THE TREASURY

Kaitohutohu Kaupapa Rawa

National Infrastructure & Resilience

National Lifelines Forum

7 November 2013

NATIONAL INFRASTRUCTURE UNIT

Agenda

- Context
- The Plan
- Direction of travel
- Evidence base
- 2014

- Resilience

NATIONAL INFRASTRUCTURE UNIT

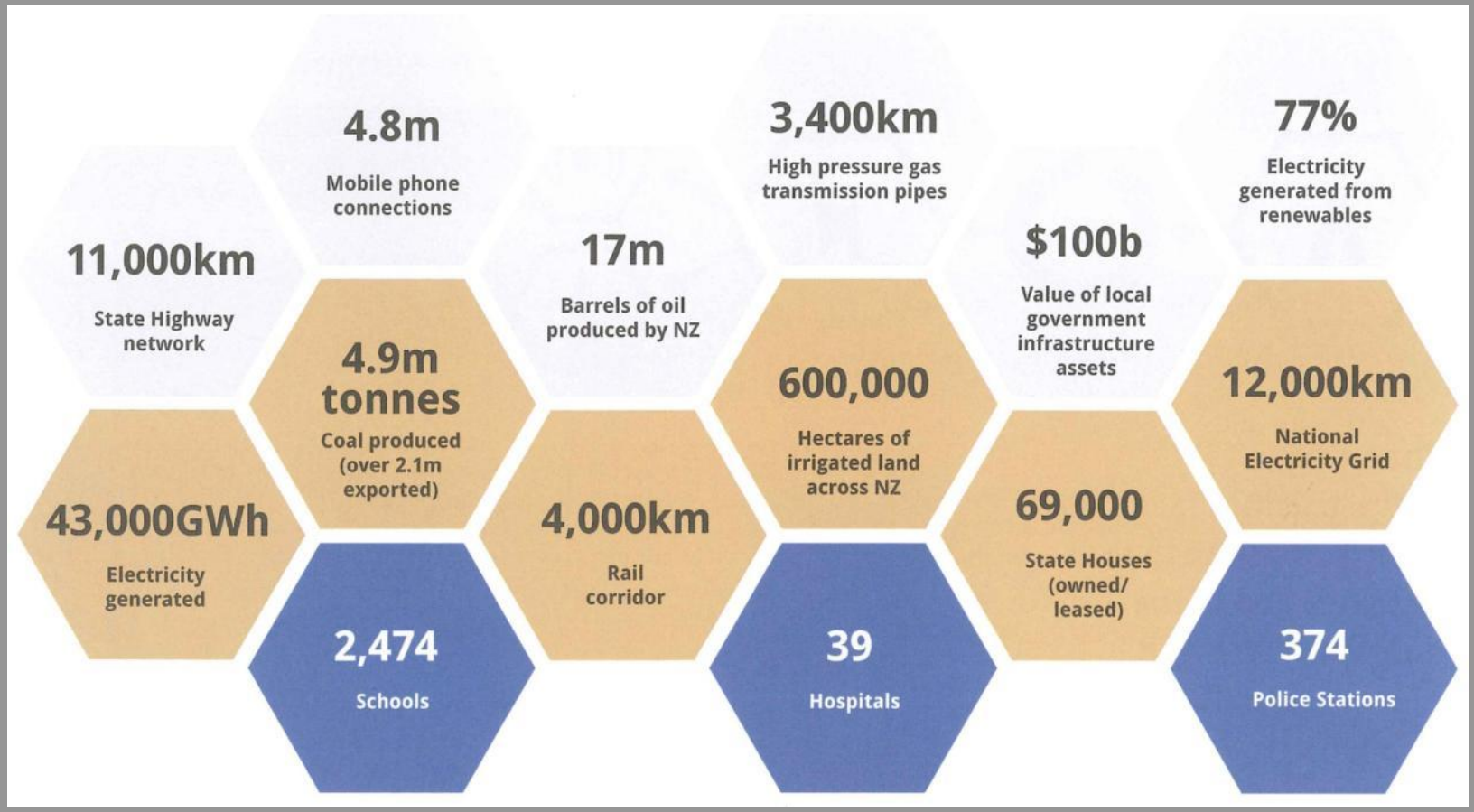
- Established 2009 ï Infrastructure identified as one of six key drivers of economic growth
- Located within NZ Treasury
- Works across specialist sector policy agencies eg. Ministry of Transport, Ministry for the Environment etc
- We are about:
  - High performing infrastructure supporting higher living standards
- Involving a lot of: Oversight ï Facilitation - Coordination
- National Infrastructure Advisory Board

Infrastructure

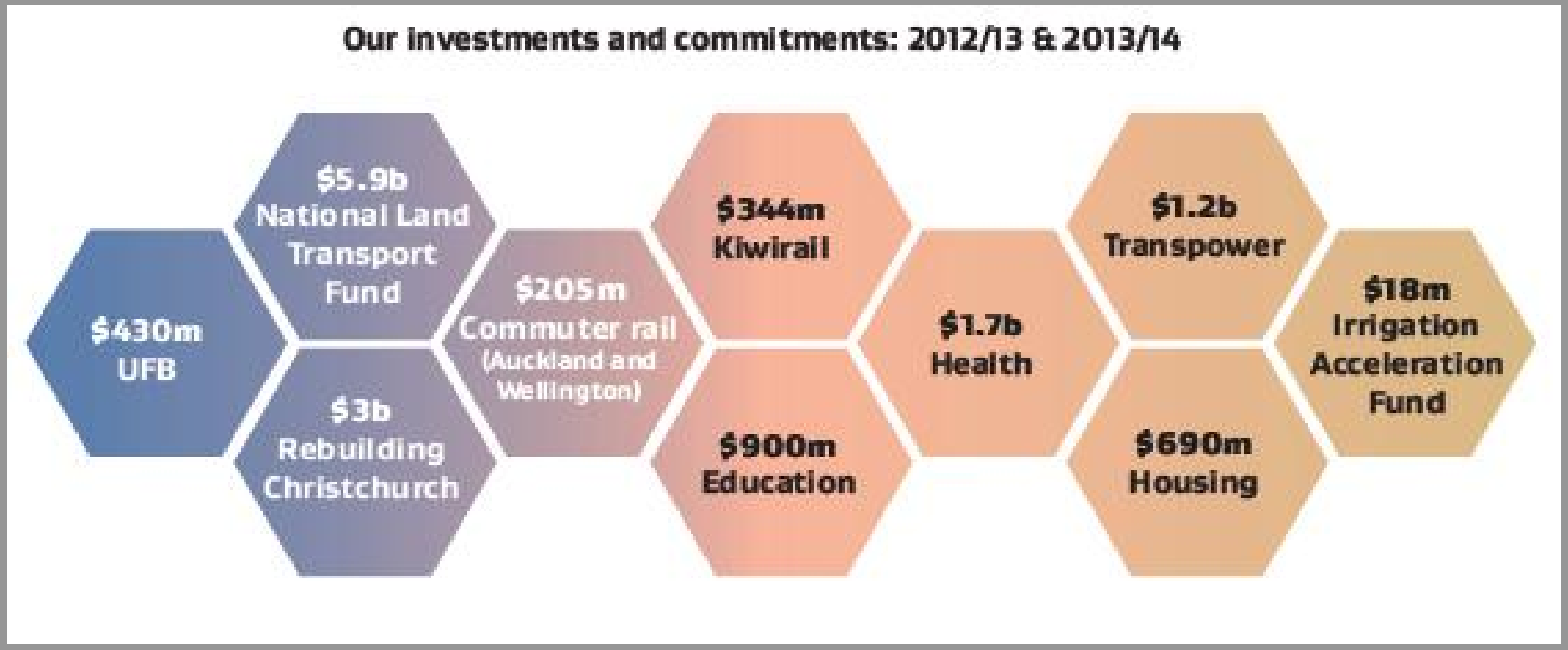
é the fixed, long-lived structures that facilitate the production of goods and services and underpin many aspects of quality of life.

é physical networks, principally transport, water, energy, communications and social assets.

A diverse business é



... current investment ...



National Infrastructure Plan

- Released in July 2011
- Strategic future focused document
- A common direction for how we plan, fund, build and use economic and social infrastructure

Vision

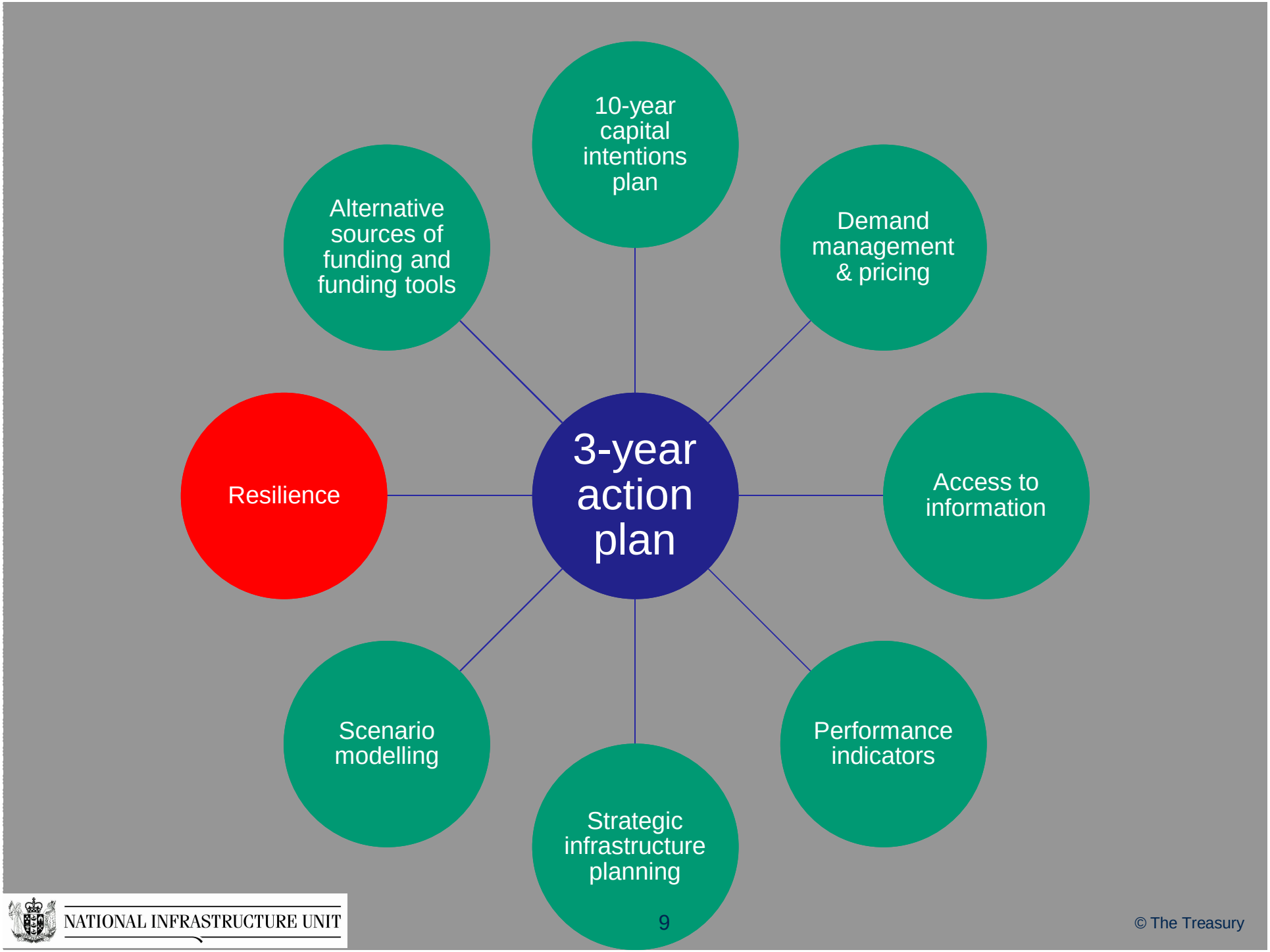
By 2030 New Zealand's infrastructure is resilient, coordinated and contributes to economic growth and increased quality of life

