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Critical Infrastructure Resilience: Perspective from New Zealand

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The Wellington Region

--------Wellington Fault

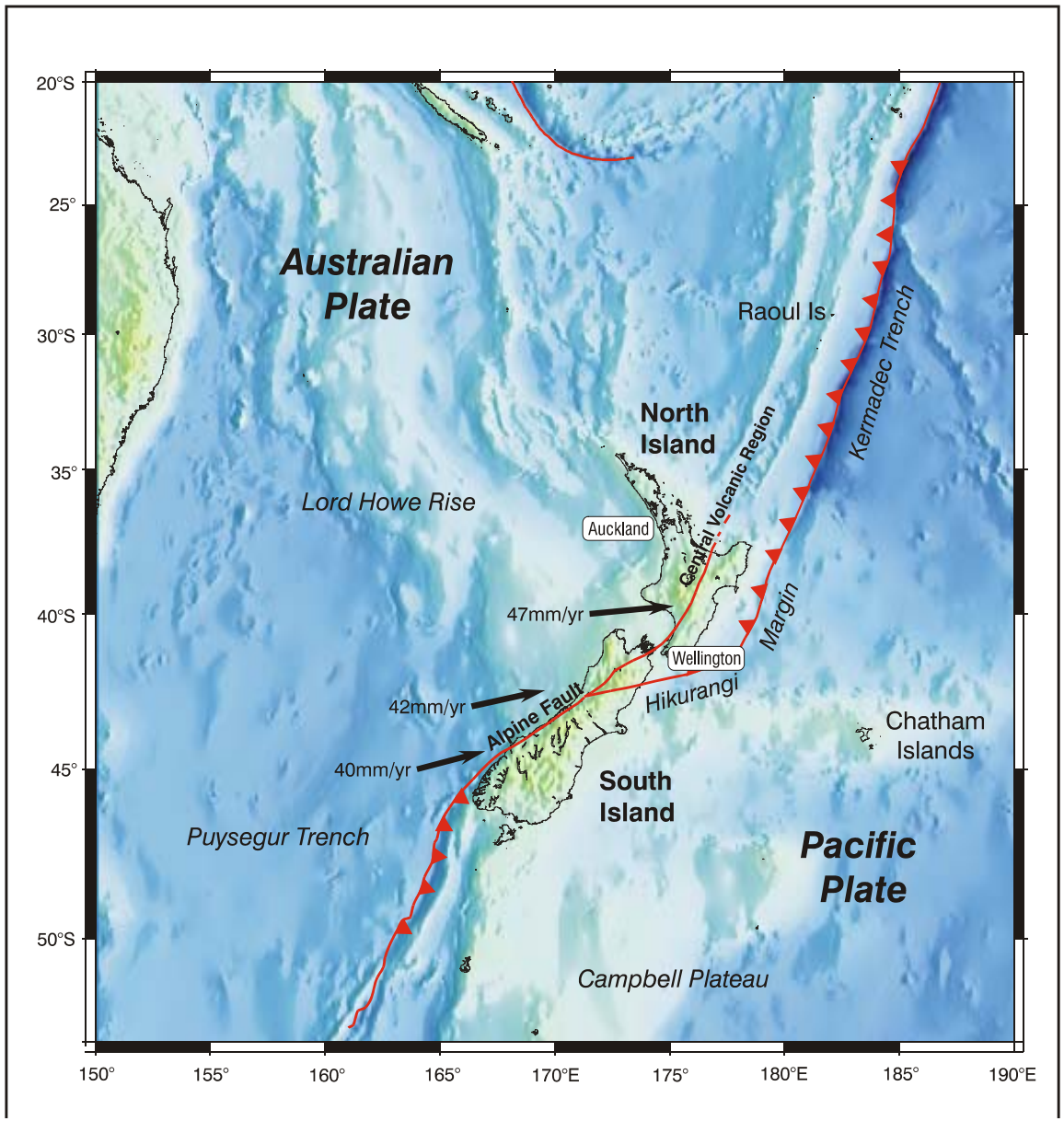
--------Wellington Fault

