

# Earth Sciences New Zealand

On July 1, 2025 **NIWA** and **GNS Science** merged to become a new Public Research Organisation called **Earth Sciences New Zealand**





# Flooding in the Motueka

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# A history of flooding in the Motueka

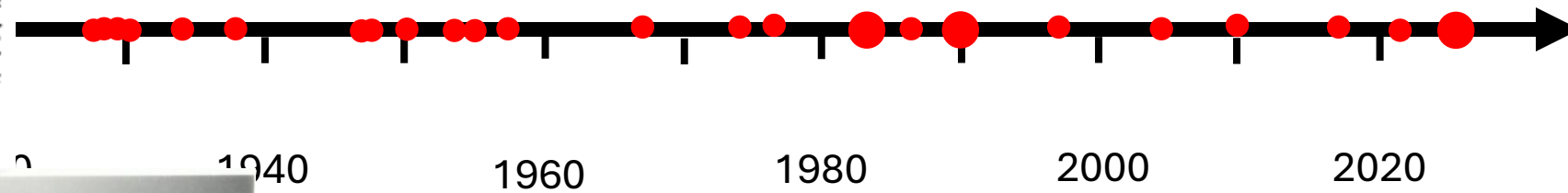
19-20 JUNE 1929

A strong gale, bringing with it torrential rain, swept the Motueka and Takaka districts. The Motueka River was in heavy flood, water reaching the northern end of High Street, Motueka. Lower Moutere was also flooded, and at Takaka 4 ft. of water invaded some shops.

6-7 JULY 1929

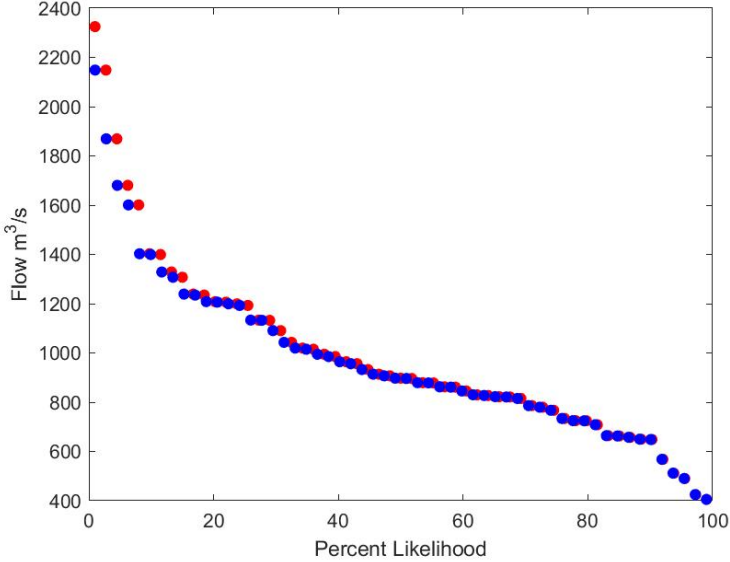
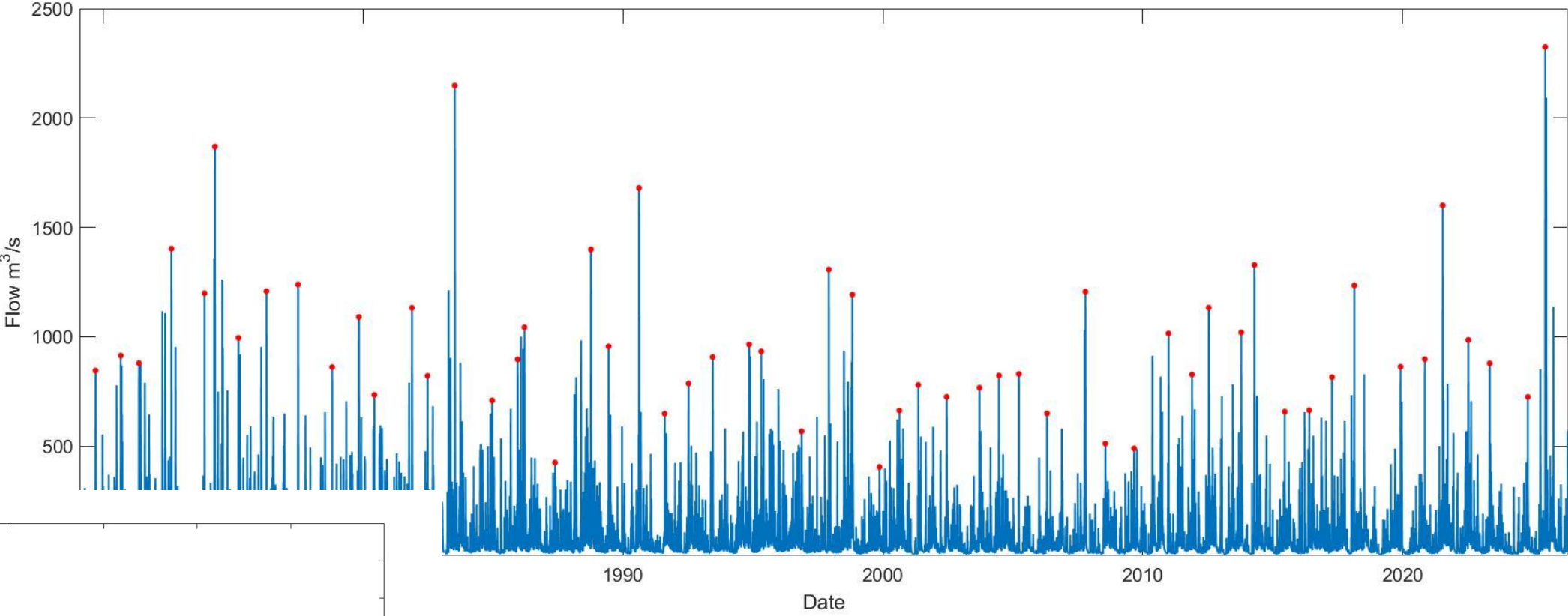
Heavy rain in the Motueka brought high floods, and so to abandon their homes in and Waingaro Rivers overflowed caused extensive inundation were blocked by slips.

13-14 JULY 1929

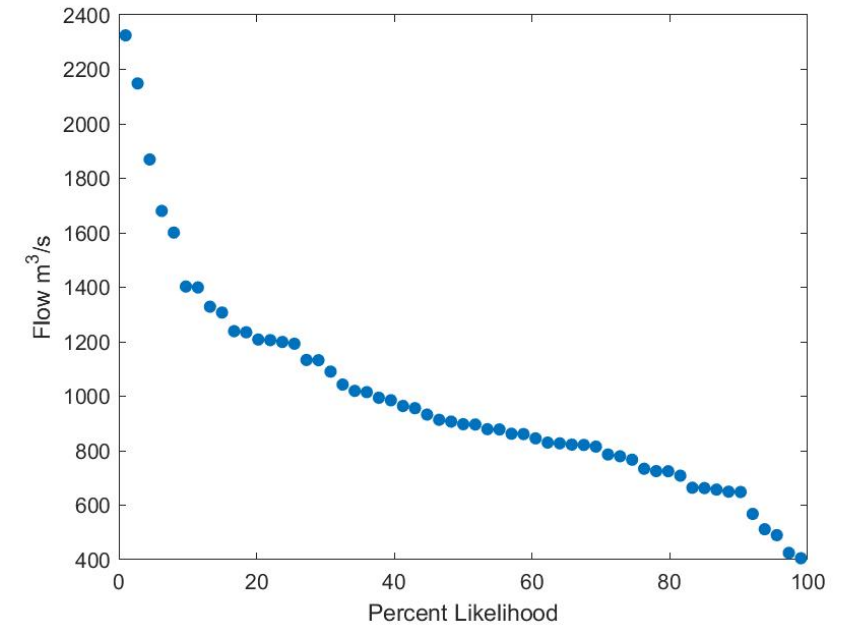


more water than the supply level 1930

# How big is big?



# What's the chances?



# Climate Change

- Rainfall intensity will increase across NZ
- **Shorter duration, more localized events are expected to increase the most**
- The more the warming, the larger the increase
- Uncertainty around ex-tropical cyclone numbers, but increasing intensity

