New Zealand Lifelines Council

NEW ZEALAND'S INFRASTRUCTURE RESILIENCE

Construction Clients' Group, 14 November 2018

Roger Fairclough, Chair New Zealand Lifelines (Utilities) Council

New Zealand Lifelines Council

EQC
EARTHQUAKE COMMISSION

TRANSPOWER
Keeping the energy flowing

Firstgas

Ministry of Civil Defence & Emergency Management
Te Rākau Whakamarumaru

NZ TRANSPORT AGENCY
WAKA KOTAHI

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Vector

water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

GNS SCIENCE
TE PŪ AO

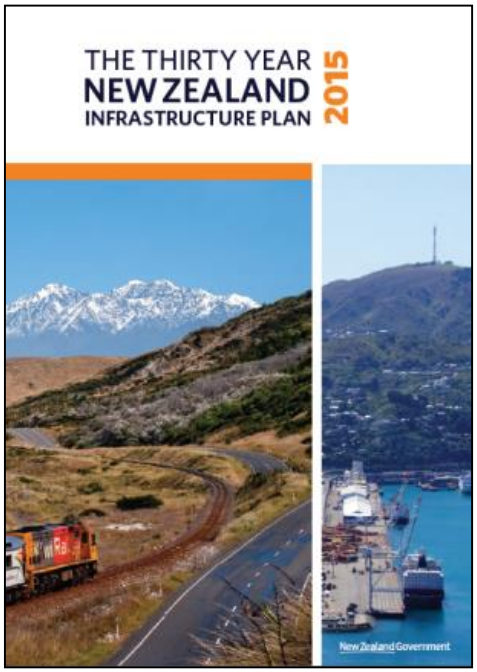
Spark New Zealand

Infrastructure Resilience …

NATIONAL INFRASTRUCTURE UNIT

The 2015 Infrastructure Plan provides the vision of:

By 2045 New Zealand's infrastructure is resilient and coordinated and contributes to a strong economy and high living standards

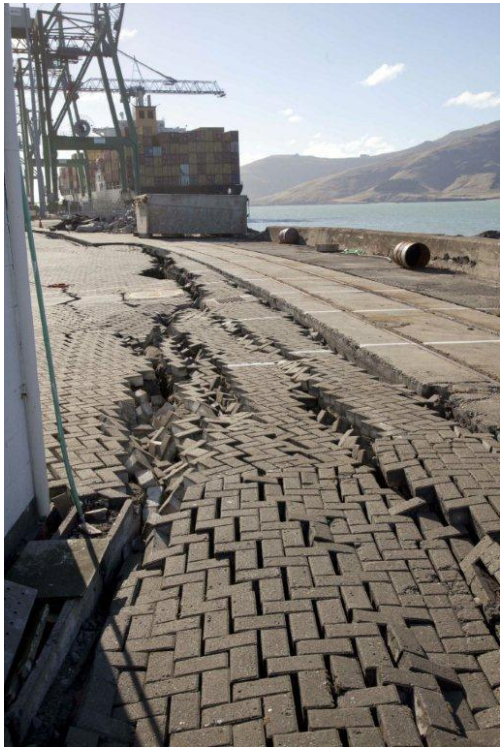


Resilience Attributes ..

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: Resilience Ethos, Situational Awareness, Management of Keystone Vulnerabilities and Adaptive Capacity. Future skills requirements are being addressed