Wellington Fault --------

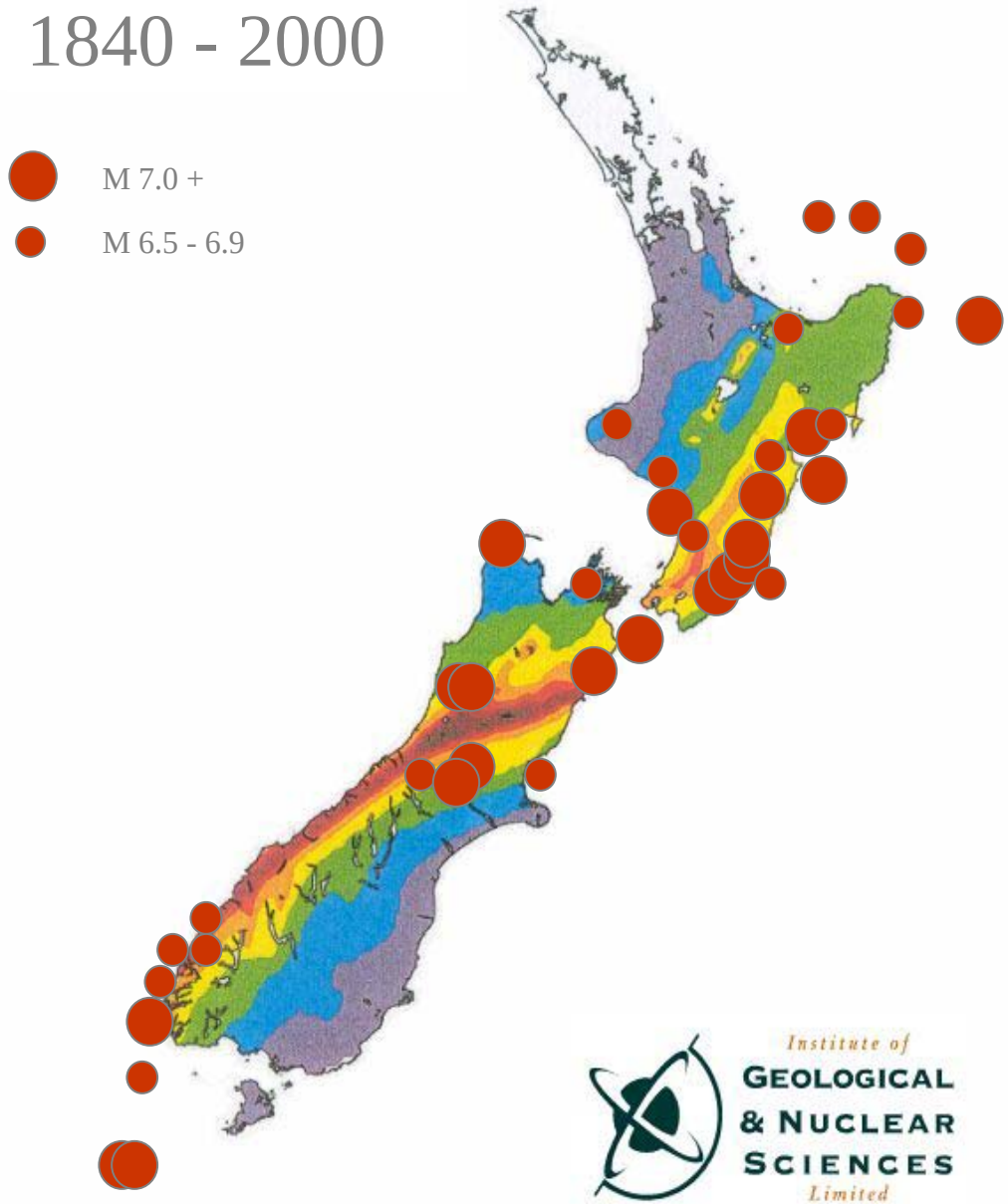
Wellington Fault ------

--------Wellington Fault

Two Subduction Zones



1840 - 2000



Institute of
GEOLOGICAL
& NUCLEAR
SCIENCES
Limited

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.