Outcomes

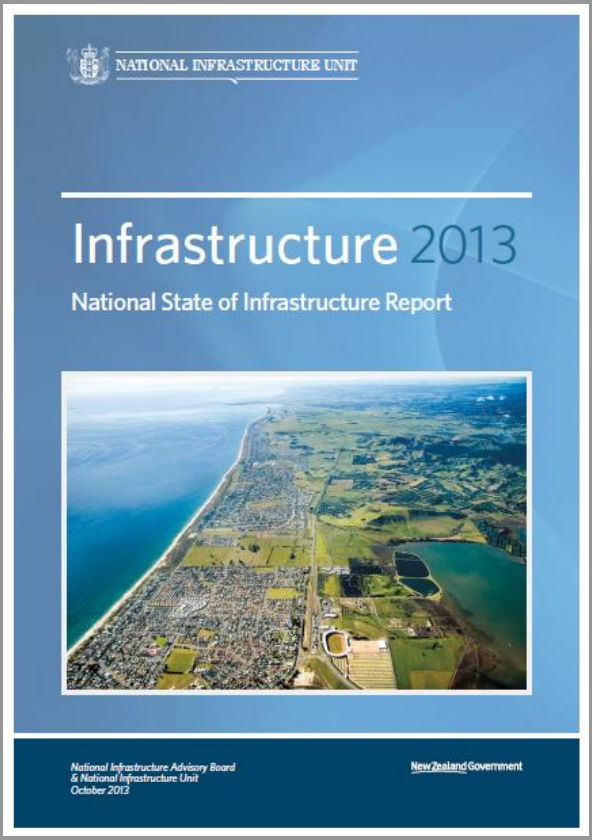
- *Better use of existing infrastructure*
- *Better allocation of new investment*

Principles

- *Investment analysis*
- *Resilience*
- *Funding mechanisms*
- *Accountability / Performance*
- *Regulation*
- *Coordination*



Recent reports ï Oct 2013



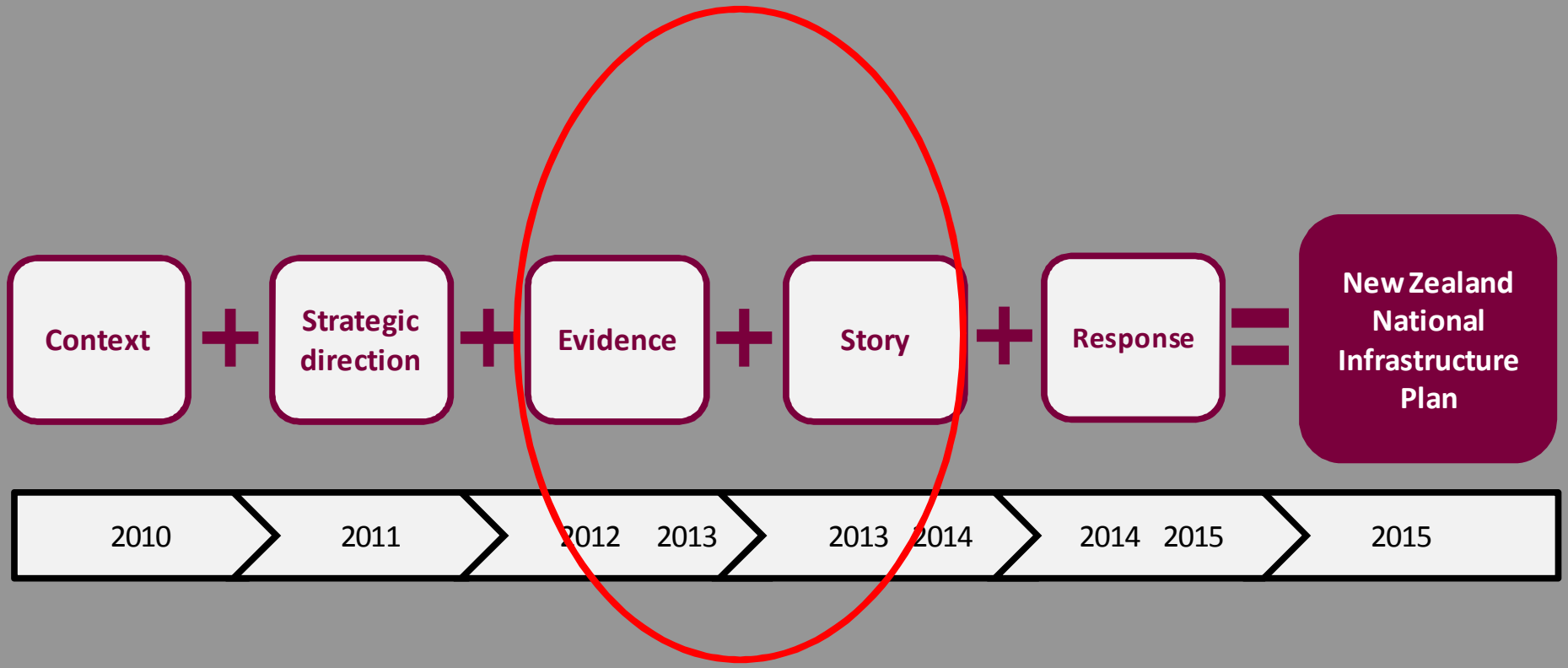
The six key areas in the Business Growth Agenda are:

Where are we heading

Five key expectations the next iteration of the Plan needs to deliver on:

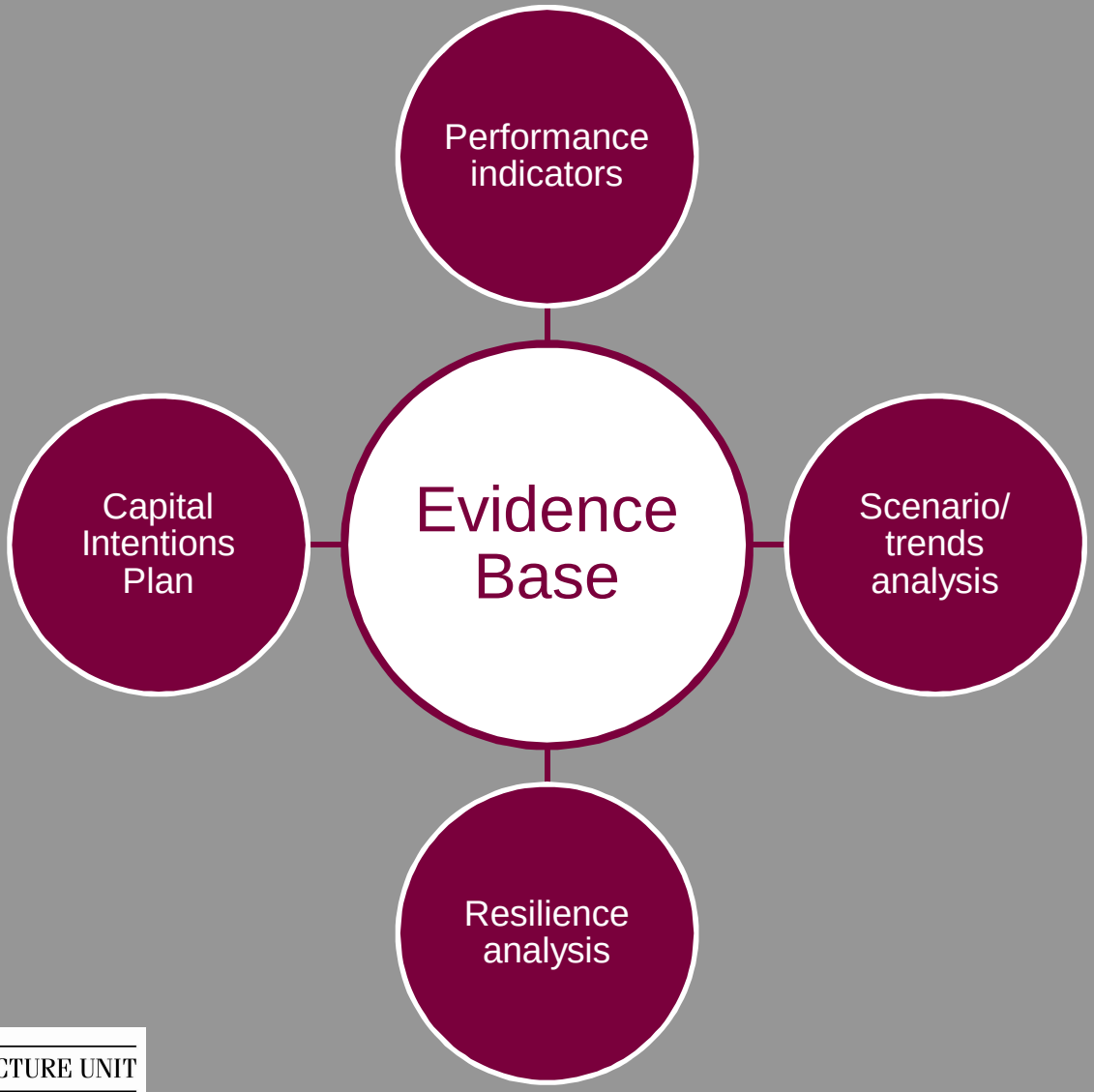
- Reinforce the current strategic direction (the vision and outcomes)
- Mature the debate around future needs and responses
- Be a collective infrastructure plan by NZ Inc across the private sector, central and local government
- Have increased specificity about the action plan and future investment programme required to achieve the strategic direction
- **Be underpinned by a more robust evidence base of future need and current performance**

Direction of travel



Framework	Focus	Key questions	Work programme (Action Plan)
Pressure	Future Infrastructure demands – drivers of demand	• What are the future drivers of demand? • How consistent is this view across the sectors? • Where are the most significant forecast deficits and the relative priorities of these?	• Scenario modelling • Macro-regional planning • Resilience framework and issues
State	Current state and performance of infrastructure	• What quantity/volume of infrastructure do we have? • Where is it located? • What is the quality? • Does it deliver the appropriate level of resiliency? • What capacity do we have, how well is it utilised? • What is it costing? The price?	• Performance Indicators framework • Resilience framework and issues
Response	Regulatory setting Funding arrangements	• How is it funded? • Who should be making the investment? • Are the regulatory settings optimised to facilitate the required level of investment?	• Capital Intentions Plan • Demand management • Alternative sources of funding • Regulatory settings analysis

