Disaster Waste Management Guideline

Planning guidance for local authorities and emergency management organisations

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National Emergency Management Agency
Te Rākau Whakamarumaru
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Manatū Mō Te Taiao

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Cover image
Burwood Resource Recovery Park, processing Canterbury earthquake debris (Courtesy of WM New Zealand Limited), Adapted.

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Preface

Disaster waste management is a complex process. It requires collaboration between territorial authorities (TAs), and other regulatory agencies, civil works and waste contractors, civil defence and emergency management (CDEM) organisations, government departments, and affected communities, often with support from Iwi Māori and technical inputs from engineering professionals, environmental specialists and insurers.

This guideline was prepared by the Ministry for the Environment and the National Emergency Management Agency, with input from a broad range of stakeholders with waste management and emergency management interests. The contents focus on planning approaches for disaster waste management but also provide basic guidance for dealing with disaster wastes during response and recovery. This guideline is intended to complement existing resources developed for disaster waste management, particularly the New Zealand Disaster Waste Management Planning Tool and the associated Workbook.

This guideline has been published outside the National Emergency Management Agency's Director's Guideline series until revised following anticipated legislative changes.

Purpose

Accumulations of disaster waste can present significant challenges to response and recovery efforts, so it is in the interest of both CDEM groups and territorial authorities to collaborate to resolve disaster waste management challenges. Effective stakeholder collaboration requires a combination of shared understanding, common objectives, clear roles and responsibilities, agreed approaches and mutual trust. This guideline provides shared understanding, clarifies responsibilities and promotes collaborative planning, which in turn should enable CDEM groups and territorial authority waste managers to develop effective working relationships and mutual trust.

This guideline provides a basis for this collaboration by:

- Outlining roles and responsibilities for disaster waste management.
- Clarifying how waste management needs may change following a disaster event.
- Encouraging collaborative planning.
- Providing information and insights to assist decision-making.

It was prepared by the Ministry for the Environment (MfE) and the National Emergency Management Agency (NEEMA), with input from a broad range of stakeholders with waste management and emergency management interests. The content is intended to complement existing resources developed for disaster waste management. In particular the New Zealand Disaster Waste Management Planning Tool and the associated Workbook.

Contents

After an introduction (Section 1), the guideline outlines waste management (Section 2) and emergency management approaches in New Zealand (Section 3). It then explores the characteristics of disaster waste, its impacts on communities and waste management operations, and goes on to present generic disaster waste management approaches (Section 4).

The appendices (Section 5) provide more specific guidance on disaster waste decision making, the management of specific waste streams, and roles and responsibilities. The appendices also include a glossary, and summaries of previous disaster waste management challenges in New Zealand and overseas.

Limitations

This guideline does not specify disaster waste management approaches that should be applied, as this is best done by CDEM groups and territorial authorities who are familiar with the operating context, issues and resources of their area.

This guideline reflects the regulatory settings at the time of writing and do not take into consideration proposed reform of the Resource Management Act, the Civil Defence and Emergency Management Act, and the Waste Minimisation Act, or the dissolution of the Ministry for the Environment (to be merged into the Ministry for Cities, Environment, Regions and Transport), proposed amendments to the Waste Minimisation Act and proposed repeal of the Litter Act and it's consolidation in to the Waste Minimisation Act, the National Emergency Management Agency and the wider civil defence and territorial authority landscape. The guideline will be reviewed once new legislation is in place, with a view to updating its content and re-releasing it as a Director's Guideline.

Acknowledgements

NEMA and MfE are grateful for the feedback provided by a diverse range of individuals including CDEM Groups, territorial authorities, waste management service providers, response managers, WasteMINZ Disaster Waste Management Sector Group and consultants specialising in disaster waste management. We have tried to accommodate their feedback where possible.

Table of contents

Section 1 Introduction

1.1 Context

Following a disaster, CDEM groups and emergency services' initial focus is on saving lives, protecting property and enabling access for emergency services (response). Authorities can then shift their focus to other needs such as maintaining public health, providing welfare support, clearing debris and repairing damage (recovery). While response activities may be completed within days, the shift from response to recovery (transition period) may take weeks, while recovery may take months or years.

Disaster impacts can create significant waste management challenges that must be dealt with by territorial authorities and CDEM response and recovery operations. Impacts can include restricted access due to slips or flood debris; land or crops smothered by silt, rocks or volcanic ash; health risks due to hazardous materials for example animal carcasses or chemical spills, and debris from structural failure that prevents occupancy or rebuilding. Disaster waste challenges often overwhelm the capacity of established waste management systems and may require new ways of working. While the challenges are diverse, they can be managed by a common approach involving forward planning, informed decision-making, and coordinated action by CDEM groups, councils, iwi and communities.

The waste sector in New Zealand involves a combination of commercial operators and councils, many of which operate independently and some may even be competitors under normal circumstances. A disaster event can quickly overwhelm business-as-usual waste management capacity, requiring available resources to be pooled in an integrated response led by CDEM groups and supported by territorial authorities and their contractors. It may also be necessary to bring in additional capacity (e.g. construction, demolition and haulage contractors, plant hire companies), technical assistance (e.g. geotechnical engineers, environmental scientists, insurance companies) and support from central government departments, in addition to the views and guidance of affected communities and Iwi Māori. Consequently, effective planning and coordination is essential to ensure all these parties collaborate effectively.

It is crucial that local government bodies and the waste management sector understand their roles and responsibilities for disaster waste management and collaborate effectively prior to response and recovery operations. While CDEM groups are responsible for emergency management, territorial authorities and their waste management contractors have the primary responsibility for waste management and will be expected to continue with their services and support response and recovery activities.

1.2 Approach

NEMA and the MfE have developed this document in collaboration with a range of waste management sector stakeholders. It describes how local government and emergency management agencies can coordinate waste management across the 'four R's' (See section 3.2) of emergency management[1] (Risk reduction, Readiness, Response and Recovery), including guidance on how:

- Local government (and their contractors) can incorporate disaster waste considerations into their strategies, plans and contracts.
- CDEM groups can plan for and respond to disaster waste management challenges in collaboration with territorial authority waste managers.
- Regional councils and unitary authorities can incorporate disaster waste management considerations into their strategies, plans, and monitoring activities.
- Waste contractors can incorporate disaster waste management considerations into their contracts, business continuity plans, and waste management activities.
- Communities (including businesses, households, Iwi Māori, non-governmental organisations) and volunteers can understand the dimensions of disaster waste management, and how they might contribute.

1.3 Scope and exclusions

This guideline focuses on forward planning for disaster waste management, and generic disaster waste management approaches during response and recovery. It informs key stakeholders (regional CDEM groups, territorial authorities, their waste management contractors, and regional planning authorities) and their relevant plans and guidance (see Table 1.1 below). It is hazard-agnostic (i.e. not tailored to a particular location, sector or waste stream) as this detail is better addressed by local and regional plans and operating procedures. Key stakeholders may develop their own disaster waste management plans or procedures if needed, following the guidance provided here.

This guideline does not replace existing disaster waste management plans developed for sector-specific waste management challenges, for example:

- Culling and disposal of animals during a disease outbreak, which is managed via emergency management plans developed by the Ministry for Primary Industries (MPI).
- Maritime oil spill clean-up, which is managed via the National Marine Oil Spill Contingency Plan developed by Maritime New Zealand (MNZ), and implemented by industry (tier 1 spills), regional councils (tier 2 spills) or Maritime NZ (tier 3 spills).

Effective management of waste across the 'four R's' requires clarity of roles and responsibilities, and a common understanding of how coordination arrangements can change following an emergency. Figure 1.2 illustrates how disaster waste management principally involves collaboration between local government and emergency management organisations, with guidance or support from central government where needed.

It is also important to understand the changes in waste management leadership following a disaster event. Under 'business-as-usual' conditions, local government leads waste management operations, while maintaining plans to improve waste service resilience and business continuity following a disaster event (with supported from CDEM groups). Following a disaster event, CDEM groups lead any disaster waste management effort in close collaboration with emergency

[1] National Civil Defence Emergency Management Plan Order 2015

services and local authority waste functions. As response moves into recovery, territorial authorities will regain control (unless a recovery agency has been established which manages disaster waste issues).

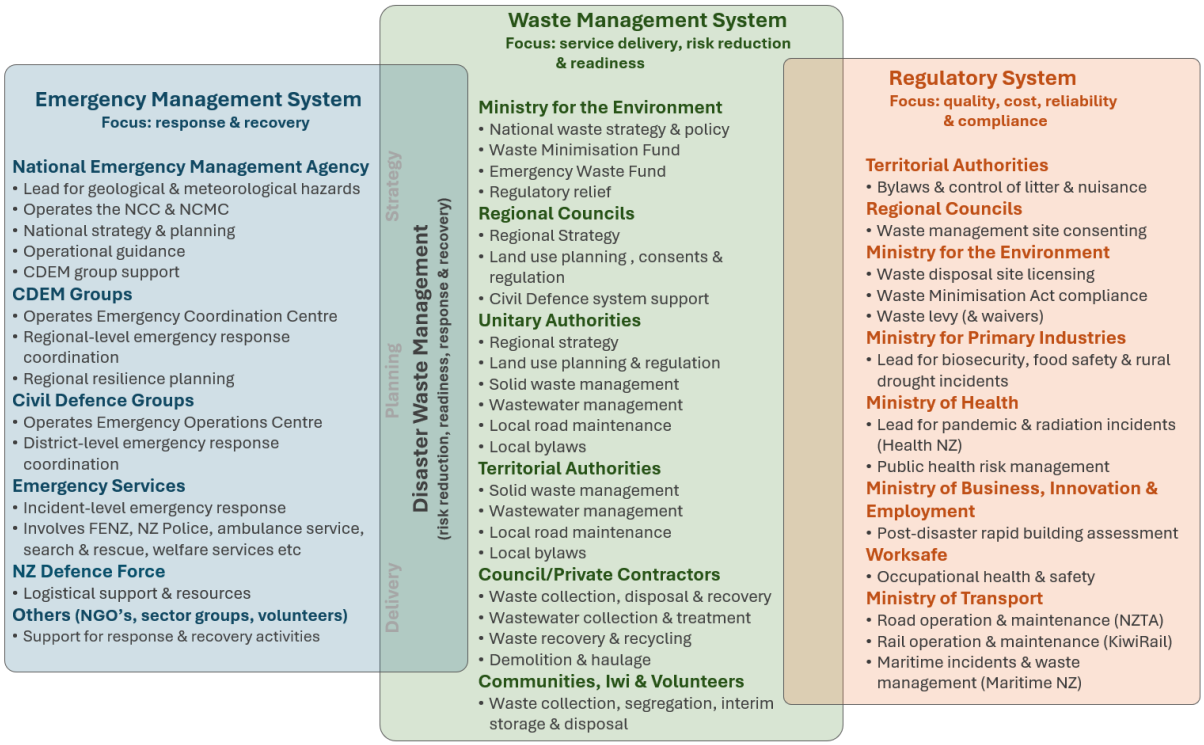

Figure A.2 Emergency waste management stakeholders

1.4 Monitoring, review and testing

This guideline will be reviewed and updated in response to any significant change affecting waste management or CDEM legislation. CDEM Group and TA emergency waste management plans should be reviewed and updated accordingly. CDEM groups routinely exercise emergency management arrangements and should test the effectiveness of disaster waste management arrangements and identify opportunities for improvement. Other opportunities for continued improvement can come from waste data collected and lessons learned during response and recovery activity. Table 1.1 below shows the key documents relevant to disaster waste management for different stakeholders.

Key Stakeholders	Relevant Documents & Activities
Regional CDEM groups	• Coordination & support for EOC activity • Vulnerability Assessment • Disaster waste management planning • Response Action Plan • Recovery Action Plan • Guidelines
Territorial Authorities	• Waste Management & Minimisation Plans • Infrastructure Strategy • Long Term Plan • Waste management contracts • Activity & asset management plans • Bylaws • Mayoral Relief Fund
Waste Management Contractors	• Waste management contracts • Site operating procedures • Business continuity plans • Contingency plans
Regional Councils & Unitary Authorities	• Regional strategy • Regional Plans • Resource consents • Monitoring activities
Government Agencies	• Acts & regulations • Standards & guidelines
Sector Groups	• Codes of practice & guidelines
Communities	• Community waste management activity • Community-led recycling/resource recovery centres • Iwi Māori support for recovery • Other support from non-governmental organisations, volunteer groups and interest groups
Government Departments	• Support for CDEM response and recovery activity (e.g. national coordination, regulatory relief) • Support to territorial authorities and affected communities (e.g. funding)

Table 1.1 Emergency waste management stakeholders and resources

Section 2 Waste management system

Territorial authorities are responsible for municipal waste collection and disposal services in their districts. While some deliver these services in-house, many use contractors to deliver services on their behalf, and these contractors may also serve private sector clients. The waste management sector has access to substantial resources, with several large organisations providing waste management services regionally or nationally. There is also a range of smaller contractors who provide specialist waste management services such as collection, haulage, construction and demolition (C&D), waste processing, composting, sorting, hazardous waste treatment or removal, recycling and resource recovery.

Industrial and commercial organisations may have their own arrangements for waste collection and disposal, or for treatment and disposal of hazardous or other wastes that are not permitted in public facilities or disposal sites. Rural waste systems differ as landowners may be able to dispose of waste on their own land provided there is no adverse impact on the environment or local communities. Waste disposal options include waste burial of inert waste and diseased animals, burning of appropriate combustible material (untreated timber and green waste) and land application for liquid wastes such as manure and waste milk.

The complexity of the waste management system makes it vulnerable to disruption following disaster events. This is because the sector relies upon:

- A regular cycle of collection, transport and disposal that can be disrupted by a range of hazards. Disasters events can block transport routes or generate quantities of waste that are orders of magnitude greater than the capacity of the waste management system or established regulatory settings.
- Multiple operators who have varying degrees of inter-dependency (e.g. managing a municipal waste stream can involve kerbside collection, transfer stations, demolition contractors, haulage contractors, disposal facilities, composting plant, materials recovery and resale, landfill gas and leachate management).
- 42 municipal (Class 1) sites where disposal activity is strictly controlled and regulated. Most landfill sites are located near larger urban areas, and some smaller districts may depend on waste disposal sites operating in adjacent territorial authority areas. Not having Class 1 landfills near the impacted communities significantly increases the complexity of managing waste in the response phase.
- Several essential services that may be impacted by disaster events, including fuel for vehicles and mechanical equipment, water for cleaning and dust suppression, power and communications systems for site payments, and road access to link waste sources to a disposal site.

2.1 National governance

The waste management system encompasses waste collection, transport, recovery and disposal, to avoid waste accumulating in communities where it could undermine public health, safety or environmental quality. It also includes activities such as waste segregation, and treatment to reduce hazardous properties[2], and waste levy payments and reporting requirements in the WMA[3]. The following sections provide further information about each component.

[2] Hazardous substance classification categories are: flammable, reactive, oxidising, corrosive, explosive, toxic, irritant, carcinogen and biohazard.
[3] Hazardous substance classification categories are: flammable, reactive, oxidising, corrosive, explosive, toxic, irritant, carcinogen and biohazard.

2.2 Components of waste management

The waste management system encompasses waste collection, transport, recovery and disposal, to avoid waste accumulating in communities where it could undermine public health, safety or environmental quality. It also includes activities such as waste segregation, and treatment to reduce hazardous properties, and waste levy payments and reporting requirements in the WMA.

The following sections provide further information about each component.

2.2.1 Waste collection

Almost all territorial authorities provide kerbside collection services for household waste, recyclables and disposal service themselves or contract out these services, while industrial and commercial premises may have private arrangements in place for waste collection, treatment and disposal. Territorial authorities are also responsible for assessing disposal needs for solid and liquid waste generated by communities and ensuring that appropriate collection and disposal arrangements are in place.

For solid waste and recyclable material collection, most urban and suburban communities rely on kerbside collection, while lower density communities may require residents to take their waste to a transfer station where it is held pending transfer to a disposal site. A transfer station may also facilitate the collection of cardboard, plastic, metal, and miscellaneous waste streams. Construction and demolition (C&D) contractors manage the removal and disposal of bulk debris arising from buildings, in conjunction with resource recovery and clean fill operations.

Waste segregation is an important consideration. If hazardous material contaminates otherwise clean waste, then it must all be treated as a hazardous waste and significantly increase the cost and complexity of waste management. Similarly, if waste is mixed with recyclable materials, it makes segregation more difficult and can undermine the economics of resource recovery. Note that some hazardous substances present a hazard for a limited time (e.g. the biohazard properties of wastewater and sewage sludge decline over days due to factors such as sunlight, drying and dilution) while others can remain hazardous for years (e.g. inorganic chemicals and heavy metals).