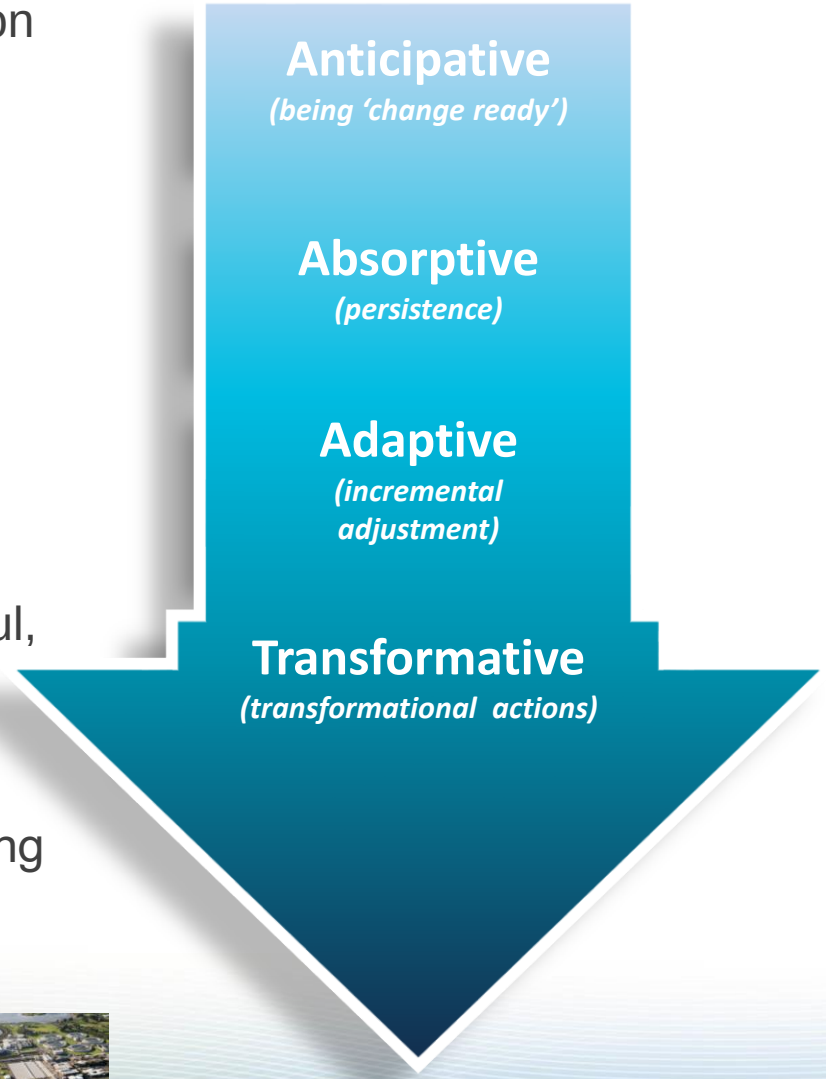
Resilience Home Truths …



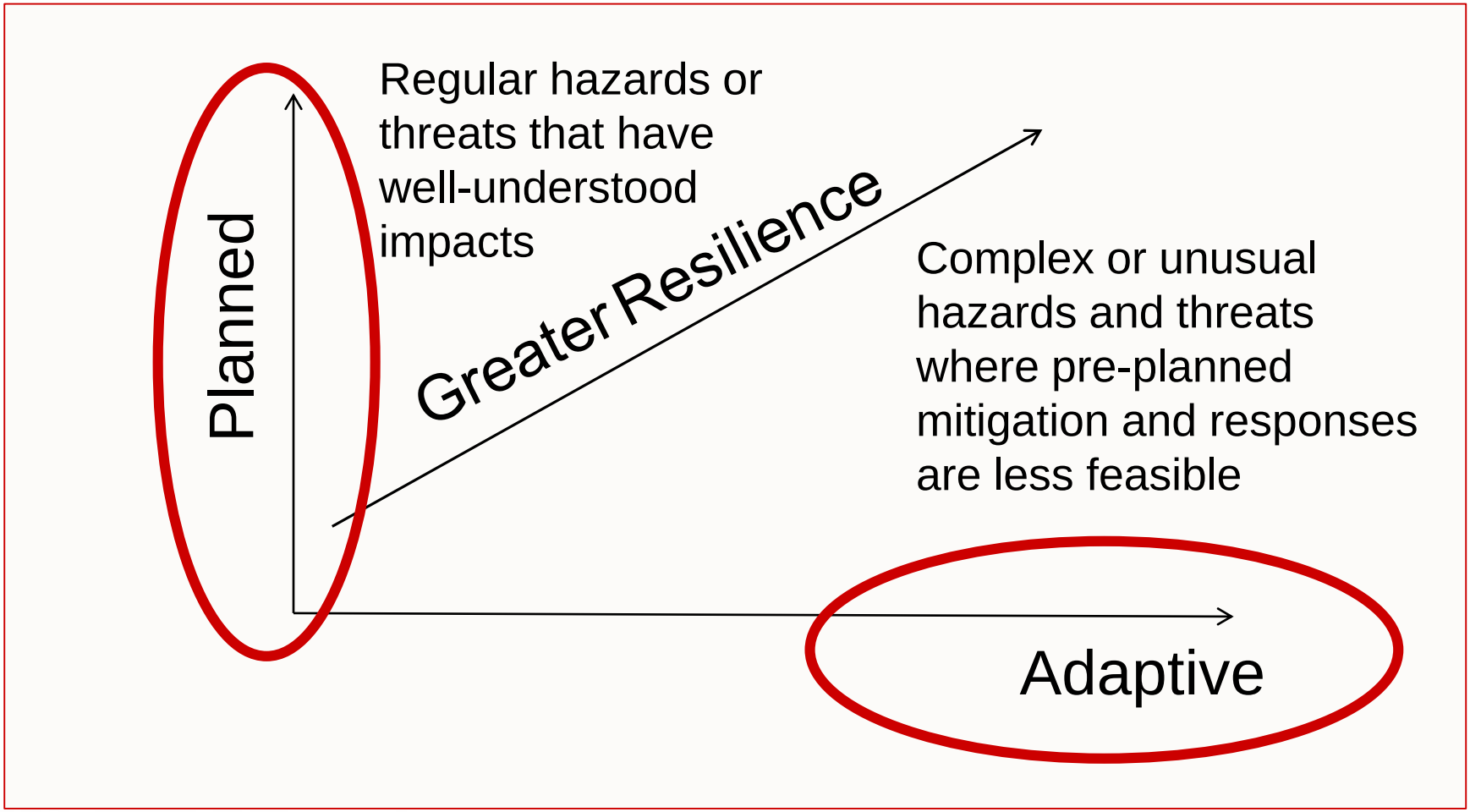
- Infrastructure fails
- Resilience:
  - something you are, not something you do
  - not necessarily more expensive
  - emergent as well as shock events
  - technical, socio-technical and natural hazards
  - not always about making things stronger
  - beyond codes, regulations, guidelines & policy
  - recognising “learned helplessness”
  - includes decommissioning infrastructure
  - includes recovery
  - scale and perspective important
  - experience, learn and act
  - often achieved by operational changes
- Equilibrium is never constant

