# Grossly Disproportionate – *how much is enough?*

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RISK NZ

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# RiskNZ

- RiskNZ is the New Zealand professional body bringing together people and organisations managing risk.

- Membership of RiskNZ includes many public sector and commercial organisations with a vital interest in managing risk well.

www.risknz.org.nz

# Risk Acceptance Criteria SIG

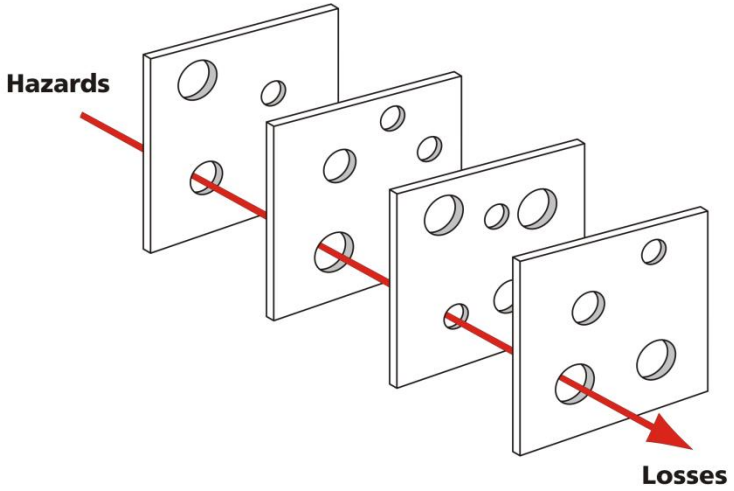
- A RiskNZ Special Interest Group has been formed to explore and develop guidance for risk practitioners on practical methods for determining acceptability of risk and the associated criteria.
- Such criteria are likely to be important when considering end points for Safety in Design.

# Overview

| Context | Grossly Disproportionate | Possible Model | Way forward |
| --- | --- | --- | --- |
| A look at Safety in Design, NZ risks and existing criteria | What is grossly disproportionate? | Synthesis - a possible model to assess grossly disproportionate | What's missing and what is the way forward? |

# Risk Management

- Risk management
  - tools can vary between industries
  - core approach remains the same



# Safety in Design Approach

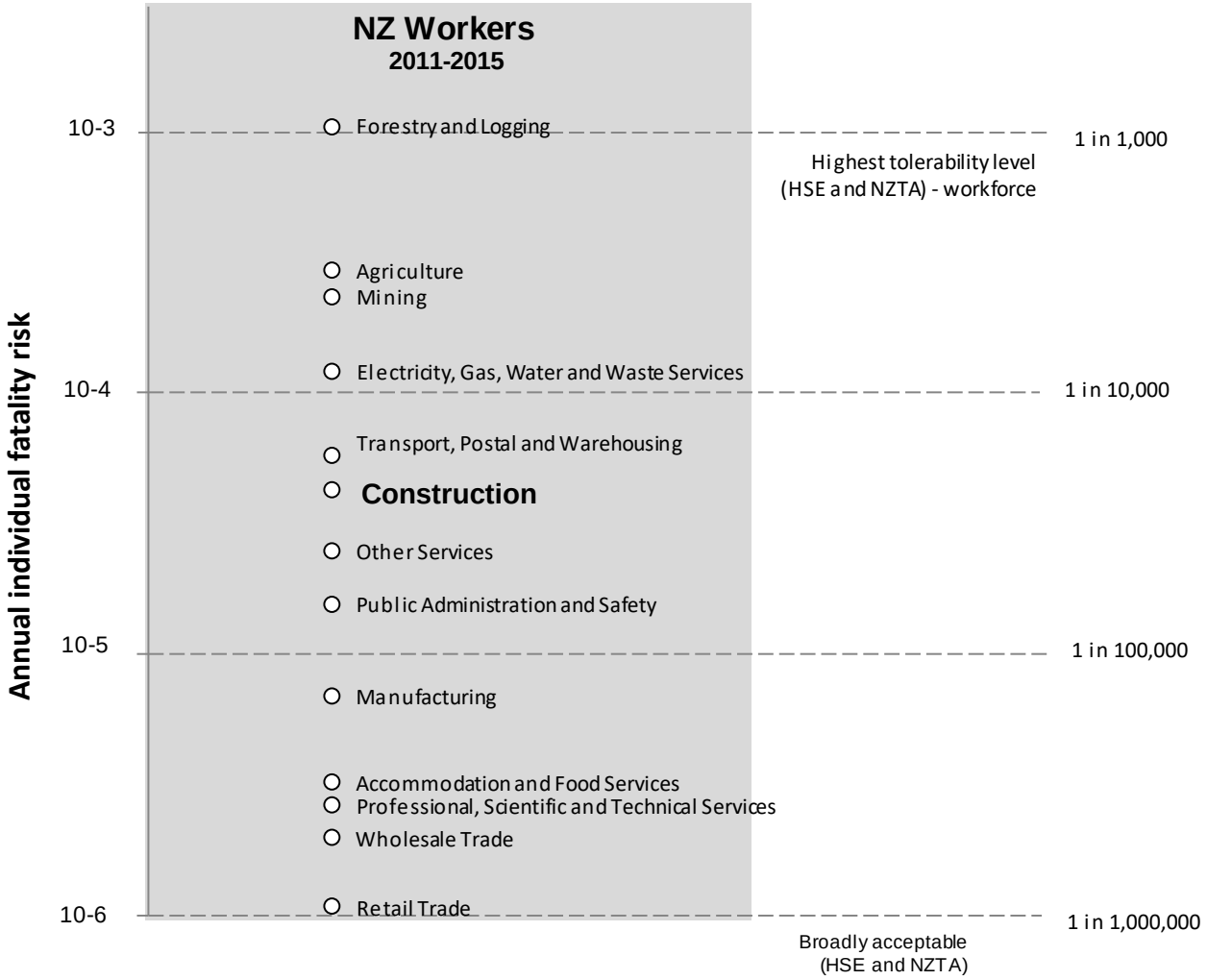
- Identify risk tools appropriate to your operations
- Implement controls based on risk
- Demonstrate your action or policy is appropriate for the risk