2.2.2 Waste transportation

The bulk of solid waste transportation in New Zealand is by road. Vehicles used to collect waste from businesses and communities include refuse collection vehicles, skip trucks, tankers, bulk bin trailers and tipper trucks. Bulk waste transportation to disposal sites should ideally use routes that minimise community impacts from vehicle movements and potential nuisance from odour and litter. The New Zealand road network is vulnerable to failures following emergency events. These failures can include slips, washouts, cracks, misalignments and culvert/bridge collapse. Therefore, it is prudent to identify alternate routes to existing waste management facilities, including those outside of the district/region if necessary. It may also be possible to obtain access through private roads such as on farms or forestry sites if this presents a significant distance saving and the roads are suitable for the vehicles used.

Wastewater networks and to a lesser extent tanker trucks are used to transport wastewater (including trade waste), septage, sludges and liquid wastes to a wastewater treatment plant from domestic and commercial premises. Wastewater networks typically rely on gravity flow although they may need pump stations, which should have a back-up pump in case of mechanical failure and a wet well for short-term storage in the event of power failure. If the wastewater cannot be pumped, the network operators may restrict discharges to the network and use sucker/tanker trucks to remove wastewater from the pipework to allow repairs. Wastewater may overflow onto

land or into adjacent watercourses in the event of a physical failure of the pipe network, long-term mechanical failure, power outage or downstream blockage.

2.2.3 Temporary storage

A sudden increase in the quantity of waste can overwhelm available transport and disposal options, such as a large slip onto a road or failure of a bulk storage tank. Non-hazardous waste can be held at temporary storage sites until sufficient transport and disposal capacity becomes available (e.g. roadside stockpiles), which also provides opportunities for segregation to help subsequent disposal (e.g. separating soil, rock and vegetation). Temporary storage can be established using emergency powers during a state of emergency, although large scale holding sites may require resource consents or regulatory relief of some description (footnote examples).

CDEM groups and council waste officers should carefully consider the location of temporary waste holding sites and ideally limited to sites that are convenient for the community users and waste contractors, while minimising nuisance impacts and risks to health, safety and the environment. Temporary facilities will eventually need to be closed and rehabilitated unless they are consented to operate as a permanent facility.

Ideally, the need for waste holding sites should be anticipated, so that territorial authorities can reference them in relevant plans. This enables temporary storage and disposal sites to be activated via emergency provisions or through orders in council under the Resource Management Act.

The temporary storage of hazardous waste is determined by its quantity, hazardous properties and risk exposures. Typically, hazardous waste should be contained at source if it is safe to do so, to avoid transport challenges and prevent it from contaminating soil or water which would increase the waste quantity. It may also need covering to prevent rainwater ingress and wind dispersal, plus barriers and warning signs.

2.2.4 Waste treatment

Some regions may have dedicated facilities for the treatment or disposal of hazardous or noxious wastes such as chemicals, biohazard substances and asbestos containing materials. Treatments are used to reduce the risk or nuisance properties of wastes, or to improve their handling. The type of treatment applied is determined by the quantity of waste material, its hazardous properties and beneficial use options.

Organic wastes such as sewage sludge, animal manure and slurry can be disinfected, desiccated or mixed with sawdust or other organic bulking agent to make compost via commercial composting activities or aerobic digestion. If the organic waste results from a pandemic/foot and mouth disease type outbreak where the animals must be euthanised and disposed of quickly as close to the source as possible to minimise disease transmission. MPI and possibly MOH may need to work with CDEM groups and council waste officers to identify appropriate disposal options.

It may be possible to reduce or neutralise hazardous properties by treatments such as dilution, oxidation, reduction, neutralisation, incineration and encapsulation. Mixed liquid wastes may be concentrated by settlement, coagulation, precipitation or drying to make them more amenable to transportation and disposal. Hazardous waste treatments should be informed by professional assessment and information in material safety data sheets.

2.2.5 Waste disposal

A thorough understanding of waste management facilities within local districts and regions, as well as those in adjacent areas will support CDEM Groups and council waste officers when formulating their emergency waste management plans.

At the time of publishing, the MfE's Waste Facilities and Disposal Dashboard reports 637 registered waste disposal facilities[4] operating around New Zealand (Figure 2.1), comprising 192 landfills, 175 cleanfills, 245 transfer stations. In addition, there are 127 closed landfill sites. In 2024-25, registered waste disposal facilities (class 1-4) received 6.9 million tonnes of waste, of which 24% was diverted via recovery, reuse or energy recovery. Cleanfills and industrial monofills received 12.4 million tonnes of waste over the same period, of which 1.3% was diverted for beneficial reuse.

The Technical Guidelines for Disposal to Land[5] (TGDL) classify disposal facilities according to the type of waste they can accept (see Table 2.1), and guides approaches to landfill siting, design, permitting, monitoring, waste acceptance criteria and operational controls.

Territorial authorities issue land use consents for waste management sites to ensure that nuisance conditions are avoided. Consent conditions may restrict transportation routes for bulk waste transfers, to avoid traffic congestion and noise nuisance. Regional councils and unitary authorities issue consents allowing the waste to be discharged to land and monitor environmental quality to ensure that leachate or run-off from disposal sites does not contaminate water resources.

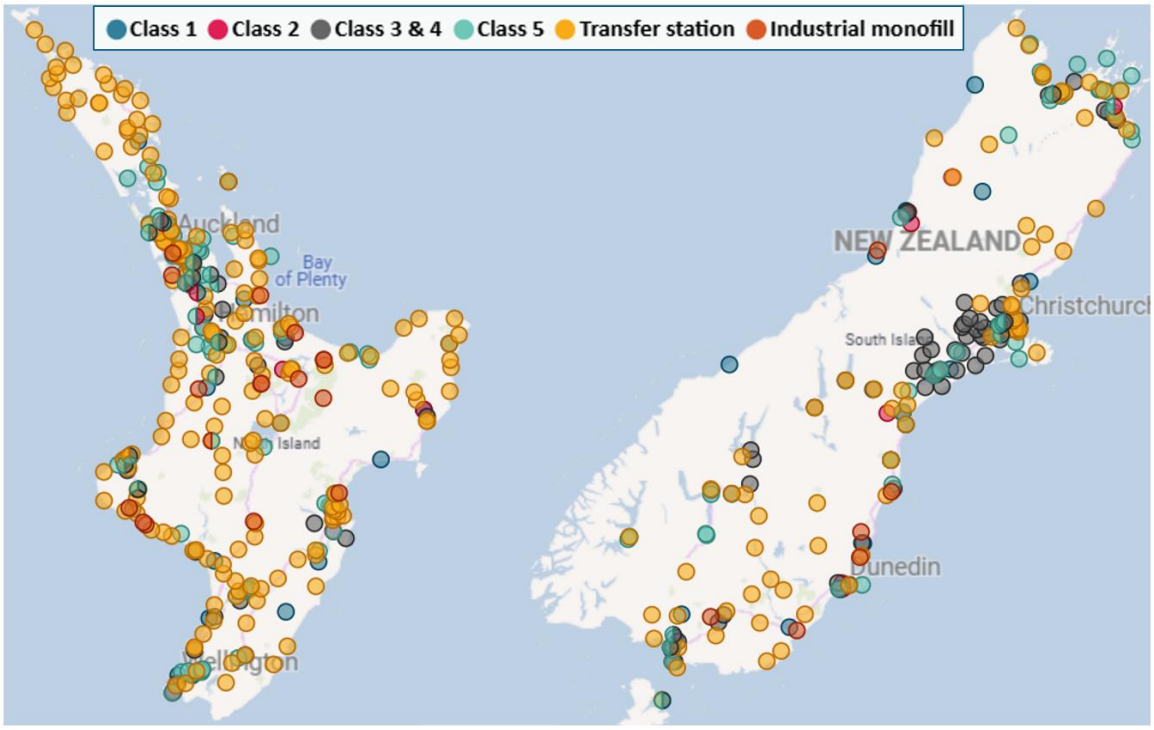

Figure B.1 Waste disposal facility locations[6]

[4] Source: interactive map on the Ministry for the Environment's Waste facilities & disposal web page.

[5] For further detail, refer to the latest version of the Waste Management Institute New Zealand (WasteMINZ), Technical Guidelines for Disposal to Land (TGDL).

[6] Waste Facility Locations

Class	Descriptor	Number	Waste Accepted
1	Landfill	42	Mixed municipal solid waste, construction and demolition waste, some industrial waste and contaminated soils.
2	C&D Landfill	16	Non-putrescible wastes including construction and demolition waste (e.g. rubble, plasterboard, timber), managed fill, controlled fill and clean fill.
3	Managed Fill	134	Clean fill and controlled fill material specified in the TGDL Guidelines.
4	Controlled Fill		Soil and inert C&D materials with chemical contaminants at concentrations > local natural background, but < specified maximum total.
5	Clean Fill	175	Virgin excavated natural material (e.g. clay, soil, rock) that is free of combustible, putrescible, degradable or leachable components.

Table 2.1 New Zealand waste disposal facilities: classifications and numbers (as at 22 April 2026)

Landfill operators charge waste generators a disposal fee for every tonne of waste sent to landfill, which covers capital and operating costs, plus regulatory costs (including the government-imposed waste levy[7] which is designed to reduce waste sent to landfills, fund waste minimisation initiatives and support environmental projects). The levy rates are set for different classes of landfills and reflect the risks posed by the waste.

Site establishment

Territorial authorities and regional councils issue resource consents for a disposal facility including consents for land use and discharges to the environment. The scrutiny applied to siting and permitting is largely determined by the disposal facility classification; for example, disposal facility sites for inert waste require fewer controls than hazardous waste disposal sites. Disposal sites are subject to regulatory requirements under the Waste Minimisation Act and its associated

[7] Waste Disposal Levy

regulations. This includes mandatory registration of the site with MfE via the Online Waste Levy System upon establishment.

Territorial authorities identify proposed waste disposal facilities in their Infrastructure Strategy and Long-Term Plan based on forecast waste disposal needs, which in turn guides investigations, consenting and earthworks required to build new disposal facilities. CDEM groups and councils waste officers' strategic planning of waste disposal options should consider potential disaster scenarios. It may also be possible to incorporate disaster waste provisions into the resource consent for a disposal site, where the regulator accepts the need for operational changes during emergencies, such as longer operating hours or relaxation of waste acceptance criteria.

Site features and operations

Features of a waste disposal facility typically include the following:

- Access road, often with an access barrier to prevent after-hours entry to site.
- Perimeter fence to restrict access and reduce litter beyond the boundary.
- Waste reception facility, comprising an entrance weighbridge and reception office.
- Exit weighbridge and pay station.
- Domestic waste reception point.
- Special waste reception and handling (may be at a separate location).
- Active face, where refuse disposal vehicles deposit their load.
- Wheel wash at the exit from the disposal face, to reduce mud being tracked off-site.
- Site lighting for after-hours operation and security.
- Mobile plant (trucks, excavators, bulldozers, graders, compactors and forklifts).
- Storage and refuelling facilities, including storage of fuel, lubricant and chemicals.
- Staff facilities, including offices, sanitary accommodation and rest rooms.
- Recovery facilities where reusable materials can be recovered (e.g. glass, metal, cardboard, plastic, oil), organic waste collected for composting, and other items held pending safe disposal (e.g. gas bottles, appliances, paint).
- Other features (e.g. back-up generator, maintenance workshop, gas extraction and pumping, leachate collection, treatment and disposal, bulk water storage, sludge dewatering, stormwater diversion, recycle shop, water sprays for dust suppression, deodoriser for odour control, pest control provisions, and soil stockpiles).

Routine operation of waste disposal facilities also involves:

- Transfer of incoming waste to the active cell face of the landfill.
- Compacting and daily cover of active cells to reduce water ingress and nuisance.
- Measurement and reporting of incoming waste (type and quantity).
- Receipt of Waste Disposal Levy payments (determined by the type and weight of waste material) and reporting of receipts (commonly using digital systems).
- Monitoring of leachate or stormwater run-off, biogas, odour and windblown dust or litter.
- Vehicle refuelling, cleaning and maintenance.

CDEM Groups and council waste officers when developing emergency waste plans should consider how these features and operations can be maintained following an emergency event.

2.2.6 Resource recovery

Some waste can be recycled or reused, which reduces waste volume and preserves limited and valuable landfill space. Where there is time, space and the resources available, and these materials can be separated on-site, or waste may need to be transported to a more appropriate location for processing.

Providing organic biodegradable wastes such as food, vegetation and animal waste can be separated from non-biodegradable wastes, enables these wastes to be managed through composting or digestion. This can reduce the nuisance properties of wastes such as rotting foodstuffs, which includes odour, leakage, rats, flies and biogenic methane emissions.

Inorganic waste such as rock, soil, and rubble can be used for site development where it is free from contamination. Reuse options include the construction of embankments, levelling uneven land and land reclamation.

The economics of resource recovery are an important consideration, and recovery will only be financially viable where recovery revenues exceed processing costs. CDEM Groups and council waste officers planning resource recovery should estimate operating costs, the market for recovered resource and anticipate changes in demand and value. It is also important to avoid loss of value along the waste value stream, as potential revenue can be reduced by 'picking' high value items, damage in transit, poor segregation or cross-contamination.

Following a disaster, recovery agencies must weigh the increased demands of resource recovery against the urgency of service restoration, the standards of the renewed environment, and efficient use of available landfill capacity.

2.2.7 Illegal activity

Illegal waste dumping (fly tipping) can occur where people want to avoid disposal fees or have a waste that will not be accepted at a convenient disposal facility, so dump their waste on private or public land. Other illegal activities include disregard for waste disposal site classifications (e.g. concealing hazardous material in non-hazardous waste), movement by unlicensed contractors, disposal at unapproved disposal sites or site contamination. Illegal dumping effectively transfers the waste management problem to somebody else and may cause public health risk or environmental problems. Illegal activity needs to be monitored and regulated by TAs and other public authorities[8], which diverts resources away from legitimate waste management and recovery activities.

The illegal dumping of waste can increase after disasters as access to disposal facilities and people's ability to pay disposal costs are potentially reduced. CDEM Groups, TAs and other public authorities may consider whether offering free disposal of waste or reduced disposal costs at waste disposal facilities makes appropriate waste disposal more palatable. Increased monitoring and regulation of fly tipped wastes may also deter illegal waste disposal.

2.2.8 Health and safety considerations

Waste materials may have hazardous properties (physical, chemical or biological) which present a health or safety risk to those dealing with them, and a contamination risk for soil and water resources if they escape containment. All participants engaged in response and recovery operations must manage hazardous waste materials in compliance with relevant health and safety legislation and established sector or WorkSafe guidelines. Waste in the community may also present a significant risk to members of the public, who may be unaware of the hazardous

[8] Public authorities as defined in the Litter Act 1979.

properties or lack appropriate protective equipment. While contamination can be confirmed by testing, the approach should be to assume a waste is contaminated unless testing or other evidence proves it is not.

2.3 Stakeholders in waste management

2.3.1 Territorial authorities

The following legislation imposes waste and emergency waste management obligations on the 67 territorial authorities.

- The Health Act 1956 requires territorial authorities to provide sanitary works *"….for the collection and disposal of refuse, nightsoil and other offensive matter"*, which includes the infrastructure and appliances associated with collection and disposal.
- The Local Government Act (LGA) 2002 requires territorial authorities to assess the provision of 'other sanitary services' within their district and empowers them to make bylaws to regulate waste management, trade waste and solid waste, and to develop Waste Management Plans. They are also required to consider waste management issues in their Long-Term Plans and Infrastructure Strategies. The LGA also requires territorial authorities to make provision for wastewater drainage, treatment, and disposal (which includes trade waste).
- The Waste Minimisation Act 2008 requires territorial authorities to promote waste minimisation practices and develop Waste Management and Minimisation Plans (WMMPs). It also imposes the Waste Disposal Levy to raise revenue for waste minimisation activities. Half of the Waste Disposal Levy receipts are used to fund territorial authority waste minimisation activities outlined in their WMMPs such as waste recovery, recovery and reuse that divert it away from disposal facilities.
- The Resource Management Act 1991 requires territorial authorities to manage land use in their district, which can include identifying waste disposal sites and securing the necessary resource consents for their establishment and operation.
- The Litter Act 1979 makes it an offence to litter in public places, which includes fly tipping. It empowers territorial authority and other public authority Litter Control Officers to issue fines for littering offences.
- The CDEM Act 2002 requires territorial authorities to establish a joint CDEM group, which should identify and understand hazards and risks in their district, implement viable measures to reduce their impact, prepare CDEM Plans and implement them where needed. Councils must also ensure their business continuity. They are also required to fully operate during and after an emergency, ensuring that essential services such as roads, power, water supplies and waste management services remain available.

2.3.2 Unitary authorities

The 6 unitary authorities amalgamate the functions of territorial authorities (see previous) and regional councils (see next).

