BUILDING PERFORMANCE

Changes to the earthquake-prone building system

Engineering New Zealand Webinar

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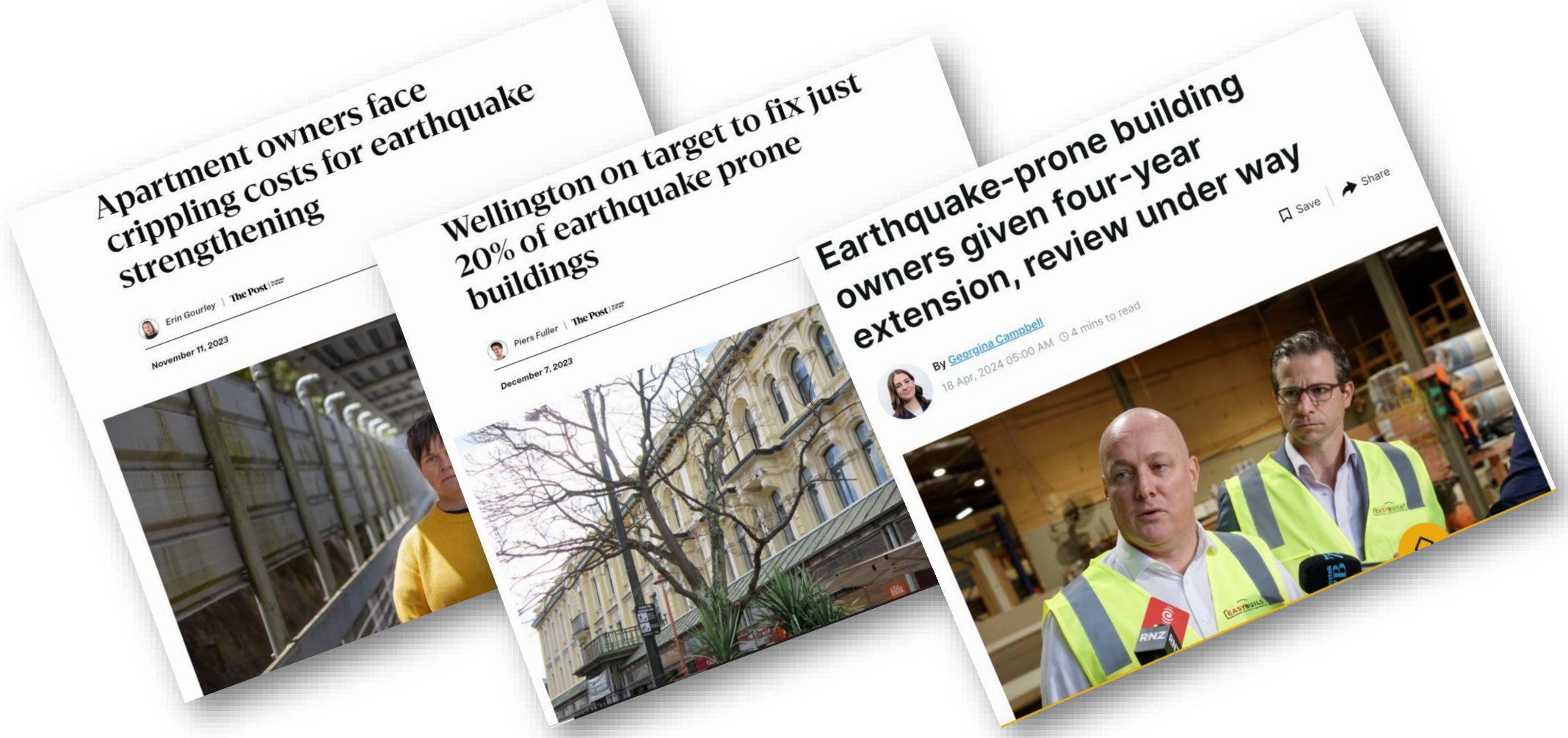
MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Te Kāwanatanga o Aotearoa
New Zealand Government

Earthquake-Prone Building Policy Review



Seismic Review findings

Despite some 1,500 earthquake prone buildings (EPBs) being strengthened or demolished, problems have emerged:

- remediation is often uneconomic or unaffordable
- many lower risk buildings becoming EPBs
- %NBS causing confusion
- impractical enforcement tools
- heritage restrictions posing barriers to remediation.

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Case study – Dannevirke

Case Study 1: Commercial Building - 102 High Street, Dannevirke

This retail store has been home to a small owner-occupier IT business since 2014. Tararua District Council issued an earthquake-prone building notice in December 2023, and the building must now be remediated by June 2035.

The owner purchased the property for $50,000, but estimates strengthening work could cost $200,000. In contrast, demolition works could cost $60,000 but, without the store to run their business from, the owner does not know how they would pay these costs.

