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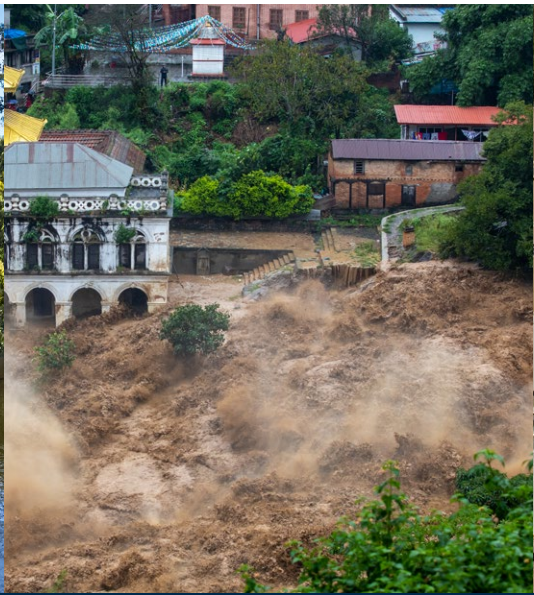
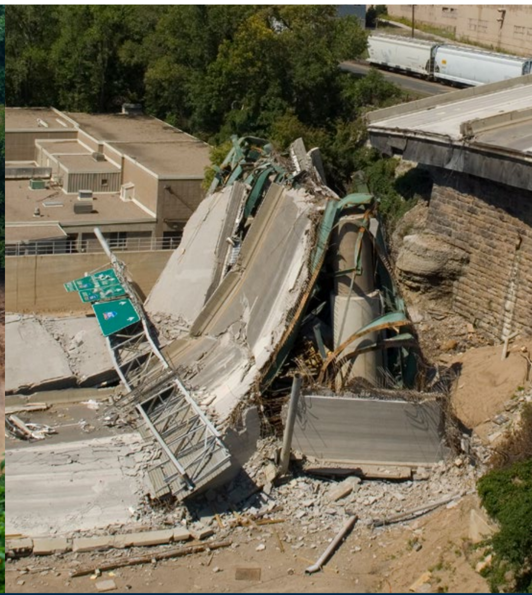
IFME MEMBER GUIDEBOOK

DISASTER RECOVERY MANAGEMENT GUIDEBOOK

A Practitioner's Guide for Municipal Engineers





This Guidebook Covers:

- The Four Phases of Disaster Recovery Management
- Climate Change & Increasing Disaster Risk
- Internal Protocols & Organisational Structures
- Engineering Assessment, Triage & Build Back Better
- Community & Stakeholder Engagement

Case Studies: Australia, Japan, USA, Netherlands, New Zealand, South Africa

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ABOUT THIS GUIDEBOOK

A Practitioner's Guide for Municipal Engineers

The world's cities, towns, and municipalities are being asked to do something that no previous generation of municipal engineers has faced: manage the compounding consequences of a rapidly destabilising climate while maintaining the full range of infrastructure services that communities depend on, every single day. Floods, cyclones, wildfires, earthquakes, and extreme heat events are no longer aberrations on the margins of infrastructure planning. They are central to it.

This guidebook is written for the municipal engineer who is closest to that reality, the practitioner who inspects the collapsed culvert at 2am, who chairs the emergency procurement meeting on Day 3, who must explain to a grieving community why their street flooded again, and who ultimately carries professional responsibility for the decisions that determine how quickly and how well a community recovers from disaster.

The guidebook will outline key areas of focus around the changing disaster landscape; a structure organizational framework to handle an event; a protocol for assessment and documentation standards; and to effectively work with the community and other key stakeholders.

It is produced under the auspices of the International Federation of Municipal Engineering (IFME), established in 1960 and representing municipal engineering professional bodies across the world, drawing on the practitioner knowledge, practice guidance, and field experience. The international case studies, technical frameworks, and operational checklists in these pages reflect real events, real decisions, and real consequences drawn from the experience of IFME member practitioners across six continents.

WHO THIS GUIDEBOOK IS FOR

This guidebook is written primarily for:

- Municipal engineers and directors of engineering/infrastructure services
- Infrastructure asset managers and public works officers
- Emergency management coordinators within municipal and local government
- Chief Executive Officers and senior managers of municipal councils
- Any IFME member organisation practitioner whose work intersects with disaster risk, recovery, or resilience

What this guidebook covers

The guidebook is structured as four sequential but interconnected sections, each addressing a distinct phase or dimension of disaster recovery management as experienced by the municipal engineer in the field:

Section 1

The Changing Disaster Landscape

Why municipal engineers are at the centre of the disaster recovery challenge. Climate change projections and their infrastructure implications. The structural gap between municipal responsibility and resource capacity. Illustrated by the 2022 Queensland floods and the 2022 KwaZulu-Natal flood disaster.

Section 2

The Four-Phase Framework and Organisational Structure

The international disaster management cycle applied to municipal practice. Building internal command and coordination structures. Pre-designated recovery roles. The critical 72-hour stabilisation protocol. Case studies from Christchurch (Canterbury earthquake sequence) and Cyclone Gabrielle in New Zealand.

Section 3

The Municipal Engineer in Disaster Recovery

Rapid damage assessment protocols and documentation standards. Engineering triage and infrastructure restoration priority. Build-back-better principles and IPWEA's Practice Note 12.2. Emergency procurement controls and contractor management. Case studies from the 2011 Tohoku earthquake (Japan), Room for the River (Netherlands), and Hurricane Katrina (USA).

Section 4

External Engagement, Community Recovery, and Long-Term Resilience

Community engagement principles and cultural competency. Navigating state and federal funding frameworks (DRFA — Disaster Recovery Funding Arrangements, MFMA — Municipalities/municipal funding framework, FEMA PA — FEMA Public Assistance). The Seven Pillars of Municipal Resilience. After-Action Review frameworks. Long-term resilience transformation, including Hurricane Harvey (USA) and the Kobe City 20-year resilience model (Japan).

How to use this guidebook

This guidebook is designed to be used in two modes. In the preparedness phase, before a disaster it should be read in full as a structured professional development resource, ideally as part of a council's emergency management training program. Specific checklists, tables, and callout boxes can be extracted and incorporated into council emergency plans and standard operating procedures.

In the response and recovery phase, during or immediately after a disaster, The Section headings, callout boxes, and tables are designed to be navigated quickly for specific operational guidance. The 72-hour stabilisation protocol (Section 2), the engineering documentation non-negotiables (Section 3), and the emergency procurement controls (Section 3) are specifically formatted for use under time pressure.

Municipal engineers are encouraged to annotate this guidebook with jurisdiction-specific detail, local funding stream contacts, pre-negotiated contractor panels, mutual aid partner councils, and asset register references, so that it functions as a living operational document rather than a static reference.

Section 1:
The Changing Disaster Landscape — Why Municipal Engineers Matter

Disasters are no longer exceptional events to be managed episodically. For local government practitioners around the world, they represent a compounding, accelerating reality shaped by a destabilising climate, ageing infrastructure, rapid urbanisation, and communities with deeply uneven capacities to absorb and recover from shocks. This guidebook is written for the practitioner on the ground, the municipal engineer, the emergency management coordinator, the infrastructure asset manager, the council CEO, who must translate policy and doctrine into decisions made in real time, often with inadequate resources, under significant public pressure, and with lives and livelihoods at stake.

The International Federation of Municipal Engineering (IFME), established in 1960, provides the global professional framework within which this guidebook sits. IFME connects practitioners, knowledge, and best practice across the world's municipal engineering community. The guidance in this document draws directly on IPWEA's Practice Note series and Climate Resilient Infrastructure Assets programme, IMESA's stormwater and flood management advocacy, and the international case study evidence that IFME member bodies contribute to the global exchange of practitioner knowledge.

1.1 The IPWEA Framework: Asset Management as the Foundation for Resilience

IPWEA's National Asset Management Strategy (NAMS) framework, widely adopted across Australian and New Zealand local councils, provides the strategic context within which pre-disaster preparedness, post-disaster assessment, and recovery investment decisions are made. Its Practice Note series has direct operational relevance:

Practice Note 12.1: Climate Change Impacts on the Useful Life of Infrastructure (2018) provides a methodology for asset managers to assess how climate change affects infrastructure lifespan, offering councils a structured basis for adjusting renewal cycles, maintenance budgets, and design standards ahead of disaster events. Practice Note 12.2: Climate Resilient Materials for Infrastructure Assets (2021), developed with Northern Beaches Council, Dubbo Regional Council, the University of Sydney, and UTS, gives engineers the materials guidance needed to make build-back-better decisions under reconstruction time pressure. Practice Note 15 extends resilience thinking to nature-based assets including urban forests, bioswales, and water-sensitive urban design. Collectively, these practice notes form a decision framework that every IFME member practitioner should have available at the point of disaster recovery mobilisation.

PRACTITIONER GUIDANCE

IPWEA

IPWEA Climate Resilient Infrastructure Assets Programme — Key Practitioner Outputs

The Second Australian National Action Plan (National Disaster Risk Reduction Framework) notes that since 2013, 496 (92%) of Australian Local Government Areas have been impacted by disasters at a total economy cost of $38 billion.

IPWEA's Climate Resilient Infrastructure Assets programme delivers: (1) nationally relevant industry best practice guidelines; (2) an online CPD course for asset managers, engineers, planners, and designers; and (3) supporting resources to reduce climate change risks to infrastructure and enhance asset resilience.

IPWEA's Director of Sustainability: 'Climate change is altering not only the weather systems we experience but will result in secondary hazards including coastal erosion, riverine flooding, green infrastructure collapse, and landslides.'

Practice Note 15 (Green Infrastructure Asset Management) equips practitioners to integrate nature-based assets into asset management plans — street trees, green roofs, urban forests, community gardens, WSUD assets and hybrid reefs — as cost-effective, climate-resilient infrastructure complements to hard engineering.

Reference: IPWEA (2018) PN 12.1; IPWEA (2021) PN 12.2; IPWEA (2024) Climate Resilient Infrastructure Assets Programme; IPWEA (2025) PN 15.

1.2 The IMESA Framework: Municipal Engineering in a Resource-Constrained Context

IMESA's context differs significantly from the Australian and New Zealand setting, and those differences are instructive for any IFME practitioner working in a resource-constrained environment. South African municipalities operate under the Municipal Finance Management Act (MFMA) and the Disaster Management Act (57 of 2002), with many facing compound challenges: ageing and poorly maintained infrastructure, rapid informal urbanisation, limited technical staff capacity, and budget constraints that make proactive resilience investment extremely difficult.

IMESA, working with the Water Research Commission (WRC), has produced best practice guidelines for flood estimation and stormwater design that directly address the conditions facing municipal engineers in the field. Its IMIESA journal is the primary practitioner knowledge platform for municipal engineering across Southern Africa. IMESA's 2025 position is explicit: rising flood risk in South African cities is the product of climate change intersecting with decades of deferred infrastructure maintenance, rapid urbanisation into floodplains, illegal dumping into stormwater systems, and the removal of drainage components.

PRACTITIONER GUIDANCE

IMESA

IMESA Position on Urban Flooding and Municipal Engineering Capacity — 2025

IMESA and the Water Research Commission (WRC) released joint guidelines addressing flood estimation and stormwater management best practice for South African municipalities (TT 921): design flood estimation, stormwater drainage design, and urban catchment management.

IMESA's 2025 advisory: 'In many areas, culverts overflowed, roads collapsed, and informal settlements bore the brunt of the damage. Cities like Johannesburg, Durban and Tshwane have all experienced recurring flood events. As weather patterns become more unpredictable and rainfall intensity increases, these events are likely to become more frequent and severe.'

The institute identifies a dual challenge: (1) most municipalities lack the budget and staffing to proactively inspect and clean piped stormwater systems; and (2) illegal dumping into drains and removal of manhole covers compounds failure during storm events.

IMESA advocates for: proactive stormwater inspection and maintenance programmes; community education; climate change projection integration into urban drainage design; and dedicated disaster recovery technical capacity within municipal engineering departments.

Reference: IMESA/WRC (2023) TT 921; IMESA (2025) Advisory on Urban Flooding; IMIESA Journal (2024–2025 editions).

1.3 Climate Change and the Escalating Frequency of Disaster

The IPCC Sixth Assessment Report (AR6, 2022) is unambiguous: the frequency and intensity of extreme weather events will continue to increase under all emissions scenarios for at least the next two to three decades. IPWEA confirms this for the Australian context: 92% of Australian LGAs have been impacted by disasters since 2013 at a cost of $38 billion. Globally, natural disaster losses exceeded USD 280 billion in 2023 (Munich Re, 2024). The World Economic Forum's 2024 Global Risks Report identified extreme weather events as 'the top risk most likely to present a material crisis on a global scale.'

Key Climate Projections for Local Government Planning (IPCC AR6, 2022)
Extreme rainfall: 7% increase in intensity per 1°C of warming (Clausius-Clapeyron scaling)
Coastal flooding: Sea level rise of 0.3–1.0m by 2100 under intermediate scenarios
Heatwaves: Frequency doubling under 1.5°C warming; tripling under 2°C warming
Compound events: Increased probability of concurrent flood, heatwave, and drought
Tropical cyclone intensity: Increasing proportion of Category 4–5 systems globally
Wildfire weather: Significant fire weather season extension across Southern Europe, Australia, and Western USA

CASE STUDY
Australia

2022 South-East Queensland and Northern Rivers Floods — The Local Government Capacity Gap

The February–March 2022 flood event caused over AUD 6.9 billion in insured losses. Lismore City Council faced destruction of over 3,000 homes, with a rate base simply incapable of funding recovery.

IPWEA's subsequent advocacy drew directly on this experience, highlighting to federal and state governments the structural underfunding of local government infrastructure resilience. The NAMS framework gaps were stark: pre-existing asset condition data was critically inadequate for rapid damage assessment.

Key lessons: (1) current NAMS-aligned asset registers are essential for RDA; (2) mutual aid arrangements between councils had not been formally activated in decades; (3) community-led recovery groups filled critical gaps that formal government could not.

Reference: Northern Rivers Reconstruction Corporation (2022); QRA After-Action Review (2023); IPWEA (2023) Infrastructure Resilience Advocacy Brief.

CASE STUDY
South Africa

2022 KwaZulu-Natal Floods — Structural Vulnerability and Municipal Engineering Failure

Between 8–21 April 2022, record-breaking rainfall inundated KwaZulu-Natal, causing 436 deaths and infrastructure damage of approximately R17–25 billion.

In the South Durban Basin alone (an Economic Hub of local and National importance) the total infrastructure and business loss was estimated to be R75 billion (4.1 billion USD) (Dutch Disaster Risk Reduction & Surge Support (DRRS) Program Report – 1 October 2024).

A national state of disaster was declared.

eThekwini (Durban) saw 80% of its drinking water network go out of order; major bridges collapsed; and over 600 schools were disrupted. IMESA's analysis identified that the scale of failure was compounded by years of deferred stormwater maintenance, informal settlement encroachment into floodplains, and absent floodline strategies for major catchments.

The event demonstrated that in resource-constrained municipal environments, disaster recovery capacity must be built into normal operations. IMESA subsequently intensified its advocacy for dedicated stormwater maintenance budgets and the joint IMESA/WRC flood estimation guidelines.

Reference: IFRC Emergency Appeal MDRZA012 (2022); IMESA Advisory (2025); Raphela & Matsididi (2025), Frontiers in Water.

1.4 The Local Government Role: Responsibility Without Commensurate Capacity

In most national frameworks, whether Australia's Disaster Recovery Funding Arrangements, South Africa's Disaster Management Act, or New Zealand's Civil Defence Emergency Management Act 2002 Act, local government sits nominally as a subordinate tier. Yet operationally, it is almost always the first responder, the primary infrastructure owner, the community recovery coordinator, and the last organisation standing when state and national agencies withdraw following the acute phase.

Function	Typical Resource Gap at Local Government Level
Road & Bridge Clearance and Restoration	Heavy plant deployment, damage assessment expertise, contractor availability; IPWEA National Asset Management Strategy (NAMS) data rarely comprehensive enough for rapid RDA
Drainage & Flood Infrastructure Restoration	Hydrological modelling capability, updated IFD data, IMESA/WRC flood estimation guidelines application
Community Recovery Centres	Staffing surge capacity, psychological first aid, interpreter services
Waste & Debris Management	Landfill capacity, hazardous material handling, volume surge
Building Damage Assessment	Qualified building inspectors; post-disaster accreditation schemes vary by jurisdiction
Emergency Procurement	Delegated authority frameworks, contract management systems, fraud controls
Financial Assistance Coordination	Grant administration, DRFA/MFMA/CDEM claim documentation expertise
Asset Condition Documentation	Pre-disaster condition records; IPWEA NAMS-aligned asset registers critical for claim evidence

Table 1: Functional responsibilities and common resource gaps for local government practitioners

Section 2:
Disaster Recovery Management — The Four-Phase Framework

The internationally accepted disaster management framework, grounded in the Sendai Framework 2015–2030 and UNDRR Terminology (2017), recognises four interconnected phases: Mitigation/Prevention, Preparedness, Response, and Recovery. Both IPWEA and IMESA explicitly align their technical guidance with this cycle through their membership of IFME, embedding it within asset management and infrastructure planning practice across Australasia and Southern Africa.

The Disaster Management Cycle — IFME Practitioner Summary
MITIGATION / PREVENTION: Reducing likelihood or consequences of a disaster. Includes land use planning, infrastructure design standards, building codes, vegetation management, flood levee construction, stormwater system maintenance (IMESA), and climate-adjusted asset lifecycle planning (IPWEA PN 12.1/12.2).
PREPAREDNESS: Building capability to respond effectively. Includes emergency management plans, mutual aid agreements, exercises, early warning systems, pre-positioned resources, and current asset registers (IPWEA NAMS / IMESA IAMP).
RESPONSE: Actions taken immediately before, during, and after a disaster to save lives, protect property, and stabilise the situation. Includes evacuation, search and rescue, emergency engineering works, and damage containment.
RECOVERY: Restoring and improving community wellbeing, infrastructure, and the environment. Short-term (weeks): essential services. Medium-term (months): infrastructure repair. Long-term (years): build-back-better and resilience investment aligned with IFME/Sendai Framework principles.

2.1 Building the Internal Disaster Management Structure

The single most important determinant of local government disaster recovery performance is not the plan on the shelf, it is the clarity of the internal command, coordination, and communication structure that activates when a disaster occurs.

Pre-Designated Recovery Roles

Role	Core Responsibilities
Local Recovery Coordinator (LRC)	Chairs the Local Recovery Committee; interfaces with state agencies; oversees the overall recovery programme; manages political relationships; authorises significant expenditure
Infrastructure Recovery Manager	Leads assessment and restoration of roads, bridges, drainage, water, wastewater, and community buildings; manages engineering contractors; applies IPWEA NAMS / IMESA IAMP asset data
Community Recovery Officer	Activates and manages community recovery centres; coordinates human services; manages volunteer organisations; interfaces with NGOs and community sector
Financial Recovery Coordinator	Manages disaster recovery funding claims (DRFA/MFMA/FEMA PA); establishes emergency procurement authorities; tracks all recovery expenditure
Communications & Media Coordinator	Manages all public communications; coordinates with state public affairs; manages social media; prepares briefings for elected members
Logistics & Resource Manager	Coordinates plant, equipment, personnel, and consumables; manages mutual aid requests; tracks resource deployment

Table 2: Pre-designated recovery roles for local government practitioners

CASE STUDY

New Zealand

Christchurch City Council — Organisational Recovery After the 2010–2011 Canterbury Earthquake Sequence

The September 2010 (M7.1) and February 2011 (M6.3) earthquakes caused 185 deaths, destroyed over 10,000 buildings, and generated a recovery cost exceeding NZD 40 billion.

Christchurch City Council established a clear IMS structure within the first 72 hours, with a dedicated Recovery Office reporting directly to the CEO.

The ring-fenced recovery entities (CCDU; Otakaro/Avon River Corridor) with dedicated authority and skilled personnel outside normal council structures is a model directly relevant to any council facing a large-scale, multi-year recovery.

Key lesson: Normal council organisational structures are not designed for disaster recovery. A parallel recovery structure must be planned for in advance.

Reference: Canterbury Earthquakes Royal Commission (2012); Christchurch City Council Recovery Strategy (2012–2017)

2.2 The First 72 Hours: Stabilisation and Rapid Assessment

The asset register is the recovery's most critical document. Councils with current NAMS-aligned asset registers deploy inspection teams systematically, prioritise by asset criticality, and generate documentation that meets DRFA funding requirements from the outset. IMESA makes the equivalent point for South African municipalities: Infrastructure Asset Management Plans (IAMPs) prepared to National Treasury standards before a disaster are the single most important pre-investment a municipal engineer can make.

Time Window	Priority Actions	Lead Role
0–6 hours	Activate IMS; establish EOC; initial damage assessment via remote sensing and field teams; immediate life safety works; public communications within 2 hours	CEO / Emergency Management Coordinator
6–24 hours	Systematic infrastructure damage assessment (NAMS/IAMP data); road network triage; community welfare centres open; mutual aid activation	Infrastructure Recovery Manager / LRC
24–48 hours	Critical infrastructure assessment complete; prioritised restoration schedule published; financial delegation authorities confirmed; state liaison established	Infrastructure Recovery Manager / Financial Coordinator
48–72 hours	First public recovery briefing; restoration programme communicated; DRFA/ MFMA/CDEM funding applications initiated; elected member briefing	LRC / CEO / Communications Coordinator

Table 3: 72-hour stabilisation and assessment protocol for local government practitioners

CASE STUDY

New Zealand

Cyclone Gabrielle (2023) — Local Government Infrastructure Response

Cyclone Gabrielle struck New Zealand's North Island in February 2023, causing 11 deaths and NZD 9–14.5 billion in damage, the second-costliest natural disaster in New Zealand's recorded history. Infrastructure damage to central and local government assets alone was estimated at NZD 5–7.5 billion.

Auckland Transport recorded data from over 2,000 landslides post-Gabrielle, developing a Landslide Framework evaluating 30 parameters across its road network using machine learning.

Multiple affected councils, Hawke's Bay, Tairāwhiti, and Tararua, faced near-simultaneous recovery and mandatory Long-Term Plan (LTP) obligations. Councils with current asset management plans were significantly better positioned to model recovery costs.

Reference: IPWEA (2023) Cyclone Gabrielle: What Can NZ Teach and Learn; NZ Treasury (2023); Wairarapa AAR (2023); Auckland Transport Landslide Framework (2023).

Section 3:
The Municipal Engineer in Disaster Recovery

The municipal engineer occupies a unique and demanding position in disaster recovery. They are simultaneously technical expert, project manager, procurement authority, community liaison, and regulatory decision-maker.

3.1 Rapid Damage Assessment — Engineering Protocols

Rapid damage assessment (RDA) is the systematic process of inspecting and categorising infrastructure damage immediately after a disaster. The quality of post-disaster damage assessment is directly proportional to the quality of the pre-disaster asset register. Engineers and asset managers who have maintained current, spatially referenced condition data can deploy inspection teams by asset criticality, generate reliable repair cost estimates, and produce the funding documentation needed from the outset.

Engineering Assessment: Documentation
1. Record ALL assessments in real time using a standardised mobile form (GIS-enabled; linked to NAMS/IAMP asset register where available)
2. Photograph all damage with GPS-tagged images linked to asset identifiers
3. Record the assessment date, time, inspector name, and initial condition rating
4. Use a standardised damage classification: Minor / Moderate / Severe / Destroyed
5. Estimate repair quantum even if only an order-of-magnitude at initial assessment
6. Record pre-disaster condition (link to asset register; if unknown, document the gap for post-event NAMS/IAMP update)
7. Back up all records off-site within 24 hours — damage assessments have been lost to subsequent events
8. Establish a single Register of Damage (RoD) as the master record for all financial claims
9. Document the nexus between each damaged asset and the declared disaster event (essential for DRFA/MFMA/FEMA PA claims)

Engineering Triage: Infrastructure Restoration Priority Classification

Priority Level	Criteria	Target Timeframe
Priority 1 — Life Safety Critical	Immediate danger to life; evacuation route access; emergency vehicle access; water supply for fire suppression; hospital/clinic access; imminent structural collapse	0–72 hours
Priority 2 — Community Welfare Critical	Access to emergency relief centres; essential water and sewerage; access for vulnerable populations; primary school access	72 hours — 2 weeks
Priority 3 — Economic Recovery Critical	Agricultural access routes; commercial precinct access; freight and supply chain routes; business district drainage	2 weeks — 2 months
Priority 4 — Full Network Restoration	Secondary roads; minor drainage infrastructure; parks and recreation facilities; aesthetic and amenity works	2 months — 2 years

Table 4: Engineering triage framework for infrastructure restoration priority

CASE STUDY

Japan

Tohoku Earthquake and Tsunami (2011) — Engineering Protocols and Lifeline Restoration

The March 2011 Great East Japan Earthquake (M9.0) and tsunami caused approximately 20,000 deaths, destroyed over 120,000 buildings, and generated 20 million tonnes of debris.

Japan's pre-existing kensetsu-gyosha kyotei (construction industry disaster cooperation agreements), pre-negotiated arrangements between municipalities and local contractors, enabled the Sanriku Expressway lifeline route to be cleared for emergency vehicles within 72 hours of the event.

The staged, triage-based approach to infrastructure restoration, with lifeline routes prioritised absolutely above all other restoration activities.

Reference: National Police Agency of Japan (2011); Cabinet Office of Japan (2012); Hayashi & Katsumi (2013), Journal of Disaster Research.

3.2 Build Back Better: Engineering for Resilience

International experience, from the Sendai Framework to the World Bank's Global Facility for Disaster Reduction and Recovery consistently demonstrates that the disaster recovery phase is the most cost-effective window in which to improve infrastructure resilience. The World Bank estimates that every dollar invested in resilient infrastructure saves $4 in avoided repairs and economic disruption.

IMESA's perspective from resource-constrained settings is equally important: build-back-better does not require unlimited resources. It requires better decisions, which require better information. The most valuable resilience investment a South African municipality can make before a disaster is to update its Infrastructure Asset Management Plan, apply the IMESA/WRC flood estimation guidelines to major drainage catchments, and implement a proactive stormwater inspection programme.

PRACTITIONER GUIDANCE

IPWEA

Practice Note 12.2 — Build Back Better in Practice: Material Selection for Disaster Reconstruction

IPWEA Practice Note 12.2 was developed in response to councils rebuilding infrastructure after extreme weather events only to have it fail again in the next event, because the same materials and design standards were used.

Key guidance: (1) concrete exposed to coastal inundation, higher cement content, reduced water-cement ratios; (2) bitumen roads in high-rainfall areas, modified binders with improved moisture resistance; (3) steel elements in post-flood environments, galvanised or stainless specifications; (4) timber in flood-prone areas H5/H6 hazard class treatment.

Practical application: IPWEA recommends every council include a 'climate-adjusted materials specification' clause in disaster recovery procurement templates, requiring engineers to justify design standard and material selection against current climate projections, not historical baselines.

Reference: IPWEA (2021) Practice Note 12.2 (BMT, Northern Beaches Council, Dubbo Regional Council, University of Sydney, UTS).

CASE STUDY

Netherlands

Room for the River — Build Back Better at National Scale

The Netherlands' Room for the River programme (2007–2015) redesigned river management across 34 projects at 35 locations following the near-catastrophic 1993 and 1995 Rhine and Meuse floods. Cost: EUR 2.3 billion. Outcome: 30% increase in flood discharge capacity.

Rather than raising levees, engineers redesigned river channels, created floodplains, and relocated flood-prone communities, addressing root cause vulnerability, not the symptom. Reference: Ministry of Infrastructure and the Environment, Netherlands (2015); Rijke et al. (2012), Journal of Environmental Science & Policy.

The Netherlands, National Delta Program. Spatial adaptation is one of the three themes in the Delta Programme. The ultimate goal and the joint ambitions are laid down in the Delta Decision on Spatial Adaptation. The core of this is that the Netherlands will be water-resilient and climate-proof by 2050. The central government has laid down the content of this Delta Decision and the spatial policy related to climate adaptation in the National Water Programme (NWP), the National Environmental Vision, and the National Climate Adaptation Strategy (NAS). The implementation of the Delta Decision is described in the Delta Plan on Spatial Adaptation. It is a step-by-step approach in a cyclical process from risk analyses to measures and emergency response.

Reference: Spatial adaptation | Delta Programme

3.3 Procurement and Contractor Management in the Recovery Phase

Emergency procurement is one of the highest-risk activities in local government disaster recovery. Pre-negotiated emergency contractor panel arrangements should be considered as a standard preparedness element, modelled on Queensland's Contractor Prequalification Scheme. IMESA highlights the compounding risk in municipalities where supply chain management systems are under-resourced and procurement irregularities in normal operations create systemic vulnerability when emergency procurement authority is granted.

Emergency Procurement: Critical Controls (IFME/IPWEA/IMESA Aligned)
1. Confirm delegated authority levels in writing before committing expenditure
2. Obtain at least two verbal or written quotes even in emergency conditions where possible
3. Document the basis for any sole-source award (unique capability, time criticality, safety)
4. Specify scope and quantities as precisely as possible — open-ended day-rate contracts regularly produce 200–400% cost overruns
5. Require daily activity reports and signed timesheets for all time-and-materials contracts
6. Appoint a dedicated contract superintendent for each significant contractor; do not allow self-reporting
7. Photograph all works before, during, and after completion for funding claim purposes
8. Use NAMS-referenced asset IDs on all procurement documents to facilitate DRFA claims (IPWEA)
9. Ensure all emergency procurement complies with MFMA Section 36 and is reported to the Municipal Manager within prescribed timeframes (IMESA)

CASE STUDY

USA

Hurricane Katrina (2005) — Procurement Failures and the Cost of Inadequate Controls

The U.S. Government Accountability Office (GAO) documented over USD 1 billion in improper and wasteful disaster-related contracts in the first year of Katrina recovery. Key failures: open-ended time-and-materials contracts without scope; contractor work unreconcilable with invoices; duplicate payments; qualified local contractors bypassed.

For IFME member practitioners, whether managing DRFA-funded recovery in Queensland, Cyclone Gabrielle restoration in Hawke's Bay, or KZN flood infrastructure reinstatement, the lesson is identical: procurement discipline must be established on Day 1. Pre-negotiated contractor panel model and IMESA's MFMA compliance framework both provide structural protections that are most valuable precisely when pressure to 'just get it done' is greatest.

Reference: GAO-06-844T (2006); U.S. House Select Committee on Hurricane Katrina (2006); FEMA PAPPG (2023).

Section 4:
External Engagement, Community Recovery, and Building Long-Term Resilience

Recovery from disaster is not just a technical process. It is a human and social process in which technical activities occur within a community experiencing grief, dislocation, economic stress, and social disruption. Community trust, transparent communication, and genuine engagement are as critical as any technical capability.

4.1 Community Engagement in Recovery

Engagement Principle	Practical Application for Local Government
Nothing about us without us	Community members should be present at all significant recovery planning meetings. Establish a Community Recovery Reference Group within two weeks of the event.
Meet people where they are	Recovery centres must be in affected areas, not at the civic centre. Opening hours must accommodate working people, evenings and weekends included.
Consistent, honest communication	Regular updates (minimum weekly) even when there is little new information. Acknowledge what is not known. Never promise outcomes that cannot be guaranteed.
Recognise community leadership	Informal community leaders who emerge in disaster response should be respected and supported, not supplanted by formal council structures.
Culturally appropriate engagement	Information must be available in relevant community languages. IMESA specifically highlights the need for engagement in indigenous languages in South African rural municipal areas and with traditional council structures.
NZ: Māori partnership	The role of iwi and hapū in emergency management planning and recovery under Te Tiriti o Waitangi. The public sector including local government must engage Māori communities as recovery partners.
Responder wellbeing	Local and central government staff and volunteers are also members of the affected community. Staff wellbeing programmes, EAP access, and workload management are critical recovery functions.

Table 5: Community engagement principles and practical applications

PRACTITIONER GUIDANCE

NZ Department of Prime Minister and Cabinet & Ministry for the Environment

NZ Emergency Recovery and the partnership role of Māori

New Zealand's National Disaster Resilience Strategy (NDRS 2019–2029) and the Government's 2024 response to the North Island Severe Weather Events Inquiry (NISWE) both explicitly recognise that Māori iwi and hapū play critical roles in extending care and protection during disasters.

Recovery plans, infrastructure prioritisation decisions, and community engagement processes must reflect the principles of Te Tiriti o Waitangi.

Cyclone Gabrielle demonstrated this in practice: in Tairāwhiti and Hawke's Bay, iwi organisations were among the first responders and the most sustained community recovery support providers. Councils with pre-existing iwi relationships coordinated more effectively and navigated culturally sensitive recovery decisions with greater legitimacy.

Reference: NZ DPMC (2024) Strengthening Disaster Resilience and Emergency Management; NEMA NDRS (2019); Cyclone Gabrielle Wairarapa AAR (2023).

Link to New Zealand's National Disaster Resilience Strategy (NDRS 2019–2029)
https://www.civildefence.govt.nz/strategy-capability/plans-strategies/ndrs

The NZ Government has published a Long-term Insights Briefing on building New Zealand's long-term resilience to hazards, such as severe weather, pandemics, volcanic activity, and earthquakes. The briefing looks at how New Zealand's hazard landscape is shifting, the major national risks we face and what we can do as a nation to help build Aotearoa's resilience to hazards.

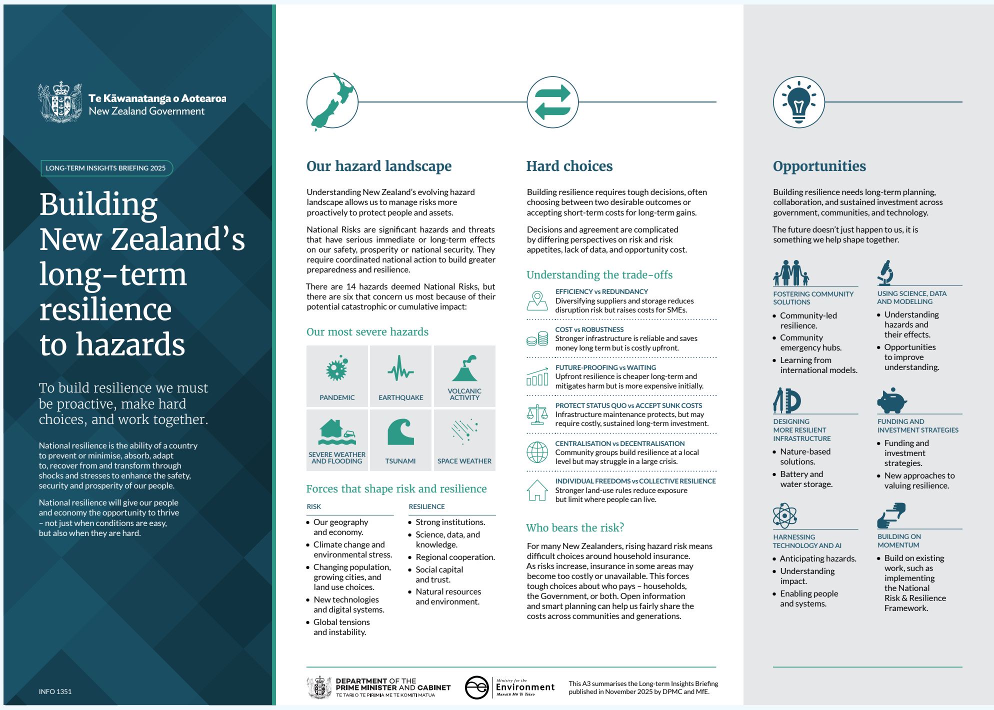
PRACTITIONER GUIDANCE

Continued

Building national resilience will help us manage the impacts of more frequent and severe disasters and provide economic, social and environmental benefits.

Long-term Insights Briefings serve as a conversation starter to help people plan for future hazards. They look at future challenges and opportunities for New Zealand and are a requirement under the Public Service Act 2020, developed independently of Ministers, so not Government policy.

Link to Building New Zealand's Long-term Resilience to Hazards: Long Term Insights Briefing https://environment.govt.nz/news/building-a-safer-and-more-resilient-new-zealand/ https://www.dpmc.govt.nz/sites/default/files/2025-11/ltib-2025-building-nz-long-term-resilience-hazards.pdf



New Zealand faces a number of complex hazards and national security threats that we define as National Risks. These National Risks could have serious immediate and/or long-term effects on New Zealand's safety, prosperity and/or national security, requiring national-level intervention and coordination. The National Risk and Resilience Framework (pictured below) is used across government to strengthen New Zealand's resilience to National Risks.

The Framework outlines the strategic actions taken at the national level to proactively build resilience to National Risks. Through these actions, New Zealand is better able to anticipate, prepare for and manage National Risks, preventing them where we can, and reducing their potential likelihood, consequences and cost where we cannot.

The Framework is used to drive action across agencies and provide assurance that National Risks are being actively managed.

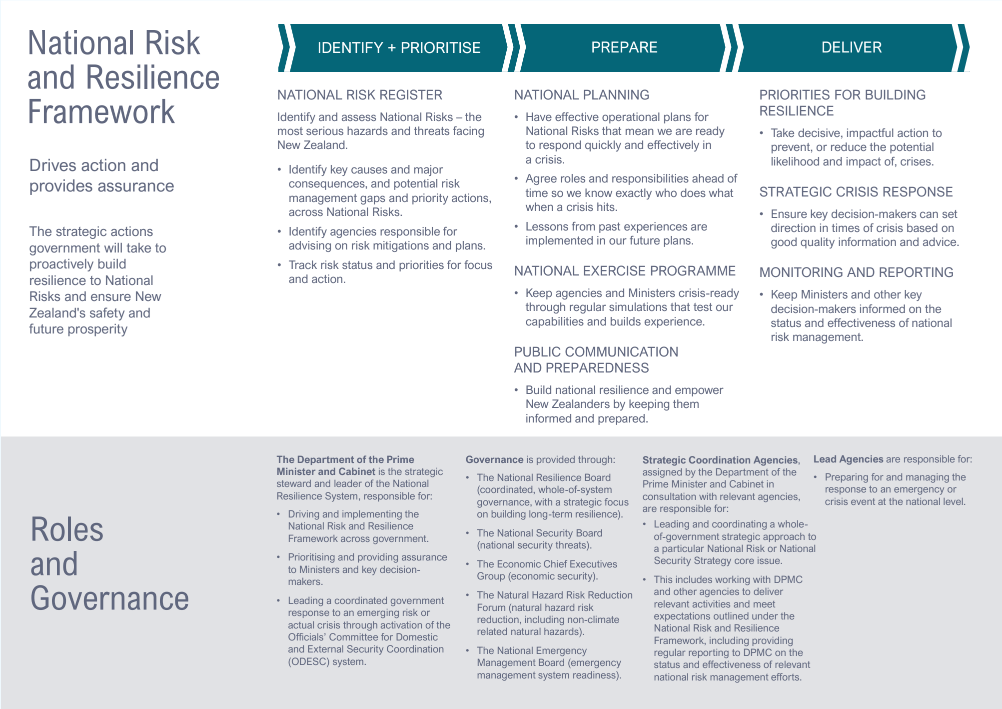
The Framework includes the National Risk Register, which identifies 28 National Risks across five broad categories:

- natural hazards
- biological hazards
- technological hazards
- malicious threats
- economic crisis.

PRACTITIONER GUIDANCE

Continued

Link to National Risk and Resilience Framework https://www.dpmc.govt.nz/our-programmes/risk-and-resilience/national-risk-and-resilience-framework



4.2 Interfacing with State and Federal Agencies — Funding Frameworks

PRACTITIONER GUIDANCE

IMESA

Funding Access and Municipal Capacity — The Resource-Constrained Recovery Challenge

IMESA's analysis of repeated disaster events identifies a consistent pattern: municipalities with weak asset registers, underfunded maintenance programmes, and limited technical staff struggle not only to respond to disasters but to access available recovery funding, because they cannot produce the required evidentiary documentation.

The institute advocates for: (1) pre-disaster completion of IAMPs to IMESA/National Treasury standards; (2) dedicated post-disaster technical support from provincial engineering units; (3) recognition of community-level infrastructure (informal settlement drainage, rural access roads) as eligible for recovery funding; (4) pre-approved emergency procurement frameworks aligned with MFMA Section 36.

IMESA also advocates for stronger integration between the Disaster Management Act (57 of 2002) and the Municipal Systems Act (32 of 2000), requiring that Integrated Development Plans (IDPs) include a substantive disaster risk reduction component developed with input from the municipal engineer.

Reference: IMESA (2023–2025) IMIESA Journal; IMESA Skills Development Programme; IMESA/WRC TT 921.

CASE STUDY

USA

FEMA Public Assistance —
Grants Management Lessons from Hurricane Harvey (2017)

Hurricane Harvey caused USD 125 billion in damage. Over 700 local government entities filed FEMA PA claims. Initial documentation inconsistency caused significant reimbursement delays across multiple councils.

FEMA's post-Harvey Applicant Agent programme, a dedicated grants management professional coordinating all FEMA interfaces, consistently delivered faster reimbursement and higher claim success. The lesson applies equally for DRFA (Australia), MFMA emergency provisions (South Africa), and CDEM funding (New Zealand): a single full-time grants coordinator typically recovers their salary cost by a factor of 50:1 through improved claim completeness.

Reference: FEMA (2018) Hurricane Harvey DR-4332 After-Action Review; Texas Division of Emergency Management (2018).

4.3 Long-Term Resilience Planning: From Recovery to Transformation

The Seven Pillars of Local Government Resilience - Sendai Aligned Checklist
1. **INFRASTRUCTURE RESILIENCE:** Assets designed to current/projected climate standards (IPWEA PN 12.1/12.2); redundancy in critical networks; regular condition assessment (NAMS/IAMP)
2. **FINANCIAL RESILIENCE:** Disaster reserve fund; insurance review; pre-negotiated contractor panels (IPWEA); MFMA-compliant emergency procurement framework (IMESA)
3. **ORGANISATIONAL RESILIENCE:** Trained IMS structure (AIIMS/NDMC); succession plans; mutual aid agreements; cross-training of key roles
4. **INFORMATION RESILIENCE:** Accurate and current asset register (NAMS/IAMP); pre-disaster condition records; off-site data backup; community vulnerability mapping
5. **COMMUNITY RESILIENCE:** Community Based Early Warning Systems (SA/ICLEI/IMESA),Community recovery plans; iwi/traditional council partnerships (NZ/SA); neighbourhood network programmes; CALD and vulnerable population outreach
6. **NATURAL SYSTEMS RESILIENCE:** Urban greening (IPWEA PN 15); wetland and riparian corridor management; WSUD integration; proactive stormwater system maintenance (IMESA/WRC)
7. **GOVERNANCE RESILIENCE:** Updated emergency management plans (CDEM/NDMC); elected member training; legal authorities clarified; post-event AAR culture; IDP disaster risk integration (IMESA)

CASE STUDY

Japan

Kobe City —
Two Decades of Resilience After the 1995 Great Hanshin Earthquake

The January 1995 Great Hanshin Earthquake (M6.9) killed 6,434 people and destroyed over 100,000 buildings. It remains the defining case study in municipal disaster recovery.

Kobe's recovery (80% of infrastructure restored within two years) was followed by twenty years of sustained resilience investment: mandatory community disaster management organisations (jichikai); seismic retrofit of all public buildings; the Disaster Reduction and Human Renovation Institution (DRI Hyogo); and formal integration of disaster risk reduction into the city's master planning framework.

By 2011, Kobe's capacity to deploy trained personnel and equipment to support Tohoku-affected municipalities demonstrated the direct operational dividend of sustained resilience investment, a model directly applicable to IFME member organisations and their local government clients globally.

Reference: City of Kobe (2015) Kobe's 20-Year Reconstruction; DRI Hyogo (2015); Shaw & Goda (2004), Earthquake Spectra.

4.4 After-Action Review: The IFME Learning Imperative

Priority Level	Criteria	Target Timeframe
Hot Debrief	Within 48–72 hours of stabilisation	What happened? What was the immediate decision quality? What resources were most/least effective? What communications worked?
Operational Review	2–6 weeks post-event	Were procedures followed? Where did the plan fail? What contractor/ procurement issues arose? Were NAMS/IAMP asset data adequate?
Strategic Review	3–6 months post-event	Did infrastructure perform to design standard? What funding gaps emerged? Were IPWEA/IMESA/IFME guidelines applied? What community feedback was received?
Long-Term Lessons Review	12–24 months post-event	Have plan updates been implemented? Have resilience investments been programmed? Have pre-negotiated contractor panels been established? Have NAMS/IAMP updates been completed?

Table 6: After-Action Review phasing for local government practitioners

Conclusion
The Practitioner's Imperative

Disaster recovery management is among the most demanding and consequential work that local government practitioners undertake. It demands technical excellence, organisational leadership, community empathy, financial rigour, and political intelligence, simultaneously, under conditions of extreme stress, with the wellbeing of real people and the resilience of real communities in the balance.

The evidence from decades of international experience, from Kobe to Christchurch, from the Netherlands to New Orleans, from South-East Queensland to the Tohoku Coast, from Hawke's Bay to KwaZulu-Natal is consistent. The local governments that perform best are not necessarily the wealthiest or the largest. They are the ones that have invested in preparation: in trained people, clear structures, robust asset information, tested plans, community relationships, and a culture of continuous learning.

Climate change will not wait for local government to be ready. The disasters are coming more frequently, more intensely, and with less recovery time between events. Prepare before. Perform during. Learn after. Build back better. These are not slogans, they are the operational disciplines that define effective disaster recovery management.

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