Dealing with changes in our climate

Research findings

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**Purpose**—to develop a consistent framework for considering vulnerability to climate change in NZ to enable decision makers to build resilience to the adverse effects

**Local government**
- Flooding—Hutt Valley
- Sea level rise—Auckland
- Water security—Wellington

**Maori communities**
- Adaptive capacity
- Cultural factors

**Health**
- Modelling communicable diseases for social and climate factors
- Rainfall variability and rainwater tanks
- Heat exposure of outdoor workers
- Prepay electricity metres
http://www.victoria.ac.nz/sgees/research-centres/ccri/ccri-publications
Hutt Valley Flooding case study
research questions

- Projected changes in flood frequency and severity of the Hutt River flooding over the next century
  *Reese and Ramsay, 2010; Ballinger et al., 2011a; Ballinger et al., 2011b*

- The impacts of a range of different flood events on the Hutt Valley community
  *Lawrence et al., 2011a; Quade and Lawrence, 2011*

- Socio-economic factors influence the community’s ability to adapt to flood risk and to cope with, and recover from flooding
  *Lawrence et al., 2011a; Quade and Lawrence, 2011*

- The social and institutional barriers and opportunities for adaptation and for improving adaptive capacity
  *Lawrence and Quade, 2011*
Hutt Valley Flooding case study methods

- Modelling of the Hutt River flood frequency changes and inundation modelling of the potential damages from a range of flood events using a RiskScape flood damage model.

- A survey of households to gauge the effects of previous floods on the community, how communities responded to flood risk and their views on future climate change induced flood risk, analysed quantitatively, and qualitatively by themes.

- A workshop with practitioners across a number of councils in the Wellington region and follow-up interviews with a sample of them, analysed thematically.
Projected flooding changes

- Flooding projected to be more frequent and degrade protection standards of existing and planned protection measures with a large uncertainty range.
- Uncertainty conflicts with decision making quest for ‘robust’ definitive guidance (averages or best estimates) mislead due to mischaracterisation of extremes.
- Lower warming scenarios currently 1% likely each year will become 2.5% likely by 2100 and for higher warming scenarios 1% is likely to become 6% likely by 2100.
- The 1:440 year protection degrades to a 1:100 year protection by end of century on low emission trajectories.
- Peak flow volume of the 1:100 year flood increases to between 2300 cumecs and 2600 cumecs.
- Above 2300 cumecs flood damages increase sharply with significant cost impacts on Hutt community.
Impacts of flooding
- Flood impacts increase non-linearly beyond 2300 cumecs as increasing flood volumes damage more properties to greater depths
- Flood impacts can have a disproportionate impact on different social groups

Ability to adapt, cope and recover from flooding
- Understanding of flood risk was low over Hutt Valley
- Past experience affects household preparedness behaviour and willingness for flood protection
- Council flood risk communication can result in maladaptation
- Households prefer a region wide flood risk management regime, and land use planning over structural measures
- The framing of risk affects households understanding of the likelihood and severity of flood risk and their level of preparedness e.g. ARI, AEP and chance
Hutt Valley Flooding case study

Barriers for improved adaptive capacity

- Lack of integration and strategic oversight within and between levels of government
- Leadership for integration and central government direction could influence long term risk management
- How risk is communicated—AEP and ARIs are misinterpreted
- Different risk assessment approaches across the region
- Mismatch of timeframes across council functions
- Dominant focus on costs rather than who pays

Opportunities for improved adaptive capacity

- Flood events could provide a window of opportunity for a strategic approach to flood risk reduction that is more resilient and adaptive to changing climate risk
- Resource pooling; access to LIDAR; visual media of past flood damage; shared learning via workshops; reflection in LTP for improved risk assessment and communication the risk as changing over time
- Use of maps showing flooding above a defined common floor levels for a range of scenarios
Sea level rise impacts and adaptation Auckland
(Mission Bay/Kohimarama and Kawakawa Bay)

Purpose

The impacts on Auckland of changing coastal conditions as sea level rises; adaptation options; implementation barriers; potential of different management options for reducing vulnerability and increasing resilience of existing coastal settlement

Research questions

- What effect will sea level rise have on extreme sea levels and how will the impacts related to a 1 in 100 year event vary under a range of sea level rise scenarios (in the absence of adaptation)?
- How are coastal hazards and projected sea level rise managed now?
- What adaptation opportunities and barriers exist?
- Could managed retreat be implemented and what are the barriers to implementing managed retreat?
Sea level rise impacts and adaptation Auckland
(Mission Bay/Kohimarama and Kawakawa Bay)

Current barriers

- Uncertainty of projections
- Climate change scepticism
- Unpopularity of SLR as an issue focuses attention to the short-term
- Extremes and changing risk levels not considered
- No strategic preparations for change
- Risk management framework in MfE guidance not adopted by council but considered necessary by officers
- A perception that there are limited options in existing settlements
- Reliance on NPSs to sort out the direction and guidance
- Communities resistant to ‘top-down’ approach of councils to adaptation
- A range of response options not provided by council when addressing hazard risk
- Strong opposition to managed retreat given current risk information
Sea level rise impacts and adaptation Auckland
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Conclusions

- The framing and communicating of the nature of the risk is very important
- Continual engagement with communities and discussion of response options very important
Case study conclusions

- The framing and communicating of the nature of the risk is very important
- Continual engagement with communities and discussion of response options very important
- Better integration of structural, emergency management and planning options needed
- A long term strategic approach to changing climate risk is required
- A multi-hazards approach can help prioritise risk and the relationships between different hazards e.g. SLR and flooding
- Different vulnerabilities (social economic) has salience for prioritising risk and decisions on them