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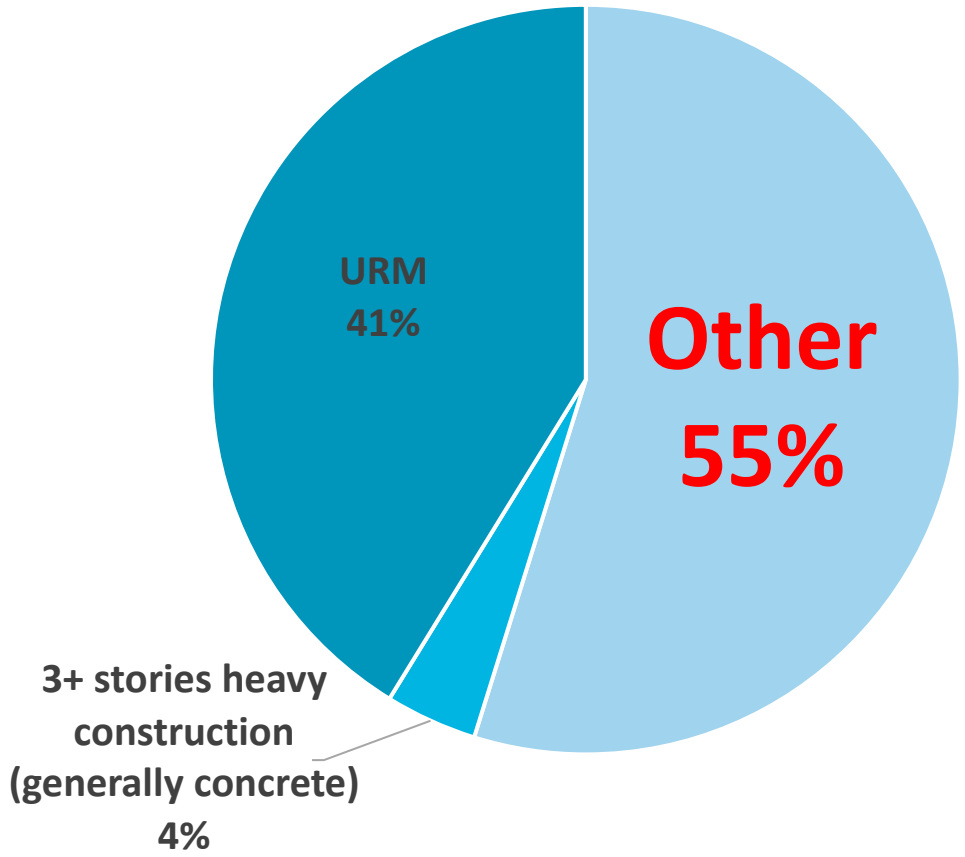
And the cumulative result…



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Proposed changes to the EPB system

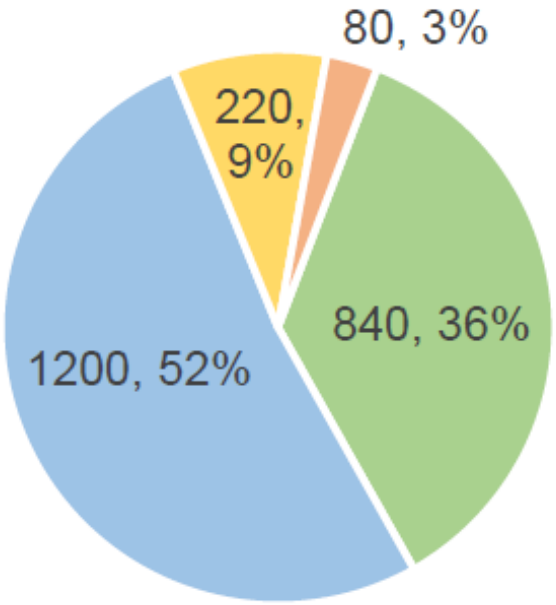
- **Only two types of buildings** (unreinforced masonry and 3+ storey of concrete/heavy construction) **in medium and high seismic zones** can be EPBs.
- All EPBs outside of these building types or in Auckland / Northland will be delisted.
- Cheaper and simpler mitigation requirements for remaining EPBs.

The proposed changes will not come into force until a new law is in place. Until then, the current requirements apply.

Mitigation requirements

Mitigation requirements by building type and height, and location:

		BUILDING TYPE		
		3+ storey high risk heavy construction (eg concrete) buildings	Unreinforced masonry buildings	
			1-2 storey	3+ storey
LOCATION	Rural or small town[3]	Targeted retrofit[4]	Risk register[5] only	Façade securing[6]
	Urban centre		Façade securing	Full retrofit[7]



Approx. distribution of mitigation requirements for current EPBs

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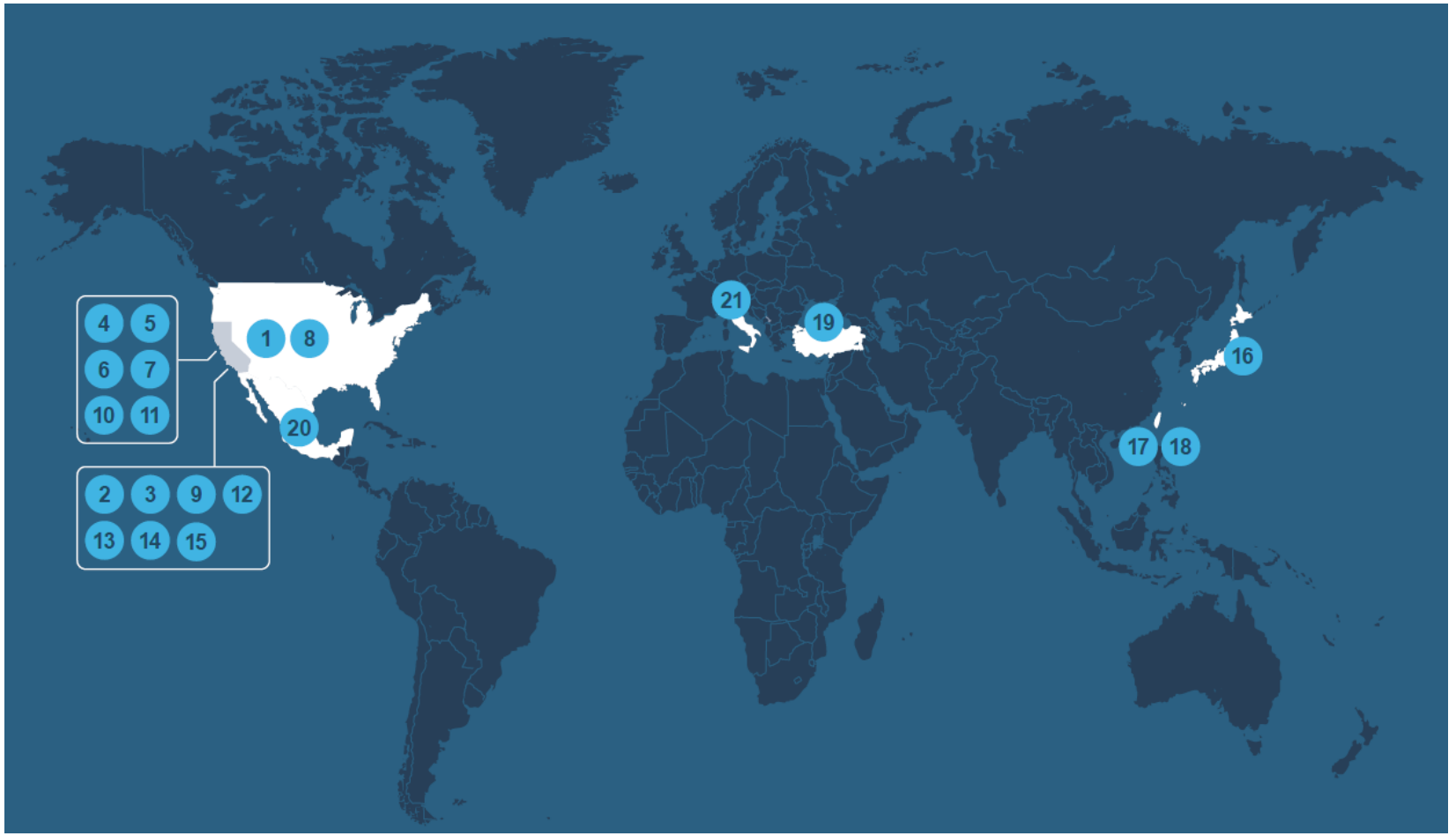
Other changes to the EPB system

