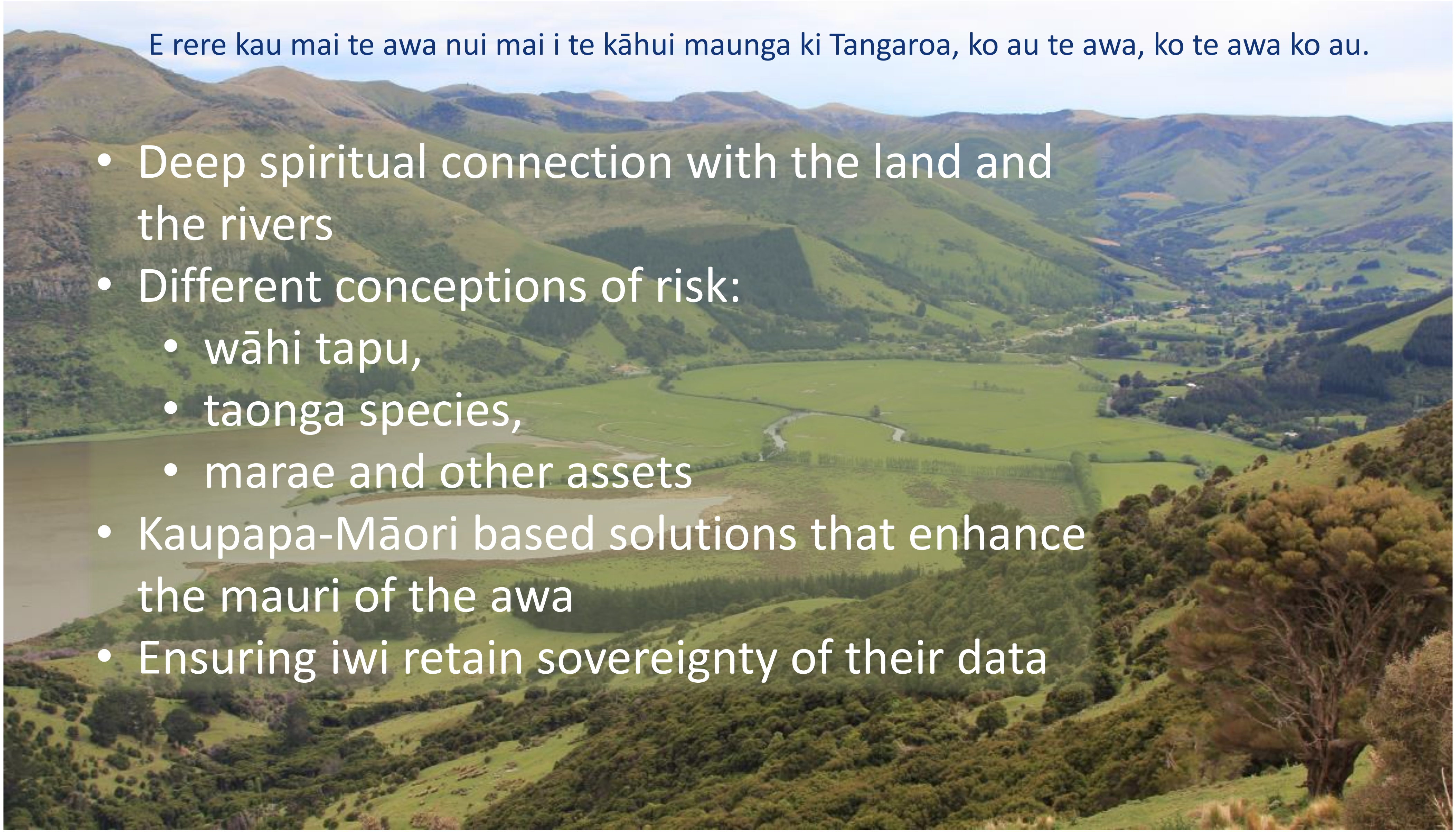
University of BRISTOL

UC
UNIVERSIDAD DE CANTABRIA



Mātauranga Māori Theme
Research Aim 1: National Flood Hazard Mapping
Research Aim 2: Flood Risk to Built Environment
Cascading systems loop – Stop bank breach
Extreme rainfall event
Higher than normal tide
Stop banks overtopped
Drainage impeded
New system emerges
Ability to finance upgrade?
Small rating base/high debt
Lending and insurance policy
Maintain current system?
Repair to the same standard
Pressure to upgrade levels of service:
Higher stop banks
Increased drainage
Water & power supply
Homes and Business are flooded
Community affected:
Ability to insure
Quality of life
Research Aim 3: Societal Vulnerability to Cascading Events
Research Aim 4: Reducing Flood Risk and Adapting to Change
Uncertainty Theme
Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

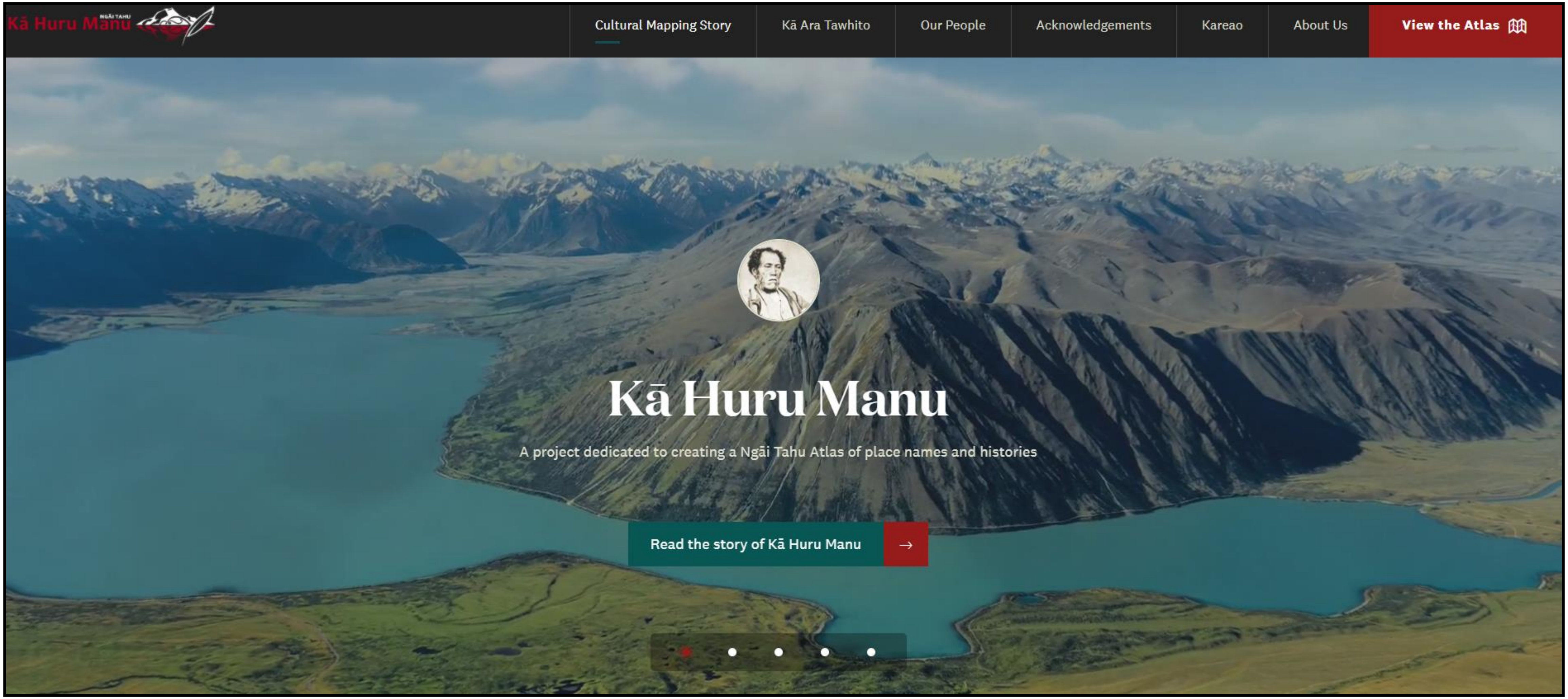
Mātauranga Māori



E rere kau mai te awa nui mai i te kāhui maunga ki Tangaroa, ko au te awa, ko te awa ko au.

- Deep spiritual connection with the land and the rivers
- Different conceptions of risk:
  - wāhi tapu,
  - taonga species,
  - marae and other assets
- Kaupapa-Māori based solutions that enhance the mauri of the awa
- Ensuring iwi retain sovereignty of their data

Potential option: kahurumanu.co.nz



Mātauranga Māori

- Working with the hapū of Wairewa Rūnanga Kāti Mako and Ngāti Irakehu
  - (Dr Benita Wakefield and Kaitiaki Advisory Group)
- Understanding knowledge of flooding from a Māori perspective
- Developing a climate change flooding strategy for the rūnanga following Te Tāhū o te Whāriki.
- More generally, developing a framework for flood risk and climate change for iwi and rūnanga across Aotearoa

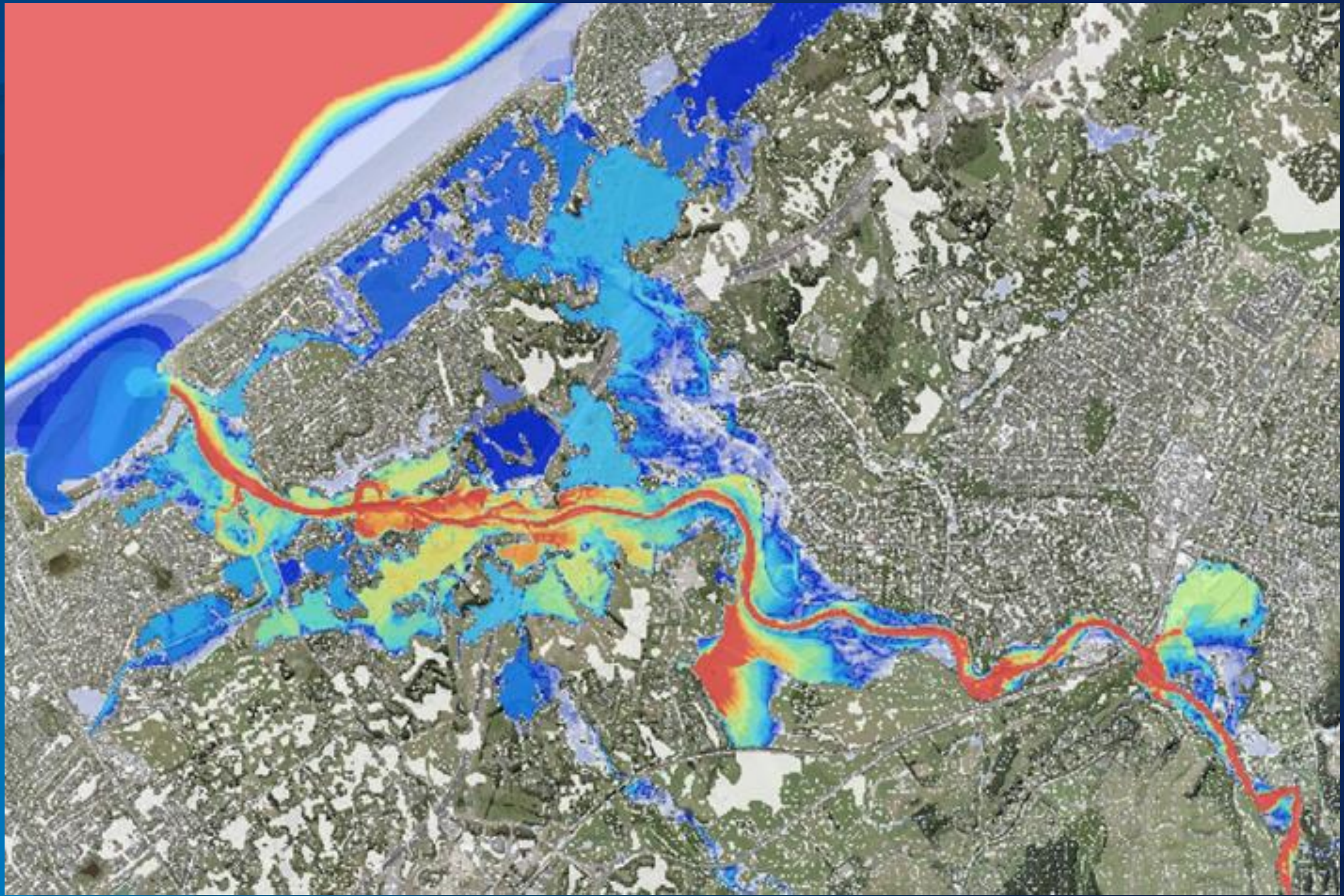
Mō tātou, ā, mō kā uri ā muri ake nei

Programme name

The name of this programme, “Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu” acknowledges an ancestor of Wairewa Rūnanga, who are partners in the research.

It translates to “By keeping the water of Rākaihautū safe the water will survive eternally”. Rākaihautū was an ancestor who was said to traverse the South Island, digging and naming lakes as he travelled.

You’ll also see us use a shortened version of this name: “Mā te haumaru ō te wai”, which means “By keeping the water safe”.