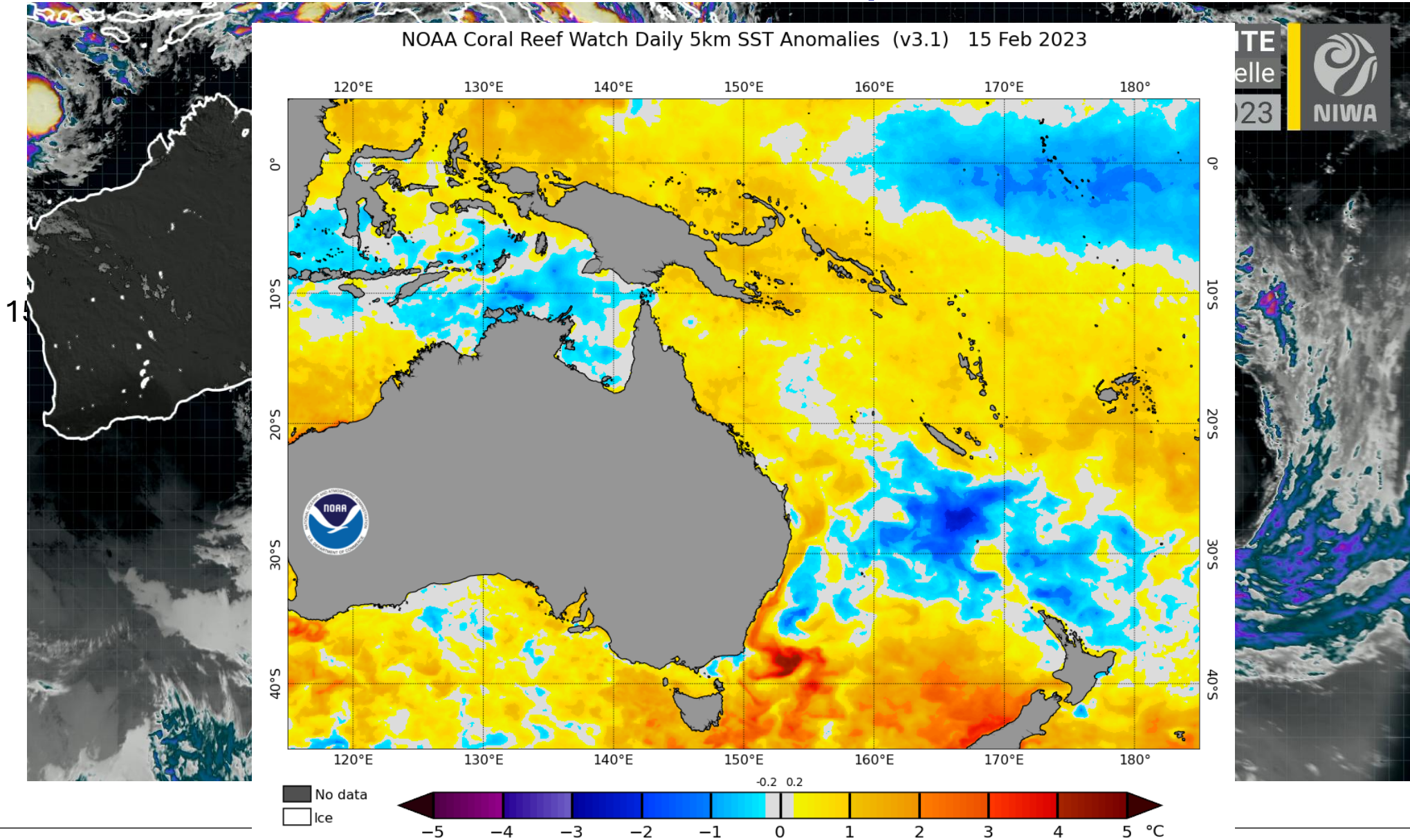


Auckland January 2023



Photo: Bibi Hawkes - Wellington Alive/Supplied

# Sea Surface Temperatures



# Climate Change

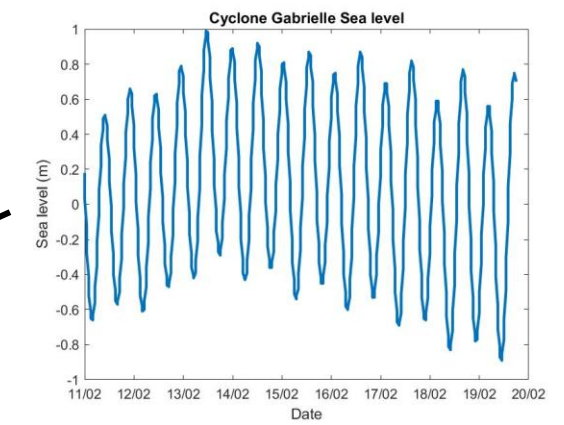
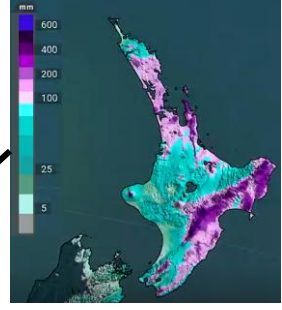
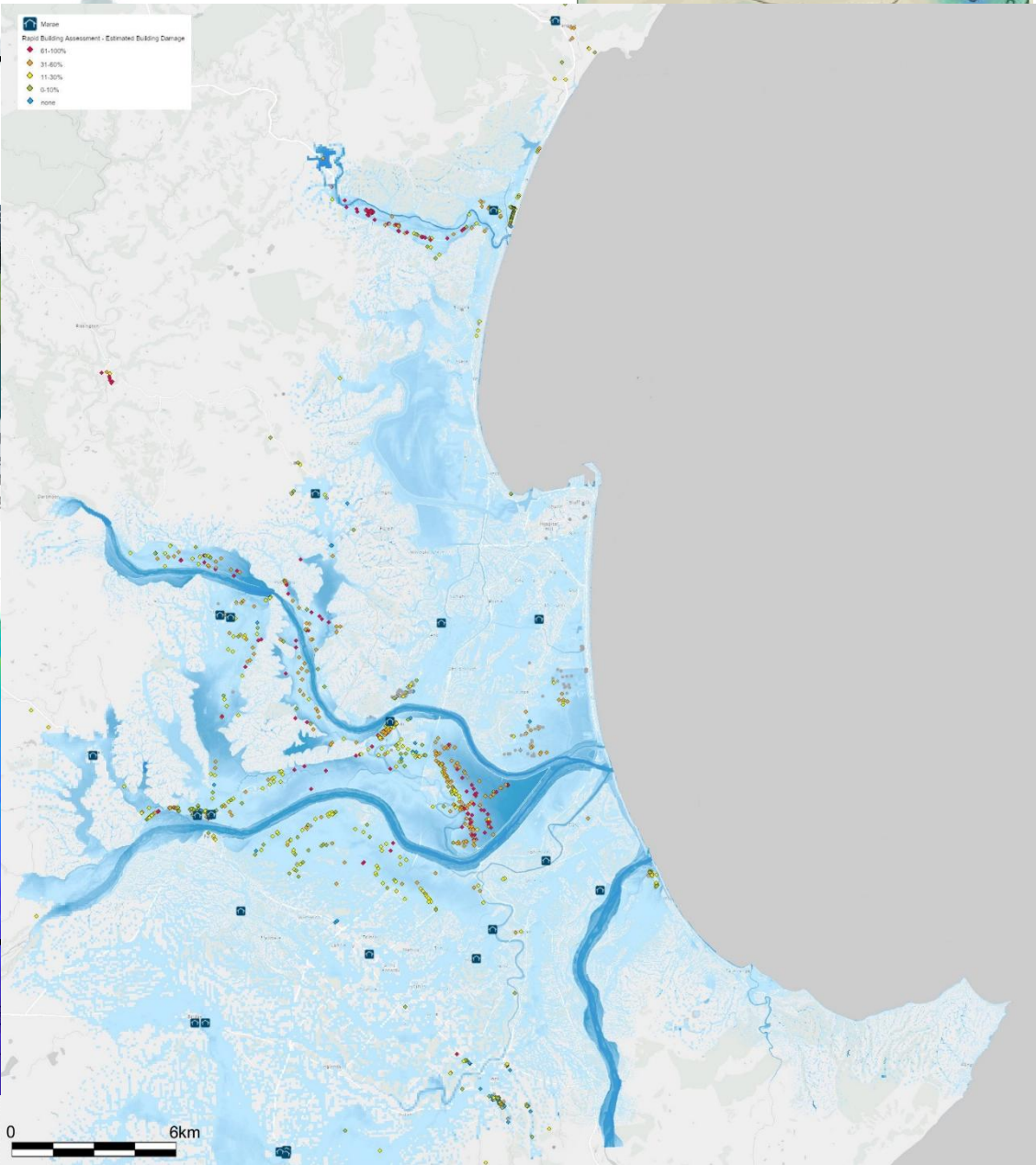
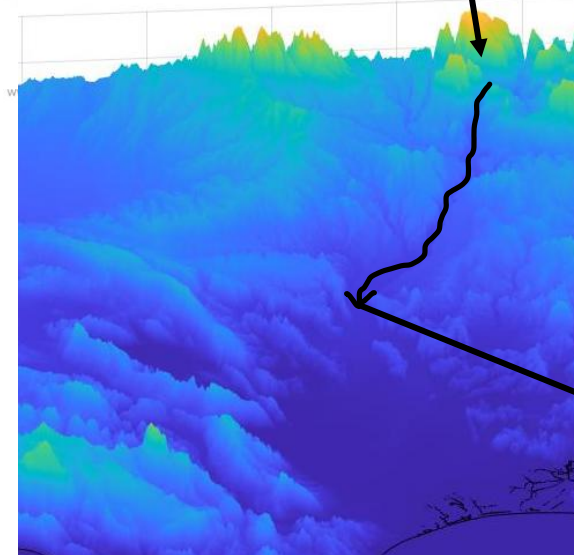
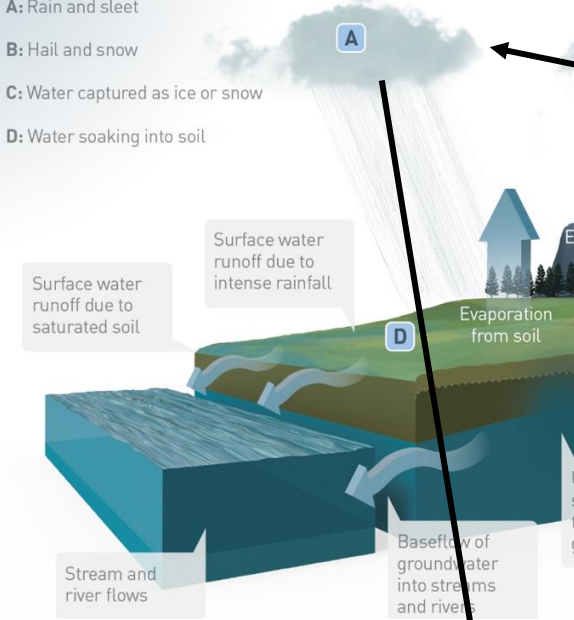
- Rainfall intensity will increase across NZ
- **Shorter duration, more localized events are expected to increase the most**
- The more the warming, the larger the increase
- Uncertainty whether there will be more ex-tropical cyclones, but they will increase in intensity.
- Marine Heat Waves (higher than normal ocean temperatures) feed ex-tropical cyclones when they come further south



