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# **Critical Infrastructure Resilience: Perspective from New Zealand**

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# The Wellington Region



-----Wellington Fault

-----Wellington Fault





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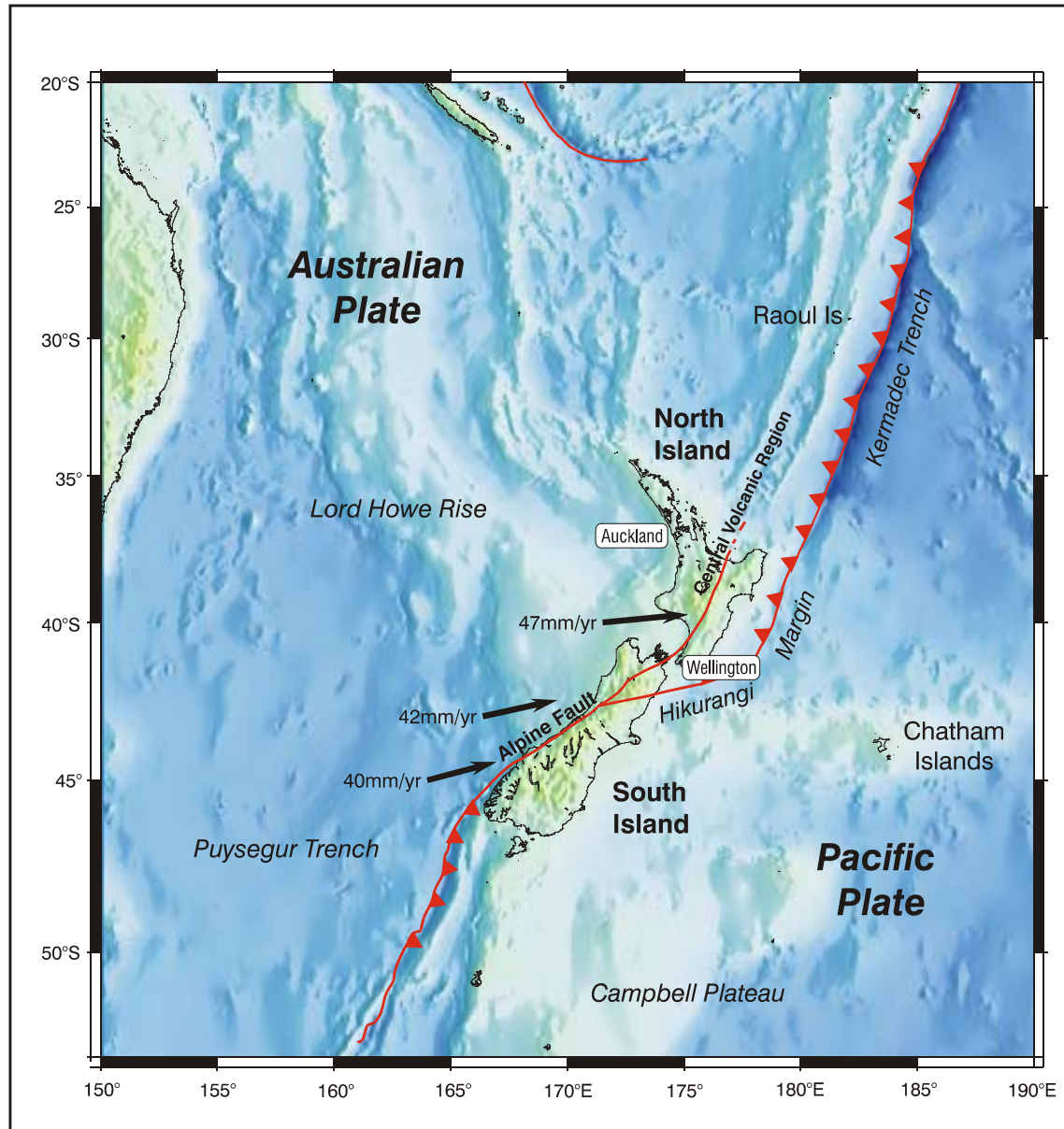
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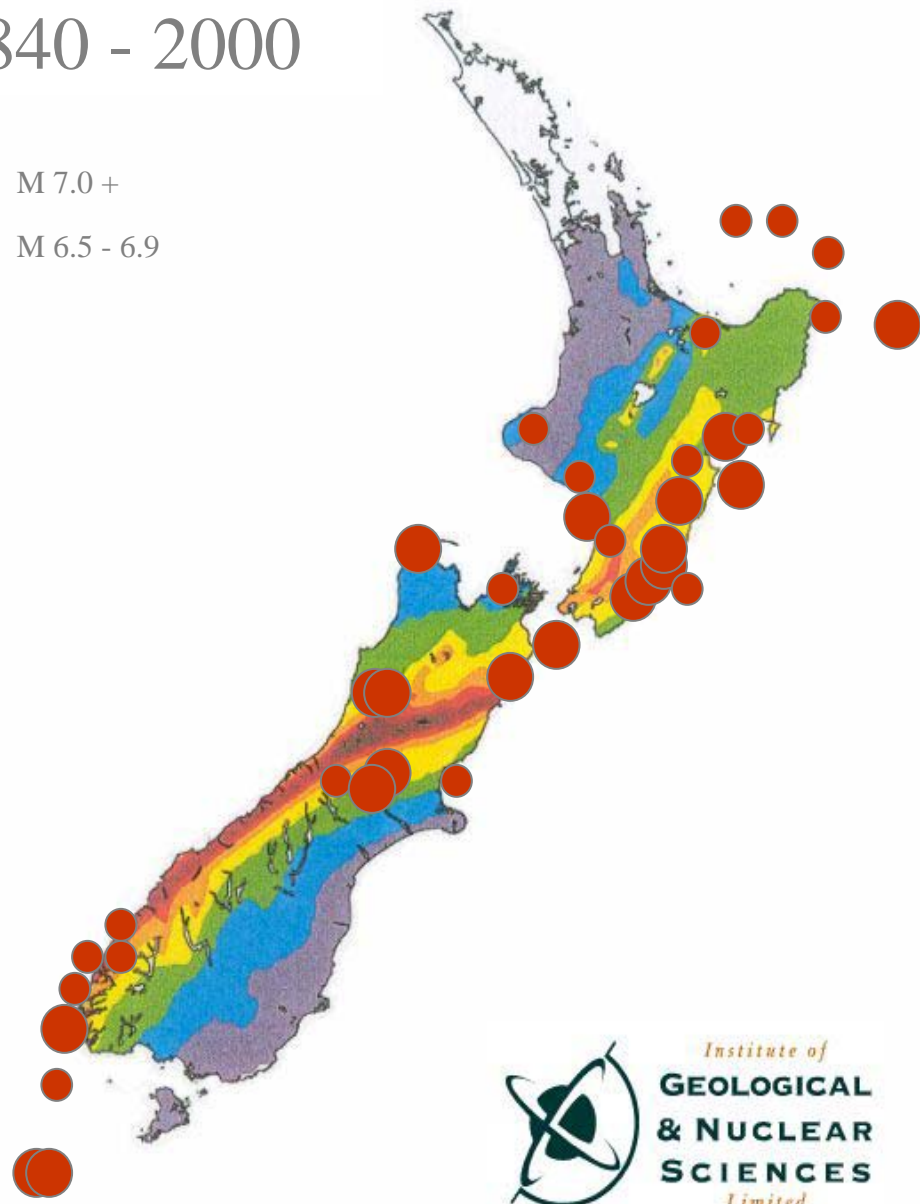
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# Two Subduction Zones



