



Resilience solutions for rural New Zealand

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Outline

- 1 Aims and objectives
- 2 Context: Resilience to Nature's Challenge
- 3 Rural Co-Creation Program
- 4 Partnerships and the way forward
- 5 Questions and Discussion



Aim

Introduce the RNC-NSC,
the Rural program and discuss
opportunities for co-creation
through participation.



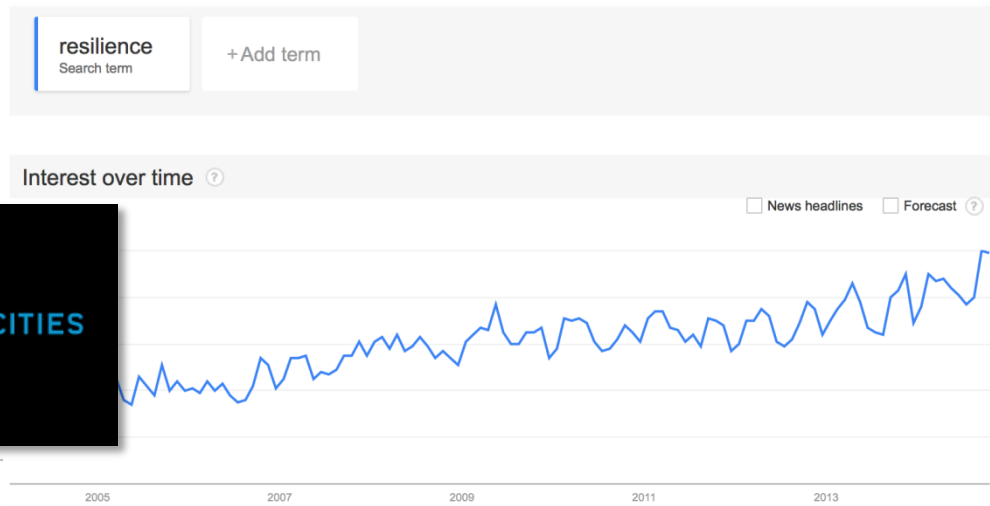
Objectives

Understand the structure of Resilience to Nature's Challenges NSC, and its contribution to DRR research in New Zealand;

Understand the Rural Co-Creation Laboratory – the program structure, research foci and the emphasis on co-creation;

Identify potential opportunities for further participation in supporting rural resilience through collaboration and research partnership; and

Continue to build a network of researchers, policy makers, practitioners interested in enhancing rural resilience throughout New Zealand and beyond.



Ecocentric

All things green, from conservation to Capitol Hill

GOING GREEN

Adapt or Die: Why the Environmental Buzzword of 2013 Will Be *Resilience*

New Zealand's biological heritage – protecting and managing our biodiversity, improving our biosecurity, and enhancing our **resilience** to harmful organisms (BioHeritage NSC)

Resilience to nature's challenges – research into enhancing our resilience to natural disasters

National

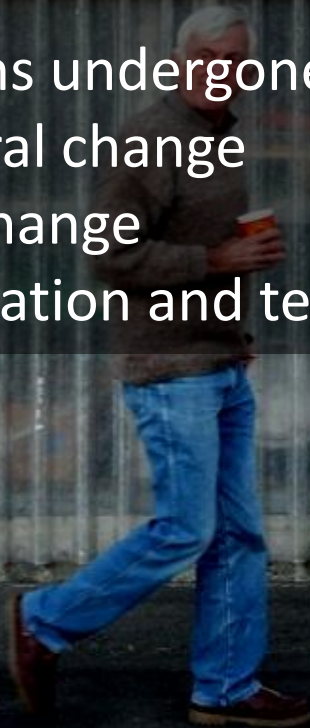


- New Zealand is the third most vulnerable economy in the world to the impact of natural disasters as a percentage of GDP (*Centre for Economics and Business Research, 2012, Lloyds Global Underinsurance Report 2012*).
- Since 1900, natural disasters cost this country an average 1% of its GDP in any year (*Insurance Council for New Zealand: 2014 Protecting New Zealand from Natural Hazards*).

A drought has no effect on the N.Z economy

- Primary economic activities significant contribution to GDP.
- Socially and culturally important: provide the basis for numerous regional economies.
- Rural regions undergone and are experiencing major change:
 - Structural change
 - Social change
 - Globalisation and teleconnections

Yeah right.





- Flood
- Earthquakes
- Wildfire
- Drought
- Landslides, debris flows, rockfall
- Snowstorms

With impacts and implications for:

- Human health and well-being
- Transportation and infrastructure
- Economic activity

13. THE ROLE OF ANTHROPOGENIC CLIMATE CHANGE IN THE 2013 DROUGHT OVER NORTH ISLAND, NEW ZEALAND

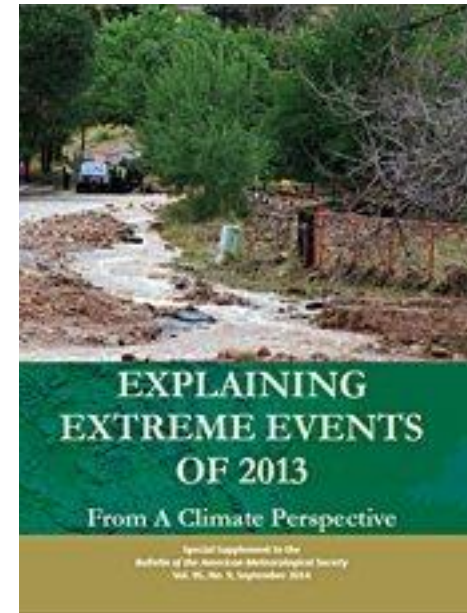
LUKE HARRINGTON, SUZANNE ROSIER, SAM M. DEAN, STEPHEN STUART, AND ALICE SCAHILL

For the 2013 New Zealand drought, evidence from a number of models suggests that the meteorological drivers were more favorable for drought as a result of anthropogenic climate change.

Introduction. In the latter part of the 2012/13 austral summer season (January–March), the North Island of New Zealand endured its most severe drought in 41 years of widespread measurements of potential evapotranspiration deficit (Porteous and Mullan 2013). For the 2013 drought, 34.2% of the North Island land surface experienced its highest recorded cumulative deficits (Supplementary Fig. S13.1), significantly greater than the 14.3% recorded for the previously severest drought (1997/98). The New Zealand Treasury (2013) estimates reduced agricultural production, attributed to the drought, cost the national economy at least US\$1.3 billion, with continued impacts expected for another two years (Blackham 2013).

record total number of dry days of 78.2 for January to March.

Was this event influenced by climate change? Previous studies concerning the attribution of individual drought events to (anthropogenic) climate change have primarily focused on precipitation departures (Rupp et al. 2013; Trigo et al. 2013) and prolonged temperature extremes (Rupp et al. 2012; Hoerling et al. 2013). For a maritime, midlatitude climate like New Zealand's, temperature is not reflective of synoptic-scale drying and, thus, does not perform well as an indicator of drought (Clark et al. 2011; Senviratne 2012). Furthermore, analysis of precipitation



Harrington *et al.* (2014)

“...Climate change is making a difference to New Zealand now, affecting our droughts and our rainfall extremes...”

NATIONAL SCIENCE CHALLENGES

Resilience to Nature's Challenges

Kia manawaroa - Ngā Ākina o Te Ao Tūroa

“New Zealand is a nation of people who have transformed their lives, enterprises and communities to anticipate, adapt and thrive in the face of ever-changing nature’s challenges”

To reach this vision, we must pursue a goal of transformative resilience, discovering and implementing new research-based solutions for our society, culture, infrastructure and governance to address factors that will enable New Zealand to thrive in the face of nature’s challenges.