How far to go?

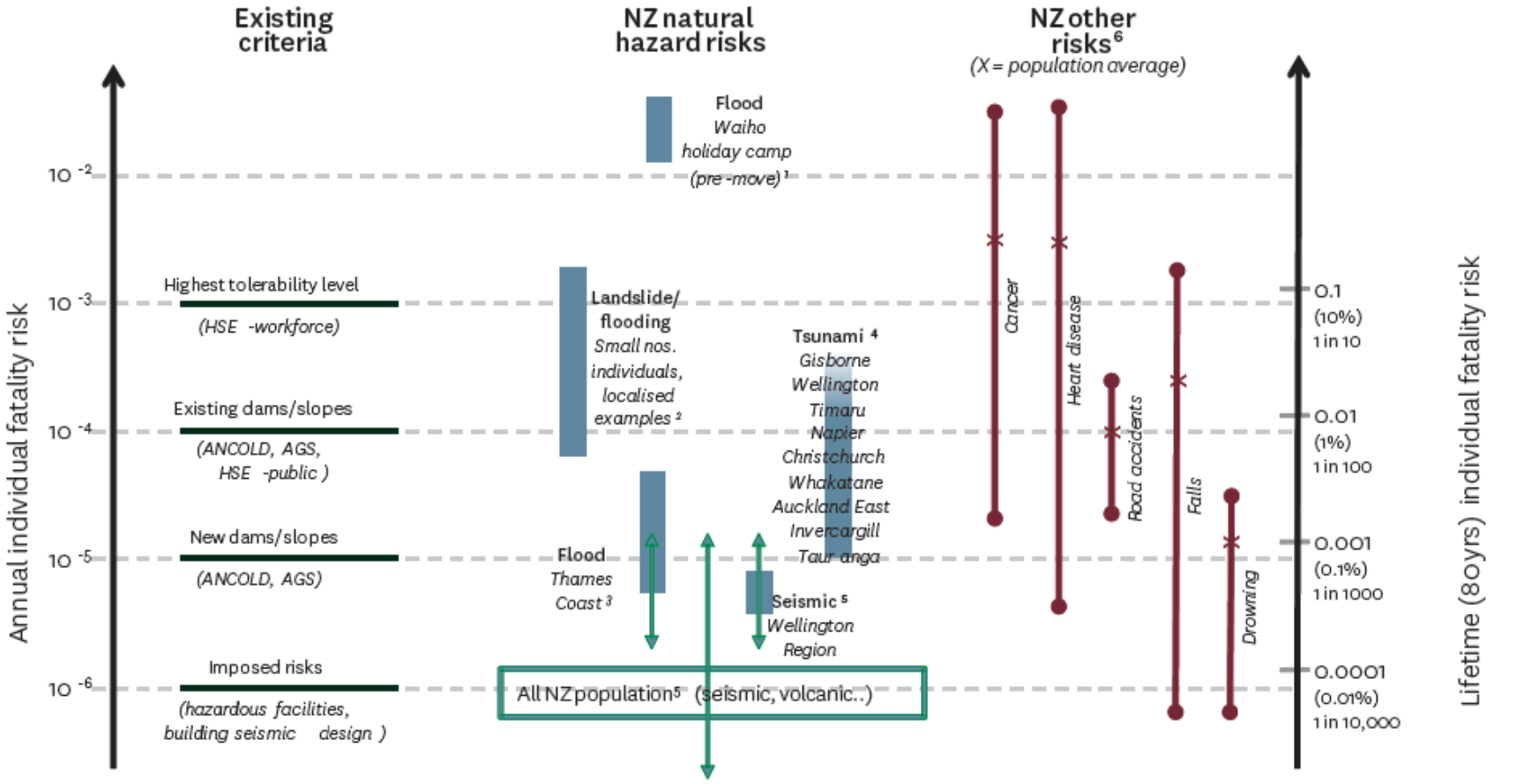
# NZ Worker risk

- Comparison of fatality rates across a range of NZ industries
- Prepared by Navigatus using
  - Fatality  data by industry (WorkSafe 2016)
  - Employment counts by industry (Statistics New Zealand)

# NZ Worker risk



# Existing NZ risks and criteria




**Notes:**

1. Derived by the authors from results of MCDEM risk assessment (Optimx, 2002)
2. Estimated by the authors based on reasonable event return periods and likely consequences - see Report Section 4.1.2
