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Grossly Disproportionate – how much is enough?





Grossly Disproportionate – *how much is enough?*

Presenter: Kevin Oldham
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Overview

Context

A look at NZ risks and existing criteria

Value of Statistical Life

VSL as applied in New Zealand and abroad

Gross Disproportion

What makes a risk grossly disproportionate

Possible Model

Synthesis - a possible model to assess gross disproportionality

Way forward

What's missing and a possible way forward



Scrutinising benefits

‘There is a growing propensity to scrutinise benefits against potential undesirable side effects. This is particularly true for risks which could lead to catastrophic consequences, where the consequences may be irreversible or which lead to inequalities because they affect some people more than others’

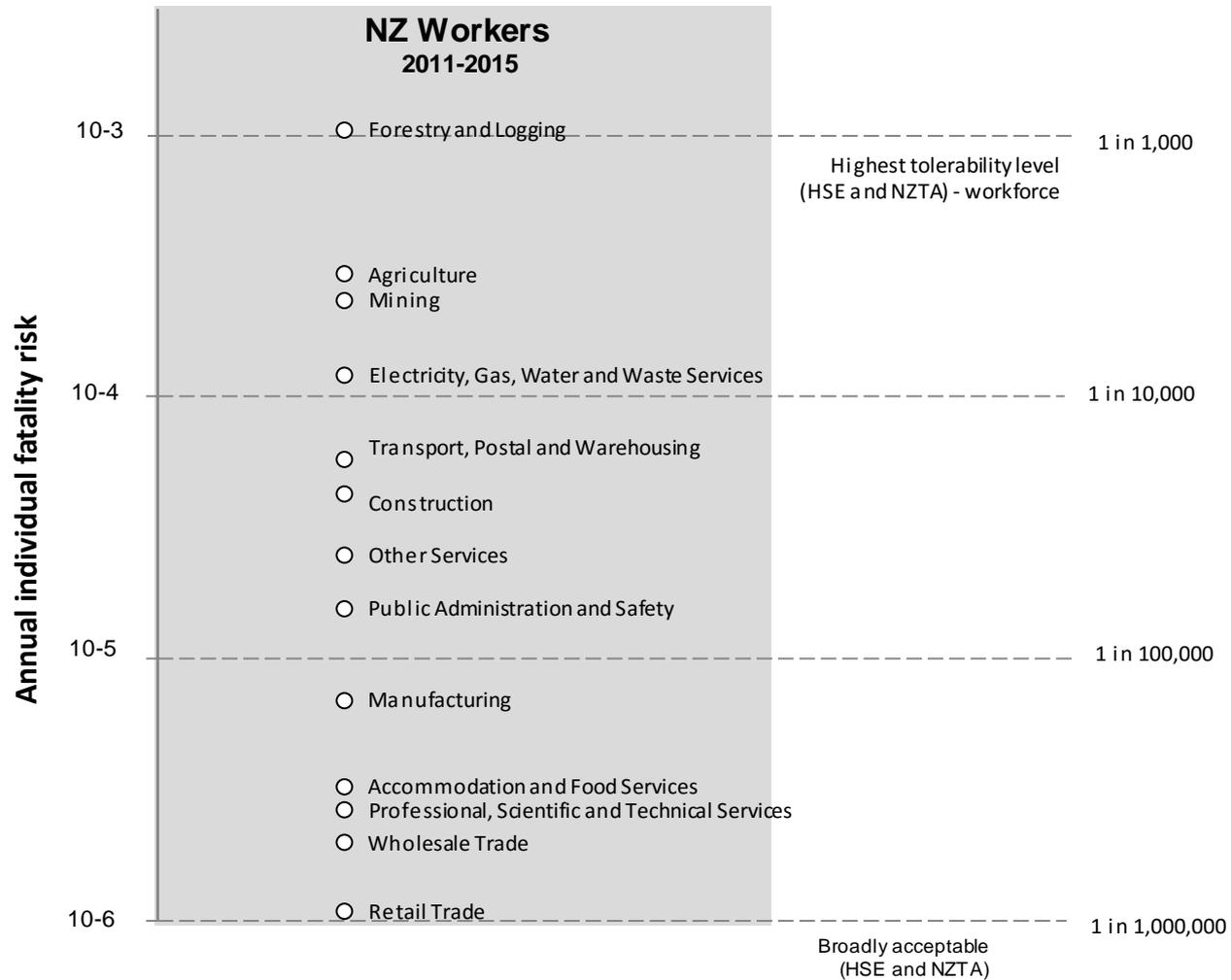
(Health and Safety Executive 2001).