# Flood Modelling – Cyclone Gabrielle

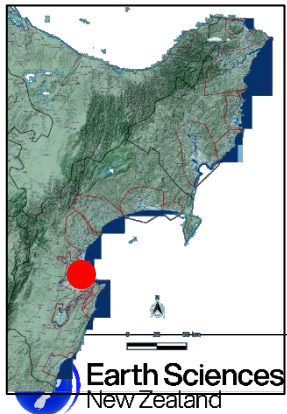
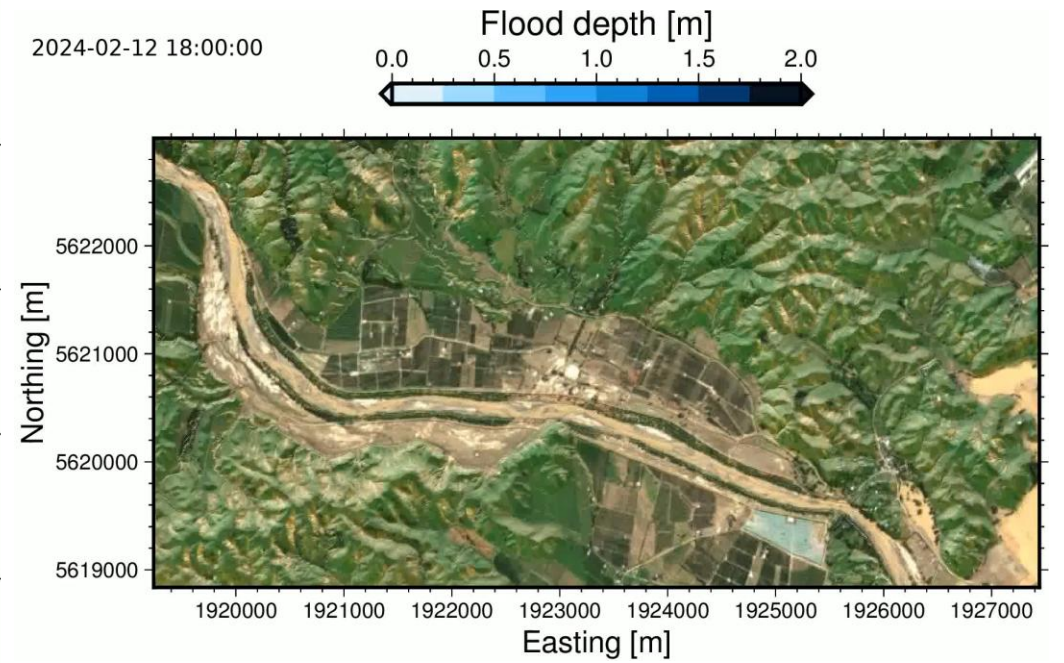
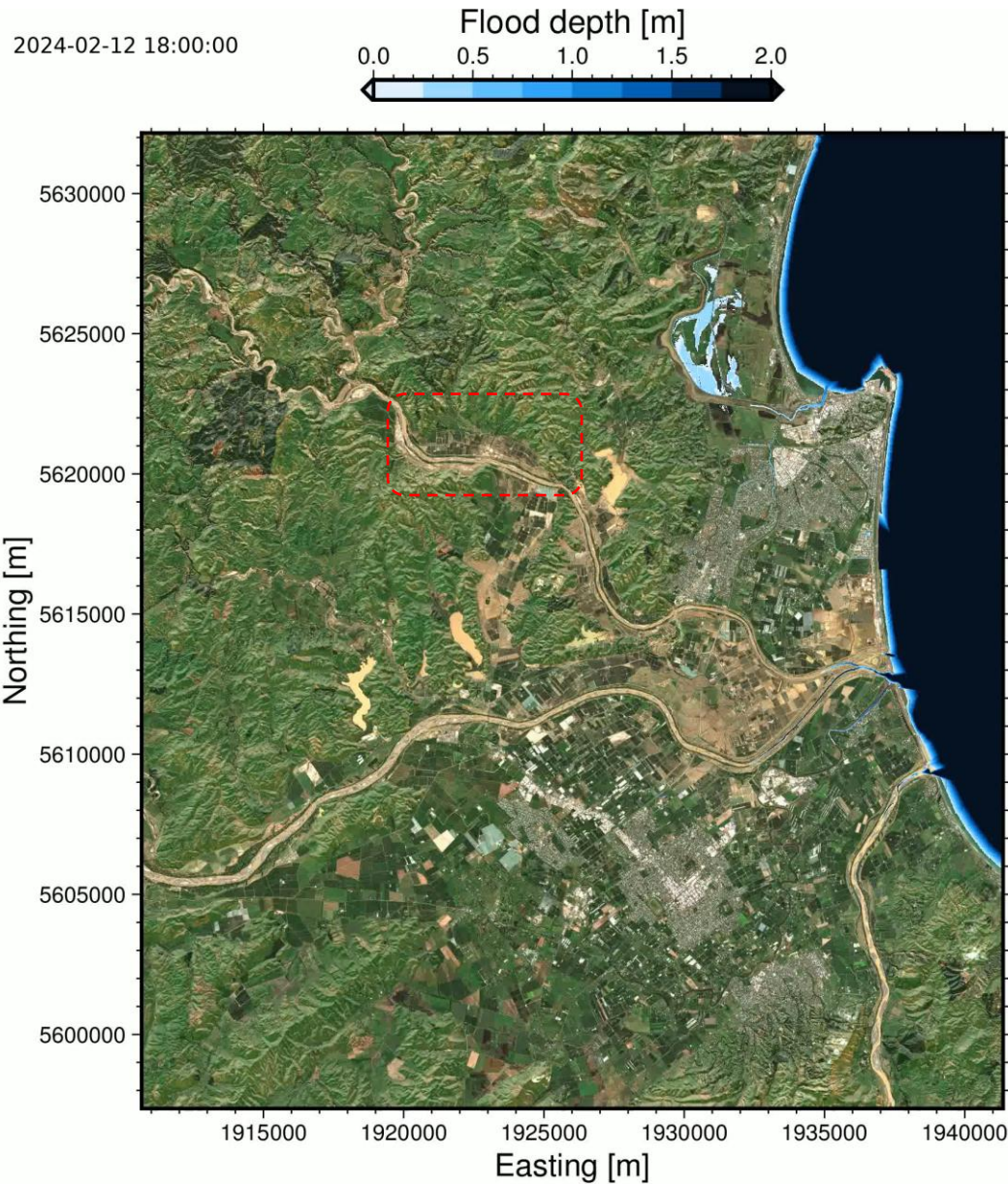
## Precipitation:

- A: Rain and sleet
- B: Hail and snow
- C: Water captured as ice or snow
- D: Water soaking into soil