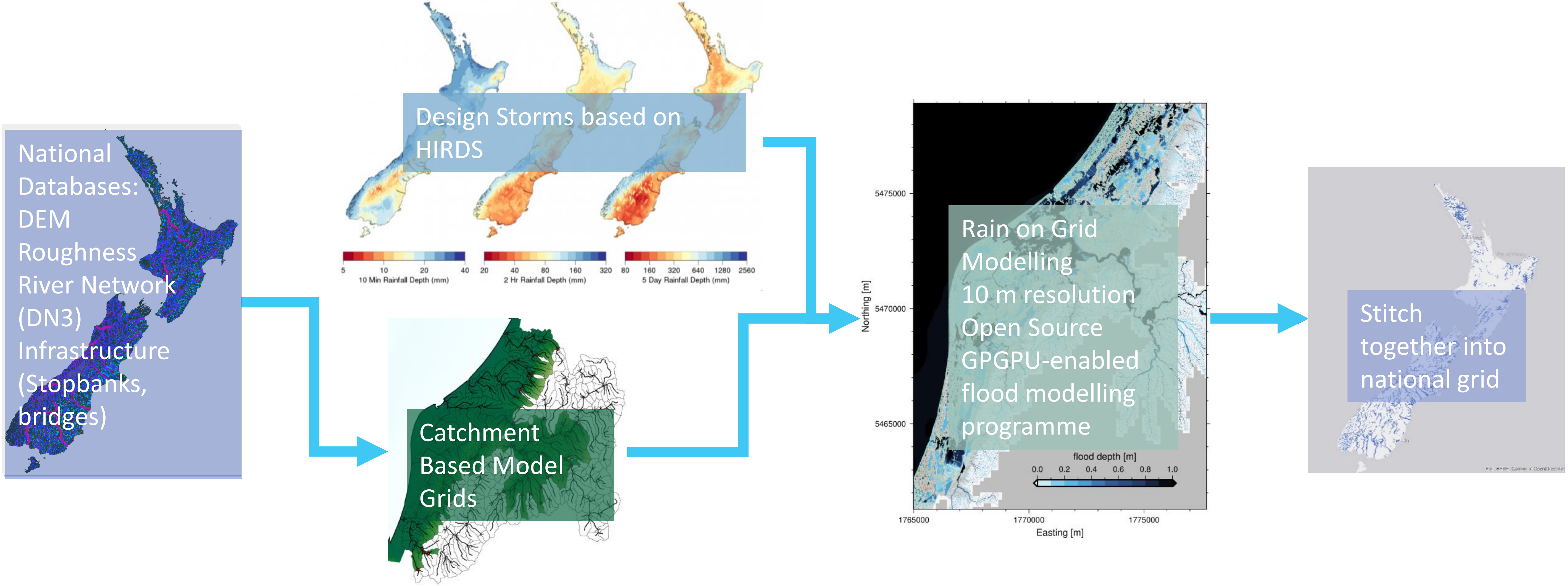
Research Area 1

National flood mapping

Emily Lane and Sam Dean (NIWA)

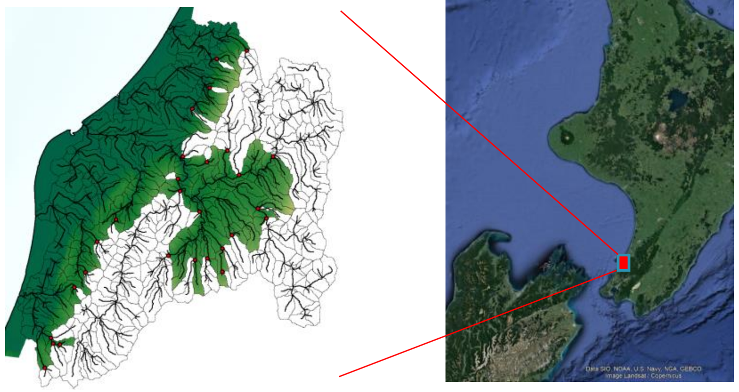
RA1 – National Flood Mapping:

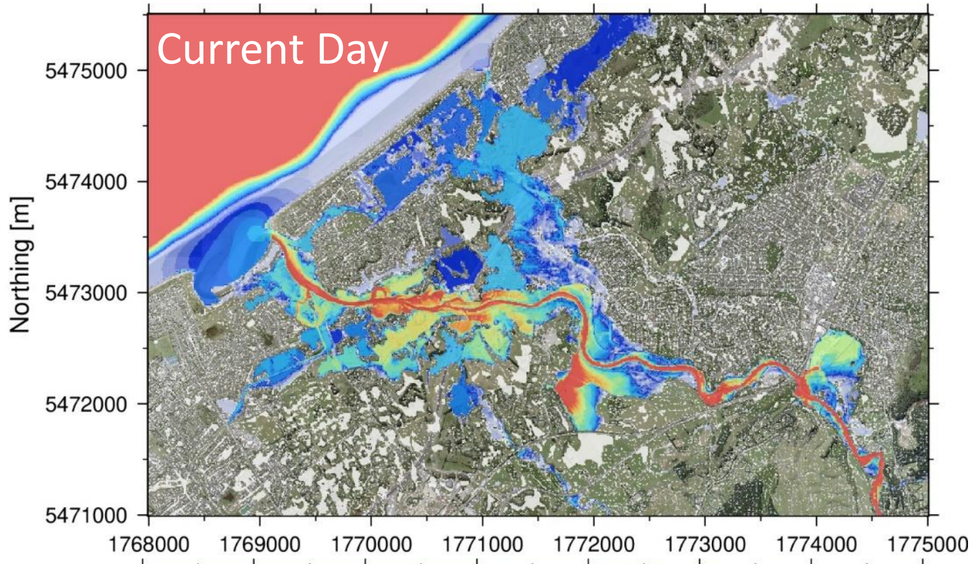
Create a semi-automated system and methodology for nationally consistent flood maps for a range of design storm events, including climate change impacts, validated against a database of historical floods.

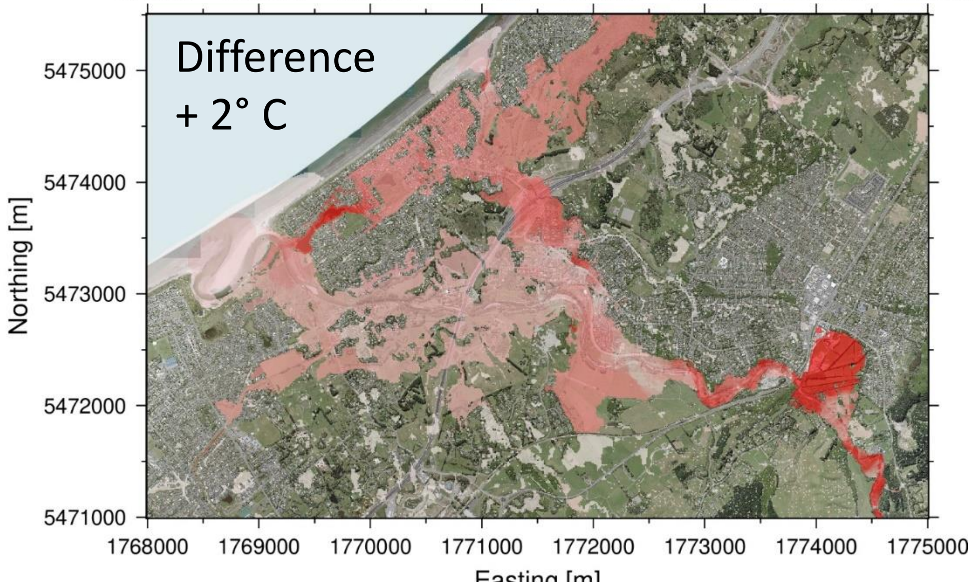


Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

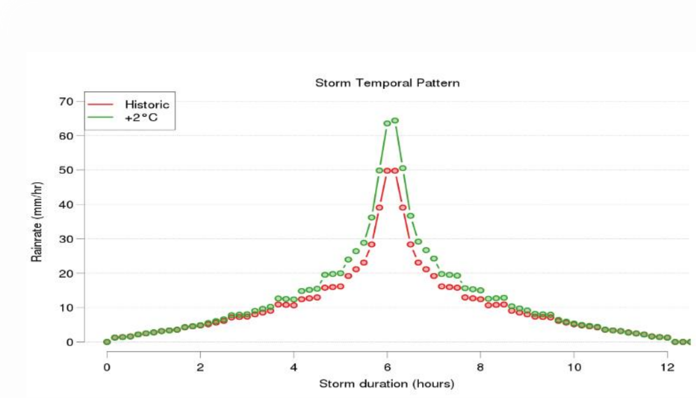
Waikanae 1% AEP 12-hour storm
Current and Climate Change scenarios

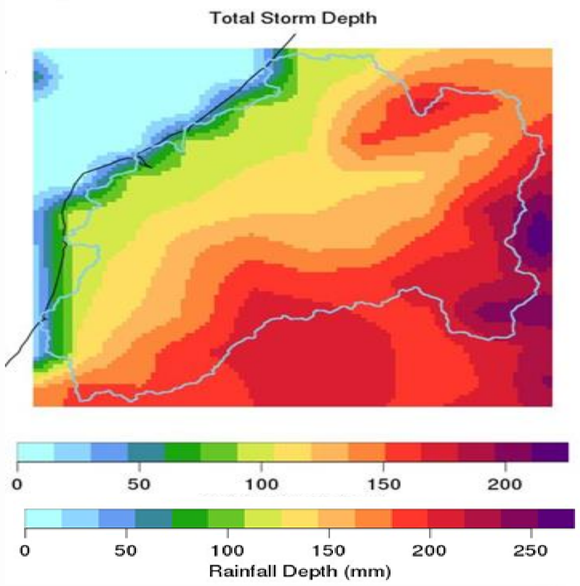






Design Storm





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

UK Solution

BETA This is a new service – your feedback will help us to improve it.

Learn more about flood risk

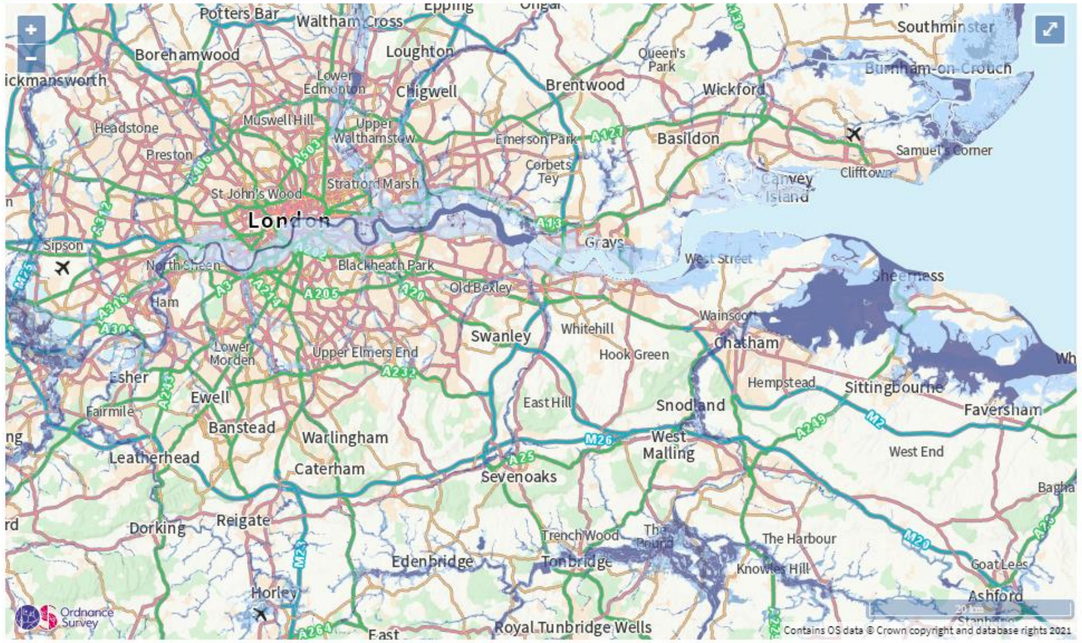
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

London



Extent of flooding from rivers or the sea

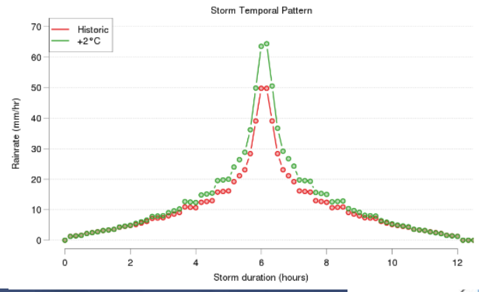
High Medium Low Very low

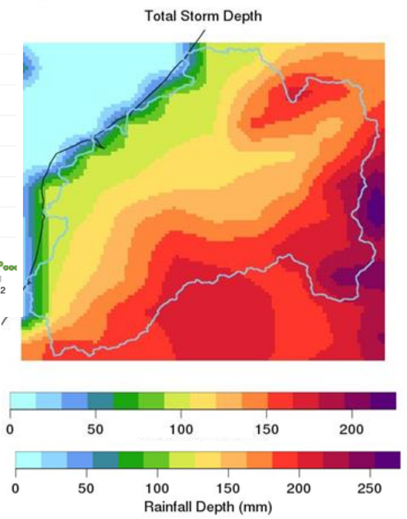
High	> 3.3%
Medium	1% - 3.3%
Low	0.1% - 1%
Very Low	< 0.1%

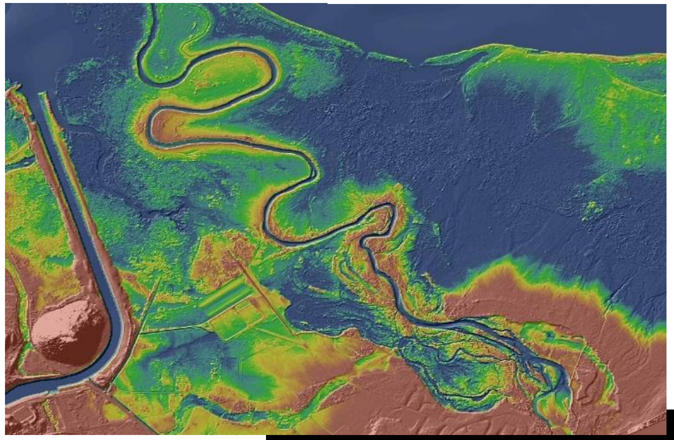
https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

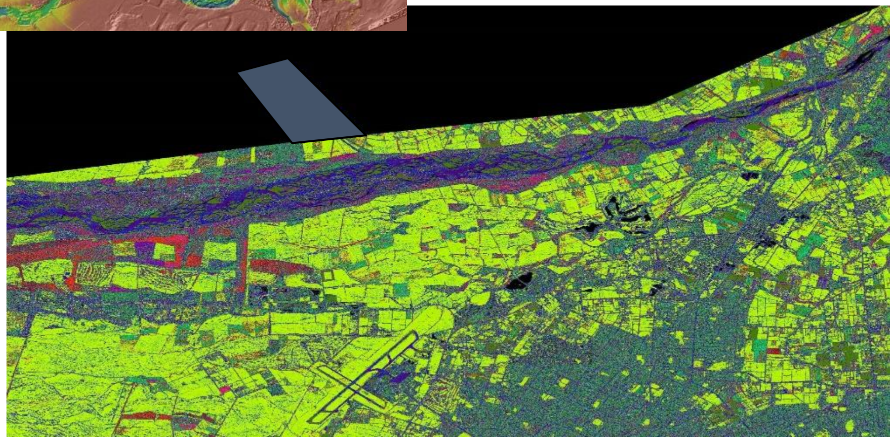
Open Source Outputs:

- Flood Hazard Maps
- Methodology for incorporating climate change in flooding
- Guidance for national scale modelling
- Consistent national scale data





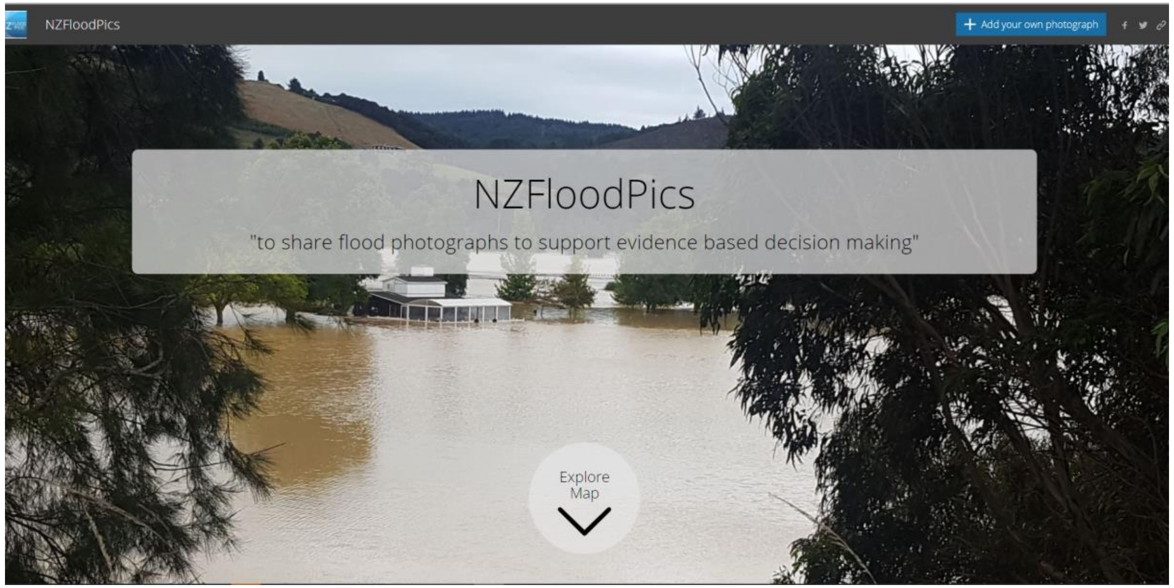


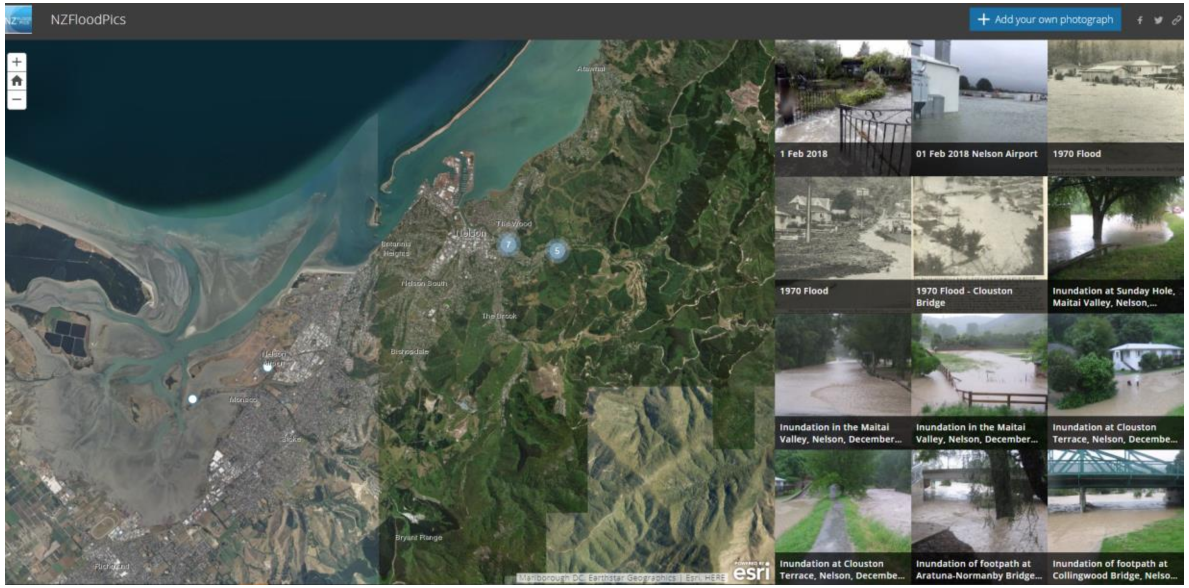


Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

Historical and current Floods

- http://www.nzfloodpics.co.nz/
- Repository of Historical Floods
- Photos ‘tell the flooding story better than maps’
- Reconstructing flood heights from historical photos





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

Uncertainty

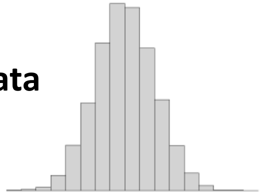
Overarching Theme

Matthew Wilson (University of Canterbury)

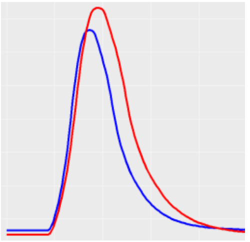
Uncertainty Theme

- Uncertainty in flood risk assessment results from many sources, e.g.:

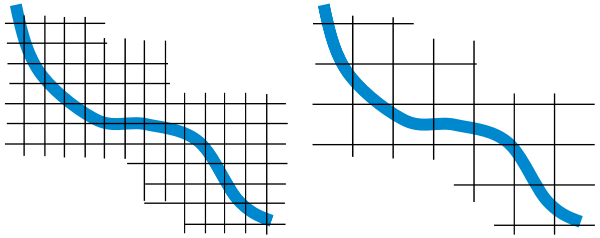
Errors in the numerous data sources



The “what-if” scenarios assessed



The structure and hydraulic formulations



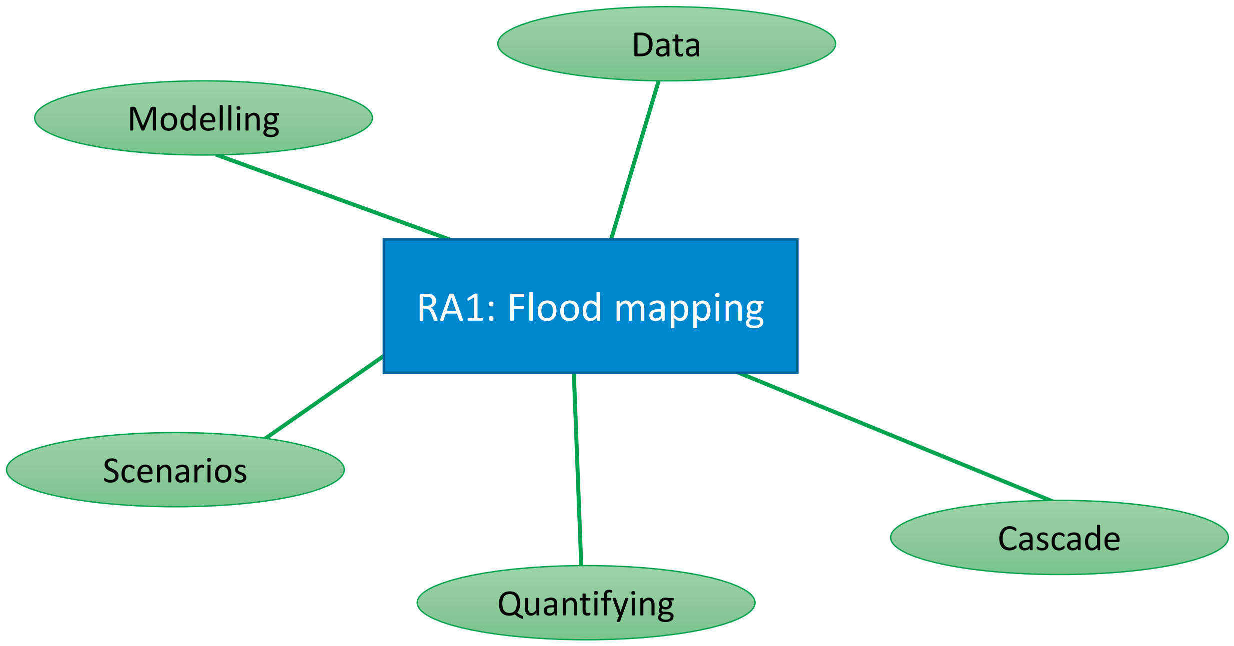
- Affects the reliability of flood assessments
- “Cascades” through the modelling/analysis chain
- Often poorly understood
- Difficult to quantify and visualise well

Without knowledge of uncertainty, *decision-makers cannot take it into account in flood mitigation strategies.*

***Uncertainty* is a cross-cutting theme that will assess the drivers and consequences of uncertainty and work with end-users to design, test and establish novel decision-making practices.**

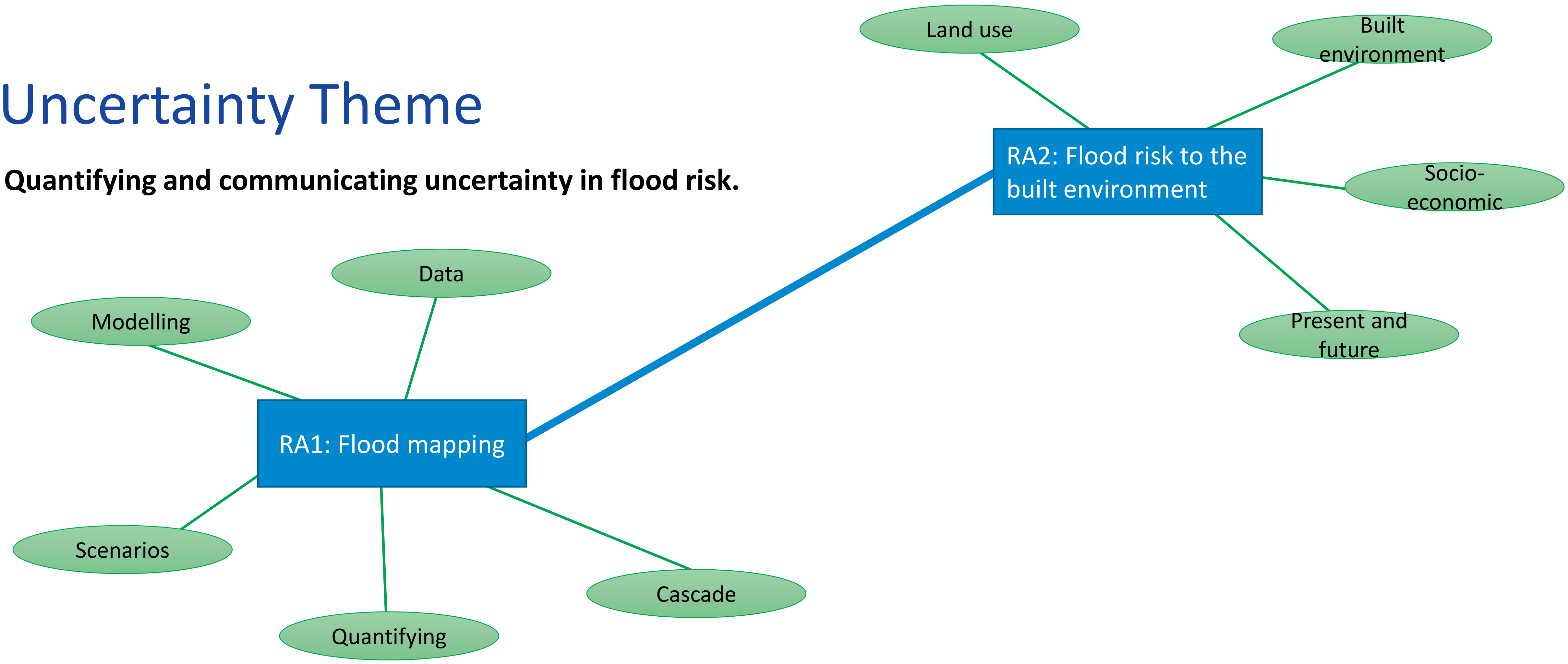
Uncertainty Theme

Quantifying and communicating uncertainty in flood risk.