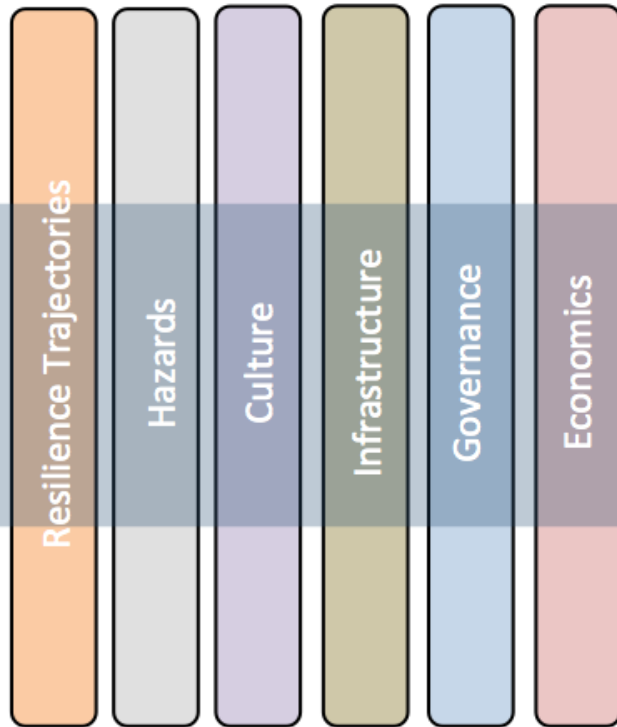
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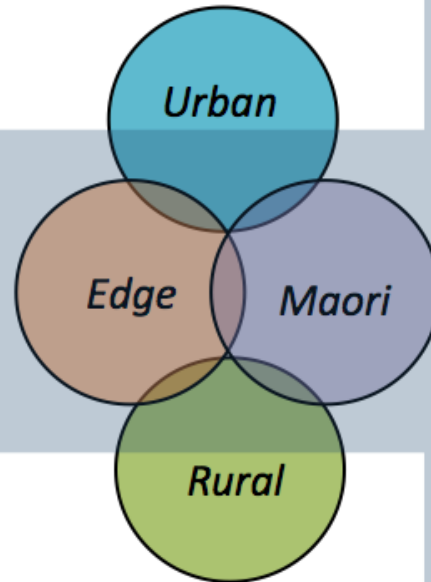
2015-19 Research Program – Resilience Challenge

Toolbox programs



Underpinning Resilience Disciplines

Co-creation Labs



Priority Partnerships

Resilience Pipeline

**Resilient
New Zealand**



Priority Laboratories

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Rural – *Tom Wilson & Nick Cradock-Henry*
– Rural resilience support trusts, supply chain resilience, community resilience to wildfire



Urban – *Suzanne Wilkinson* – Urban resilience network, Resilient Auckland communities, planning, infrastructure and businesses



Edge – *Paul Kench* – Shared development of the hard answers to the difficult questions around coastal futures.



Matauranga Māori – *Jon Procter* - Wāhanga Tuatahi (Tikanga Māori), Wāhanga Tuarua (Māori Assets), Wāhanga Tuatoru (cultural landscapes and kaitiakitanga)



Toolboxes

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Governance – *Vivienne Ivory* – Successful resilience decisions, governance contexts

Infrastructure – *Liam Wotherspoon* – Resilient networks and community infrastructure

Economics – *Garry McDonald* – Benefit-cost incentives, valuing resilience initiatives

Culture – *Julia Becker* – Resilience norms, Citizen science, Social media and resilience

Hazards – *Mark Bebbington* – size/frequency hazard-spectrum, scenario approaches

Trajectories – *John Vargo* – Resilience Indicators, Resilience digital information system



Resilient Rural Backbone

We aim to enhance rural resilience through:

- **Developing an integrated framework for assessing resilience to natural hazards** (including earthquakes, rural wildfire, drought, and tsunami) across rural value chains: from households to regions and small to global-scale agribusinesses.
- **Producing tools for resilience-interventions** through comprehensive engagement and scenario activities with key sectors, communities and regions.
- **Building a researcher-stakeholder co-creation team and outreach network** to act as 'honest brokers' for policy and practice leadership, through the development of new networks and by linking existing land care, disaster management and other farming, tourism and rural community initiatives to share ideas, and build capability.



1. **Resilience Solutions for Rural New Zealand** co-produce and broker innovative solutions for enhancing the resilience of rural New Zealand
2. **Multi-level Resilience** develop and apply an integrated, analytical framework for promoting resilience at multiple scales across rural value chains
3. **Community Resilience to Wildfire** – developing solutions to a dynamic changing hazard

Rural Team:

Hamish Rennie, *Lincoln University*

Caroline Orchiston, *University of Otago*

Sarah Beaven, *University of Canterbury*

Matthew Hughes, *University of Canterbury*



Project 1: Resilience Solutions for Rural New Zealand

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- Co-produce and broker innovative solutions for enhancing the resilience of rural New Zealand
 - Governance, Tikanga Māori, Culture and Trajectories toolboxes
- Stakeholder analysis and engagement
- Resilience Network & Stakeholder Reference group

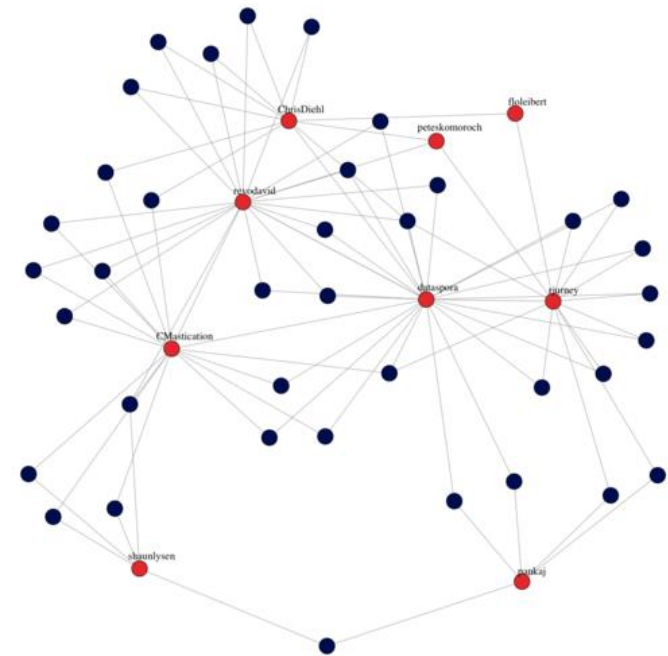


How can you build resilience in rural communities?

- Characterised by differing levels of connectivity (communications and transportation infrastructure)
- Transient populations (visitors, transient labour)

How can you monitor and evaluate resilience-building efforts?