2.3.3 Regional councils

The Resource Management Act 1991 makes 10 regional councils responsible for the integrated management of natural and physical resources within their region, via their strategies, regional plans. This includes issuing resource consents for the establishment, operation, closure, and

monitoring of waste management facilities. Landfills require separate consents for the discharge of contaminants to land, water or air.

Regional plans must consider climate change impacts on disposal facilities, such as the increasing risk of flooding, coastal inundation and erosion. Regional councils are also required to investigate waste dumping and incineration in the coastal marine area, and to identify and monitor contaminated land. They can also encourage waste reduction, reuse and recovery, support waste minimisation activities and take enforcement action where required.

2.3.4 Waste management contractors

Waste management contractors are generally private companies that provide waste services to councils, commercial clients, industrial companies and the public. Waste services can include demolition, haulage, recovery and disposal services, including kerbside collection of household waste, recyclable materials, and collection of commercial, industrial and agricultural waste.

Waste contractors may also operate or manage waste recovery and disposal facilities, such as transfer stations, general disposal sites, and hazardous waste management establishments. These contractors are obligated to adhere to applicable resource consent conditions and contractual terms, which may include specific responsibilities during emergency situations. While the duties of waste contractors are defined by their contracts, these requirements are structured to ensure alignment with the legislative responsibilities assigned to the Territorial Authority (TA). Disposal facility operators (DFOs) are obligated by the WMA and the Waste Minimisation (Calculation and Payment of Waste Disposal Levy) Regulations 2009 to comply with legislative requirements concerning levy payment and the recording and submission of waste-related information. In exceptional circumstances, a DFO can request a waste levy waiver from the MfE.

While waste contractors do not have specific legislative obligations to participate in response and recovery activities, in a state of emergency the CDEM Controller may requisition their services or equipment to support response or recovery efforts. Where resources are requisitioned, affected parties can apply to the CDEM group for reasonable compensation for use, loss, or damage.

2.3.5 Waste sector groups

Members of the following sector groups are involved in aspects of waste management in New Zealand.

The Waste Management Institute of New Zealand (WasteMINZ)

WasteMINZ provides information and networking for its members and represents member interests. It focuses on waste, resource recovery, and contaminated land. It also has a Disaster Waste Working Group.

The Waste and Recycling Industry Forum

This group represents the interests of service providers involved in waste collection, recovery, and disposal. It operates under the umbrella of the Auckland Business Chamber and advocates for its members and raise public awareness and understanding.

Aggregate & Quarry Association (AQA)

AQA represents members who aggregate, limestone and allied products on all manner of industry, government, health and safety, technical and other issues. Quarries also supply allied raw materials such as limestone which help keep our farms productive. AQA member also operate landfills and cleanfills.

NZ Demolition and Asbestos Association (NZDAA)

The NZDAA provides standards, guidance and training for the removal and safe disposal of asbestos containing materials.

Civil Contractors NZ

This group represents the interests of members from the civil engineering, construction, and general contracting sectors. Its members are widely involved in demolition and haulage work, use of heavy machinery and the design, construction and operation of disposal facilities.

NZ Association of Metal Recyclers (NZAMR)

NZAMR is the professional association for New Zealand's metal recovery industry. Members include recyclers through to large-scale processors and end-users of recycled metals.

Sector Coordinating Entities (SCE)

Lifeline utilities[9] provide essential services including electricity, gas, water, telecommunications and transport. They are required to maintain services as practicable following disaster events, which may involve waste management. During a disaster response, the incident management team will engage with relevant SCEs to monitor sector response and recovery operations and support service restoration.

Water NZ

This not-for-profit organisation provides leadership and representation for water sector operators. It promotes best practice and management for the Three Waters (potable, wastewater, and stormwater).

2.3.6 Central government departments

The following central government departments are involved in aspects of waste management. Many government agencies also generate waste through their operations - i.e. MoH, NZDF, Department of Corrections, NZ Customs, and Kainga Ora.

Ministry for the Environment (MfE)

MfE provides national leadership on waste management in emergencies. It administers the Waste Minimisation Act 2008 and Waste Minimisation Fund, waste levy waivers and exemptions, and supports good practice in waste management, including contaminated land and closed disposal facilities. MfE also administers the Emergency Waste Fund, which can assist councils with emergency clean-up and repairs to damaged waste infrastructure. MfE is the administering department for the Resource Management Act 1991 and the Hazardous Substances and New Organisms Act 1996, providing policy leadership, national direction and guidance, including on emergency provisions and regulatory relief.

Environmental Protection Authority (EPA)

The EPA is the national regulator for hazardous substances under the HSNO Act. It approves hazardous substances and sets system-level controls for their safe management, including disposal requirements. The EPA regulates the import and export of hazardous waste, including e-waste and plastic waste, administers international obligations such as the Basel and Waigani

[9] Designated sectors are: electricity, gas, fuel, telecommunications, transport (road, rail, aviation, maritime), water, ports and airports (specified in Schedule 1 of the CDEM Act 2002).

Conventions, and approves HSNO codes of practice. Enforcement of hazardous substance controls is shared with other regulators depending on context.

WorkSafe New Zealand

WorkSafe is the regulator for the Health and Safety at Work Act 2015. In an emergency waste context, this includes managing risks to workers and others from hazardous substances, machinery and equipment, and sharp or dangerous materials. WorkSafe enforces the Health and Safety at Work (Hazardous Substances) Regulations 2017 in workplaces, including requirements for the safe storage, labelling and handling of hazardous substances and hazardous waste which could include chemicals or contaminated water and soil recovered during a response. PCBUs must ensure appropriate controls are in place, including personal protective equipment where required.

2.3.7 Other stakeholders

Other stakeholders with interests in disaster waste management include the following.

Water Services Authority (WSA)

WSA ensures all communities have access to safe and reliable drinking water. The treatment process for drinking water produces sludge which requires appropriate disposal.

Insurance Companies

Insurers may have policy obligations to deal with disaster waste collection and disposal. NEMA has signed a memorandum of understanding with the Insurance Council of New Zealand (ICNZ) and the Natural Hazards Commission (NHC), which references a ‘waste’ workstream to consider the role and responsibilities of parties involved in the clean-up of disaster debris and silt from flooding and ash from volcanic eruptions.

Iwi Māori

Iwi Māori are often involved in community response recovery efforts, with waste related involvement including working closely with Councils in recovery to ensure Treaty partnership is upheld.

Communities

Communities may not have formal waste management responsibilities during emergency response and recovery (other than for waste at their own property), they are expected to cooperate with those delivering response and recovery activities.

Businesses in urban and rural areas may not be able to operate without adequate waste disposal arrangements in place. While rural operations may have space for temporary waste storage, this may have environmental consequences or increase the risk of nuisance.

Volunteer and support groups may form to help communities deal with waste management challenges. Examples include the Student Volunteer Army helping to remove liquefaction silt in Christchurch, the Silt Removal Taskforce clearing affected property in Hawkes Bay, and Enhanced Taskforce Green’s clean-up support for farmers, growers and other producers.

Section 3 Emergency management system

3.1 National Governance

The Minister (and Associate Minister) for Emergency Management and Recovery oversees the emergency management system, coordinates government response and recovery efforts. Ministers can declare a state of national emergency and a national transition period, during which the Director of Civil Defence Emergency Management assumes control and NEMA manages the response via the National Crisis Management Centre.

The Officials Committee for Domestic and External Security Coordination (ODESC) is a group of Government Chief Executives that may activate in response to a national emergency. Its role is to assess risk, agree priorities and advise relevant Ministers. ODESC is informed by Watch Groups and inter-agency working groups.

NEMA provides national strategic and policy guidance for emergency management. NEMA is also the steward, operator and assurer of the emergency management system.

CDEM Groups lead practical disaster response activity in collaboration with emergency services, with support from NEMA and other Government departments where necessary (see Table 3.1). Emergency Operations Centres (EOC) coordinate disaster response at a district level while Emergency Coordination Centres (ECC) coordinate a regional response if needed. The lead for disaster events of national significance is determined by the causal hazard and operates from a national coordination centre (NCC) or the national crisis management centre (NCMC).

Hazards	National	Regional/Local
Geological/meteorological hazard, infrastructure failure	NEMA	CDEM group
Animal/plant pests & disease (biosecurity), food safety, rural drought	MPI	
Human infectious disease (pandemic)	MoH	Health NZ
Terrorism, major transport accident	NZ Police	
Urban fire, wildfire, hazardous substance incident	FENZ	
Maritime incidents	Maritime NZ	Regional council
Radiation incident	MoH	FENZ

Table 3.1 Lead Agencies for Emergencies (national, regional and local)[10]

[10] Source: National Civil Defence Emergency Management Plan Order 2015

3.2 The four R's of Emergency Management

New Zealand's integrated approach to emergency management can be described by the four areas of activity, known as the '4 R's (risk reduction, readiness, response, and recovery).

Risk Reduction

Identifying and analysing long-term risks to human life and property from hazards; taking steps to eliminate these risks if practicable and, if not, reducing the magnitude of their impact and the likelihood of their occurring.

Readiness

Developing operational systems and capabilities before an emergency happens including self-help and response programmes for the public, and specific programmes for emergency services, lifeline utilities, and other agencies.

Response

Actions taken immediately before, during, or directly after an emergency to save lives and protect property, and to help communities recover.

Recovery

The coordinated efforts and processes to bring about the immediate, medium-term, and long-term holistic regeneration of a community following an emergency.

Figure 3.1 illustrates how the primary responsibility for emergency management changes across the four 'R's and how local response and recovery efforts may be supplemented by regional or national resources. Organisations and individuals should ensure their own readiness and resilience and look to their community or sector for support in the first instance. Following a disaster, emergency services may be needed to help save life, protect property or reduce risk. CDEM groups can provide further help if needed during response and transition to recovery. Support during the longer recovery period is typically provided via councils, with coordination and support available from government departments or a recovery agency if needed.

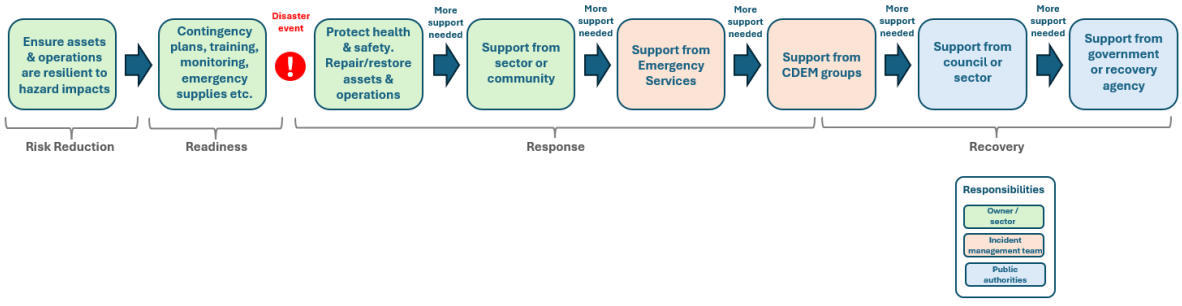

Figure C.1 Responsibilities for Emergency Management across the '4R's'

3.3 Coordinated Incident Management System (CIMS)

New Zealand uses the Coordinated Incident Management Structure (CIMS) to allocate appropriate resource and decision making in response to emergency events. This system acknowledges that first responders may not have sufficient resource, and that local regional or national support may be needed to ensure an adequate response. CIMS provides an operating

model that enables multiple organisations to collaborate effectively during an emergency response. It is used by NEMA, other central government agencies, CDEM groups, lifeline utilities, communities, Iwi Māori and businesses, and is supported by agreements with other domestic and international partners. While CIMS was developed to guide response, some aspects may also be carried through into recovery, such as maintaining Intelligence, Welfare and PIM functions.

Figure 3.2 summarises how the different CIMS functions take information from different sources to develop situation reports during response and recovery that inform decision making and the development of an Action Plan which is then put into effect by collaboration amongst several functions. It also illustrates key engagements outside the response team, with the Minister for Emergency Management being informed by NEMA's National Controller or the Director and other ministers being informed via ODESC, and the Recovery Manager aligning actions with a Recovery Agency (if established). Public communication and media releases are handled by the Public Information Management (PIM) function.

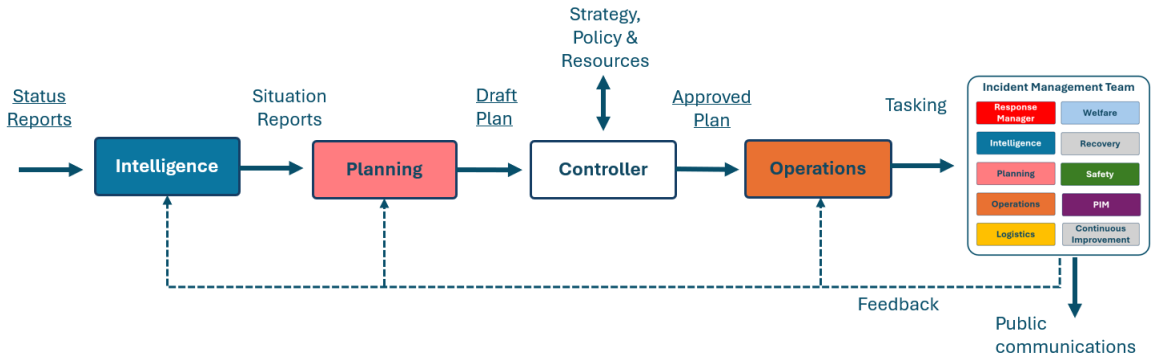

Figure D.2 Information flow between CIMS Functions in the IMT

Table 3.2 summarises how CIMS functions are likely to engage with different aspects of disaster waste management during response and recovery.

Function	NCC/NCMC	ECC	EOC
Controller	Ensure Action Plan adequately addresses waste management		
Recovery Manager	Ensure the Transition Plan and Recovery Action Plan adequately address disaster waste management		
Intelligence	Collate information/data on waste location, classification, quantity, presence of hazardous substances, risk, disposal options, transport constraints		
Planning	Incorporate waste removal, transport, interim storage, disposal and sector coordination into Plans		
Operations	Engage with MfE, NZ Insurance Council, NHC, MPI, MNZ to support protocols for integrated waste removal	Engage with local councils, waste contractors, insurers, regional councils & Iwi Māori to agree responsibilities & protocols for integrated waste removal	Engage with local councils, contractors, insurers, Iwi Māori & volunteers to arrange clean-up

Function	NCC/NCMC	ECC	EOC
Lifelines	Engage with: • MfE (Sector Coordinating Entity) on sector capacity to manage issues, use of Emergency Waste Fund. • NZTA/MoT (transport challenges) • LUCs (status, issues, priorities & plans)	Engage with: • Regional councils (consenting & environmental issues) • Councils/contractors (collection & disposal challenges) • NEMA (status, issues, priorities & plans)	Engage with: • Regional councils (consenting & environmental issues) • Councils/contractors (collection & disposal challenges) • NEMA (status, issues, priorities & plans)
	Promote use of the Disaster Waste Management Guidelines.		
Logistics	Support efforts to secure equipment (excavators, trucks) and materials needed for waste management in affected areas		
PIM	Inform Minister & public about waste-related impacts, risk and management plans	Inform public about waste-related impact, risk and management plans	Inform public about risk, community collections & disposal options
Finance	Assess funding needs & sources (for waste collection, transport & disposal). Note allocation & track expenditure.	Monitor expenditure on waste collection, transport & disposal	Monitor expenditure on waste collection, transport & disposal, & use of Mayoral Relief Fund
Legal	Assess need for secondary legislation to deal with waste challenges	Assess need for resource consents for storage & disposal	
Safety	Ensure risks are understood and adequately mitigated (e.g. handling & disposal of hazardous substances) during response and recovery		
Welfare	Engage with: • Councils (community needs) • MoH (public health risk) • MSD & IRD (support options)	Assess regional priorities for community support. Engage with volunteer support groups for waste removal and resource recovery.	Assess community needs and risk exposures. Engage with volunteer groups to support clean-up.
Advisory	Technical data on waste properties/quantities/risks/forecasts		

Table 3.2 CIMS function interests in disaster waste management

3.4 Levels of Emergency Management

Table 3.3 summarises the CIMS functions that may be activated in a response at national, regional and local level. Some of these functions may extend into recovery.

CIMS recognises the following four levels of emergency response, with response activity scaled up or down according to circumstances and resource needs:

Incident

Incidents typically include events such as car accidents, fires, and structural defects etc. and are managed by local agencies and first responders. If further resource or coordination is required, the incident escalates to the district level EOC or the regional level ECC.