1840 - 2000

- M 7.0 +
- M 6.5 - 6.9





# Critical Infrastructure . . . . .

## . . . . . ideas still forming

- Began as “Lifelines” programme in 1989 led by Centre for Advanced Engineering
- Focus was on essential utilities after natural disasters
- That work continues at both service and national levels
- Increased interest in 2000 as a complementary aspect of new arrangements for Civil Defence Emergency Management
- Cabinet set some guidelines in 2001



Definition: EXG(01)58

*"Critical infrastructure is that infrastructure necessary to provide critical services, whose interruption would have a serious adverse effect on New Zealand as a whole or on a large proportion of the population, and which would require immediate reinstatement."*



## Definition: EXG(01)58

*"New Zealand's critical infrastructure has been identified as those assets and systems required for the maintenance of:*

- *governance including law and order and national and economic security;*
- *telecommunications and the Internet;*
- *energy including electricity generation and distribution, and the distribution of oil and gas;*
- *finance and banking;*
- *transport;*
- *emergency services."*



# Risk Context - Vulnerabilities

Infrastructure vulnerabilities are increasing, eg:

- As as people concentrate in ever larger cities and increasingly occupy hazard-prone areas.
- As communities become more reliant on advanced technologies to maintain their security and way of life;
- As they increase their dependency on closely coupled infrastructural systems (eg, electricity and communications).



## Risk Context - Consequences

*In such situations there are opportunities for unexpected synergies to develop between otherwise independent risks, and the scale of potential disaster is magnified*

*In infrastructure there are new classes of risks that are developing that are inadequately understood.*

*Complex new interdependencies are emerging between different infrastructure sectors.*

