# LESSONS LEARNED FROM GLOBAL BUILDING FAILURES

What would be done differently with the benefit of hindsight?

## New Zealand’s Leaky Building Tragedy

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# Introduction

“From the mid-1990’s thousands of New Zealand homes were constructed with design details, materials, and methods that resulted in leaks, where rainwater could not drain away, frequently leading to damage in the wall assemblies.” (BRANZ).

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# Agenda

- **The Perfect Storm** – background
- **The Impacts** – owners and investors, banks, insurers, building product manufacturers, economy
- **The Response**
- **The Future**

# The Perfect Storm

- In the early part of the 21st century, New Zealand had a ***Prescriptive Building System*** for residential dwellings.
- In 1993, a new ***Performance Based Building System*** was essentially fully effective.
- Designers began looking at **international design trends and materials** → wider range of house styles
- **Houses also became larger, taller and more complex** – increasing wind and rain exposure,
  - Suddenly house styles and features designed for dry climates were being erected in NZ's high wind and rainfall areas
  - Inadequate features and detailing included:
    - parapets,
    - decks, low roof slope
    - membrane roofs,
    - lack of eaves and
    - complex junctions

Hurricane Maria 20 September 2017

# The Perfect Storm cont'd

## Increased range of material availability

- From the early 90's – many ***not fit-for-purpose, used in wrong situations,*** or ***incorrectly***
  - Manufacturers ***overstating performance***
  - Designers and builders ***not following manufacturer instruction***
  - Manufacturers ***not testing*** or not providing ***interaction information*** with other materials
  - **Builders not communicating with designers** when designs were problematic
  - ***Direct-fixed monolithic cladding design boom in the 1990's***
    - a time where 1000's of houses were built using direct-fixed monolithic cladding
    - most claddings were EIFS and fibre-cement stucco (polystyrene sheets and cement based plaster)
    - Water entering via penetrations and door/window junctions was trapped in the structure as there was no drainage cavity