Local

A local level response is usually activated to coordinate a response involving multiple incidents or organisations. The local authority Civil Defence Group is the lead agency, operating out of the EOC, led by the Controller (although other agencies may lead or provide support if circumstances dictate). Marae, community organisations, volunteers, and the community play key roles at the local level, particularly in getting ready for and responding to emergencies. If further resource is required, the incident escalates to the regional CDEM group. The impact of an incident may span multiple local authority areas, so activate multiple local CDEM groups.

Function	NCC/NCMC (National)	ECC (Regional)	EOC (Local)
Controller	Ensure Action Plan adequately addresses waste management		
Recovery Manager	Ensure the Transition Plan and Recovery Action Plan adequately address disaster waste management		
Intelligence	Collate information/data on waste location, classification, quantity, presence of hazardous substances, risk, disposal options, transport constraints		
Planning	Incorporate waste removal, transport, interim storage, disposal and sector coordination into Plans		
Operations	Engage with MfE, NZ Insurance Council, NHC, MPI, MNZ to support protocols for integrated waste removal	Engage with local councils, waste contractors, insurers, regional councils & Iwi Māori to agree responsibilities & protocols for integrated waste removal	Engage with local councils, contractors, insurers, Iwi Māori & volunteers to arrange clean-up
Lifelines	Engage with: • MfE (Sector Coordinating Entity) on sector capacity to manage issues, use of Emergency Waste Fund. • NZTA/MoT (transport challenges) • LUCs (status, issues, priorities & plans)	Engage with: • Regional councils (consenting & environmental issues) • Councils/contractors (collection & disposal challenges) • NEMA (status, issues, priorities & plans)	Engage with: • Regional councils (consenting & environmental issues) • Councils/contractors (collection & disposal challenges) • NEMA (status, issues, priorities & plans)
	Promote use of the Disaster Waste Management Guidelines.		
Logistics	Support efforts to secure equipment (excavators, trucks) and materials needed for waste management in affected areas		
Tākaihere	Ensure appropriate involvement of Iwi Māori		

Table 3.3 CIMS function interests in disaster waste management

Regional

A CDEM Group represents a consortium of the territorial authorities in a region, and coordinates arrangements for emergency management within their group area (a unitary authority may be the CDEM group). During response, CDEM groups identify hazards, reduce risk exposures, prepare for emergencies, respond when needed and lead the recovery afterwards. The CDEM response will involve coordination of territorial authorities, emergency services, Iwi Māori, and others. If further resource is required, the incident escalates to the national lead agency.

National

The National Emergency Management Agency (NEMA) is the Government lead for emergency management. NEMA provides strategic leadership and contributes across the 'four R's'. NEMA ensures coordination at local, regional, and national levels during emergencies (whether a state of emergency is in place or not). Nationally, NEMA works with central and local government, national organisations, Non-Government Organisations (NGOs) such as Red Cross, communities, Iwi Māori, and business. Depending on the type of emergency, other agencies may be the lead agency with the primary mandate for managing the response (see Table 3.1). For example, the response to the COVID-19 pandemic was led by the Ministry of Health.

3.5 State of Emergency Declarations

A state of emergency can be declared where an emergency caused (or may cause) loss of life, injury or in any way endangers the safety of the public or property and cannot be adequately dealt with by emergency services. The declaration is intended to help authorities respond to an emergency at local, regional, or national level. The powers to declare a state of emergency vary with the geographic scale of the emergency, as summarised in Table 3.4.

Extent	Declared by	Declaration
Territorial authority	Mayor (or elected member nominee), CDEM group appointee, Minister	Local State of Emergency or Transition Period
Regional	CDEM group appointee, Minister	
National	Minister	National State of Emergency or Transition Period

Table 3.4 Powers of Declaration (source: CDEM Act 2002)

Those managing response activities during a state of emergency may request to control access, requisition property or to require support from public and private organisations (subject to compensation provisions).

Various legislative acts, such as the Resource Management Act 1991, Health Act 1956, and Biosecurity Act 1993, provide emergency powers that may be exercised by government agencies, local authorities, and utility network providers following the declaration of a state of emergency. These powers are designed to mitigate or prevent the consequences of an emergency and are particularly relevant to disaster waste management. They include the authority to clear roads, restrict public access, control traffic, remove vehicles, aircraft, or vessels, and manage deceased persons or animals.

Territorial authorities, regional councils and government agencies such as NZTA can request suspensions or changes to legislation (e.g. suspension of certain provisions that could impede their activity) from NEMA NCC/NCMC and/or the agency administering the specific legislation.

3.6 Emergency Works and Regulatory Relief

Emergency works and powers may be exercised when preventive or remedial action is necessary to address environmental harm or an event that is causing, or has the potential to cause, loss of life, injury, or significant property damage. Sections 9 and 12-15 of the RMA impose restrictions on land and water usage as well as environmental discharges. During a declared state of emergency, these limitations do not apply to authorised individuals (see section 330) operating under emergency powers. Individuals without appropriate delegation are not permitted to exercise these powers.

It is important that authorised persons consider whether using the RMA powers is the most appropriate option in the circumstances before starting emergency works. Where emergency works would otherwise have required a prior resource consent, the consenting authority must be notified within seven days of commencing the activity and an application submitted within 60 working days of notification.

If necessary, response or recovery actions exceed what is permitted under emergency powers, the Governor-General can, by Order in Council (OIC), enact emergency response regulations under the RMA to permit or allow these activities, provided the Minister for the Environment is satisfied that:

- The works are needed and are no broader than necessary.
- Potential environmental effects have been considered (including how any adverse effects can be avoided, remedied, or mitigated).
- There has been significant consultation with affected stakeholders.

The OIC process can be lengthy, typically taking over three months to enact. OICs have been used to relax regulatory requirements such as allowing open burning or the establishment of waste management and disposal facilities (temporary and permanent).

Emergency powers are may also be available under the Public Works Act 1981, Biosecurity Act 1993, and the Hazardous Substances and New Organisms Act 1996. Many of these provisions confer general powers, rather than being specific to disaster waste management.

3.7 Transition periods

CIMS response structure does not apply to recovery. There is a transition where response operations led by the Controller transfer to recovery operations led by the Recovery Manager. The process for this transition is defined in the Response to Recovery Transition Plan, while the Recovery Action Plan presents recovery objectives, actions, priorities, responsibilities and governance arrangements. The end of recovery is effectively the point at which recovery objectives have been achieved.

A transition period can be declared to smooth this transition from one system to another and is initiated by a formal declaration (see table 3.2). A formal declaration provides the Recovery Manager with access to a range of powers to smooth the shift from response to recovery. Local transition can last up to 28-days while national transition periods are 90-days, although there is an option to extend both where justified.

Disaster waste management considerations may be addressed in the Transition Plan and the Recovery Action Plan.

3.8 Stakeholders in emergency management

3.8.1 Emergency services

The primary emergency response agencies in New Zealand are Fire and Emergency New Zealand (FENZ), New Zealand Police and ambulance services. Other specialist response groups may also be established to deal with incidents at ports, airports, and major facilities, while urban search and rescue (USAR) services may be mobilised during the response to major and severe emergencies in urban centres (possibly including international contributions). First responders assess the situation and establish an incident control point to organise their response to save life, reduce damage to property and make the scene safe. They deal with incidents such as accidents, fire, hazardous substance release, flooding, storm damage and slips. This may require them to coordinate with other organisations to support their response (e.g. health, welfare, and disability services), control access or evacuate people as necessary. Where first responders lack sufficient resource to resolve an incident, it is escalated via the CDEM system to secure the necessary support. Emergency services have no role or responsibility for Emergency Waste Management.

Fire and Emergency New Zealand (FENZ)

FENZ is the lead agency for emergencies involving fire and hazardous substances. It is largely funded by a levy on property fire insurance contracts. While FENZ will respond to a fire or hazardous substance event, the property owner is responsible for dealing with debris arising.

NZ Police

The roles of NZ Police in emergency response include traffic control, conducting search and rescue, enforcing evacuation orders and victim identification to assist the coroner.

New Zealand Defence Force (NZDF)

In times of emergency, NZDF may be asked to perform public services or assist the civil power where local and regional civil defence assets are insufficient to meet demand, and the NZDF can maintain operational outputs and missions. The CDEM Incident Controller (at local, regional, or national level) can request support at short notice via NZDF Headquarters. NZDF determines which resources will be deployed to support an emergency, and NZDF personnel deployed remain under military command, but may be tasked by the CDEM group where appropriate. While they are authorised to save life in any circumstance and respond to requests from NZ Police, they are not authorised to exercise NZ Police powers. The NZDF may participate in emergency planning and exercises.

3.8.2 CDEM Groups

CDEM groups work with local stakeholders to plan the establishment and operation of waste collection and disposal activities following an emergency. These arrangements are formalised at a high level in CDEM plans (such as a district-specific Disaster Waste Management Plan).

The CDEM Act 2002 defines the roles and responsibilities of organisations involved in preparing for and responding to emergencies. It requires territorial authorities and regional councils to plan and provide for civil defence emergency management within their district and requires regions to establish a CDEM group that includes representation from each Territorial authority in the region. A CDEM group Controller can declare a local state of emergency, which enables CDEM groups to exercise a range of powers. The emergency powers relevant to Emergency Waste Management in an emergency are:

- Carry out rescue and recovery works.
- Close or clear roads and other public places (including vehicle removal).
- Remove or dispose of dangerous structures and hazardous substances.
- Prohibit or regulate land, air, and water traffic.
- Urgently remove human bodies and animal carcases to protect public health.

When using emergency powers to manage disaster waste, CDEM groups should collaborate with local authority waste managers as they have the primary responsibility for waste management. It may also be necessary to bring in technical specialists to inform decision making (such as geotechnical engineers and hazardous substance experts).

Local CDEM response and recovery

Most territorial authority districts have a CDEM EOC. It is staffed by CDEM representatives from affected districts and can call in technical expertise where required. Where an emergency is very significant or involves more than one territorial authority district, control of the incident can be escalated to the regional CDEM group, or an independent regional recovery office may be established.

Regional CDEM response and recovery

Regional CDEM groups are established when the Group Controller declares a state of emergency and establishes an emergency coordination centre (ECC) to coordinate the response, control access to dangerous areas, provide public information and where necessary, provide temporary accommodation, food, and water. The CDEM group can establish a National Control Centre (NCC) and regional recovery office if needed, and request support from NEMA or other Government departments.

3.8.3 Territorial Authorities

Local councils and unitary authorities (including their contractors) implement a range of community-based emergency works that support CDEM response and recovery activities. This may involve activities such as clearing local roads, unblocking drains, setting-up cordons, assessing building damage, dealing with unsafe structures and waste removal. Territorial authorities are commonly responsible for commissioning and constructing coastal protection works where they protect public assets or communities, such as roads, parks, reserves, and urban areas above mean high water springs. This includes council-led protection schemes like seawalls or bunds to protect settlements and infrastructure. Regional Councils

Regional councils are responsible for responding to tier 2 marine oil spills that affect coastal waters and shorelines within their jurisdiction. Response involves the collection and disposal of large quantities of contaminated material such as oil, flotsam and contaminated sand and shoreline debris.

Regional councils are also responsible for providing and maintaining flood management assets[11] that deliver levels of protection specified in territorial authority long term plans. Failure of these assets can generate large quantities of flood debris including: silt and boulders from river channels; woody debris from vegetated catchments; damaged structures, vehicles and furnishings from developed areas; hazardous substances from industrial areas; fencing and agricultural chemicals from farmed catchments; and waste eroded from historic disposal facilities.

3.8.4 Government departments

National Emergency Management Agency (NEMA)

NEMA leads the response and recovery efforts for national emergencies arising from geological hazards, meteorological hazards and infrastructure failure, in collaboration with regional and local CDEM groups. NEMA manages the national crisis management centre (NCMC) and National Coordination Centre (NCC) in Wellington, and the alternative National Crisis Management Centre in Auckland. NEMA also hosts the National Recovery Coordination Group (NRCG) standing committee, and the National Recovery Office (NRO).

NEMA supports CDEM group efforts during disaster response where needed and coordinates the involvement of other government departments in emergency response. NEMA may also engage with local government, communities, Iwi Māori, and business to make sure responses to and recovery efforts are effective and integrated. which may include coordinating central government support for disaster waste management.

Ministry of Transport (MoT)

MoT is the Government's system lead for all forms of transport (road, rail, maritime and aviation) and acts as steward and Sector Coordinating Entity for the transport sector. MoT's operational functions are delivered through operational agencies for roads (NZTA), rail (KiwiRail), ports (Maritime NZ) and airports (Civil Aviation Authority). MoT also leads the Transport Response Team (TRT) which may be involved in the disposal of waste arising from disaster events and accidents.

NZ Transport Agency (NZTA)

NZTA manages the state highway network, which includes roads, culverts, bridges, tunnels, and other associated structures. It may close roads if there is urgent risk of damage or danger and can remove buildings and trees where required. Its operations may involve the removal and disposal of debris from roads following accidents and natural hazards such as earthquake, landslide, flood, fire, cyclone, and tsunami. NZTA is also the rail regulator.

KiwiRail Holdings Limited (KiwiRail)

KiwiRail is a state-owned enterprise which manages the Government's rail and ferry businesses and is responsible for their operation and maintenance. While KiwiRail owns the tracks, it leases rail corridor land from the NZ Railways Corporation. Urban networks such as Auckland One Rail and Wellington's Metlink operate on the rail network under contract to KiwiRail.

[11] Flood control assets include stop banks and flood gates.

Maritime NZ

Maritime NZ administers New Zealand's maritime safety framework, which includes maintaining the New Zealand Oil Spill Response Strategy and the National Contingency Plan and leading the response to major maritime incidents. The Strategy provides the framework for responding to marine oil spill incidents, led by MNZ's Marine Pollution Response Service (MPRS).

Civil Aviation Authority (CAA)

The CAA oversees civil aviation safety and security on behalf of the Ministry of Transport, which involves collaboration with Airways NZ, airports and airlines.

Ministry of Business, Innovation and Employment (MBIE)

MBIE has a regulatory role for electricity, gas, and fuel sectors, and is the lead agency for fuel-related infrastructure emergencies. MBIE also coordinates rapid impact assessment of buildings following disasters, to determine their structural integrity.

Ministry for Primary Industries (MPI)

MPI manages New Zealand's response to terrestrial biosecurity risks and biological pandemic outbreaks such as Foot and Mouth disease. Such incidents may generate large quantities of plant or animal waste requiring appropriate disposal. MPI is the lead agency for biosecurity emergencies.

Ministry of Health (MoH)

MoH has a National Health Emergency Plan guides the health sector response to disaster waste to avoid transmission of communicable diseases. Waste associated with health sector operations in emergencies includes contaminated materials (e.g. bodies and body parts, other biological waste, medical equipment, and chemicals) and non-contaminated materials (e.g. building waste).

3.8.5 Lifeline Utilities

Lifeline utilities provide essential services that support public health, safety and welfare and functioning of the economy and include specified ports and airports, electricity, gas, fuel and water utilities, transport networks (road, rail, air and maritime), plus telecommunications and broadcasting companies. Lifeline utilities are obliged to function 'to the fullest possible extent' during and after an emergency, even at a diminished level. NEMA welcomes voluntary participation by the waste, cash and payments sectors (which are not currently captured by the lifeline utilities definition. Each lifeline utility sector is represented by a Sector Coordinating Entity, who engages with the CDEM incident response to represent sector interests.

Section 4 Disaster Waste Management

4.1 Disaster waste characteristics

Different disaster events generate different waste types and volumes. Table 4.3 summarises the typical waste streams associated with different disaster types.

Waste Type	Earthquake	Landslide	Eruption	Tsunami	Flood/erosion	High Winds	Disease	Fire	Drought	Transport Accident
Sediment/soil/sand	X	X	X	X	X					
Rock/rubble	X	X	X	X	X					
Sludge/mud	X	X	X	X	X					
Wastewater	X		X	X	X					
Contaminated water			X	X	X			X		X
Ash/dust			X					X	X	
C&D waste	X	X		X	X	X		X		X
Woody/timber waste	X	X		X	X	X		X		
Charred wood			X					X		
Green waste	X	X		X	X	X				
Food waste	X			X	X					
Sanitary waste	X			X	X					
Corpses/Coronial waste	X	X	X	X	X		X	X	X	X
Animal carcasses			X	X	X	X	X	X	X	
Metallic waste/vehicles	X	X		X	X	X		X		X
Whiteware	X			X	X			X		
Packaging	X		X	X	X		X		X	X
Fixtures/fittings	X			X	X	X		X		
Hazardous Substances	X	X	X	X	X	X		X		X

Table 4.3 Typical Disaster Waste Streams

The following paragraphs introduce characteristics of some of the more commonly encountered disaster waste streams.