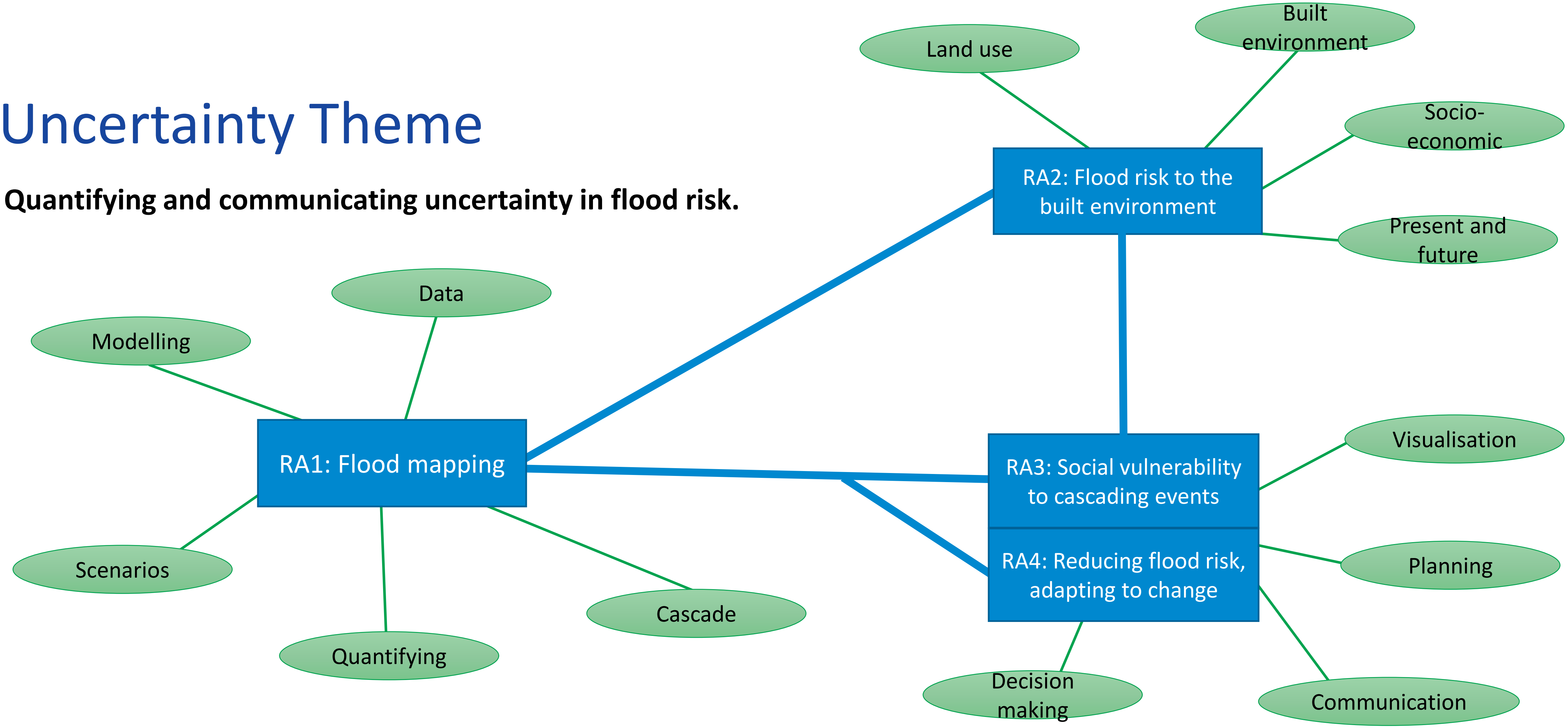
Uncertainty Theme

Quantifying and communicating uncertainty in flood risk.



Uncertainty Theme

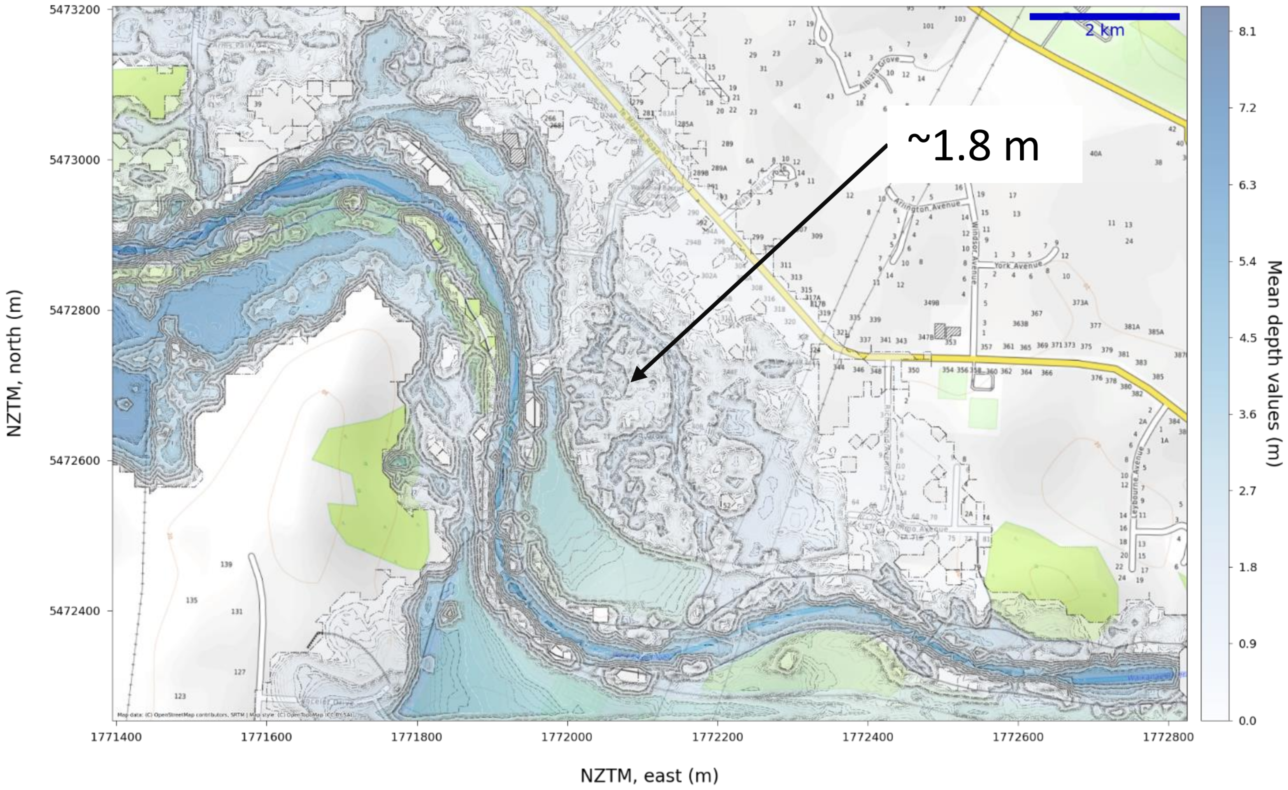
Quantifying and communicating uncertainty in flood risk.



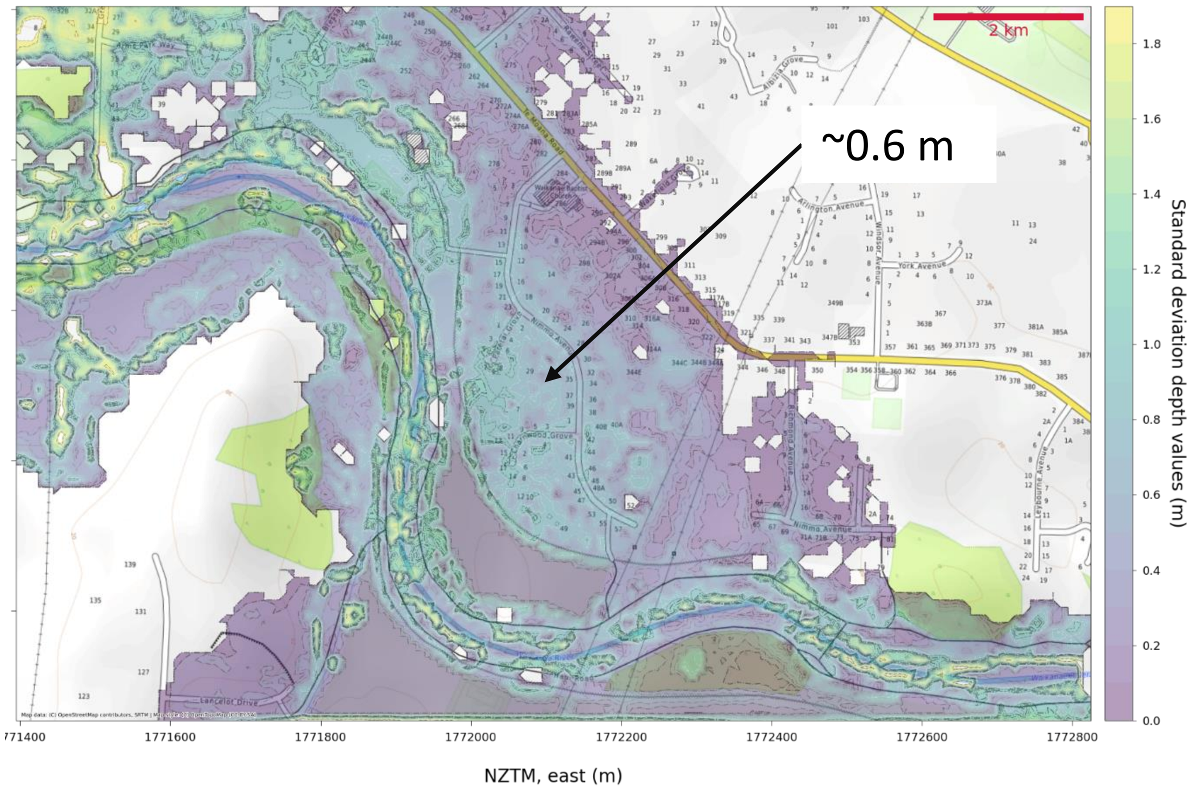
Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

Initial uncertainty assessment, Waikanae River (Martin Nguyen)

Mean predicted depth, after ~600 simulations



Depth standard deviation



Please engage with us about uncertainty

- What should be a priority?
- How does uncertainty in risk assessment affect your decision making?
- Let us know how you use flood risk assessments and what you need to know.
- How should we present uncertainty within risk assessments? What is most useful to you?

- Engage with us via the flooduncertainty Slack channel: https://shorturl.at/mACL3
- Or contact me via email on matthew.wilson@canterbury.ac.nz

Research Area 1 – National flood mapping
Overarching Theme – Uncertainty
Overarching Theme - Mātauranga Māori

Q & A

Break – 5 mins

Research Area 2: Flood Risk to Built-Environments

Research Aim 2 Team Members: Ryan Paulik (NIWA), Alec Wild (NIWA); Liam Wotherspoon, Conrad Zorn (UoA); Kenney Bell, Richard Law (MWLR); Liam Foster, Tom Nikkel (WSP)

Flooding accounts for ~40% of all loss-related natural catastrophes since 1980, with losses worldwide totaling more than US$1tn (Munich Re, 2020).

Between 2015 and 2019, 16 of the 25 weather disasters in Aotearoa were floods, they caused $200M in insurance-claimed damage.

ICNZ: 2020 “the costliest year ever for severe weather events” almost $250M insurance paid

Around 700,000 people and more than 400,000 buildings ($135 billion) are potentially exposed to fluvial-pluvial flooding in Aotearoa.

Climate change is expected to increase fluvial-pluvial flood exposure and impacts in Aotearoa, but this has not been quantified at regional or national scales.

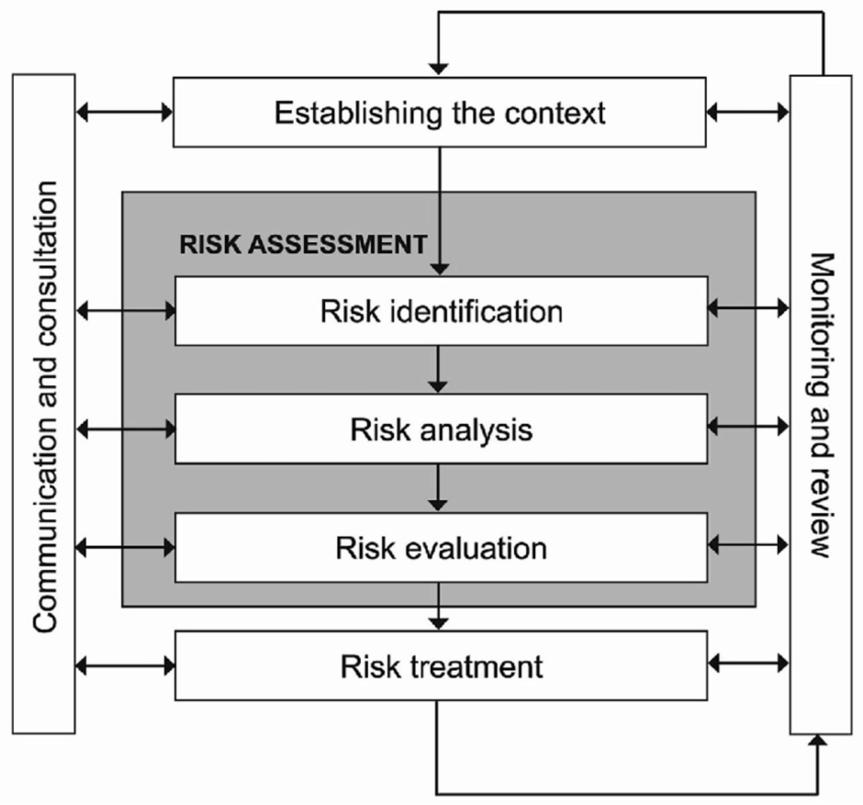
RA2: Flood Risk to the Built-Environment (Oct 2021 – Sept 2025)

CS2.1|2.7 A dynamic flood risk model and tool

CS2.2|2.3 Built-environment flood exposure and vulnerability

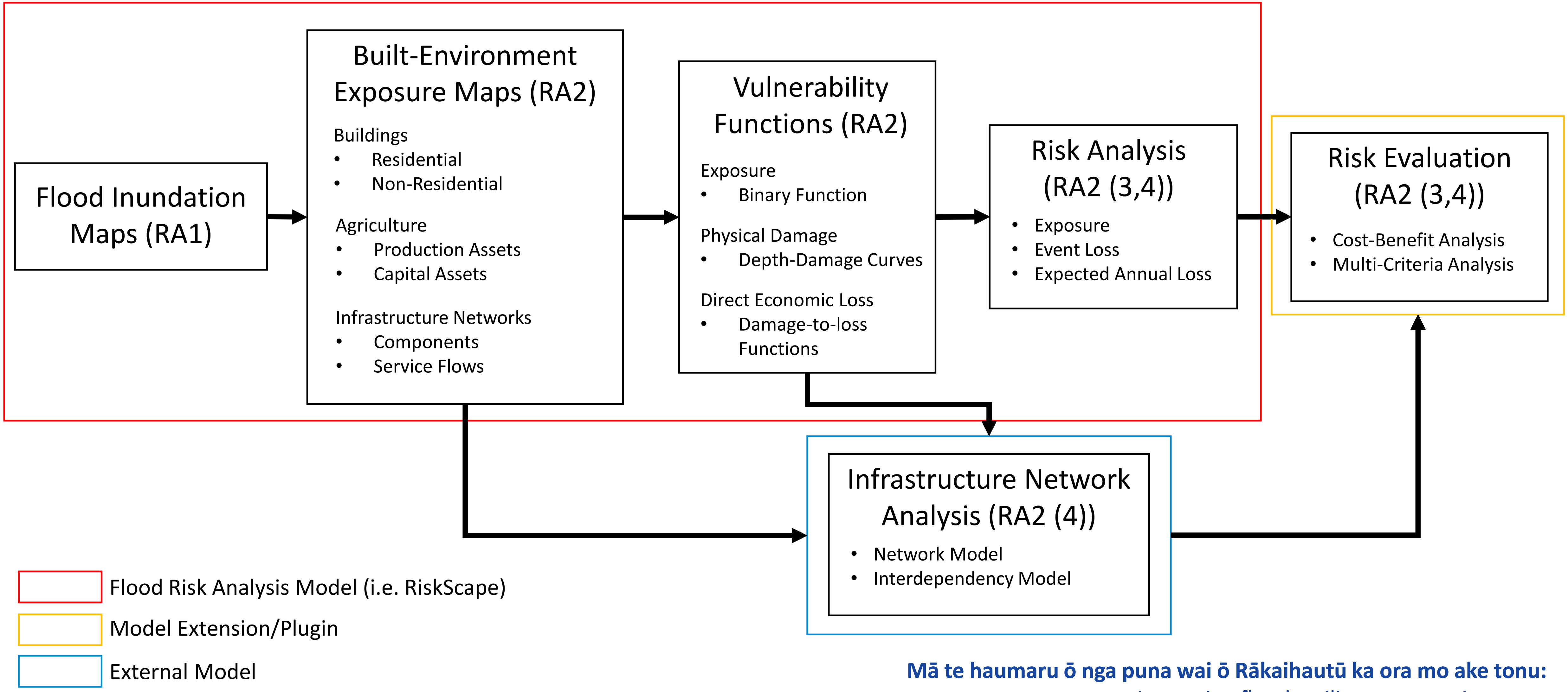
CS2.4|2.6 National flood risk assessment