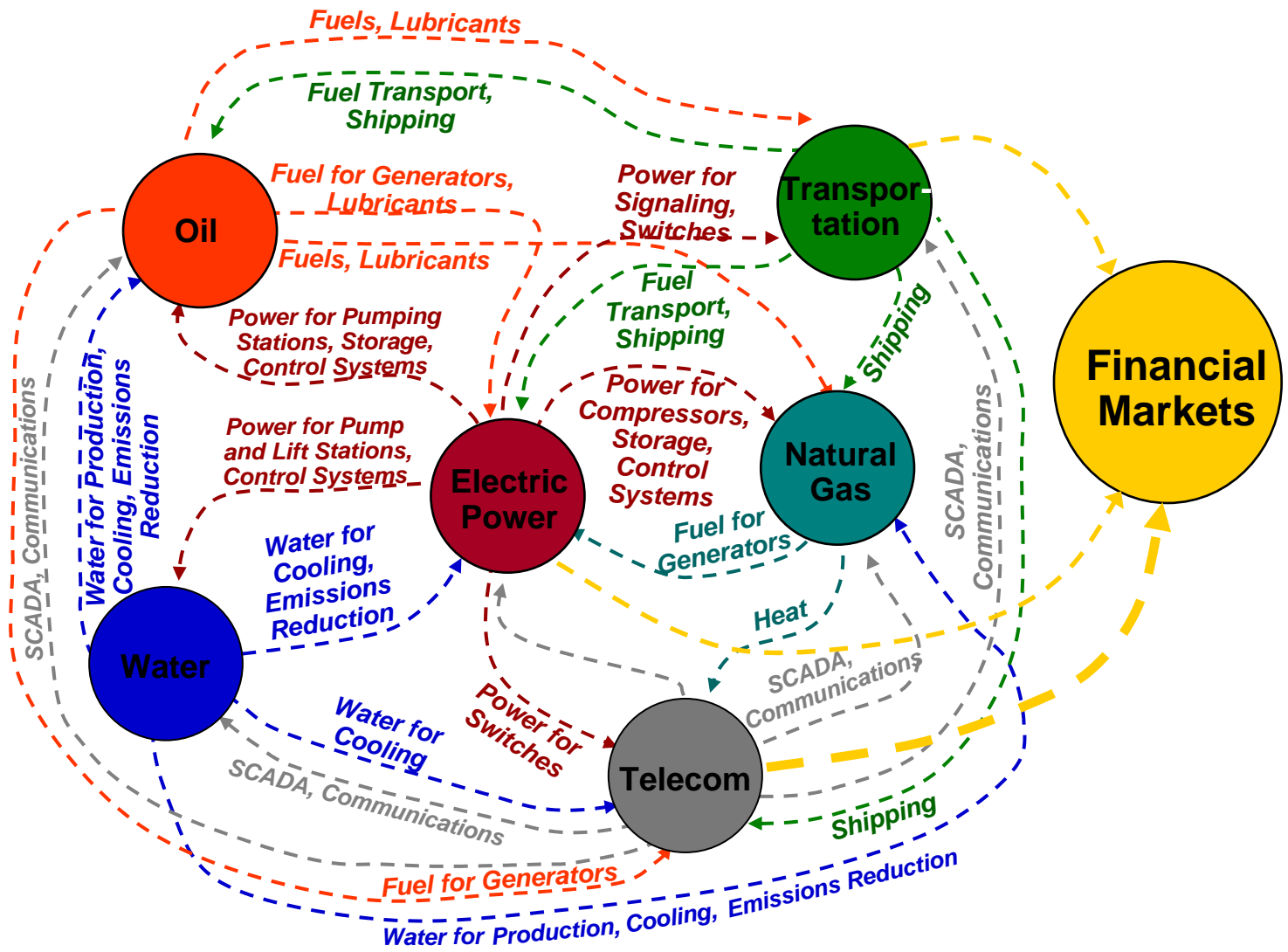


# Interdependence . . .

Several sectors comprise  
systems of systems  
or have interconnectedness

\* \* \*

Failure in one sector  
can rapidly  
cascade more widely,  
as the following examples show



O'Rourke from Peerenboom, Fisher, and Whitfield, 2001



## Our Goals . . .

1. Protection of communities against infrastructure shocks whether caused by natural hazards or man-made threats
2. Rapid restoration of services following failure
  - This will require a new paradigm based on collective responsibility (all stakeholders: ie, private sector, user communities, local and central govt)
  - There must be shared understand of the total infrastructure system and assets, their importance, their inter-linkages, ownership issues, vulnerabilities, threats to normal functioning, sustainability issues, etc.



## Key risk management questions:

- What matters most ?
- How could disruption occur ?
- What could we do ?
- What should we do ?



# Risk Assessment

- understand the ‘system’
  - i.e., the parts, elements, agents, structure
  - interrelationships, mutual constraints, internal forces
  - characteristics, properties, behaviours
- understand the ‘dynamics’
  - responses to internal and external forces
- understand the ‘uncertainties’
  - so that risks can be managed