- Changes to **alterations and change of use** rules to remove barriers to remediation and reuse of EPBs.
- Building owners will be able to apply to their Council for seismic work **extensions** of up to 15 years.
- The **identify at any time pathway** will be narrowed to capture CTV-type buildings only (ie post-'76, 3+ storey concrete).
- **Priority building** status will be removed from EPBs that are not likely to fall on people/vehicles or impede access to key emergency facilities.
- **%NBS will no longer be used to identify EPBs**. Instead:
  - URM will be deemed EPBs by default (unless retrofitted post-2011)
  - 3+ storey concrete buildings will be evaluated for EPB status through review of deficiencies.

How we got here…

International lessons



QuakeCoRE
NZ Centre for Earthquake Resilience
Te Hiranga Rū

Olga Filippova
Jason Ingham
John Hopkins

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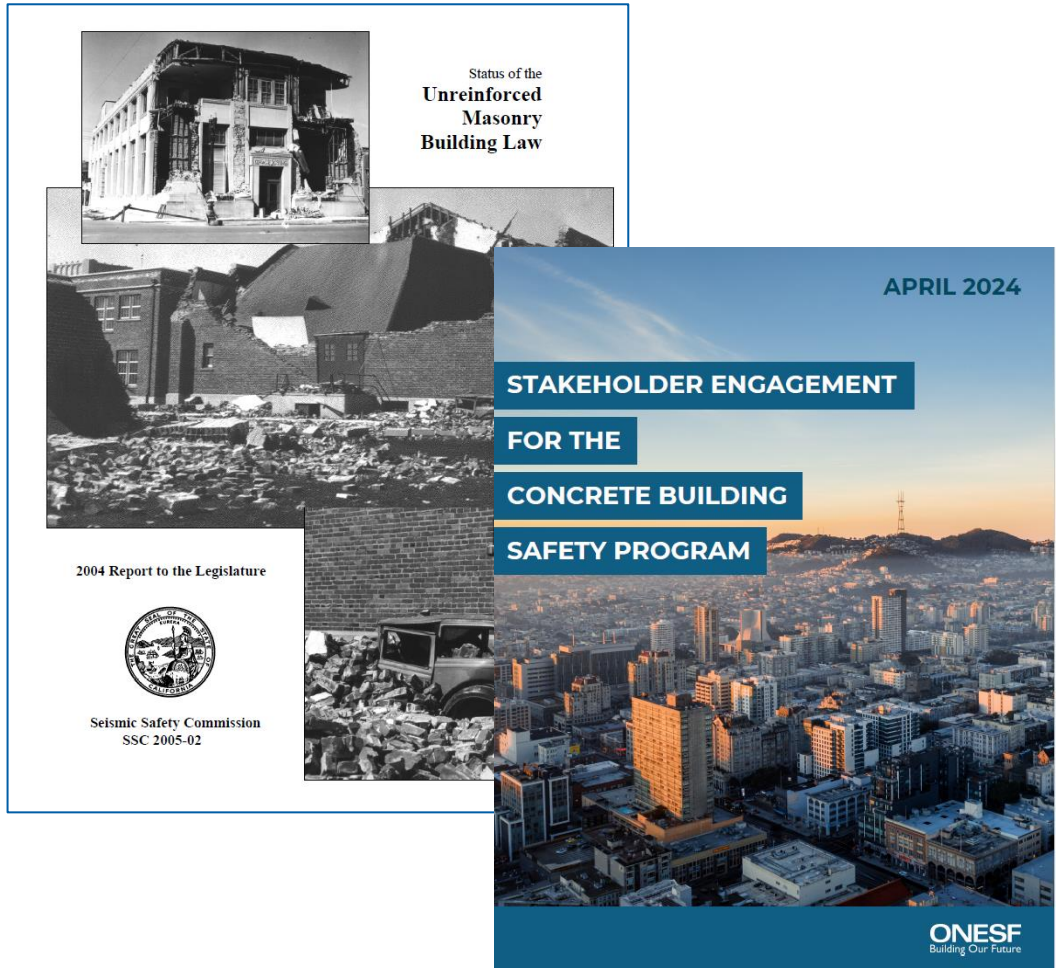
International lessons: building types included

Programme	URM	Older Concrete	Modern Buildings (with low ratings)
Los Angeles – URM	✓		
San Francisco – URM	✓		
Berkeley – URM	✓		
Los Angeles - Concrete		✓	
Japan		✓	
Taiwan		✓	
New Zealand	✓	✓	✓