CS2.5 Uncertainty in built-environment risk



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

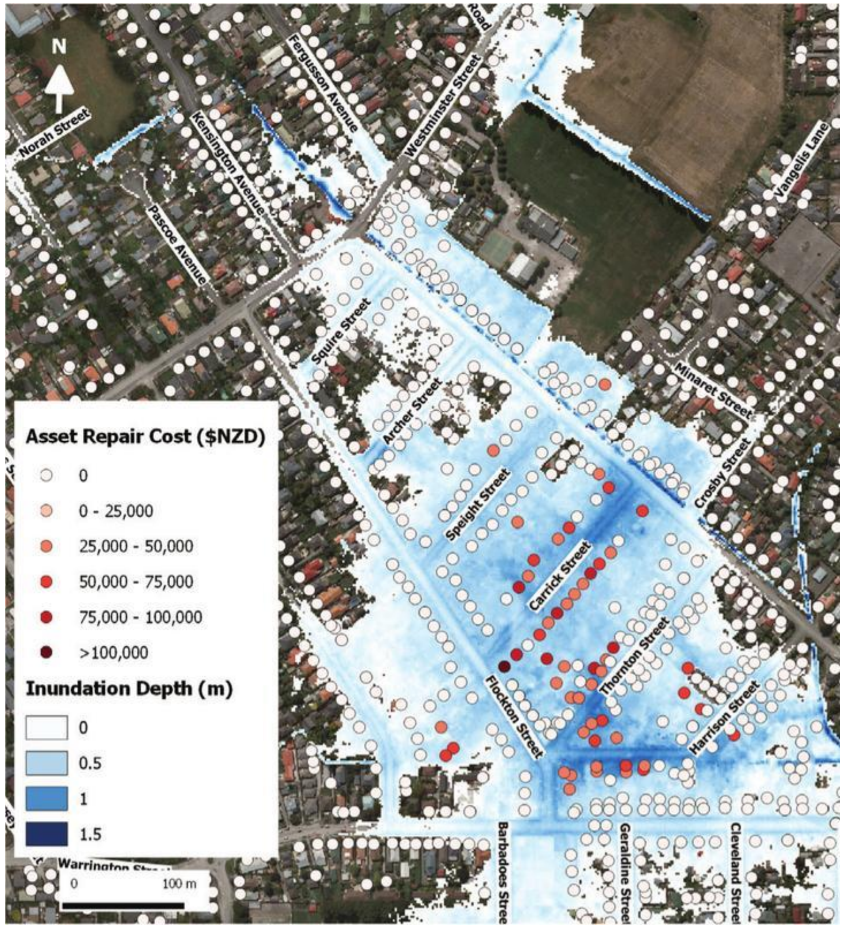
RA2 Implementation Workflow (TBC)



RA2: Flood Risk to the Built-Environment

RA2 Key Features

- Modular and scalable approach.
- Model workflows support analysis of present-day and future flood hazards and exposure.
- Like all models, outputs and their quality are input data dependent so a key focus for a first national risk assessment is direct physical damage and economic loss.



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

Research Area 3

Societal vulnerability and cascading impacts

Paula Blackett (NIWA)

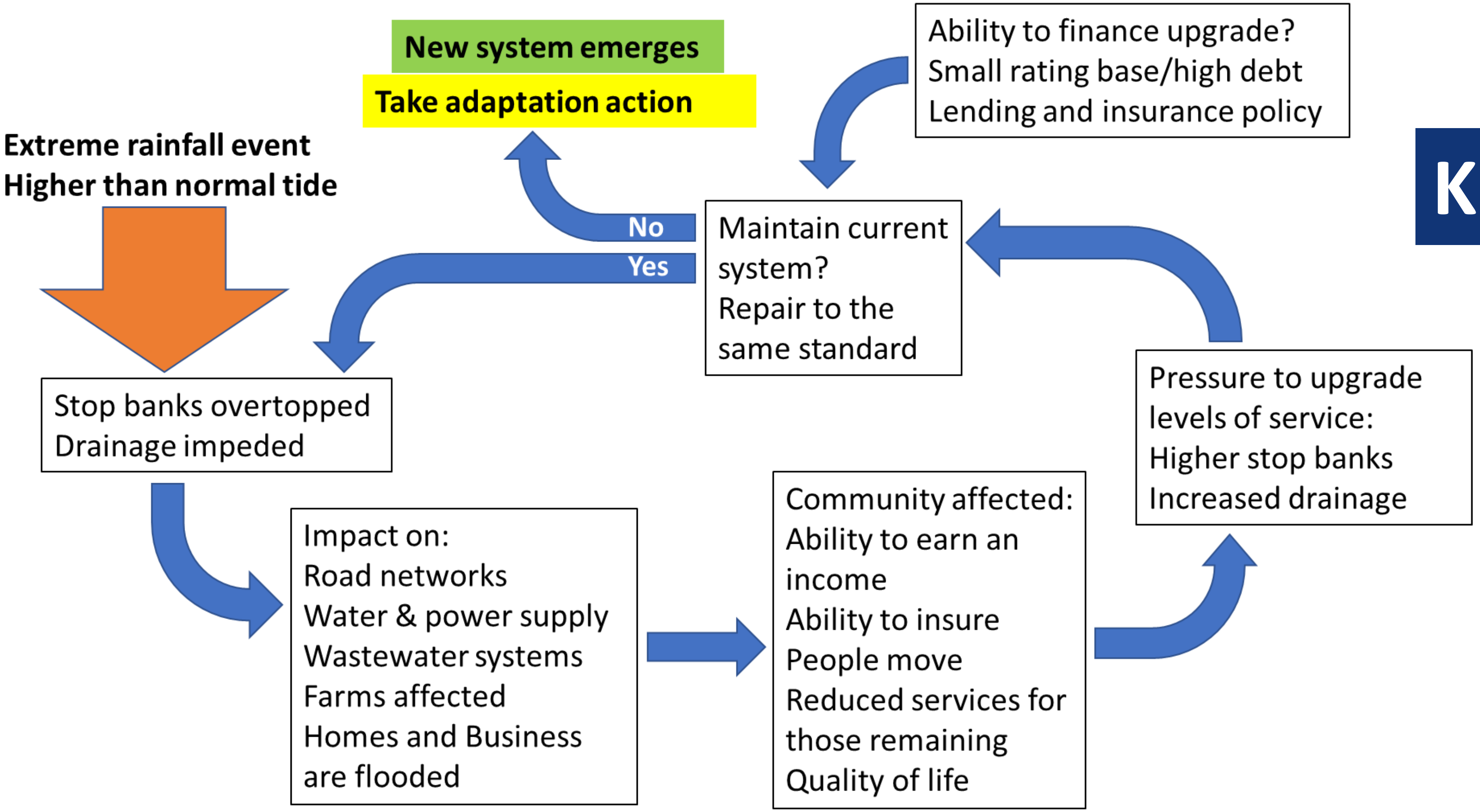
R.A 3: Societal Vulnerability to cascading events

Outcome:

Improved risk assessments and adaptation decisions are made because we understand how flooding effects people and economies over time and within complex settings

Team: Benita Wakefield, Paula Blackett, Paula Holland, Justin Connolly, & Vivienne Ivory.

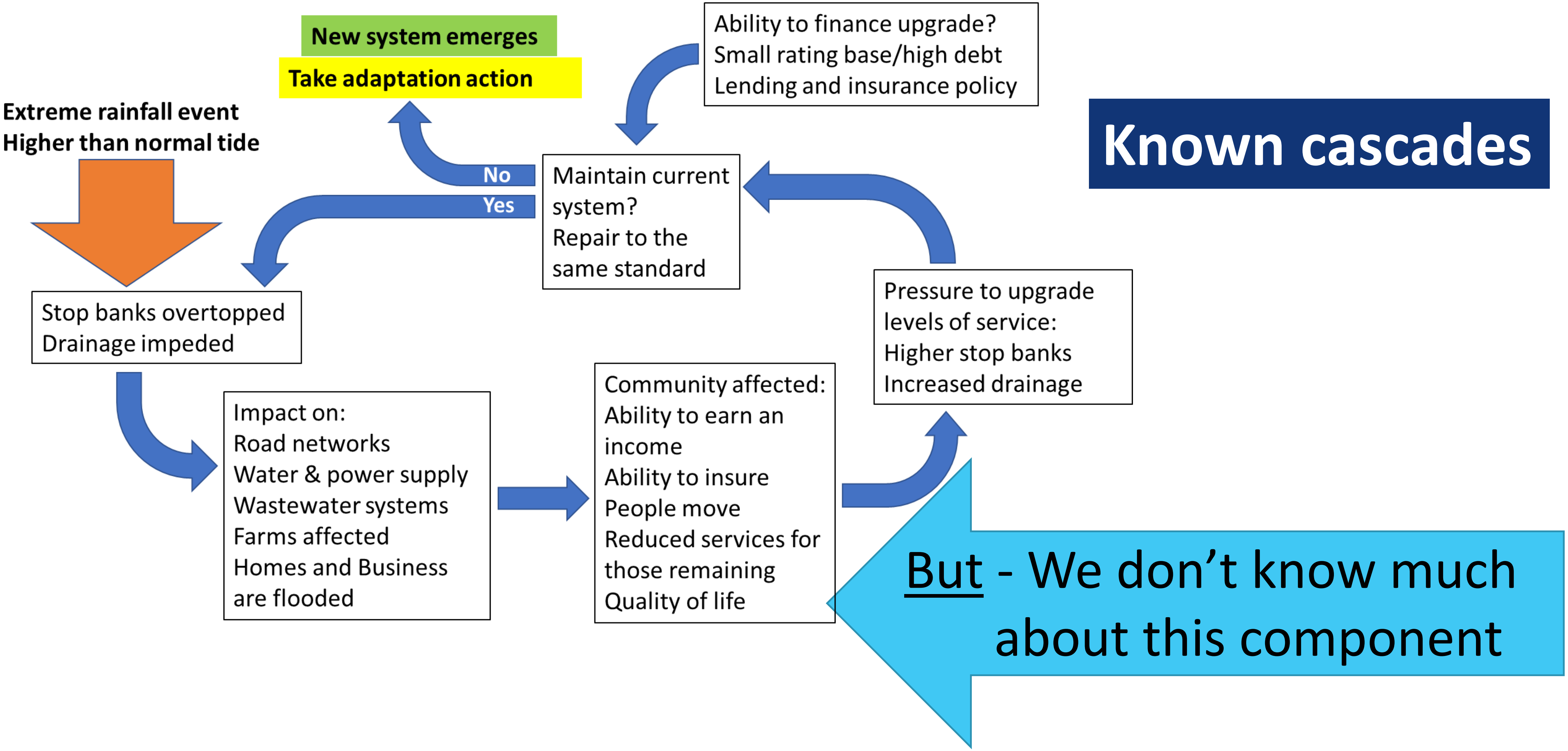
Cascading systems loop – Stop bank breach