# Reducing Risk

Policies for  
Minimising, Mitigating, and Managing  
risk

involve trade-offs between

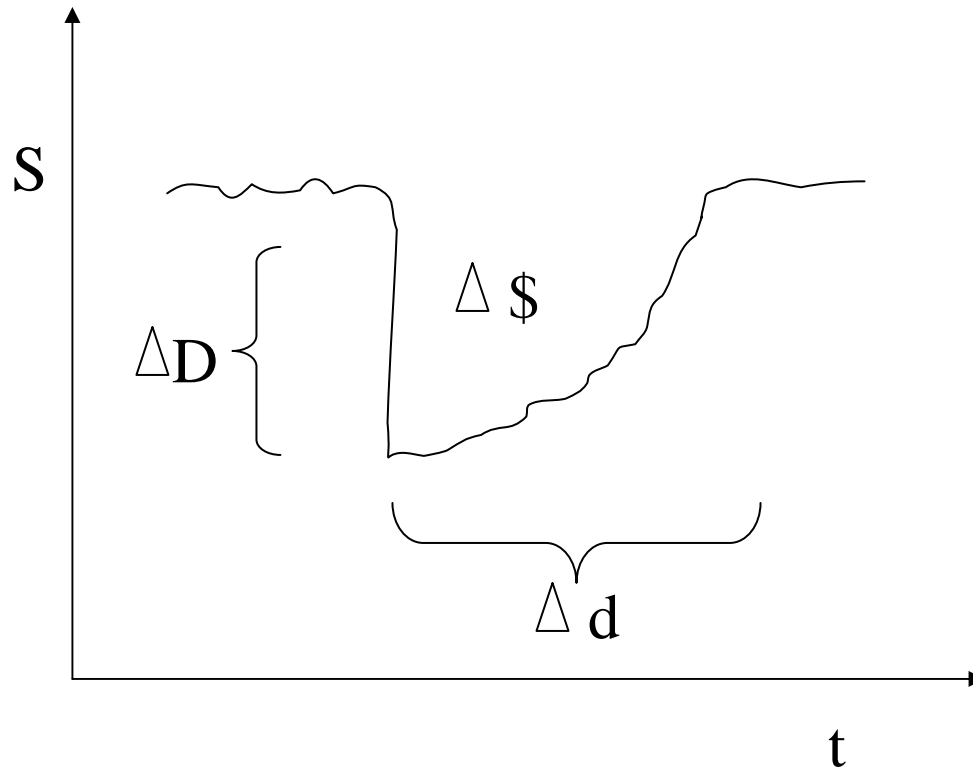
**Damage** potentially possible

**Duration** of likely interruption

**Dollars** to mitigate or restore



# Damage, Duration, Dollars balance the deltas . . .





## Recent work in NZ . . .

- 1990s: Local Govts & CAENZ - excellent work in Lifelines
- 2002/03: DPMC brought together a group to explore basic ideas and linkages to wider security and infrastructure work
- 2004: MED commissioned infrastructure stock-take
- 2004/05: FRST introduced new criteria for allocation of science funding in natural hazards research
- 2005: MCDEM intensified work with utilities
- 2005: CAENZ hosted international conference “Resilient Infrastructure” aimed at promoting awareness
- 2005/06: MOH/MED undertook programme of consultation with selected infrastructure sectors for pandemic planning
- 2007: Infrastructure Resilience project.