Evidence base ï January 2014



NATIONAL INFRASTRUCTURE UNIT

Performance indicators

Objective data

+

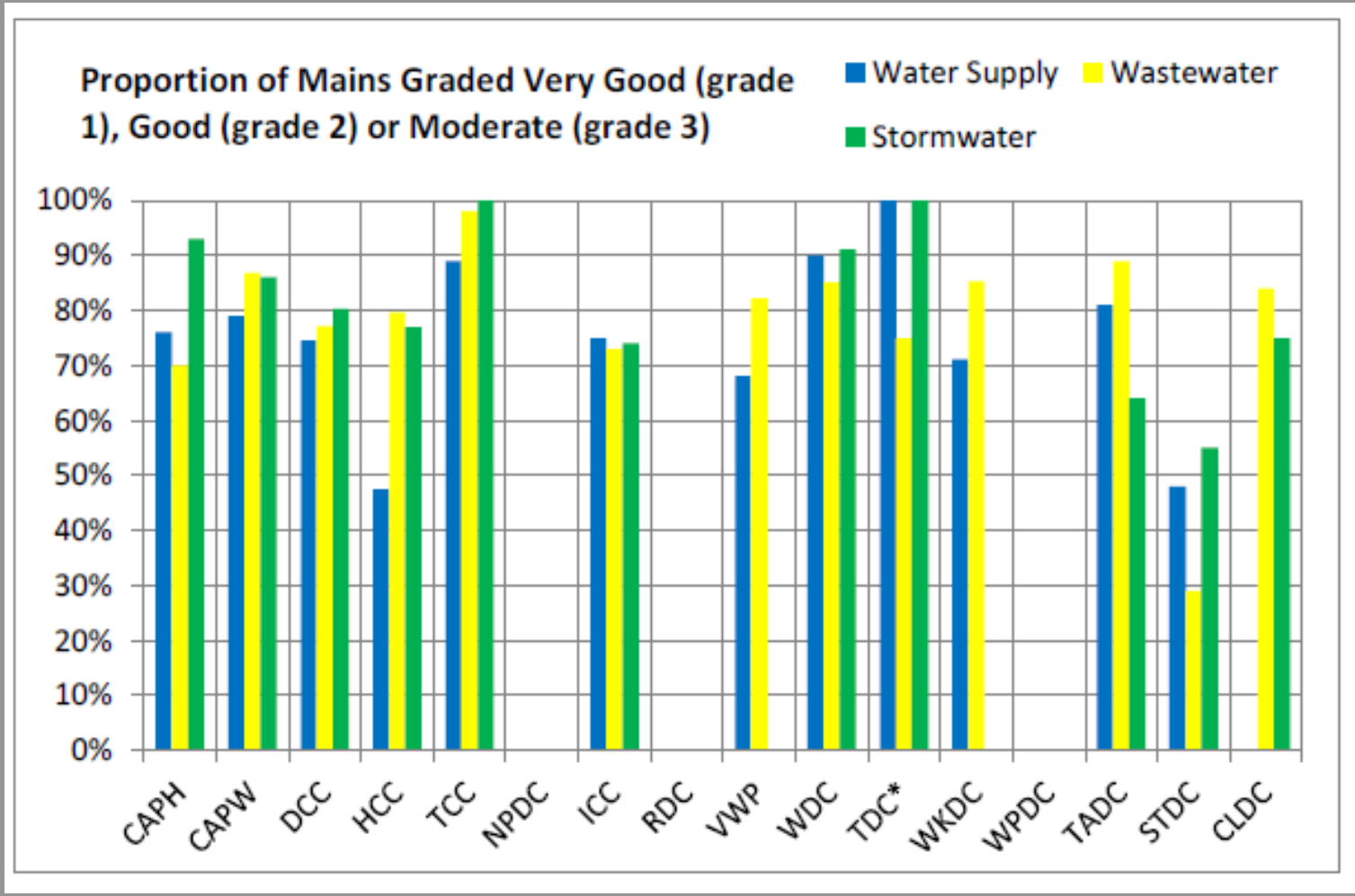
Subjective knowledge

Asset Condition	Asset condition generally reflects the need to make future investments in maintenance and renewals. Better asset condition therefore is associated with greater welfare, to the extent this translates to future cost savings.
Quality / Reliability of Service	Quality and reliability of services provided using infrastructure are attributes that are generally valued by infrastructure users. Improvements in these dimensions will increase welfare, everything else equal.
Service Availability	Broader service availability (both across space and time) increases the options to use infrastructure services. Greater options are generally valued by infrastructure users.
Capacity Utilisation	
Environmental Performance	Negative environmental effects associated with infrastructure can reduce welfare either through effects on human health or people's intrinsic value of the environment. To the extent these are not offset by policies such as the Emissions Trading Scheme, an improvement in environmental performance increases welfare, everything else equal.

Level of Competition	The intensity of competition (in sectors such as electricity and telecommunications where infrastructure services are provided in markets) affects the prices that users face relative to costs and thus the efficiency of use of existing infrastructure.
Productivity	Productivity (ideally measured as total factor productivity reflecting the value of all inputs) reflects the output produced per unit of input. Greater productivity translates to greater welfare, as fewer scarce resources are used and can be put to alternative use.
Investment evaluation processes	Higher quality investment evaluation processes will lead to better investment decisions and therefore greater welfare generated by new investment.
ROI	Return on investment is an alternative measure of (capital) productivity that is easier to calculate in some cases as it does not require valuing all inputs. Greater return on investment should reflect higher productivity and welfare, provided it is not associated with excessive margins between prices for infrastructure services and costs of provision.
Accuracy of forecasts	Forecasts are crucial for investment decisions involving long-lived assets. Forecasts can be improved by reducing error, and most importantly by eliminating systematic biases.

Urban water ï key sources

Water ï asset condition



But ...

*"On average, **less than 60% of local government** and 40% of central government decision-makers were receiving regular asset condition information."*

OAG 2013, 5.10

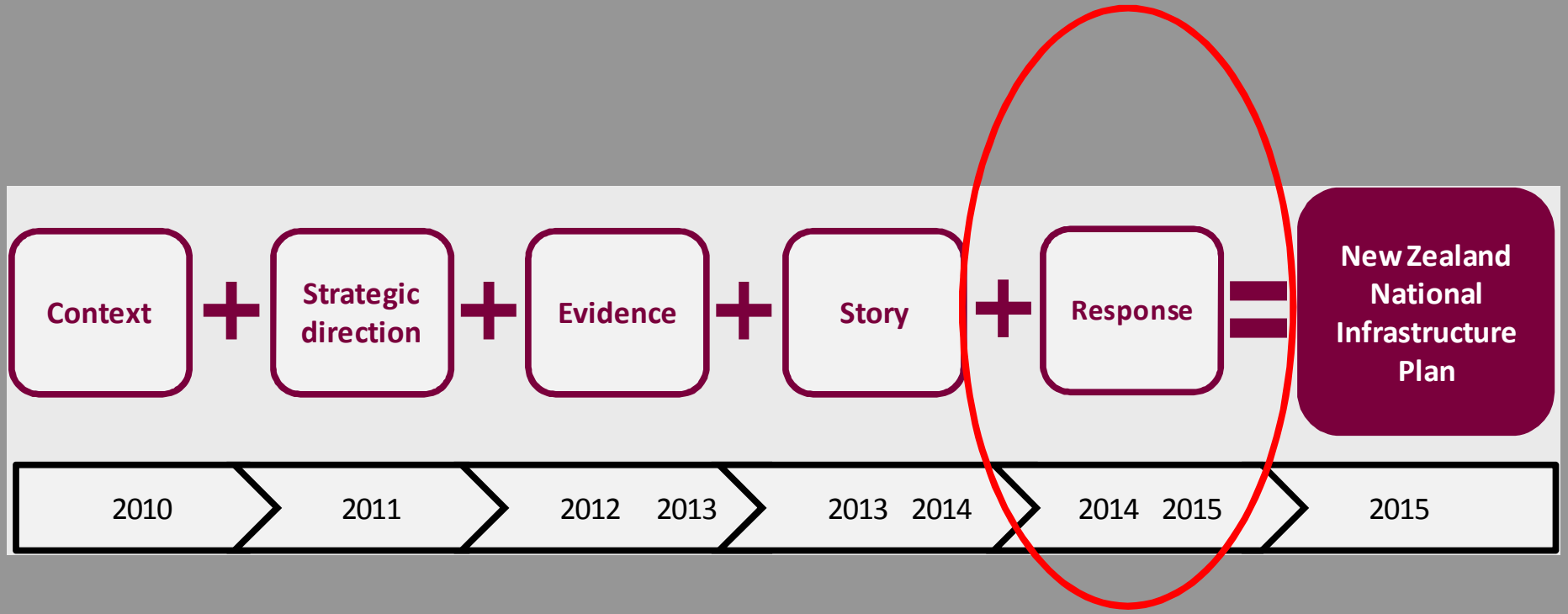
Water ï resilience

Table 7. Scores against each metric for the Resilience principle, for pilot study operators

Metrics for Resilience	Waikato	Hamilton	Waipa	Taupo	Watercare	P
Overall score for principle						
Design & construction standards						
Natural hazard risk assessments						
Vulnerability assessments						
Key risks: understand & mitigation						
Network resilience consideration *						
Power outage contingency plan						

Note: (*) The score for this metric was derived from scores for sub-metrics. The scores for each sub-metric are shown in Appendix C.

WSA4 - Pump Stations	13	33	29	6	11
WSA5 - Water Supply Reservoirs	24	81	58	7	21
WSA6 - Capacity of Water Reservoirs (m^3)	71,577	126,502	151,000	88,200	82,076
Reservoir Days of Supply	*2.0*	*1.7*	*3.4*	*1.7*	*2.4*



- January: publish evidence base
- Feb/March: engagement/discussions/refining
- April ï Dec: What does it mean
  Developing response options
- Bring together into 2015 National Infrastructure Plan

Vision

By 2030 New Zealand's infrastructure is resilient, coordinated and contributes to economic growth and increased quality of life

Outcomes

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NZ features

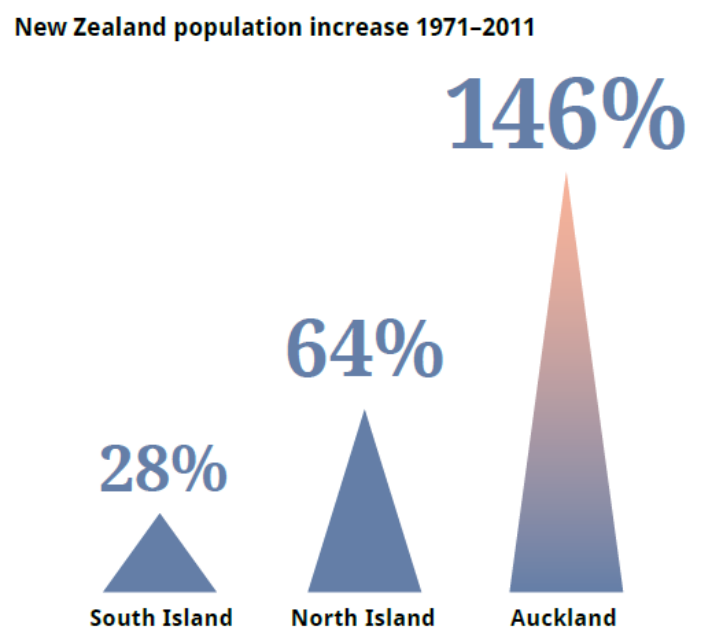
- Isolated ï long way from markets
- Heavily dependent on primary products
- More urbanised than France and Germany
- Challenging geography
- Hazardous

In the face of:

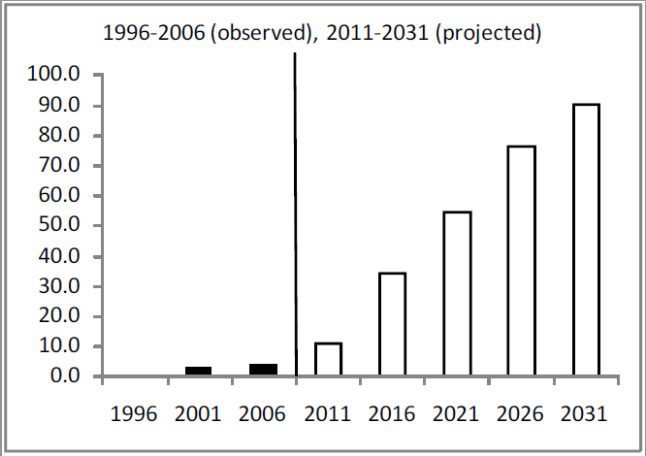
- rapid changes
- hazards

Hazards to infrastructure:
- natural,
- socio-natural, or
- technological

Viewed against:
- short term change (shock, unexpected events), and
- long term, more gradual change or stresses.