Known cascades

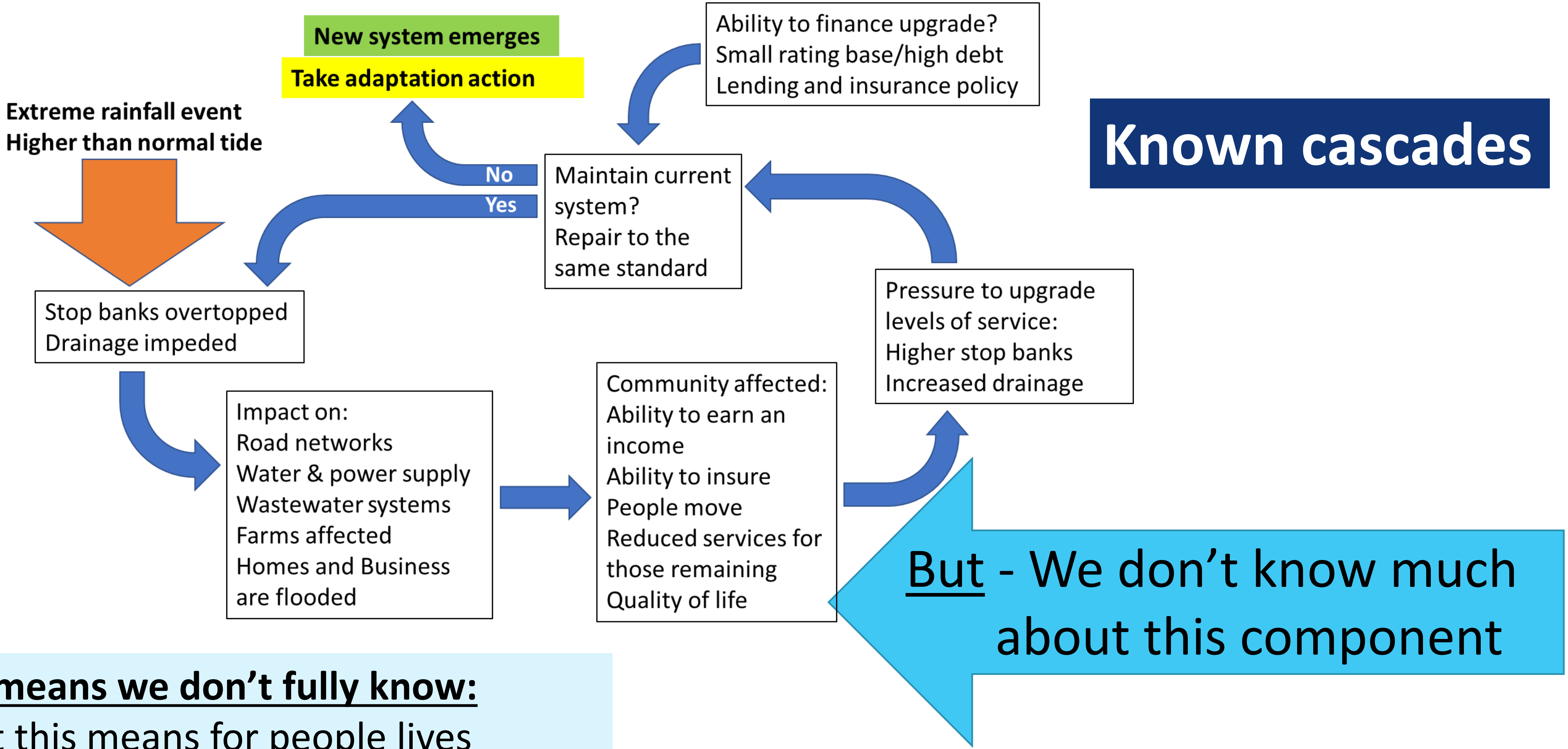
Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

Cascading systems loop – Stop bank breach



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

Cascading systems loop – Stop bank breach



<u>This means we don’t fully know:</u>

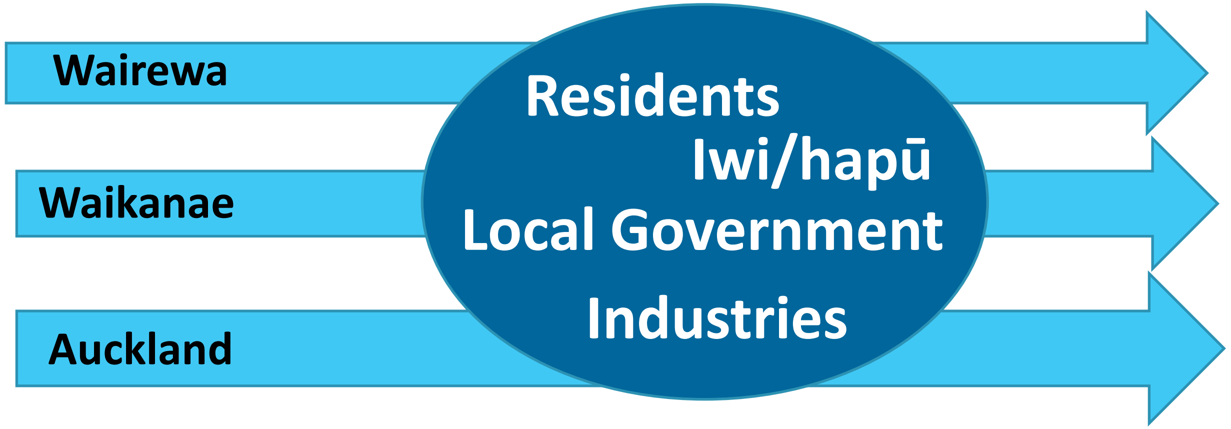
What this means for people lives

The strength of the pressure to upgrade

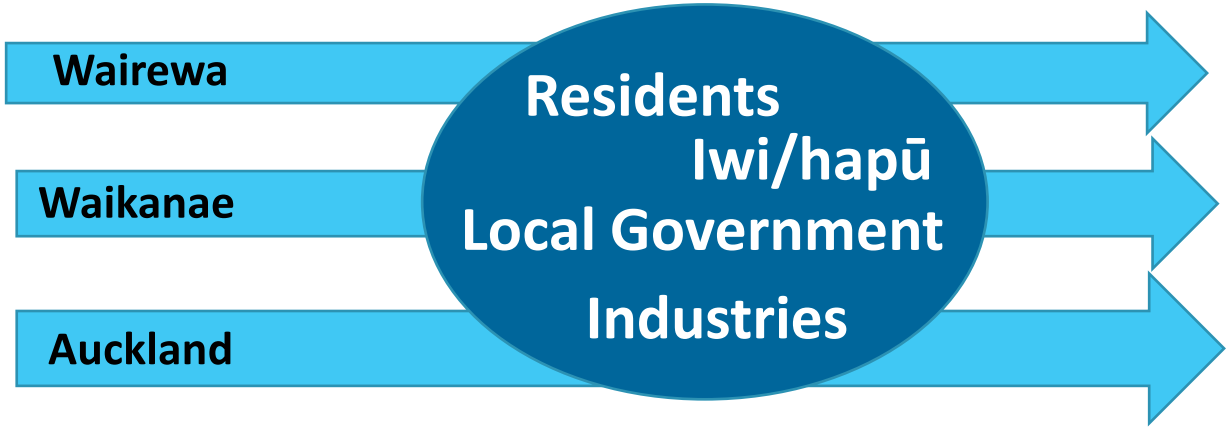
How we might live with floods

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

3 in-depth case studies



3 in-depth case studies



Stories of Impact – from those who have been affected

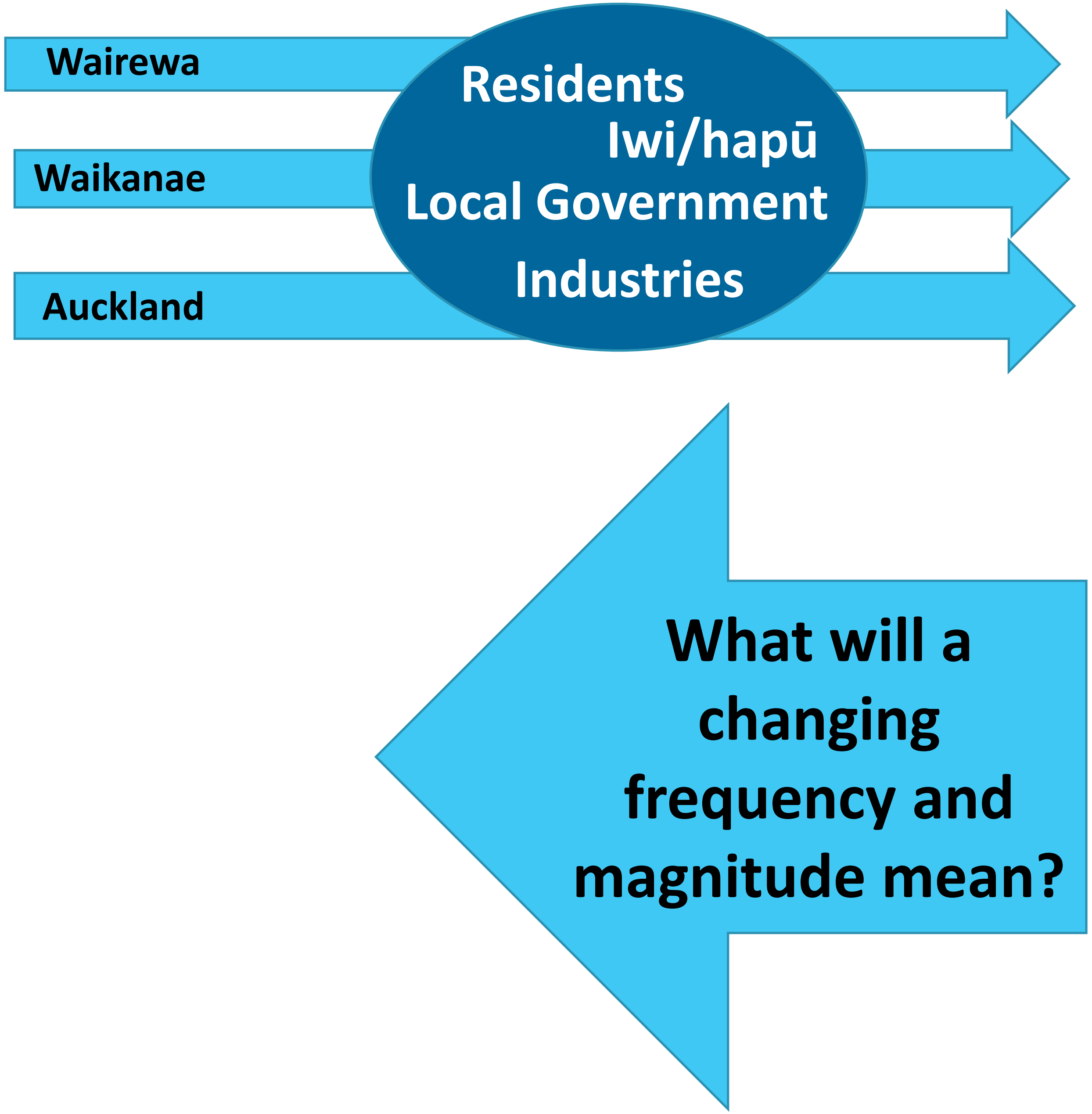
What are the financial, cultural and social impacts and costs of floods?, who experiences these, how? where? and why?

What impacts, risk and cost cascades across sectors regions and nations? how? where? and why?

What stressors exacerbate the impacts, vulnerability and risks and how?

Are there thresholds (or tipping points) with in the system? Where are they? and **who** is affected?

3 in-depth case studies



Stories of Impact – from those who have been affected

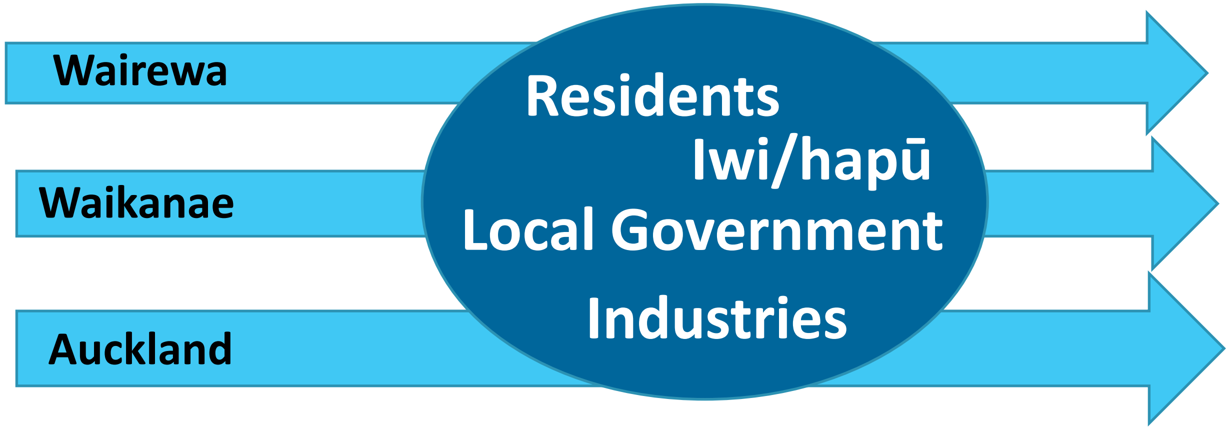
What are the financial, cultural and social impacts and costs of floods?, who experiences these, how? where? and why?

What impacts, risk and cost cascades across sectors regions and nations? how? where? and why?

What stressors exacerbate the impacts, vulnerability and risks and how?

Are there thresholds (or tipping points) with in the system? Where are they? and who is affected?

3 in-depth case studies



Stories of Impact – from those who have been affected

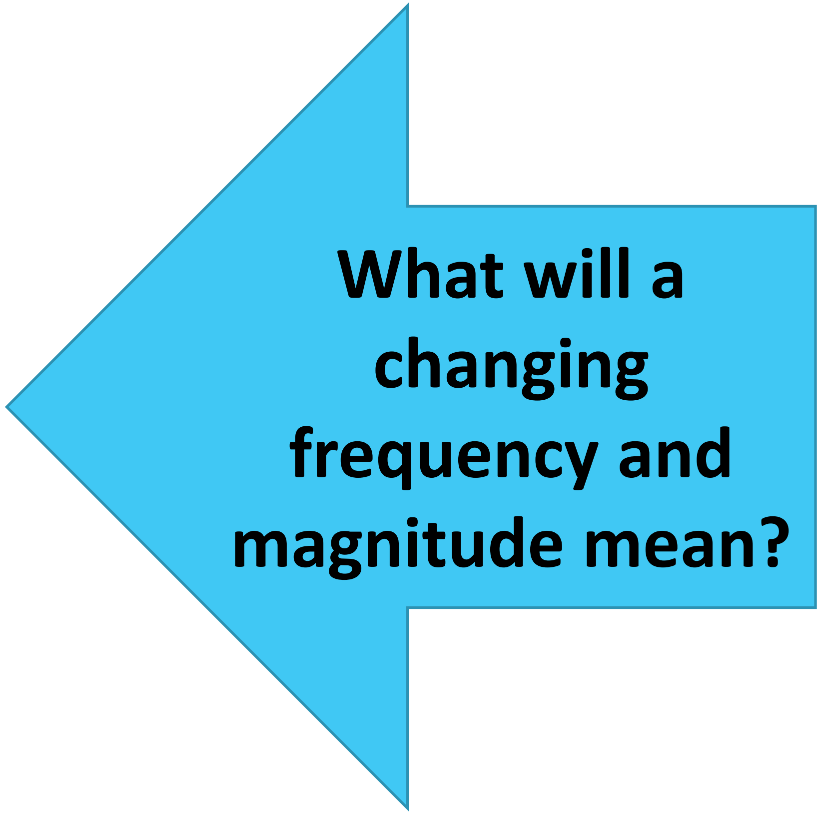
What are the financial, cultural and social impacts and costs of floods?, who experiences these, how? where? and why?

