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Behavioural Science and Risk-Based Decision Making: A Case Study of Earthquake Prone Council Buildings

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Behavioural science and risk-based decision making: a case study of earthquake prone council buildings

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BRANZ

Working in collaboration

BRANZ led a levy-funded project to find a solution. Specific expertise came from a range of key industry players.

Special thanks also to the territorial authorities who gave their time and effort to the project, providing information and testing and refining the solution.

What is behavioural science?

- Behavioural science focuses on the influences that impact perceptions, decisions, and behaviours.

- It emphasises that human behaviours are not solely based on rational evaluations of facts but are heavily influenced by a complex array of individual and social influences.

What was the challenge?

- When public buildings close, communities go without spaces to meet, socialise and access services, sometimes leading to negative socio-economic impacts.
- Some territorial authorities have rapidly closed council buildings categorised as earthquake prone, therefore suspending the provision of community facilities and services.
- Unclear how some territorial authorities approached closure decisions.
- Lack of clear policy on decisions potentially leads to public scrutiny.

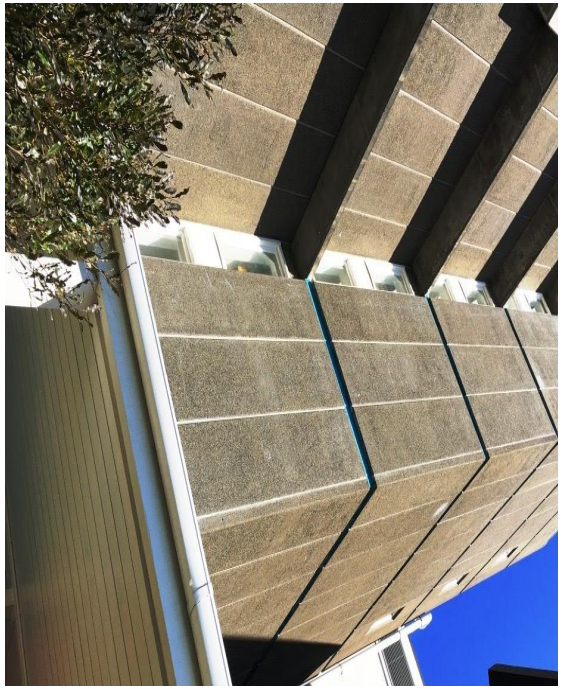
Legislative context

- Building Act 2004
  - Building (Earthquake-prone Buildings) Amendment Act 2016
  - Introduced current mechanism around EQP buildings
- Health and Safety at Work Act 2015
  - The concept of the PCBU
- The Local Government Act 2002
  - Responsibilities and Liabilities for Territorial Authorities

Interview and workshop findings

- Health & safety a key driver: concern about PCBU liability (risk to TAs).
- Little mention of ‘acceptable risk’ under an earthquake scenario: risk consequence considered above risk likelihood.
- Building safety prioritised over building function or provision of community services largely irrespective of risk probability.

Seismic Risk: Perceptions, Myths & Fallacies



Perceptions of Seismic Risk

Earthquake Prone (<34%NBS) = Unsafe

Myth 1

A low %NBS rating means that the building will collapse in a moderate earthquake

Myth 2

HSWA requires risk to be eliminated

We must vacate the building

1 + 2 = 10!

Perceptions of Seismic Risk

Likelihood	Consequence

Prior to February 2011:

The likelihood of a major earthquake is low

- *We won't worry about the consequence*

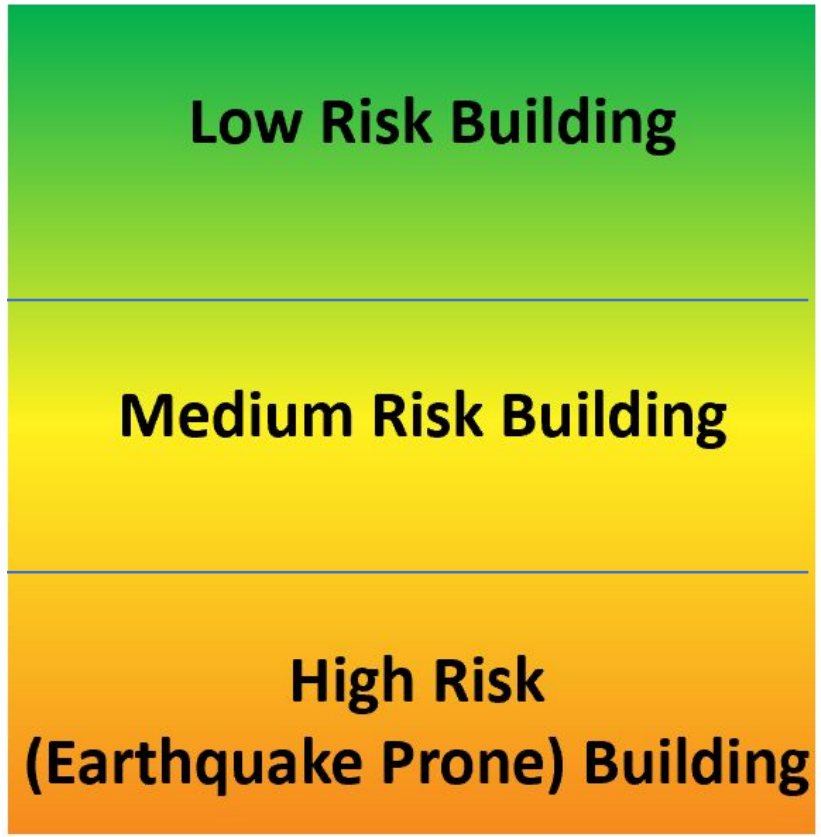
After February 2011:

The consequence of an earthquake is collapse

- Likelihood *isn't relevant*

- Conditional Probability – *if an earthquake occurs (and they do quite frequently), this low rating building is likely to collapse…..*

Seismic Assessment Outcomes in Overview



Strengthening not necessary unless needed to meet other objectives

Strengthening recommended over time

Recommended within short term if rating due to a vulnerability that could lead to collapse in a major EQ

Strengthening or demolition required within Building Act time frames

Recommended within short term if rating due to a vulnerability that could lead to collapse in a major EQ

Recap on the original mission – *Which 'third' is the building in?*

What %NBS Ratings Do and Don't Mean (1)

- *%NBS* ratings are a risk comparator
  - they relate the subject building to an equivalent new building
- They are not a predictor of expected performance in a particular earthquake
  - every earthquake is different in terms of frequency of shaking, etc
- They therefore don't represent a *specific assessment of safety*

What %NBS Ratings Do and Don't Mean (2)

- A building with a seismic rating less than 34%NBS is not a dangerous building or necessarily in any imminent risk of failure in an earthquake
- Low %NBS ratings reflect the presence of structural shortcomings and a lack of resilience in these systems, not the levels of shaking at which they might fail
- A 33%NBS rating means the building has the same likelihood of collapse in moderate levels of earthquake shaking (one-third current code) as a new building has under full design shaking

What %NBS Ratings Do and Don't Mean (3)

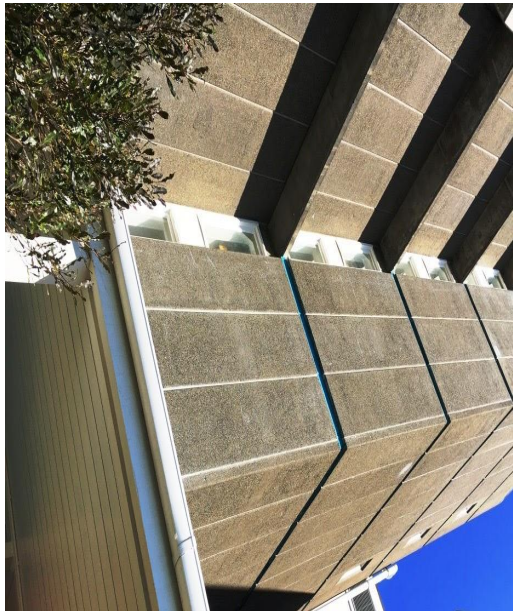
- The intended outcomes of a low %NBS rating can be summarised as:
  - To signal heightened risk in the event of earthquake occurrence;
  - To convey the need for mitigation work to be undertaken, and sooner rather than later; and
  - If the building is determined to be earthquake prone, to link this with defined statutory timeframes