Common Factors in Definitions of Resilience …

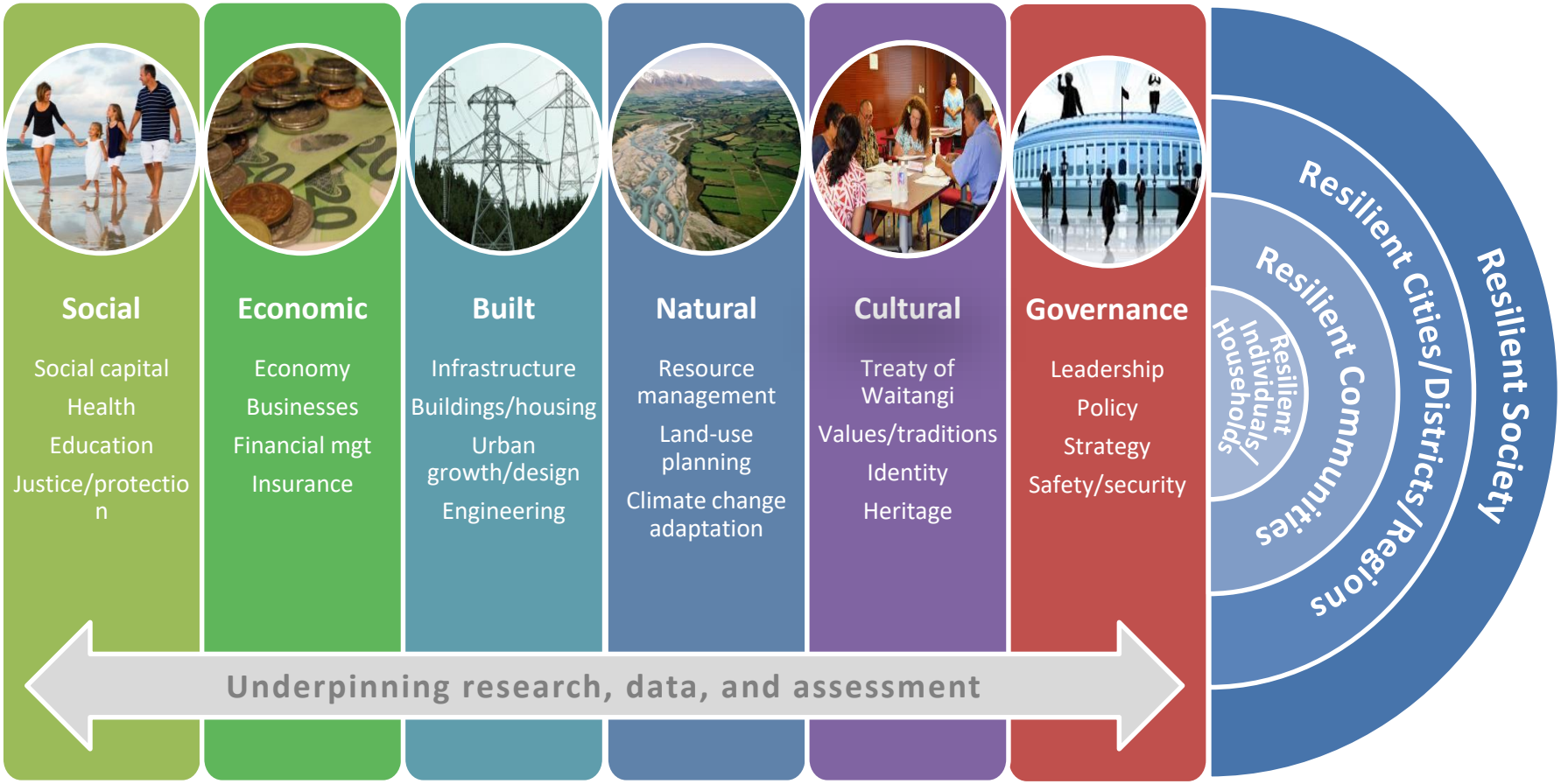
- Understanding and anticipating changing circumstances and potential disruption
- Ability to reduce, resist or withstand impacts
- Having survival/coping and recovery strategies
- Being capable, adaptable, resourceful, and innovative
- Learning from experience and 'building back better'