Percentage of territorial authorities with more elderly than children

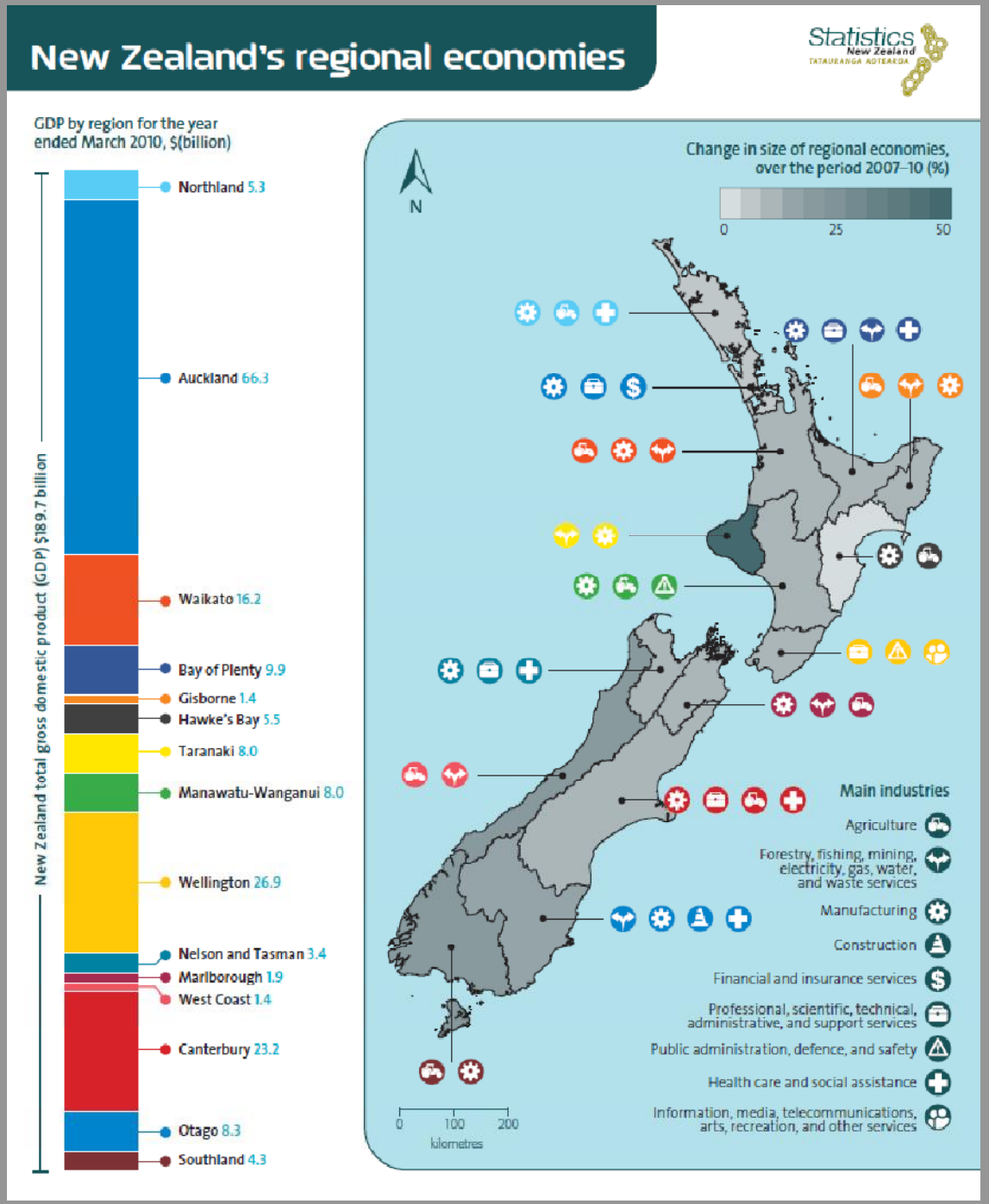


Source: Jackson, Natalie, The demographic forces shaping New Zealand's future. What population ageing [really] means

Home Truths é .

- Infrastructure fails
- New Zealand is hazardous
- Resilience:
  - something you are not something you do
  - not necessarily more expensive
  - emergent as well as shock events
  - natural hazards and beyond
  - not always about making things stronger
  - includes decommissioning infrastructure
  - often achieved by operational changes
- Equilibrium is never constant
- Our diverse regional economies are valuable

New Zealand's regional economies



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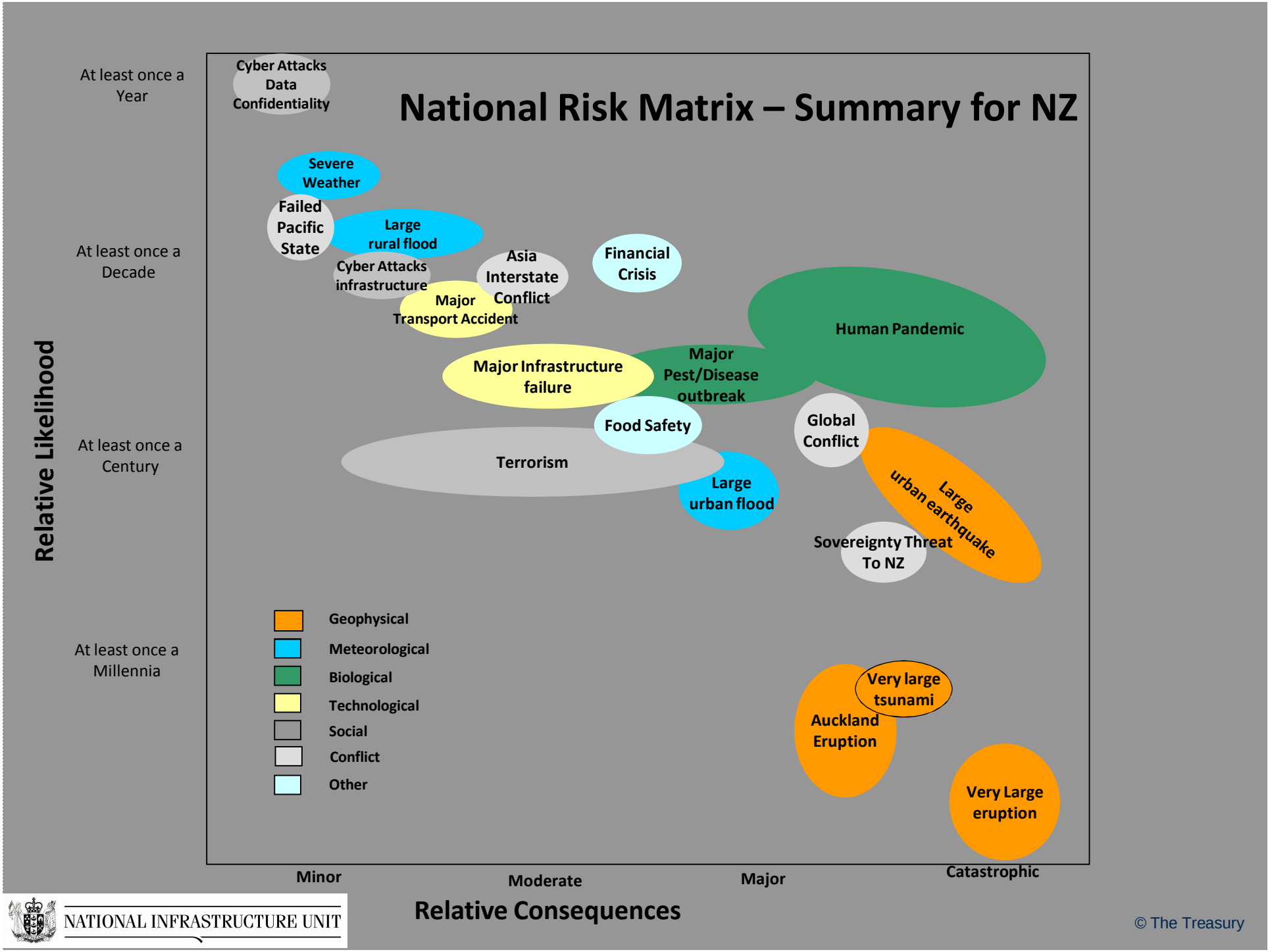
National Risk Matrix – Summary for NZ



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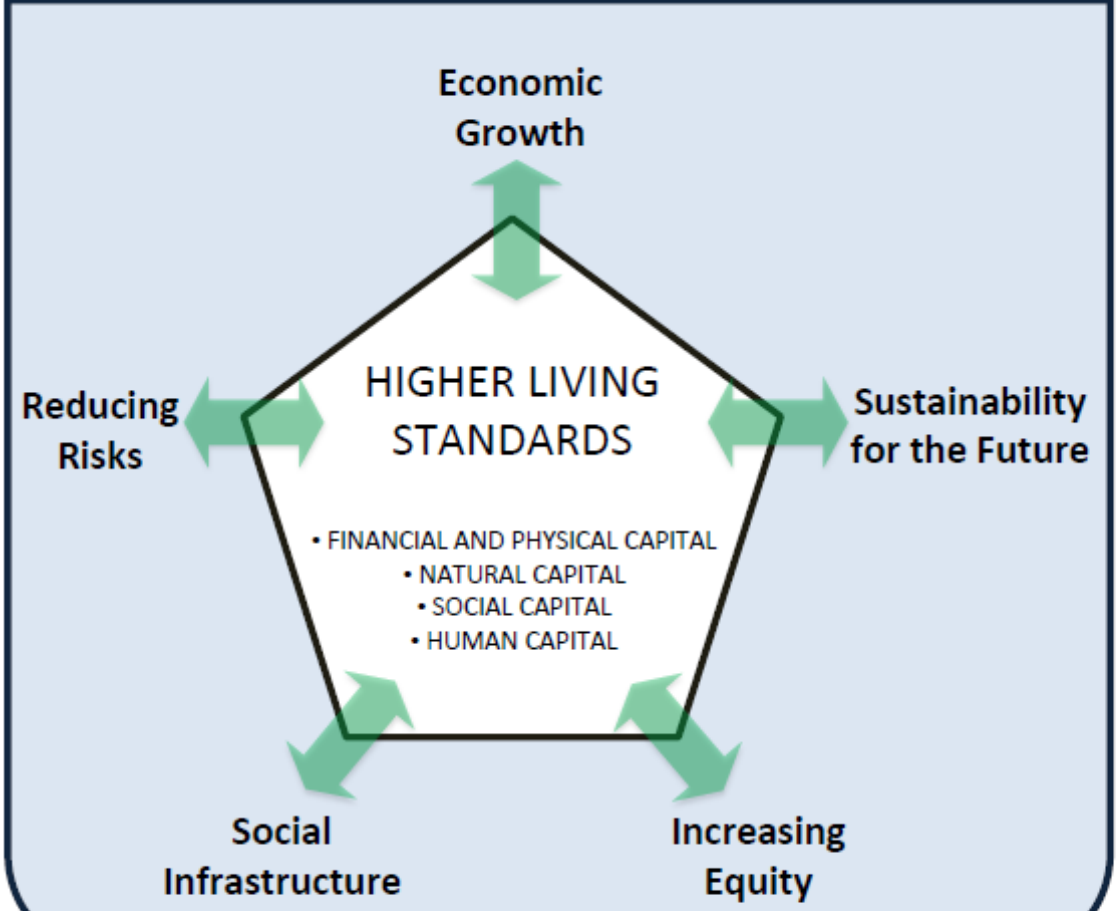
LIVING STANDARDS: THE HEART OF OUR POLICY ADVICE

Assess the impact of policy across key living standards dimensions



Economic Growth

- Does this improve the opportunities or incentives for higher incomes or greater economic growth?
- Does this remove obstacles that hinder resources moving to their most efficient use, or enhance the ability of people to take up new opportunities?

Sustainability for the Future

- Does this impact on the capital stocks for future use (e.g. physical capital, human capital, or the sustainability of the environment)?

Increasing Equity

- Does this impact on the distribution across society (both intra and intergenerational)?
- Does this improve opportunities for people to improve their position?

Social Infrastructure

- Does this impact on core institutions that underpin our society (e.g. trust in the rule of law, democracy, Crown-Māori relationship, cultural identity)?
- Does this impact on the trust and connections between people?