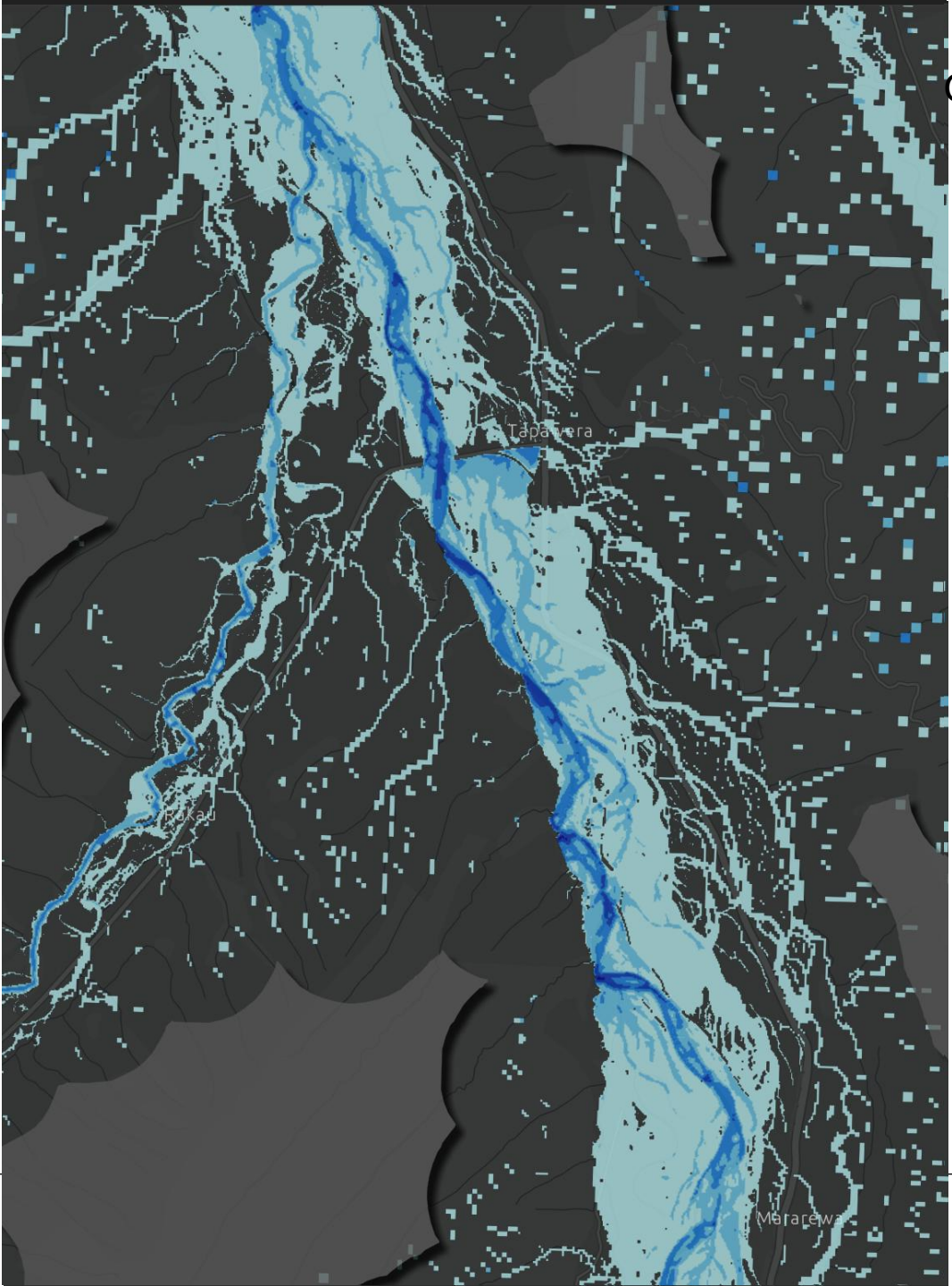


# Cyclone Gabrielle: Flood extent assessment

## Heretaunga Plains

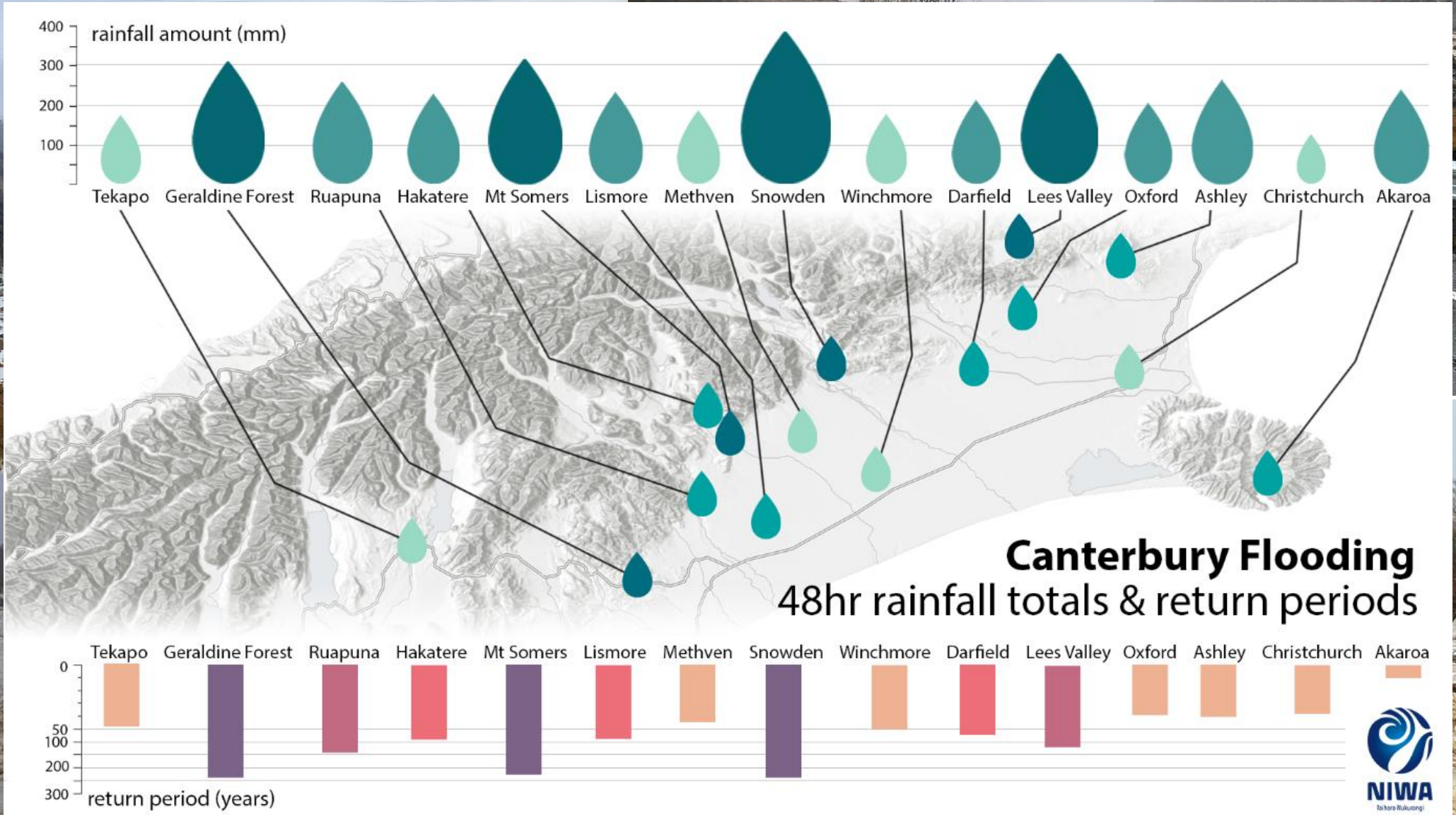


# What might the future bring?



Current Climate



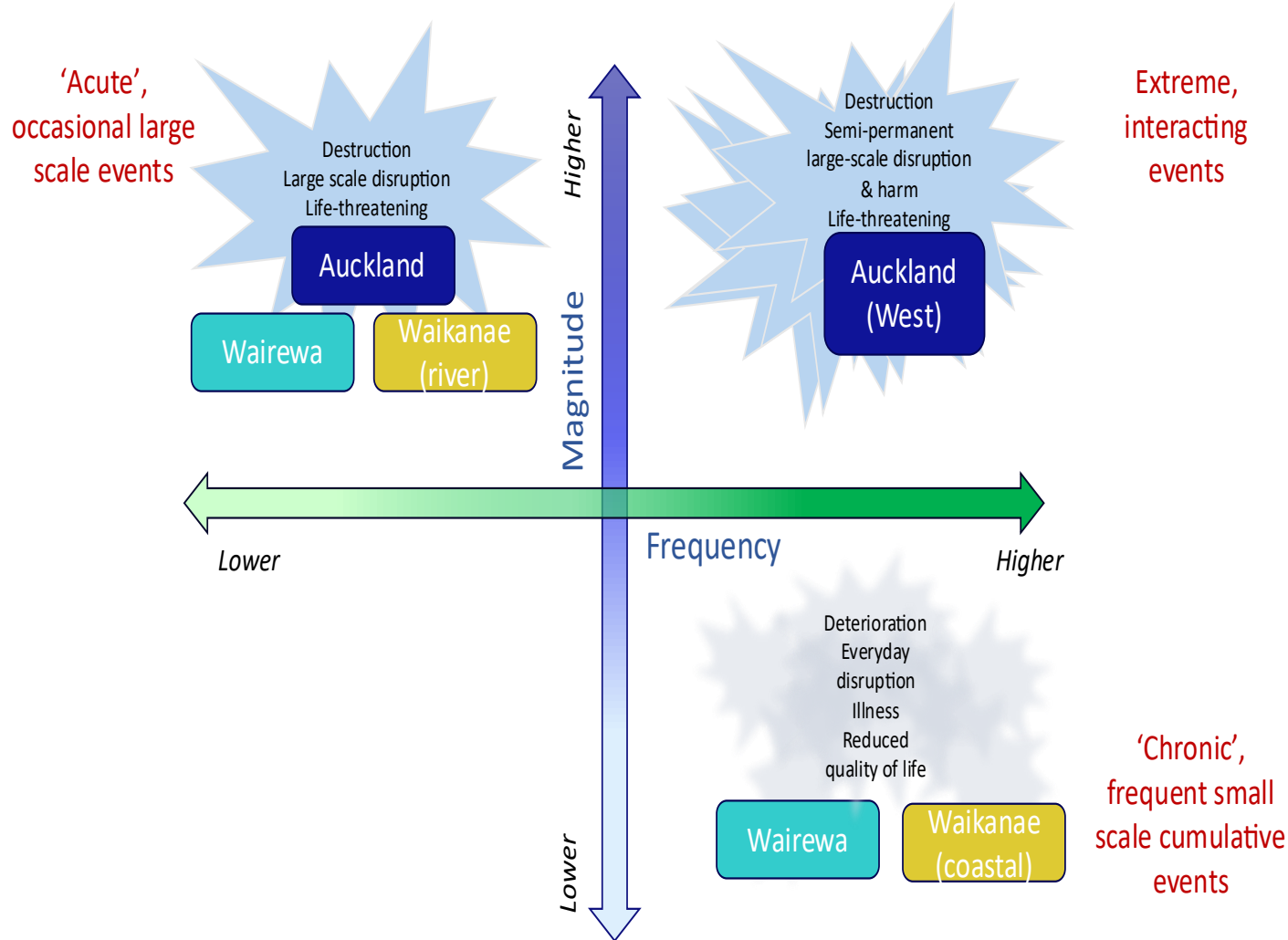


# Questions?

# The human side of flooding

**Paula Blackett, Paula Holland, Justin Connolly, Vivienne Ivory**

# Case study-based method



## Weather trauma is taking mental health toll as NZ gets battered by storm after storm

Rob Stock | The Post

May 18, 2026

Comment (1) Share



Adults and children alike experience ongoing weather-related anxiety. KWOK YI LEE / THE POST

With New Zealand experiencing a storm on average every eight days, thousands of properties in coastal inundation and flood zones could become uninsurable. Our new series explores the impacts of relentless weather events on families and communities, asks for how much longer insurance will be available, and how the Government is planning to respond.

"Rain anxiety", the spiking of anxiety during downpours, is being increasingly reported by academics studying storm disasters around the globe.