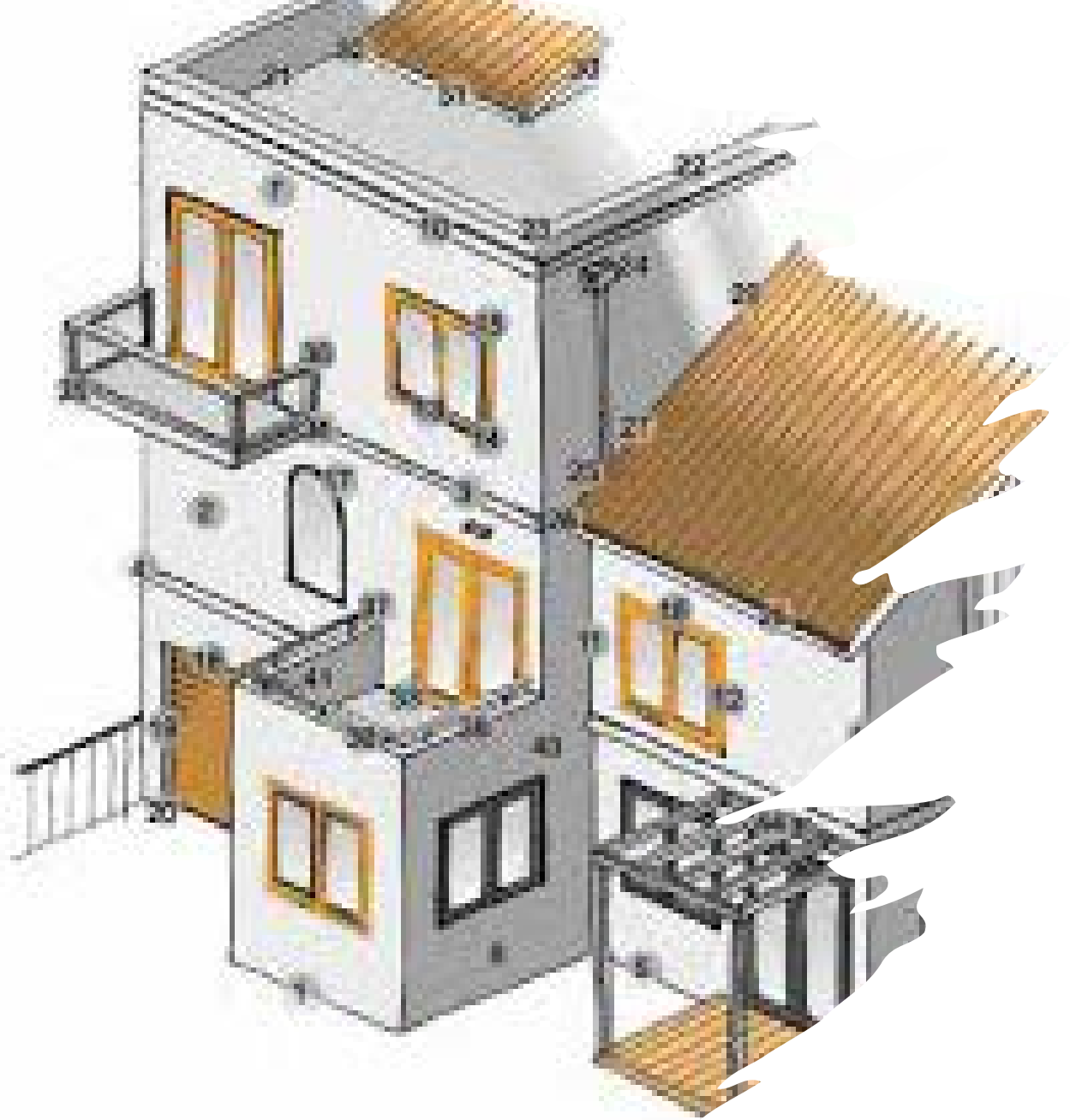
# The Perfect Storm cont'd


## Changes in Timber Treatment

- Lobbyists had pushed for abandonment of boron treatment
- From 1998 to 2004, homes were commonly constructed with kiln-dried timber framing
  - Exotic softwood pinus radiata from fast growing immature stands

BUT

  - Kiln-dried timber (both heart and sap) is susceptible to anobium beetle and fungi rot when wet