3. Upper estimate for High Risk zones; arrow denots wide range of risks downward (URS, 2003)
4. AIFR at 2-4m above sea level, no effectiveness assumed for warning (Webb, 2005)
5. Averages over large populations; arrows denote likelihood of substantial groups of people at higher/lower risk
6. Bars show range of values across age bands for men and women (Ministry of Health, 2008)

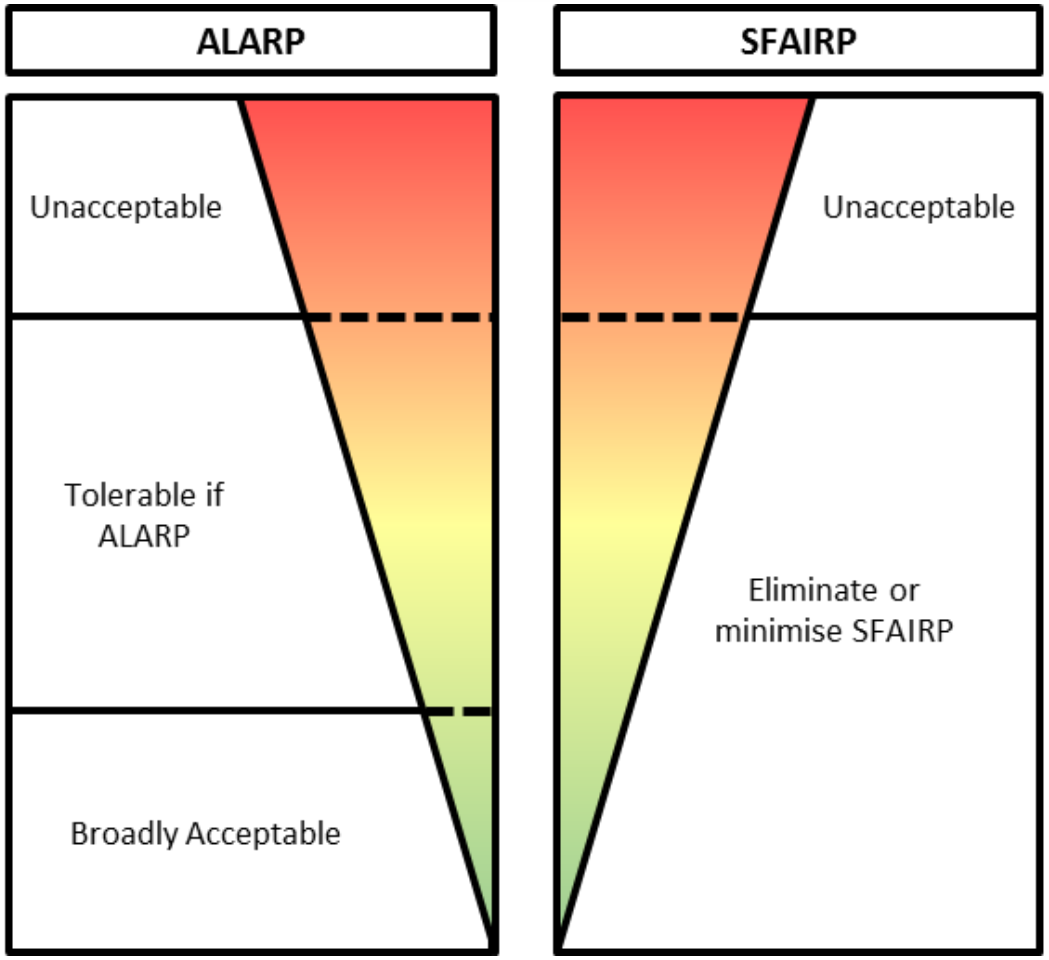
Source: Willis 2014

# WorkSafe NZ

Know your health and safety **Risks** ...