# The hidden (human) costs of flooding

## During Event



- Urgent accommodation (people & pets)
- Need help and support
- Loss/damage of property & possessions
- Physical harm
- Loss of services/support
- Stress/Anxiety/Fear



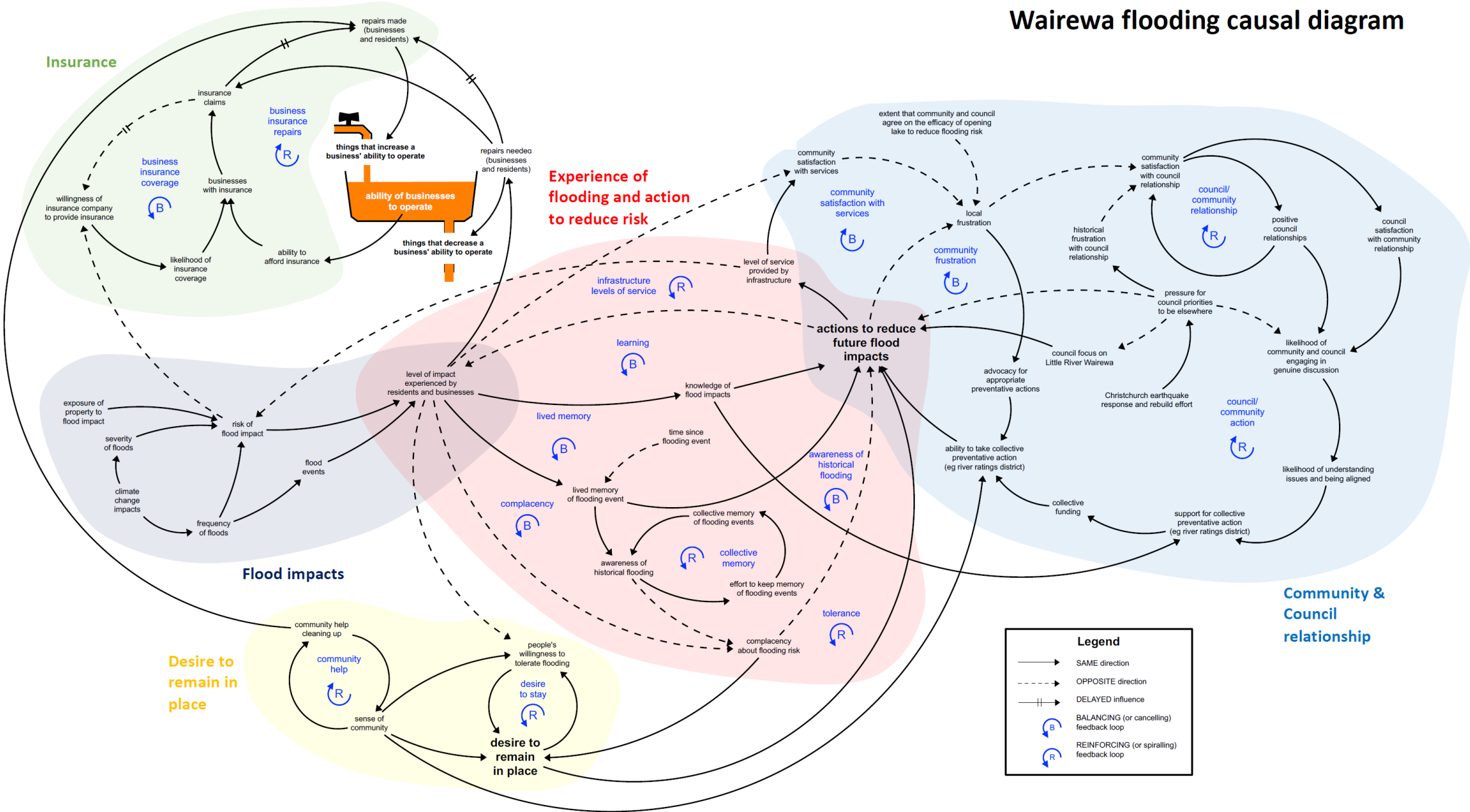
## After Event – short and longer term

- Dislocation from community / family / job / school
- Competition for accommodation
- Health impacts living in damaged homes
- Physiological impact of smell, debris, dust, rodents
- Stress of repairs costs / waiting for decisions / dealing with insurance
- Difficult decisions
- Damage to community facilities / wāhi tapu / cultural assets
- Supply chain issues
- Access
- Access

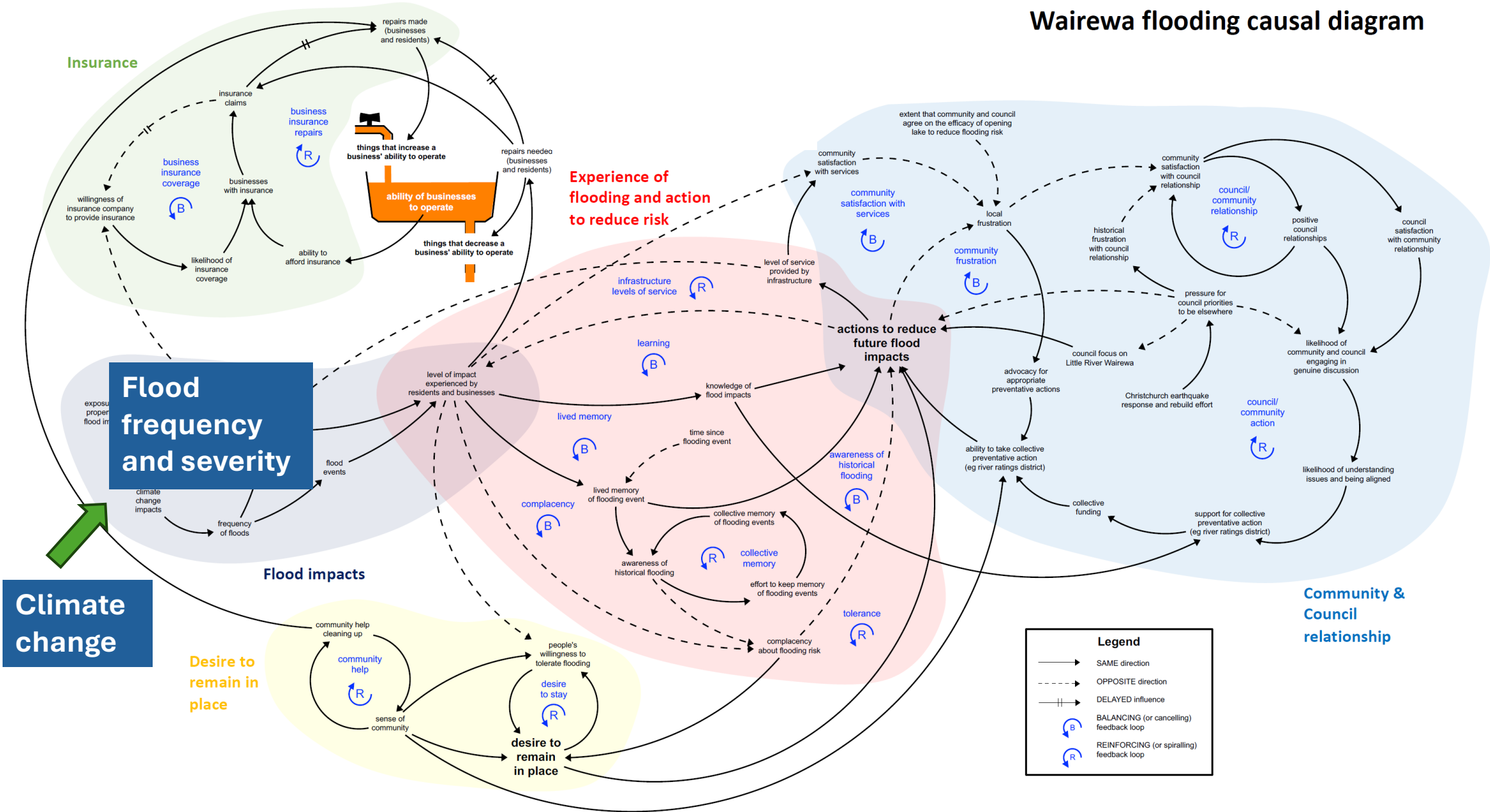


- Increasing insurance costs
- Time off work for recovery tasks
- Increased commute
- Compounding costs (mortgage and rent)
- Hopelessness
- Families may be separated (esp large families in rented accommodation)
- Housing insecurity
- Managing injuries
- Worry about other events