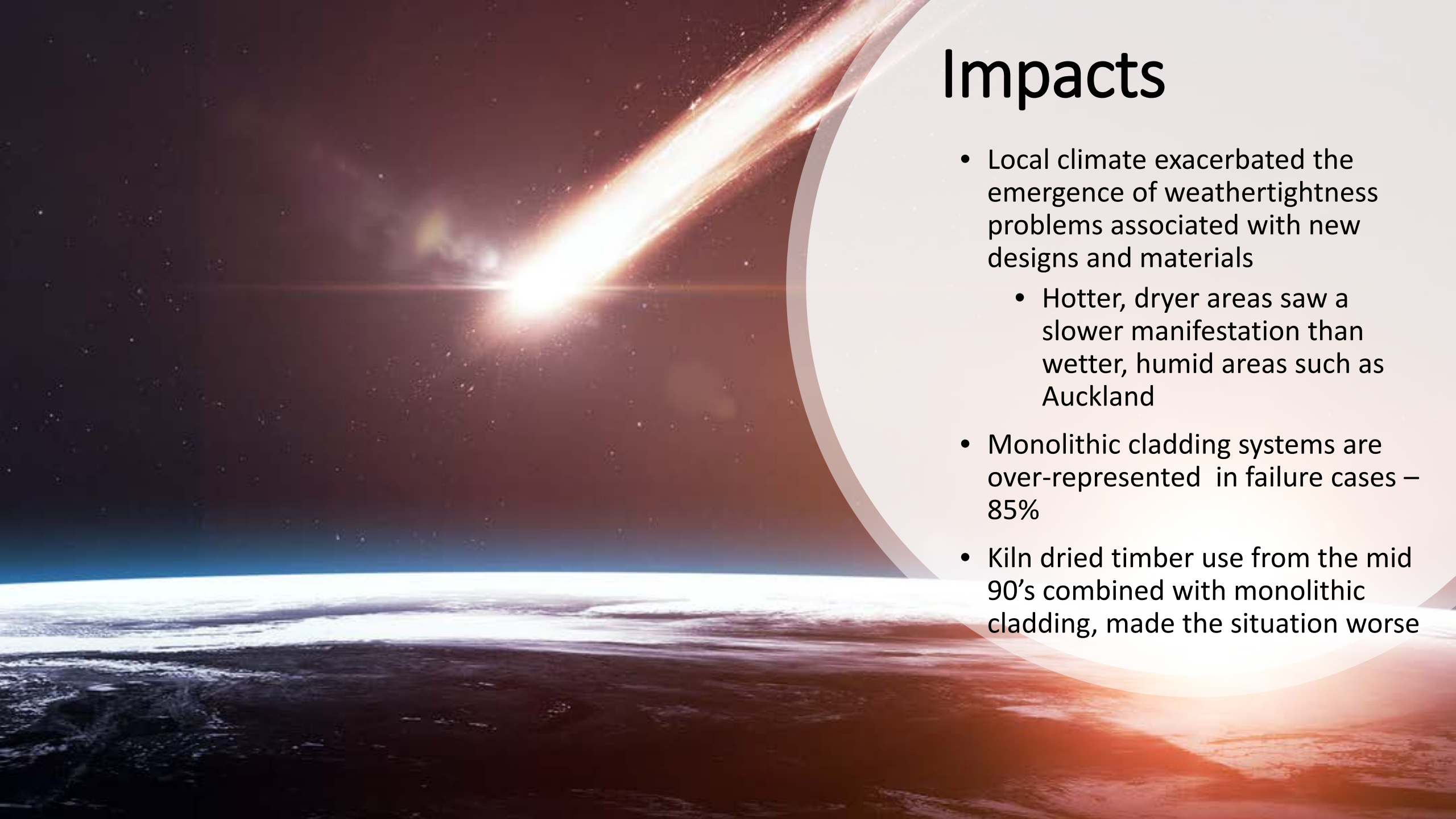


# • The Perfect Storm cont'd

- **<u>Inadequate Detailing</u>**
  - By designer or builder – such as:
    - including lack of and poorly installed flashings,
    - insufficient surface drainage,
    - poorly detailed and constructed joints,
    - poorly detailed membranes,
    - lack of cladding overlap, and
    - inadequately detailed cladding penetrations (pergolas, decks, shutters)

- **<u>Incomplete Documentation</u>**
  - Builders and designers saving costs for Building Consent
  - Private building certifiers introduced

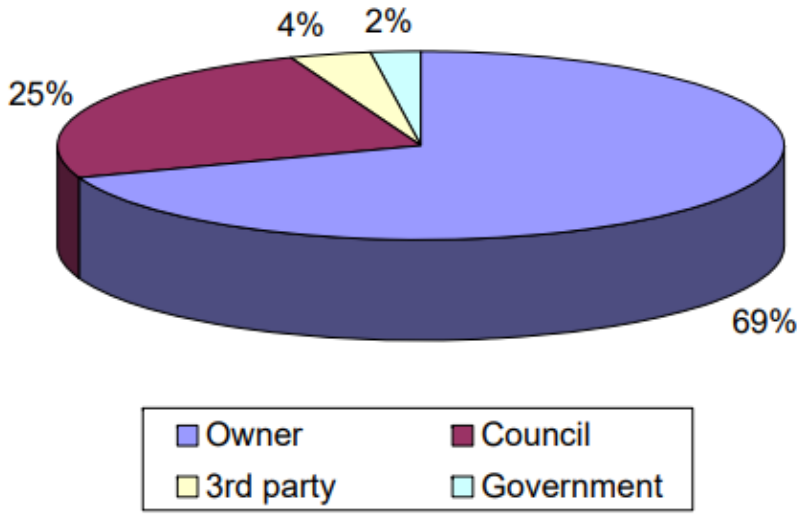
- **<u>Boom Cycle</u>**
  - lack of supervision and inflow of unskilled workers