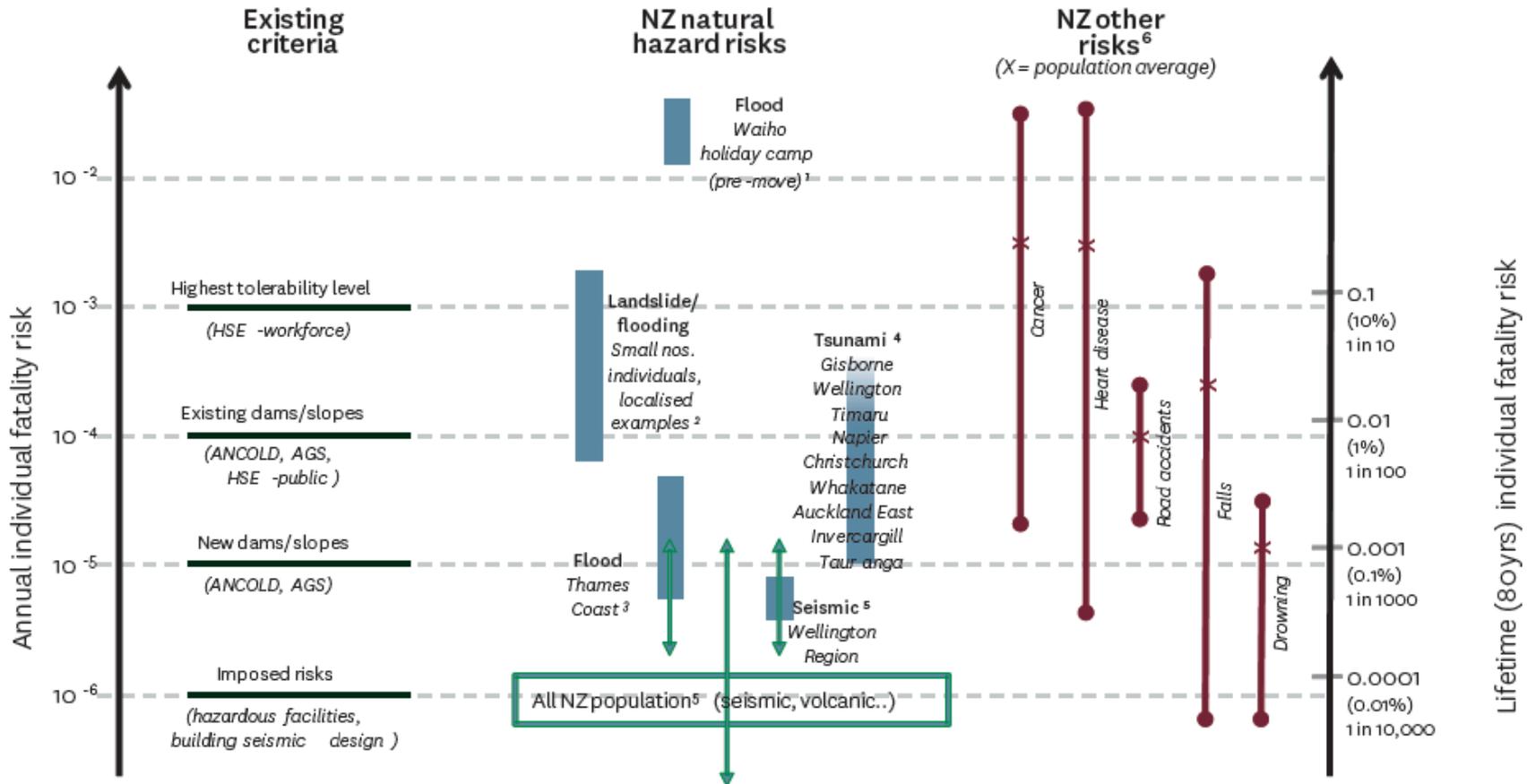
NZ Worker risk

- ▶ 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



NZ risks and existing 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 denotes 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)

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.