# Purpose of workshops with Infrastructure Providers in May 2008

## **Focus:**

**Community functioning**

## **Infrastructure:**

**International security-related definition**

## **Aim:**

**Reduce incidence and severity of infrastructure disruptions**

**Rapid service restoration**

## **This is a work in progress:**

**Not government policy**

**(Chatham House rule)**



# SCOPE OF THE ISSUES

**Assets, systems and organisations in:**

**Networks:** energy, communications, transport, water and waste

**Food**

**Banking**

**Health**

**Bio-security**

**Primary production**

**Law and order**

**Emergency services**

**Government services**



# DEFINING RESILIENCE

**At the community level:**

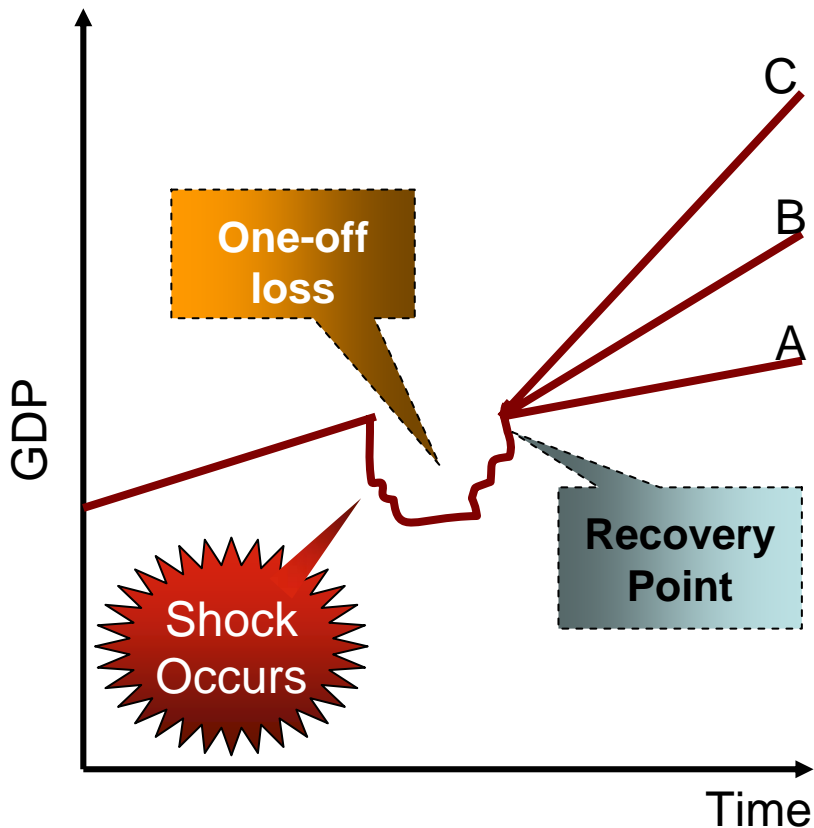
**DEFINING RESILIENCE** *The ability at every relevant level, to anticipate and, if necessary, to handle and recover from disruptive challenges*

**Several dimensions including:**

- **Technical**
- **Social**



# LOSSES – ACTUAL AND POTENTIAL



## LOSSES

- New Zealand 1992 electricity shortage: 0.6 % GDP impact
- Wellington gas outage 2006: Cost \$5m
- Victoria gas explosion 1998: Cost A\$1.3b

## EXERCISE ESTIMATES

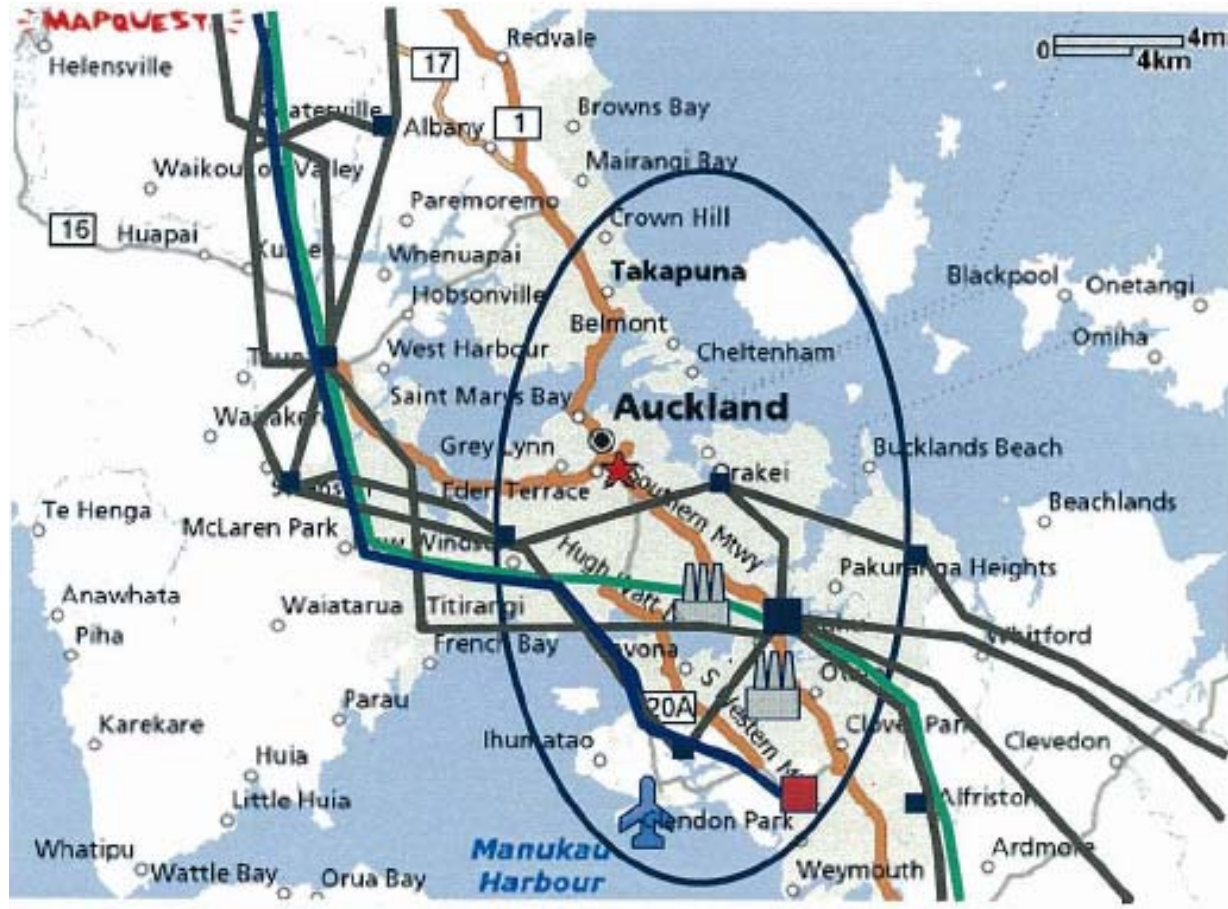
- Ruamoko: Estimated 12 % GDP loss
- Major Wellington earthquake: Estimated losses: Capital \$10 b, production \$1 b