# Impacts

- Local climate exacerbated the emergence of weathertightness problems associated with new designs and materials
  - Hotter, dryer areas saw a slower manifestation than wetter, humid areas such as Auckland
- Monolithic cladding systems are over-represented  in failure cases – 85%
- Kiln dried timber use from the mid 90’s combined with monolithic cladding, made the situation worse

**Figure 24: Estimated distribution of weathertightness costs, by party (%, 1992 – 2020)**




Source: PwC modelling estimate based on assumptions confirmed by expert opinion.

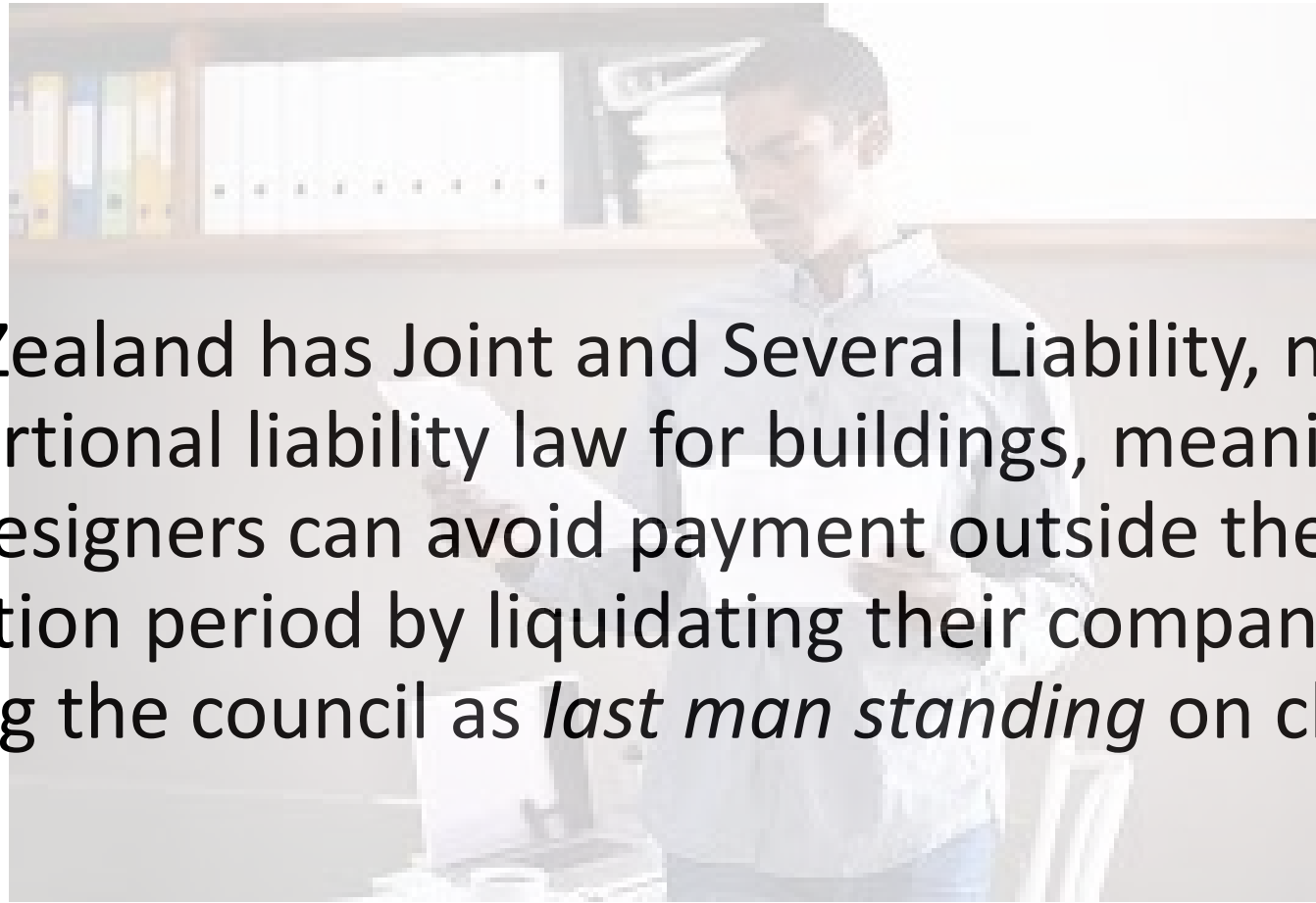
# Impacts

## Owners

- Shouldering the vast bulk of leaky home expense
- 3 types of Leaky Home owners:
  - The Fixers
  - The Delayers (usually finance related)
  - The Head in the Sand-ers
- Owner impacts also include health, mental health, long term indebtedness, insurance renewals, mortgage renewals, remediation stress, relocation
- Sellers become increasingly aware of **Leaky Home syndrome**
  - Repair and Remediation focus

# Councils

# Impacts



- New Zealand has Joint and Several Liability, not proportional liability law for buildings, meaning builders and designers can avoid payment outside the 10-year limitation period by liquidating their companies and leaving the council as *last man standing* on claims

# Banks

# Impacts

- Banks became increasingly cautious
  - Significant mortgage portfolio exposure
  - Many home owners struggle to re-mortgage leaky buildings due to financial position
  - Pre purchase building inspection reports increasingly essential
  - Any weathertight issue – An immediate *"No"* response


Subsequent evaluation of leaky buildings reflect the condition of the leaky building status – not worth what it was

# Response

From 1991 New Zealand has had six prime ministers.

- Research: The Hunn Report
- Select Committee inquiry
- NZS3602 revised in 2003 to no longer allow untreated timber for use in exterior walls
- Legislative change (New Building Act 2004)
- Weathertightness Homes Resolution Service  Act (WHRS) 2006 came into force