Slip, flood and storm debris

This class of waste is often a mixture of silt, rock and woody debris, that may block roads, choke waterways or accumulate in lowland and beach environments. Its composition reflects that of the contributing catchment and debris is often saturated by rain or flood water, making it harder to handle. In rural areas, this waste may also contain large amounts of fencing wire, which creates a challenge for waste collection and segregation. There is also a risk that this waste may be contaminated by chemicals released into the contributing catchment during the disaster event.

Volcanic Ash and Liquefaction Silt

Both volcanic ash and liquefaction silt can occur in very large quantities and affect large areas. Volcanic ash has a very fine particle size which is abrasive (accelerates mechanical wear and tear, scratches windscreens) and conductive (affects electrical systems). It forms a slurry when wet that sets like concrete and can accumulate on power lines causing them to fail. Liquefaction silt appears as sand boils that can spread a fine-grained slurry over large that can smother surfaces, block drains and raise ground level. As ground liquefaction reduces the loadbearing capacity of soil, it can also damage roads, buildings and other structures and partially bury vehicles, adding to the disaster waste challenge.

Residential, industrial and commercial waste

People will typically try to clear disaster debris from their property (e.g. furniture, fixtures, carpet, foodstuffs), but without suitable waste disposal options they may try to store the waste on their property or nearby sites or dispose of it illegally. Even where disposal sites are available, access to them may be difficult due to transport disruption or fuel shortage, or people may be discouraged by long queues. This can result in private waste disposal challenges becoming community challenges and may present a risk to health or the environment. It is important that CDEM Groups and territorial authorities provide communities with clear and practical advice on appropriate disaster waste management.

Sanitary waste

Drainage and sewerage systems can be damaged by earthquakes and slips, or overflow due to flooding, blockage or power failure. This increases the risk of community exposure to communicable disease or public health nuisance, particularly where people are living in temporary or overcrowded conditions. Collection or burial of solid sanitary waste following a disaster may be an appropriate short-term solution, but the need for collection and off-site disposal increases with time (using approaches such as portable toilets, long drops or bucket collection systems). Flooding can also cause silt to accumulate in septic tanks, reducing their treatment effectiveness.

Coronial waste

Where bodies may be trapped in collapsed structures or damaged vehicles, they must be collected by the Police on behalf of the coroner, to confirm their identity and cause of death. FENZ, urban search and rescue (USAR) teams may identify coronial waste, and the Police will advise whether it should be securely stored in situ or removed. Where a disaster event causes multiple fatalities, it may be necessary to establish a temporary mortuary pending coronial examination.

Medical waste

A disaster event will also impose demands on medical facilities treating the sick and wounded. Treatment or welfare facilities established in the community will introduce new waste streams that will require appropriate waste management services. This can include sanitary waste, biohazard material, food waste and packaging. Packaging. Medical facilities should have business continuity plans in place, that consider how medical wastes are to be managed and how medical facilities should collaborate with territorial authorities to ensure effective waste management.

4.2 Disaster Waste Impacts

4.2.1 Disaster Waste Impacts on Communities

Disaster events can create substantial waste management challenges for communities, presenting risk to public health, safety and the environment, and nuisance from pests and odour (see Table 4.1). Waste management challenges have greater significance where they impede the response, slow recovery, or present a risk to public health. Disaster waste clearance can have long-term consequences in communities. Floods, slips and other natural disasters can deposit thousands of tonnes of material (e.g. sediment, boulders, vegetation) onto property and roads that can take months or years to remove. Flood debris[12] can also be washed downstream or along the coast, affecting other communities.

Immediately following a disaster event, affected communities may need to deal with waste to prevent nuisance, health risks or further property damage. As territorial authority resources are likely to be committed elsewhere, residents and businesses may need to deal with disaster waste to enable access, prevent erosion, provide drainage or prevent nuisance. If drainage networks are damaged, they may also need to safely dispose of domestic waste (including sanitary waste). Once waste collection services start to return, they may need to stockpile damaged items where they can be collected. Factors that can further complicate disaster waste collection and disposal include the presence of human remains, the presence of hazardous substances, impacts on sacred sites, marae or cultural artefacts, and shortage of fuel or funds to support disaster waste management efforts. Response and recovery activity can also introduce new waste streams that increases pressure on waste management systems (e.g. medical waste and used overalls from response, or demolition waste, packaging and building waste from demolition and reconstruction activity).

Direct Disaster Waste Impacts on Communities	Causal Hazards
Silt and rock can bury property, damage utility services, and block transport routes and drainage systems.	Earthquake, landslip, flood, tsunami
Ash accumulations can block drains, coat power lines, contaminate water supplies and cause respiratory issues, while ash plumes can damage aircraft components.	Volcanic eruption
Hazardous substances and other contaminants may leak from damaged containment, contaminating surrounding soil and water and undermining waste recovery.	Earthquake, landslip, flood, tsunami, wildfire
Historic waste disposal sites or contaminated sites may be exposed by flooding or erosion, contaminating land and water and increasing public health risk.	Flood, tsunami, landslip

[12] Flood debris challenges for downstream communities include waste from farms and orchards (dead animals, baleage, shade cloth, plastic wrap, fence poles and fencing wire), slash from forested catchments and sediment from slips and erosion prone slopes, and invasive weed species.

Direct Disaster Waste Impacts on Communities	Causal Hazards
Damaged roads can prevent access to waste disposal facilities (and waste transportation can also damage fragile roads).	Earthquake, flood, landslip
Damaged buildings & structures (fences, power lines, drainage) generate demolition waste that needs to be disposed of.	Earthquake, landslip, flood, tsunami, cyclone, tornado or fire
Damaged fixtures, fittings and furniture can take up a large amount of space during collection and disposal and are not suited to kerbside collection by compacter trucks.	Flood, fire, tsunami, earthquake
Damaged vehicles damaged by are typically written off by insurers and stripped of valuable components before being sent to metal recyclers. There is a risk that uninsured damaged vehicles may be abandoned or repaired for sale.	Flood, fire, tsunami, earthquake
Damaged trees and vegetation generate woody debris that can affect roads, property, watercourses or beaches.	Strong winds, cyclone or tornado
Power outages can lead to freezer failure, resulting in decaying food causing nuisance odours & attracting pests.	Earthquake, landslip, storm
Ground movement can damage pipe and drainage networks, causing leakage or flooding.	Earthquake, landslip
Communicable disease outbreaks may require on-farm culling and disposal of livestock if stock movement is restricted or prohibited.	High pathogenicity avian influenza (HPAI), foot and mouth disease

Table 4.1 Disaster waste challenges facing affected communities

Where normal waste collection and disposal services have been interrupted by a disaster event, councils and contractors will resume services as soon as the conditions allow, but may need to introduce interim arrangements for collection, segregation, storage, and disposal until normal services are reestablished. Until that time, it is important that communities collaborate to deal with disaster waste, as moving waste from one property to another simply transfers the waste problem rather than resolving it. Similarly, illegal disposal of waste can divert resources from other waste management efforts. Public messaging before and following disaster events can guide the community response to waste management, and reduce the risk that waste is dealt with inappropriately.

Community-based groups and rural support trusts may be able to contribute input when deciding on appropriate disaster waste management options, including appropriate transport routes and disposal sites. The Ministry for Primary Industries may also help coordinate support via sector groups such as Federated Farmers, Dairy NZ, or the NZ Forest Owners Association.

4.2.2 Disaster Impacts on Waste Management Operations

Significant disaster events such as tsunami, floods, earthquakes and storms can create a range of challenges for waste collection, transportation, processing and disposal services (see Table 4.2).

Impact on Waste Management Operations	Causal Hazards
Significant increases in disaster waste can overwhelm capacity of transport, storage, disposal & recycling facilities.	Earthquake, landslip, flood, tsunami, eruption, wildfire
Disrupted transport routes & damaged bridges can: • Constrain waste transport to disposal sites (causing delays and increased cost). • Prevent disposal site staff reaching the site. • Increase perishable product waste. • Encourage informal waste disposal (fly tipping, bonfires).	Earthquake, landslip, flood, tsunami, fire, cyclone, tornado, eruption
Damaged or blocked sanitary drainage increases communicable disease risk, requiring the use of temporary alternatives.	Earthquake, flood, tsunami, landslip
Electricity outage affects weighbridge, e-payments, compacter, pumping, lighting, IT, charging of electric vehicles.	Earthquake, landslip, flood, tsunami, fire, cyclone, tornado, space weather
Telecoms outage affects e-payments, vehicle communications & IT systems.	
Water outage affects potable supply, dust suppression, wheel washing, vehicle cleaning, sanitary appliances.	Earthquake, landslip, flood, tsunami, storm
Fuel rationing or unavailability due to power outage affects waste and recycling trucks, back-up generator & site plant (bulldozer, digger, grader, compacter, sorters, etc).	
Shortage of cash prevents waste disposal payments at the gate (if e-payments are down).	Earthquake, landslip, flood, tsunami, space weather
Changed waste composition (e.g. increased co-mingling, contamination) can affect disposal & recovery options.	Earthquake, landslip, flood, tsunami, wildfire
Miscellaneous impacts: • Staff may be unable to attend work due to personal or transport challenges, affecting waste collection & disposal capacity. • Site flooding may wash waste onto riverbanks & beaches. • Waste stored in the community increases the risk of nuisance, pests, & communicable disease.	Earthquake, landslip, flood, tsunami, wildfire, eruption

Table 4.2 Disaster impacts on waste management operations

4.3 Managing Disaster Waste

A disaster event can affect many aspects of the waste management system, either directly (e.g. asset damage) or indirectly (e.g. service outage). It is important that CDEM groups, council waste officers and waste contractors understand the impacts of plausible scenarios, and plan alternate waste management approaches with affected stakeholders. This should be done in advance of a disaster, as there will be limited opportunity to do so during response and recovery. Planning outcomes can then be incorporated into operating procedures, contingency plans and business continuity plans.

The rest of this section provides general information about disaster waste management approaches for each component of the waste management system. The appendices provide more specific information about disaster waste decision making (Appendix 1) and management of specific waste streams (Appendix 2).

4.4 Site clean-up

Property owners are responsible for the removal of waste from their site, but most have access to rates-funded collection services during business-as-usual. Following a disaster event, property owners and communities may need to take a more active role in waste management under the guidance of their council and CDEM group. Examples of modified approaches include temporary suspension of collections, community-based waste stockpiles, kerbside collection of larger water damaged items, waiver of disposal site levies and deployment of portable toilets where sewerage systems are damaged.

Insurance policies and the Natural Hazards Fund can help property owners to meet the cost of waste clean-up following a disaster, but receiving payment may take time. If waste needs to be moved urgently (e.g. to save life, reduce risk or reinstate access), CDEM groups and councils will need to deal with the waste and seek reimbursement retrospectively, which presents a significant administrative challenge for community-scale events that involve multiple properties and multiple insurers.

An alternative approach is to use a collective model where key stakeholders[13] pool resources to plan and implement disaster waste management. Collective approaches have challenges and benefits, but can significantly streamline response and recovery efforts:

- Challenges include bringing together multiple stakeholders at short notice, balancing public and private interests, agreeing priorities, responsibilities, expenditure tracking and dealing with properties that are under-insured, uninsured or unoccupied.
- Benefits include economies of scale, quicker delivery, consistency of approach, shared use of available contractors, streamlined administration and fewer delivery gaps or overlaps. Stakeholders should ideally reach an in-principle collective agreement during business-as-usual conditions, which can be activated following a disaster event. While the Insurance Council of New Zealand may facilitate negotiations, any formal agreement would be with individual insurers.

[13] Key stakeholders include: CDEM (response and recovery), local councils, recovery agency (if established), waste contractors, MfE, NEMA, insurers, plant hire companies, recyclers, property owners and community groups.

4.4.1 Disaster waste collection and transportation

Territorial authorities may not be able to maintain their kerbside collection service following a disaster, due to challenges arising from increased waste quantities, new waste streams, blocked roads, cordon restrictions, fuel rationing, or staff shortages. Temporary approaches may be needed until normal services can be resumed, with options including revised collection schedules, suspended collection, or encouraging the community to transport their own waste to stockpiles or disposal sites. Placing waste-specific skip bins in communities (for metal, plastic, paper and general waste) enables waste management companies to boost waste collection capacity.

An increase in demand for waste collection and transport services may attract service providers who lack sufficient technical skills or understanding of the local context, which can increase risk, cost or delays. There is also a risk of increased activity by unregistered service providers, potentially using illegal disposal options.

It is important to identify alternate routes to existing waste management facilities, including those outside of the district/region if necessary. It may also be possible to obtain access through private roads such as on farms or forestry sites if this presents a significant distance saving and the roads are suitable for the vehicles used.

4.4.2 Waste holding and triage

Waste treatment and disposal facilities may be unavailable after a disaster due to blocked access or lack of power, or insufficient capacity. These factors may require temporary waste stockpiles to be established until suitable disposal options become available. These sites can be used for holding and triage, and may enable waste to be segregated pending treatment, resource recovery or disposal. Temporary holding sites for slip waste are typically established beside roads or on nearby land, while vacant sites or reserves may be requisitioned for holding waste from disasters affecting urban areas. Coastal debris should be moved above the high-water mark for processing, to avoid disruption or resuspension by tidal activity. Siting considerations should include the potentials for: run-off, habitats, encouragement of fly tipping, psycho-social impacts should temporarily stretch into longer-term, etc.

There may be opportunities to leave some wastes it in situ, such as flood-sourced silt in rural areas. This approach effectively reduces vulnerability to future floods as it raises the local ground level and may be viable where silt removal costs exceed those of raising, relocating or replacing affected structures.

4.4.3 Waste segregation & treatment

The sorting of waste types enables resource recovery and can also reduce waste volume, which in turn reduces transport demand and conserves valuable landfill capacity. Transfer stations and recycling centres are likely to be overwhelmed or unavailable following a disaster, so segregation may need to be done at temporary sites, ideally situated close to the source of disaster waste. Challenges to waste segregation and treatment include increased waste quantity, change in its composition, increased co-mingling, power outages, fuel shortages, disrupted road transport, intermittent telecommunications, and limited availability of experienced staff.

Where disasters result in the controlled demolition of structures, it may be cost-effective to recover material at source that would otherwise become waste. The dismantling of buildings enables recovery of items such as building services (heating, lighting and ventilation systems), wall cladding, windows, structural steel, appliances, furnishings and other items of value. Concrete and rubble may be diverted to reclamation projects or crushed for use as an alternative

to hardcore for construction. It may also be possible to crush and reuse asphalt from road surfaces and car parks, dependent upon its binder.

Treatment options for woody debris include cutting logs to make them more transportable and mulching branches to make bark chips that may be used locally for landscaping or soil conditioning. On-site burning of woody debris may be done in consultation with, and approval from, FENZ and the regional council.

Where sewerage networks are unavailable, it will be necessary to set-up community scale composting toilets and organic waste treatment facilities, to reduce nuisance and public health risks associated with sanitary waste accumulations.

Treatment options for hazardous disaster waste are determined by the hazardous properties, quantity of waste involved and risk of exposure. It is also important to contain contaminants and prevent water ingress which will effectively increase the quantity of hazardous waste. Once hazardous properties are confirmed, treatment may involve containment and labelling for disposal, although it may be possible to treat or neutralise some chemical contaminants in situ. Contaminated soil can be treated by soil washing or bioremediation, while contaminated water may be treated by oxidation processes or chemical precipitation to concentrate hazardous substances in a sludge.

4.4.4 Resource recovery

Resource recovery reduces the demand for waste transport and disposal. It can also generate employment opportunities and revenue for affected communities. Resource recovery is typically done on a commercial basis and is only cost-effective if revenues cover operating costs. It is important to test financial viability of proposed recovery operations before they begin, taking into consideration capital costs, operating costs, revenue forecasts (including anticipated changes in the value of recovered materials) and community benefits. Even where assessment shows a proposed recovery operation is viable, effective management of operations is needed to ensure operations remain within tolerance. For example, operating costs can increase if incoming waste is co-mingled or contaminated, while revenue will decrease if supply exceeds demand or if there is ‘cherry-picking’ of high value resource before it reaches the recovery centre.

The location of resource recovery operations often has a large impact on their financial viability. Resource recovery close to the waste source can significantly reduce waste handling and transport demand, provided space, power and vehicle access is available.

4.4.5 Waste disposal

The quantity and characteristics of solid waste requiring disposal will vary substantially between disaster scenarios, though most waste types will increase in volume compared to ‘business as usual’ conditions. Earthquake, flood and tsunami events can cause a dramatic increase in the amount of inert waste and debris requiring disposal, while storms and slips tend to increase the amount of green waste and soil. Power outages can increase the amount of food waste due to freezer breakdowns, while co-mingling of waste will worsen if transfer stations and resource recovery centres are impacted. Sanitary waste may also require centralised disposal where sewerage network damage requires portable toilets to be deployed in communities.