... manage them **proportionately**

# SFAIRP


ALARP
Unacceptable
Tolerable if ALARP
Broadly Acceptable
SFAIRP
Unacceptable
Eliminate or minimise SFAIRP

# When is it safe enough?

SFAIRP, how do you know when to stop?

- This question has important policy implications:
  - Approaches that are too lax may lead to avoidable death and injury.
  - Approaches too strict may divert users to less safe alternatives (a worse societal outcome).
  - If funded from the public purse, a solution may divert funding from more cost effective means of advancing social welfare.




# What is reasonably practicable?

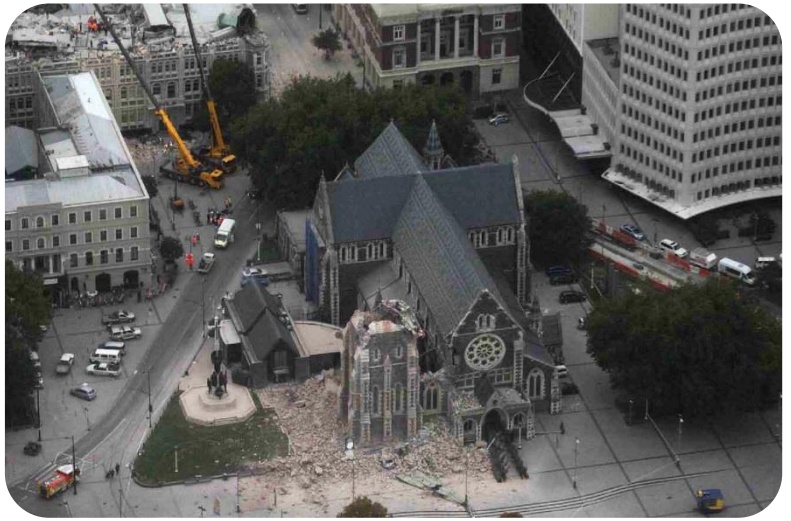
- Society's perception of what is and is not reasonably practicable is likely to vary greatly depending on the circumstances.

- Case law introduces the concept of 'grossly disproportionate'. Extreme examples (HSE) might be:
  - To spend £1m to prevent five staff suffering bruised knees is obviously grossly disproportionate; but
  - To spend £1m to prevent a major explosion capable of killing 150 people is obviously proportionate.

# When is a risk grossly disproportionate?

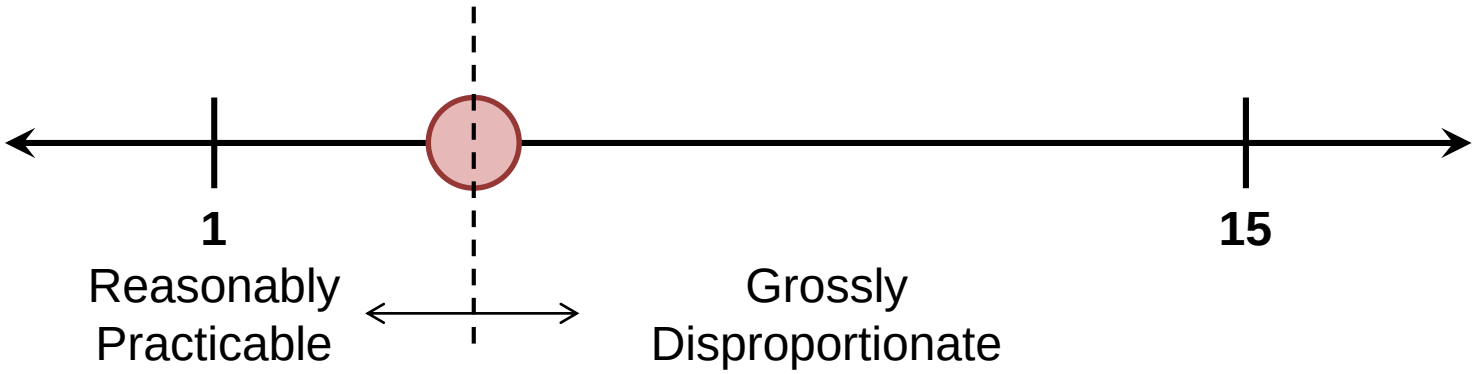
# Grossly Disproportionate

- We define “g” as being the point where costs are grossly disproportionate in relation to benefits
  - *Note;*
    *benefits = Value of a Statistical Life x ΔPotential Loss of Life*



# UK HSE

- UK HSE suggests a “g” ratio
  - less than or equal to the statistical value of a life is reasonably practicable;
  - A cost 15 times the statistical value of a life is disproportionate.