Resilience: Planned and adaptive capacities ….



Concept of National Resilience …

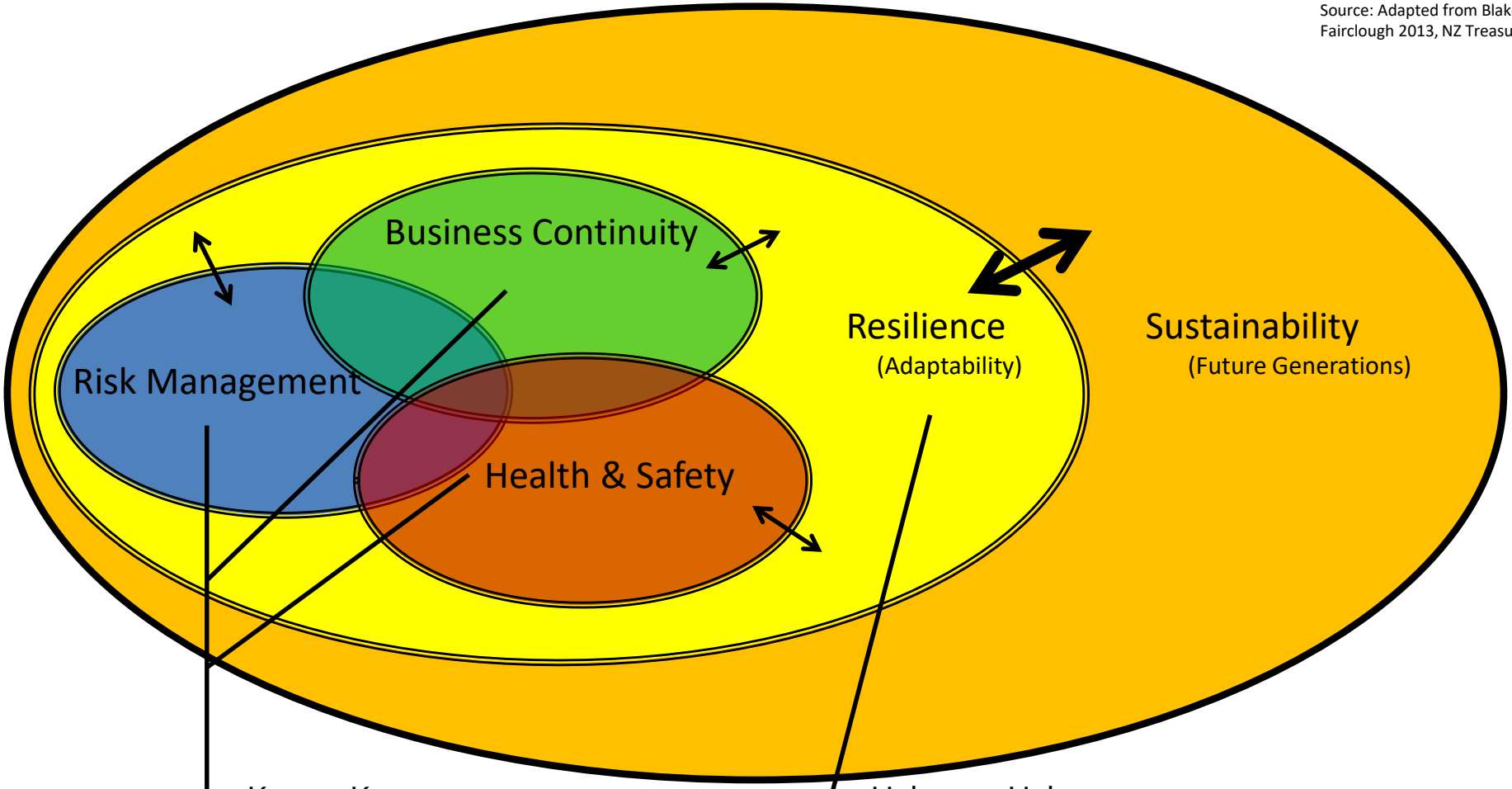


Source: Ministry of Civil Defence and Emergency Management

Risk, Resilience and Sustainability …..

(Linking to Treasury's Living Standards Framework)

Source: Adapted from Blake & Fairclough 2013, NZ Treasury



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

Game Changers ….

Source: Adapted from National Infrastructure Unit, NZ Treasury

- Champions of resilience; business leaders, political leaders, ….
- Resilient organisations (www.resorgs.org.nz)
- Systemic weaknesses
- Interdependencies (opportunities, cascade failures, multi-hazards, …) The power of “Appreciative (Positive) Inquiry”
- Challenging current paradigms (why networks?, “safe-to-fail”, low damage, user centred design, …)
- Vulnerability awareness (Regional Vulnerability Assessments, National Security System, global supply chains)
- Targeted research & research translators (research to practice)
- Opportunities through policy
- Action and achievement through rapid-prototyping (trial/s, design thinking, refinement, ...)

New Zealand Lifelines (Utilities) Council …

- Energy, Transport, Telecommunications, & Water
- Supporting regional Lifelines Groups
  - Focusing on improving the consistency of output
- Providing information to national lifeline utilities to assist them in their resilience work
- Liaising with Government agencies on infrastructure resilience

Lifelines Governance & Leadership

- Where do Lifelines fit and what role do Lifelines want into the future?
  - Peak body
  - Scale
  - Influence
  - Positioning
  - Complementarity to others:
    - Infrastructure New Zealand
    - Sector representatives eg. Water NZ
    - National Infrastructure Body
    - MCDEM / DPMC
    - Others?

Lifelines Definition & Reality …

- CDEM Act, Schedule 1:
  - Radio NZ, Television NZ, ports, airports
  - Entity that produces, supplies, or distributes manufactured or natural gas
  - Entity that generates electricity … or distributes electricity
  - Entity that supplies or distributes water to inhabitants …
  - Entity that provides a telecommunications network …
  - Entity that provides a road network ..
  - Entity that produces, processes, or distributes to retails outlets and bulk customers any petroleum product …
  - Entity that provides a rail network or service
- Should Lifelines include; stopbanks, solid waste, Fast Moving Consumer Goods (FMCG), banking & finance, logistics, flood protection, erosion protection, crematorium
- What about; Airways, Civil Aviation Authority, Air New Zealand, commercial and residential premises generating and/or distributing electricity, rural water supplies to homes, port operators, …