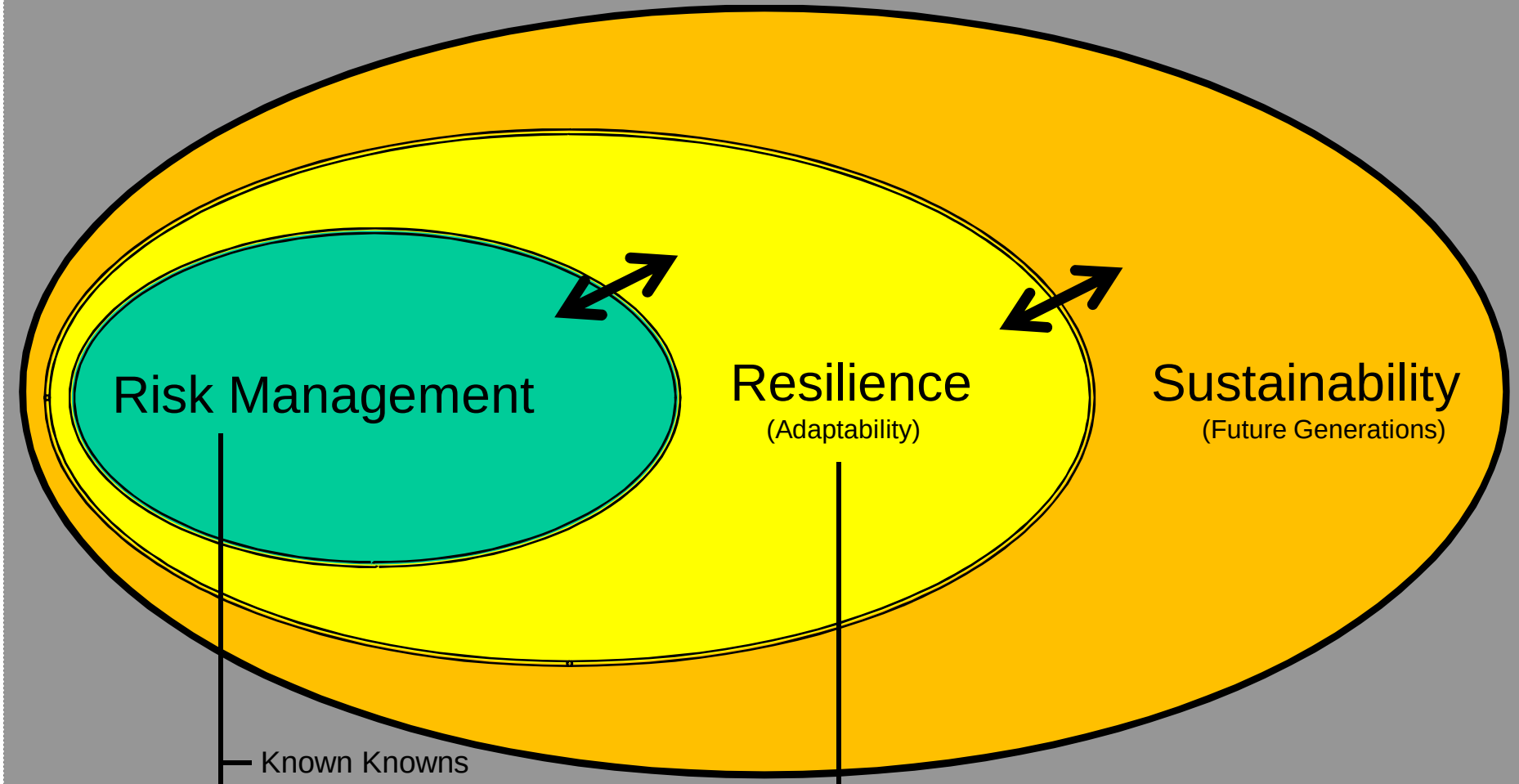
Reducing Risks

- Does this impact on NZ's ability to withstand unexpected shocks?
- In particular, does this impact on our macro-economic position (debt, deficits, inflation etc)?

Considering these five key aspects when developing your policy advice will ensure that Treasury consistently embeds Living Standards in our advice. It is an adjunct to, not a replacement for, a good evidenced-based process for developing free and frank advice. Need help or more information? See Girol Karacaoglu.

Risk, Resilience and Sustainability é ..

(Linking to Treasuryôs Living Standards Framework)

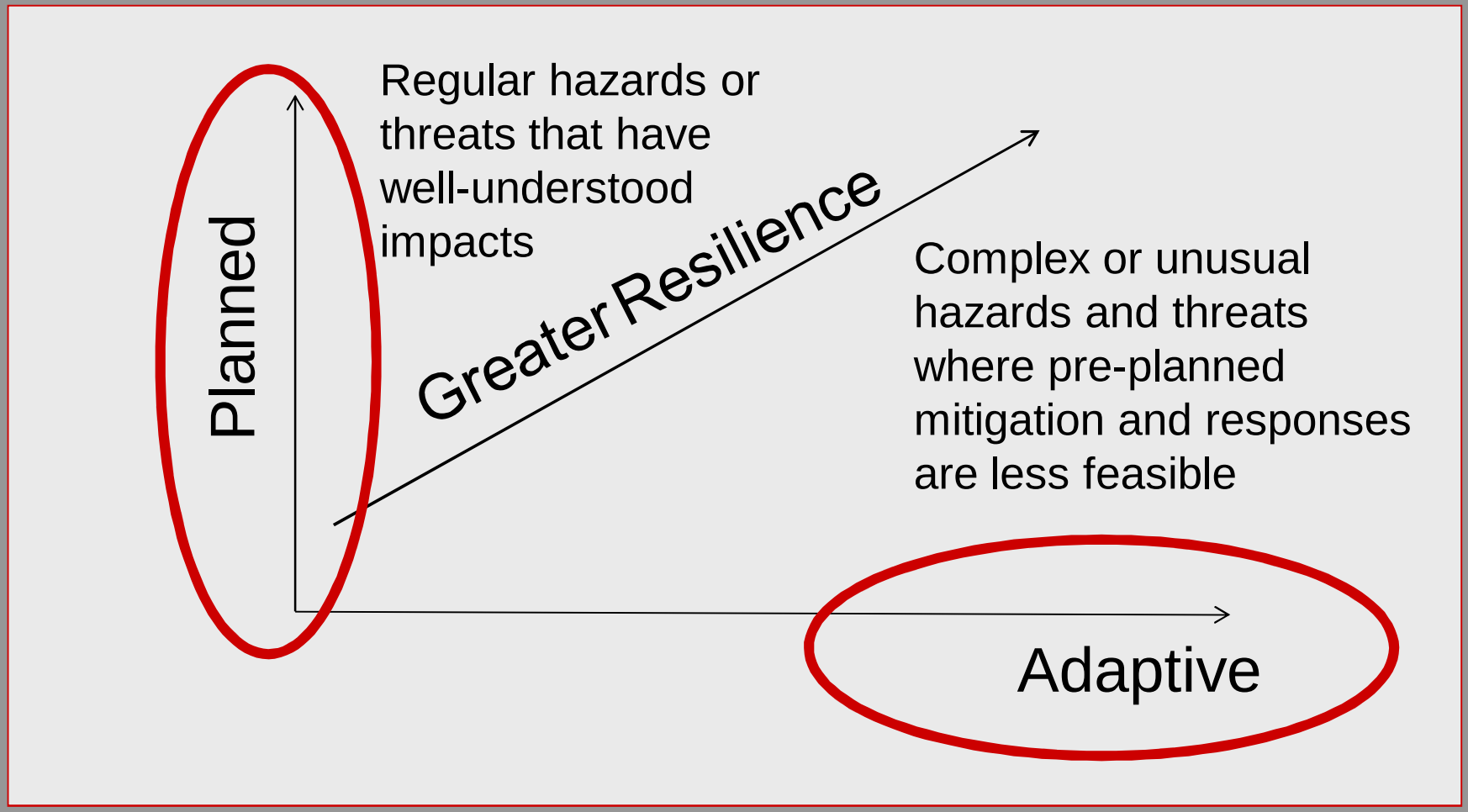


Known Knowns
- Variability can be readily described

Known Unknowns
- Limitations, assumptions

Unknown Unknowns
- Black swan
- Threats where you have an adversary
- Complex system risks with dynamic interdependencies

Planned and adaptive capacities é .



The Quest for Resilience é .

- ñStrategic resilience is not about responding to a onetime crisis. Itôs not about rebounding from a setback.
- Itôs about continuously anticipating and adjusting to deep, secular trends that can permanently impair the earning power of a core business.
- Itôs about having the capacity to change before the case for change becomes desperately obvious.ò

(Hamel & Välikangas, 2003)

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Resilience Attributes

- Service Delivery
  - Focus on national, business and community needs in the immediate and longer term
- Adaptation
  - National infrastructure has capacity to withstand disruption, absorb disturbance, act effectively in a crisis, and recognises changing conditions over time
- Community Preparedness
  - Infrastructure providers and users understand the infrastructure outage risks they face and take steps to mitigate these. Aspects of timing, duration, regularity, intensity, and impact tolerance differ over time and between communities
- Responsibility
  - Individual and collaborative responsibilities are clear between owners, operators, users, policy-makers and regulators. Responsibility gaps are addressed
- Interdependencies
  - A systems approach applies to identification and management of risk (including consideration of interdependencies, supply chain and weakest link vulnerabilities
- Financial Strength
  - Financial capacity to deal with investment, significant disruption and changing circumstances
- Continuous
  - On-going resilience activities provide assurance and draws attention to emerging issues, recognising that infrastructure resilience will always be a work in progress
- Organisational Performance
  - Leadership and culture are conducive to resilience, including: Leadership & Culture, Networks & Change Ready. Future skills requirements are being addressed

Resilience é é

Not all elements of infrastructure require high resilience

All infrastructure sectors have vulnerabilities

Infrastructure systems can not guarantee supply of services at all times

Indicators, Pinchpoints and Hotspots

(http://www.infrastructure.govt.nz/)

Transport

Resilience Expectation

Assessed Resilience

		Resilience Expectations	Assessed Resilience	Desired Movement	Indicator Sources/Points of Assurance Transport global : Transport Monitoring Indicator Framework (TMIF) Best Practice Asset Management Plans eg. PAS 55 or IIMM 2011 Business Continuity Management eg. Standards NZ BCM Annual Financial Reports Resilient Organisations Practices
Local Roads	Suburban			ī	
	Main arterial with alternate			ī	
	Main arterial ï no alternate			ī	
	Strategic freight routes			↑	
National Roads	National with alternate			ī	
	National ï no alternate			↑	
Road/Rail Link Span	Cook Straight ferries & terminals			ī	
Rail	Suburban (incl .rolling stock)			↑	
	National (incl. rolling stock)				
	National Train Control Centre			↑	
Ports	Individual Ports			ī	Compliance International Ship and Port Security Code
	Ports with specialist facilities			↑	Compliance International Ship and Port Security Code
	Ports Network			↑	Compliance International Ship and Port Security Code
Airports	Regional airports			ī	
	Airways NZ			ī	
	International airports			ī	

Desired Movement

Pinchpoints
(Nationally Significant)

- Northland
  - New Zealand Refining Company (NZRC)
- Auckland
  - Ports of Auckland
  - Auckland International Airport
- Wellington
  - Avalon Tower, Lower Hutt
  - Wilton Substation
  - Central Park Substation
- Canterbury
  - Wastewater Treatment Plant & ocean outfall
  - Cass Peak air traffic control radar installation
- Otago
  - Dunedin Fuel Terminal

Hotspots
(Nationally Significant)

- Auckland
  - Wiri Oil Terminal
  - Auckland Harbour Bridge
  - Greenlane Roundabout
  - Newmarket viaduct
  - Grafton Gully
- Wellington
  - Thorndon / Kaiwharawhara
  - Seaview
  - Haywards
  - Paekakariki / Pukerua Bay
- Canterbury
  - Lyttelton Road Tunnel and control centre
  - Ferrymead Bridge
  - Timaru Port & Tank Farm

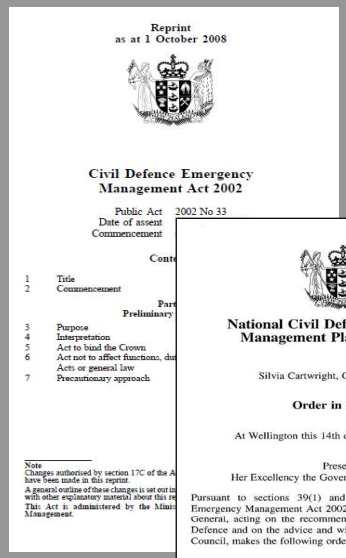
Work Programme

- Coordination
  - Cross government agency
  - Climate change adaptation
  - Best practice guidelines
- Economic/Financial
  - Banks, financiers, insurers
  - Seeking exemplars
  - Economic modelling
- Indicators
  - Develop evidence base; MoT, MBIE et al
  - Hotspots & Pinchpoints
  - Sector priorities
- Regional/Community
  - Lifelines
  - Regional vulnerability mapping
  - Service restoration times
- Research
  - Encourage resilience related research
  - Interdependencies, economics, water, ports
  - Some parts of infrastructure more important
- Outreach
  - LGNZ, Lifelines, Resilience conferences
  - Engage with private sector, consultants
  - NIU newsletter

Examples of recent activities

- Joint Resilience Operating Framework (KiwiRail, Transpower and NZTA)
- Measuring resilience of transport (NZTA lead)
- Oil security (MBIE lead)
- Gas security (MBIE lead)
- Lyttelton Recovery Plan (CERA lead)
- Update of CDEM Directors Guide (MCDEM lead)
- International cables (MBIE lead)
- TA Emergency Management Offices and Lifelines (Auckland, Wellington, Canterbury, Bay of Plenty, Otago, Southland, é .)
- Joint NIU, Natural Hazards Research Platform, Lifelines and University of Canterbury Interdependencies workshops planning for early December

Advancing Interdependencies: CDEM & Lifelines


Reprint
as at 1 October 2008

Civil Defence Emergency Management Act 2002

Public Act 2002 No 33
Date of assent
Commencement

Contents

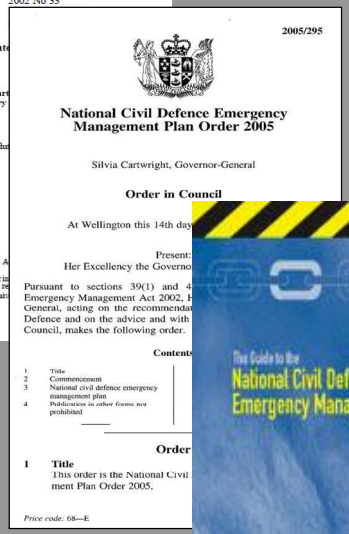
1 Title
2 Commencement

Preliminary

3 Purpose
4 Interpretation
5 Act to bind the Crown
6 Act not to affect functions, du
Acts or general law
7 Precautionary approach

Note
Changes authorised by section 17C of the A
have been made in this reprint.
A general outline of these changes is set out in
with other explanatory material about this re
This Act is administered by the Minis
Management.