# UK HSE Rule of Thumb

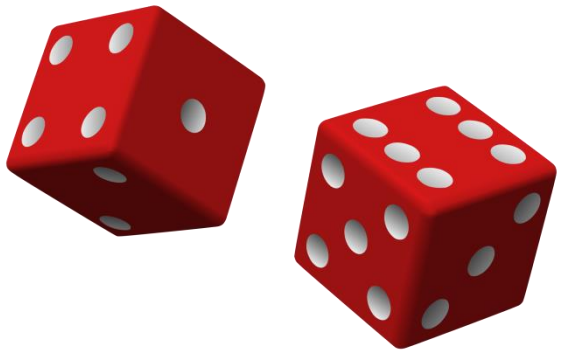
- HSE advises that each decision on proportionality should take into account
  - the level of individual risk and
  - the extent and severity of the consequences of major accidents.
- This results in the recommended rule of thumb of the ratio for gross disproportionality (g)
  - Workers - ratio of 3
  - Public – ratio varying between 10 for higher risks and 2 for lower risks

# Examples (g)

- **Examples:**
  - 1987 Sizewell — Workers: g = 3; Members of Public: g = 2 to 10 (depending on level of risk)
  - 2006 HSE Offshore installations: g = 6 (using VSL £1m)



# Influencing Factors



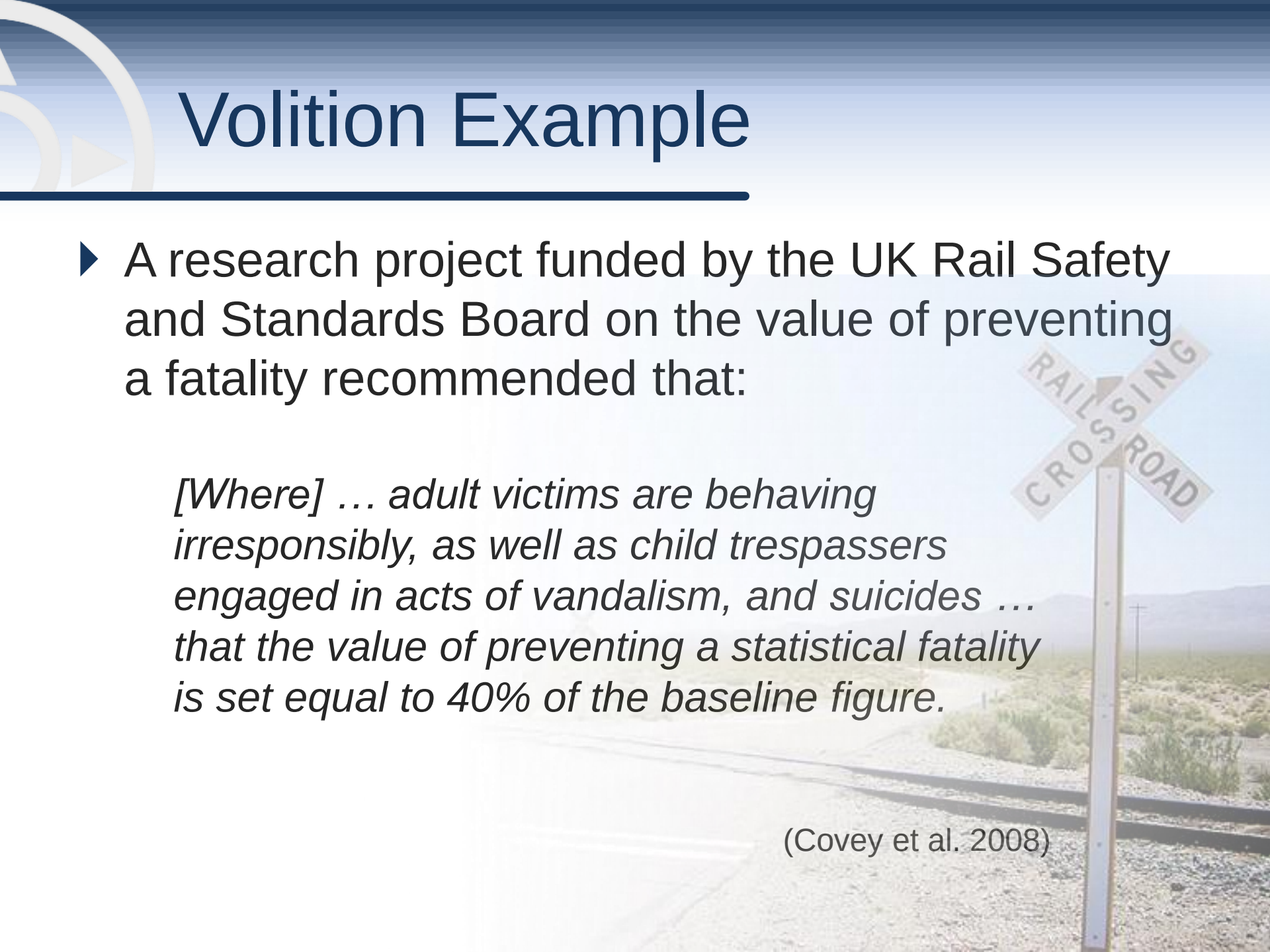
- Factors that can influence the value of g;
  - Volition (including control, choice)
  - Likelihood
  - Uncertainty (especially for high consequence, low probability events)