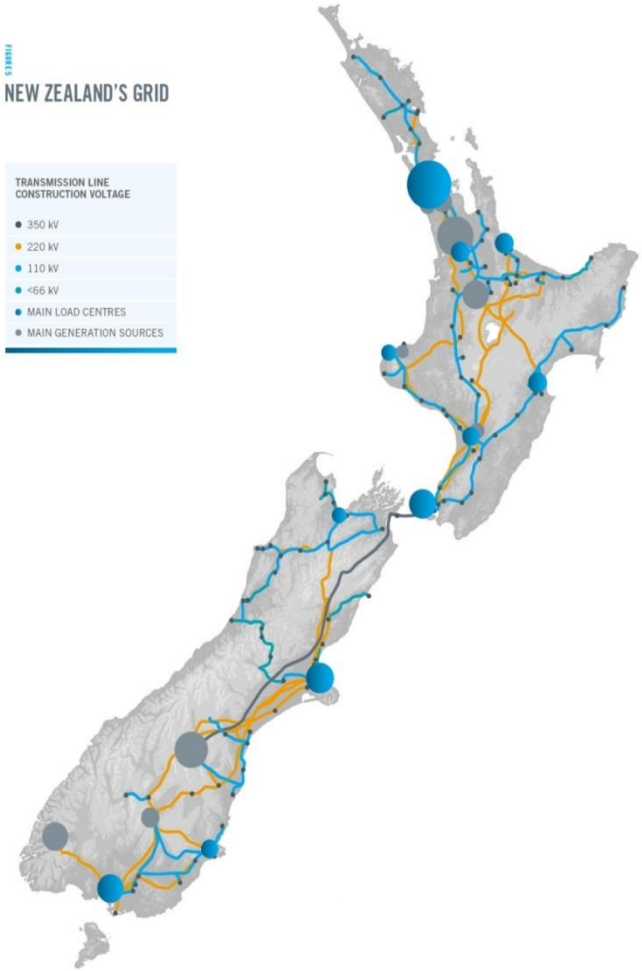
National Vulnerability …

- **“New Zealand Lifelines Infrastructure Vulnerability: Stage 1**
  September 2017” (available from MCDEM website and Auckland Lifelines website)
- Provides a national context for regional lifelines studies
- Informs lifelines resilience planning, national policy / strategy, future research priorities
- Draws on regional lifelines and other reports, National Lifelines Forum, supported by information from utilities and others.
- Presents a ‘sector’ and ‘hazard’ perspective.
- Identifies potential Stage 2 and 3 work.

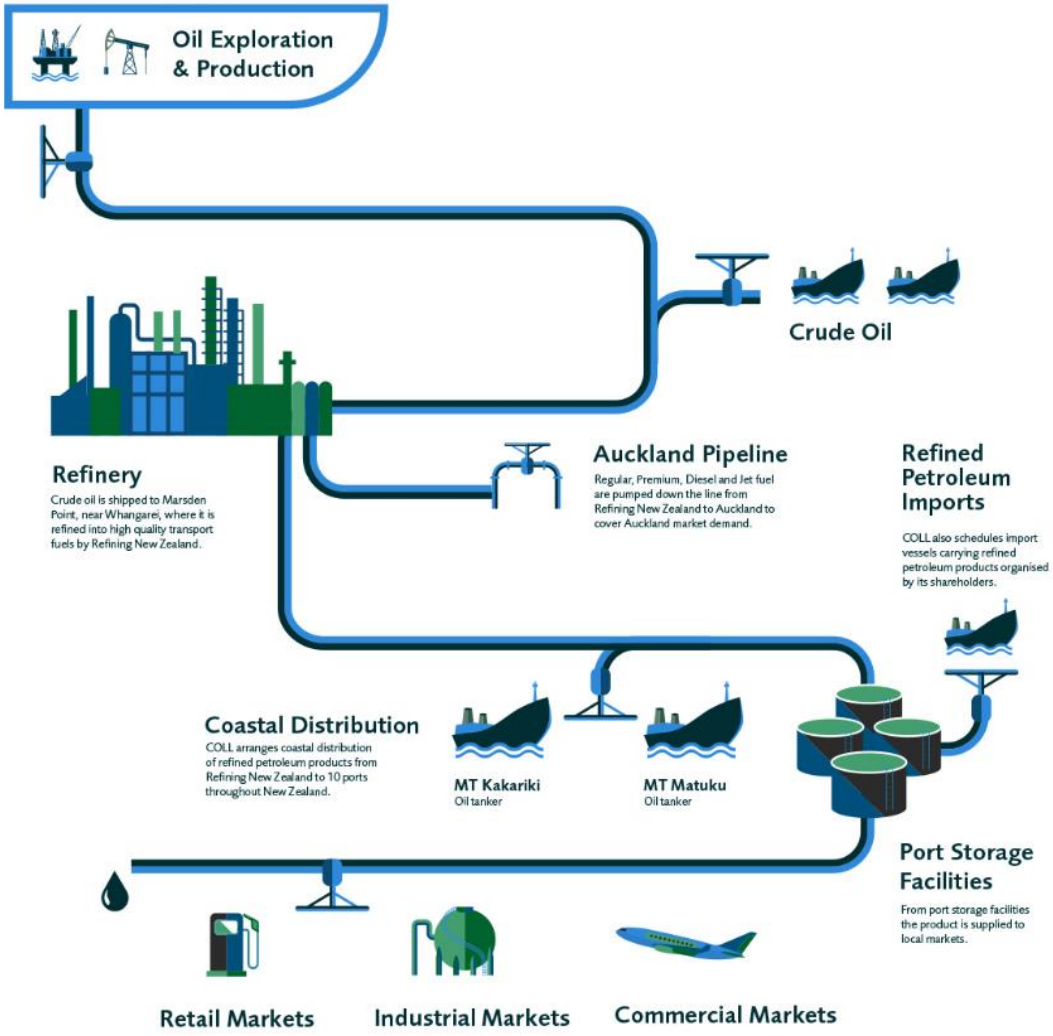
http://www.aelg.org.nz/document-library/other-documents/
https://www.civildefence.govt.nz/assets/Uploads/lifelines/National-Vulnerability-Assessment-Stage-1-September-2017.pdf