- Cognitive
- Normative
- Relational learning



Case study selection criteria

Selection Criteria	Queenstown-Lakes	Kaikoura	Marlborough	Selwyn	Hurunui	West Coast
Complex hazardscapes	Green	Green	Green	Yellow	Green	Green
Access to stakeholders Ability to inform policy	Green	Green	Green	Green	Green	Green
Current state of research knowledge	Green	Green	Green	Green	Green	Red
Inclusive of sectors (agribusiness, tourism)	Green	Green	Yellow	Red	Yellow	Green
Match to team skills, logistics/accessibility	Yellow	Green	Red	Green	Green	Green
Vision Matauranga and iwi considerations	Red	Green	Yellow	Green	Yellow	Yellow



Rural Laboratory – Kaikoura Case Study

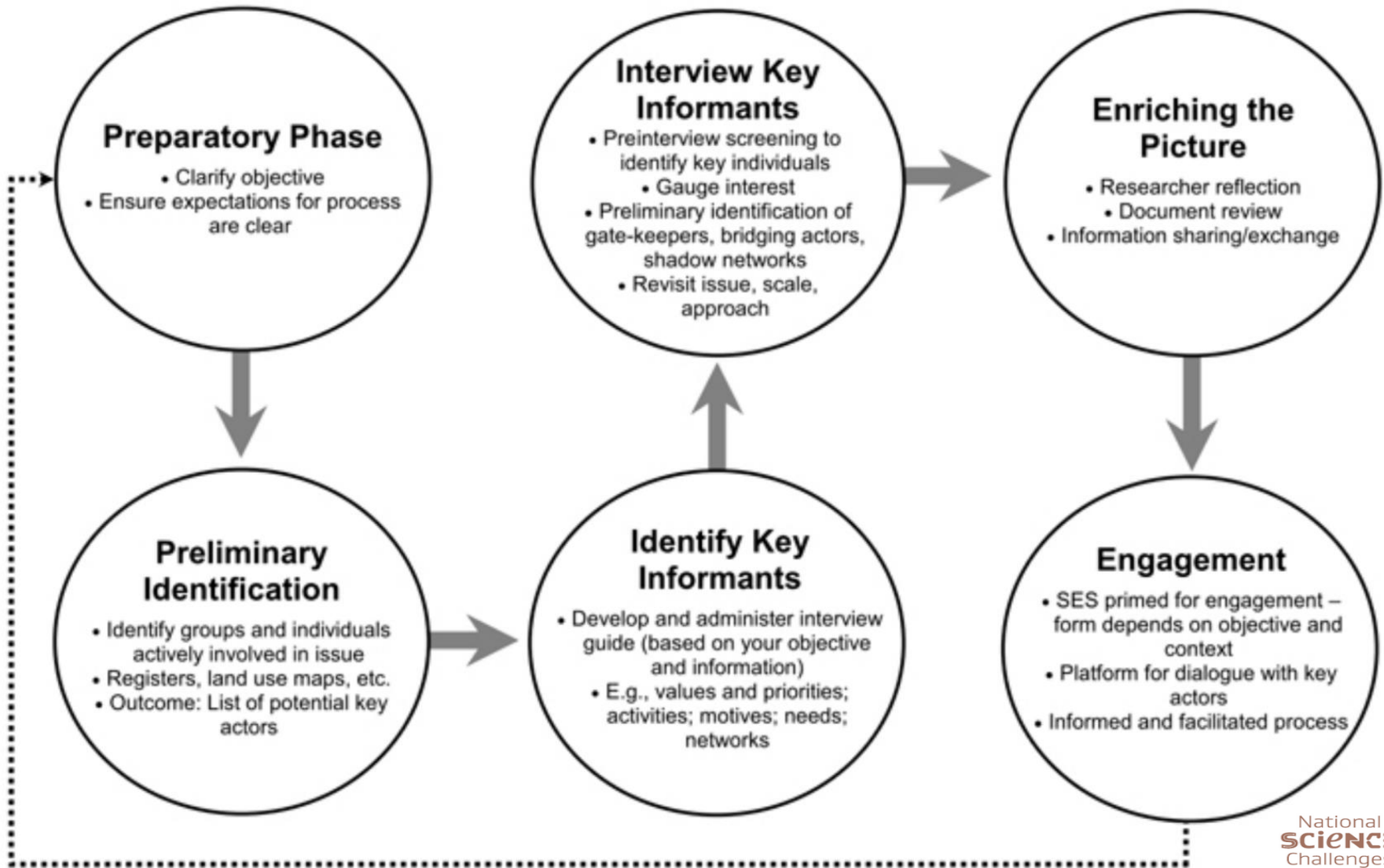
Destination tourism and agriculture
Agribusiness
Climate change impacts
Wildfire as a community hazard

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“Priming” the governance system for engagement



Project 2: Multi-Level Resilience

- Develop and apply an integrated, analytical framework for promoting resilience at multiple scales across rural value chains.
- Showcase the economic consequences of resilience initiatives for agri- and tourism businesses under multi, cascading and creeping natural hazard events



The horsepower

Ali Davies Building resilience to multi-hazard impacts to critical infrastructure for rural and isolated communities



Tyler Barton Exploring decision support tools for assessing and evaluating risk and resilience initiatives across rural value chains



OUR NEXT PhD Student Assess and evaluate economic consequences of resilience initiatives for agri- and tourism businesses under multi, cascading and creeping natural hazard events (*fusion of Riskscape and MERIT models*)

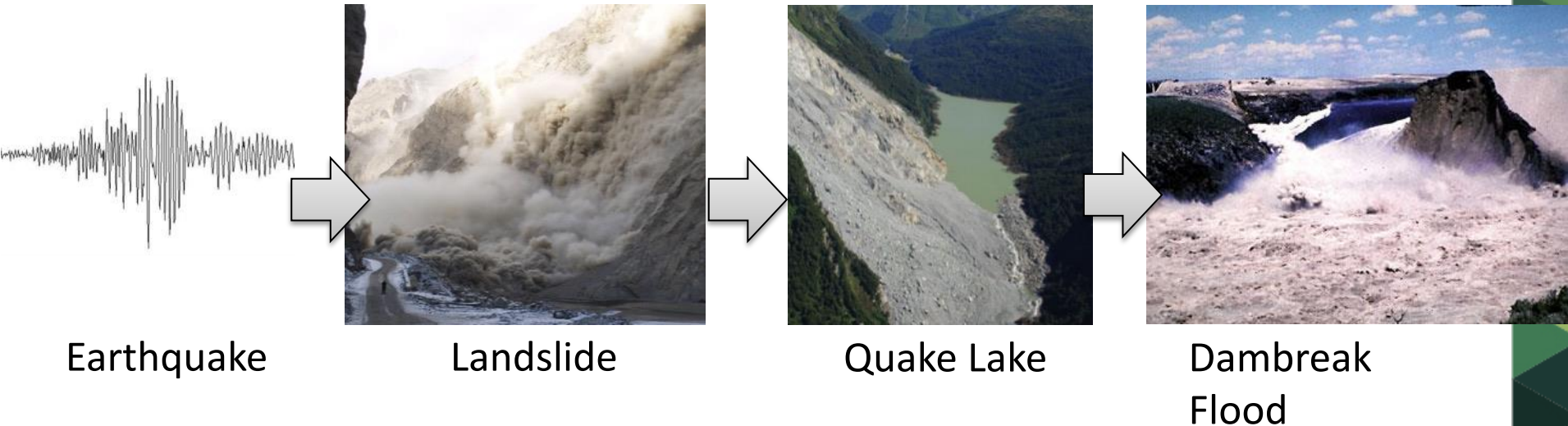


Example: Multi-Hazard Impacts

Sendai FDRR emphasises a multi-hazard approach across DRR policies, planning and programming