# Wairewa flooding causal diagram



# Wairewa flooding causal diagram



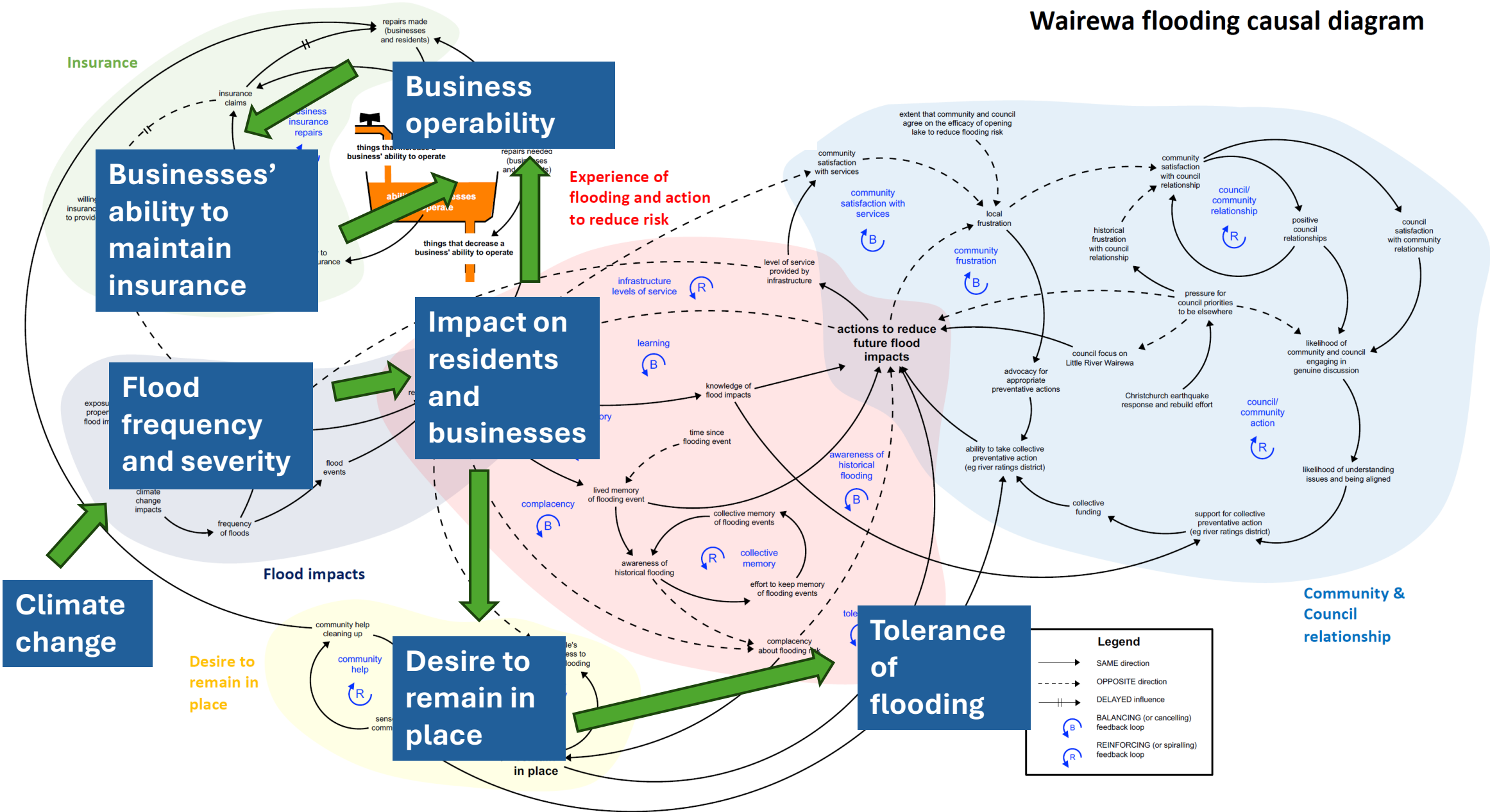




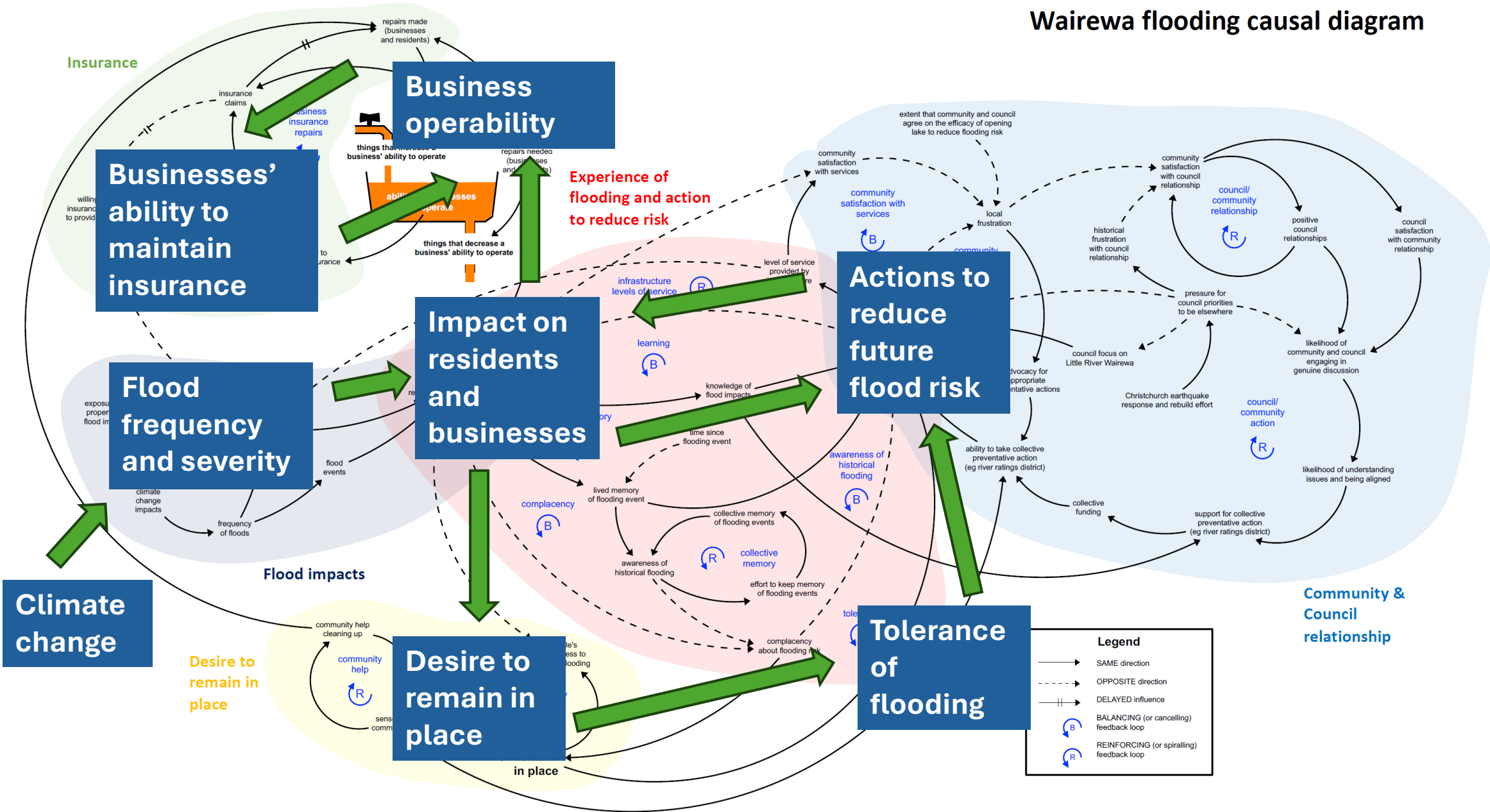




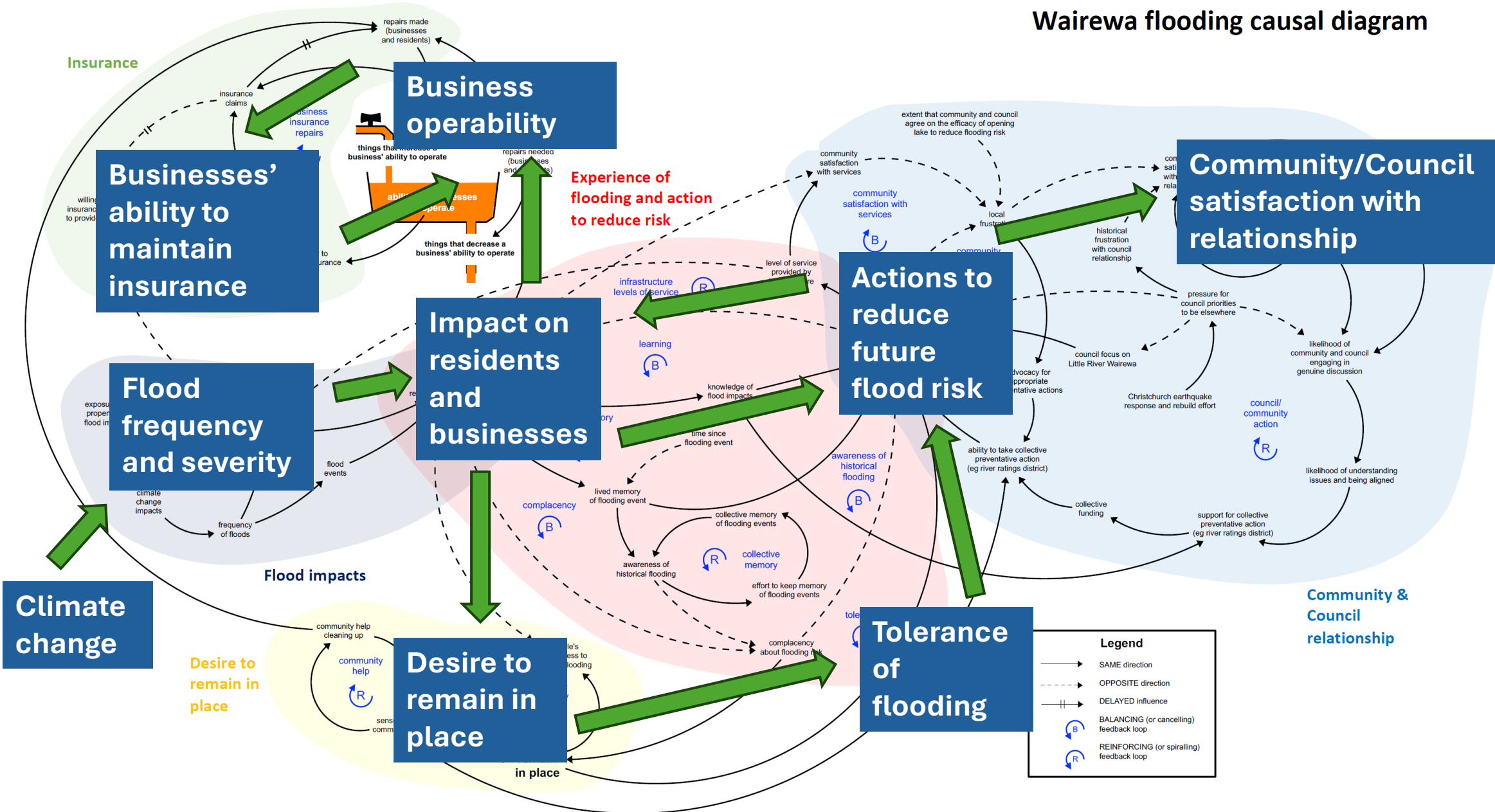
# Wairewa flooding causal diagram



# Wairewa flooding causal diagram

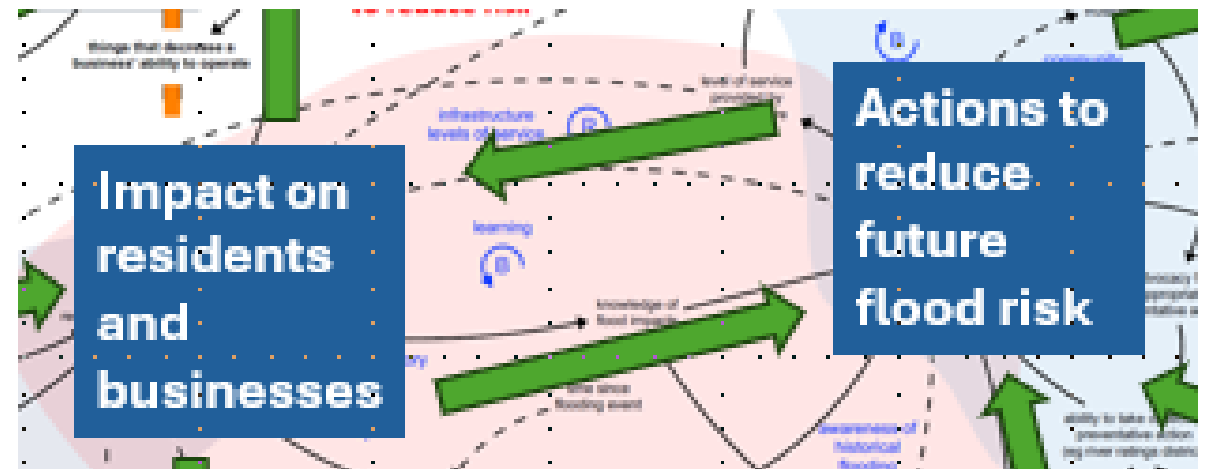


# Wairewa flooding causal diagram



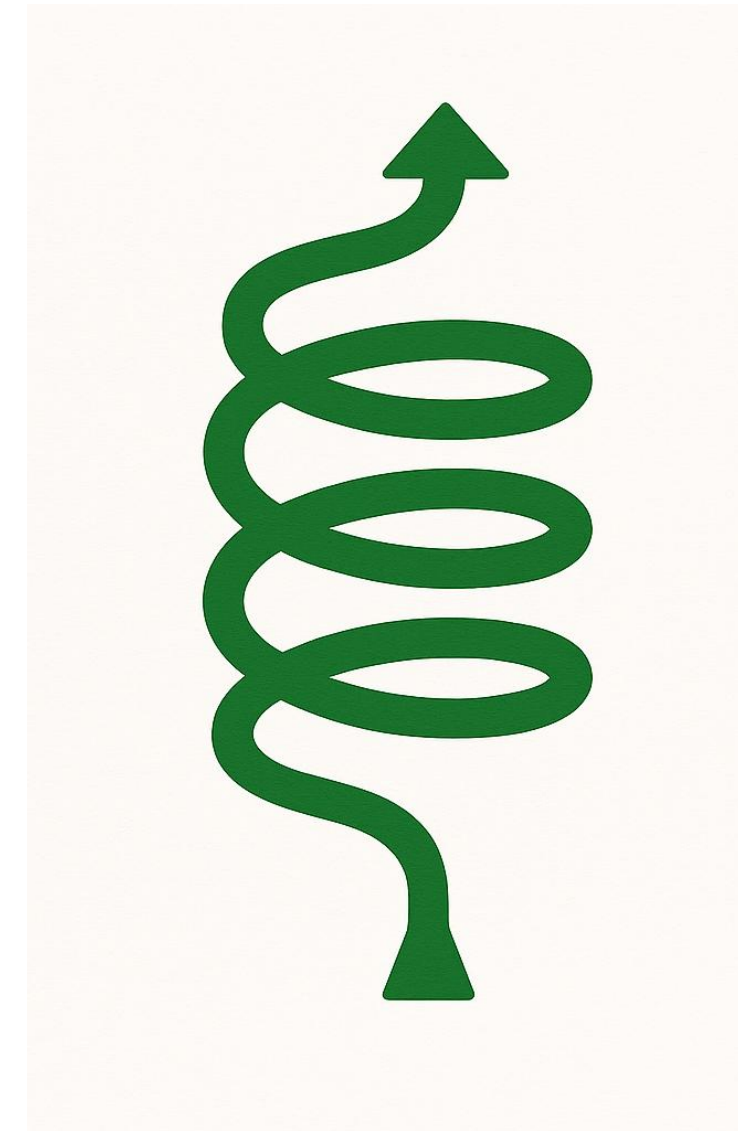