International Lessons: Rating Systems and Targeted Retrofits

- Rating systems (eg %NBS) are <u>not</u> used internationally as part of seismic mitigation programmes
  - Programmes are building-type specific
  - Criteria for what buildings are included in programmes based on prescriptive structural characteristics

- Targeted retrofits keep costs down:
  - Taiwan weak story retrofits
  - California Bolts-plus URM retrofits



Future State Options

Status quo (EPB system)

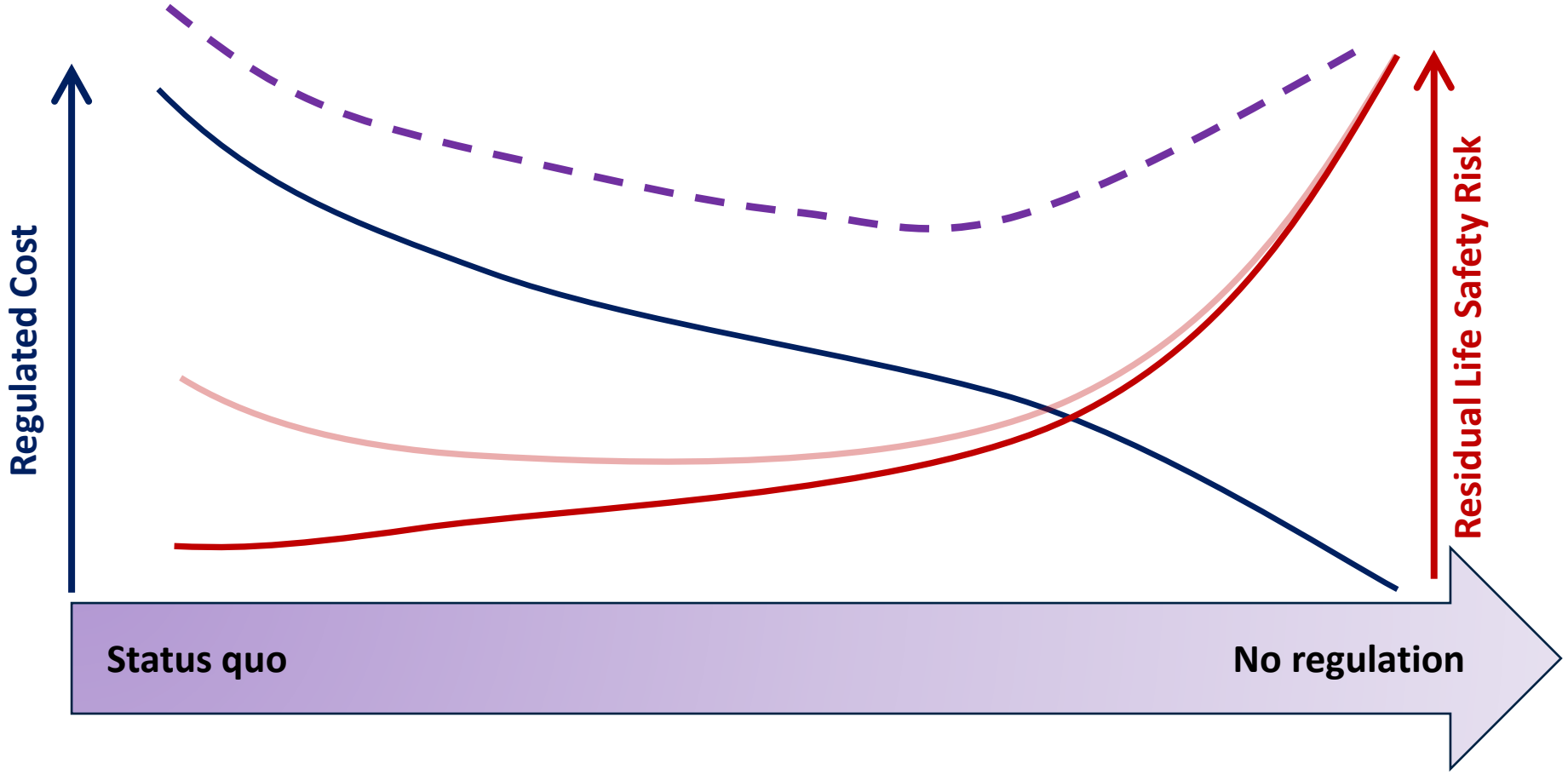
1. Improve the current system