 A low *%NBS* rating is not intended to prevent people from accessing and occupying the buildings before a mitigation plan with time frames can be developed and implemented

Rebalancing the Treatment of Seismic Risk

Introduce *Vulnerability* more explicitly

- For low likelihood events, consider the vulnerability of the building elements at different level of earthquake shaking
  - *e.g. moderate (100 year Return Period), significant (250 year RP), major (500 year RP)*
- And more clearly separate the vulnerability of primary and secondary structural elements



Challenges and Opportunities with HSWA (1)

- The Health & Safety at Work Act has a focus on eliminating risk
- The June 2016 Worksafe Position Statement re-iterates the intent of s35 *Compliance with other enactments:*
  - *If you're a PCBU who owns or occupies a building, and you're meeting the requirements of the Building Act, we are not going to enforce to a higher standard under HSWA.*
  - *If a building is found to be earthquake-prone, this doesn't necessarily mean that it shouldn't be occupied.*

Challenges and Opportunities with HSWA (2)

- **Utilise the considerations in s22 of HSWA *Meaning of reasonably practicable* as a decision-making framework**

(a) the likelihood of the hazard or the risk concerned occurring

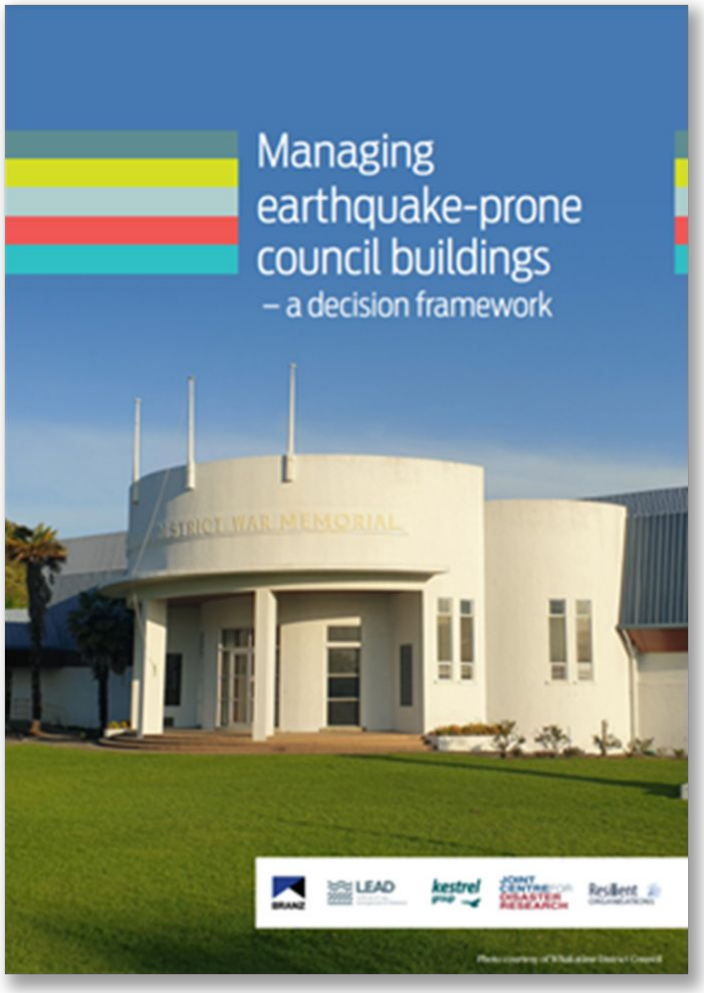
(b) the degree of harm that might result from the hazard or risk

(c) what is known about the hazard or risk; and ways of eliminating or minimising the risk

(d) the availability and suitability of ways to eliminate or minimise the risk; and

(e) after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk

Introducing the Decision Framework



Decision making for council-owned earthquake-prone buildings

STEP 1

Building assessment

Start with a detailed seismic assessment of the building that clearly identifies any structural vulnerability, mode of failure and the area of the building that is affected.

Is the building or any part of it identified as dangerous?

NO

Is the building less than 34%NBS?

YES

GO TO STEP 2

YES

Manage as a dangerous building (see sections 121–124 of the Building Act 2004).

NO

Use normal asset management process. Include in the long-term seismic upgrade programme.