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
 ΔPLL = change in potential loss of life





ICAF value

- ▶ UK HSE suggests (non definitive) an ICAF value
 - If ICAF is less than or equal to the statistical value of a life (VSL) then the works are reasonably practicable;
 - A cost of say 15 times VSL would be disproportionate.





Ratio of ICAF to VSL

- ▶ 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) between ICAF and VSL
 - Workers - ratio of 3
 - Public – ratio varying between 10 for higher risks and 2 for lower risks

Value of Life Saved

Used to be the standard method



**Human
Capital
Method**

Current method
in Australia



Hybrid

Currently the
standard method



**Willingness
to Pay**

*Usually in road
safety context*

Value of Life Saved

Examples:

▶ Edwards vs National Coal Board (1949)

- ▶ Compensation of £984 (1949)
£32k (2016) \$70k (NZD 2016)

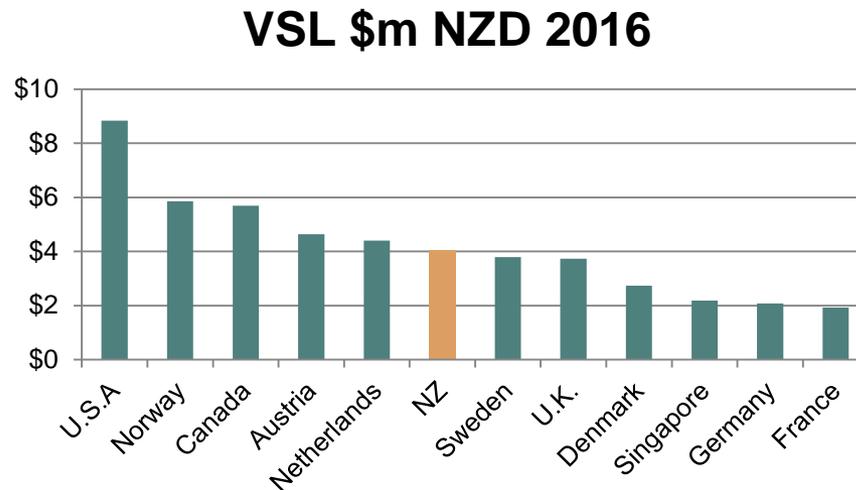
▶ UK Court Compensation (1952-2002)

- ▶ 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 New Zealand 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.



When is expenditure to reduce risk grossly disproportionate?

Grossly Disproportionate (g)

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

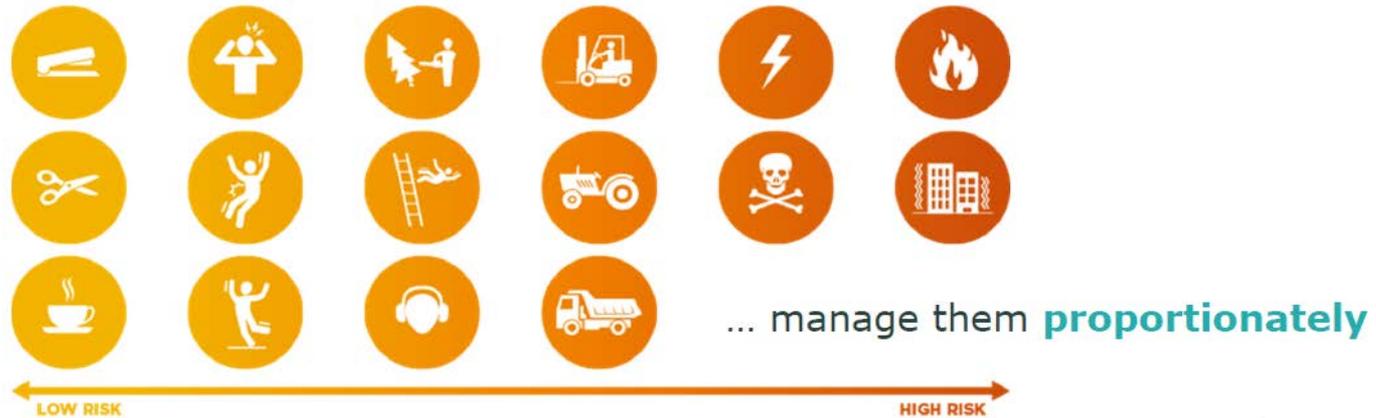


Image: WorkSafe NZ

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

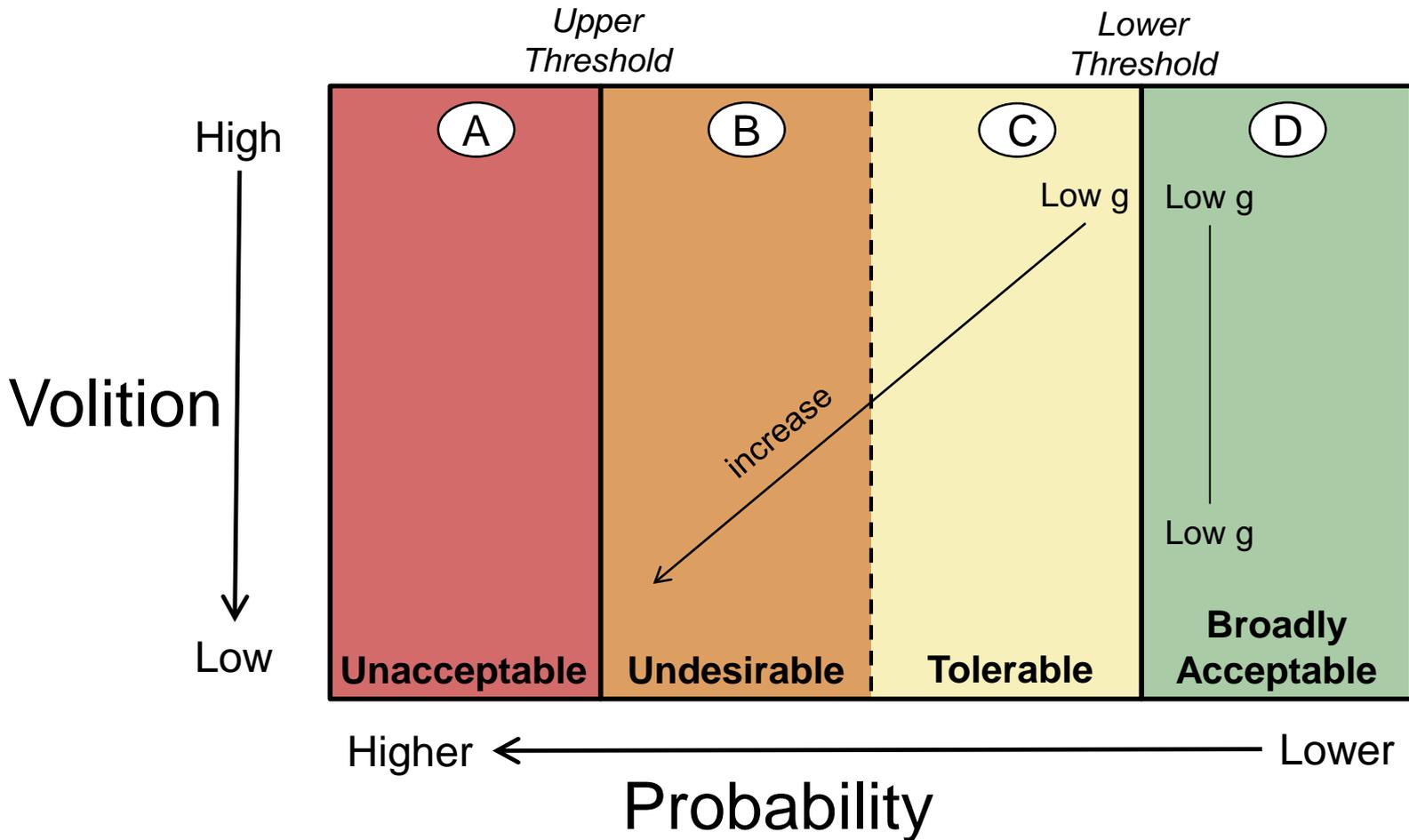
Volition

- ▶ A rail 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.



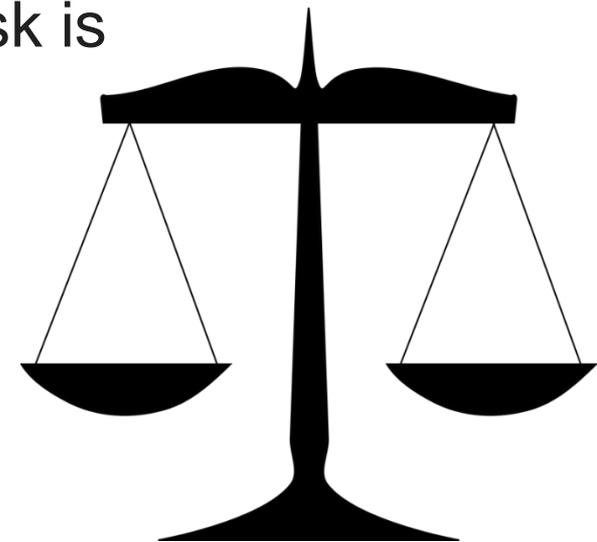
Synthesis – Possible g model



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 the 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 compare current operations (ie calculate g_{Observed}). This should lead to:
 - Better informed decisions
 - Proportionate solutions

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



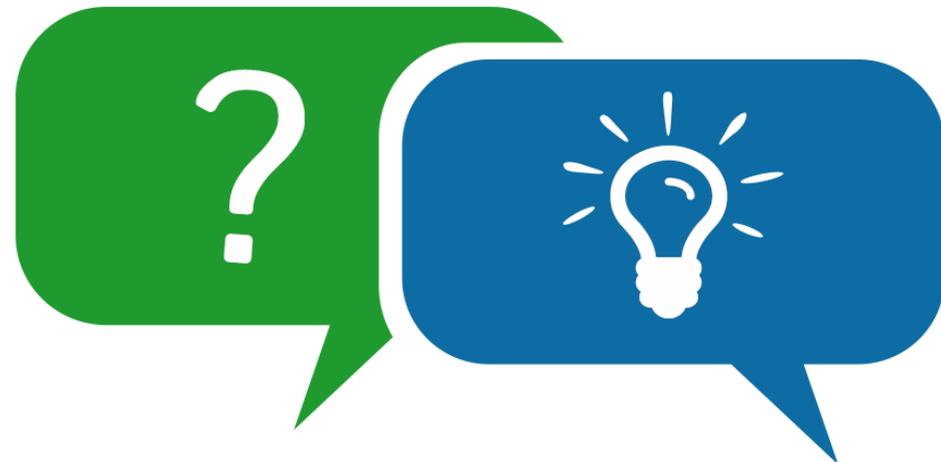


What's needed?

- ▶ Is the current (inflation adjusted) 1991 VSL suitable for application across a wider range of circumstances in 2016?
 - ▶ Guidance on selection of g values for various conditions.
 - ▶ Practical guidance on method and practices to determine acceptability of risk in differing contexts.
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Possible SIG

- ▶ A RiskNZ Special Interest Group has been mooted to focus on exploring and developing guidance to risk practitioners on practical methods for determining acceptability of risk and the associated criteria.





Thank you

- ▶ Comments and discussion
- ▶ Is there interest in exploring this issue further?
- ▶ What might a RiskNZ SIG realistically be expected to achieve?