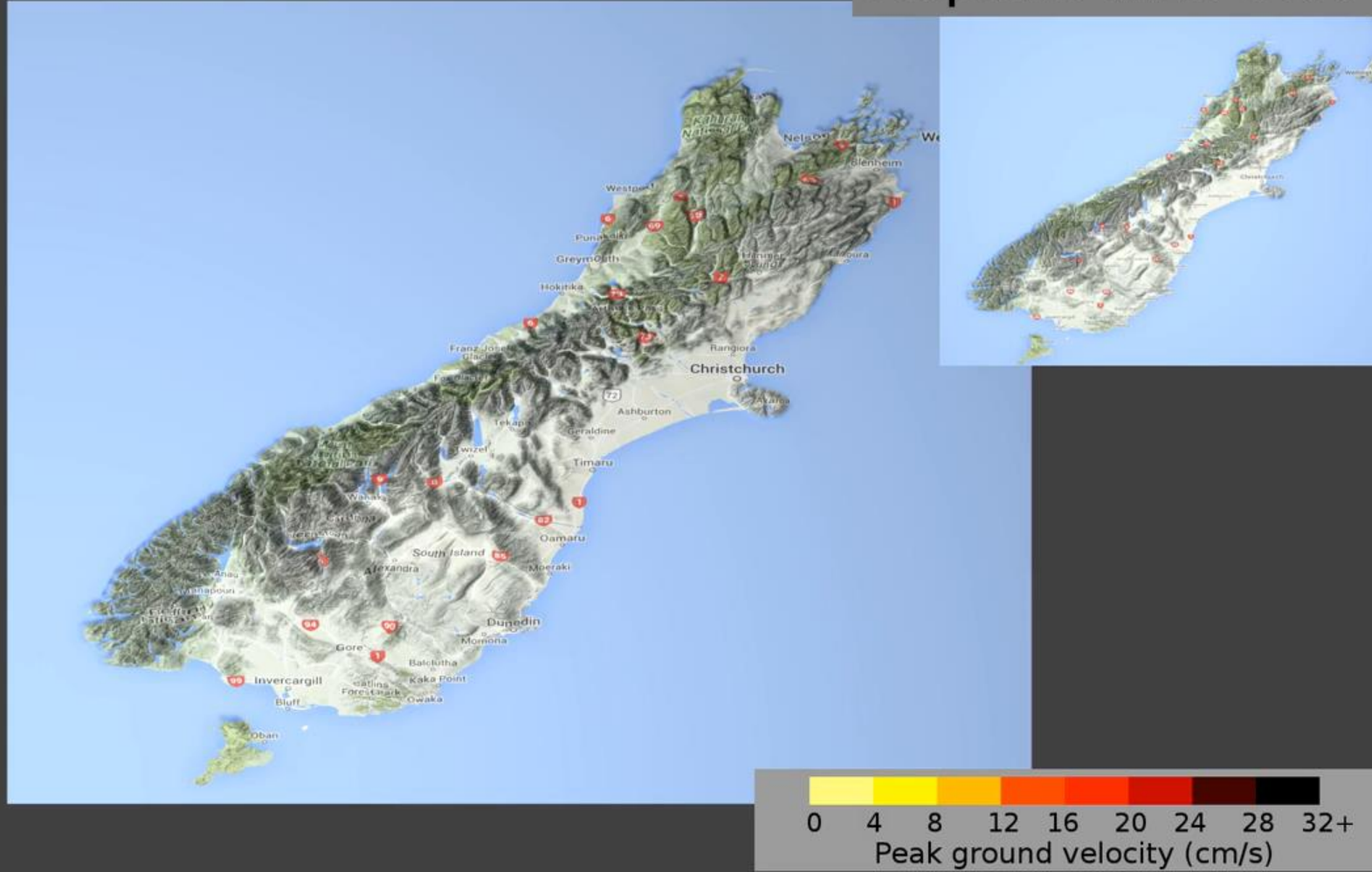
- Cascading, compounding, interacting, etc.
- But historically little guidance of what is a multi-hazard approach & how to implement it

Dynamic hazard and impact in space and time



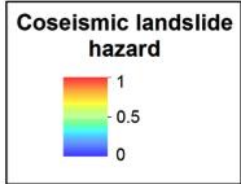
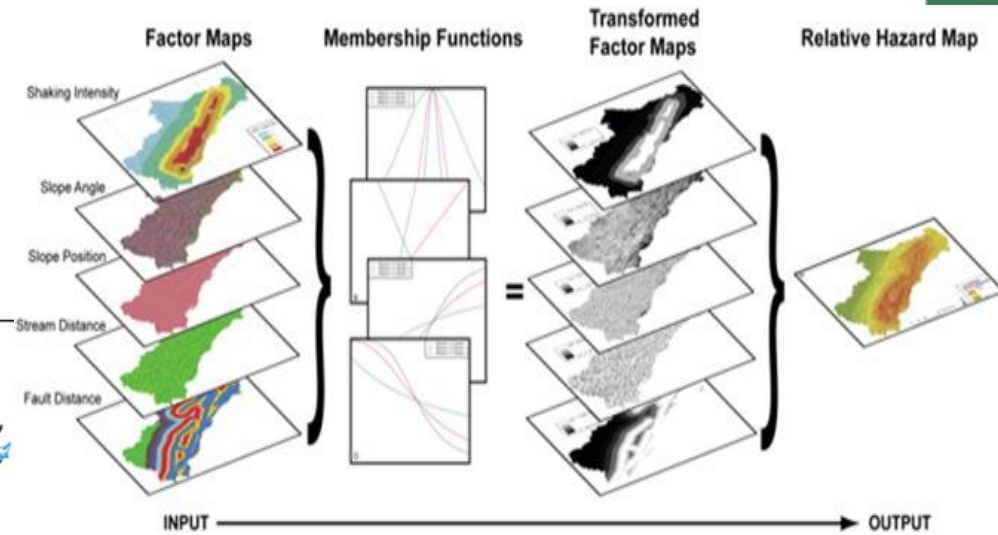
Brendon Bradley et al. – Ground motion simulation of full length Alpine Fault rupture

Rupture time 0:00



<https://www.youtube.com/watch?v=uGWbjYy3to0>

Simple multi-hazard impact approach co-produced with end-users



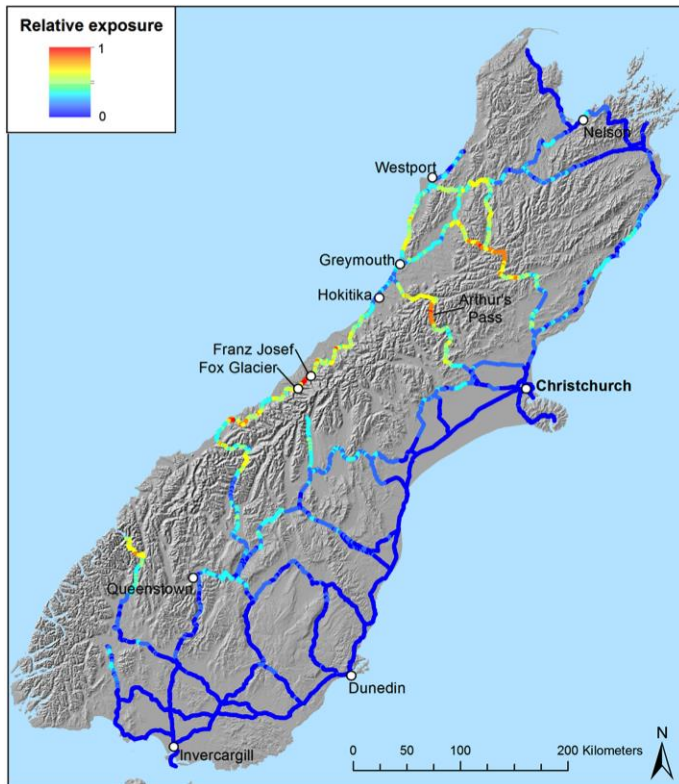
Co-seismic landslide model for an Alpine Fault earthquake scenario



Robinson, T.R., et al. 2015 *Multiple infrastructure failures and restoration estimates from an Alpine Fault earthquake*. Economics of Resilient Infrastructure Research Report

What does this mean?