## ISSUES TO WATCH FOR

- Direct and flow-on impacts, reputation impact
- Recovery effect



# CASCADE FAILURE





# THE HEART OF THE MATTER

**Some propositions:**

***Infrastructure is increasingly important, but providers acting under commercial imperatives don't meet all public expectations***

- **Commercial drivers include reputation**
- **Risks are increasing**
- **Expectations are rising**
- **A case for collaborative action**



# OTHER CURRENT DEVELOPMENTS

- **Learnings from exercises**
- **Sector groups emerging**
- **Regional initiatives**
- **Regulatory developments**
  - **Networks**
  - **Banking**



# POSSIBLE GUIDING PRINCIPLES

## Principles might focus on:

- **Building knowledge**
- **Collaboration**
- **Risk management**
- **Building on what we've got**
- **Cost-effectiveness**
- **Continuous improvement**



# WHAT WOULD IMPROVED RESILIENCE LOOK LIKE?

## Regular dialogue

### Better infrastructure operating practices, e.g.

- Risk management
- Coordination and role clarity
- Geospatial interoperability
- Maintenance

### Resilience in investment decisions, e.g.

- Better design standards
- Location
- Redundancy



# WHAT PROGRESS POSSIBLE BY PROVIDERS? .....

**Do the following appeal from a provider's perspective?**

- **Better information on risks?**
- **Better information on good industry practice?**
- **Improved mutual support?**
- **Improved inter-sector / intra-sector coordination?**
- **Improved collaboration with government?**