Disaster planning considerations for active disposal sites should include identifying alternative waste disposal sites and temporary storage locations; contingency arrangements for service outages (including paper-based and cash-based operations) and staff shortage.

Historic waste disposal sites may also be impacted by disaster events such as flooding and erosion, particularly if they are built in stream gulleys, on low-lying land (prone to floods), near

rivers or the coast (prone to erosion), or in narrow valleys (prone to wildfire or landslide). The risk presented by historic landfill sites is greater where they contain hazardous waste. Once historic waste is exposed, enormous quantities of waste can be washed downstream or along the coast where it can affect communities and ecosystems.

Other on-site disposal options that could be considered in an emergency providing that they are either permitted activities, subject to a resource consent, or if regulatory relief has been granted. Examples of on-site disposal for disaster waste include burial, burning and reclamation.

4.5 Funding Disaster Waste Management

Disaster waste management often requires additional waste collection, transport and storage capacity, and Table 4.4 identifies potential funding sources. It is important to note that each funding source will have its own specific criteria and that demand can often exceed available resource, requiring decisions about how to best allocate available funding to meet priority needs. NEMA's Recovery Team can help navigate the options available. However, it takes time and effort to apply for funding, which typically comes with financial reporting and acquittal obligations that will also need resourcing.

Following a disaster event, territorial authorities or CDEM groups may set up a Mayoral Relief Fund which can be used to provide immediate assistance during response and may receive donations from government or other donors. Funds may be used at local authority discretion to support the immediate needs of affected individuals, families, community organisations and marae. MfE may also approve a levy waiver[14] in some cases. While the waiver does not provide funding, it effectively reduces landfill charges to reduce disaster waste management costs and encourage appropriate disposal.

Stage	Disaster Waste Focus	Support	Source
Risk Reduction & Readiness	Vulnerability assessment	In-house investment, contingency funds	Company / sector
	Resilience building		
	Contingency planning		
	Exercises & drills		
	Waste reduction & resource recovery	Waste disposal levy contribution to territorial authorities	Disposal fees
Response & Recovery	Disaster waste management	Mayoral Relief Fund[15], debt headroom, special purpose funds	Territorial authorities
			Donors
	Emergency Waste Fund • Collection & disposal • Hazardous waste disposal • Interim storage & transport • Repair/replacement of damaged equipment	Waste in an Emergency: Waivers and Funding	MfE
	Waste Levy Waiver and Exemptions		

[14] Waste in an Emergency: Waivers and Funding (MfE)
[15] Details available via the territorial authority website. Government contributes to the Mayoral Relief Fund. Payments can go to CDEM Groups, companies or individuals.

Stage	Disaster Waste Focus	Support	Source
	State highway clearance/repair	Emergency Works	NZTA
	Marine oil spill clean-up	Oil Pollution Fund	Maritime NZ
	Specific disaster waste issues	Recovery funding[16]	Government
	Unfunded waste-related activities	One-off Special Purpose Funds*	Government Departments, Minister/Cabinet
	Asset cleaning, repair or replacement	Insurance claim	Insurance company
	Sediment removal from around insured properties	Natural Hazard Fund	Crown & levy payers
	Miscellaneous support	NZ Disaster Fund	Salvation Army
		Volunteer Labour	Student Volunteer Army, Taskforce Kiwi, community groups etc.

Table 4.4 Support for disaster waste-related response and recovery activities

Funding may also be available via MfE's Emergency Waste Fund, while marine oil pollution response can be funded via Maritime New Zealand's Oil Pollution Fund. Finally, where other funding sources are not sufficient to meet immediate needs, Cabinet may approve one-off Special Purpose Funds. Financial assistance for waste management can also include the waiving of waste disposal levy fees or disposal facility charges. It is important to note that accessing many forms of funding involves an application process which can take time, while contestable funds may be significantly over-subscribed following a major disaster event.

The longer-term cost of significant disaster waste management mobilisations will often be borne by a combination of local authority funds or debt headroom (the cost of which will subsequently be reflected in rates) and contributions from government departments, Cabinet or other donors.

[16] Event-related funding allocated at the discretion of departments or Cabinet

Section 5 Appendices

Appendix A Decision Tree for Disaster Waste Management

This Appendix provides generic guidance for initial decision making when dealing with disaster waste during response and recovery, which cannot be dealt with via normal kerbside collection. Each disaster situation may have waste-specific or location-specific considerations that will require a different approach (as determined by the Controller/Recovery Manager with territorial authority Waste Managers).

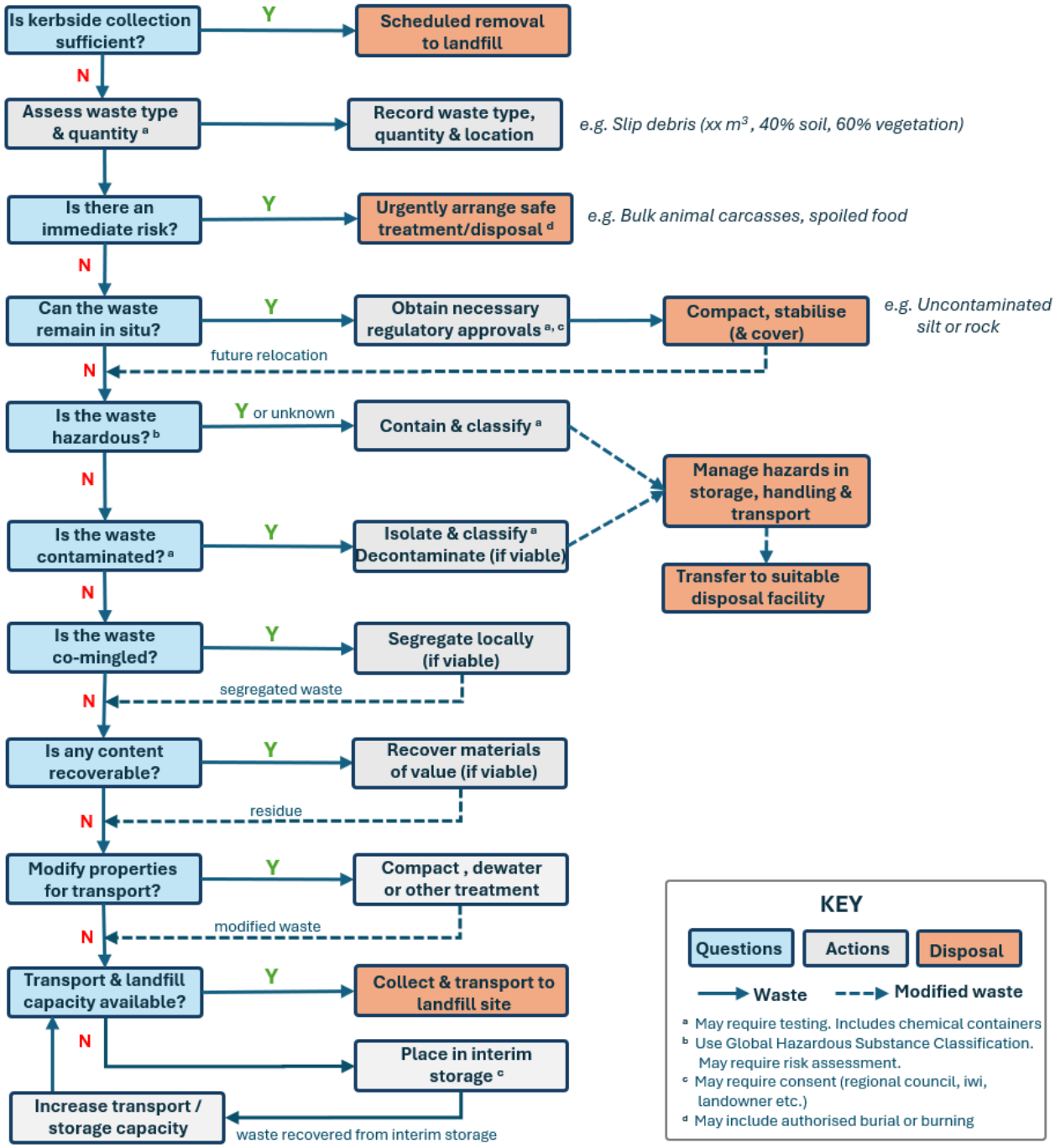

Figure A1.1 Support for disaster waste-related response and recovery activities

Class	Descriptor	Waste accepted*
1	Landfill	Mixed municipal solid waste, construction and demolition waste, some industrial wastes and contaminated soils.
2	C&D landfill	Non-putrescible wastes including construction and demolition wastes (e.g. rubble, plasterboard, timber), managed fill material, controlled fill, and clean fill material.
3	Managed fill	Clean fill and controlled fill material specified in the TGDL Guidelines.
4	Controlled fill	Soil and inert C&D materials with chemical contaminants at concentrations > local natural background but < specified maximum total.
5	Clean fill	Virgin excavated natural material (e.g. clay, soil, rock) that is free of combustible, putrescible, degradable or leachable components.

Table A1.2 Disposal Site Classifications

Appendix B Generic disaster waste guidance

The following table summarises disaster waste management options that may be considered during response and recovery.

Waste	Considerations for response	Considerations for recovery
Agricultural waste - diseased & dead animals	Territorial authorities & MPI to plan on-farm burial or incineration, or disposal to a class 1 facility.	Territorial authorities & MPI to plan on-farm burial or incineration, or disposal to a class 1 facility.
Agricultural waste - baleage	Recover for stock feed if not damp or deteriorated. Otherwise, segregate polythene (for disposal or recovery) and baleage (for composting or land application).	Use for stock feed or dispose via land application to pasture where there is no risk of run-off into watercourses (with approval of council/MPI).
Agricultural waste – milk	Use for stock feed or dispose via land application to pasture where there is no risk of run-off into watercourses (with approval of council/MPI).	Use for stock feed or dispose via land application to pasture where there is no risk of run-off into watercourses.
Agricultural waste – chemicals (& containers)	Need for approved handlers. Contain any leakage from damaged containers. Avoid contaminant release or mixing of substances. Owner responsible for disposal in accordance with waste code classification.	Dispose of contents in according to waste code classification. AgRecovery operates a nationwide collection and disposal system for unwanted and expired agrichemicals. Owner responsible for disposal in accordance with waste code classification. Need for approved handlers. Contain any leakage from damaged containers.
Agricultural waste - fence posts & wire	Do not burn treated timber posts as it will contaminate soil at the burn site (there may be options to repurpose them).	Agricultural waste - fence posts & wire.

Waste	Considerations for response	Considerations for recovery
Construction and demolition waste (building rubble)	Clear debris to enable emergency vehicle access. Establish local stockpiles if necessary, pending collection for segregation & disposal. Asbestos building materials and other hazardous products/chemicals, e.g. batteries, oil and pesticides. Use PPE and environmental controls.	Assess nature & severity of contamination & dispose of appropriately. Minimise movement to prevent release of contaminants to the environment. If contaminated, minimise disturbance, identify and restrict access and install environmental controls. Segregate hazardous substances and product for appropriate disposal. Use PPE and environmental controls.
Contaminated sediment / soil	Restrict access or contact and prevent water ingress (from rain or drainage). If safe to do so, clear debris to enable emergency vehicle access & stormwater drainage. Minimise disturbance and mixing with uncontaminated material.	Clear from other areas, check waste acceptance criteria at local disposal facilities and dispose of at an appropriate disposal site. Reduce contamination (e.g. soil washing) where contamination is treatable, before disposal.
Coronial waste (dead bodies and body parts)	Police coordinate body removal for identification by Coroner (leave in-situ until instructed to remove). Sites may need to be secured to protect evidence & waste may need separate secure storage pending investigation by the Police and Coroner. Identify sites suitable for coronial waste storage until investigations have been completed.	Police to arrange for removal to the coroner. Consideration should also be given to site access restrictions, secure storage of remains, cultural considerations and psycho-social support needs.
Electrical equipment	Recycle e-waste and metal where possible (removing gas from refrigerators). Note that solar panels and batteries are likely to contain heavy metals.	Recycle e-waste and metal where possible (removing gas from refrigerators). There are multiple battery disposal sites across New Zealand. Damaged solar panels may need to be disposed of in Class 1 facilities.
Fire waste (burned items and ash)	Once the fire is extinguished, allow burnt materials to cool. Property owner (or their insurer) responsible for debris disposal.	Assess the level of contamination in the ash and burnt items & determine whether waste pre-treatment is required prior to disposal by property owner (or their insurer).
Food waste & packaging	Collect for disposal at class 1 facility, composting or anaerobic digestion facility.	Collect for disposal at class 1 facility, composting or anaerobic digestion facility.

Waste	Considerations for response	Considerations for recovery
Hazardous waste - asbestos containing material	Owner responsible for disposal. Asbestos containing materials should be double bagged in heavy duty polythene and disposed of at a class 1 facility approved to receive asbestos waste. Follow WorkSafe guidance.	Asbestos containing materials should be double bagged in heavy duty polythene and disposed of at a class 1 facility approved to receive asbestos waste. Follow WorkSafe guidance.
Hazardous waste - solid, liquid or gas	Owner responsible for disposal in accordance with waste code classification (see MSDS). Contain any leakage from damaged containers. FENZ may support if there is immediate risk to life, public safety or the environment.	Manage according to waste code classification.
Household furnishings & whiteware	Remove food from refrigerators and freezers. Segregate whiteware, furniture, beds and electronics at source for street collection, recovery and disposal. Reduce volume by crushing. De-gas refrigerators.	Segregate whiteware (remove putrescible wastes), furniture, beds and electronics at source for street collection, recovery and disposal. Reduce volume by crushing. De-gas refrigerators.
Household hazardous substances	Cleaning chemicals, fuel, lubricant, paint, gas cylinders and batteries etc. should be segregated at source for hazardous waste collection, treatment if necessary and disposal.	Cleaning chemicals, fuel, lubricant, paint, gas cylinders and batteries etc. should be segregated at source for hazardous waste collection, treatment if necessary and disposal.
Mixed waste	Segregate waste streams for recovery where viable. Dispose of remainder at class 1 facility if capacity available.	Segregate waste streams for recovery where viable. Dispose of remainder at an appropriate facility if capacity available.
Mixed waste (on shoreline & river beaches)	Move above tide / flood affected areas. Segregate timber, organic waste, metal and plastic Stockpile locally pending removal. Work with MNZ/salvager to deal with marine incident generated waste.	Prioritise organic waste removal to avoid nuisance. Invite businesses to recover their crates or containers (Assess container contents if possible). Recycle timber and metal where possible. Consider controlled burning where removal is not practicable (seek FENZ, territorial authority and regional council approval). Dispose of waste that cannot be recycled at an appropriate disposal site.

Waste	Considerations for response	Considerations for recovery
Oily sand (marine & coastal)	Collection by spill response teams mobilised by industry (tier 1), regional council (tier 2), or Maritime NZ (tier 3), with potential for oil recovery.	Collection by spill response teams mobilised by industry (tier 1), regional council (tier 2), or Maritime NZ (tier 3), with potential for oil recovery.
Oil in watercourse	Spill response team may be mobilised by industry (tier 1), regional council (tier 2), or Maritime NZ (tier 3). Recover oil where viable via booms, absorbent or oil recovery equipment such as oil:water separator (use of dispersant undermines recovery). Avoid mixing with uncontaminated water. Collect residual waste via vacuum truck.	Collect oil and oil contaminated material. Use oil:water separator before discharging water to the environment. Final disposal options managed by appointed waste contractor.
Sandbag waste	N/A	Dry (to reduce weight) then distribute contents on local land, if possible, with containment bags sent to disposal site or stack neatly for re-use.
Sanitary waste (faeces, urine, sewage sludge)	Short-term sanitary waste storage (using a two-bucket system) or on-site burial (consider disinfection with lime). Further information is available from NEMA[17].	Deploy portable toilets or long drops in affected communities. Coordinate sanitary waste collection for off-site disposal where necessary (e.g. high-density housing). Maintain and progressively replace communal toilets as sewer networks are reinstated.
Sediment / soil / rock	Clear debris to enable emergency vehicle access & stormwater drainage (otherwise leave in situ). Minimise disturbance and prevent mixing with contaminated material. Use locally for fill / landscaping if permitted or dispose to an appropriate disposal site.	Clear from other areas and dispose of at an appropriate disposal site.
Wastewater in aquifers or surface water	Identify source of contamination and protect against groundwater aquifer contamination (boil borehole water before drinking). Advise health authorities and follow their guidance.	Identify source of contamination and protect against groundwater aquifer contamination (boil borehole water before drinking). Advise health authorities and follow their guidance.