State Highway Network



Exposure maps show the likelihood of a section of road being affected by a landslide

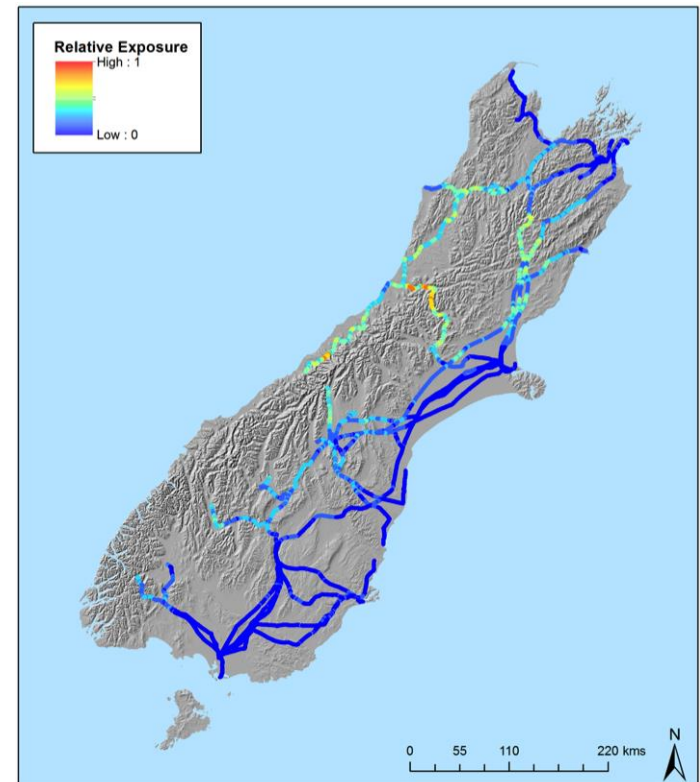
1 = almost certainly

0 = almost impossible

5 sections are particularly exposed:

1. Arthur's Pass
2. Lewis Pass
3. Fox Hills (Franz-Fox)
4. Haast Pass
5. Milford Road (Homer Tunnel)

Power Transmission Network

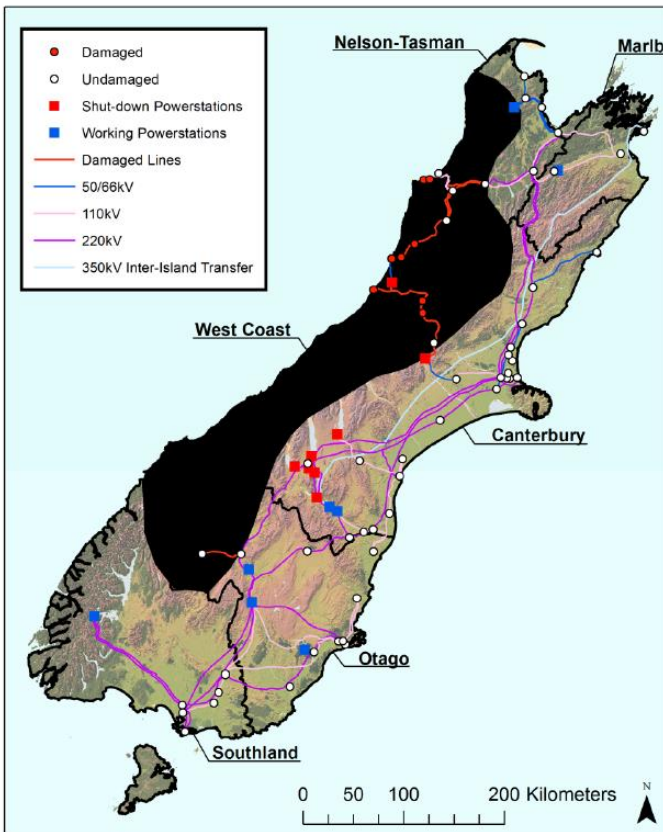


Thanks to Tom Robinson (UC/Durham Uni)
Robinson et al. 2015

What is the End-User Experience?

Loss of Service (electricity distribution)

Restoration Priorities

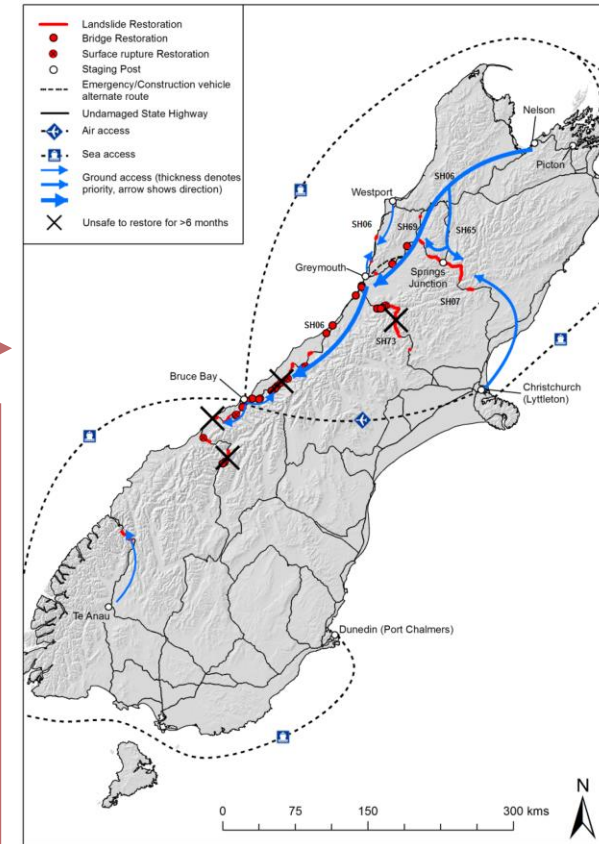


- Scale of outage...
- Duration of outage...
 - Time slices through the scenario

Collaboration with CDEM (including lifeline) agencies to establish level of service estimates, restoration priorities.

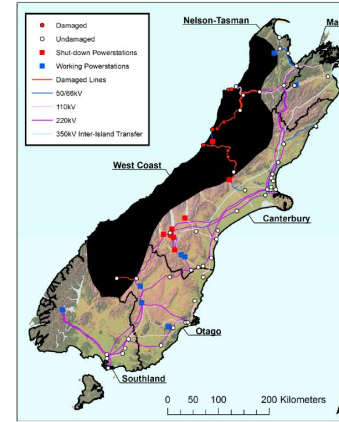
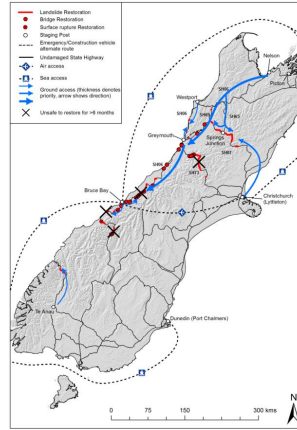
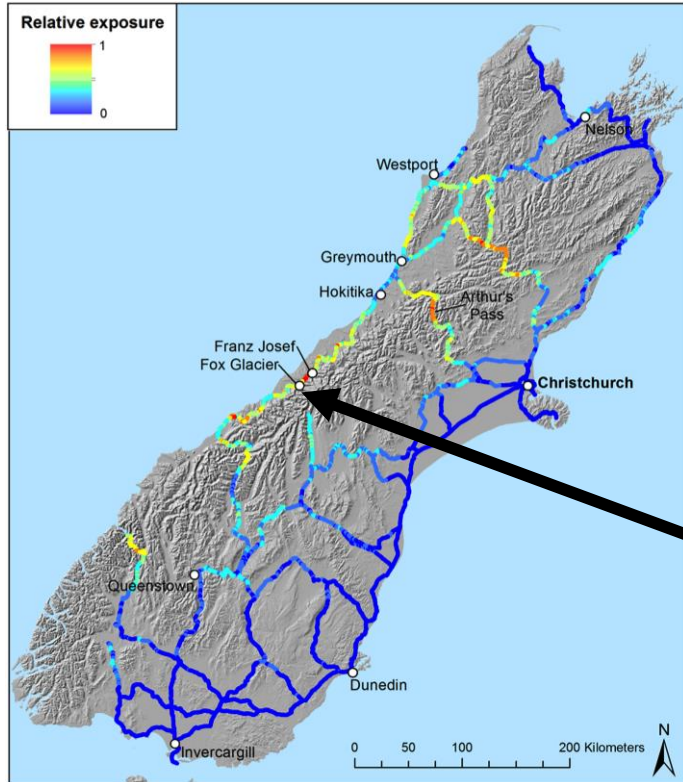
- Aftershocks
- Accessibility
- Available resources
- Interdependencies

Build a picture of recovery through time



Thanks to Tom Robinson (UC/Durham Uni)
Robinson et al. 2015

What does this mean for a community, e.g. Franz Joseph?