STEP 2

Building user exposure to risk

Evaluate the number of people using the building and the length of time they spend there (see Tables 1, 2 and 3).

What is the level of life safety exposure?

LEVEL I

LEVEL II

LEVEL III

GO TO STEP 3

Building remains open. Communicate any risk to building owners and visitors. Include building in seismic upgrade programme (Building Act requirements as minimum). See also notes 1 and 2.

STEP 3

Risk mitigation measures

Identify any temporary measures that can be put in place to reduce safety risk to building users (e.g. fence off the dangerous part of the building, close adjacent footpaths, remove parapets).

Can risk be mitigated temporarily?

NO

GO TO STEP 4

YES

STEP 4

Consequences of building closure

Determine likely immediate consequences of closing the building. This includes impacts on staff, building users and neighbouring business and the community (see Table 4).

GO TO STEP 5

STEP 5

Overall assessment of building risk

Evaluate the overall risk (safety and consequences of closure) (see Tables 3, 4 and 5).

What is the overall risk?

Category A

Category B

Category C

Close building within reasonable period. See note 1.

Note 1: Before making a final decision, do a sense check: is this a reasonable and justifiable decision?

Note 2: Consider the demographics of the people using the building – are they elderly, physically impaired or vulnerable in any way? Does this change the risk? Consider other hazards that might create additional risk, like the presence of hazardous substances or asbestos in the building or natural and geological hazards nearby such as unstable ground.

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Poorly defined context

Context setting should identify:

- Organisational priorities
- Legislative responsibilities
- Relevant considerations / information required
- Key stakeholders

Bias

Many types of bias:

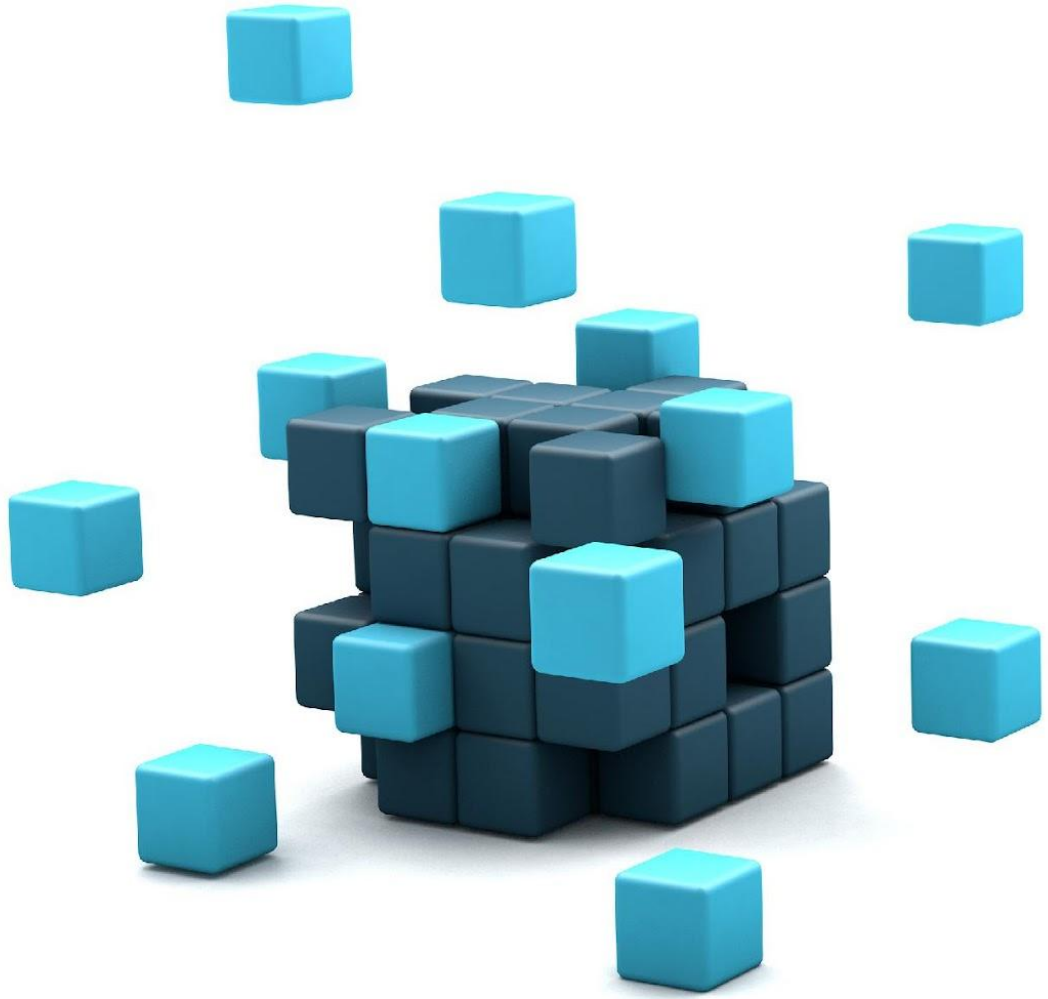
- Recency bias
- Consequence bias
- Optimism bias

Be conscious of bias and actively manage it.

Bounded rationality

Beware of simplifying heuristics.

If people are using ‘rules of thumb’ in a complex situation, break down the decision into a clear process that evaluates all relevant information.



Trust

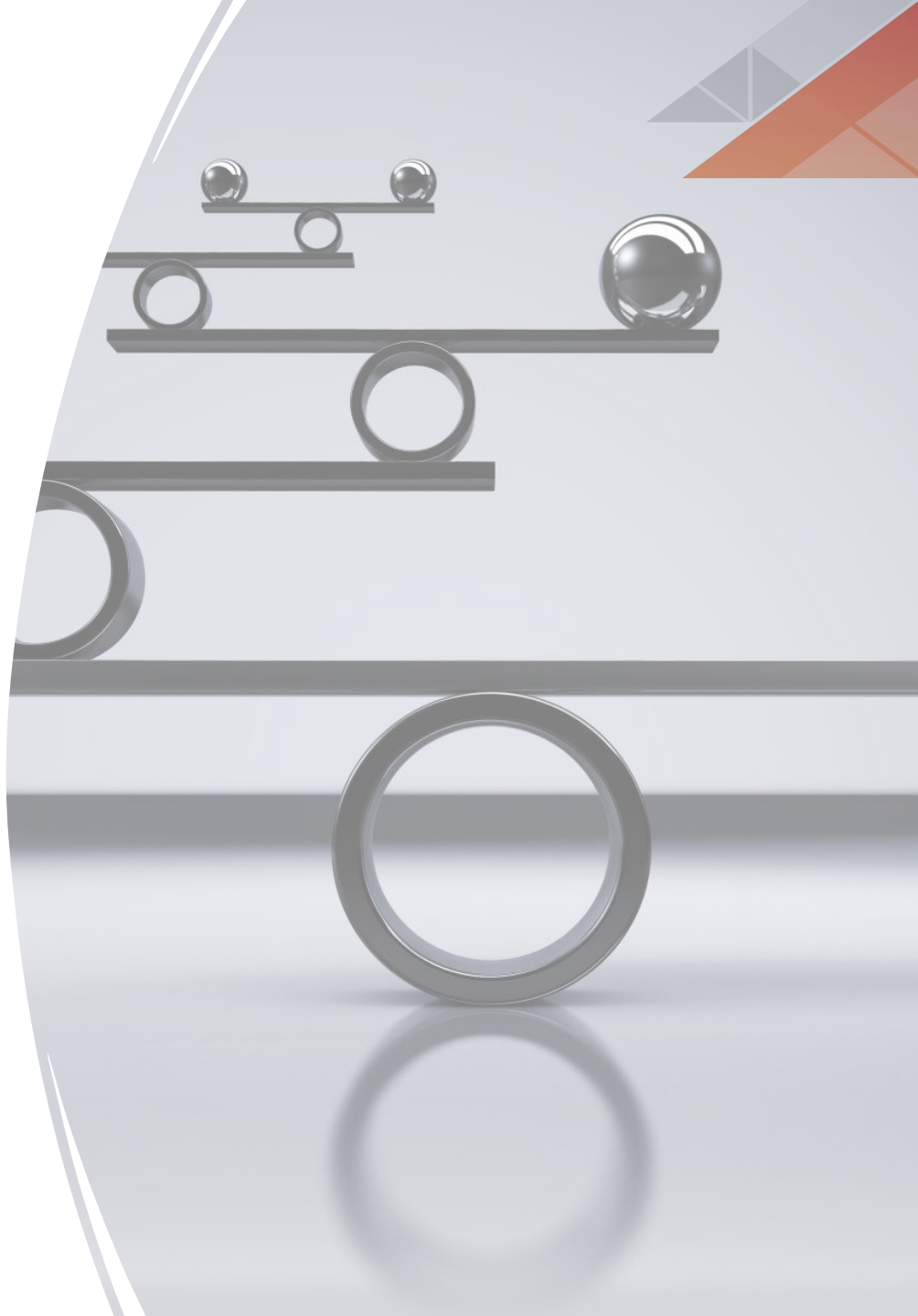
Trust is not a substitute for understanding.

Decisions need to be defendable so ask questions of experts and make sure you understand the information within your context.

Responsibility and liability

Liability potential is a strong decision driver.

Recognise these drivers and detach them from the decision process as far as possible, to avoid unbalanced, reactive, or fear-driven decision making.



Social influences

Social cues and values can be extremely influential, both positively and negatively.

Where you can use social cues to constructively influence decision making.

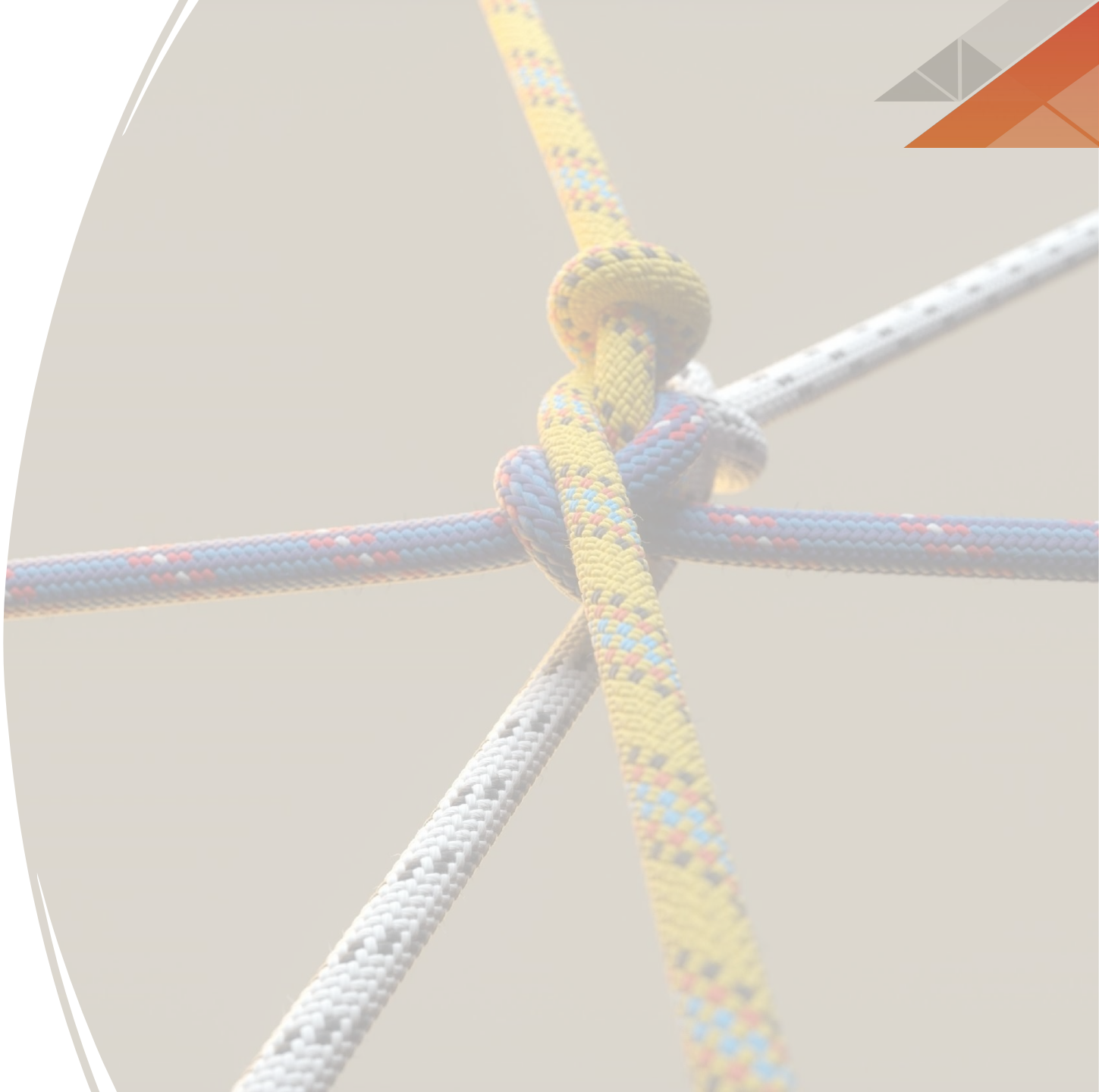
Socially defined risk tolerance