Electricity …

- Good understanding of national grid and distribution through regional Lifelines Groups, less so generation / system operator network.
- For major vulnerabilities, specific contingency plans are in place (eg: Bunnythorpe, Kawarau Gorge) or being developed.
- Funding of ‘high impact low probability’ event investigations and relative importance of ‘loss load’ of customers is a challenge.



Fuel …

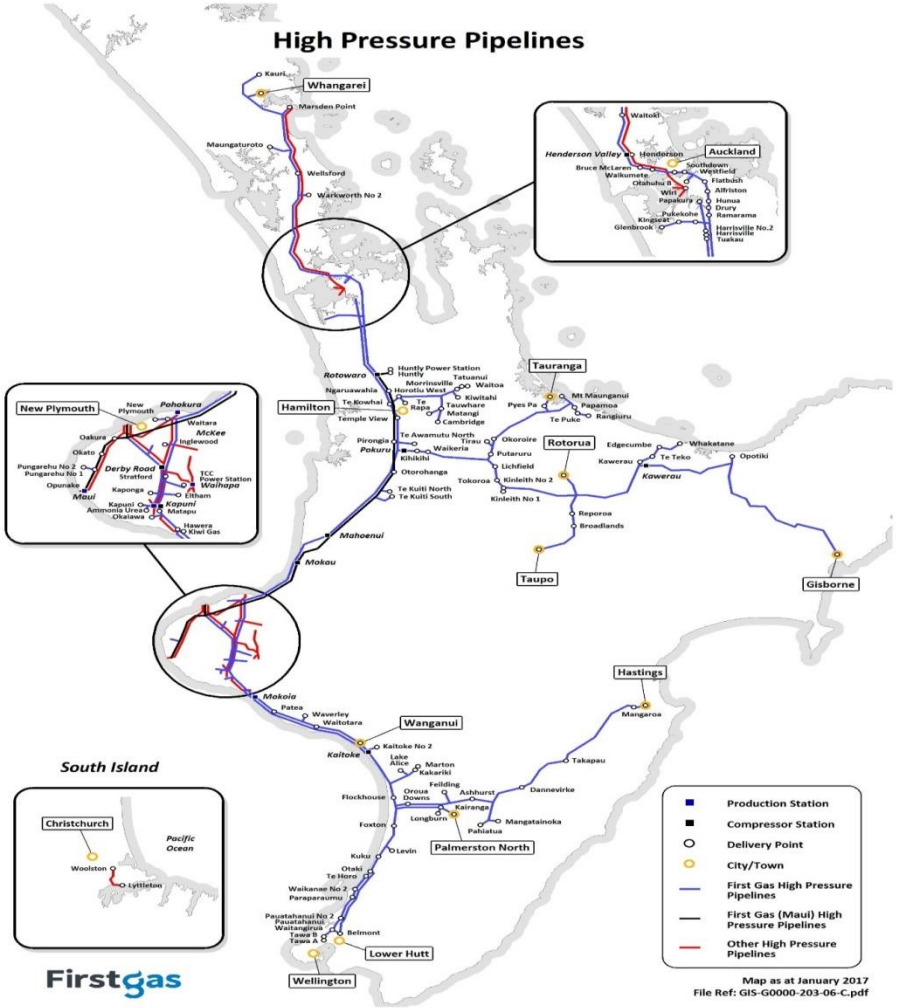

Oil Exploration & Production
Crude Oil
Refinery
Crude oil is shipped to Marsden Point, near Whangarei, where it is refined into high quality transport fuels by Refining New Zealand.
Auckland Pipeline
Regular, Premium, Diesel and Jet fuel are pumped down the line from Refining New Zealand to Auckland to cover Auckland market demand.
Refined Petroleum Imports
COLL also schedules import vessels carrying refined petroleum products organised by its shareholders.
Coastal Distribution
COLL arranges coastal distribution of refined petroleum products from Refining New Zealand to 10 ports throughout New Zealand.
MT Kakariki
Oil tanker
MT Matuku
Oil tanker
Port Storage Facilities
From port storage facilities the product is supplied to local markets.
Retail Markets
Industrial Markets
Commercial Markets

Fuel …

- Good understanding of national network and significant components.
- Varying views around risk acceptability of reliance on overseas stocks.
- Concerns around impacts of growth on stock levels.
- No specific information on ‘minimum’ acceptable storage before refill.
- MBIE (H&T) – consider more jet fuel storage in Auckland and impacts of Wynyard Wharf closure.