What impacts, risk and cost cascades across sectors regions and nations? how? where? and why?

What stressors exacerbate the impacts, vulnerability and risks and how?

Are there thresholds (or tipping points) with in the system? Where are they? and who is affected?

What does this mean for how societies copes with risk and adaptation?



R.A 3: Year 1 Getting started!

Case studies selected

Methods decided

Ethics provisionally approved

Very early stages of the case studies are underway

Research Area 4

Reducing flood risk and adapting to change

Iain White and Silvia Serrao-Neumann (University of Waikato)

RA4 – Reducing flood risk and adapting to change

WATER NEW ZEALAND FLOODING

Research to increase flood resilience

In late May, parts of Canterbury were heading towards recording their driest year on record. But at the end of the month the drought was suddenly broken by two days of torrential rain. Several rivers burst their banks, extensive areas of farmland were flooded, many people evacuated, and a regional emergency was declared. By Dr Emily Lane, hydrodynamic scientist and programme leader: resilience to hazards, NIWA.

Locations in the Canterbury foothills recorded quantities of rainfall over those 48 hours that are only expected to occur, on average, once every 200 years. However, while this statistic is useful in providing a sense of scale, as the figure from the recent IPCC 6th Assessment Report makes clear, events like these are expected to become much more frequent.

Just two months later, the Canterbury event was eclipsed by severe flooding in Westport and Marlborough. The Buller River reached its highest level since 1926 and Westport was completely cut off by the flood waters. More than 2000 properties were flooded, with over 70 houses red stickered and over 300 yellow stickered.

It was only because of accurate forecasting and prompt action by the regional council and emergency services that people were evacuated in time and worse outcomes largely avoided. Scientists are clear that the likelihood of the flooding seen in Westport has increased significantly as a result of climate change.

While the most recent flooding has predominantly affected the South Island, flooding is a national issue and there are few parts that have been untouched in recent decades. It is our most frequent natural hazard, beaten only by earthquakes in terms of dollar losses.

A year after the 2017 flooding in Edgecumbe, almost 80 homes were still unliveable. Photo by : Dave Allen NIWA

60 www.waternz.org.nz

SEPTEMBER / OCTOBER 2021 WATER NEW ZEALAND 61

https://www.waternz.org.nz/Article?Action=View&Article_id=2083

Prof Iain White

Assoc Prof Silvia Serrao-Neumann

Dr Christina Hanna

Dr Xinyu Fu

Dr Belinda Sleight

Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:

Increasing flood resilience across Aotearoa

The problem context…

- More housing, more density, more urbanized surfaces, more exposure.
- We will have a more enabling environment for development. **So we need good, consistent evidence on hazard/risks, and how climate change will affect this** – but we don't do 'time' or 'uncertainty' well in planning (White and Haughton, 2017).

Proposed Medium Density Residential Standards

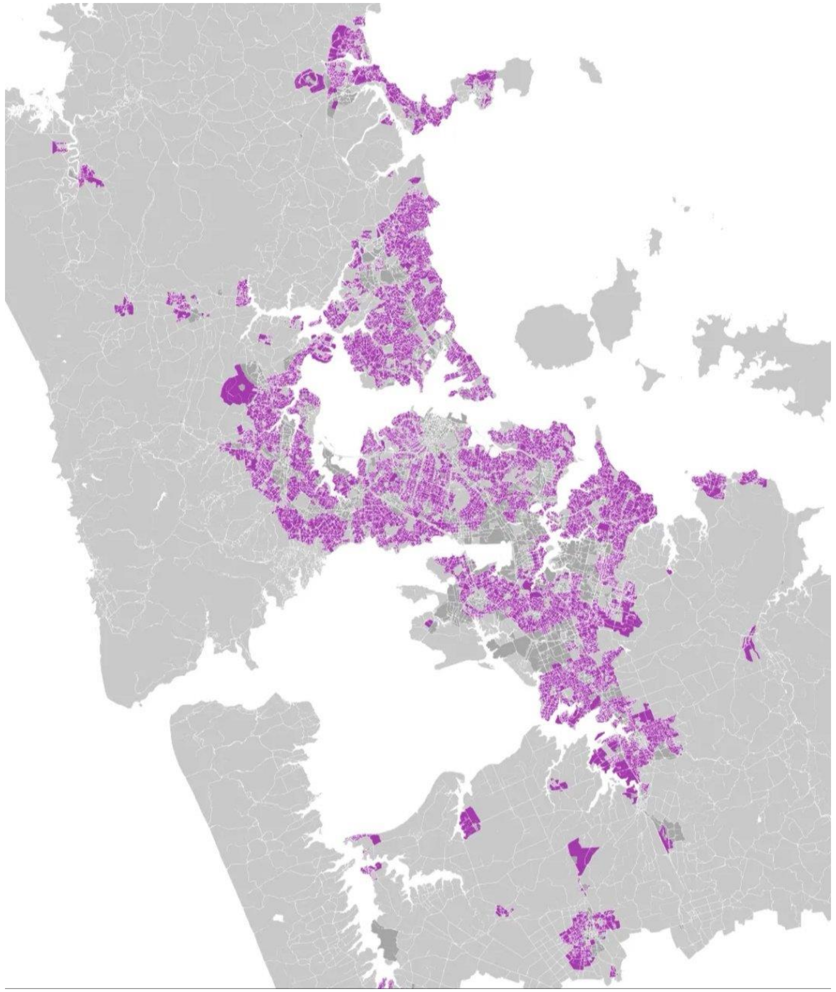
Council RMA plans must permit housing that at least meets the following:

Height	up to	**11m** high + an additional **1m** for a qualifying pitched roof
Height in relation to boundary	up to	**6m** high at site boundary + **60°** recession plane
Setbacks	as close as	**2.5m** of the front yard boundary **1m** of the side yard boundaries **1m** of the rear boundary (except on corner sites)
Building coverage	up to	**50%** coverage of the site area
Impervious surface	up to	**60%** coverage of the site are (ie. 50% building coverage plus 10% for pavement)
Outdoor living space (one per unit)	of at least	**15m²** for houses at ground floor, with a minimum dimension of 3m **8m²** for houses with no ground floor per floor, with a minimum dimension of 1.8m
Outlook space (per unit)	of at least	**3m x 3m** space from a principal living room: From all other habitable rooms: **1m x 1m**

Councils may choose to amend any of the above standards, so they are more enabling (i.e. providing greater heights or smaller outdoor spaces). Alternatively, developers may apply for a resource consent to undertake activities that are not permitted by the standards.

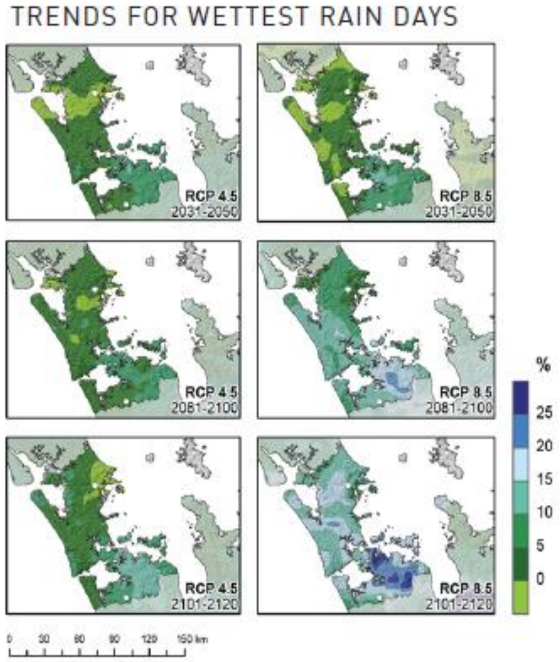
Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

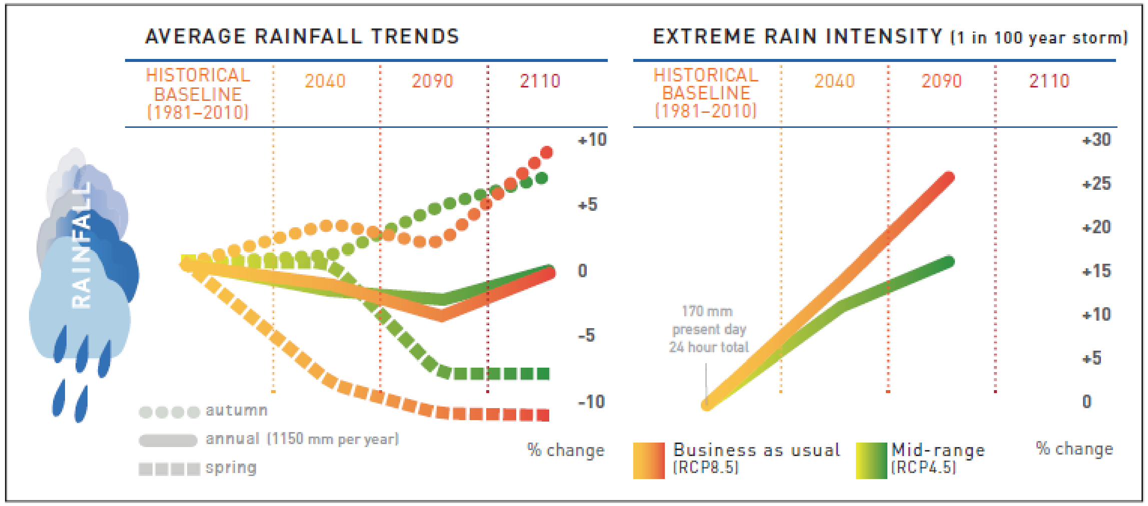
Auckland climate projections/density



https://twitter.com/ScootFoundation/status/1450236882827186181

- In Auckland, rainfall is projected to be about the same level annually but much more extreme (wet/dry) e.g. much more of those short 1 hr bursts.
- The behaviour of that when it hits the ground will change in an uncertain way depending upon market responses to deregulatory triggers.
- But, the 3 Waters reforms announced yesterday will transfer stormwater ownership to a new entity, which *should* have more resources to upgrade pipes and have less local political trade-offs, but we do not know details as yet. It may be an important new partner for us though
- We also need to masterplan to use spaces in-between development to take load off infrastructure as well as provide greenspace.





This can now be upzoned to 3 dwellings x 3 stories as of the new NPS announcement and just 'plug in'. HOW WILL THE MARKET RESPOND? DO YOU PLAN/FUND INFRASTRUCTURE UPGRADES? etc

Need to link future climate change in spatial planning

We cannot consider future flooding and climate change as separate from future urban development. Aotearoa-NZ:

1. has a housing crisis & is experiencing huge development pressures.
2. is shifting toward more dense urban development patterns/forms
3. is changing from RMA planning to a more long-term Spatial Planning.
4. has difficulties in managing flood risk that will continue regardless of map quality

How can we better link climate futures with development futures? And how can we understand which development future will bring the least/most flood risk? How can we link this to policy pathways?

- 'What if – How to' flood scenarios combine **future climate change projections** and **current/future development** aspirations, with **fit-for-purpose policy pathways**.

  ‘What if’ will combine climate change projections with development scenarios (densification and greenfield) to model how catchment behaviour, physical and financial exposure and risk profiles differ in response to which future land use plan is followed (e.g., differing urban densities/urban forms).

  'How to' will combine this with different types of flood mitigation policy options and pathways to understand barriers to change and help make guidance more effective (e.g. institutional culture, political pressure, lack of funding, lack of direction, etc).

How might these new ‘risk signals’ affect the housing market?

- Researchers are confused why **risk signals (like maps) have not affected housing markets in a consistent way**. E.g. prices rise in some of the riskiest places (why does market ‘ignore’ info?)
- Little research has been done on understanding price adjustment in the face of anticipated vulnerability, and what there is is inconclusive. Some observe pricing discounts others find no effect. E.g. Differs by primary v non-primary buyers, and the age/politics of those buying

Who Cares? Future Sea Level Rise and House Prices

Olga Filippova *Senior lecturer, Department of Property, University of Auckland, Auckland, New Zealand; o.filippova@auckland.ac.nz*
Cuong Nguyen *Graduate student, School of Economics and Finance, Victoria University of Wellington, Wellington, New Zealand; cuong.nguyen@vuw.ac.nz*
Ilan Noy *Professor, School of Economics and Finance, Victoria University of Wellington, Wellington, New Zealand; ilan.noy@vuw.ac.nz*
Michael Rehm *Senior lecturer, Department of Property, University of Auckland, Auckland, New Zealand; m.rehm@aukland.ac.nz*

ABSTRACT *Sea level rise is a consequence of climate change. Using evidence from a coastal community, we pose a question: Do people factor in warnings by scientists and governments about sea level rise when making their investment decisions? Using a difference-in-differences framework, we examine if disclosure of future risks affects coastal property prices. New Zealand's Kapiti Coast published detailed projections of coastal erosion in 2012 and was forced to remove them by the courts in 2014. Results indicate posting of this information had an insignificant impact on prices, suggesting people do not factor in long-term risks of sea level rise, as future risks are not capitalized in prices.* (JEL Q54, R38)

Carpe diem quam minimum credula postero.

—Horace's *Odes* (Seize the day, put very little trust in the future.)

1. Introduction

Globally, the single most observable, predictable, and certain, impact of climate change is sea level rise (SLR). “Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 ...

Global mean sea level rise will continue during the 21st century, very likely at a faster rate than observed from 1971 to 2010. For the period 2081–2100 relative to 1986–2005, the rise will likely be in the ranges of 0.26 to 0.55 m for RCP2.6 [best likely case scenario], and of 0.45 to 0.82 m for RCP8.5 [worst likely case scenario]. . . . Sea level rise will not be uniform across regions. . . . About 70% of the coastlines worldwide are projected to experience a sea level change within ±20% of the global mean. (IPCC 2014, SPM p. 13).

Using a case study, we pose a simple question: Do people factor in the warnings provided by scientists and governments about the risk of SLR when making their investment decisions? We examine the single most important financial decision that most people make—purchasing a home—to see whether prices of coastal properties change when more/less information becomes available about the property-specific consequences of future SLR.

In order to identify an empirical answer to this question, we use a unique case study from one local council in New Zealand: the Kapiti Coast District Council. In this case ...