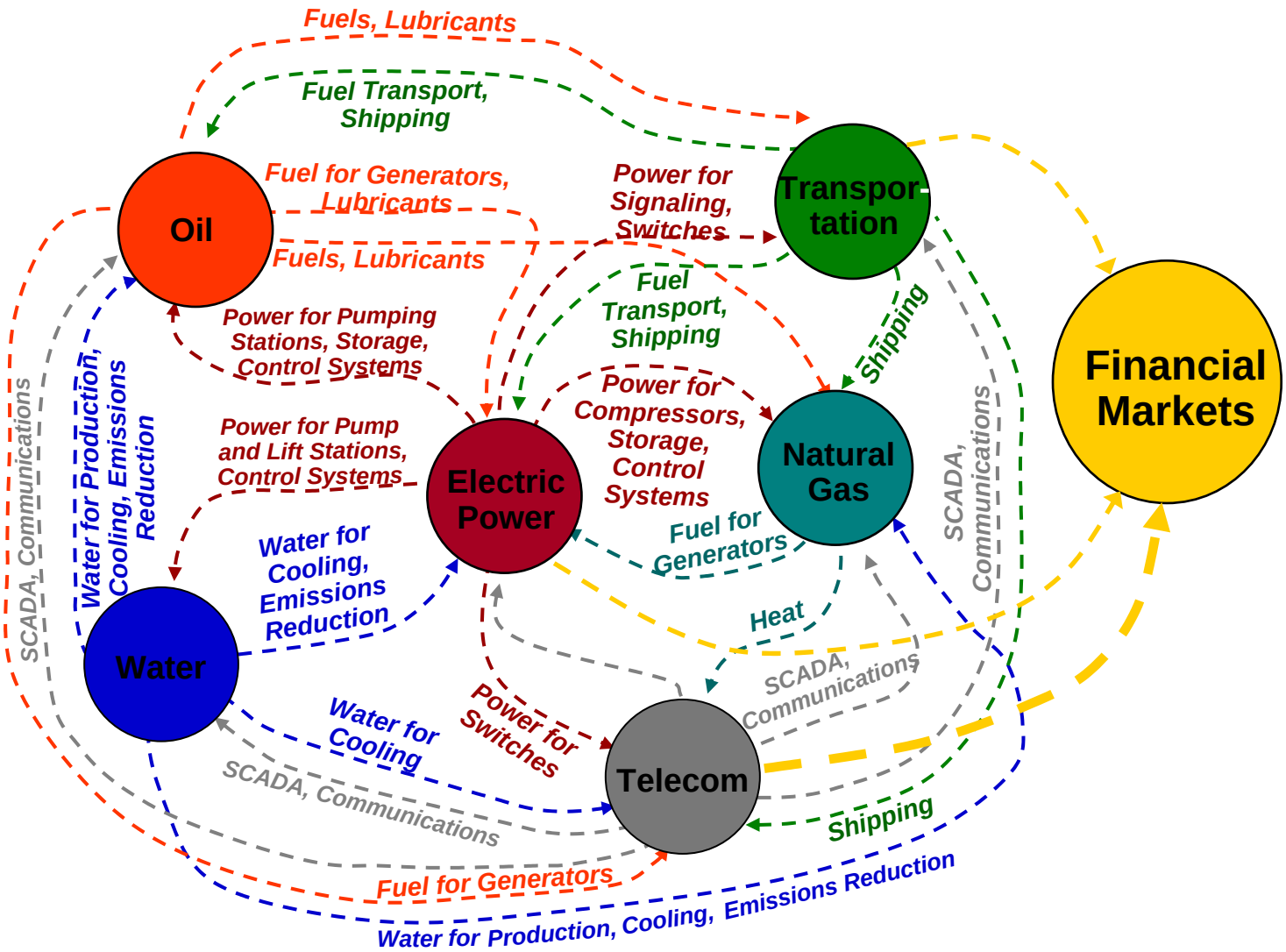
Complex new interdependencies are emerging between different infrastructure sectors.

