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Natural hazard risks:

State of existing knowledge and its place in the management of infrastructure assets

Outline

1. Outcomes sought from the work
2. What we assessed
3. Key findings/recommendations
4. Wider context

Outcomes

Supporting the development of the initial AMPs.

For each Entity:

- Extent and scale of assets exposed to natural hazards
- How much of the asset base is covered by a good understanding of the risk exposure
- Recommendations

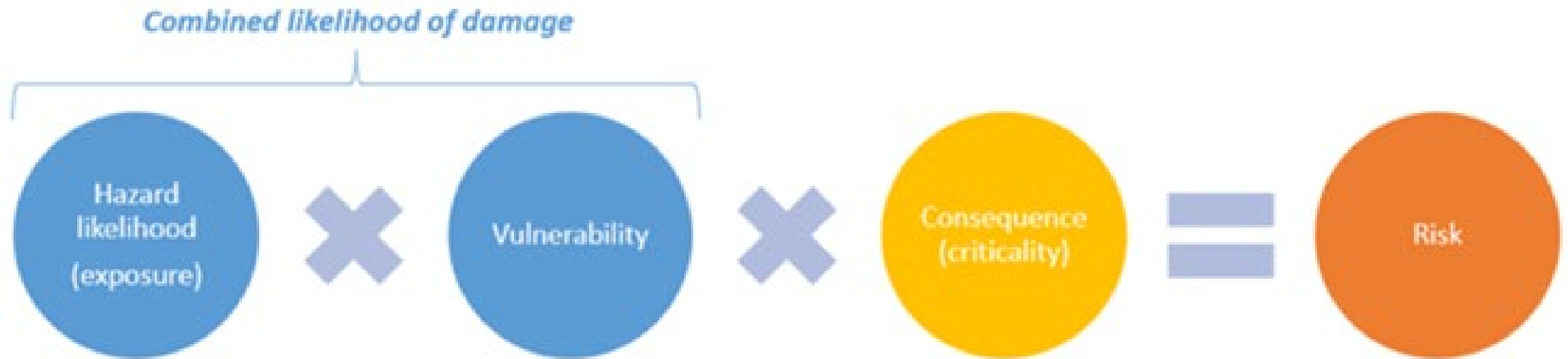
Three overarching principles

1. Make best use of available information.
2. Ensure effort is proportionate to outcomes.
3. Continually improve over time

What we assessed

- Extent and scale of assets exposed to natural hazards
 - Exposure assessment of WWTP and WTP assets
- How much of the asset base is covered by a good understanding of the risk exposure
 - Data maturity assessment of existing AMPs
 - Review of lifelines studies
 - Collated lists of hazard information held by Regional and Unitary councils
- Recommendations

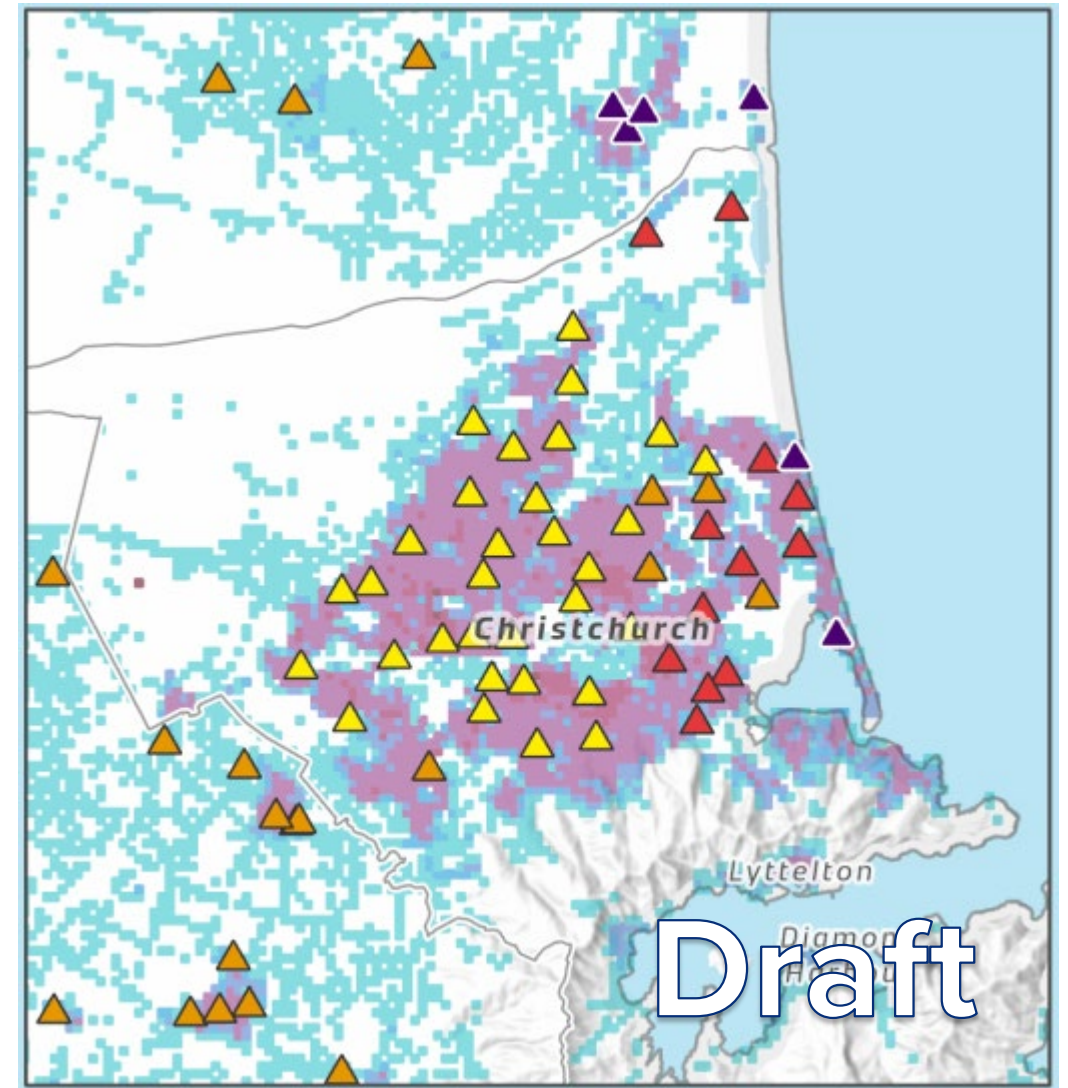
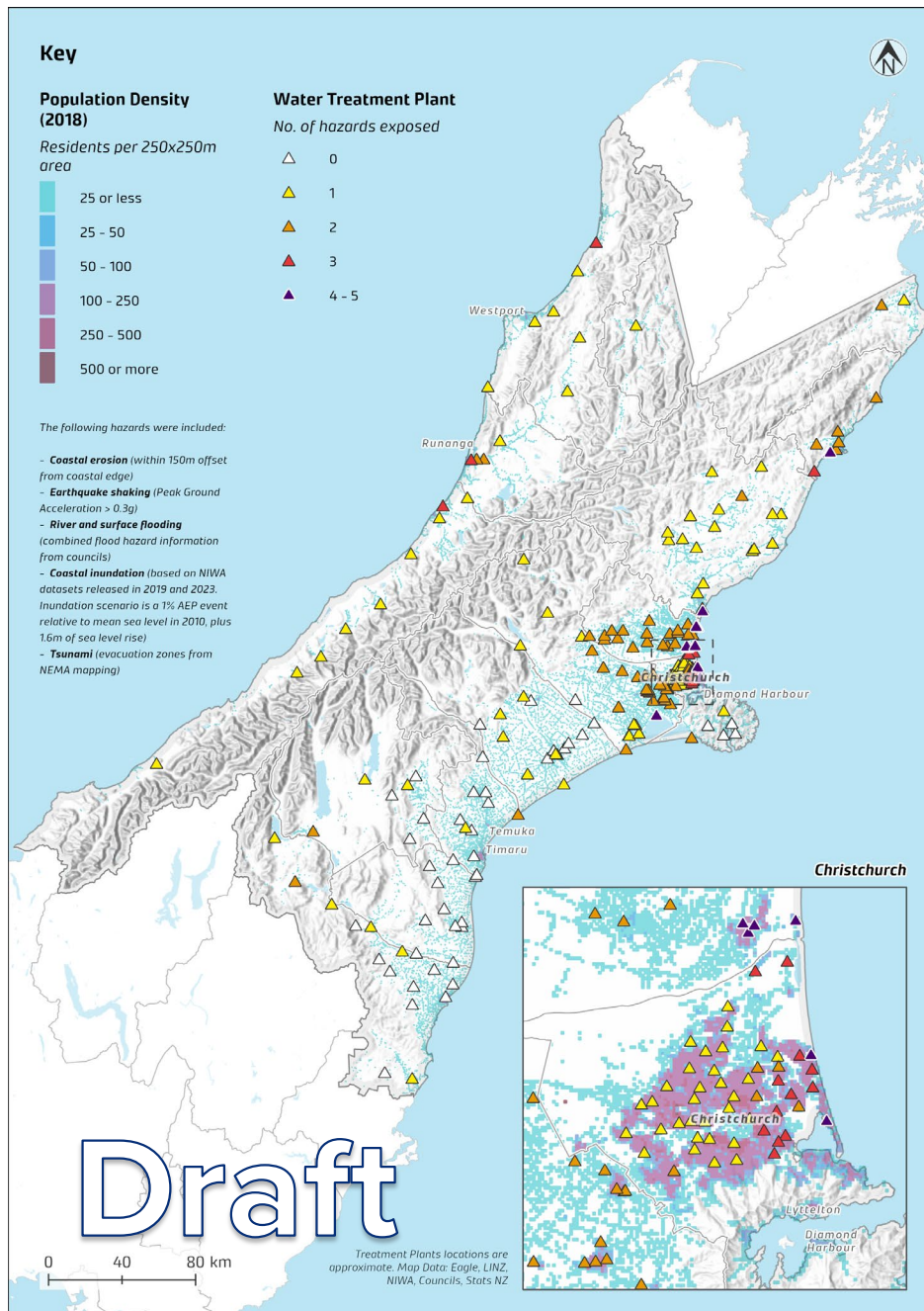
Important definitions



WTP and WWTP exposure assessment

Hazards:

- Coastal inundation
- Tsunami
- Riverine/surface water flooding
- Coastal erosion
- Seismic ground shaking



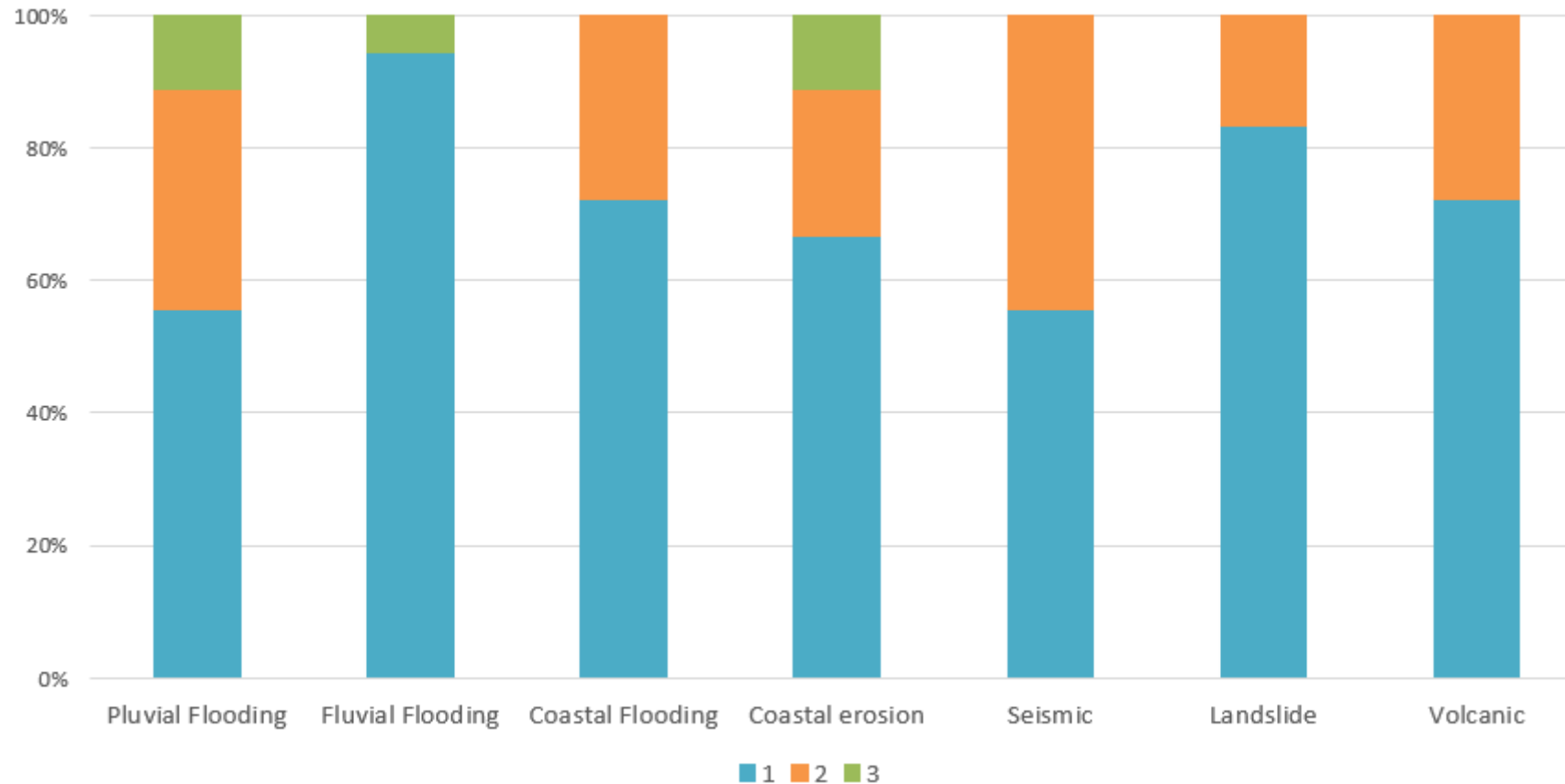
Data maturity assessment

- 275 asset planning documents scored
- Hazards:
 - *Coastal inundation*
 - *Coastal erosion*
 - *Tsunami*
 - *River/surface flooding*
 - *Seismic and co-seismic hazards*
 - *Volcanic ashfall*
 - *Landslides*
- Assets:
 - *Exposure*
 - *Vulnerability*
 - *Criticality*
 - *Risk*
 - *Planning*

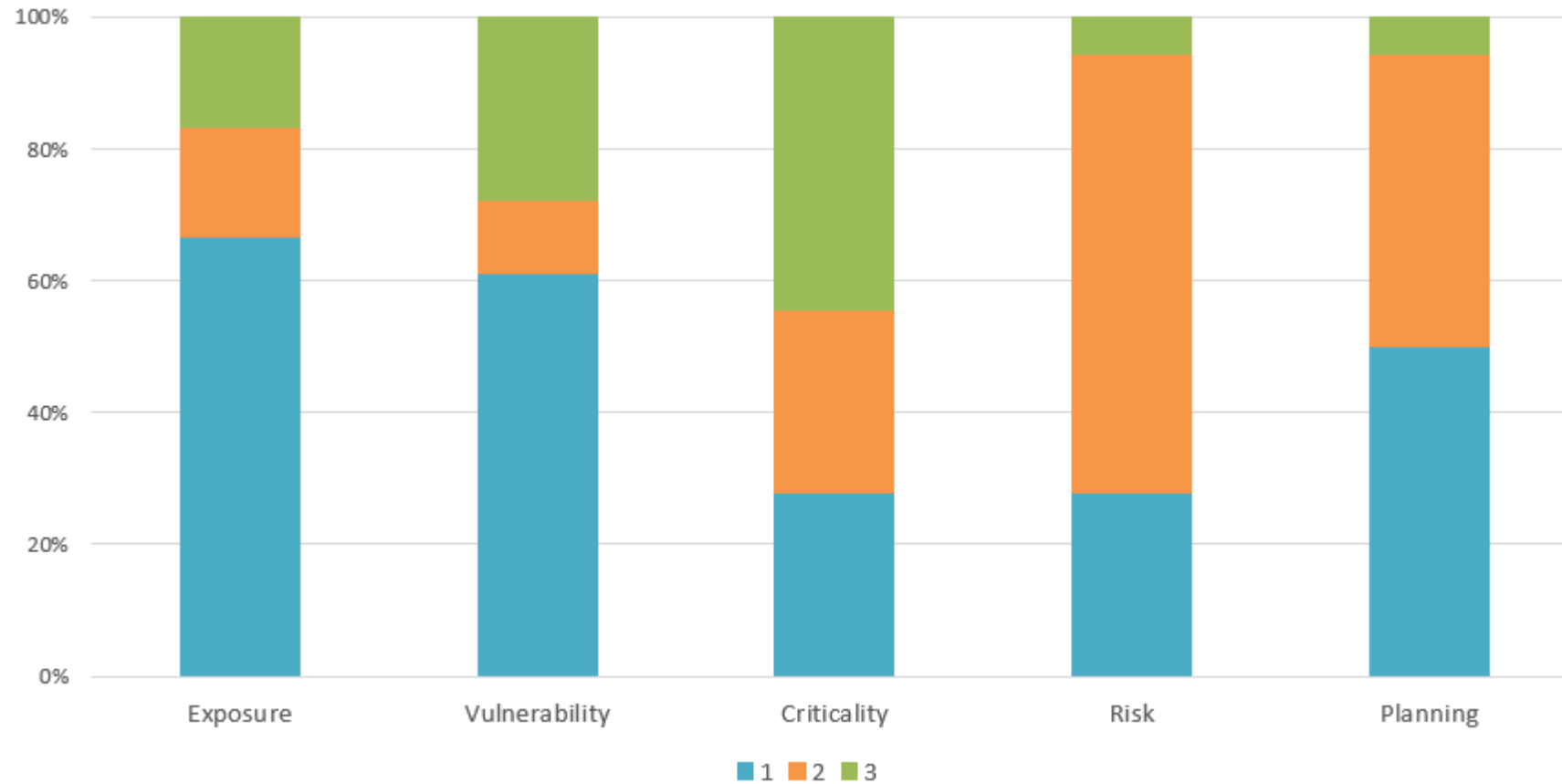
Assessment criteria

Ranking 1 - 3	Hazard	Exposure	Vulnerability	Criticality	Risk	Planning
1	Hazard not mentioned or only in very general terms	No identification of assets exposed to any hazards	Not mentioned, or only in a broad sense (not about natural hazards)	Not discussed	No risk assessment beyond at most an exposure assessment	Not discussed
2	Hazard mentioned, areas or scenarios of known hazard broadly identified ⁷	The exposure of some key assets to a single hazard is identified	Vulnerability mentioned in relation to specific natural hazards, or particularly vulnerable asset type(s) identified with respect to one hazard	Some critical assets identified	Some attempt to rank or quantify risk to specific assets or asset types from specific natural hazards	Mention of investment or resilience planning in response to specific natural hazards, or discussion of projects already undertaken
3	Hazard described, appears to be based on detailed mapping or studies	The exposure of (at least) key assets to multiple hazards has been assessed	Detailed comments on vulnerability of different asset types and/or identification of high vulnerability assets with respect to one or more hazards	Evidence of assessment and ranking of asset criticality	Evidence of detailed risk assessment or ranking taking hazard, exposure and vulnerability into account, across different assets	Detailed planning has been undertaken (programmable), improvements or projects already identified and scheduled.

Data maturity assessment - hazards



Data maturity assessment – ctnd.



Collating hazard information

- From Regional and Unitary Councils only
- From web viewers/data portals, email responses and video meetings
- Focus on information available in GIS format but all information was noted

Collating hazard information

Hazard	Locality	Scenario(s)	Date	Data format	Produced by	Public source? (link)	Other comments
Coastal erosion	Regional	SLR to 2130	2019-2023		T+T		Staged by district. Public release planned in late 2023.
Coastal erosion	Sites	Beach profiles (annual monitoring) ca. 30 locations.	~1970 -	Not geospatial - XS survey	BoP RC		Available on request
Coastal inundation	Regional	SLR to 2080 and 2130, each with RCP4.5 and RCP8.5. Also a 2130 RCP8.5+	2019-2023		NIWA		Nearing completion -staged release from June 2023. XXXX YYYY is responsible at BOP RC Tauranga
Coastal inundation	Regional	Coastal calculator - fixed point design levels at a site	2023		NIWA		
River flooding	Kaituna R	See notes below.	in prog	Peak depth and velocity rasters	River Edge		
	Whakatāne R	See notes below.	in prog	Peak depth and velocity rasters	River Edge		Only just started - complete post-2023
	Utuhina R	See notes below.	2022-23	Peak depth and velocity rasters	DHI		Complete
	Rangitaiki	See notes below.	in prog.	Peak depth and velocity rasters	Awa		Nearly complete
	Waioeka/Otara	See notes below.	2022	Peak depth and velocity rasters	Cardno		Unpublished

National or broader findings

- Emphasis in almost all AMPs is on risks that are pressing.
- Resilience is typically mentioned in a broad sense
- Natural Hazards are often lumped together as one risk in a risk register
- Mitigations tend to focus on operational readiness or emergency management planning
- Criticality generally is well understood and documented

National or broader findings ctnd.

- Lifelines studies are useful and often focus on the significant hazards, but sometimes only for water supply
- There is huge variation in the coverage and standard of flood hazard information particularly, and hazards information more generally
- As would be expected, WWTP are generally exposed to greater (and increasing) hazard than WTP

Key recommendations

- Assess and describe natural hazard risks in AMPs.

Key recommendations

			Likelihood								
			AEP	<0.2% ARI	~ 1% ARI	~ 5% AEP	~ 20% AEP	Annual			
			ARI	>500	100	20	5	Annual			
			Likelihood over a 30-year period	6%	26%	79%	Practically certain	Practically certain	Lesson: Even highly unlikely events are quite likely over the lifetime of infrastructure		
			Category	Rare	Very unlikely	Unlikely	Likely	Very likely	Risk scoring definitions		
			Score	1	2	3	4	5			
Consequence	Widespread and catastrophic damage to a range of assets. Repairs and reconstruction are immense, requiring substantial resources, long-term planning and multiple years.	Substantial	100	100	200	300	400	500			
	Extensive network-wide damage, or major damage to several critical assets requiring costly, complex and time-consuming repairs	Major	50	50	100	150	200	250			
	Localised damage to critical assets, or network damage in multiple suburbs that cannot be repaired within 2-3 weeks	Moderate	25	25	50	75	100	125			
	Localised minor or moderate damage to non-critical assets that can be repaired within 2-3 weeks with the allocation of additional resources	Minor	10	10	20	30	40	50			
	Localised nuisance damage to non-critical assets only, assets can be repaired within 2 weeks under normal operational work programmes	Minimal	1	1	2	3	4	5			

Key recommendations

- Assess and describe natural hazard risks in AMPs.
- Natural hazard risk mitigation

Key recommendations

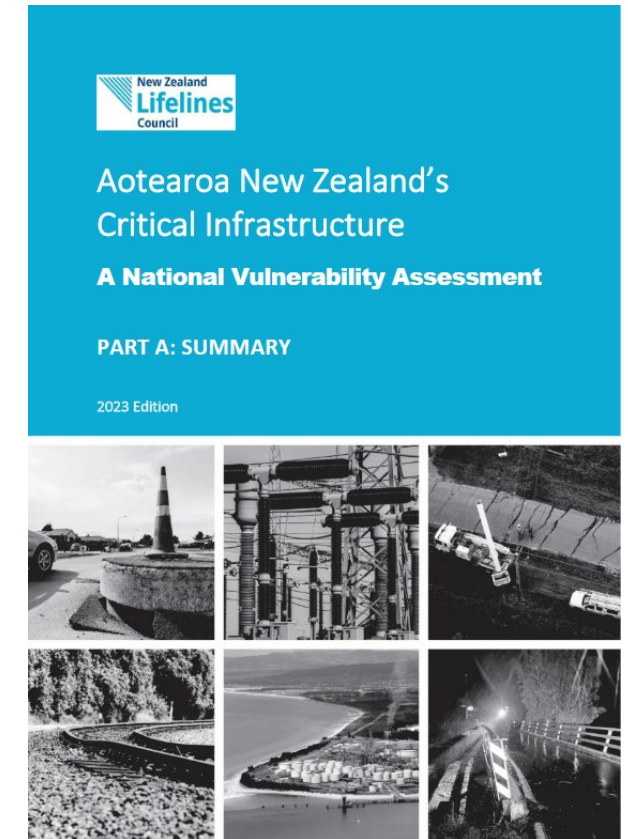
- Assess and describe natural hazard risks in AMPs.
- Natural hazard risk mitigation
- National benchmarking or standards

Key recommendations

- Assess and describe natural hazard risks in AMPs.
- Natural hazard risk mitigation
- National benchmarking
- Comprehensive risk assessments and integration into AMP processes

Wider context – NZLC National Vulnerability Assessment

- No national assessment/monitoring of planned investment in infrastructure resilience
- Lack of defined resilience standards
- Every region should conduct a regional infrastructure vulnerability assessment and develop programme business cases for any identified significant regional or national risks



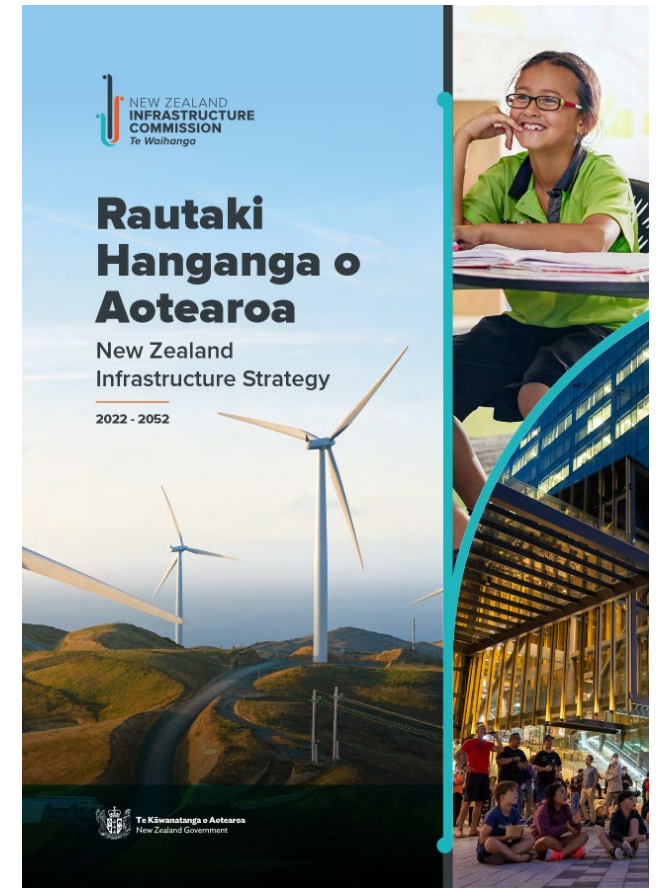
Wider context – Guide to local climate change assessments, MfE

- Promoting consistency in assessments
- Assessing hazards, exposure, vulnerability and risk
- Establish the level/scope of the assessment
- Broad screening approach followed by a detailed assessment, possibly geospatial



Wider context – NZ Infrastructure Strategy

- Increase resilience of critical infrastructure
- Improve infrastructure risk management by making better information available
- Prepare infrastructure for the impacts of climate change



Thank you!

Extra slides

Risks of not knowing your risks

An incomplete or inaccurate understanding of natural hazard risk to water services infrastructure carries significant risk to the organisational objectives of the WSEs. These include:

1. Delivery risks
 - Unexpected or unexpectedly severe losses of service.
 - Public health and/or environmental water quality impacts from asset damage.
 - Avoidably large impact on normal work programmes resulting from an event.
2. Financial risks
 - Inefficient resilience spending, potentially on the wrong priorities.
 - Higher rebuild costs following an event.
 - Higher investment costs if the need for investment is discovered late.
 - Higher insurance costs than necessary associated with over-insurance, or conversely under-insurance leading to uninsured losses.
3. Physical asset risks
 - Greater asset damage than would have occurred if assets had been planned/designed appropriately.
4. Governance and leadership risks
 - Reputational and political risk if damage or loss of service from an event are seen as having been easily avoidable.
5. Planning risks
 - Environmental damage due to unforeseen or avoidable asset damage.
 - Operational response planning insufficient to deal with the scale or type of damage.