2. Reduce the scope of the EPB system but retain its essential features

3. Mandatory remediation for highest risk buildings only

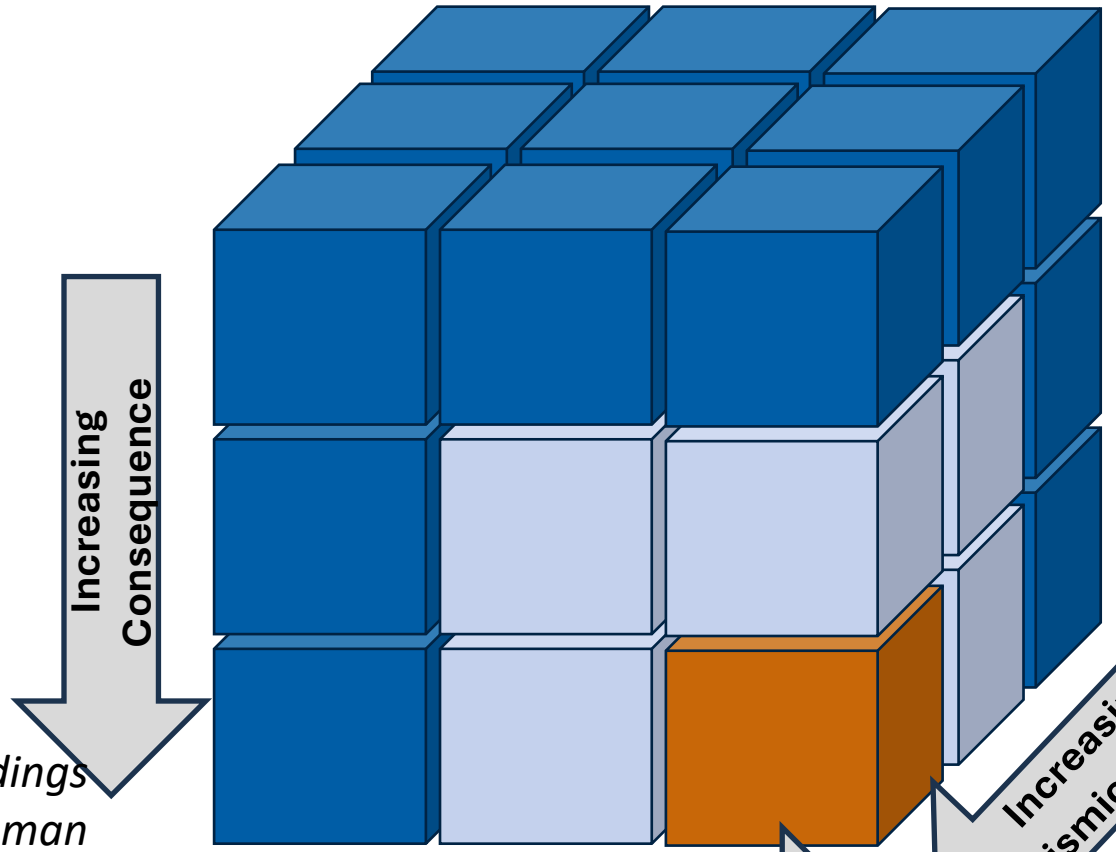
4. Remove the EPB system

A range of options



Risk

- Three components to risk:
  - Seismic Hazard
  - Building Vulnerability
  - Consequence (human exposure)



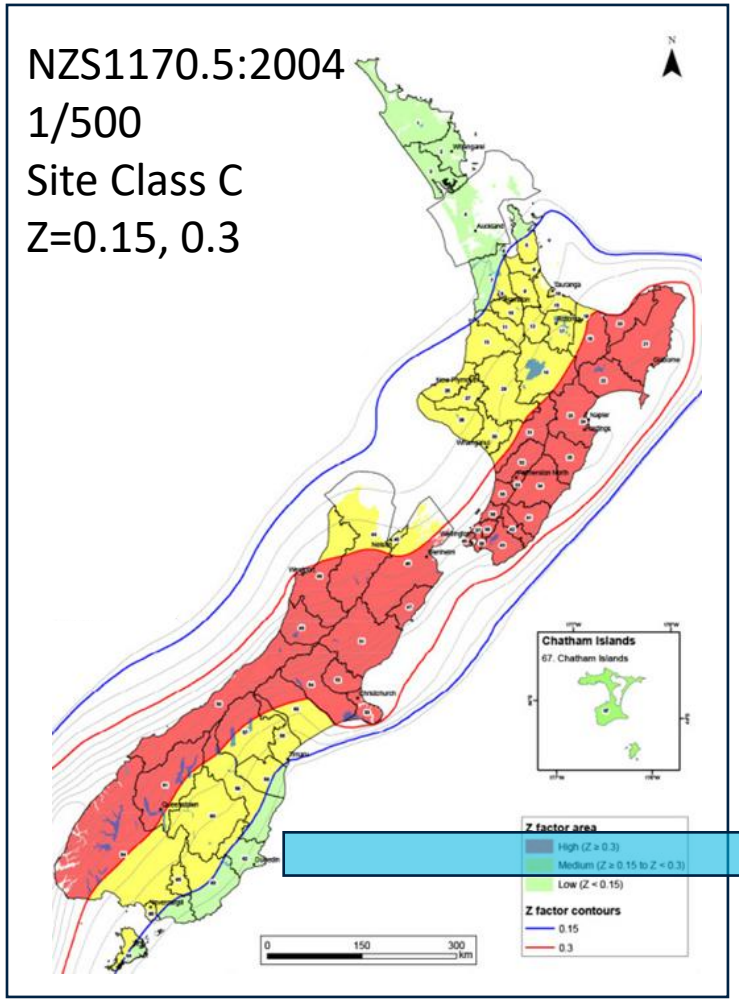
Relaxation for small buildings in small towns where human exposure is typically lower?

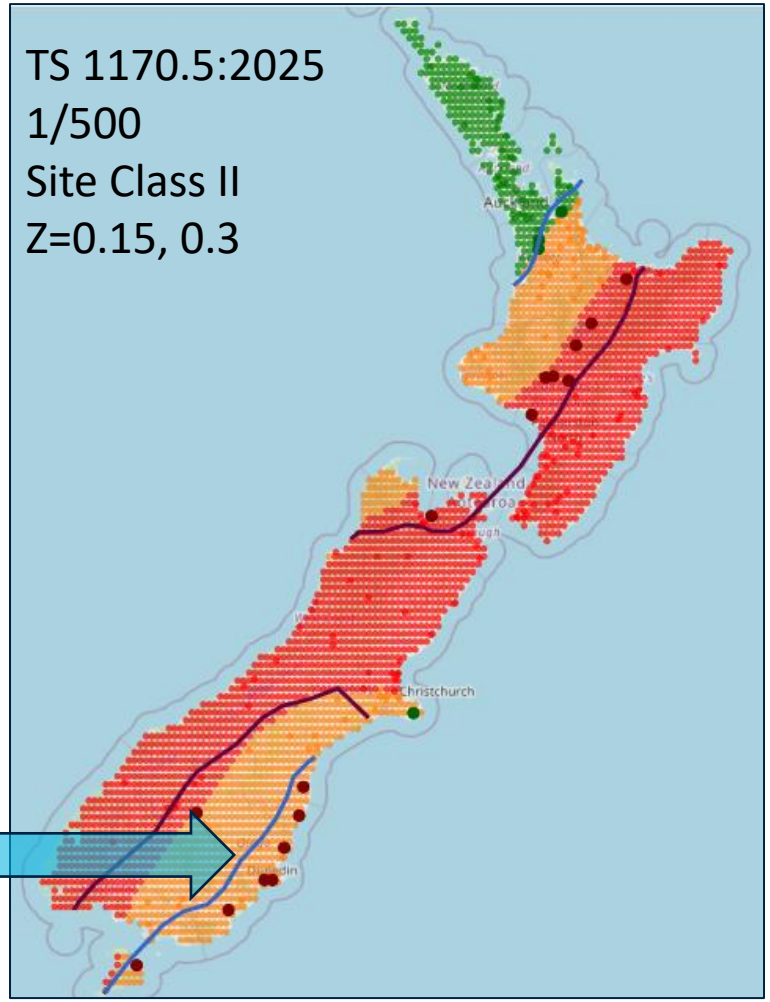
Need for obligations in lower hazard zones?