CDEM Act 2002


2005/295

National Civil Defence Emergency Management Plan Order 2005

Silvia Cartwright, Governor-General

Order in Council

At Wellington this 14th day

Present:
Her Excellency the Governo

Pursuant to sections 39(1) and 4
Emergency Management Act 2002, H
General, acting on the recommendat
Defence and on the advice and with
Council, makes the following order.

Contents

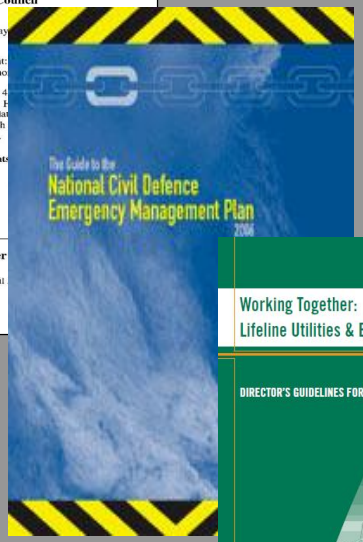
1 Title
2 Commencement
3 National civil defence emergency management plan
4 Publication in other forms not prohibited

Order

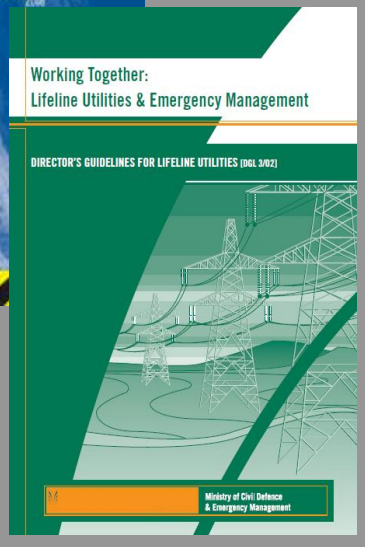
1 Title
This order is the National Civil
ment Plan Order 2005.

Price code: 6B—E.

National CDEM Plan Order 2002



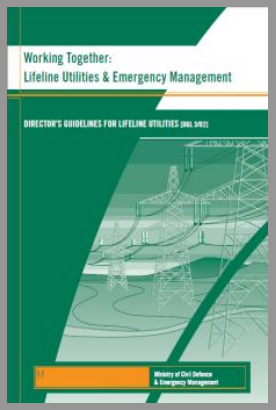
Guide to the National CDEM Plan



Director's Guideline for Lifeline Utilities

Civil Defence Emergency Management Act 2002

- Schedule 1 Lifeline utilities,
  - Part A specific entities (airports, ports, radio, television),
  - Part B certain businesses (gas, electricity, water, waste water, stormwater, roads, fuel, rail)
- Section 59 – Every department, Civil Defence Emergency Group, local authority, emergency service, and lifeline utility, and
- Section 60 Duties of lifeline utilities; ability to function, participate, provide technical advice

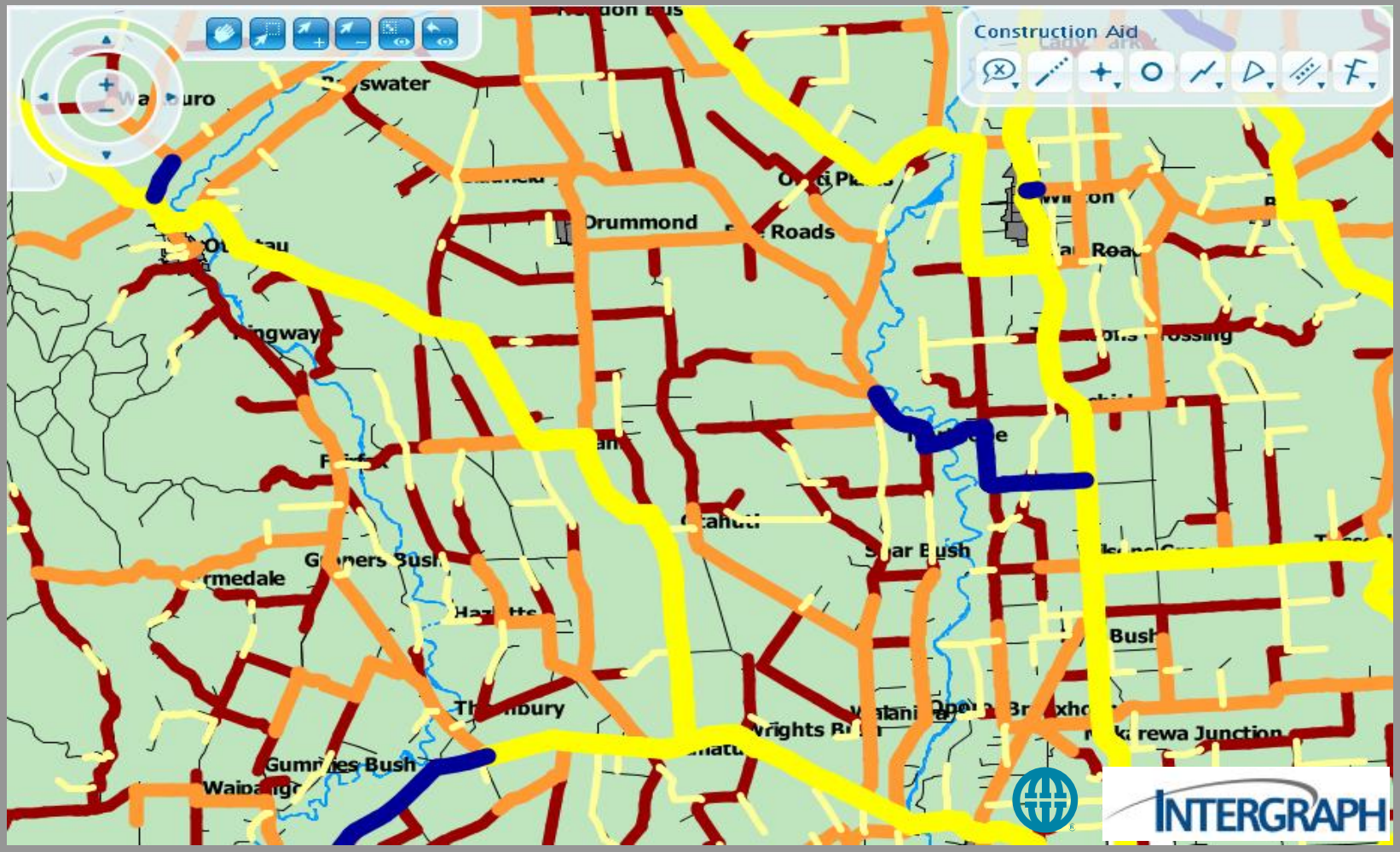


Guideline issued by the Director of CDEM. Provides guidance to LU's on how to meet their obligations under the CDEM Act

Financial resilience: Southland

Asset information	Economic Data	GIS Modelling	Strategy Validation	Implement	Outcomes

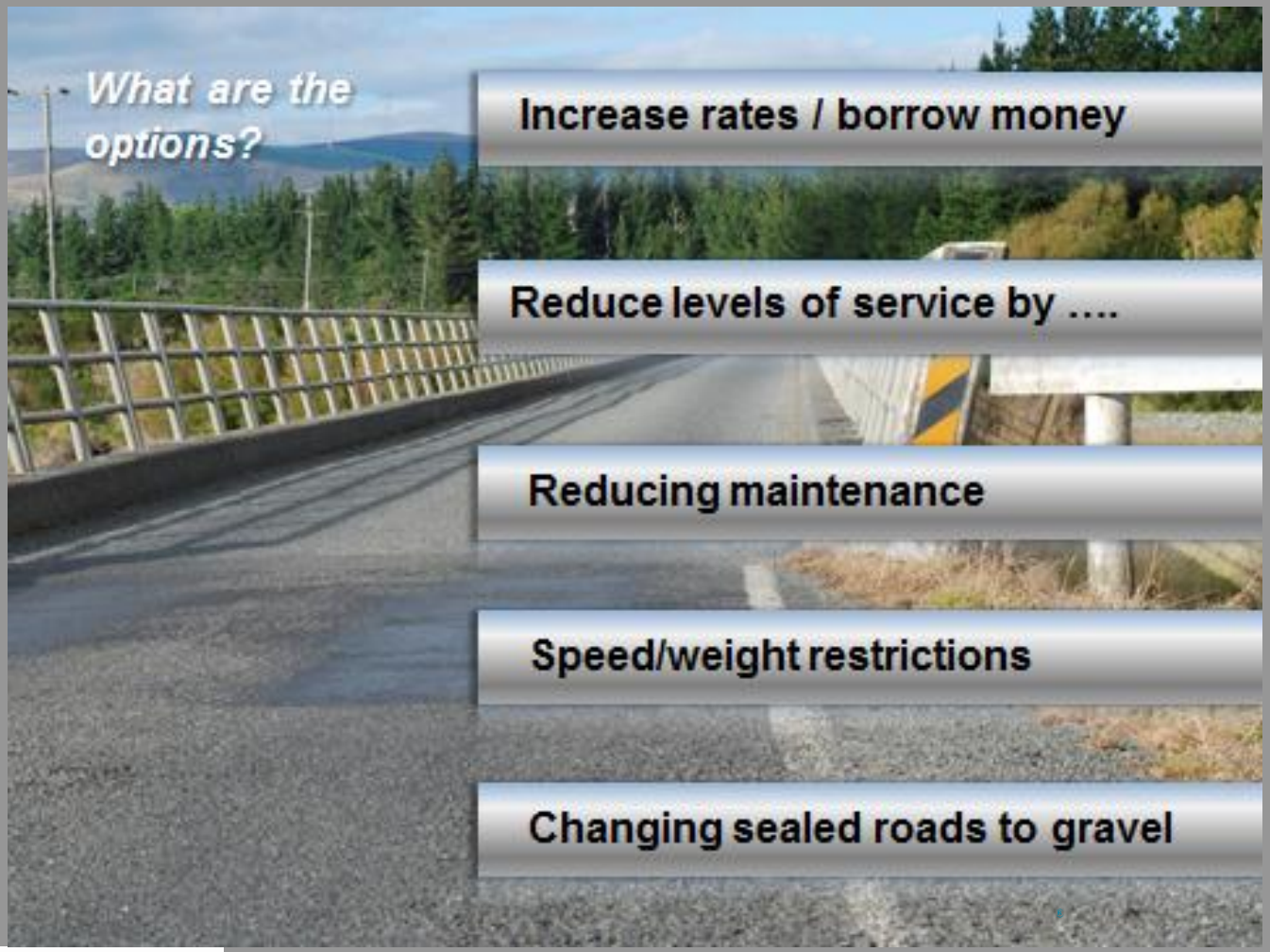
Export flow



Financial resilience: Southland

Asset information	Economic Data	GIS Modelling	Strategy Validation	**Implement**	Outcomes