# Volition Example

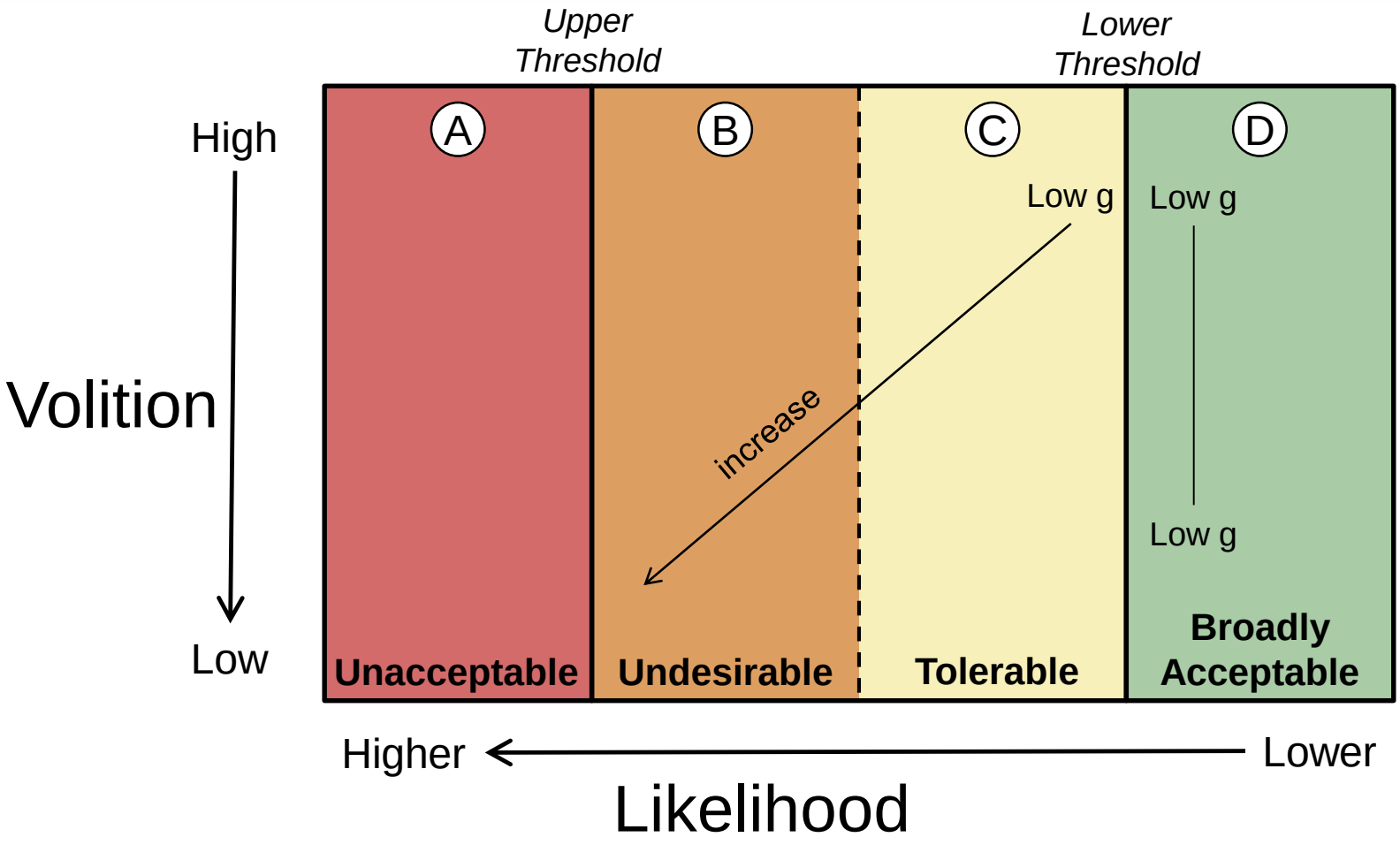
- A research project funded by the UK Rail Safety and Standards Board on the value of preventing a fatality recommended that:

  *[Where] … adult victims are behaving irresponsibly, as well as child trespassers engaged in acts of vandalism, and suicides … that the value of preventing a statistical fatality is set equal to 40% of the baseline figure.*

  (Covey et al. 2008)



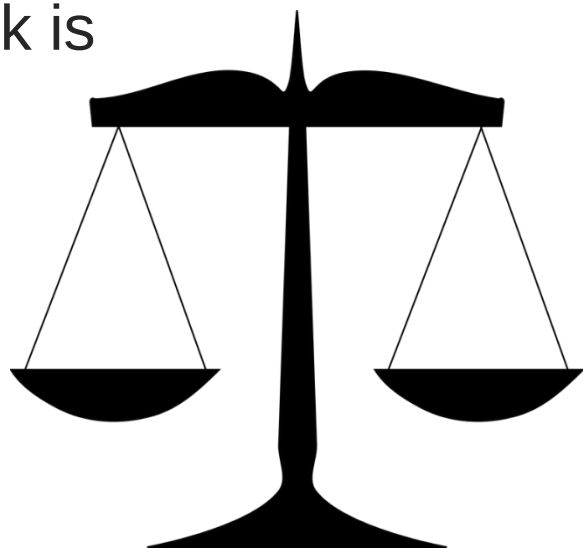
# g - Possible Conceptual Model




g = gross disproportionality

# Dealing with uncertainty

- Precautionary principle – benefit of doubt goes towards safety
  1. Need to be highly certain that risk is not in unacceptable region
  2. If incident is low probability, high consequence then increase g? (or increase required certainty?)
  3. Need degree of certainty that the risk is appropriately assessed



# Outcomes

- Having defined g (the target level for SFAIRP) it is then possible to benchmark current operations (ie calculate $g_{Observed}$). This should lead to:
  - Robust decisions
  - Proportionate solutions


Image: WorkSafe NZ

# What's missing?

- Practical guidance on method and practices to determine acceptability of risk in differing contexts
- Guidance on selection of g values for various conditions

# Thank you

- Comments and questions?
- Would guidance on grossly disproportionate be helpful to Safety in Design practitioners?

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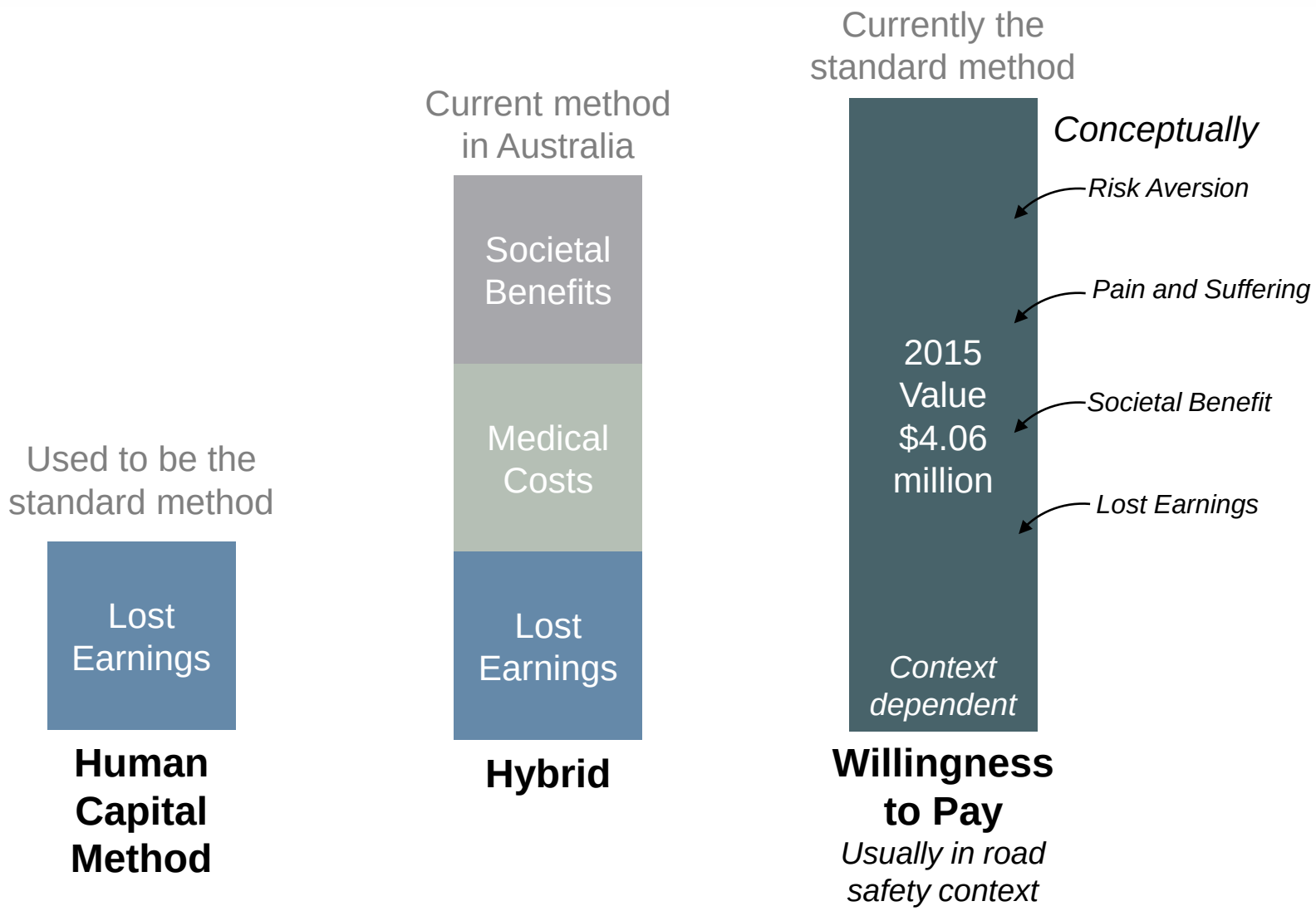
# Deciding the cut-off