Gas …

- Good understanding of supply chain
- Coordinated sector contingency response
- MBIE (WP) 2014 report concludes risks well understood and managed.
- High impact low probability risks (eg: Taranaki eruption)



Roads …

- ‘ONRC’ (One Network Road Classification) good base for criticality rating.
- NZTA’s resilience programme – aiming to improve approach to ‘resilience’ funding and programmes.
- Local road alternatives are often inadequate.
- Recognition that this network is highly vulnerable to all the major natural hazards.

Sea and Air Transport …

- Ports – recent study on natural hazard vulnerability – seismic and tsunami risk.
- Vulnerability of access and egress roads are often a key vulnerability.
- Reliance on alternative modes /sites if a port /airport is unable to operate but not fully tested or understood.
- Jet fuel availability is a key issue for airports.
- No information captured on specifics of capacity / use / traffic volumes, etc.

Rail …

- Little route redundancy in network.
- Typically not thought to be one of the most critical networks (apart from perhaps metro areas) – other transport modes offer alternative.
- Kaikoura highlighted importance.
- Often vulnerable to same hazards as adjacent road.
- No information captured on specifics of capacity / use / traffic volumes, etc.

Telecommunications …

- Understanding of the significant sites / assets but not necessarily the service consequence of failure – complexity, interconnectivity.
- Commercial drivers required for investment (Govt subsidy otherwise – rural blackspots).
- MBIE review will improve understanding of critical sites and vulnerabilities.
- Northland outage in February ‘17 tested reality of battery backup times.
- Building stock vulnerability issue identified.
- Broadcasting has many significant sites / single points of failure – rely on highly robust sites.

Telecommunications …

- Centralisation
  - The service controlling elements (such as switching centres and exchanges) of a modern telecommunication network are becoming centralised into a **small number of nationally significant sites**.
  - The consequence of removing these local exchanges will be to **remove the ability for subscribers to make local calls when the backhaul links are broken**.
- Telecommunications and Electricity
  - Telecommunications and electricity are **indelibly linked**, one cannot exist without the other.
  - Progressively, with the introduction of modern services (including cordless phones) such as DSL (Digital Subscriber Loop) there has been a requirement for the **subscriber to provide their own local power**.
  - Service concentrators such as **Mobile Base Stations (Cell Sites) and Chorus MUX (Multiplex) cabinets also require power** to operate and often need to be sustained using portable generation during conditions that cause mains power failure.
- Meshed and Single Ended
  - The Telecommunication network is a combination of **fully meshed and single ended** architecture.
  - **A single ended network (one with no physical diversity) is usually found feeding smaller communities** such as Hokitika, Westport and their derivative communities.
  - A **city suburb** tends to have the benefits of route **diversity** and access to multiple providers as a mitigating factor.

Water and Wastewater …

- Key pinchpoints an area of focus in Auckland, Wellington, Hamilton.
- Rely on building robustness into significant sites and redundancy as growth enables investment.
- Distribution networks are highly vulnerable to seismic activity – gradual, prioritised improvements through renewal programmes.
- A number of recent events have resulted from water quality rather than quantity issues.
- DIA is leading a review of the three waters sector.

NZ Stopbank Networks …

Refer Kaley Crawford-Flett
kaley.crawford-flett@canterbury.ac.nz

- Stopbank information is presently ‘piecemeal’:
  - Various formats
  - Completeness varies by region
  - Assemble National Inventory of Stopbanks (NZIS) (geospatial)

- Lack of stewardship at national level (data, lessons from events, etc.)
  - Create standard data framework

- Basic characterisation of assets is lacking at national scale
  - Geospatial analysis of stopbank characteristics (+ other datasets)

Critical Community Services …

- Emergency Services
- Health Services
- Government
- Banking
- Fast Moving Consumer Goods (FMCG)
- Corrections Facilities
- Solid Waste
- Major Industry

Your questions and feedback are most welcome.

Resilient is something you are not something you do

NZ Lifelines (Utilities) Council:

roger.fairclough@neoleafglobal.co.nz

Mob +64 276 456 225