National Lifelines Forum

Rockefeller Foundation
100 Resilient Cities

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Christchurch and Rockefeller 100 Resilient Cities

- Christchurch was selected earlier this year as one of the first 33 cities from 372 applications to be part of the global program

- 100 RCs funds a Chief Resilience Officer and contributes funding to development and implementation of a Resilience Strategy

- Initial stakeholder and community group workshop in March 2014

- Chief Resilience Officer appointed – Mike Gillooly (ex CCC Land Drainage Manager)

- AECOM being engaged to provide Resilience Strategy support – opportunity to link closely with Lifelines

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Rockefeller 100 Resilient Cities Program

North America

Los Angeles (CA)   New York City (NY)
El Paso (TX)   Norfolk (VA)
San Francisco (CA   Boulder (CO)
Oakland (CA)   New Orleans (LA)
Alameda (CA   Jacksonville (FL
Berkley (CA)   Mexico City (Mexico)

Europe

Glasgow (UK)   Bristol (UK)
Rome (Italy)   Vejle (DK)
Rotterdam (Netherlands)

Middle East

Ashkelon (Israel)
Ramallah (Palestine)
Byblos (Lebanon)

South Asia
Surat (India)

Southeast Asia

Bangkok (Thailand)
Mandalay (MM)
Da Nang (Vietnam)
Semarang (ID)

Africa

Dakar (SN)
Durban (South Africa)

South America

Medellín (Colombia)
Rio de Janeiro (Brazil)
Porto Alegre (Brazil)
Quito (Ecuador)

Oceania
Melbourne (Australia)
Christchurch (New Zealand)

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Growing urbanization is reshaping the modern world

- Our future is increasingly urban: By 2050, more than 75% of the world will live in urban areas
- Our future is increasingly interconnected: What happens in cities impacts everyone else, everywhere

The resilience of cities is essential to our global vitality

- Cities must be able to prepare for, adapt to, and quickly rebound from shocks and stresses

100 Resilient Cities was pioneered by the Rockefeller Foundation to catalyze city resilience by:

- Working closely with 100 member cities from around the world
- Partnering with local government, civil society, and private stakeholders,
- Helping member cities to develop and implement resilience strategies,
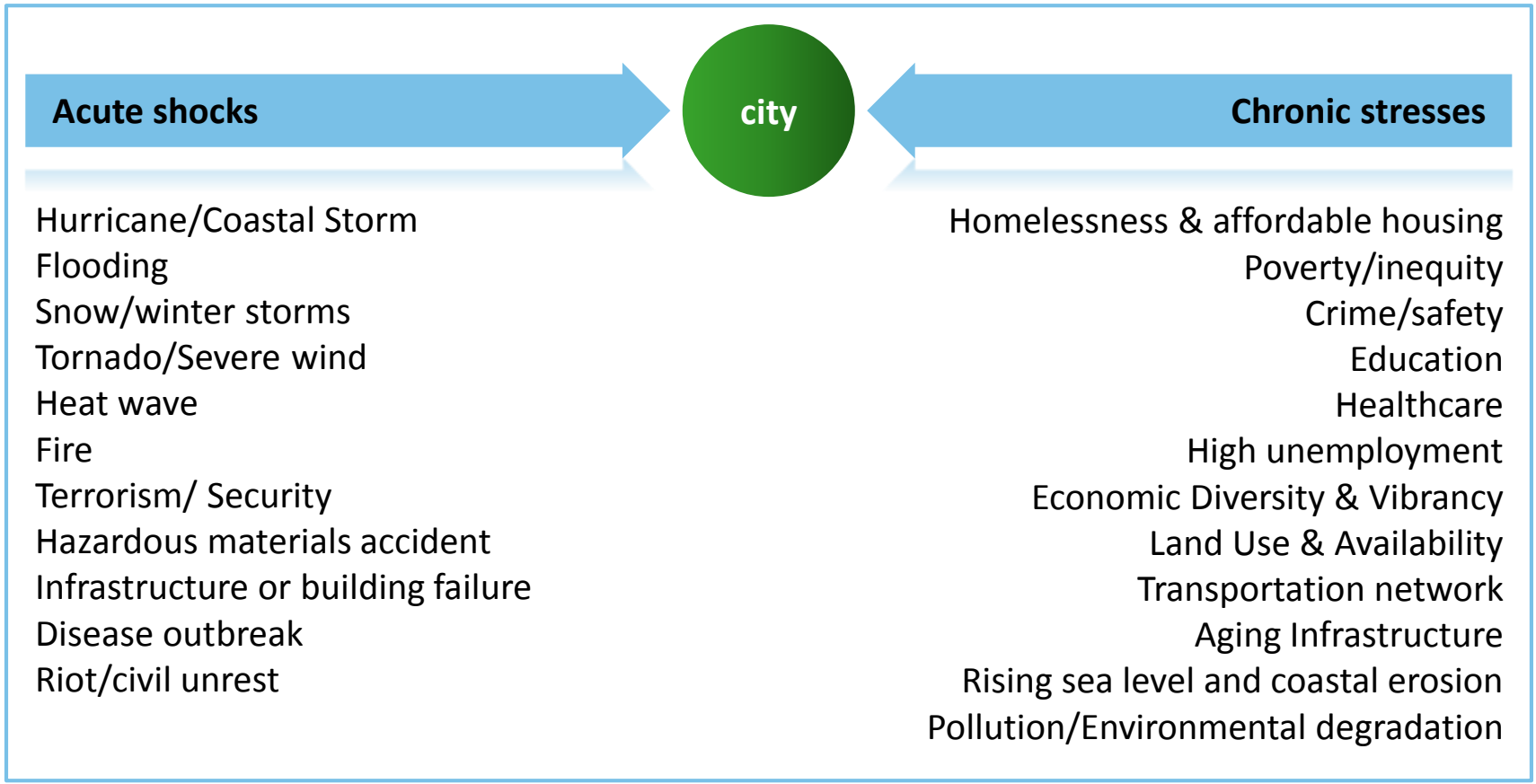- Elevating the understanding and significance of resilience

Resilience

The ability of a **city** to **maintain essential functions** and to **evolve and emerge stronger** in the face of **acute shocks** and **chronic stresses**.

A city's ability to maintain essential functions is threatened by both acute shocks and chronic stresses

Acute shocks → city ← **Chronic stresses**

Acute shocks	Chronic stresses
Hurricane/Coastal Storm	Homelessness & affordable housing
Flooding	Poverty/inequity
Snow/winter storms	Crime/safety
Tornado/Severe wind	Education
Heat wave	Healthcare
Fire	High unemployment
Terrorism/ Security	Economic Diversity & Vibrancy
Hazardous materials accident	Land Use & Availability
Infrastructure or building failure	Transportation network
Disease outbreak	Aging Infrastructure
Riot/civil unrest	Rising sea level and coastal erosion
	Pollution/Environmental degradation

Resilient cities perform essential functions well

Qualities associated with urban resilience

Accepting of uncertainty and change

Expects a wide range of unpredictable outcomes

Reflective

Learns from past experiences

Adaptive

Changes based on new evidence

Robust

Is organized & transparently managed

Resourceful

Develops efficient and redundant systems

Diverse

Maintains flexibility with varying options across systems

Inclusive

Covers wide range of people and places

Integrated

Collaborates effectively across systems

100RC's Strategy development process in a nutshell

- The **resilience strategy process** is one of 100RC's primary engagements with member cities.

- It was designed in conjunction with **global experts** and draws from many of the best practices in our member cities.

- It uses the **City Resilience Framework** to diagnose and understand the City's resilience and its primary areas of strength and weakness.

- The resilience strategy process is designed to empower stakeholders, raise awareness and build **support for a resilience agenda**.
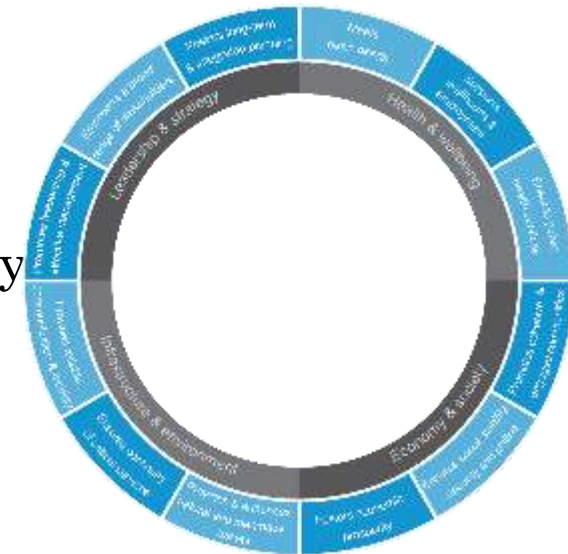
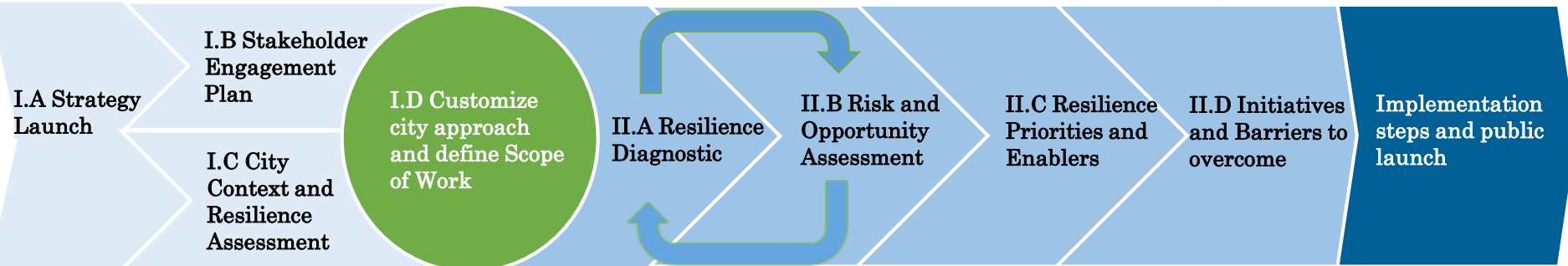# The Strategy building process and 100RC resources

100 RESILIENT CITIES

100RC supports:
Stakeholder Engagement and Community Participation
Strategy Communication and Awareness Building

**Phase I: 10-12 weeks**
Establishing the foundation

Phase II: 14-18 weeks
Strategy development

Phase III: Ongoing Execution and Iteration

I.A Strategy Launch

I.B Stakeholder Engagement Plan

I.C City Context and Resilience Assessment

I.D Customize city approach and define Scope of Work

II.A Resilience Diagnostic

II.B Risk and Opportunity Assessment

II.C Resilience Priorities and Enablers

II.D Initiatives and Barriers to overcome

Implementation steps and public launch

100RC provides:
Technical Assistance and Capacity Building from Platform
Knowledge Sharing and Training through Network

NZTA State Highways Resilience Framework Research Project
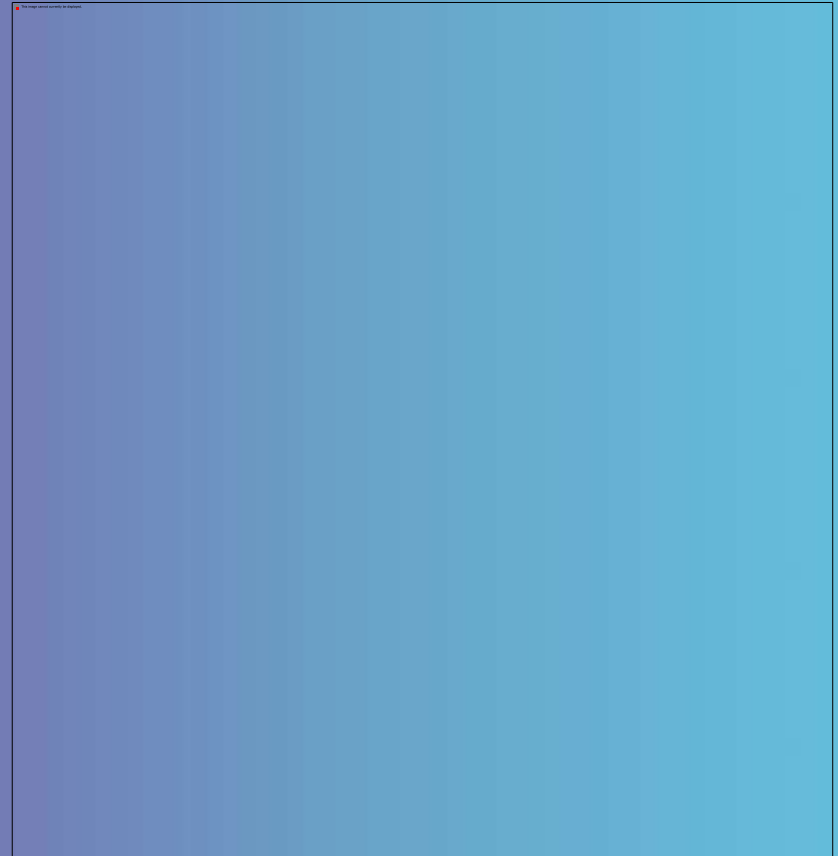
NZTA Resilience Framework – Dimensions & Principles

Technical	Robustness
	Redundancy
	Safe-to-fail
Organisational	Change Readiness
	Networks
	Leadership and culture

Source: NZTA Research Report TAR 12/07

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NZTA Resilience Framework – Dimensions & Principles

Dimension	Principle	Definition
Technical	Robustness	Strength, or the ability of elements, systems, and other units of analysis, to withstand a given level of stress or demand without suffering degradation or loss of function
	Redundancy	The extent to which elements, systems, or other infrastructure units exist that are substitutable, i.e., capable of satisfying functional requirements in the event of disruption, degradation, or loss of functionality
	Safe-to-fail	The extent to which innovative design approaches are developed, allowing (where relevant) controlled failure during unpredicted conditions, and where hazard identification is limited. This may involve new approaches to design, to complement traditional, incremental risk-based design.

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NZTA Resilience Framework – Dimensions & Principles

Dimension	Principle	Definition
Organisational	Change Readiness	The ability to **sense** and **anticipate** hazards, identify problems and failures, and to develop a forewarning of disruption threats and their effects through sourcing a diversity of views, increasing alertness, and understanding social vulnerability. Also involves the ability to **adapt** (either via redesign or planning) and **learn** from the success or failure of previous adaptive strategies. The capacity to mobilize resources when conditions exist that threaten to disrupt some element, system, or other unit of analysis; resourcefulness can be further conceptualized as consisting of the ability to apply material (i.e., monetary, physical, technological, and informational) and human resources to meet established priorities and achieve goals.
	Networks	The ability to establish relationships, mutual aid arrangements and regulatory partnerships, understand community interconnectedness and vulnerabilities across all aspects of supply chains and distribution networks, and; promotes open communication and mitigation of internal / external silos.
	Leadership and culture	The ability to develop an organisational mind-set/culture of enthusiasm for challenges, agility, flexibility, adaptive capacity, innovation and taking opportunity.

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NZTA Resilience Framework – Desired Level of Resilience determined by Criticality or Risk

Figure 7.1 All- Hazards: Criticality and resilience assessment

Figure 7.2 Hazard specific: Detailed risk assessment and resilience assessment

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NZTA Resilience Framework – Desired Level of Resilience determined by Criticality or Risk

Table 7.1 Example translation of criticality score to 'Desired' level of resilience

Criticality Score	Desired level of Resilience
Highly critical	Very High (4)
Medium	High (3)
Low	Moderate (2)
Not critical	Low (1)

All hazards criticality and resilience view

Table 7.2 Example translation of risk score to 'Desired' level of resilience

Risk Score (NZTA tool)	Desired level of Resilience
4 (Extreme)	Very High (4)
3 (High)	High (3)
2 (Moderate)	Moderate (2)
1 (Low)	Low (1)

Hazard specific risk based resilience view – more detailed

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NZTA Resilience Framework – Measuring Resilience

Principle	Measurement category	Description
Robustness (NIP Attributes: Service delivery, adaptation, Interdependencies)	Structural	Physical measures relating to asset/network design, maintenance and renewal
	Non-structural	Non-physical measures relating to existence, suitability and application of design codes, guidelines
	Interdependencies	This relates to upstream dependencies and their relative robustness in both a structural and non-structural sense
Redundancy (NIP Attribute: Adaptation, Interdependencies)	Structural	Physical measures relating to network redundancy, alternate routes and modes and backup supplies/resources
	Non-structural	Non-physical measures relating to existence of diversion and communication plans
	Interdependencies	This relates to upstream dependencies and their relative redundancy in both a structural and non-structural sense
Safe-to-fail	Structural	The extent to which innovative design approaches are developed, allowing (where relevant) controlled failure during unpredicted conditions, and where hazard identification is limited. This may involve new approaches to design, to complement traditional, incremental risk-based design.

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NZTA Resilience Framework – Measuring Resilience

	Communication and warning	This relates to the existence and effectiveness of communication and warning systems
Change readiness (NIP Attributes: Community preparedness, Responsibility, Interdependencies, Financial strength, Organisational performance)	Information and technology	This relates to the use of technology to monitor events, communicate, share data, assess resilience etc.
	Insurance	This relates to the adequacy of insurances for hazard events.
	Internal resources	The management and mobilization of the organization's resources to ensure its ability to operate during business-as-usual, as well as being able to provide the extra capacity required during a crisis. Also relates to ensuring roles and responsibilities of all internal stakeholders are clear and that coordination is effective.
	Planning strategies	The development and evaluation of plans and strategies to manage vulnerabilities in relation to the business environment and its stakeholders.
	Clear recovery priorities	An organization wide awareness of what the organization's priorities would be following a crisis, clearly defined at the organization level, as well as an understanding of the organization's minimum operating requirements.
	Proactive posture	A strategic and behavioural readiness to respond to early warning signals of change in the organization's internal and external environment before they escalate into crisis.
	Drills and response exercises	The participation of staff in simulations or scenarios designed to practice response arrangements and validate plans.
	Funding	Extent to which funding is available for all elements of resilience planning including technical and organisational.
	Adaptation	Constant vigilance and situation awareness (see below) allows adaptation strategies to be developed. These may be procedural / planning focused / organizational / or technical (increased robustness, redundancy, innovative design (redesign), or designing for 'safe-to-fail' modes).
	Learning	Past actions and adaptation strategies are observed and evaluated in terms of their success in mitigating hazards. Appropriateness of actions can be assessed and iterations and changes made.

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NZTA Resilience Framework – Measuring Resilience

Principle	Measurement category	Description
Networks (NIP Attributes: Interdependencies)	Breaking silos	Minimization of divisive social, cultural, and behavioral barriers, which are most often manifested as communication barriers creating disjointed, disconnected, and detrimental ways of working.
	Leveraging knowledge (internal and external)	Critical information is stored in a number of formats and locations and staff have access to expert opinions when needed. Roles are shared and staff are trained so that someone will always be able to fill key roles.
	Effective partnerships (external)	An understanding of the relationships and resources the organization might need to access from other organizations during a crisis, and planning and management to ensure this access. Also relates to clear coordination and understanding and between organisations, and that all roles and responsibilities are identified.
Leadership and culture (NIP Attributes: Organisational performance)	Situation awareness (sensing and anticipation)	Staff are encouraged to be vigilant about the organization, its performance and potential problems. Staff are rewarded for sharing good and bad news about the organization. Early warning signals are quickly reported to organizational leaders. Newly incorporated knowledge gained from vigilance is used to foresee/anticipate crises. This can be used to develop adaptation strategies.
	Leadership	Strong crisis leadership to provide good management and decision making during times of crisis, as well as continuous evaluation of strategies and work programs against organizational goals.
	Staff engagement and involvement	The engagement and involvement of staff who understand the link between their own work, the organization's resilience, and its long-term success. Staff are empowered and use their skills to solve problems.
	Decision making authority	Staff have the appropriate authority to make decisions related to their work and authority is clearly delegated to enable a crisis response. Highly skilled staff are involved, or are able to make, decisions where their specific knowledge adds significant value, or where their involvement will aid implementation.
	Innovation and creativity	Staff are encouraged and rewarded for using their knowledge in novel ways to solve new and existing problems and for utilizing innovative and creative approaches to developing solutions.

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NZTA Resilience Framework – Measuring Resilience

ROBUSTNESS				Weighted Robustness Score	3

Category	Measure	Measurement	Measurement Scale	Individual Score	Category average	Weighting (%)	Weighted Score
Structural	Maintenance	Processes exist to maintain critical infrastructure and ensure integrity and operability - as per asset management plans (e.g. – roads maintatined, flood banks maintained, stormwater systems are not blocked)	4 – Audited annual inspection process and corrective maintenance completed when required. 3 – Non-audited annual inspection process and corrective maintenance completed when required. 2 – Ad hoc inspections or corrective maintenance completed, but with delays/backlog. 1– No inspections or corrective maintenance not completed.	3	2.1	33.33%	71.4
	Renewal	Evidence that planning for asset renewal and upgrades to improve resilience into system networks exist and are implemented.	4 – Renewal and upgrade plans exist and are reviewed, updated and implemented. 3 – Renewal and upgrade plans exist, however no evidence that they are followed. 2 – No plan exists and an adhoc approach is undertaken 1– No plan exists and no proactive renewal or upgrades of assets.	2			
	Design	Percentage of assets that are at or below current codes	4 – 80%+ are at or above current codes 3 – 50-80% are at or above current codes 2 - 20-50% are at or above current codes 1 - nearly all are below current codes	1			
		Percentage of assets that are in zones/areas known to have exposure to hazards	4 – <20% have some exposure to known hazarrds 3 – 20-50% are highly exposed, or >50% are moderately exposed 2 - 50-80% are highly exposed 1 - 80%+ are highly exposed to a hazard	2			
		Percentage of critical assets with additional capacity over and above normal demand capacity	4 – 80%+ of critical assets have >50% spare capacity available 3 – 50-80% of critical assets have >50% spare capacity 2 - 20-50% of critical assets have >50% spare capacity 1 - 0-20% have spare capacity	3			

NZTA Resilience Framework – Measuring Resilience

Summary Dashboard for Resilience Scores

Focus	Dimension	Principle	Category	Category Score — Average Score	Weighting	Weighted score	Principle	Principle Score — Average Score	Weighting	Weighted score	Dimensions	Dimension Score — Average Score	Weighting	Weighted score	Total Event Score
Pre Event	2A. Technical Resilience	Robustness	Structural	2.8	33%	92	Robustness	2.2	33%	74	Technical Resilience	2.1	50%	103	2.3
			Non Structural	2.0	33%	66									
			Interdependencies	2.0	33%	66									
		Redundancy	Structural	2.0	33%	67	Redundancy	2.0	33%	66					
			Non Structural	2.0	33%	67									
			Interdependencies	2.0	33%	67									
		Safe to fail	Structural	2.0	100%	200	Safe to fail	2.0	33%	66					
	2B. Organisational Resilience	Change readiness	Communication and warning	1.5	9%	14	Change readiness	2.7	33%	90	Organisational Resilience	2.6	50%	128	
			Information and technology	2.0	9%	18									
			Insurance	3.0	9%	27									
			Internal resources	2.3	9%	21									
			Planning strategies	2.1	9%	20									
			Clear recovery priorities	2.5	9%	23									
			Proactive posture	2.0	9%	18									
			exercises	3.2	9%	29									
			Funding	1.7	9%	15									
			Situation awareness (sensing and anticipation)	1.5	9%	14									
			Learning	2.5	9%	23									
		Networks	Breaking silos	3.0	33%	100	Networks	2.2	33%	73					
			Leveraging knowledge (internal and external)	1.5	33%	50									
			Effective partnerships (external)	2.1	33%	70									
		Leadership & culture	Leadership	3.0	25%	75	Leadership & culture	2.8	33%	92					
			Staff engagement and involvement	3.0	25%	75									
			Decision making authority	3.0	25%	75									
			Innovation and creativity	2.0	25%	50									

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