- One tool to compare and rank alternatives is the Implied Cost of an Avoided Fatality (ICAF).
  - ICAF = C/$\Delta$PLL

    *where;  C = net cost of option*

    *$\Delta$PLL = change in potential loss of life*

# Value of Life Saved



# Value of Life Saved

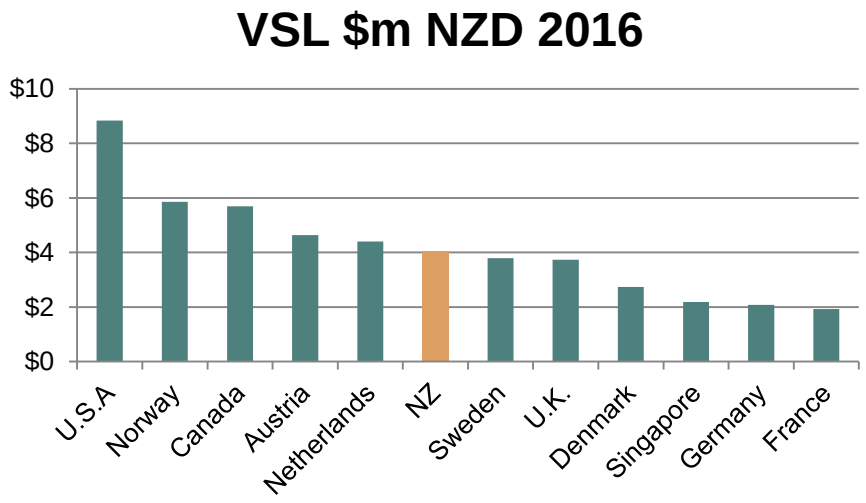
**Examples:**

- Edwards vs National Coal Board (1949)
  - Compensation of £984 (1949)
    £32k (2016) $70k (NZD 2016)

- UK Court Compensation (1952-2002)
  - Average compensation of £157k $330k (NZD)
  - All were less than £200k $420k (NZD)
  - HSE VSL at the time was £1m (≈ 2002)
    - VSL was 5 times the compensation amount

# Value of Life Saved

- The current VSL is derived from a 1991 study by Miller and Guria asking approx. 600 people what they would be willing to pay for various improvements in road safety.
  - This implicitly includes a degree of risk aversion




Source: MoT Understanding Transport Costs and Charges (2009), inflated to 2016 in local currency and converted to NZD.

# Volition Example

- A research project funded by the UK RSSB on the value of preventing a fatality (Covey et al. 2008) found that:

  *For cases in which adult victims are behaving irresponsibly (including adult trespassers engaged in acts of vandalism, car drivers behaving irresponsibly at level crossings, and drunks falling from platforms), as well as child trespassers engaged in acts of vandalism, and suicides, the Value of Preventing a Statistical Fatality (VPSF) ratios relative to the baseline case all lie in the region of 0.4:1 so that for such cases it is recommended that the VPSF is set equal at 40% of the baseline figure.*