# Balancing loops: – pushing against a brick wall



# Reinforcing loops: Spirals – down and up

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# So, what's the answer?

- No simple answer. But...
- Communities have the best chance if they
- Acknowledge the hazard and are aware of its impacts
- Work together as a community
- Have high social connectedness

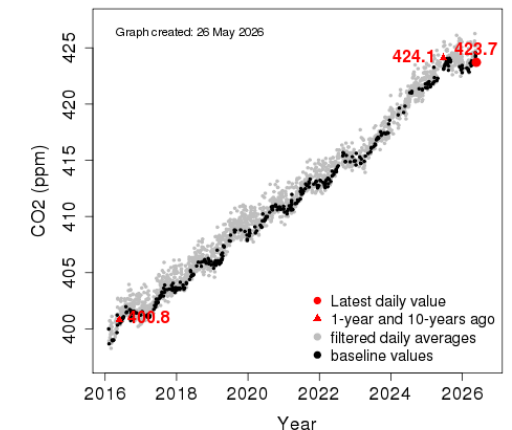
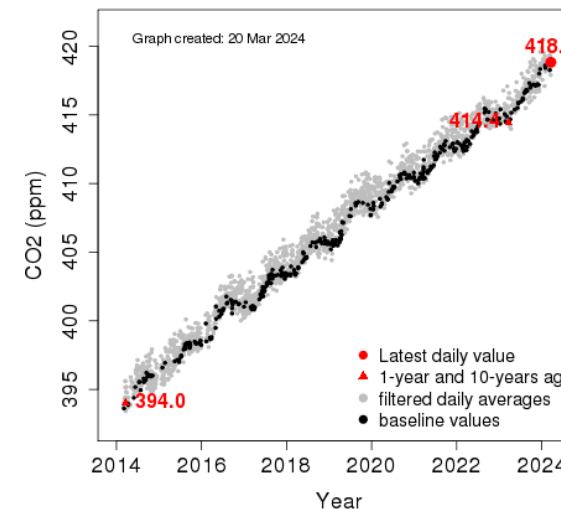
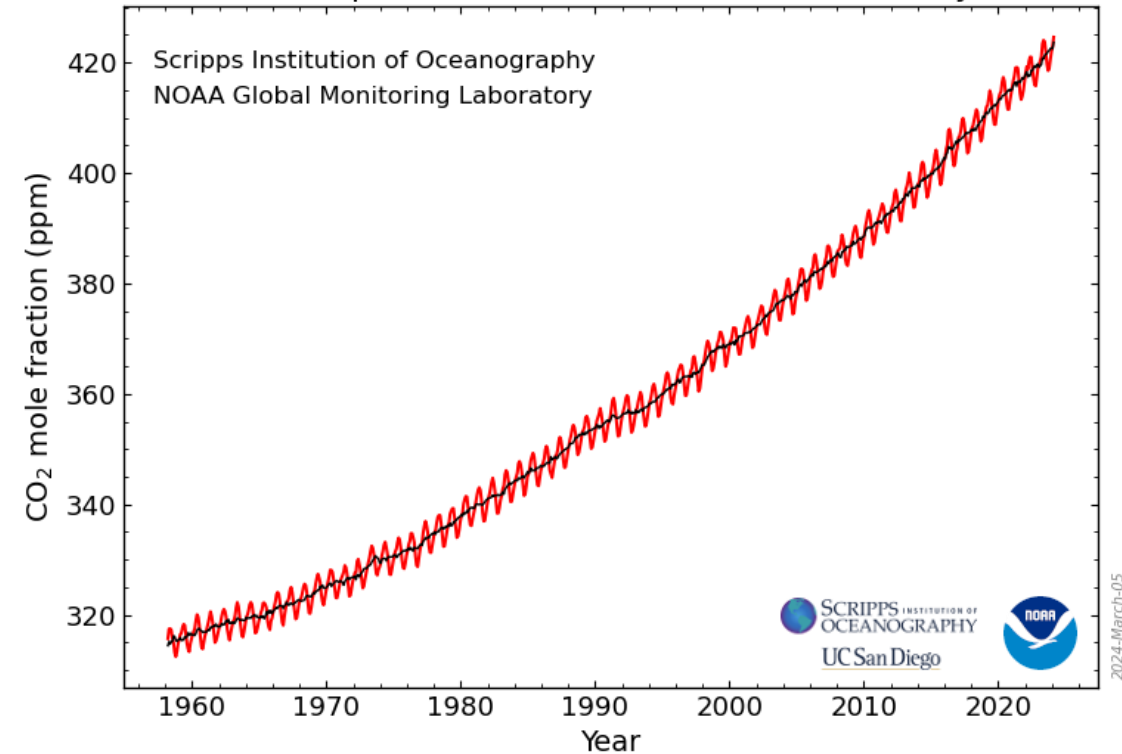


Thank you & Questions?

# Atmospheric CO<sub>2</sub>

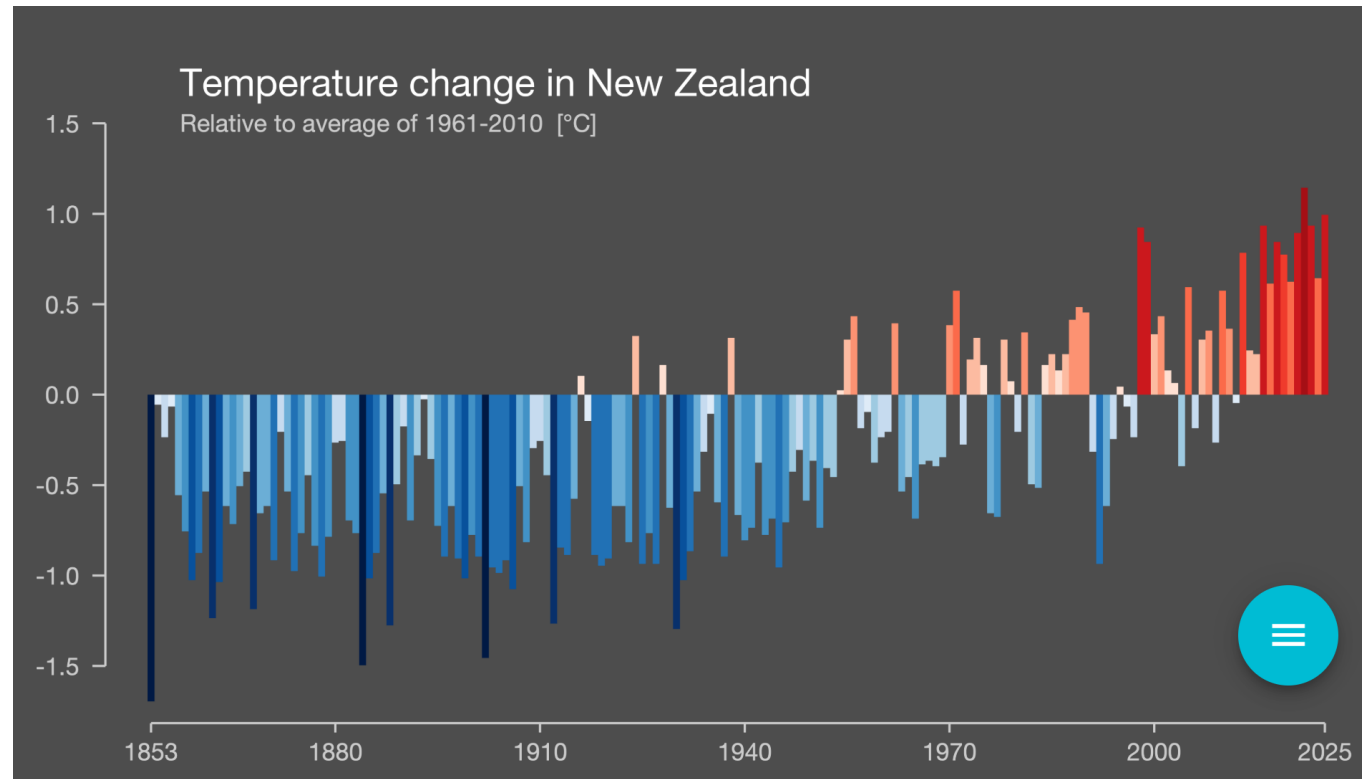
- CO<sub>2</sub> plays an important role in our atmosphere, making our planet liveable
- BUT, we are polluting the atmosphere by adding too much
- We have increased atmospheric CO<sub>2</sub> around 45% in the last 200 years
- CO<sub>2</sub> measurements at Mauna Loa since 1958
- Measurements at Baring Head since 1972

Atmospheric CO<sub>2</sub> at Mauna Loa Observatory



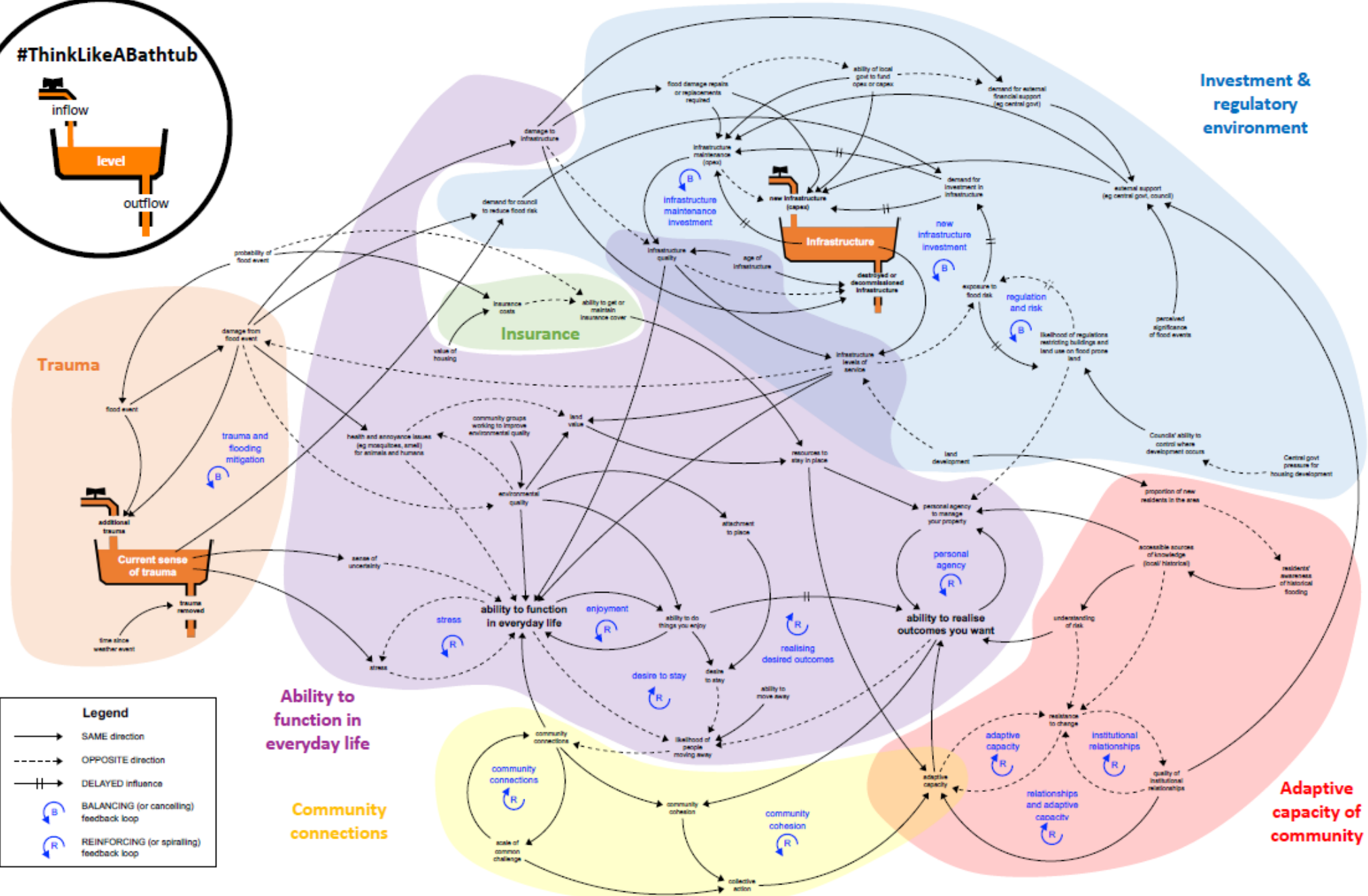
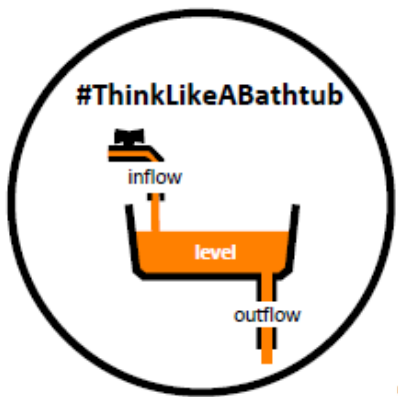
# Evidence of climate change in NZ

- NZ average temperature +1°C since 1909
- Record or near-record high temperatures set almost every month
- NZ glaciers have lost 35% of ice volume since 1978
- ~20 cm sea level rise since 1900
- Marine heatwaves more common
- More acidic oceans around NZ



<https://showyourstripes.info/c/australasia/newzealand/all/>

**Mā te haumarū o ngā puna wai o Rākahautū ka ora mō ake tonu:**  
Increasing flood resilience across Aotearoa



**Legend**

- SAME direction (solid arrow)
- OPPOSITE direction (dashed arrow)
- DELAYED influence (arrow with double bar)
- BALANCING (or cancelling) feedback loop (circle with B)
- REINFORCING (or spiralling) feedback loop (circle with R)

Waikanae flooding causal diagram