*Focus on URM and **high-risk** 3+ storey concrete?*

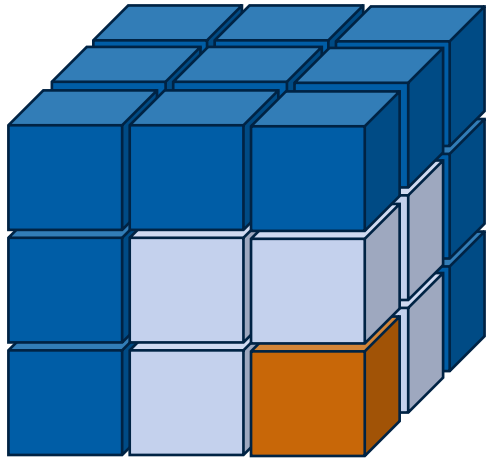
Seismic Hazard

- **Remove Low Hazard zone from EPB system due to lower risk.**
- New seismic hazard: Coastal Otago not as low as Auckland and Northland.
  → *move to Medium Zone*





Risk-based mitigation requirements



Lower risk	→	No mandatory mitigation
Intermediate risk	→	Targeted retrofit / Façade securing
Highest risk	→	Full Retrofit

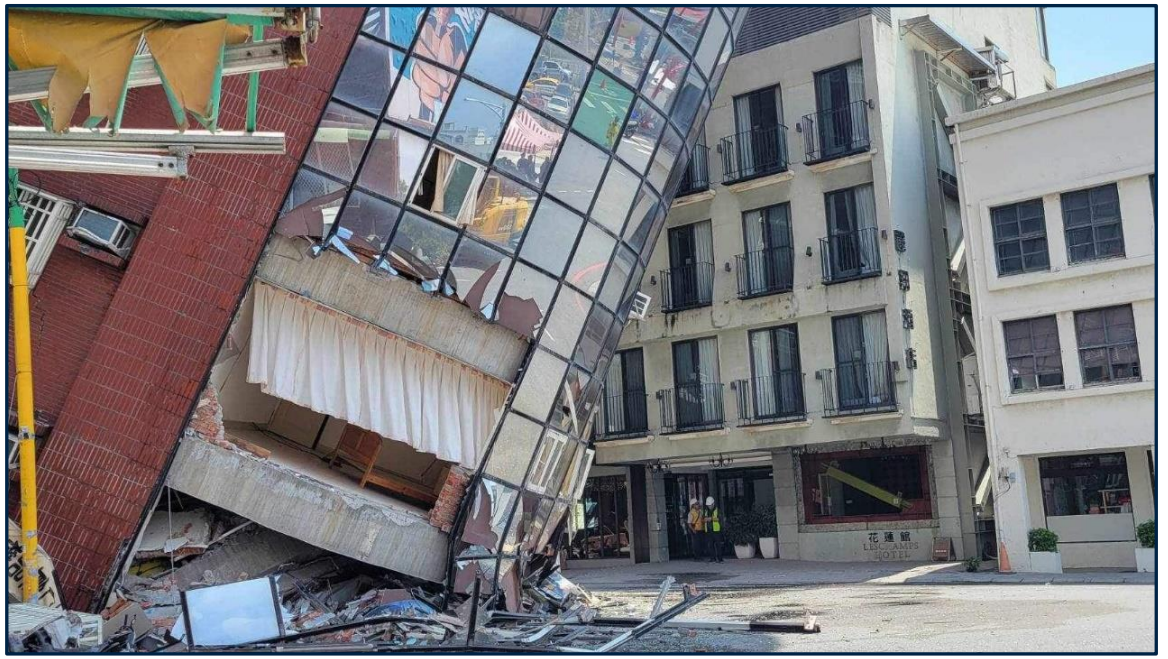
Increasing Life Safety Protection

URM Mitigation Requirements

- Façade Securing:
  - Restrain walls facing onto public spaces or above adjacent properties.
  - ~80% cost savings
- Full Retrofit:
  - Address all high-risk deficiencies.
  - Similar cost to 34% retrofit.

3+ Storey Concrete Buildings Mitigation Requirements

- Targeted Retrofit:
  - Target *highest risk deficiencies* → greatest risk reduction per unit cost!
  - Large variation in cost savings – average ~20% savings

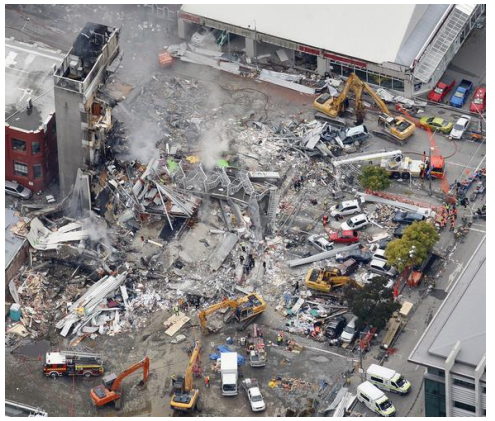


Taiwan Weak Story Retrofit

3+ Storey Concrete Buildings: High-Risk Deficiencies

- Only **High-Risk** 3+ storey concrete buildings considered EPB
- **High-risk** Building = Building with **High-Risk Deficiency**
- Buildings <u>without</u> High-Risk Deficiencies can be *removed* from register.
- Feasibility study has explored application of this concept to 20 buildings with %NBS < 34%.