The government response has not significantly reduced the cost to homeowners.

The Building code within the Act since 1991 has only been changed for Structure and Fire.

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# Our leaky home shame

17/12/2017 Like 43

- The amendment to the acceptable solution for external moisture E2/AS1 came into effect requiring, among other things, stucco cladding to be used only over a wall cavity was published in June 2005
- Weathertight Homes Resolution Service Act 2006 come into force – with key provisions for future damage and general damages being able to be claimed, more easily for multi-unit buildings.
- 2004 Schedule 1 of the Building Act 2004 amended to reinstate 1993 provision requiring durability failures to require a building consent

# Costly choices

Some typical house designs that contributed to the leaky building issues


# Future

- It still is New Zealand's largest and most expensive man-made problem
- 30 years on it casts a shadow over our economy and housing market
- Remediation costs have depleted funds available for new home builds, leading to a shortage of housing
- PWC in 2017 estimated New Zealand's leaky building crisis has a cost implication of $20B
- The authors of "Rotten to the Core - The story of New Zealand's Leaky Home Catastrophe" are probably more realistic with their $30 to $100B
- The middle ground ($50-$60B) represents about 20% of NZ's GDP
- With costs of building materials rising by about 20% in the last two years, the ability for home and apartment owners to find the $250-$450K to remediate their properties is a difficult conundrum

# Future

## The Residential Building Stock

- The high repair costs will prolong the leaky building saga.
- Potentially there are still 150-200K buildings requiring remediation
- Approximately 400,000 homes have been built with untreated timber (1995-2004)
- Remediation has diverted scarce skilled resource away from new builds and an uptake in unskilled labour on construction sites adding to NZ’s housing shortage and housing affordability issues

# Thank you