NEW ZEALAND'S CRITICAL INFRASTRUCTURE RESILIENCE

New Zealand Lifelines Infrastructure Vulnerability Assessment

National Lifelines Utilities Forum, 16 October 2018

Roger Fairclough, Chair New Zealand Lifelines (Utilities) Council

Lisa Roberts, Programme Manager New Zealand Lifelines (Utilities) Council

Ministry of Civil Defence & Emergency Management
Te Rākau Whakamarumaru

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New Zealand Lifelines Council

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The New Zealand Water & Wastes Association Wairoa Aotearoa

GNS SCIENCE

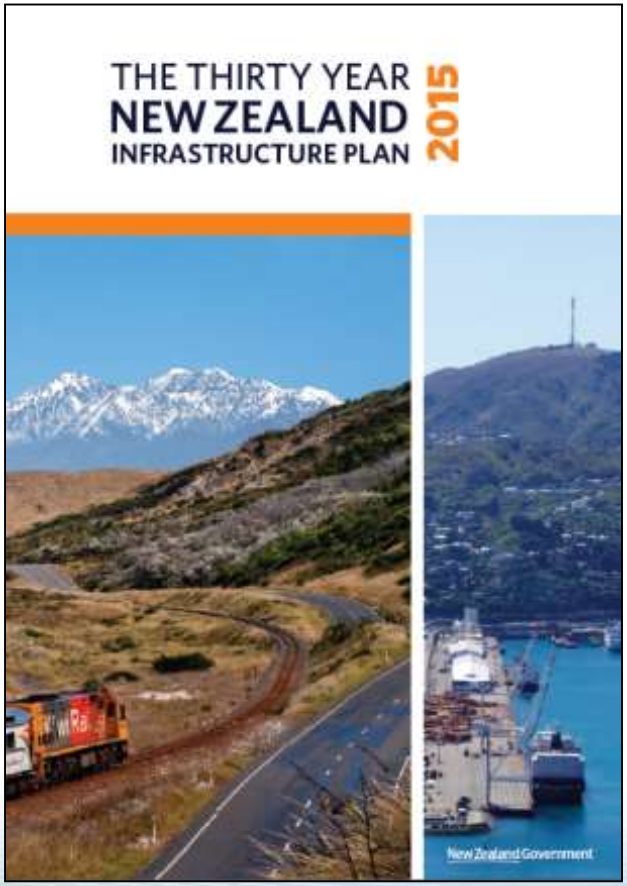
Spark New Zealand

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 ..

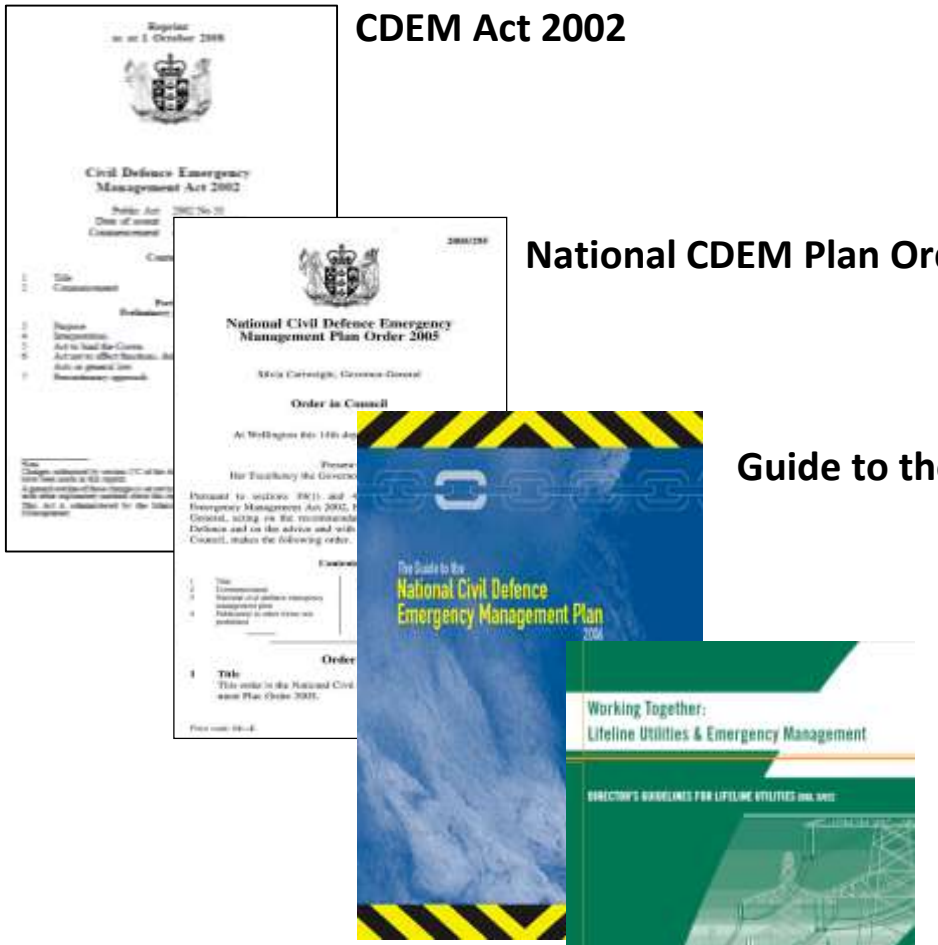
Experience ….

- Slow rate of uptake
- Dealing with systems of systems, complex
- Confirmation that standards and regulations contribute strongly but can at best provide only part of the solution
- Confirmation that “measuring” resilience should not be the priority. Conversations and narratives are more revealing
- Infrastructure service providers are (in general) giving insufficient attention to Civil Defence Emergency Management (CDEM) Act responsibilities ie. Lifelines
- Interdependencies are extremely important and current efforts are insufficient. We have no evidence to prioritise across infrastructure.

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

Civil Defence Emergency Management Act (CDEM)



CDEM Act 2002

National CDEM Plan Order 2002

Guide to the National CDEM Plan

Director's Guideline for Lifeline Utilities

Regional Vulnerability Studies …

‘To assess the potential impacts of hazards on lifelines infrastructure and identify mitigation strategies to reduce that risk.’

New Zealand Lifelines

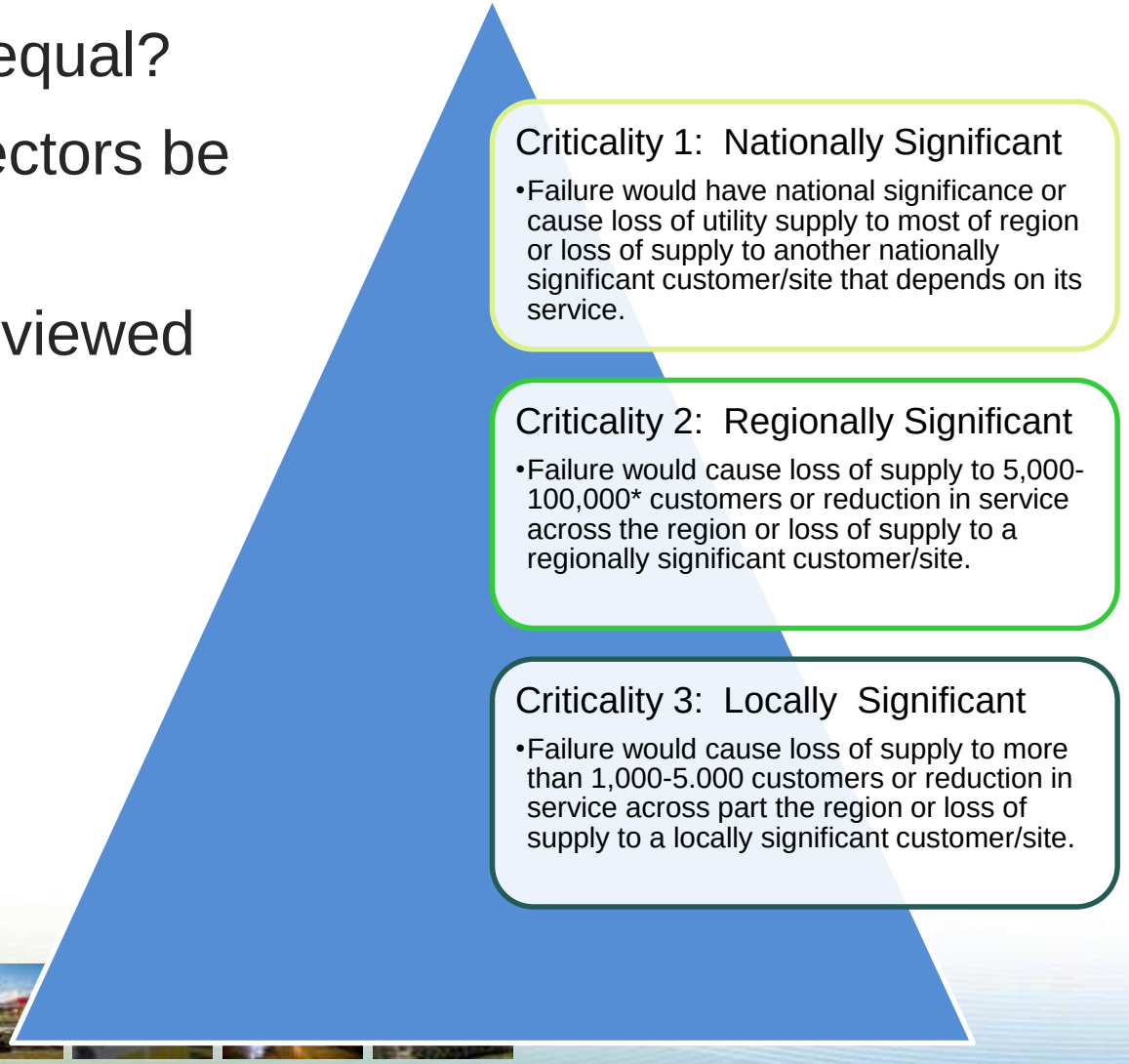
National Vulnerability …

- **“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

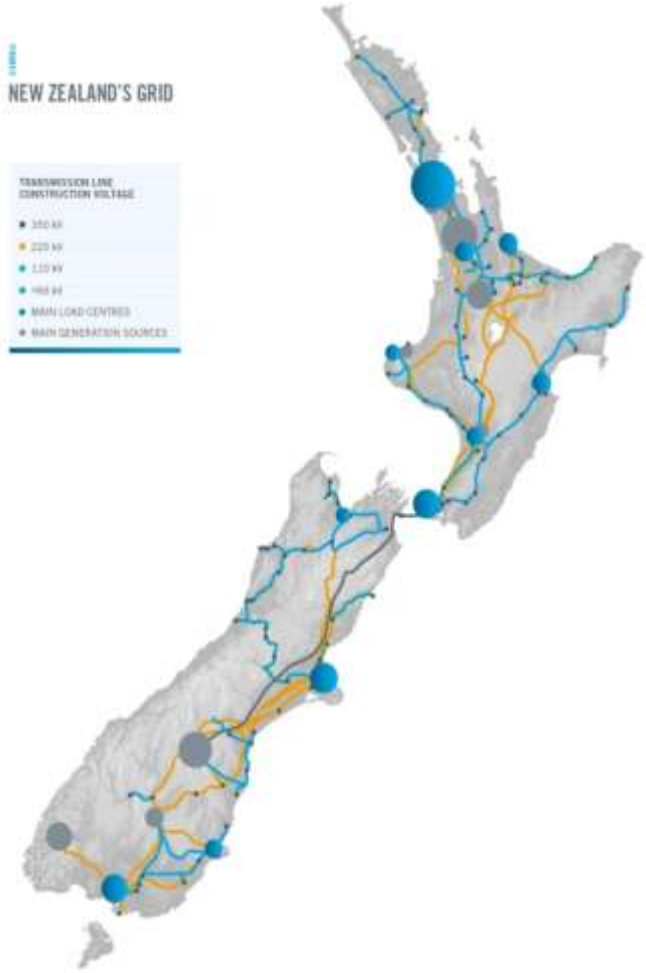
Defining Critical Infrastructure …

- Are all sectors equal?
- Should other sectors be included?
- Being further reviewed

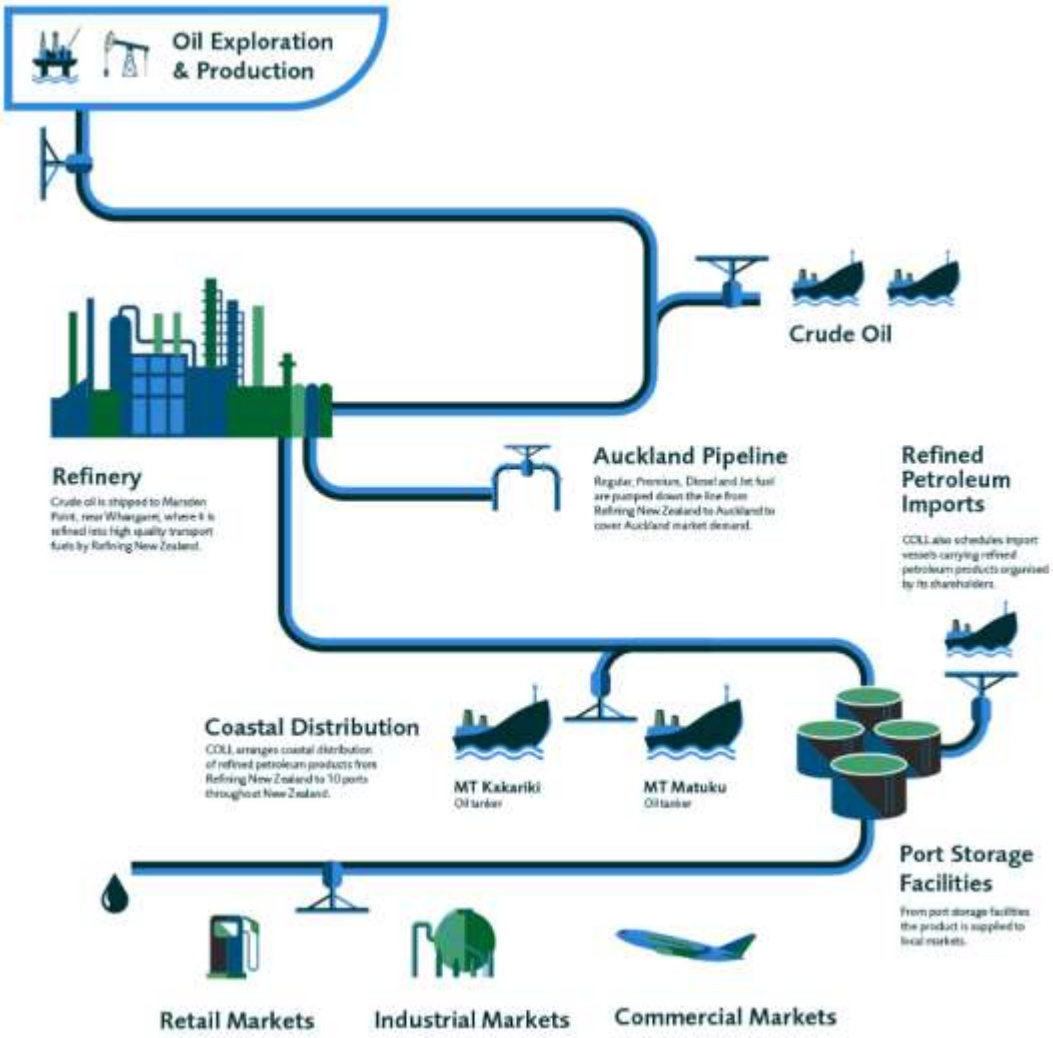


Electricity …

- 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 …

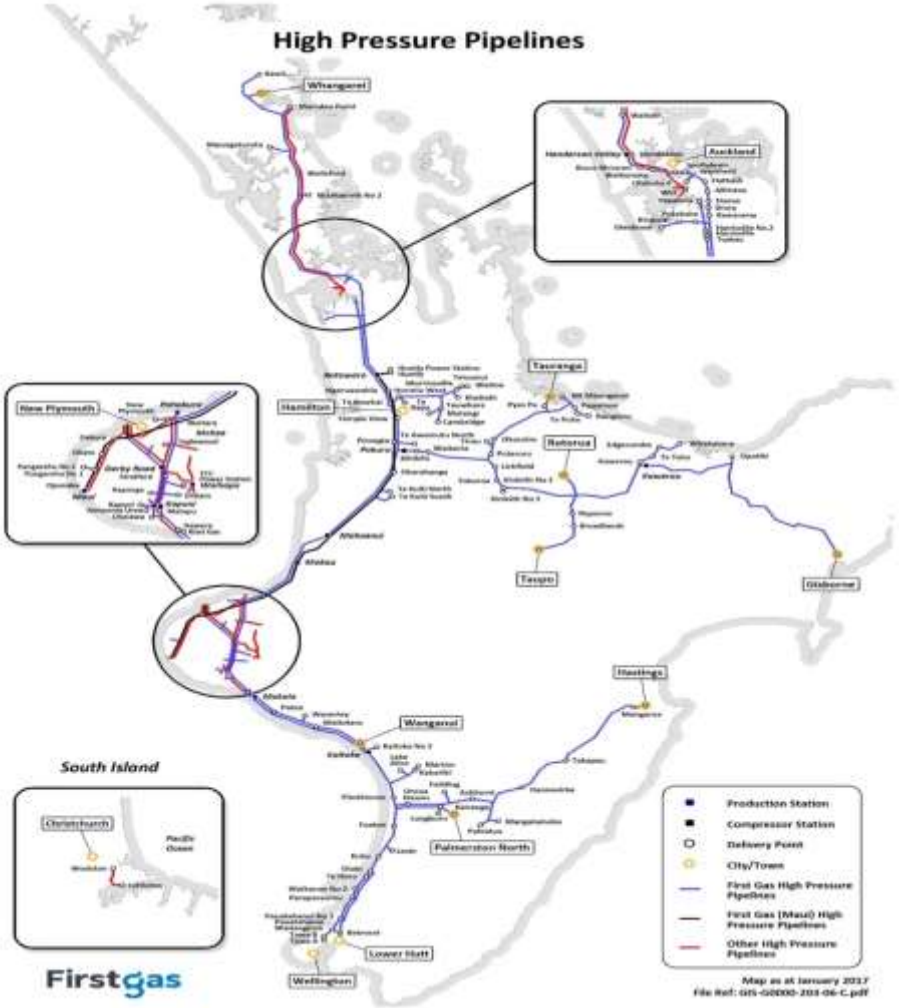

Oil Exploration & Production
Crude Oil
Refinery
Crude oil is shipped to Marsden Point, near Whangarei, where it is refined into high quality transport fuels by Refining New Zealand.
Auckland Pipeline
Regular, Premium, Diesel and Jet fuel are pumped down the line from Refining New Zealand to Auckland 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) 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**.
  - Increasing 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.
- **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.

Interdependency …

- Good understanding of sector level lifelines interdependency.
- Developing understanding of site level lifelines interdependency.
- Limited understanding of ‘critical customer’ dependency and backups.

The degree to which the utilities listed to the right are dependent on the utilities listed below	Roads	Rail	Sea Transport	Air Transport	Water Supply	Wastewater	Stormwater	Electricity	Gas	Fuel Supply	Broadcasting	VHF Radio	Telecomms	Total Dependency
Electricity	1	2	3	3	3	3	2		2	2	3	3	3	30
Roads		3	3	3	2	2	2	2	2	3	2	2	2	28
Fuel	2	3	3	3	2	2	2	2	2		2	2	2	27
Tele-comms	2	2	2	2	2	2	2	2	2	2	2	3		25
Water Supply	1	1	1	2		3	1	1	1	1	1	1	2	16
VHF Radio	2	2	2	2	1	1	1	1	1	1	1		1	16
Stormwater	2	1	1	2	1	1		1	1	1	1	1	1	14
Wastewater	1	1	1	2	1		1	1	1	1	1	1	1	13
Rail	1		1	1	1	1	1	1	1	1	1	1	1	12
Sea Transport	1	1		1	1	1	1	1	1	1	1	1	1	12
Air Transport	1	1	1		1	1	1	1	1	1	1	1	1	12
Gas	1	1	1	1	1	1	1	1		1	1	1	1	12
Broadcasting	1	1	1	1	1	1	1	1	1	1		1	1	12

Critical Community Services …

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

Infrastructure Hotspots …

- **Petone/Seaview**
- **Thorndon/Kaiwharawhara**
- **SH6 Kawarau Gorge** (road, electricity, fibre, alluvial activity, landslide, rockfall)
- **Auckland Harbour Bridge**
- **Central Plateau**
- **SH20 Near Mangere Bridge** (fuel, transmission, wastewater)
- **South Dunedin**
- **Cook Straight**
- **Lyttelton Tunnel**
- **Kaikoura Coast**

Hazards …

- Most information available on vulnerability to volcano, earthquake, tsunami, weather.
- Developing understanding of technology failure risks.
- Report mainly limited to sites/assets vulnerable rather than wider service impacts.
- National hazard datasets not currently available for many hazard types – varying methodologies applied at regional level.
- Limited information on programmes to mitigate hazard risks.
- More information available from research projects?

Stage 2 …Five Priority Projects

Guidelines for Defining Critical Lifelines Infrastructure	Review / refine / expand the definitions of 'nationally', 'regionally' and 'locally' significant to provide additional guidance. Implement a strategy for uptake of work through regional policy / land use planning.
'CDEM Critical' Customers for Lifeline Utilities.	Engage with the 'critical community' sectors to better understand their nationally critical sites and supply chains, the impacts of failure of lifelines services and extent of backup arrangements. Consider inclusion of strategic industrial sites.
Incorporate outputs from major national and regional projects and programmes.	Draw on key outputs from major projects/programmes as they progress, such as AF8 and Wellington Resilience Programme and many, many more.
Complete information gaps in report on Critical Lifelines Infrastructure	Include further information on the airports, ports and fuel sectors (eg: fuel storage volumes, airport and ports capacity / traffic). Plus other identified gaps, eg: electricity generation - minimum generator operation requirements.
List of national infrastructure resilience projects.	A collated list of strategic national projects that will improve the resilience of national networks. - such as Transmission Gully or a second RAP (fuel) line. They may be in progress, planned or potential future ideas. Will incorporate information from key projects above.

Workshop Discussion Topic …

Scenario:

- The **infrastructure body exists** in it's formative stage as 8 respected individuals forming an "Infrastructure Commission".
- Each table will be assigned funding for investment in any or all of resourcing capability, capacity, capital, expenses, etc, etc.
- How and on what will funds be deployed?

Funding Allocation:

- $ 500,000
- $ 5,000,000
- $50,000,000
- $ More?

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

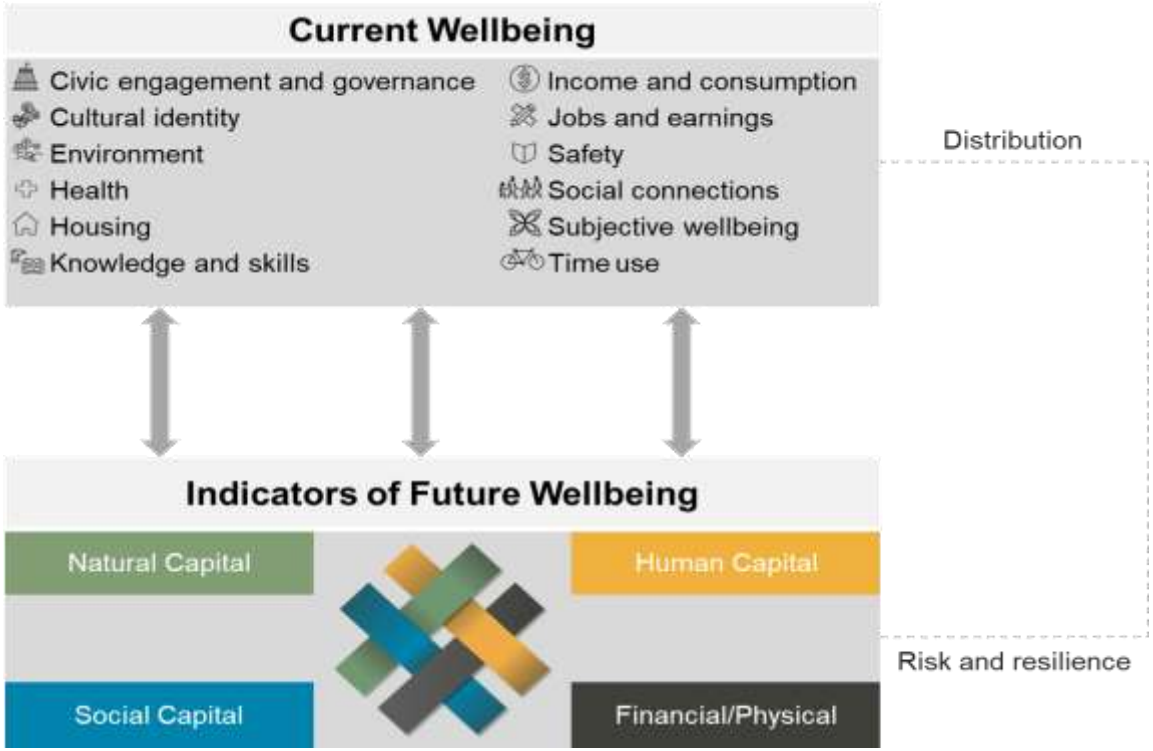
THE TREASURY
Kaitohutohu Kaupapa Rawa

Resilience and Future Wellbeing

Ken Warren
Chief Accounting Advisor

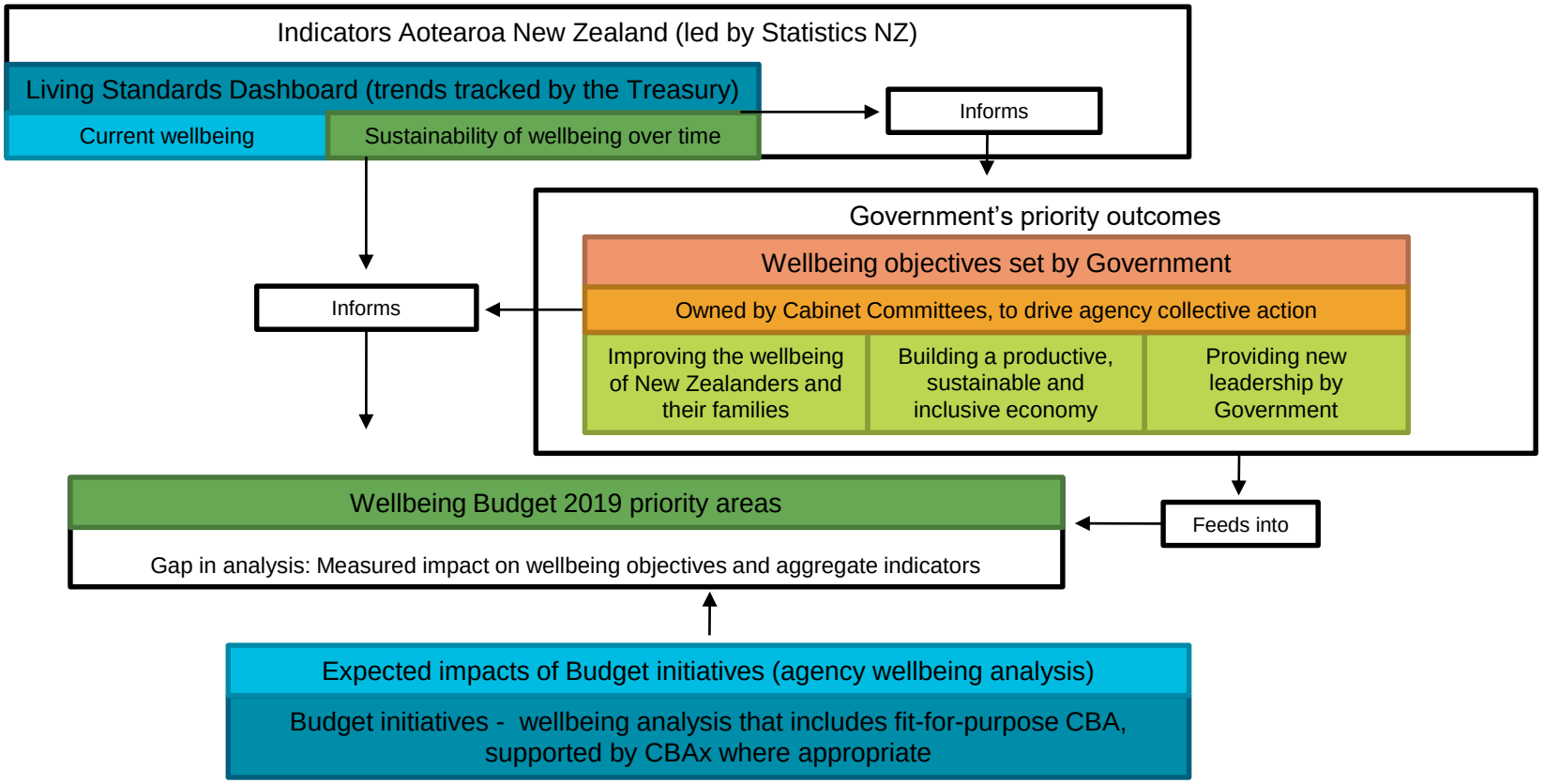
October 2018

Building a Living Standards Framework

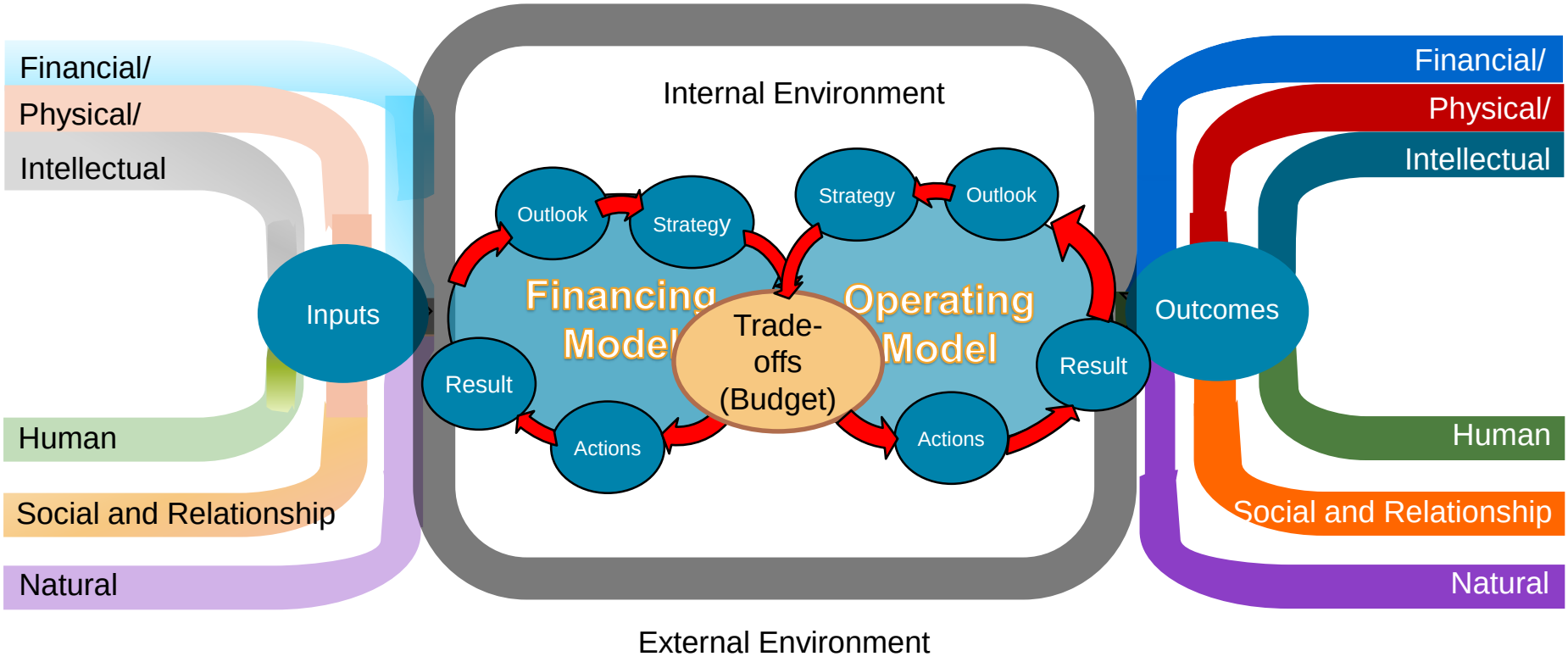


For more, see: https://treasury.govt.nz/information-and-services/nz-economy/living-standards

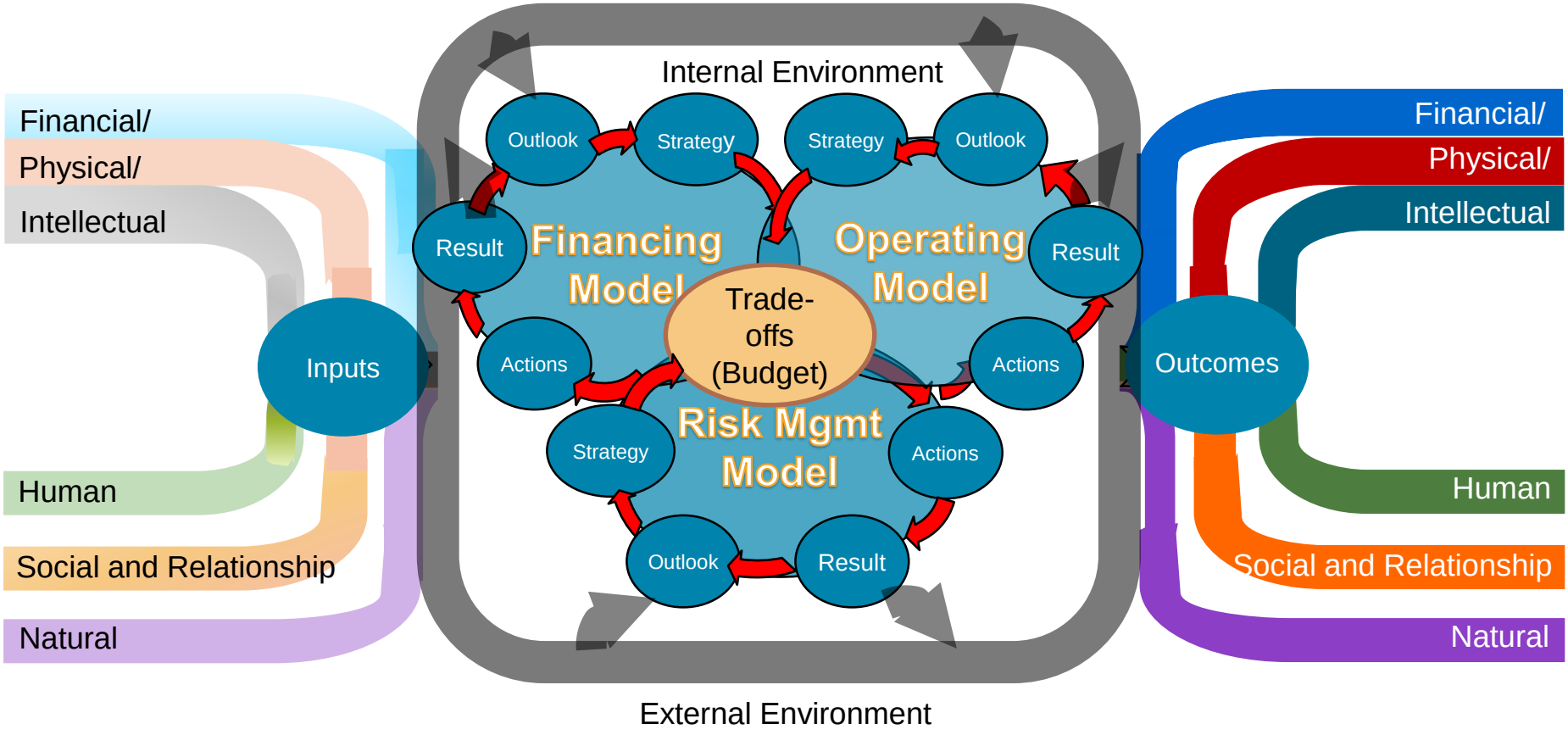
Building a Wellbeing Budget



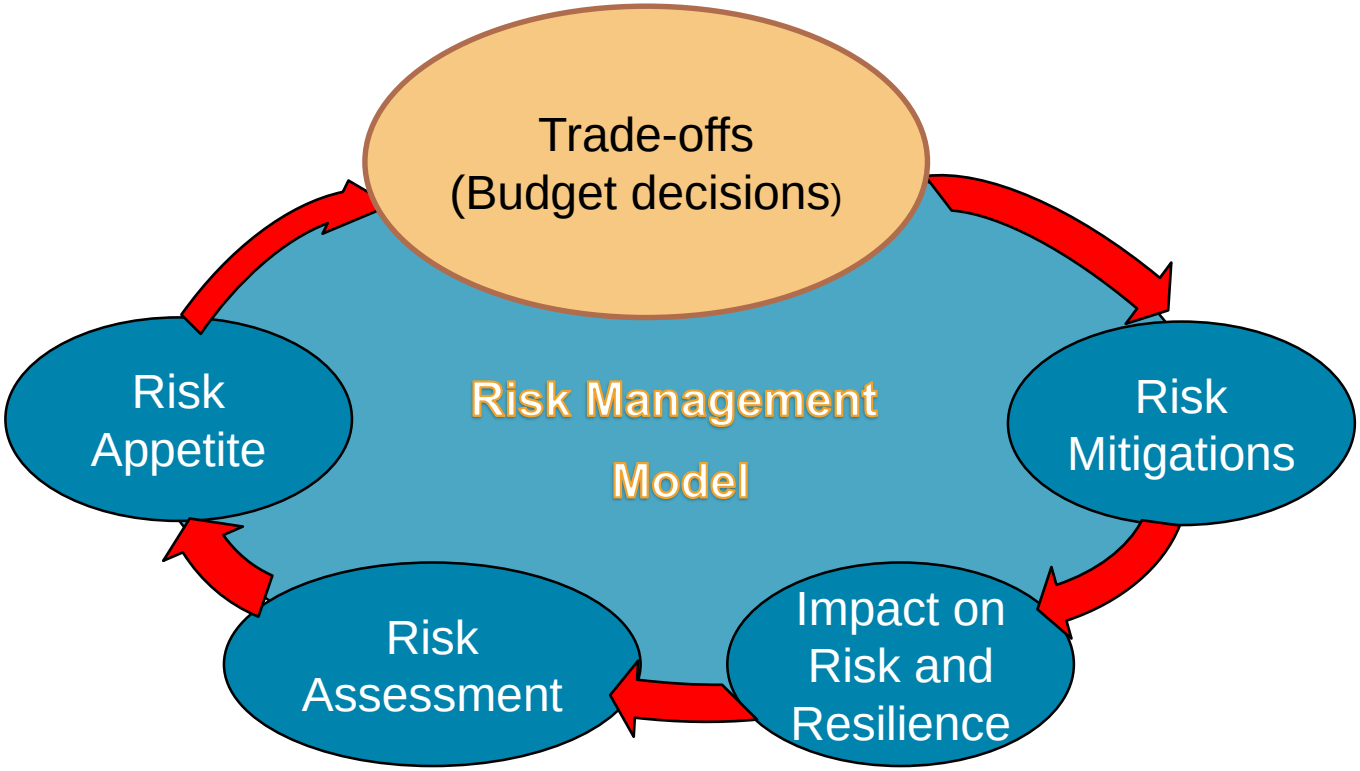
Wellbeing Budget 2019



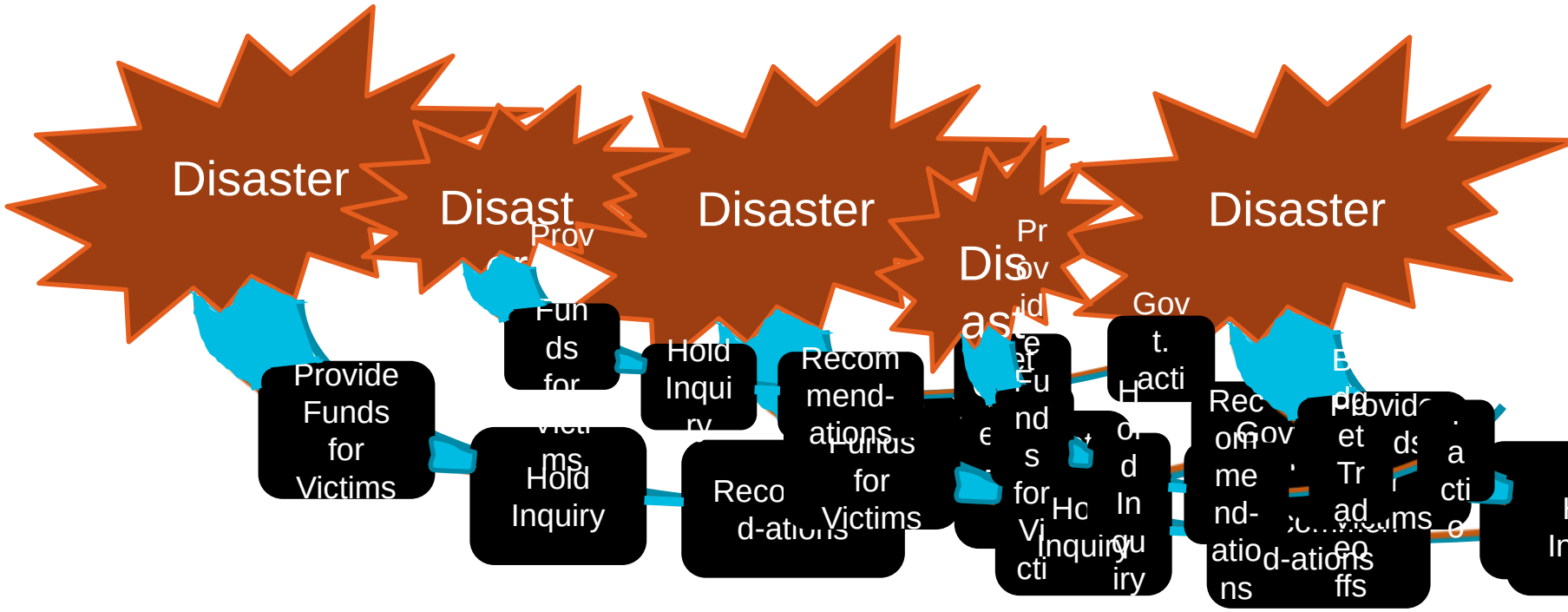
Fully Integrated Budget Improving Living Standards



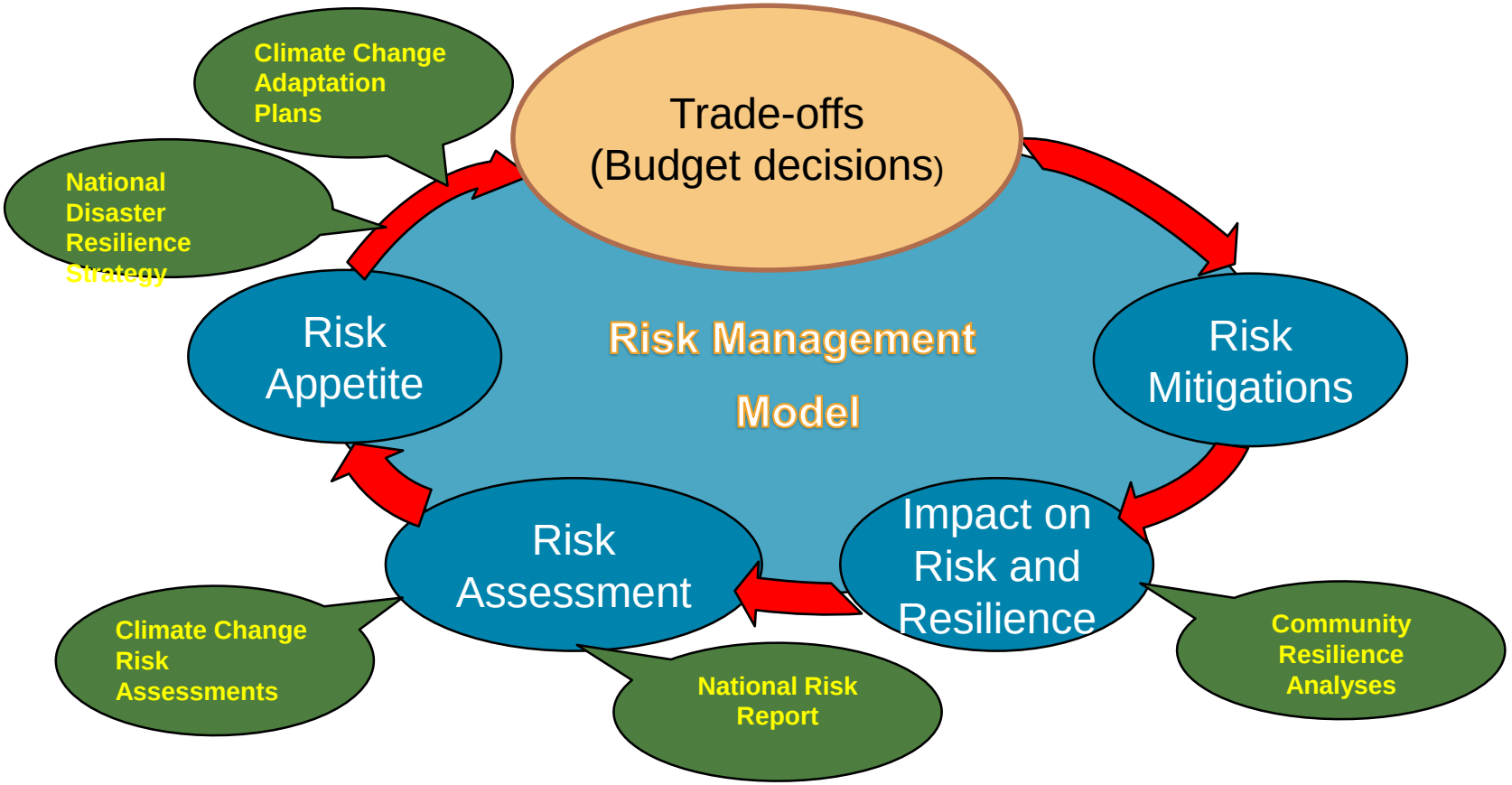
Proactive Risk and Resilience Management



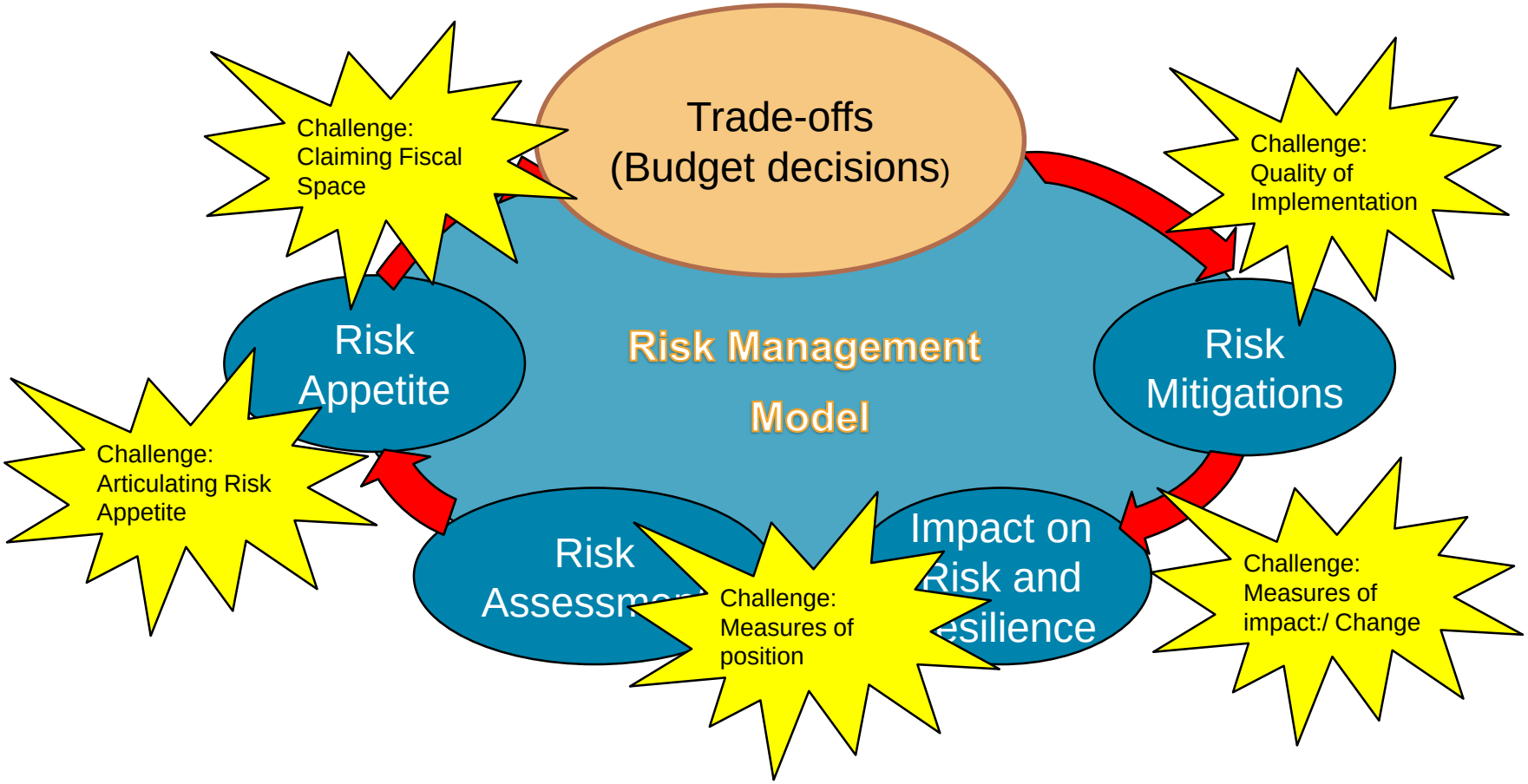
Reactive Risk Management



Proactive Risk and Resilience : Signs of Hope



Risk and Resilience Systems: Challenges



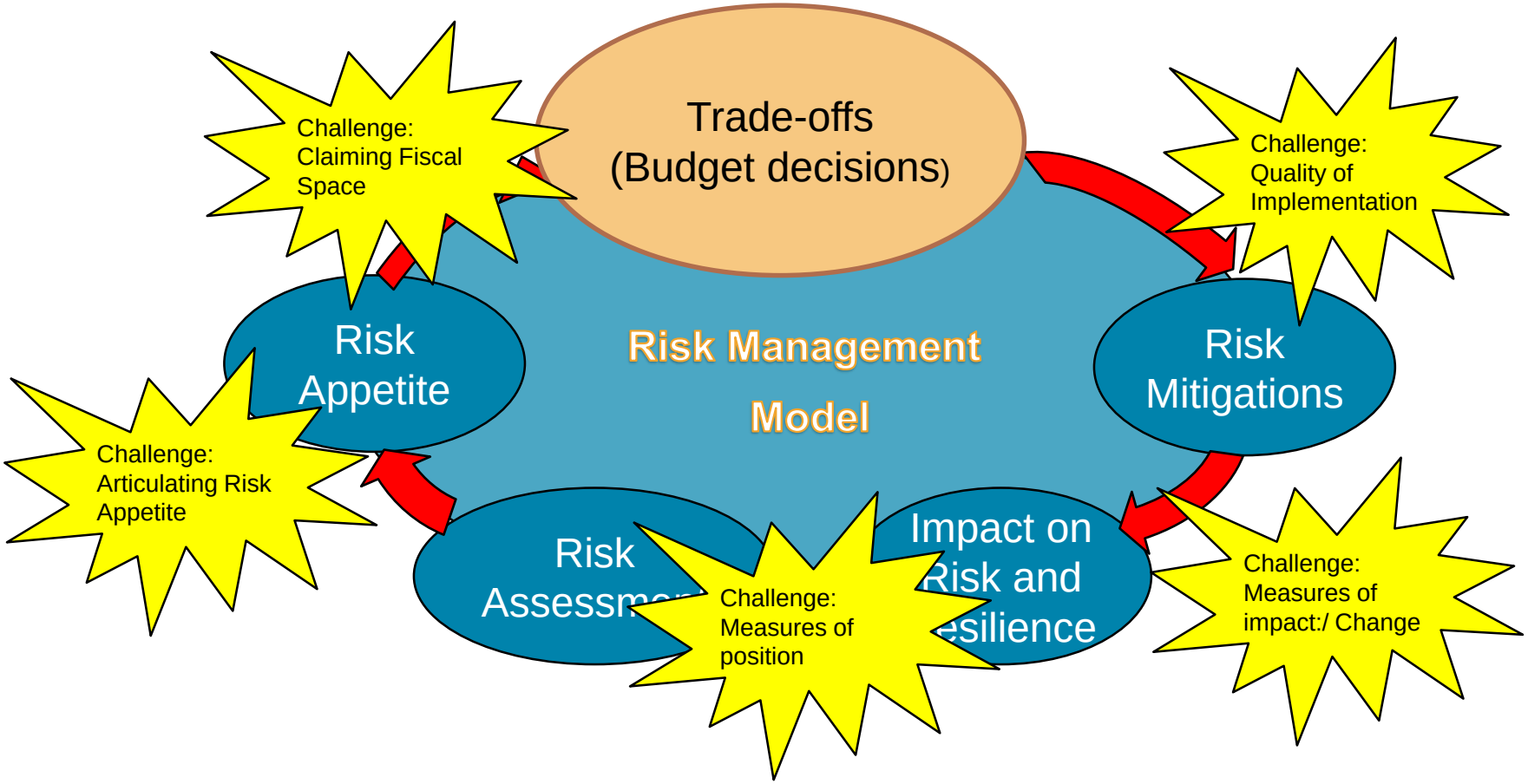
Risk Appetite Articulation: Recognising Behavioural Biases

Known Behavioural Bias	Very Useful Because	But tendency for sub-optimal decision-making affecting resilience
Myopia	Encourages a focus on immediate problems	To plan over short future horizons
Amnesia	Progress enabled as the pain of missteps fades	To base decisions on recent events
Optimism	Necessary for hope	To underestimate consequences
Inertia	Protects hard won gains from being lost	To choose default courses of action
Simplification	Protects against paralysis when uncertain	To process limited information
Herding	There is safety in groups	To make decisions by imitation

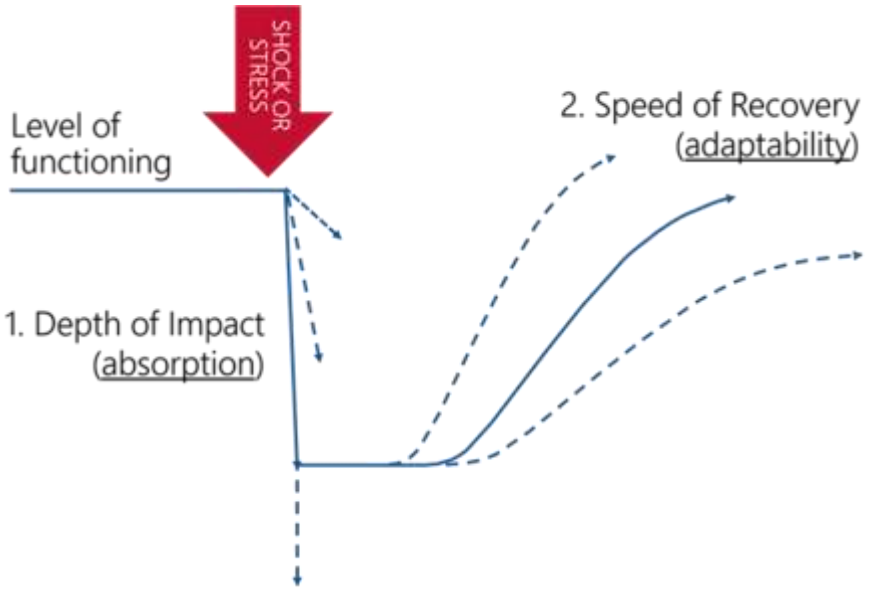
Risk Appetite Articulation: Struggling with World Views

	Markets are Ineffective	**Markets are Effective**
Government is Ineffective	***Fatalism*** Regulation: Pointless People: Amoral, unpredictable Value: Survival Risk: Uncontrollable, shift to others Risk: Willing to pay very little Blame: Fate, "them"	***Individualism*** Regulation: Light touch People: Intelligent, self-centred Value: Economic freedom Risk: Opportunity Risk: Willling to invest Blame: Excessive regulation, incompetence
Government is Effective	***Egalitarianism*** Regulation: Insufficient People: Good but easily corrupted Value: Solidarity, equality Risk: Imminent collapse Risk: Willing to pay to mitigate many risks Blame: The system & vested interests	***Managerialism*** Regulation: Macro-prudential People: Flawed, need guidance. Value: Duty to control and protect Risk: To be managed Risk: Willing to pay to mitigate large risks Blame: Dishonesty, people not rule abiding

Risk and Resilience Systems: Challenges



Measuring Resilience: Absorption and Adaptability



Start of a Conversation: Measuring Resilience

<table>
<tr><th>NATURAL CAPITAL</th><th colspan="2">FINANCIAL/PHYSICAL CAPITAL</th></tr>
<tr>
<td>Absorption
• Safety margins in environmental thresholds (planetary boundaries)
Adaptation
• High-quality and comprehensive institutional regulations sensitive to sustainable use of natural capital
• Biosecurity response and recovery capability
• Whole-of-society collaboration for environmental protection and restoration</td>
<td>Financial capital

Absorption
• Strength of Government and Corporate Balance Sheets
• Vulnerability to climate change
• Inclusive growth
• Strong cyber security
Adaptation
• Trade diversification
• Well-functioning, high- penetration insurance markets</td>
<td>Physical capital

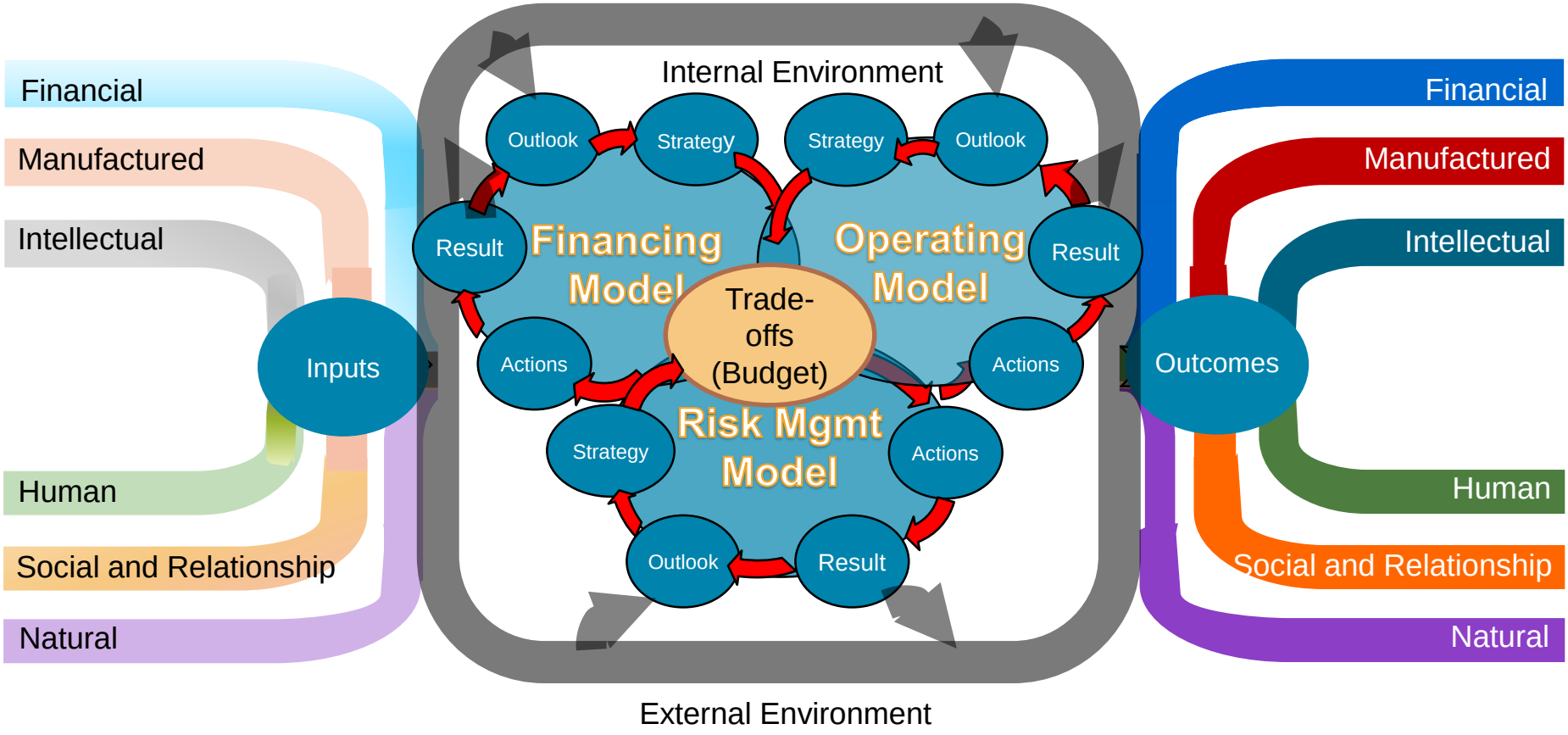
Absorption
• Robustness of physical capital
• Redundancy and flexibility of critical physical capital

Adaptation
• Capacity and level of collaboration within New Zealand’s construction industry</td>
</tr>
<tr><th>SOCIAL CAPITAL</th><th colspan="2">HUMAN CAPITAL</th></tr>
<tr>
<td>Absorption
• Low inequality
• High trust in public institutions
Adaptation
• Collaboration and conflict resolution skills</td>
<td>Health
Absorption
• Investment in new agricultural technologies, increasing national food stocks and emergency reserves to deal with decreasing food security
• Effectiveness of public health prevention efforts

Adaptation
• Public, institutional and political support for water management reform
• Emergency preparedness and resourcefulness</td>
<td>Knowledge and skills
Absorption
• Strong foundational skills
• Higher skills

Adaptation
• Responsive educational institutions
• Flexible labour market</td>
</tr>
</table>

Integrated Government Improving Living Standards



Feedback to ken.warren@treasury.govt.nz

Incident Classification Levels

CIMS 3rd edition

National Lifelines Utilities Forum

Tuesday 16 October

DRAFT 12/10/18

For more information, please contact
carla.drayton@dpmc.govt.nz or
mike.hill@maritimenz.govt.nz

INCIDENT CLASSIFICATION MATRIX

CLASSIFICATION / RESPONSE LEVEL	1	2	3	4
National level	N1	N2	N3	N4
Regional level	R1	R2	R3	R4
Local level	L1	L2	L3	L4
Incident level	I1	I2	I3	I4

INCIDENT CLASSIFICATION GUIDE

INCIDENT CLASSIFICATION			1	2	3	4
RESPONSE LEVEL		CONSTRUCT	DESCRIPTOR			
NATIONAL LEVEL (N) / REGIONAL LEVEL (R) / LOCAL LEVEL (L)) / INCIDENT LEVEL (I)		Consequences/Impacts	**Minor** (a small number of population in the area are/would be/could be impacted)	**Moderate** (some of population in the area are/would be/could be impacted)	**Major** (many of population in the area are/would be/could be impacted)	**Severe** (majority of population in the area are/would be/could be impacted)
		Resources	Manageable within available resource	Requires some allocation of resource	Resource limits and capacity are full	Resource limits are exceeded
		Public, political & media Interest	Management are engaged Minimal or no interest	Senior Leadership and executives are engaged Some degree of interest	Elected officials and ministers are engaged National interest	Elected officials and ministers are actively engaged Global interest
		Response characteristics	Familiar/routine/ predictable Known solutions to familiar/routine/ predictable problems	Mostly familiar/routine /predicable with some degree of irregularity Known solutions to known but irregular problems	Mostly irregular with some degree of familiarity and predictability Mostly known solutions to irregular and possibly unknown problems	Unfamiliar/unprecedented/ unpredictable Unknown solutions to unknown problems

CONSTRUCT	EXAMPLES of things to be considered
Consequences/Impacts	Health & life, infrastructure, culture, community, treaty obligations, reputation, trade, economy, environment
Resources	Capacity and capability to manage (eg. availability of technical expertise, responders), finances available
Public, political & media interest	Degree of public, political & media interest
Response characteristics	Containment, stability, location, spread, number of entities involved, urgency, novelty, disruption, decisions required, timeframe/expected duration

Incident Classification Levels

CIMS 3rd edition

DRAFT 12/10/18

For more information, please contact
carla.drayton@dpmc.govt.nz or
mike.hill@maritimenz.govt.nz

Summary of current approaches used by agencies

- **'Modes of operation'** - 4 point scale, used by MCDEM to indicate how they need to engage with the response.
- **'Response Levels'** - 4 point scale based on the response levels in CIMS 2nd edition (MBIE, MSD, Corrections)
- **'Types'** – as per NIMS; 5 levels of complexity (FENZ, DOC)?
- **'Minor/Moderate/Major/Severe'** - 4 levels; not based on response levels i.e. not geographic (MPI)
- **'Minor or routine/Significant/Major'** – 3 levels; not based on response levels i.e. not geographic (MNZ)

Scale sizes:

Range from **3** point to **5** point scale

Criteria:

Variable across models

BACKGROUND INFO

Why? We currently have no common language with which to communicate across agencies in relation to the complexity of any of our responses.

Purpose: Incident classification levels provide agencies with a common language with which to communicate in relation to the complexity level of an incident.

How? The level attributed to an incident will provide an indication of the potential consequence and impact, resourcing required, political and media interest and an indication of the response characteristics.

Potential uses would likely include:

- aiding efficient and effective communication between agencies in times of crisis,
- signalling the level of commitment required or potentially required,
- guiding current or potential resourcing,
- gauging the 'stress factor' across the system,
- Analytics: to measure and monitor trends / inform and guide decision making in relation to readiness

METHODOLOGY

As part of the CIMS review, a small sub-working group was set up to work on Incident Classification Levels. This is how we went about our work.

1. Research:

Other examples of incident classification levels were used to inform the work (including AIIMS, NIMS, OPUS consulting – Project Management Classification Levels, BC Oil & Gas Commission, The National Risk Unit (DPMC) risk matrix, existing government agency classification levels, World Health Organisation Emergency Response Framework & risk assessment, St John classification levels).

2. Create:

The group met 4 times and worked, collectively, to develop the model.

3. Testing:

a) Before the model is put forward to the CIMS Steering Group for consideration, it needs to be tested for utility. This audience for testing will be the IMRG. Testing will take place on the 10th October.
b) Following the test with the IMRG, this model will be socialised with the CDEM sector and the new provider of the Controller and Recovery Manager Programme.

4. Next steps: Following testing, the model will be presented to the CIMS Steering Group, along with text, for inclusion in CIMS 3rd edition.

TIMELINE

OCTOBER 10

- Test utility of model with IMRG

OCTOBER 16

CIMS Steering Group

NOVEMBER 14

CIMS Steering Group

- Draft chapter complete for steering group to review
- Testing complete

DECEMBER 6

CIMS Steering Group

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RESPONSE LEVEL		CONSTRUCT	DESCRIPTOR			
NATIONAL LEVEL (N) / REGIONAL LEVEL (R) / LOCAL LEVEL (L)) / INCIDENT LEVEL (I)		Consequences/Impacts	**Minor** (a small number of population in the area are/would be/could be impacted)	**Moderate** (some of population in the area are/would be/could be impacted)	**Major** (many of population in the area are/would be/could be impacted)	**Severe** (majority of population in the area are/would be/could be impacted)
		Resources	Manageable within available resource	Requires some allocation of resource	Resource limits and capacity are full	Resource limits are exceeded
		Public, political & media Interest	Management are engaged Minimal or no interest	Senior Leadership and executives are engaged Some degree of interest	Elected officials and ministers are engaged National interest	Elected officials and ministers are actively engaged Global interest
		Response characteristics	Familiar/routine/ predictable Known solutions to familiar/routine/ predictable problems	Mostly familiar/routine /predicable with some degree of irregularity Known solutions to known but irregular problems	Mostly irregular with some degree of familiarity and predictability Mostly known solutions to irregular and possibly unknown problems	Unfamiliar/unprecedented/ unpredictable Unknown solutions to unknown problems

CONSTRUCT	EXAMPLES of things to be considered
Consequences/Impacts	Health & life, infrastructure, culture, community, treaty obligations, reputation, trade, economy, environment
Resources	Capacity and capability to manage (eg. availability of technical expertise, responders), finances available
Public, political & media interest	Degree of public, political & media interest
Response characteristics	Containment, stability, location, spread, number of entities involved, urgency, novelty, disruption, decisions required, timeframe/expected duration

KEY TO USE & LANGUAGE

PURPOSE	Incident classification levels provide agencies with a common language with which to communicate in relation to the overall complexity level of an incident. The level attributed to an incident will provide an indication of the potential level of impact, resourcing required, political and media interest and an indication of the response characteristics.
USE	Incident classification level determinations are to be made by the controller, or delegated authority, at the highest level of the response. Note that an incident may not fit cleanly into one classification level i.e. an incident may measure at a level 2 in regards to media interest but at level 3 in regards to resourcing. Any overall classification is provided at the discretion of the controller, as based on his or her best judgement at the time of classification. Note that attributed incident classification levels will likely change as the response scales up and down.
LANGUAGE: ***Classification***	An incident will be referred to by the first letter of the response level (see page XXX) at which the controller is operating eg. 'L' for a locally controlled incident, followed by the incident classification level attributed to the response by the controller eg. '2'. Examples: *R2 = An incident that is being controlled from a regional level and has a classification at level 2.* *N3 = An incident that is being controlled from a national level and has a classification level of 3.*
Indicating direction	If an incident currently sits at one level but looks like it might escalate or de-escalate in the near future, indicate this through the use of the term 'trending'. Examples: *'This incident is an N2 trending N3' = This incident, which is controlled at a national level, currently has a classification level of 2 but indications are that it will escalate to a level 3 in the near future.* *'This incident is a L2 trending L1' = This incident, which is controlled at a local level, currently has a classification level of 2 but indications are that it will de-es to a level 1 in the near future.*