[17] Mass Relief National Approach (NEMA 2025)

Waste	Considerations for response	Considerations for recovery
Slip material (soil, rock & vegetation mix)/ flood debris (Silt / soil/ rocks / boulders/sludge)	Clear debris to enable emergency vehicle access & stormwater drainage (otherwise, leave in situ). If it cannot be dumped locally (as clean ground cover, fill or mulch): • Establish local stockpiles for dewatering (reduces weight and improves handling). • Cut or mulch vegetation to reduce volume. • Check for contamination (e.g. wastewater, asbestos, hazardous substances, invasive weeds). • Dispose to an appropriate disposal site.	Clear stockpiles and other lower priority areas. If physically/chemically suitable for reuse, consider local reuse (e.g. to level/profile/raise land). Otherwise, dispose of at an appropriate disposal site.
Vegetation (also see 'woody debris')	Clear debris to enable emergency vehicle access & stormwater drainage. Recover for firewood or reuse if viable. Cut or mulch in situ to reduce volume to be transported. Mulch, compost or stockpile. Only burn if it is a permitted activity and a fire permit is held.	Clear from access roads, state highways & emergency vehicle access. Cut into sizes amenable to transportation. Recover for firewood or reuse. Mulch, compost or stockpile and burn if it is a permitted activity and a fire permit is available.
Vehicle (stranded or damaged)	Leave in place unless removal needed to enable emergency access. Owner responsible for removal / disposal. Check for leaks and spills of hazardous hydrocarbons removing as required & clean oil from the road (avoid oil/fuel entering stormwater drains where practicable). Notify owners of vehicles inside cordons. Notify Police where bodies present in vehicles.	Check for leaks and spills of hazardous hydrocarbons removing as required & clean oil from the road (avoid oil/fuel entering stormwater drains where practicable). Owner responsible for removal / disposal unless the vehicle is in a restricted access area. Owner/insurer to arrange for removal and repair or disposal. Recycle components and metal waste via scrap metal recyclers.

Waste	Considerations for response	Considerations for recovery
Vessel (aground or wrecked)	Vessel owner is responsible for the salvage. Owner, through their insurers, will appoint a salvor to manage the maritime casualty. If appropriate bunker fuel may be removed to minimise oil spill risk. Maritime NZ will monitor the owner's plan, provide oversight and if necessary, intervene to ensure the response is conducted in the national interest.	Vessel owner, through their salvor, to arrange for removal of vessel and cargo remains where practicable.
Volcanic ash	Wait until ash has stopped falling, before starting any clean-up. Unless ash deposits pose risks to structures/transport routes. Cover open drains so ash does not enter drains as ash can caused blockages. Clear ash to enable necessary vehicle access. Otherwise, leave in situ. If removal is necessary & material cannot be disposed of locally, establish local stockpiles, prevent contamination and arrange appropriate disposal.	Wait until ash has stopped falling, before starting any outdoor clean-up. Cover open drains to prevent ash entering drains. Clear stockpiles and other lower priority areas. If physically/chemically suitable for reuse, consider local reuse (e.g. to level/profile/raise land). Otherwise, dispose of at an appropriate disposal site. Recovery: What to do after volcanic activity
Water (uncontaminated)	Direct to drainage networks or watercourses where available. Use sandbags or barriers to protect property if necessary.	Direct to drainage networks or watercourses where available. Use sandbags or barriers to protect property if necessary.
Water (contaminated)	Restrict access or contact. Avoid further dilution by rainwater or drainage. Assess nature and concentration of contaminant, & volume of contaminated water. Seek expert input for appropriate disposal.	Restrict access or contact. Avoid further dilution by rainwater or drainage. Assess nature and concentration of contaminants & the volume of contaminated water. Seek expert input for appropriate disposal.
Woody debris	Work with landowners, territorial authorities, MPI and (contributing) forestry companies to attribute source and coordinate both recovery & disposal needs.	Work with landowners, territorial authorities, MPI and (contributing) forestry companies to attribute source and coordinate both recovery & disposal needs.
Unwanted donations	Offer to charity groups.	Offer to charity groups.
Used protective equipment & packaging	Collect and compact waste pending disposal at a class 1 facility.	Collect and compact waste pending disposal at class 1 facility.

Table A2.1 Summary Guidance for Disaster Waste Management in Response and Recovery

Appendix C Role summaries

The following section describes the actions of key stakeholders involved in disaster waste management.

C.1 Territorial Authority waste managers

Territorial authorities lead the planning and delivery of waste management services in their cities/districts. Territorial authorities could use their detailed knowledge of the waste sources and suppliers in their city/district in combination with the actions listed below and the disaster waste management Planning Tool, and Planning Workbook develop a disaster waste management plan for their city/districts. These disaster waste management plans should be considered when developing relevant CDEM plans or protocols.

During risk reduction and readiness

- Collate essential waste-related data for the district, including:
  - Waste characteristics (source, type, quantity)
  - Collection capacity.
  - Transport routes.
- Disposal sites (location, classification, capacity, operator, lifespan, site license conditions, emergency contact details).
  - Waste recovery options.
- Engage with CDEM groups to ensure:
  - You are familiar with plausible hazard exposures, emergency scenarios, sector vulnerabilities, lifeline inter-dependencies, resilience-building options and emergency contact details.
  - They are familiar with your waste management operations and arrangements for disaster waste management (including contractors used, collection options, waste transport routes and options for temporary storage locations and disposal sites).
  - Both parties understand how to collaborate in the planning and delivery of disaster waste management services (covering solid waste, wastewater, trade waste and hazardous waste).
- Engage with your waste management contractors (if used) to ensure:
  - They are familiar with plausible hazard exposures, emergency scenarios, sector vulnerabilities, lifeline inter-dependencies, resilience-building options and CDEM group emergency contact details.
  - You are familiar with their capacity to engage in disaster waste management.
- Maintain business continuity plans for plausible disaster scenarios that consider:
  - Options for the collection, storage, transportation, segregation, recovery, reclamation and disposal of disaster waste.
  - Parks or reserves that could be used for disaster waste storage or processing.
  - Other sites that could be used for disaster waste disposal or reclamation.
  - Emergency contact details for key stakeholders.

- Ensure that territorial authority strategy and planning documents[18], operating procedures and contracts are consistent with planned disaster waste management approaches.
- Exercise your disaster waste management protocols with your CDEM group, to ensure they are effective and that staff are familiar with them.
- Also consider:
    - Pre-selecting contractors (for construction, demolition and haulage) who could support disaster waste management efforts.
    - Agreements with adjacent territorial authorities, landowners or Iwi Māori if additional temporary storage or disposal capacity is needed at short notice.
    - Funding sources for resilience building efforts (e.g. via the Waste Levy, NEMA's Resilience Fund or other sources).
    - Arrangements with volunteer groups that could support disaster waste management (covering their role, responsibilities, contact details, health and safety, and financial arrangements).

During response and recovery

- Implement relevant contingency arrangements and business continuity plans.
- Assess the nature of the disaster waste management challenge (considering scale, extent, waste categories, road disruption, and risk to health, safety or the environment).
- Provide the CDEM group with waste management status updates covering:
    - Disaster waste management challenges.
    - Service impacts and restoration timeframes.
    - Disaster waste management options (with estimates of quantity, cost and timeframe).
    - Requests for assistance.
- Work with communities to establish disaster waste management services required. Discourage waste storage on the street until a roadside collection service is available.
- Ensure new and temporary disposal facilities comply with their waste disposal site license conditions, and that new waste disposal facilities are registered via the Online Waste Levy System (OWLS).
- Other considerations:
    - Reduce pressure on disposal site capacity by leaving inert waste in situ or using it for land profiling or embankments, recycling timber or composting organic waste).
    - Regulatory relief may be available to temporarily reduce or suspend regulatory barriers that impair effective disaster waste management.
    - Post-disaster rapid building impact assessments can provide useful information for estimating the quantity of demolition waste requiring transportation and disposal.
    - Financial support may be available from the Mayoral Relief Fund, MfE's Emergency Waste Fund, NEMA's Essential Infrastructure Recovery Programme and emergency response and recovery claims, or other sources.

[18] Key documents include the Waste Management and Minimisation Plan, Long Term Plan, Infrastructure Strategy, contracts for waste management services and disaster waste management plan.

- New waste storage and disposal facilities need to consider risks associated with vegetation damage, site contamination, public nuisance, invasive weeds, pests and unauthorised access).
- Any increase in the cost or difficulty of waste disposal may incentivise illegal activity such as fly tipping, unregistered disposal facilities or concealment of hazardous waste.
- Revenue estimates for resource recovery activities can be undermined if higher value items are removed from the waste stream before it reaches the recovery site.
- Waiving landfill fees may attract waste streams not associated with the disaster event.
- Interruption to telecommunications or power networks can significantly impact gate operations at a disposal facility.
- Council intervention may be needed where people do not comply with waste storage or disposal requirements (e.g. work in default).
- Waste-related public messaging issued by territorial authorities should be consistent with those from the CDEM Group public information management (PIM) function and regional council.

Key stakeholders

- CDEM group.
- Waste Management Contractors.
- Strategic Plan development team.
- Long Term Plan development team.
- Infrastructure Manager.
- Waste Manager.
- Landfill Site Manager.
- Trade Waste Officer.
- Building Inspectors (engaged in MBIE rapid building assessment).
- Environmental Health Officers.
- Water and wastewater treatment plant operators.
- Iwi Māori, landowners and community groups.

Further information

- Waste Management and Minimisation Plan.
- Long Term Plan.
- Infrastructure Strategy.
- Service contracts (solid waste, wastewater, trade waste).
- Strategic Plan.
- Annual Reports.
- Regional Waste Strategy.
- Waste and Resource Efficiency Strategy (MfE, 2025).
- Emergency Waste Management in New Zealand: Scoping Study.

- Emergency Waste Management Plan template (working draft, 2018).
- Emergency Waste Management Plan Workbook (working draft, 2018).
- National Landfill Climate Change Exposure Assessment (Tonkin & Taylor, 2024).
- National Marine Oil Spill Contingency Plan (Maritime NZ, 2020).
- WasteMINZ Technical Guidelines.

C.2 Waste management contractors

The following is preliminary guidance for Waste Management Contractors contributing to the disaster waste management planning and supporting response and recovery efforts. Note that this will likely extend to demolition contractors, haulage contractors and plant hire companies as recovery proceeds.

During risk reduction and readiness

- Maintain up to date contingency procedures and/or business continuity plans which align with local authority plans as necessary.
- Be familiar with any local or regional plans for disaster waste management.
- Stay aware of risks and vulnerabilities associated with your sites and operations.
- Test your contingency plans to ensure they are effective.
- Inform your local authority about your capacity to support response and recovery activities.
- Identify staff who are skilled in hazardous waste identification, risk management and disposal.

During response and recovery

- Support disaster waste management efforts during response and recovery efforts where appropriate.
- Inform your contracting territorial authority of:
  - Service status (damage, outage, restrictions etc.) and areas/customers affected.
  - Operating capacity, constraints and issues that might prevent or delay return to normal service.
  - Prospective temporary storage and disposal sites.
  - Opportunities to boost capacity for disaster waste collection, transport, storage, processing or disposal.
  - Other information as requested.

Key stakeholders

- Territorial authority Waste Manager.
- Other contractors involved in disaster waste management.
- Waste collection and transport service personnel.
- Site personnel (transfer stations, disposal sites and resource recovery facilities).
- WasteMINZ Disaster Waste Working Group.

Further information

- Standard operating procedures.
- Contingency procedures.
- Waste management contract (with territorial authority).
- Waste Management and Minimisation Plan (territorial authority).
- Coastal Hazards & Climate Change Guidance (MfE, 2024).
- Technical Guidelines for Disposal to Land (WasteMINZ 2023).
- Technical Guidelines: Characterising Surplus Soil for Disposal (WasteMINZ 2024).
- Waste Industry Guidelines: Disposal of low-level asbestos-contaminated soil at a disposal facility (WasteMINZ, 2024).

C.3 CDEM Groups

Section 17 of the Civil Defence Emergency Management Act 2002 (CDEM Act) lists CDEM group functions, which include identifying, assessing, and managing relevant hazards and risks. They also required the groups to consult and communicate about risks and to identify and implement cost-effective risk reduction. These functions are typically delivered through the development, approval, implementation, and monitoring of a civil defence emergency management group plan.

During risk reduction and readiness

- Engage with territorial authorities (and their contractors if necessary) to ensure:
  - You are familiar with their waste management operations and arrangements for disaster waste management (including contractors used, collection options, waste transport routes and options for temporary storage locations and disposal sites).
  - They are familiar with plausible hazard exposures, emergency scenarios, sector vulnerabilities, lifeline inter-dependencies, resilience-building options and emergency contact details.
  - They can develop business continuity plans that address service interruption (to power, transport, fuel, telecommunications, water, cash and staff shortage).
  - Both parties understand how to collaborate in the planning and delivery of disaster waste management services (covering solid waste, wastewater, trade waste and hazardous waste).
- Acknowledge arrangements for disaster waste management in relevant CDEM group plans, protocols and resources.
- Involve territorial authorities in exercises to test disaster waste management protocols.

During response and recovery

- Obtain status updates from territorial authority waste managers covering:
  - Disaster waste management challenges.
  - Service impacts and restoration timeframes.
  - Disaster waste management options (with estimates of quantity, cost and timeframe).
  - Requests for assistance.

- In a state of emergency (SoE) or when the NCMC is activated, the CDEM group (Lifelines Utilities Coordinator (LUC)) should liaise with NEMA's National Lifelines Utilities Coordinator and MfE's Waste Sector Coordinating Entity (SCE).

Key stakeholders

- National Lifeline Utilities Coordinator (nLUC).
- MfE waste and funding teams.
- Territorial authorities (solid waste managers, waste contractors, wastewater network managers, land use planners, infrastructure managers).
- NEMA Infrastructure Resilience Team.
- Regional council (strategic planners, consent and compliance teams).
- Waste services providers.
- Significant waste producers (industrial, commercial).
- Community groups.
- Iwi Māori.
- Landowners amenable to waste storage or disposal.
- Emergency responders.
- NZDF (if facilities are present in the region).
- Special interest groups (NZTA, KiwiRail, MPI, Maritime NZ etc.).

Further information

- Waste management and minimisation plans (territorial authority).
- WasteMINZ Disaster Waste Special Interest Group.
- MfE's Waste policy and compliance teams.
- NEMA's Infrastructure Resilience Team.
- Regional Waste Strategy (regional council).
- Infrastructure Strategy (territorial authority).
- Long Term Council Community Plan (territorial Authorities).
- Disaster Waste Management in New Zealand: Scoping Study.
- Disaster Waste Management Plan template (working draft, 2018).
- Disaster Waste Management Plan Workbook (working draft, 2018).
- National Landfill Climate Change Exposure Assessment (Tonkin & Taylor, 2024).
- National Marine Oil Spill Contingency Plan (Maritime NZ, 2020).
- WasteMINZ Technical Guidelines.
- Mass Relief National Approach (NEMA 2025).

C.4 Government departments

Several government departments have roles and responsibilities that may support disaster waste management efforts, which can be provided via legislation, policy, guidance, operations or funding.

During risk reduction and readiness

- Ensure that sector policy and guidelines consider disaster waste management where appropriate.
- Ensure relevant guidance and funding for disaster waste management is available and accessible.
- Participate in national disaster waste management exercises where organised by NEMA or MfE.
- Liaise with the insurance sector to develop protocols to streamline post-disaster assessment, claim processing and payment, and coordinate remedial work.

During response and recovery

- MfE may act as intermediary between the NCC / NCMC and waste sector stakeholders.
- NEMA to lead or support the NCC / NCMC as required (see table 3.1) where local or regional disaster waste management efforts require central government support.
- NEMA to administer 60/40 funding requests for insured assets under its essential infrastructure recovery programmes (for costs above the local council threshold which are not covered by insurance).
- MfE to consider waivers for the waste disposal levy, and applications to the Waste Management Fund.
- NZTA to progress emergency works where required to restore the operation of state highways.
- For a maritime disaster, Maritime NZ to activate an appropriate response under its Marine Oil Spill Readiness & Response Strategy.
- NHC to administer claims for disaster-related waste management costs incurred by homeowners.
- DIA Lottery Grants Board to consider funding options for supporting disaster waste management efforts.
- Other departments to consider portfolio re-prioritisation or funding re-allocation to make resources available for departmental grants toward disaster waste management efforts.
- NEMA to work with insurance providers to explore opportunities for collective approaches that enable insurance funds to be applied more effectively.
- Provide the incident management team with waste-related status reports and insights where required.
- Support sector coordination efforts that enhance the targeting, efficiency or effectiveness of disaster waste management efforts.
- Consider contributing to Mayoral Relief Funds to support disaster waste management efforts.

- Consider the need for regulatory relief (e.g. expedited consenting or Orders in Council for legislative change) to enable effective disaster waste management.
- Cabinet may consider options for a 'one-off special purpose fund' to deal with significant disaster waste management issues that cannot be resolved by established funding mechanisms.