OPEN ACCESS Check for updates

Sea Level Rise, Homeownership, and Residential Real Estate Markets in South Florida

Xinyu Fu
University of Waikato

Jan Nijman
Georgia State University

This article builds on a small but rapidly growing body of research that seeks to determine the impact of sea level rise on the pricing of residential properties. Through a spatial hedonic regression analysis of real estate markets in two Florida counties (Miami–Dade and Pinellas), we assess the influence of different exposure levels on market discounts. Our article stands out in terms of its focus on two comparative case studies and its differentiation between properties that are primary homes versus nonprimary homes. We find that generally discounts are positively associated with exposure levels and overall Miami–Dade experiences higher discounts than Pinellas due to the former's lower average elevations. We also observe different market behaviors of primary versus nonprimary home buyers and these are partially dependent on affluence. In Miami–Dade, price discounts are less for highly priced properties purchased by nonprimary owners. We attribute this to different buying motives and risk tolerance of affluent nonprimary homeowners. We argue that nonprimary ownership, particularly in high-end waterfront residential real estate, is tempering gradual market adaptation to sea level rise exposure risk, which could have detrimental longer-term consequences in terms of market volatility. **Key words: Florida, homeownership, real estate, risk, sea level rise.**

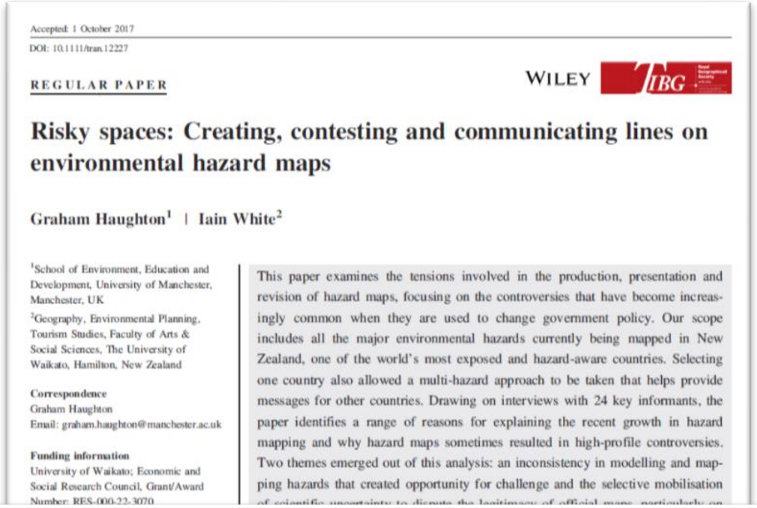
There is no doubt that sea level rise (SLR) is real and accelerating. In many locations along the U.S. coastline, high-tide flooding in 2019 was three to nine times more common than fifty years earlier (Lindsey 2019). Most projections indicate a 2–6 ft rise (0.6–1.8 m) by 2100 (Intergovernmental Panel on Climate Change 2013; Lindsey 2019). According to recent estimates, by 2050 some 340 million people worldwide could find themselves on land below projected annual flood levels, and by the end of the century the number could reach 630 million (Kulp and Strauss 2019).

... of *whether* but *when* and *how* exposed real estate markets will respond.

Clearly, the more benign scenario is one of gradual responses that distribute costs over time and across markets. However, it is unlikely that market responses run neatly parallel to (or in measured anticipation of) incremental SLR trends because of inherent volatilities of mass market behavior; for example, in reaction to extreme weather events such as hurricanes or sudden changes in the institutional environment related to mortgages or home insurance. There is, in fact, evidence of major price ...

How can we understand market responses to inform policy?

From 2012… Thousands of Hamilton residents responded angrily after **receiving letters** warning their homes are at risk of flooding… An internal council email said the letters were **deliberately vague** to prevent widespread panic. But the strategy backfired, with **residents criticising the way the council** released the information. [a resident said] adding flood risk to a LIM report was unreasonable and **would impact on property value and insurance costs**. **All this is doing is protecting themselves … it is devaluing our house**.” Are you willing to put your hand in your pocket and pay for any losses you have incurred by this debacle…It is one thing to identify the risk, but **you must be 100 % correct before you start playing with people's livelihoods**.


Accepted: 1 October 2017
DOI: 10.1111/tran.12227

REGULAR PAPER

WILEY

Risky spaces: Creating, contesting and communicating lines on environmental hazard maps

Graham Haughton[1] | Iain White[2]

[1]School of Environment, Education and Development, University of Manchester, Manchester, UK

[2]Geography, Environmental Planning, Tourism Studies, Faculty of Arts & Social Sciences, The University of Waikato, Hamilton, New Zealand

Correspondence
Graham Haughton
Email: graham.haughton@manchester.ac.uk

Funding information
University of Waikato; Economic and Social Research Council, Grant/Award Number: RES-000-22-3070

This paper examines the tensions involved in the production, presentation and revision of hazard maps, focusing on the controversies that have become increasingly common when they are used to change government policy. Our scope includes all the major environmental hazards currently being mapped in New Zealand, one of the world's most exposed and hazard-aware countries. Selecting one country also allowed a multi-hazard approach to be taken that helps provide messages for other countries. Drawing on interviews with 24 key informants, the paper identifies a range of reasons for explaining the recent growth in hazard mapping and why hazard maps sometimes resulted in high-profile controversies. Two themes emerged out of this analysis: an inconsistency in modelling and mapping hazards that created opportunity for challenge and the selective mobilisation

Stuff Home | Waikato Times | News
Weather | Hamilton's 150th | Snapper Review

Flood of fear and confusion

DANIEL ADAMS AND JONATHAN CARSON

Last updated 05:00 27/04/2012

0 | G+1 | Share

PETER DRURY/ WAIKATO TIMES

RISK ZONE: Concerned Hamilton residents peruse flood maps at the first of the council's natural hazard open days.

Need to better understand how new risk signals will affect housing and land markets

Flood risk is rising due to climate change. There are significant implications for the real estate market because:

- 60% of local government tax income is from property tax (LGNZ)
- Over time, adaptation costs will increase and property tax income decrease (when the market prices the increasing risk of flooding)
- Exposed homes due to SLR are sold at prices 7% lower than the similar unexposed ones in the US
- No noticeable price effect of sea-level rise in case studies in Melbourne, Australia and a small part of the Kapiti Coast New Zealand

We know little about whether, and to what extent, the NZ market pricing will respond to the climate change risk.

How NZ markets price the long-run risks of climate change?

Build models using property sales transaction data, bank lending data, and/or insurance premiums to empirically unveil market signals and trends with respect to climate change

What are the plausible reasons for the market (non)responses?

Conduct surveys with property owners, government officials, bankers, insurance companies, etc. to understand risk perceptions from a variety of stakeholders and to provide contextual reasoning for market (non)responses.

What are the planning/policy insights and implications for governments? How can we use this knowledge to make the market work FOR us in lowering risk?

Need to make sure it is useful and useable

Aotearoa-New Zealand currently has a **fragmented risk governance system** across and between the levels of government.

There is a lack of a clear national directive, long-term planning and information gaps affecting local flood risk management. There is a need to ensure that the findings of the project inform national and local decision making.

- Bringing together the tools and findings of RA1-RA4, we will be working collaboratively with key project partners to inform policy guidance for how the flood risk information should be used for decision-making purposes within flood policy, planning and local community engagement processes. E.g.

- What are the agreed defintions of risk, or understandings of intolerability?
- How can we link the maps into the changed RMA system?
- How can we make sure that the maps we produce become THE maps beyond the lifetime of the project?

Research Area 2 – Flood risk to the built environment

Research Area 3 – Societal vulnerability and cascading impacts

Research Area 4 – Reducing flood risk and adapting to change

Q & A

How to get involved

Te Whāriki ō te Wai – a boundary organisation for improved resilience to flooding

Silvia Serrao-Neumann (University of Waikato)

What is a boundary organisation?

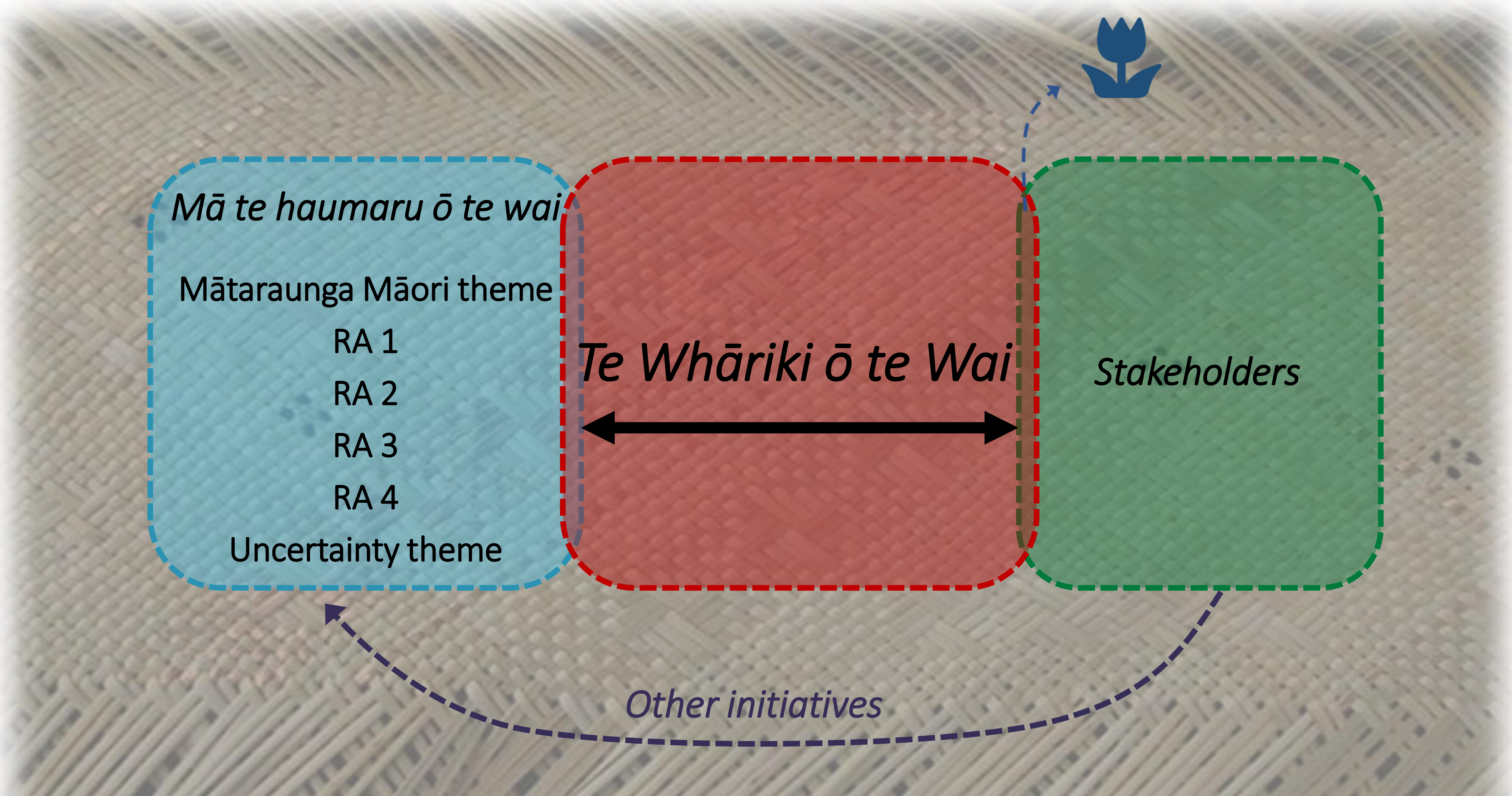
Objective: to create and use boundary objects at the science-policy interface to solve complex societal problems (Guston 2001):

- providing incentives and opportunities for the usability of boundary objects,
- engaging multiple actors from the scientific and professional realms, and
- narrowing the science-policy gap.

In our project, the boundary object is: **improved flooding resilience in Aotearoa**. It will provide the main platform to co-produce and co-disseminate information.

Boundary Organisations establish collaborative arrangements and outputs at the science and policy interface to generate credible and legitimate information and outcomes

Te Whāriki ō te Wai



The woven mat that brings the many strands of the collective together

Science-Practice Roadshows

The operationalisation of *Te Whāriki ō te Wai*

- Forum for discussion between research partners (e.g. scientists, government agencies, iwi) at key times based on timelines established by CS in RAs (e.g. twice a year)
- Interactive workshops (relating to outputs from science partners)
- Validation and testing of research outputs from RA 1, 2, 3, 4 and uncertainty theme for maximum credibility and legitimacy and uptake (research/ societal impact)
- Collection of new ideas for future joint initiatives, including longevity of *Te Whāriki ō te Wai* post project life

Possible structure

- Two-day events (potential online delivery due to Covid-19)
- Presentations to research partners to inform what is being done and gather their feedback + other practice gaps needing attention
- Interactive workshops to discuss how research outputs can be applied in practice, inform decisions
- Mini research conferences also open to stakeholders not directly involved with the *Te Whāriki ō te Wai* to maximise dissemination of research outputs

Testing the usability and usefulness of information/project outputs

Primarily through Science-Practice Road Shows

Part of co-design, co-production and co-dissemination of knowledge/ information process

- The usability of research outputs for planning for reducing flood risk and adapt to change
- The enablers to the application of research outputs based on their format and readiness for use
- Future opportunities for using research outputs (how practitioners foresee any future application of outputs, especially relating to known plan/policy review cycles)
- Context (individual, organisational and/or institutional/political) in which practitioners operated that can influence the use of outputs
- Project’s contribution to improving/ supporting practice
- Support for existing and future collaboration between project partners or other organisations

Long term

- This Endeavour will set up the framework for continued flood hazard and risk assessments, methodologies for community engagement and a platform for flood issues, Te Whāriki ō te Wai
- This is an iterative process – it won't be finished at the end of the Endeavour, we are focused on continual improvement
- NCCRA requires re-evaluation every 6 years
- Envisage updating flood hazard and risk on a similar timeframe (additional LiDAR, infrastructure data, improved methodology, climate change etc.)
- Will be looking to partnerships to fund this ongoing work

Thanks for attending this Roadshow

Contacts

Email: emily.lane@niwa.co.nz
Email: belinda.sleight@waikato.ac.nz
Website: niwa.co.nz/flood-resilience