Examples of Buildings with High-Risk Deficiencies:



Residual risk

- Some life safety risks not captured in new system, e.g.:
  - 1-2 storey reinforced masonry or concrete
  - Failure of non-vertical load bearing element
  - Precast concrete cladding
  - Stairs
  - Precast floors

→ *Importance of voluntary mitigation continuing alongside mandatory system*

Current System

Cat. A: URM (load bearing) – identified in time frame

Cat. B: pre-76 heavy const. 3+ stories – identified in time frame

Cat. C: pre-35 non-URM 1-2 stories – identified in time frame

Any other building (with restrictions) – "identify at anytime"

Proposed System

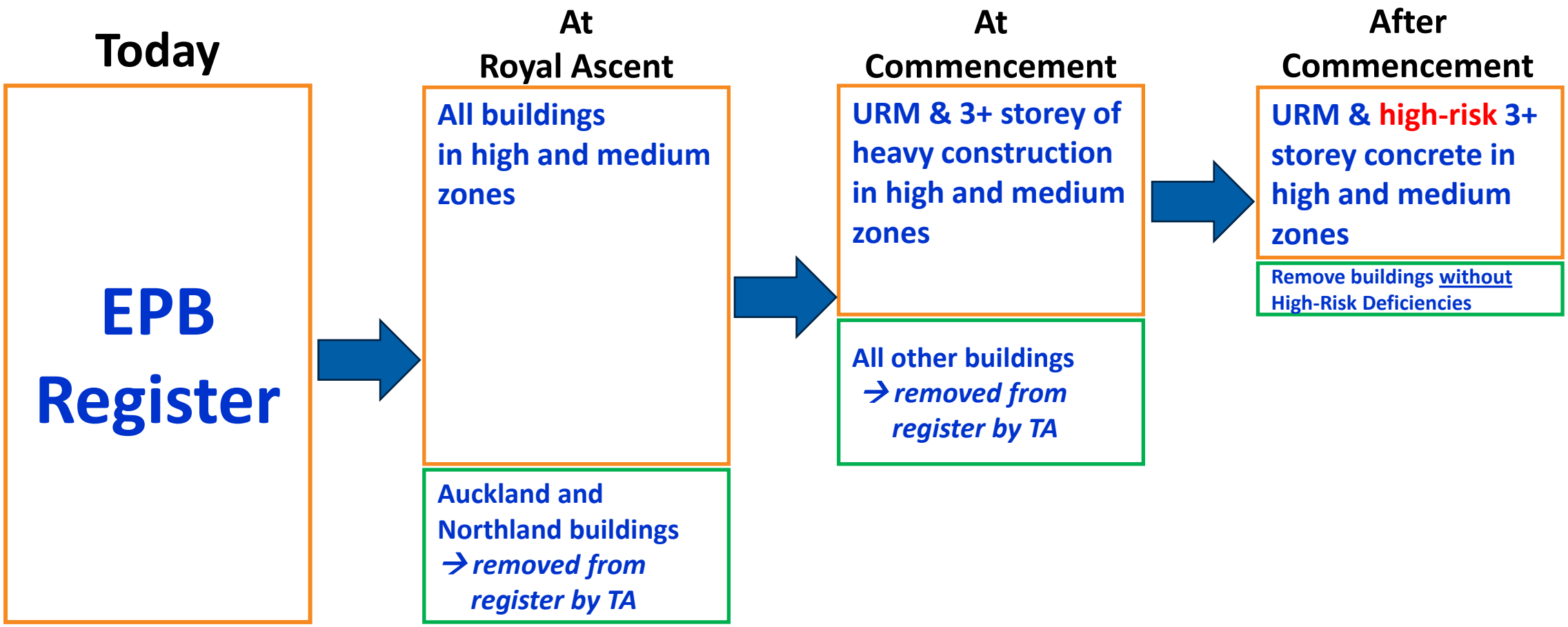
Cat. A: URM (load bearing) – identified in time frame

Cat. B: pre-76 heavy const. 3+ stories – identified in time frame

Post-76 heavy const. 3+ stories – "identify at anytime"

- High zone: Finished identification of profile category buildings
- Medium zone: 35 of 37 TAs have completed identification of profile category buildings
- Dunedin and coastal Otago: Have until 2032 to identify profile category A and B buildings.

Proposed Transition



The Future of %NBS and Seismic Assessments

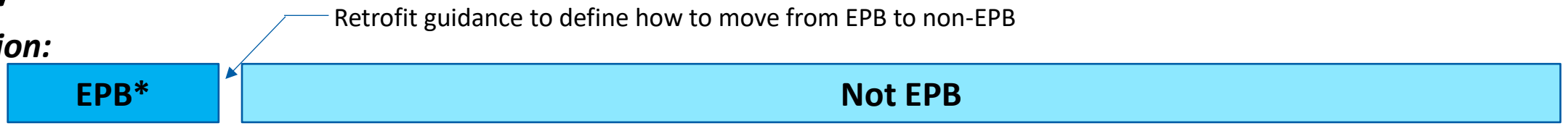
- %NBS and seismic assessments will no longer feature in the EPB system
- Buildings will be identified as EPB through their structural characteristics
  - 'High-Risk Deficiencies' (HRD) – *identified by engineers*
- Identifying HRDs will draw upon information from seismic assessments
- %NBS (or a replacement?) is expected continue to be used for other purposes (outside EPB system)

Replacing %NBS?