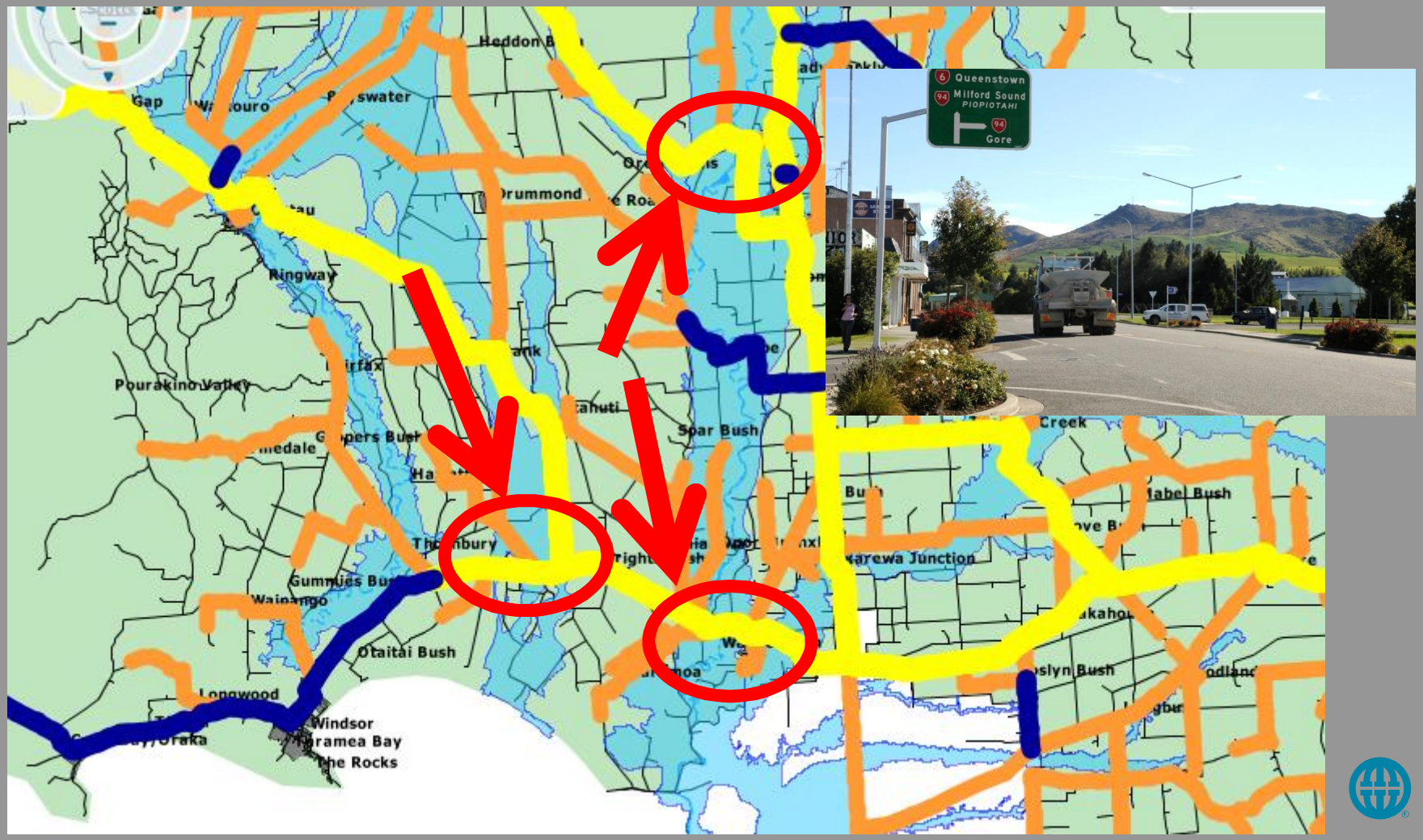
Opportunities



Event resilience: Southland

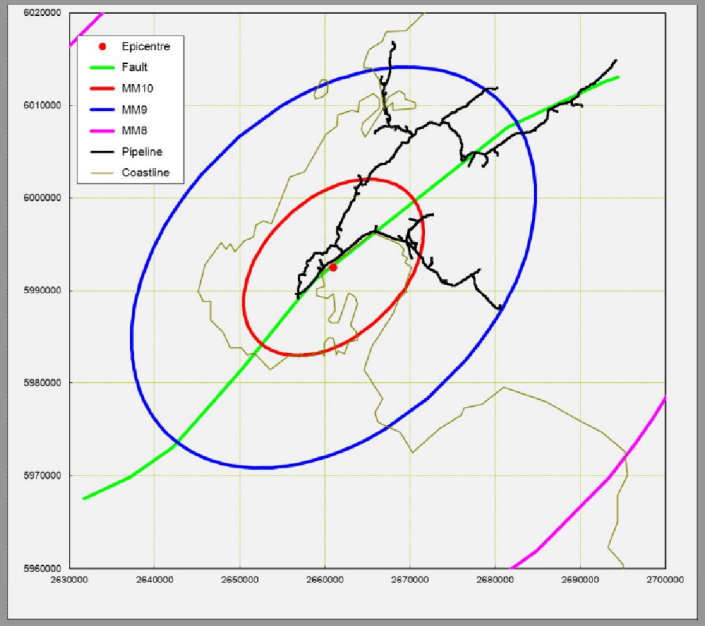
Vulnerability	Scenario	Impact	Action plans	Recovery plan	Recovery

Re-route tankers



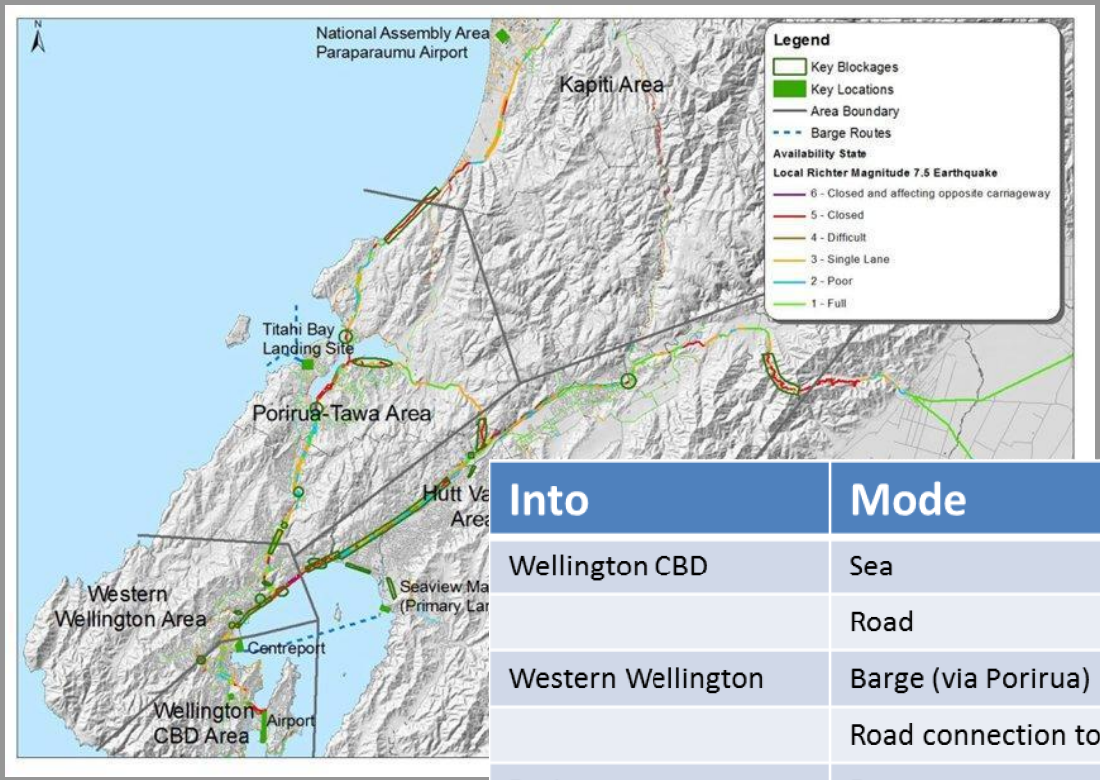
NATIONAL INFRASTRUCTURE UNIT

Lifeline Utilities Restoration Times



	Gas restoration time (days)	Power restoration time (days)	Water restoration time (days)
Hutt Central and Western Hills	80	60	25/40
Porirua, Mana, Plimmerton and Pukerua Bay	60	40	75
Northern /Western Wellington suburbs	60	60	45/55
Wellington CBD	80	95	55
Airport and Eastern Wellington suburbs	80	60	70

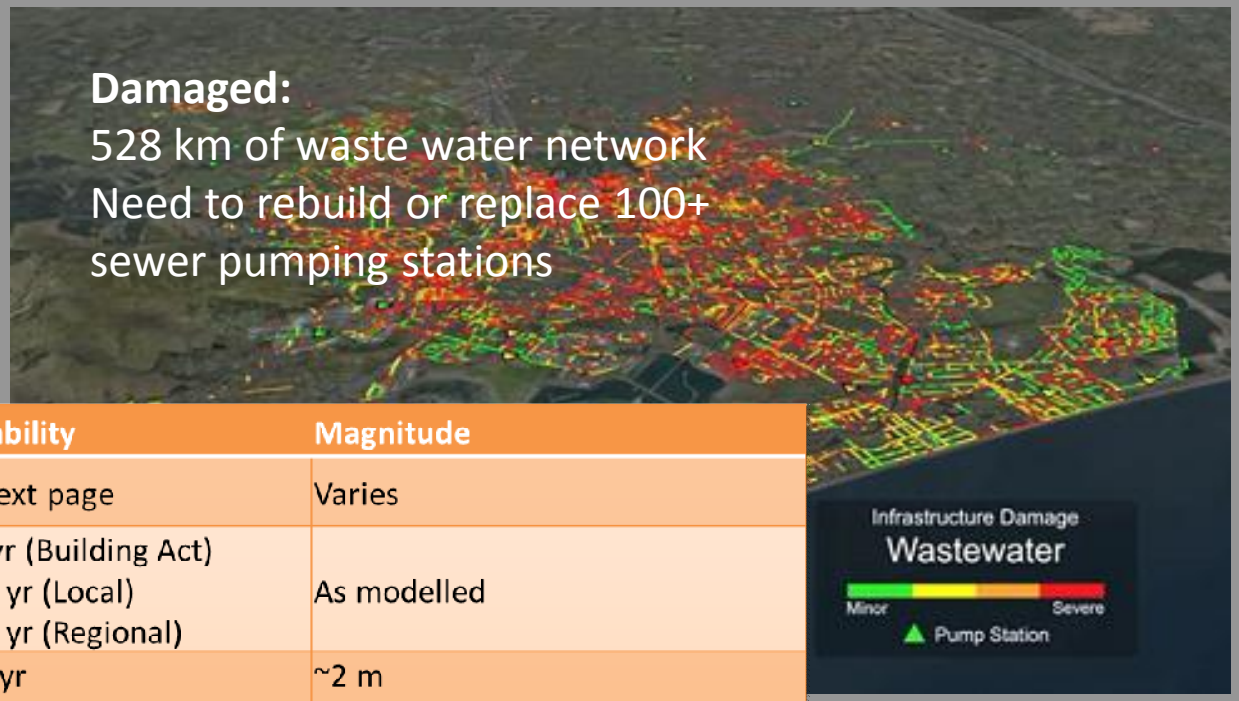
Restoring Wellingtonôs transport links



Into	Mode	Time
Wellington CBD	Sea	4-5 days
	Road	120 days
Western Wellington	Barge (via Porirua)	5-7 days
	Road connection to Porirua and Tawa	3 weeks
Porirua	Barge	5-7 days
	Road connection to the Wellington CBD area	3 weeks
Lower Hutt	Barge	5-7 days
	Road connection to the Wellington CBD area	8-10 weeks
Upper Hutt	Road connection to Lower Hutt	3 days to 2 weeks
Kapiti	Road connection to the Upper North Island	1-4 days