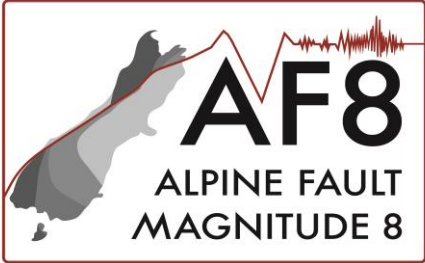


Franz Joseph Resilience Group (Community led resilience planning group)

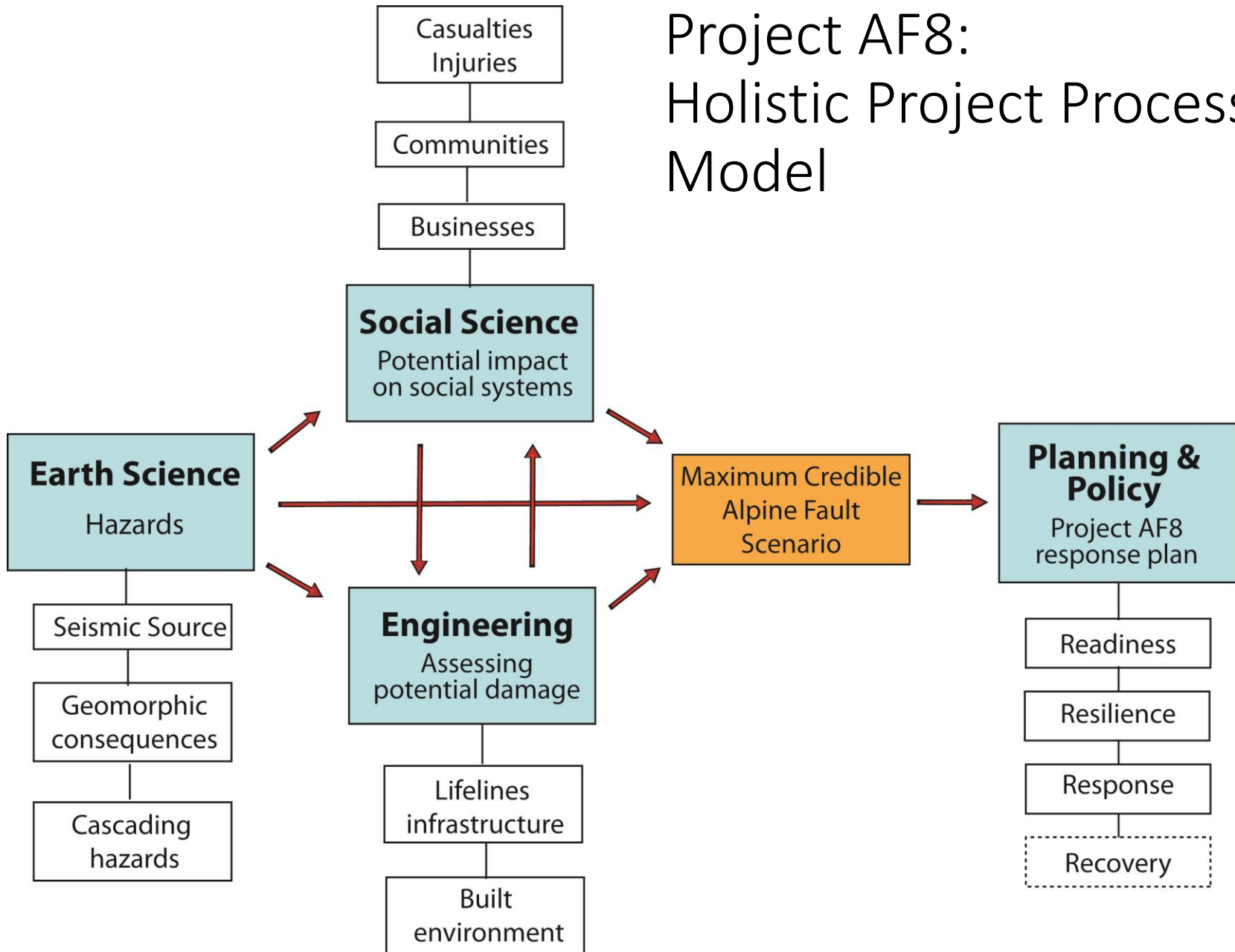
“What do these hazard maps mean? What is it going to mean for us?”

Planning for a future Alpine Fault earthquake

- 6 South Island CDEM Groups
 - Supported by 30 researchers: 6 Uni, 2 CRI, 2 consultancies
- MCDEM funded: 2 year project July 2016- June 2018.
- **GOAL:** to build a collective South Island earthquake response plan for a future Alpine Fault earthquake



Project AF8: Holistic Project Process Model



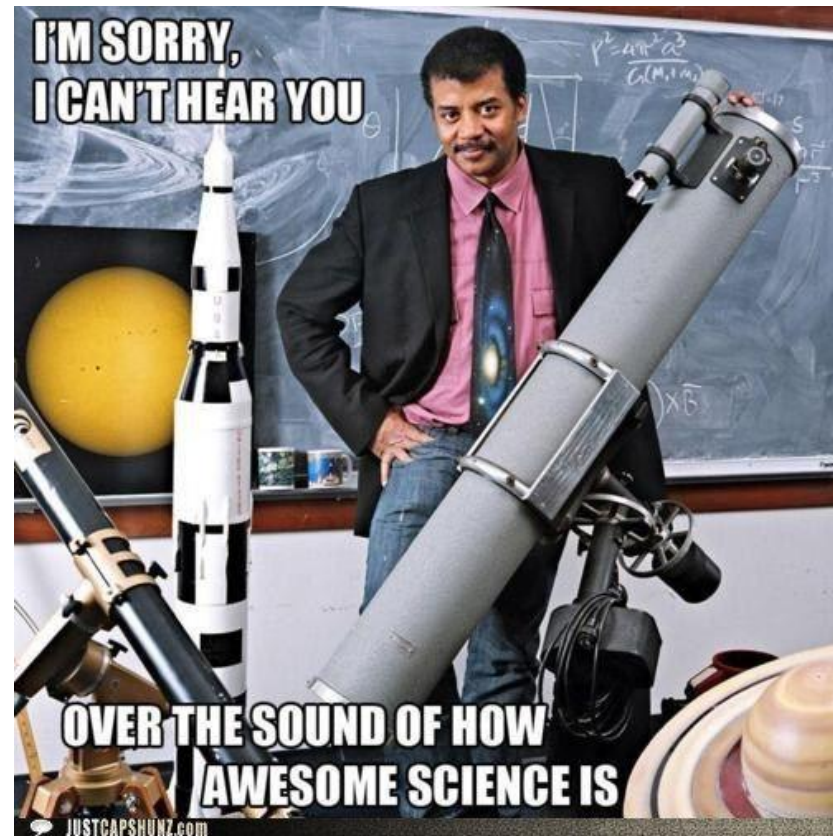
Alpine Fault Scenario workshop – August 2016





We generally know the problem...