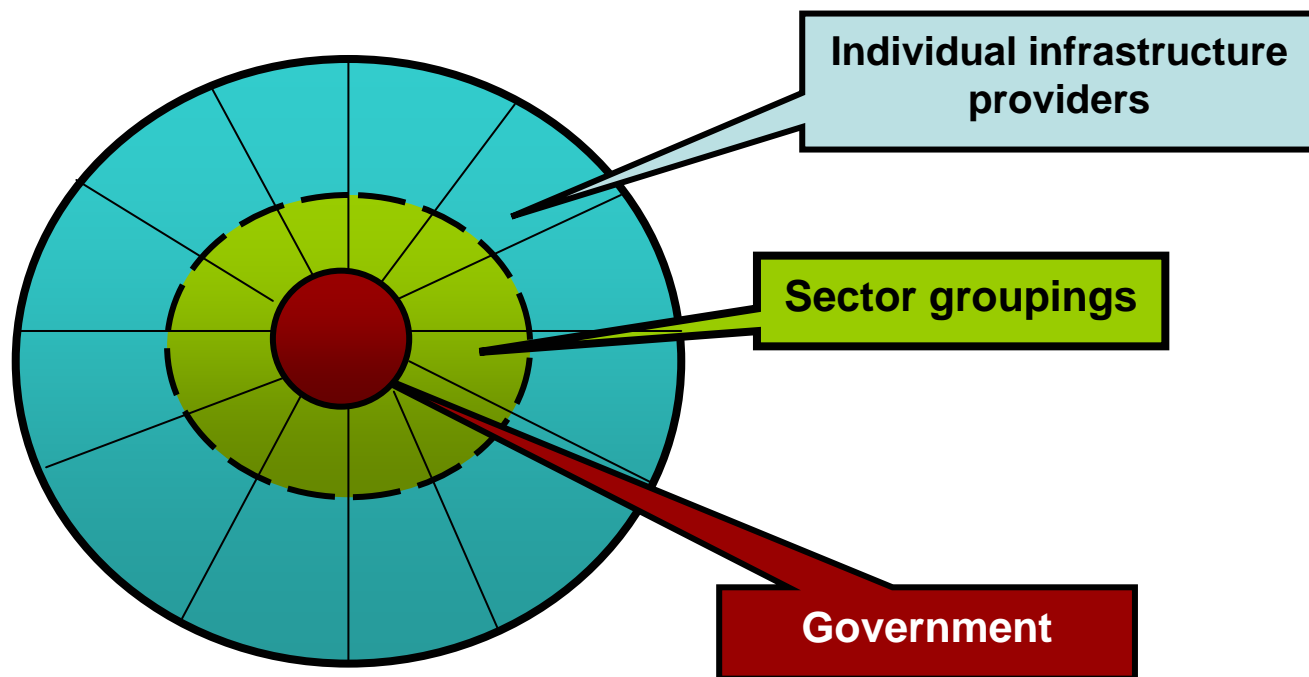
# .... AND WHAT ADDITIONAL ROLE CAN GOV'T PLAY?

## Possible approaches

- No change
- Light government facilitation
- More pro-active government coordination
- Strong government leadership



# A POSSIBLE WAY TO BRING ALL THIS TOGETHER?





# LOOKING FORWARD FROM HERE

**So the main issues are:**

- **Aligning our interests**
- **Improving the conversation**
- **Dealing with impediments and capitalising on incentives**
  
- **What more can we do?**
- **What more should we do?**

***How can government and infrastructure work together to move matters forward?***



# THEMES FROM FIRST WORKSHOPS (1)

## THE ISSUES

**Infrastructure resilience a component of community resilience**

**Interdependencies**

**100% security not achievable**

**"we are all in this together"**

**Issues tend to be scenario and sector-specific**

**but there is much common ground**

**Value proposition required**

**what is the end game? what metrics?**

**commercial reputation a powerful driver – suggests devolution**

**some enhancements costly, others much less so**

**A government role remains – suggests collaboration**



## THEMES FROM FIRST WORKSHOPS (2)

### MOVING FORWARD

- **Prioritisation required**
  - find the pressing needs and opportunities
- **Deprivation test may help**
  - what would we wish we had done?
- **Mechanisms for dialogue need improvement**
  - within and between sectors
  - with government
- **Relationships → trust → sharing → action**
  - some promising developments underway
- **Government's role?**
  - instigator, facilitator, info provider, educator ("yes" to these)
  - more pro-active leadership (?)



# Summary

- **These are some initial perspectives**
- **We recognize the importance of CI**
- **It's a natural extension of the advances made in the past decade on CDEM**
- **We are worried that current commercial imperatives are not congruent with either public expectations or Government's demand for reliable functioning of society**
- **We are trying to understand the issues, and have begun dialogue with service providers**
- **They acknowledge there are shared responsibilities.**

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