Key stakeholders

- Territorial authorities.
- CDEM groups.
- National Recovery Office (if activated), or
- Recovery Agency (if established).
- National Emergency Management Agency (e.g. emergency response and recovery claims, Essential Infrastructure Recovery funding).
- Ministry for the Environment (waste sector coordination, waste levy waivers, expedited/retrospective consent, emergency waste funding).
- NZ Transport Agency (e.g. slip clearance, bridge damage repair, disposal site consenting).
- Maritime NZ (e.g. oil spill response).
- Natural Hazards Commission (e.g. funding for slip and silt removal from insured properties).
- Ministry for Primary Industries (e.g. support for stock disposal and silt removal).
- Ministry of Social Development (e.g. rural assistance payments).
- Ministry of Culture & Heritage (e.g. heritage protection & archaeological authority).
- Department of Internal Affairs (e.g. funds reallocation, lottery grants).
- Department of Conservation (e.g. temporary use of public reserves).

Further information

- Coastal Hazards & Climate Change Guidance (MfE, 2024).
- Disaster waste management: A review article (Brown et al, 2011) .
- Disaster Waste Management in New Zealand: Scoping Study.
- Managing public funding in an emergency response or recovery (OAG 2023).
- Waste Management and Minimisation Act 2008.
- Overview of the Waste Disposal Levy (MfE).
- Natural Hazard Fund (NHC).
- Oil Pollution Fund (Maritime NZ).
- Oil Spill Readiness & Response Strategy (Maritime NZ).
- Waste and Resource Efficiency Strategy (MfE, 2025).
- National Climate Change Risk Assessment (EPA, 2025).
- National Marine Oil Spill Contingency Plan (Maritime NZ, 2020).

- National Landfill Climate Change Exposure Assessment (Tonkin & Taylor, 2024).
- Severe Weather Emergency Recovery (Waste Management) Order 2023.
- Severe Weather Emergency Recovery Legislation Act 2023.
- Severe Weather Emergency Recovery (Resource Management—Burning of Waste) Order 2023.
- Severe Weather Emergency Recovery (Waste Minimisation) Order 2023.
- Report on Operation of the Severe Weather Emergency Recovery Legislation Act 2023 since 13 April 2023 .
- Government contributions to Relief Funds (NEMA 2023).
- Response, other response and recovery claims following an emergency event.
- Approval of projects into essential infrastructure recovery programmes for 60/40 funding.

Appendix D Stakeholder organisations

Table A3-1 below provides an alphabetical list of stakeholder organisations with a summary of their interests in disaster waste management.

Type	Role in Response/Recovery	Relationships
Analytical services	Waste sampling & testing to assess hazardous properties (to inform risk assessment). Building capacity may be a challenge, which can delay recovery efforts.	Work with waste contractors and councils to enable rapid assessment & reporting of results.
CDEM groups	Situation assessment and risk assessment, planning, preparedness, and coordination of response/recovery activity. Emergency Operations Centres are responsible for district-level risk assessment, planning, preparedness and coordination of response/recovery activity. PIM function to inform stakeholders of waste-related risk & actions required.	Work with territorial authority's, waste sector, emergency services, lifeline utilities, iwi, and other agencies to assess needs then plan & execute waste management efforts.
Composting / mulch companies	The processing of organic wastes (green waste, food waste).	Support response & recovery efforts if requested.
Construction and demolition contractors	Demolition and removal of unsafe buildings and infrastructure to clear roads and enable response and recovery actions.	Work with territorial authority's, waste sector, emergency services, lifeline utilities, iwi, and other agencies to assess needs then plan & execute waste management efforts.
Coroner	Confirm the cause & circumstances of death, make recommendations to prevent recurrence. Determine what is coronial waste and needs to be protected to facilitate the collection of evidence. If necessary coronial waste may need to be segregated and stored for later examination.	Coordinate with NZ Police for body recovery and evidence collection.
Environmental Protection Authority	Regulator for Hazardous Substances & New Organisms Act 1996, including hazardous substance stockpiles, treatment, containment, waste disposal, open burning and site decontamination.	Provides technical advice to hazardous substance owners, CDEM groups, territorial authorities.

Type	Role in Response/Recovery	Relationships
Fire and Emergency NZ	Lead agency for fire & hazardous substance incidents. First responder with urban search & rescue capability.	Leads response and recovery activities from fire and hazardous substance events (Wildfires) able to request CDEM group and other agencies to support response & recovery efforts. In other events FENZ supports response and recovery efforts.
Haulage and earthworks contractors	Support for movement and transport of waste materials.	Support response and recovery efforts if requested.
Health NZ	Maintains region and district-level emergency plans Coordinates the health response to national disasters with the Ministry of Health.	Coordinates the national health response with the Ministry of Health.
Insurers	Supports insured landowners with funding for waste removal, repair and demolition.	Insurance policy holders. Collaborate with response & recovery efforts.
Insurance Council of NZ (ICNZ)	Representative body for general insurance companies. Supports insurers' response to disaster events by acting as a conduit for information & engaging with stakeholders (including emergency management agencies, central & local government & communities) on behalf of the sector.	Work with members, NEMA & impacted communities to optimise the sector's contribution to recovery efforts.
Iwi Māori	Advise on waste management, land use and areas of cultural significance.	Support local authority and CDEM response & recovery efforts.
Landowners	Responsible for waste management on private property.	Support response & recovery efforts if requested.
Lifeline Utilities	Restore service outages to fullest extent possible. Implement emergency response plans & collaborate with CDEM to restore service, provide information, and collaborate with other lifelines.	Provide status reports for CDEM response & recovery efforts. Keep sector stakeholders informed as required. Sector Coordinating Entity (SCE) provides national level sector representation.
Maritime NZ	Lead agency for maritime oil spills and groundings.	Maritime NZ train regional council staff to support oil spill response efforts. Territorial authorities and regional councils to facilitate waste management services.

Type	Role in Response/Recovery	Relationships
Ministry for the Environment (MfE)[19]	Advises lead agency on environmental issues. Administers the Waste Minimisation Act, Resource Management Act, Hazardous Substance and New Organisms Act, the Waste Minimisation Fund, the Emergency Waste Fund, waste levy waivers and Orders in Council that provide regulatory relief.	Territorial authority - waste management levies and regulations. Regional councils and unitary authorities – environmental monitoring and regulations. Waste sector organisations – assist with sector support & regulations. Central government agencies – information, advice & coordination.
Ministry of Business, Innovation & Employment (MBIE)	Fuel sector liaison role. Post-disaster rapid building assessments. Management of earthquake-prone buildings.	Fuel companies. Territorial authority building inspectors. Central government agencies.
Ministry of Cities, Environment, Regions and Transport (MCERT)	A new government agency to be formed on 1 July 2026, amalgamating MHUD, MfE, MoT and administrative functions of DIA.	
Ministry of Health (MoH)	Lead agency for pandemic and radiation incidents. Advise public on health risks posed by contaminated materials/wastes. Maintains the National Health Emergency Plan.	Health NZ. District health boards. Territorial authorities. Central government agencies involved in a response. Alignment with the National CDEM Plan.
Ministry of Housing & Urban Development (MHUD)	Managing investment in housing development and renewal, in coordination with land use planning and infrastructure development.	Collaborate with Recovery and Welfare operations to optimise the impact of house rebuilding and replacement efforts.
Ministry for Primary Industries (MPI)	Lead agency for biosecurity and food safety incidents, and drought affecting the rural sector. Manage disposal of animal carcasses. Funding to support farmers.	Agricultural sector. Central government agencies.
Ministry of Transport (MoT)	Transport sector Liaison Officer role (coordinates transport sector response and recovery efforts where required).	Coordinate transport sector entities as required.
National Emergency Management Agency (NEMA)	Lead agency for geological and meteorological hazards, space weather and infrastructure failure. Supports response and recovery efforts, including request for Orders in Council (to the Executive Council).	Support and guidance for CDEM groups, and engagement with others involved in response and recovery.

[19] To be incorporated into the Ministry of Cities, Environment, Regions & Transport in July 2026

Type	Role in Response/Recovery	Relationships
National Recovery Coordination Group (NRCG)	NEMA-based standing committee of government agencies, providing strategic direction & oversight for national recovery planning and inter-agency coordination. Provides role clarity for those responsible for recovery at national, regional & local levels.	Government agencies, National Recovery Manager and the Minister for Emergency Management.
NEMA Recovery Team (if activated)	Chairs the National Recovery Coordination Group which coordinates central government agencies in support of locally led recovery efforts, provides a consolidated national picture to inform decision makers, and helps local government to plan recovery action for impacted communities.	Advises NEMA and Ministers and engages with CDEM groups, territorial authorities, government agencies and others involved in recovery efforts.
Natural Hazards Commission (NHC)	Provides natural hazards insurance cover to repair or rebuild homes damaged by a natural disaster.	May collaborate with insurers and others to optimise allocation of funding to support recovery efforts.
NZ Defence Force (NZDF)	Logistical support for response and recovery.	Coordination with the Planning and Logistics functions.
NZ Police	Lead agency for major traffic accidents & terrorism incidents. Maintains law & order, protects property & assists emergency services (e.g. access & traffic restrictions).	Coordinate with other emergency services, response functions & the coroner's office.
NZ Transport Agency (NZTA)	Conducts emergency work required to keep the state highway open (or re-open the highway if closed) and repair damage.	Coordinates priorities and transport/ disposal efforts with territorial authorities, KiwiRail etc.
Property owners & tenants	Responsible for waste management on private property.	Support response & recovery efforts if requested.
Recovery Agency/Office (if established)	A national, regional or local entity established to plan and coordinate recovery activity.	Engages with CDEM groups, territorial authorities, government agencies and others involved in recovery efforts.
Regional Councils & Unitary Authorities	Maritime oil spill response. Regulation of waste storage, treatment, disposal sites and emergency discharges. Environmental monitoring.	Support planning at local and regional level. Support response and recovery actions at local and regional level.
Salvage companies	Support for maritime incidents involving recovery of vessels and cargo.	Maritime New Zealand. Regional councils and unitary authorities.
Search & Rescue organisations	Support CDEM and first responders where required.	FENZ. CDEM. NZ Police.

Type	Role in Response/Recovery	Relationships
Telecommunications Emergency Forum (Sector Coordinating Entity)	Restore service outages to fullest extent possible. Support CDEM to maintain service, provide information, implement emergency response plans and collaborate with other lifelines.	Telecommunications sector liaison role for the response (coordinates telecoms sector engagement to support service continuity).
Territorial Authorities	Lead CDEM response and recovery actions for small local events, waste management services, building inspections, health inspections & repair of council infrastructure assets. Coordinate with regional councils and unitary authorities and CDEM during larger response and recovery actions.	Waste sector/contractors. MfE. MBIE. MoH. Operate disposal facilities if owned. Sector policy & monitoring by MfE. Community. Iwi/hapu.
Transpower (Sector Coordinating Entity)	Restore service outages to fullest extent possible. Support CDEM to maintain service, provide information, implement emergency response plans and collaborate with other lifelines.	Liaise with affected lifeline utilities.
Volunteer Groups	Provide operational and logistical support for clean-up and recovery operations.	Coordinate with territorial authority and CDEM response.
Waste Management Contractors	Restore service outages to fullest extent possible. Support CDEM to maintain service, provide information, implement emergency response plans	Territorial authorities. CDEM. MfE.
WorkSafe	Power to declare a hazardous substance emergency and control a workplace. Assist protecting the safety of response and recovery staff.	FENZ. Property owner. CDEM.

Table A4.1 Key Stakeholders for Disaster Waste Management

Appendix E Glossary

4 R's	Acronym describing NEMA's four stages of emergency management (i.e. Risk reduction, Readiness, Response and Recovery).
C&D	Construction and demolition.
CDEM	Civil Defence and Emergency Management.
CDEM group	A consortium of the territorial authorities in a region working in partnership with emergency services, lifeline utilities and government departments to: • Identify and understand hazards and risks. • Prepare plans and manage hazards and risks in accordance with the four R's.
Contaminated site	Land where a contaminant is present, or is likely to be present, on or under the land in concentrations that pose an unacceptable risk to human health or the environment.
Clean fill	Virgin excavated natural materials such as clay, soil and rock that are free of combustible, putrescible, degradable or leachable components. When discharged to the environment, clean fill material will not have a detectable effect relative to the background, and the fill site will be able to be utilised for an unrestricted purpose on closure. Future excavation into the filled materials will be unrestricted.
CRC	Community Recycling Centre.
Debris	Debris typically comprises: • Boulders (large rocks displaced by earth movement). • Sediment (sand, silt, alluvium, ash, or other fine inorganic material left behind by flooding, lahars or generated by liquefaction). • Forestry slash (branches and logs moved from commercial forestry operations by landslips or flooding).
Disposal facility	A commercial facility (including a disposal facility) licensed for the disposal of waste. Disposal sites/Landfills are classified according to the waste type accepted: Class 1: municipal solid waste, construction and demolition waste, some industrial wastes, and contaminated soils. Class 2: non-putrescible wastes including construction and demolition wastes, managed fill material, controlled fill, and clean fill material. Class 3: clean fill and controlled fill material specified in the TGDL Guidelines. Class 4: controlled fill materials soil and inert C&D materials with chemical contaminants at concentrations greater than local natural background concentrations, but with specified maximum total concentrations. Class 5: virgin excavated natural material such as clay, soil and rock that are free of combustible, putrescible, degradable or leachable components.

ECC	Emergency Coordination Centre (usually regional if referring to CDEM).
EOC	Emergency Operations Centre (usual at city/district level if referring to CDEM).
Emergency waste	Is defined by the Waste Minimisation Act 2008 as: (a) waste that has been caused by an emergency; or (b) anything identified as disaster waste by notice made under section 38A. It encompasses a range of waste streams including: • Debris (waste generated from damaged structures, such as concrete, bricks, glass, steel, fixtures, and furnishings etc.). • Vehicles and equipment damaged by the emergency. • Spoiled foodstuffs. • Bodies and animal carcasses. • Packaging discard generated during response and recovery efforts
EWMP	Emergency Waste Management Plan.
FENZ	Fire & Emergency New Zealand.
GHS 7	7th edition of the Globally Harmonized System of Classification and Labelling of Chemicals (labels summarized in Annex 1) .
Hazardous material	Substance that can cause harm, but they need not be hazardous (includes hazardous substances).
Hazardous substance	Substance that can cause harm to people, property or the environment and are regulated under the HSNO Act.
Hazardous waste	Waste generated from manufacturing and industrial operations likely to be hazardous or contain at least one hazardous substance.
HSNO Act	Hazardous Substances and New Organisms Act .
IICG	Inter-Infrastructure Coordination Group (NEMA convened collection of Sector Coordinating Entities).
Inert waste	Waste that is neither chemically nor biologically reactive, so doesn't undergo significant physical, chemical, or biological changes and is unlikely to cause environmental pollution or harm human health.
Landfill	See Disposal facility.
LUC	Lifeline Utilities Coordinator (within an EOC or ECC).
MBIE	Ministry of Business, Innovation and Employment.
MCERT	Ministry of Cities, Environment, Regions & Transport.
MfE	Ministry for the Environment (Manatū Mō Te Taiao).
MNZ	Maritime New Zealand.

MoH	Ministry of Health.
MPI	Ministry for Primary Industries (Manatū Ahu Matua).
MSDS	Material safety data sheet.
NCC	National Coordination Centre.
NCMC	National Crisis Management Centre (facilitates an all-of-government response in support of government crisis management arrangements, and co-ordination of national responses).
NEMA	National Emergency Management Agency.
NZTA	NZ Transport Agency (Waka Kotahi).
ODESC	Officials Committee for Domestic & External Security (a strategic body comprising CEOs from relevant government departments, which advises the Prime Minister on security and intelligence matters).
PPE	Personal protective equipment (e.g. respirator, overalls, gloves).
Recovery	The immediate, medium-term and long-term holistic regeneration and enhancement of a community following an emergency. More information.
SCE	Sector Coordinating Entity (represents the interests of lifeline utilities in dealing with CDEM sector stakeholders).
Sediment	Solid material that is moved and deposited in a new location, with grain size ranging from silt to boulders.
SitRep	Situation Report (used to convey information to the CDEM Incident Management Team).
SoE	See State of Emergency.
SoNE	State of National Emergency.
State of Emergency	Declaration made under the CDEM Act 2002: • National state of emergency may be declared by the Minister where: (a) an emergency has occurred or may occur; and (b) it is, or is likely to be, of such extent, magnitude, or severity that the CDEM necessary or desirable in respect of it is, or is likely to be, beyond the resources of the CDEM groups whose areas may be affected by the emergency. