



Climate Change & Engineering Lifelines

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Climate change is a real and happening thing ...

- The evidence for global warming is unequivocal (IPCC)
- It is very likely to be human-induced (IPCC)
- Represents a “real and present danger”
Sir David King, Chief Advisor to UK Government

**The climate is changing and it is our fault ...
but there are things we can do!**



Engineering Lifelines Context

- "... climate change is not a new hazard, it is an exacerbator..."
- Historic climate conditions no longer accurate indicators
- Design of new structures must account for climate scenarios several decades into the future
- Urban infrastructure needs to adapt to new climate risks to ensure safety & quality of life, as well as reduce long-term costs.

www.mfe.govt.nz/issues/climate/sectors/engineering.html

and

www.mfe.govt.nz/issues/climate/resources/engineering/index.html

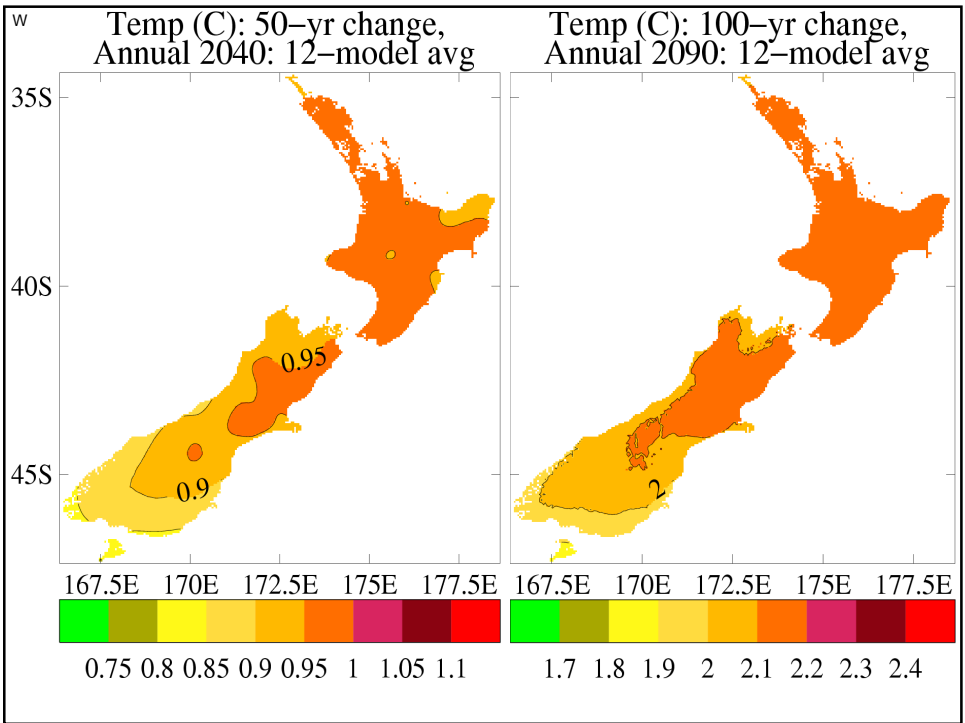
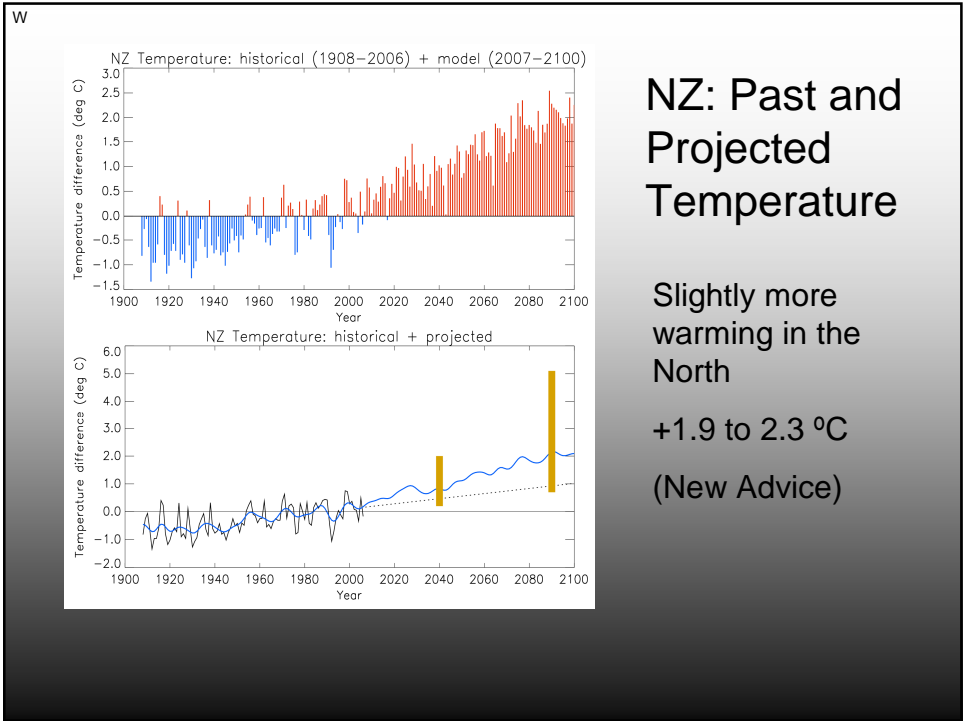
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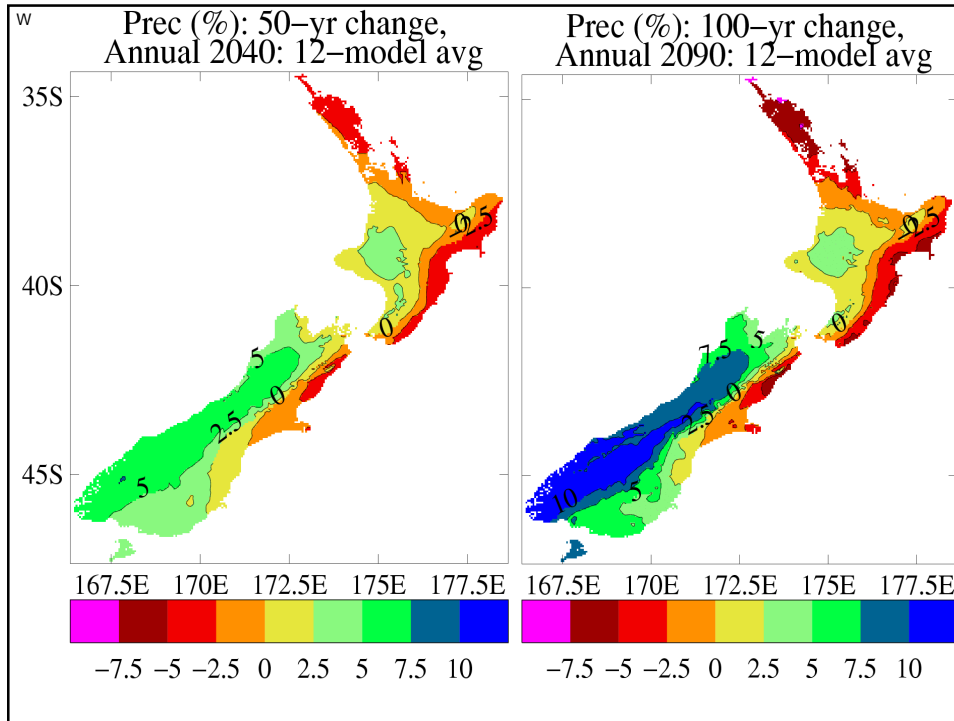
www.mfe.govt.nz/issues/climate/resources/adaptation/index.html

Climate change in NZ

- In NZ, changes already observed since 1950 include:
 - Mean temperature increase of 0.4 °C
 - Decrease in cold nights & frosts
 - Sea level rise of 0.07 m
 - Loss of >¼ of alpine ice mass
 - Increased beech seed production
- NZ's climate "virtually certain" to be warmer in 21st century, with noticeable changes in extreme events
- Natural systems, water security and coastal communities most vulnerable







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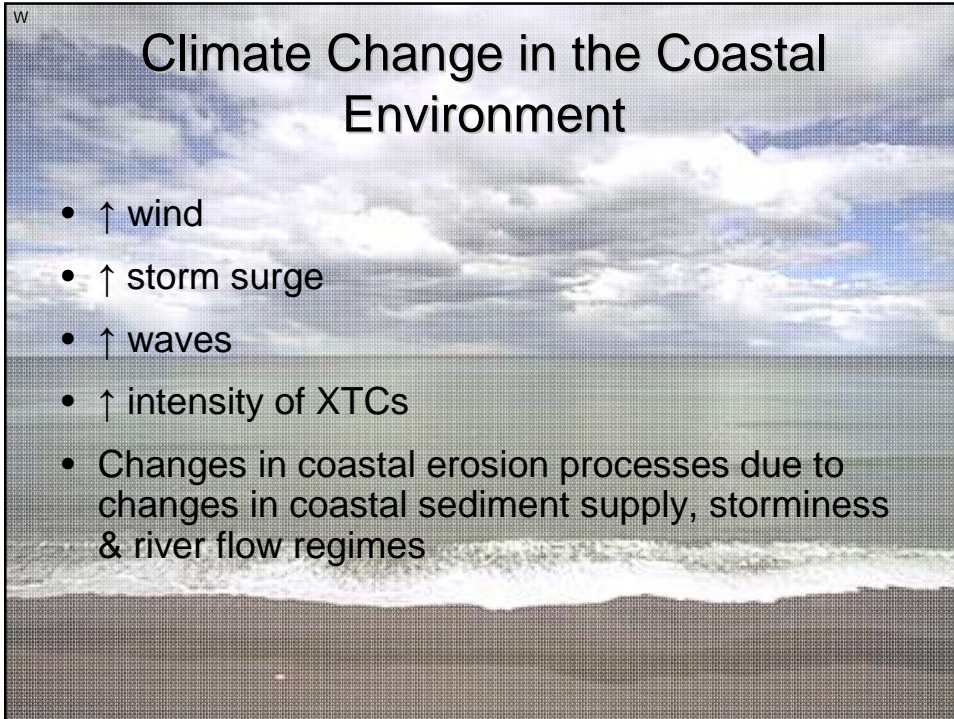
Global Sea Level Rise

- Global average sea level rose by approx. 0.17m ($\pm 0.05m$) over 20thC, faster than sea level rise in 19thC
- Recent sea level rise (1993–2003) has been an average of about 3.1 mm/yr
- 2007 IPCC projections: globally-averaged sea level rises of 0.18 to 0.59m by 2100
- NB: Estimates could be higher if melting of Greenland & Antarctic ice sheets continue to increase (extra 25%?)

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Climate Change in the Coastal Environment

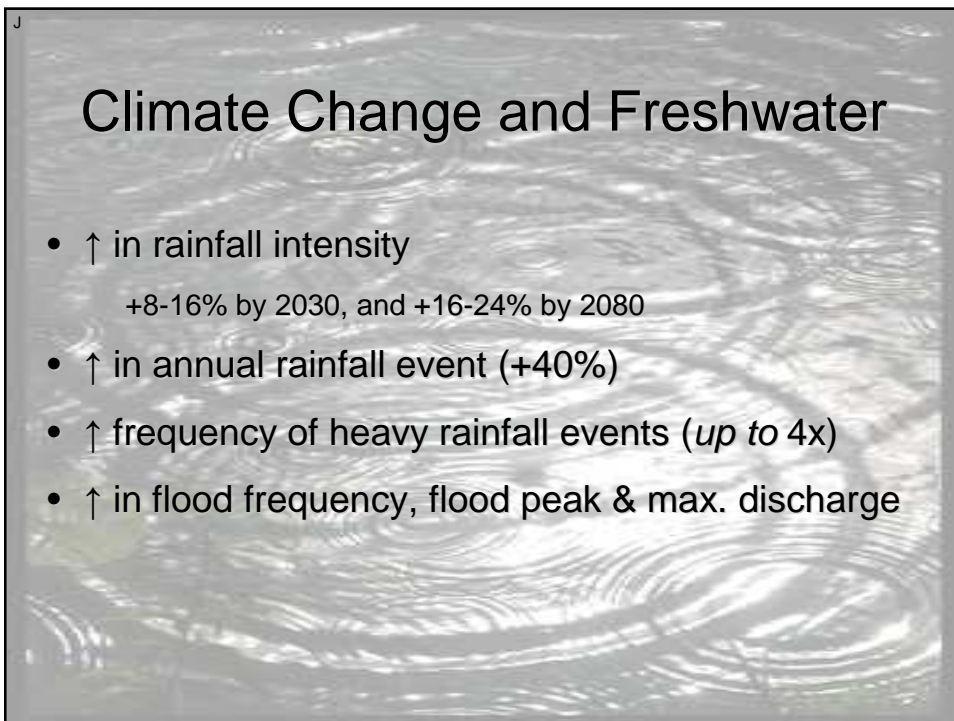
- ↑ wind
- ↑ storm surge
- ↑ waves
- ↑ intensity of XTCs
- Changes in coastal erosion processes due to changes in coastal sediment supply, storminess & river flow regimes



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Climate Change and Freshwater

- ↑ in rainfall intensity
+8-16% by 2030, and +16-24% by 2080
- ↑ in annual rainfall event (+40%)
- ↑ frequency of heavy rainfall events (*up to 4x*)
- ↑ in flood frequency, flood peak & max. discharge





MfE Adaptation Work Programme

- Partnerships with
 - Local Government
 - Engineers (ELG & IPENZ)
 - Central Govt. depts.
 - Insurance sector
 - Agriculture (led by MAF)
- Wider engagement with professional bodies
- Focus on NZ's particular vulnerabilities:
 - Water and coastal
 - Infrastructure & utilities
 - Primary production
 - Biodiversity and biosecurity



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What work already exists?

- Guidance brochures
- Quality Planning Guidance Note
- Technical reports
- Workshops
- Engagement with stakeholders
- Govt CC work programmes



www.mfe.govt.nz/issues/climate/resources/adaptation/index.html

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What's coming in 2007/08?

- IPCC 4th Assessment Report
- Update of guidance materials
 - CC Effects & Impacts Assessment
 - Local Govt Guidance book (aka 'red book')
 - Coastal Hazards & Climate Change
- New MfE Impacts & Adaptation web pages (incl. case studies)
- QP Guidance Notes
 - Update: climate change
 - New: coastal & natural hazards





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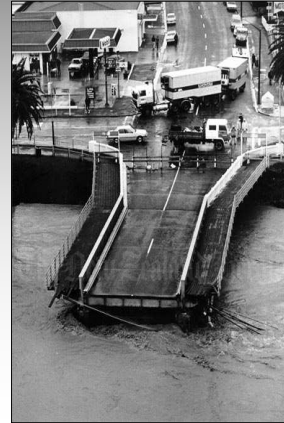
ELG Seminar Outline

Two hour interactive session in Wgtn, Wairarapa, West Coast & Chch

- Exercise 1: How does current climate/weather affect your sector?
- Discussion 1: Climate Change & the Coastal Environment
- Discussion 2: Climate Change and Freshwater
- Exercise 2: Risk Assessment for Engineering Lifelines
- Group Discussion

Lifelines workshops

- Aim:
 - To stimulate thinking and action about climate change and lifelines
 - To inform with latest results
- To get some feedback on “The Issues”
 - Areas of concern
 - Gaps
 - Ideas for action



Matrix 1

Credit to Terry Boyle of Transit, founder of the original Climate Change Matrix!

Lifelines Sector		Climate Variables					
		Sea Level	Wind	Storm Surge + waves	Erosion + Slipping	Rainfall Intensity	Floods
Transport	Road						
	Rail						
	Aviation						
	Marine						
Power	Gas						
	Fuel						
	Electricity						
Telecoms	Phone						
	Radio						
Civil	Urban						
	Storm water						
	Sewage						
	Water Supply						

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Matrix 2 – with climate change

		Climate Variable and Change Indicators					
		Sea Level Rise	Wind	Storm Surge + Waves	Erosion + Slipping	Rainfall Intensity	Floods
		↑ 0.19 - 0.58m by 2100	60% ↑ westerly component	↑ storm surge ↑ waves ↑ coastal erosion	↑ potential Linked to rainfall intensity	8-24% ↑ intensity 40% ↑ annual event 1-4x ↑ heavy events	↑ frequency ↑ flood peak ↑ max. discharge
Lifelines Sector							
Transport	Road						
	Rail						
	Aviation						
	Marine						
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	Fuel						
	Electricity						
Telecoms	Phone						
	Radio						
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	Storm water						
	Sewage						
	Water Supply						

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Results

- Rain intensity often top issue
- Rain totals next
- Wind, sea level and storm surge
- Lightning, hail
- Snow

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Mind catching!

- Liquefaction
- Fog
- Copper cable underground at coast
- Quote: Possibly the key is to design in flexibility to “allow” for future change rather than make things bigger/stronger.
- “Current capacity inadequate!”



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Finding Solutions

- Lifelines workshops
 - who’s next?
- IPENZ partnership
 - Workshops
 - Best practice guides, codes of practice, standards etc
- Triangular Meeting
 - Engineers, Local government, Insurance
- MfE Guidance updated
 - Including case studies

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Group break-out

- Problem
 - Specific
 - Barriers
 - Solution
 - Specific
 - Measurable
 - Appropriate
 - Reasonable
 - Time bound
 - Action
 - Who!
- Sector Spilt, ÷ by 2



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Problem-solution-action

Specific climate change impact problem
or

General climate change issue

- 5 mins to decide
 - 10 mins to solve!
 - 2 min report back
-
- Barriers to ACTION



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Summary

- Climate change is a real and happening thing ... how will you respond?
- Lifelines workshops – round 2
- MfE Guidance – coming soon
- New MfE Impacts & Adaptation web page – under construction