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

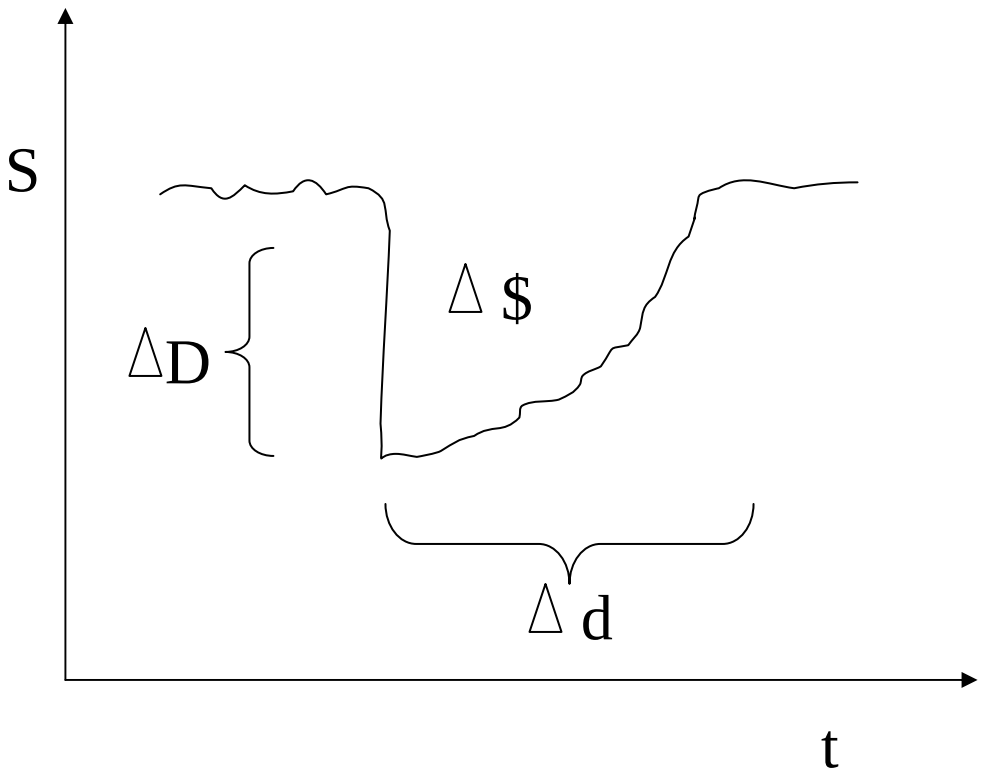
- understand the ‘system’
  - i.e., the parts, elements, agents, structure
  - interrelationships, mutual constraints, internal forces
  - characteristics, properties, behaviours
- understand the ‘dynamics’
  - responses to internal and external forces
- understand the ‘uncertainties’
  - so that risks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

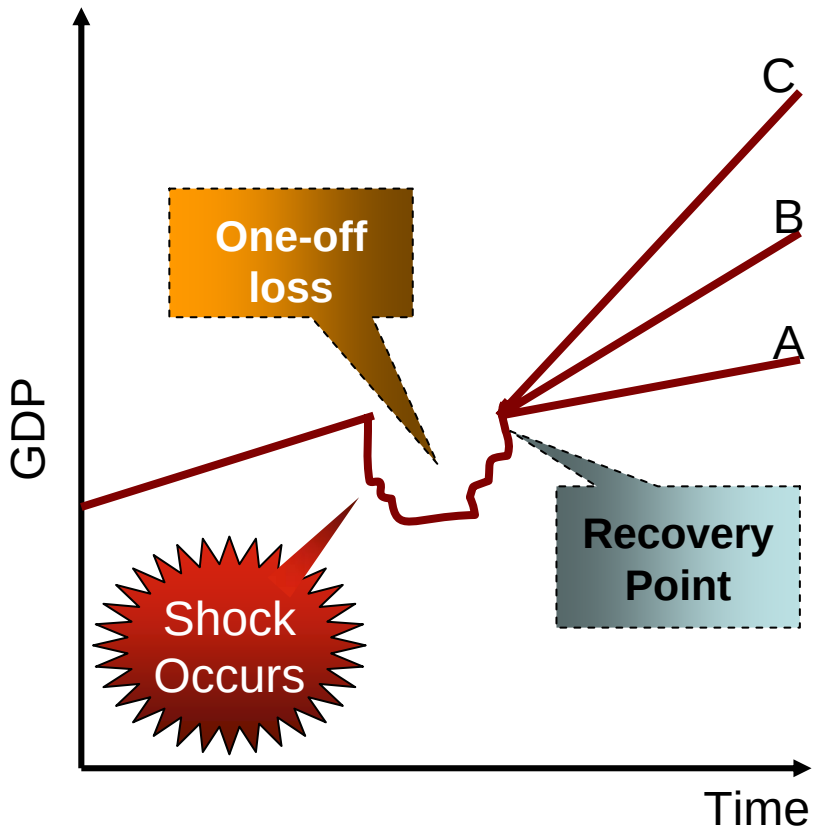
At the community level:

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

- Ruaumoko: 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?

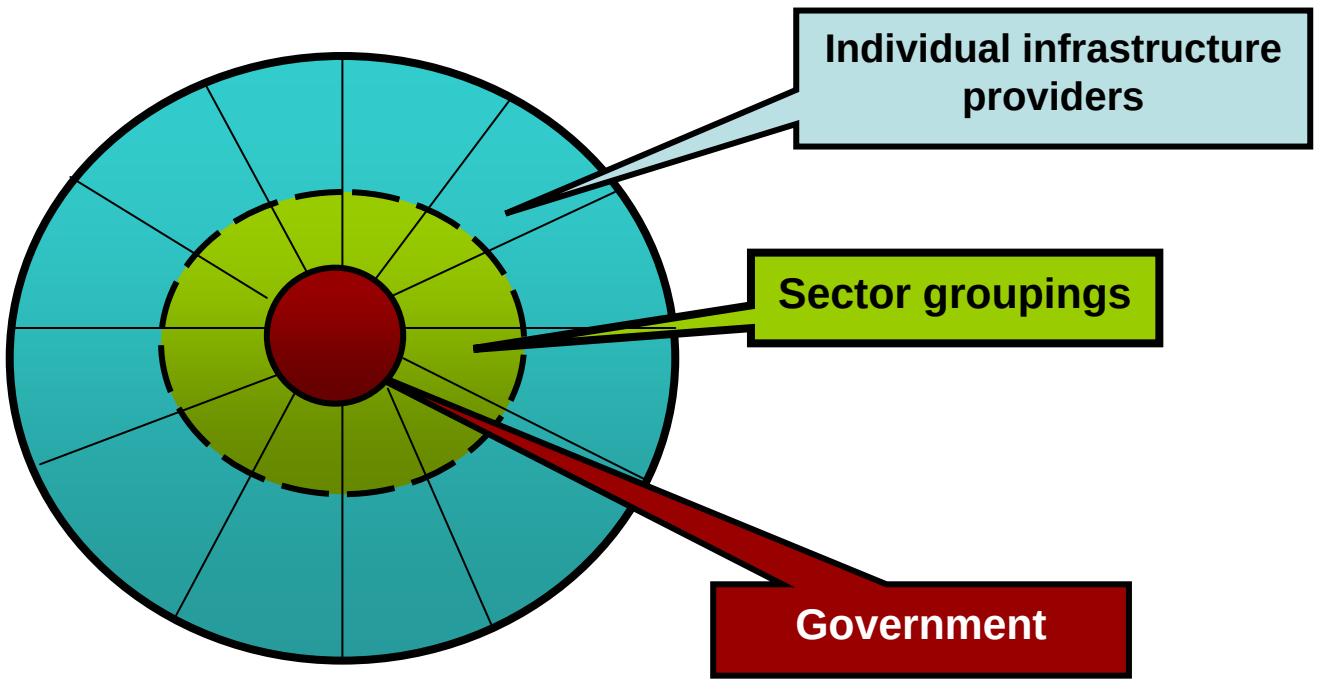
- **Better information on risks?**
- **Better information on good industry practice?**
- **Improved mutual support?**
- **Improved inter-sector / intra-sector coordination?**
- **Improved collaboration with government?**

…. 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 acheivable
- "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

- Prioritistion required
  - find the pressing needs and opportunities
- Deprival 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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