To increase objectivity and consistency in decision making, identify risk tolerance levels before making decisions.

Participatory processes

It can be tempting to make complex decisions behind closed doors (excluding those directly affected by the risk).

Participatory processes help building understanding and trust in decision process. And discussions can alleviate fears of decision makers.



Key messages

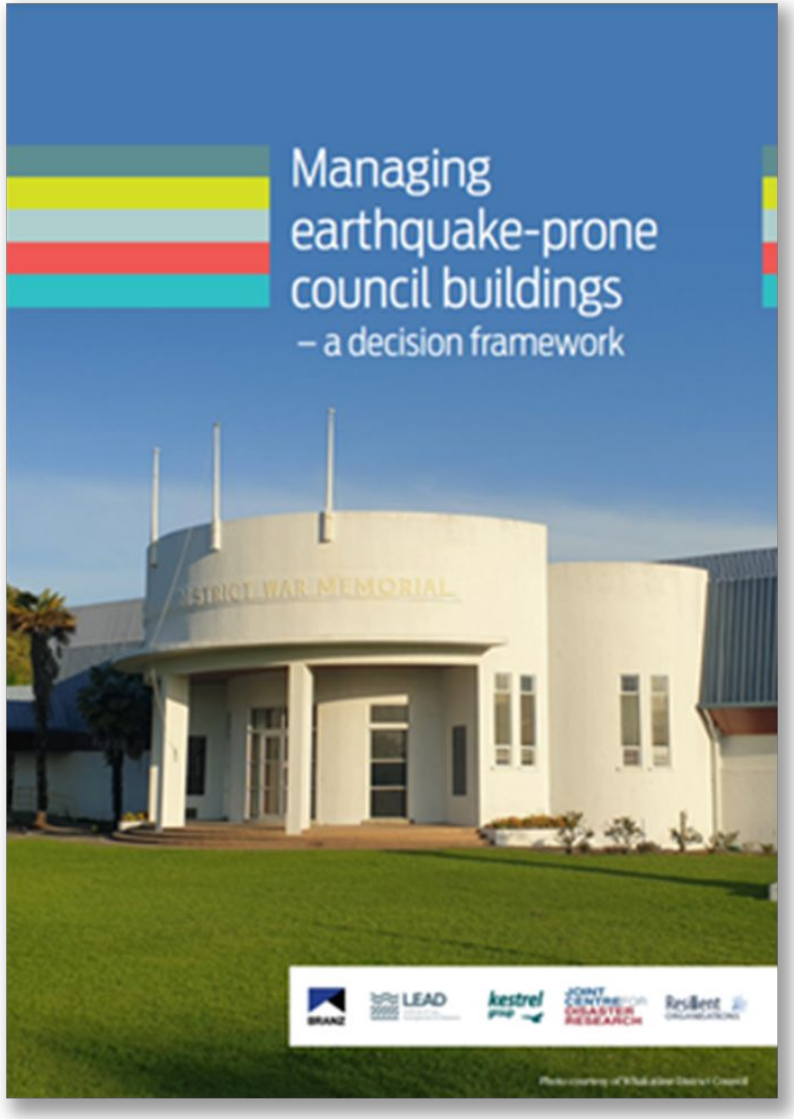
- Facts are only part of the decision-making process.

- Decision makers are often ‘rationally bounded’.

- We can therefore begin to understand why it is sometimes difficult to ensure that building science translates into policy.