...but sometimes struggle to **identify, evaluate** and **translate** solutions for decision makers.



Project 3:

Community resilience to wildfire

- Co-produce community plans w/wildfire focus
- Community-based planning processes
- Traditional/non-traditional rural volunteerism in wildfire management within a multi-hazard environment



Former research programme: "Protecting New Zealand from Emerging Rural Fire Risks"

Scion wildfire research: Enhanced community resilience

Improve at-risk communities' readiness to respond to, and recover from, rural fire events

1. Human-caused fires
2. Risk communication and fire danger warnings
3. Effective communication of wildfire messages
4. Māori traditional use of fire



Community case studies:

- Effective communication/resilience (Queenstown, Nelson & Mahia)
- Northland (Karikari Peninsula).



Case study approach to explore resilience



- 3 communities that have suffered wildfires
- National agency representatives
- 80 community and agency interviews.

➤ *Determine how resilience has been affected by interactions of agencies and residents.*

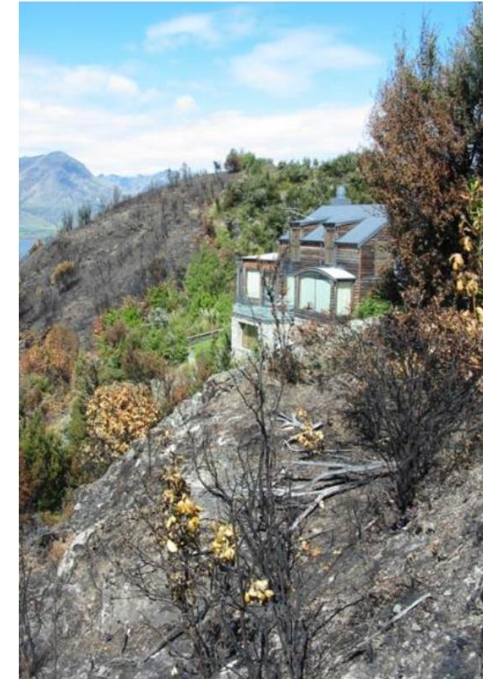
How did respondents define 'community'?

Agencies

- Community contain separate and diverse areas
- But wildfire resilience planning based on geographic community
- Closeburn: geographic area set of smaller sub-communities

Community respondents

- Diverse and distinct sub-communities
- Did not operate as single entity
- Social interaction with people in their own localities
- Communities of belonging – hapū, interest groups etc.



Who should lead community resilience?

Agencies

- Communities should play leading role
- Vision of 'community champions' taking main responsibility and workload

Community respondents

- Local fire agencies should retain responsibility
- Agencies should take lead.

➔ *Mismatch.*



Shared responsibilities to enhance resilience

Agencies

- Cannot devolve responsibilities to communities
 - Cannot expect 'champions' will take over leadership
 - Must have continued input
- *Enhance community resilience by working with communities in active approaches
e.g. Queenstown Red Zone plan with active agency and community fire wardens.*

Karikari Peninsula case study

- Small remote rural population in Far North - 54% Māori
- 2011 significant fire destroyed
 - 3 homes, 9 other buildings
 - 145 ha scrub & farmland
 - 2 fatalities in helicopter crash
- Gained understanding of residents' awareness of wildfire risk and use of fire

- *Window of opportunity to maximise learning following significant wildfire*
- *Need to work with local community using existing social networks*
- *Need to target visitors and newcomers.*



Resilience to Nature's Challenges

National Science Challenge



Resilience to Wildfire Challenges

'Rural toolbox' research:

Improving community resilience

- Community-based planning processes across all natural hazards – Kaikōura case study
- Integrating indigenous knowledge - Māori engagement for wildfire resilience – Northland case study
- Traditional and non-traditional rural volunteering in wildfire management within a multi-hazard environment
- Fire as land management tool – reduce number of escapes from controlled burns that can lead to serious injuries or deaths.



Photo: Otago daily times



Resilience to Nature's Challenges

National Science Challenge



Resilience to Wildfire Challenges

'Hazards toolbox' research:

Quantification of wildfire risk for multiple hazard mapping

- Likelihood & consequence probabilities
- Integration into multi-hazards risk assessments, and linking to infrastructure vulnerability/ impacts modeling.



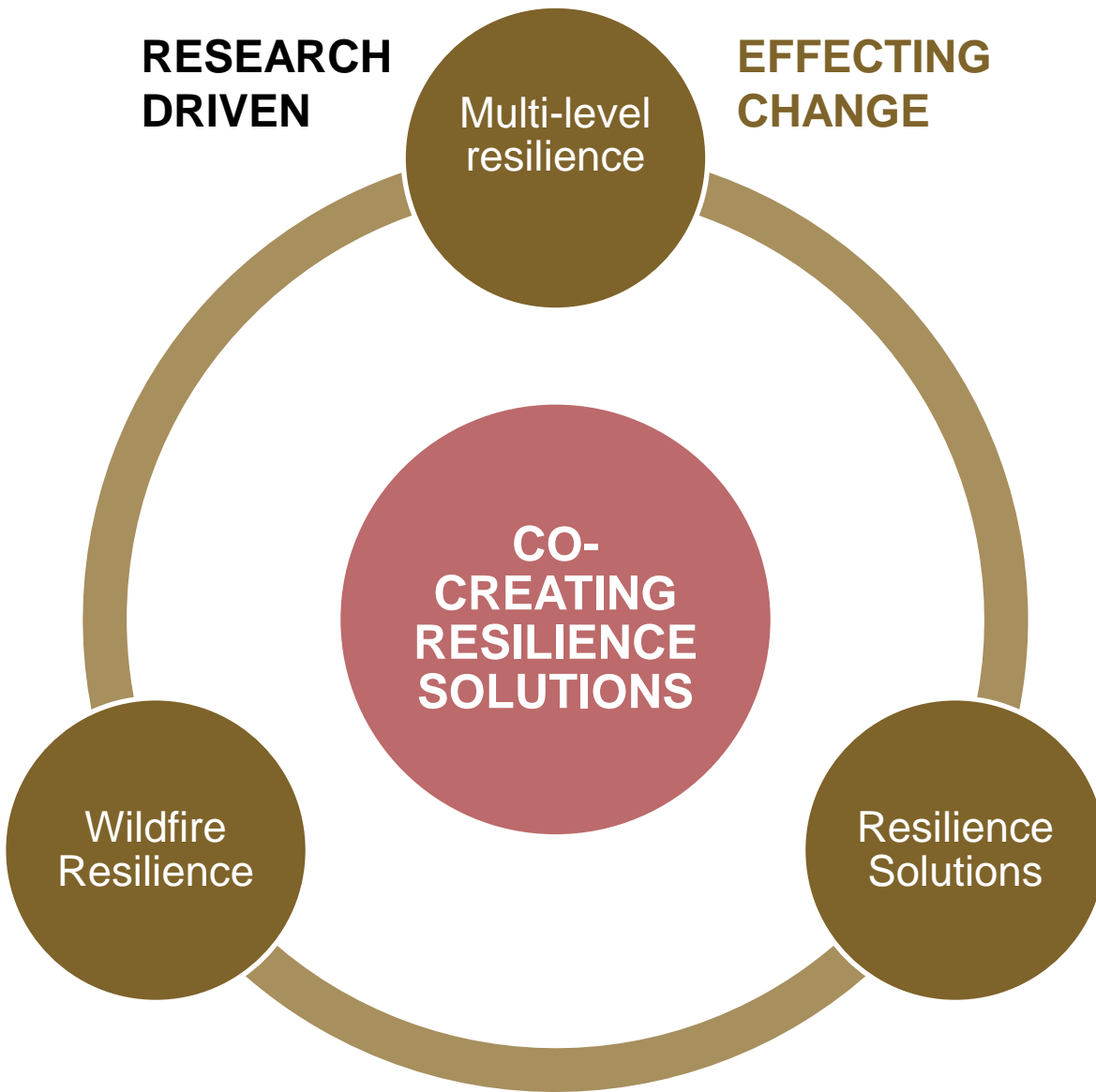
New Scion MBIE programme

Preparing New Zealand for extreme fire

Five-year programme with four research themes:

1. Extreme fire behaviour
2. Real-time fire monitoring tools
3. Extreme fire prevention technology
4. Targeted protection of important sites/taonga species.



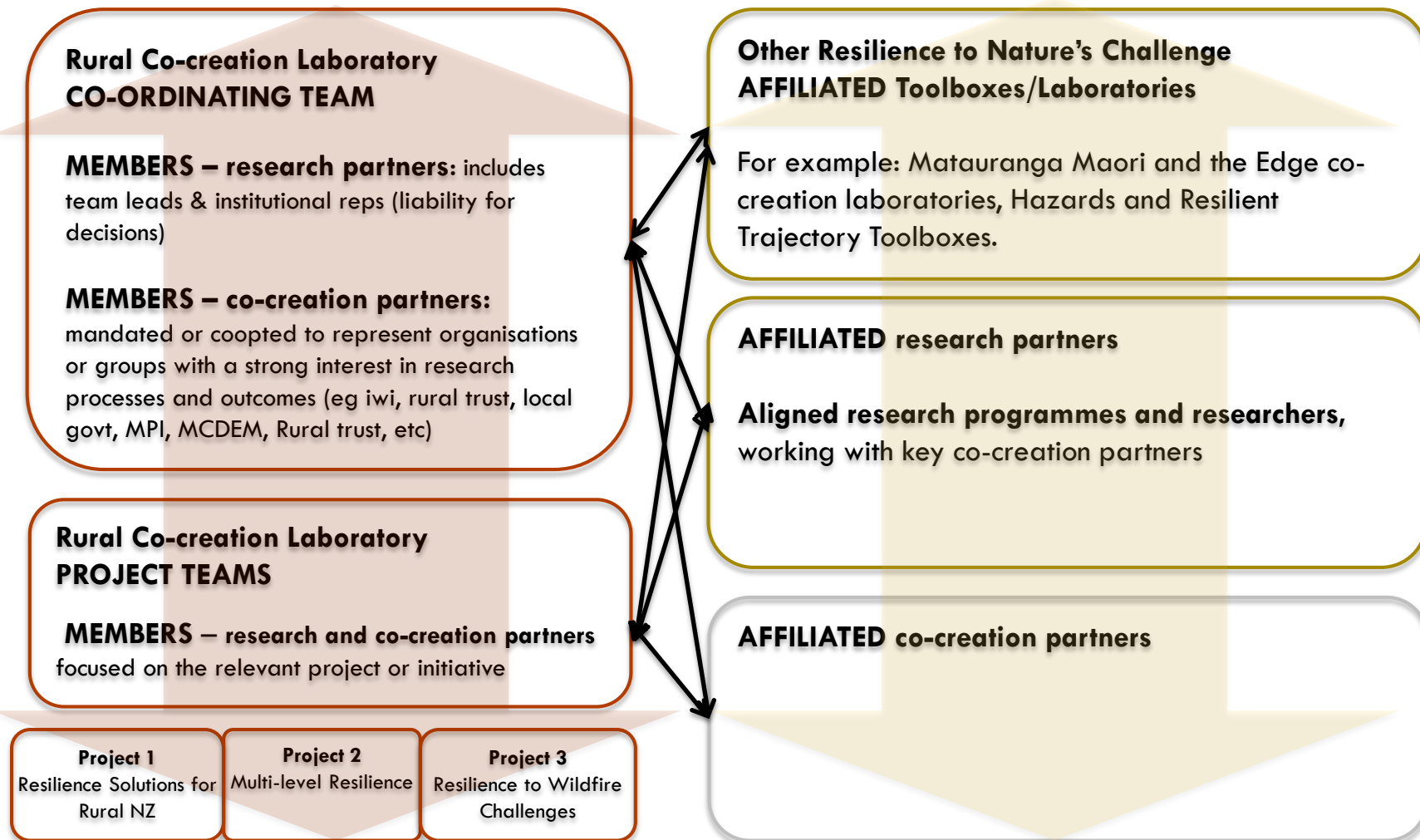


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Rural Co-creation Laboratory: structure



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BRIEF: small funding investment to maximise networking

Across:

Resilience to Nature's Challenge Programme

Existing research programmes and initiatives

Potential partners (with research/political/professional/emotional/cultural/financial interest in the programme and outcomes)

Current (initial):

Coordinating team members include research representatives from UC, LU, Landcare, Otago, and Scion

Recruiting co-creation partners

How:

Partnership can involve membership at coordinating or project team level, or varieties of affiliation with the programme.

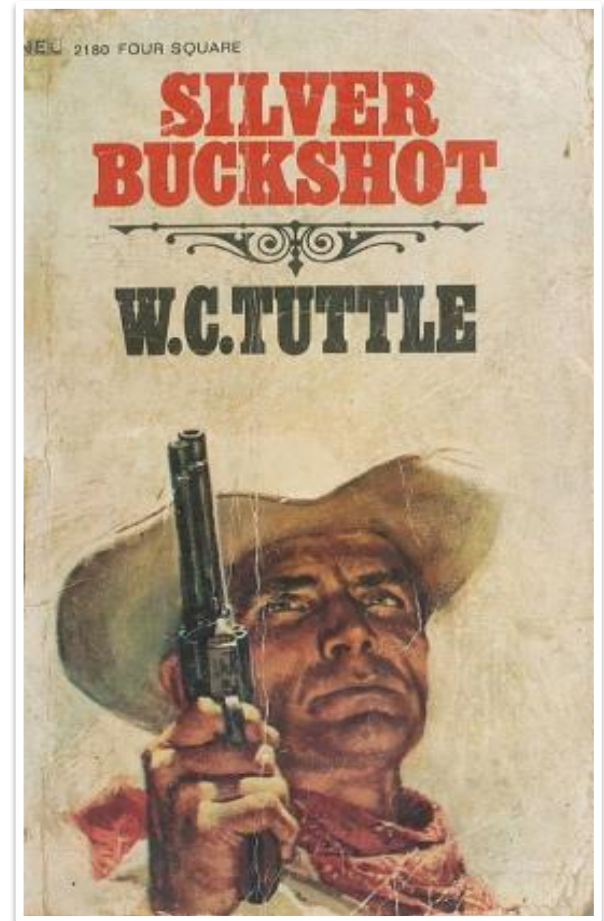


Lead by example. Demonstrate a linked-up, integrated approach to DRR, resilience-building and co-creation of practical resilience solutions.

Resilience is an integrating concept.

Interdisciplinary science is urgently needed to help mediate decision-making, highlight options for better policies for inclusive social and economic development in rural areas, and ensure resilient rural futures.

Together, how can we achieve that?



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Questions?

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