Current System:

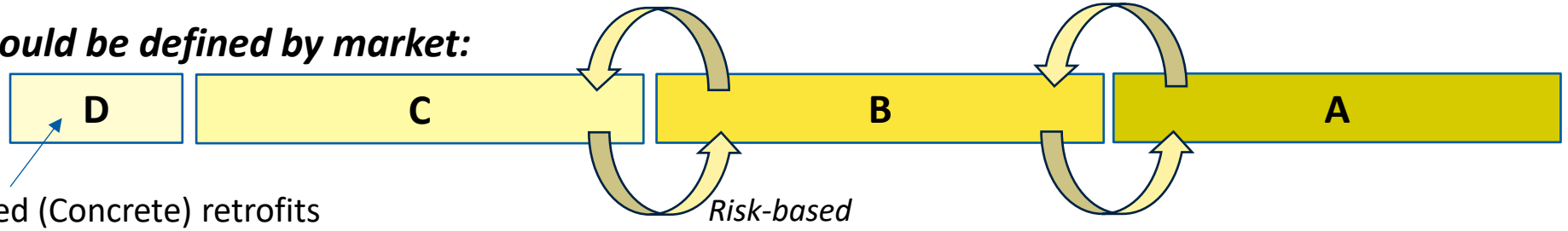
Proposed System:

Regulation:

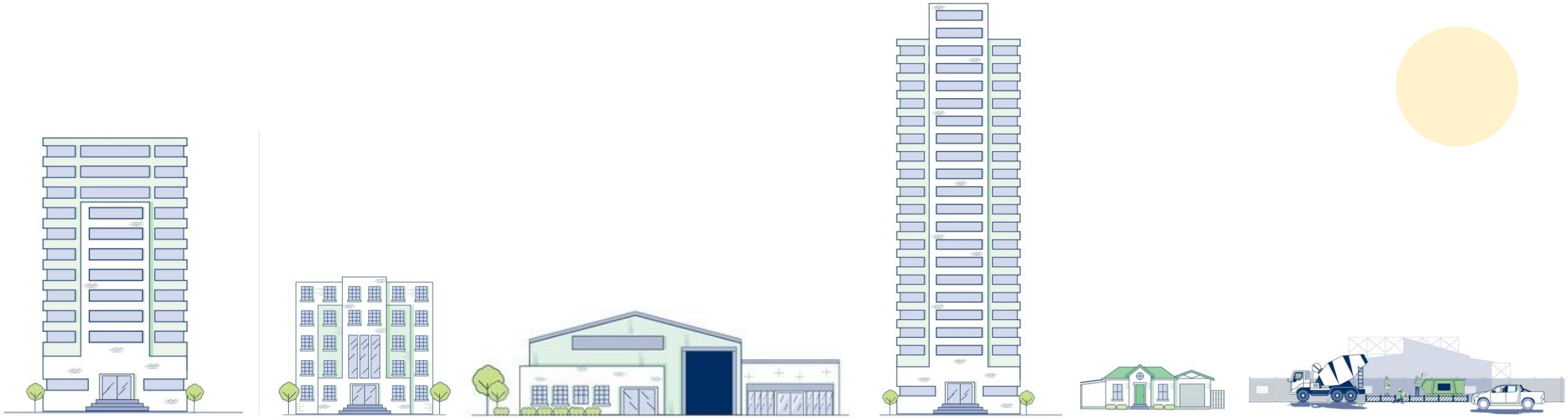


*URM and high-risk concrete 3+ storeys

Possible rating system could be defined by market:



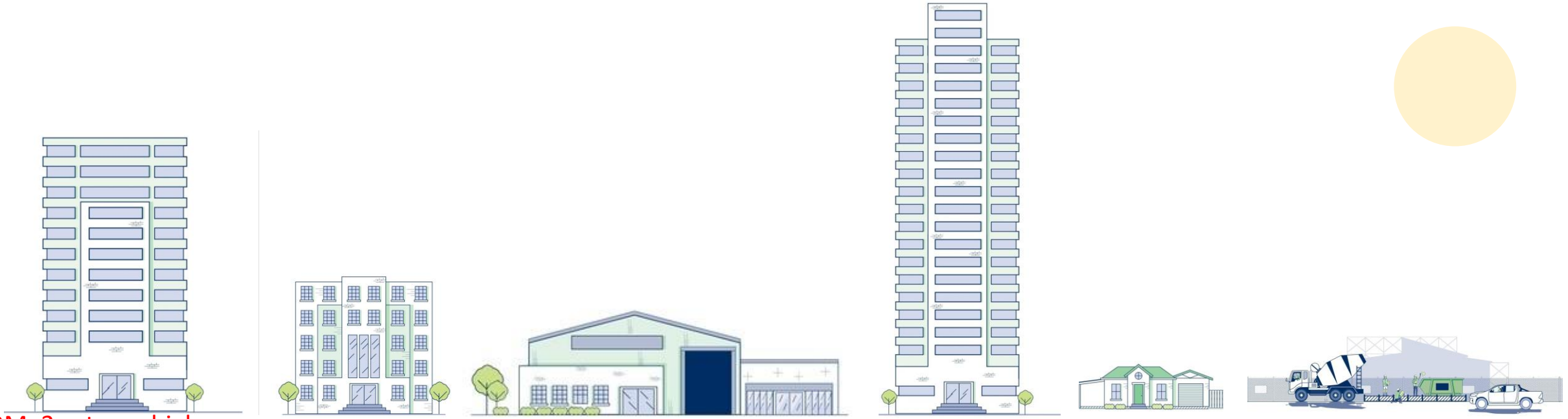
Seismic risk and the current building regulatory system



<34%NBS life safety risk → 34-67%NBS and >67%NBS - economic, resilience, repair cost drivers → 100+%NBS

Earthquake-prone buildings	Not Earthquake-prone Existing Buildings	New and future buildings
Seismic risk regulated through upgrades	*Seismic risk not regulated, but market forces may drive building performance improvements*	*Seismic risk regulated through new standards*

Seismic risk and the updated building regulatory system



URM, 3+ storey high-risk concrete buildings → Lower-Risk Existing Buildings - economic, resilience, repair cost drivers → Building Code

Earthquake-prone buildings	Not Earthquake-prone Existing Buildings	New and future buildings
Seismic risk regulated through upgrades	*Seismic risk not regulated, but market forces may drive building performance improvements*	*Seismic risk regulated through new standards*

Thank you.

Questions?

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