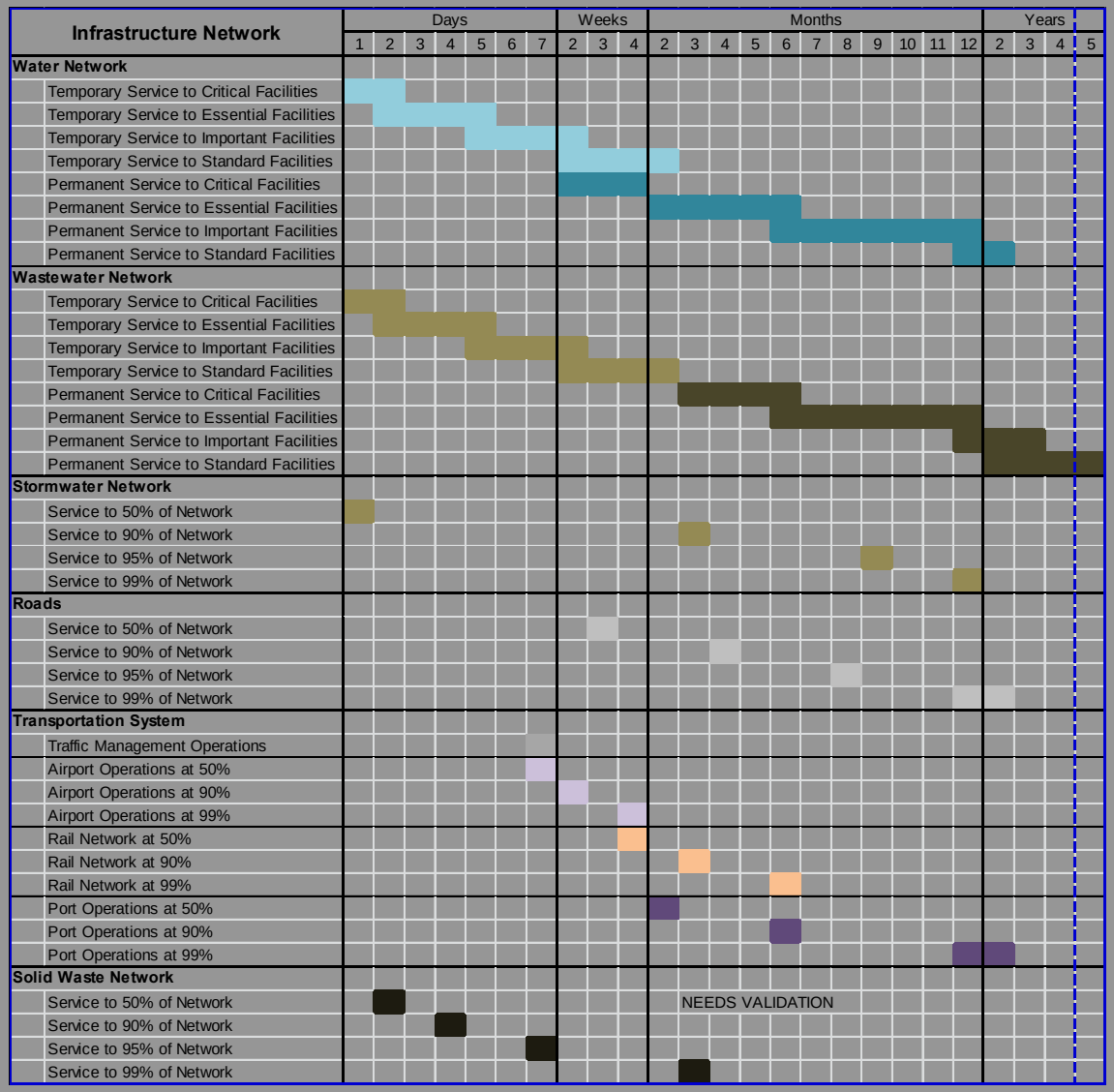
CERA
Canterbury Earthquake Recovery Authority

Damaged:
528 km of waste water network
Need to rebuild or replace 100+ sewer pumping stations



Hazard	Probability	Magnitude
Seismic	See next page	Varies
Flood	1:50 yr (Building Act) 1:200 yr (Local) 1:500 yr (Regional)	As modelled
Tsunami	1:100yr 1:500yr	~2 m ~4 m
Coastal Erosion & Storm Surge	1:10-15 yrs	Significant
Landslide & Rockall	Exposure to seismic activity, rainfall etc.	n/a
Wind	1:150 yr	130 km/h (gusts to 200 km/h)
Snow	Low	n/a
Changing Sea Level	~ next 80-90 yrs	0.5 m (0.8 m)
Volcanic	Very Low	n/a
Drought	n/a	n/a
Other (Natural or Man-made, instant or gradual)	n/a	n/a

Service Restoration Times



- **Critical Facilities**
  - includes emergency response
- **Essential Facilities**
  - includes lifelines infrastructure (MESHT)
- **Important Facilities**
  - includes high priority facilities and infrastructure
- **Standard Facilities**
  - includes everything else,
  - including residential dwellings.

Service Restoration Times

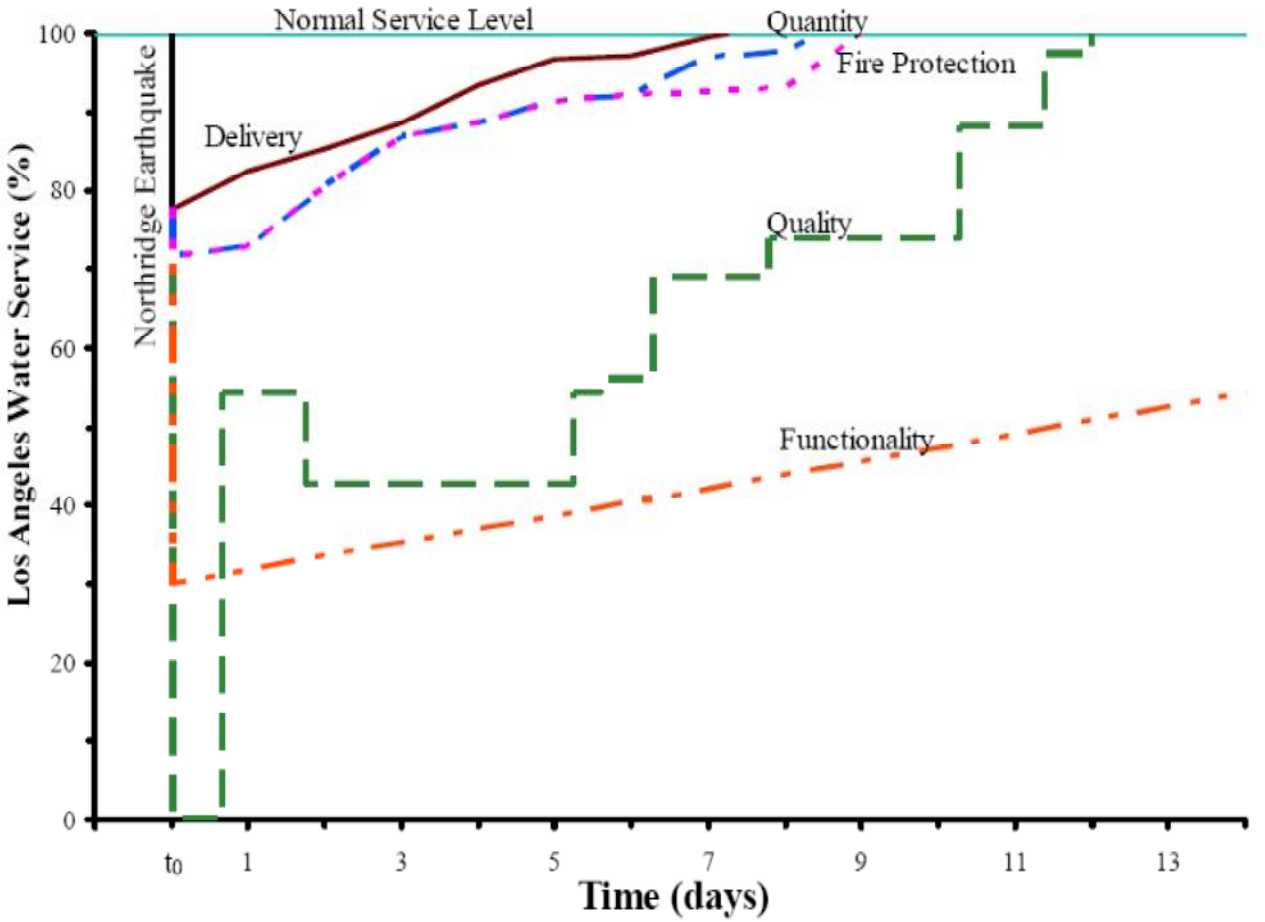
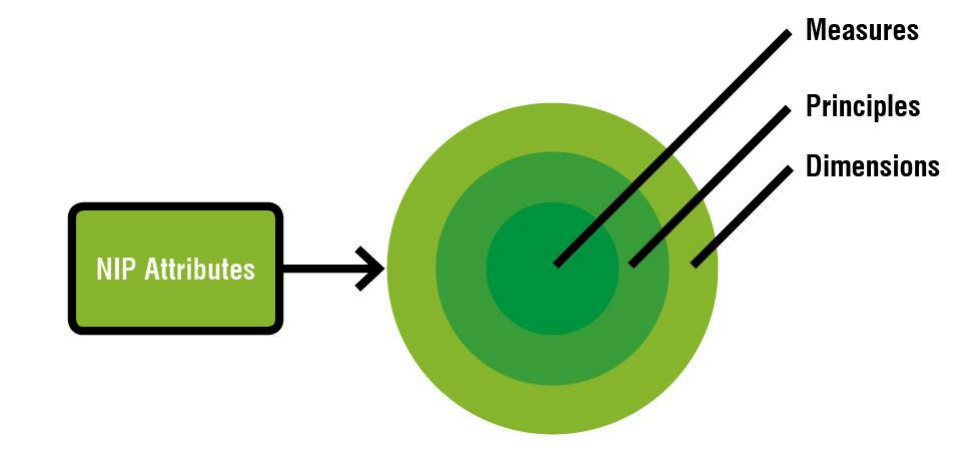


Figure 3. Los Angeles water system service restorations following the 1994 Northridge earthquake.

Measuring Resilience

Relationship between NIP Attributes, and Dimensions, Principles and Measures of Resilience



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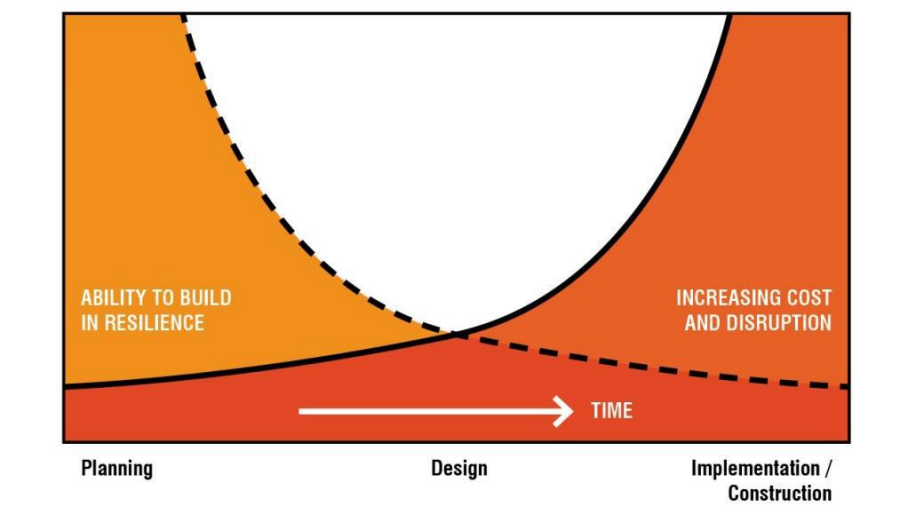
Ability to build in resilience into planning and design



NZTA Research Project: Measuring the Resilience of Transport Infrastructure, AECOM 2013 (Work in progress)

Game Changers é .

- Regional Vulnerability Assessments (TAôs and Lifelines)
- Community engagement
- Champions of resilience; business leaders, political leaders, é .
- International thought leaders
- Resilient organisations (www.resorgs.org.nz)
- Lead global thinking (theory & practice)
- Create/maintain options (option value)

- Vulnerability awareness (National Security System, global supply chains)
- Interdependencies (opportunities, cascade failures, multi-hazards, é)

Game Changers é .

- Re-mobilise ñLifeline utility operatorsò(responsibilities under CDEM Act)
- Challenging current paradigms
  (why networks?, ñsafe-to-failò, low damage, é)
- Outreach
- Denser urban forms (distributed cells)
- Targeted base & applied research
- Research translators (research to practice)
- Opportunities through policy

From you

- Engage with us
- Articles/exemplars of good practice/innovation ï share the news!
- Recognise the threat ï advocate and work together - take the opportunity

National Infrastructure Unit
The Treasury
www.infrastructure.govt.nz
richard.ward@treasury.govt.nz
roger.fairclough@treasury.govt.nz