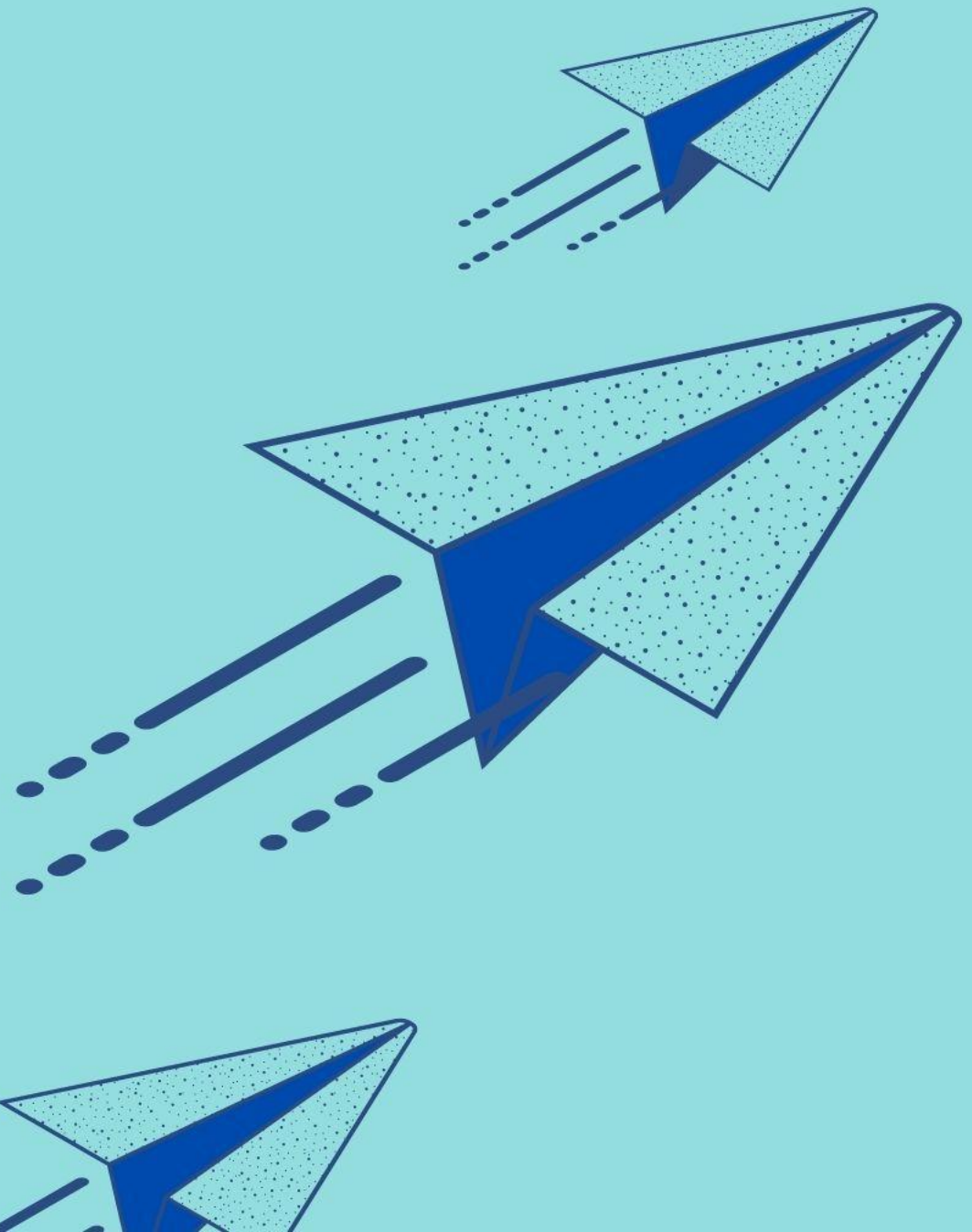
Concluding statements

- How to get support using the decision framework
- Contact:
  - Dave Brunsdon, Director Kestrel Group. db@kestrel.co.nz or 021 679 338
  - Charlotte Brown, Joint Managing Director, Resilient Organisations. charlotte.brown@resorgs.org.nz or 021 142 5420



Do you have any questions?

Type them into the Q&A platform



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Thank you for joining us today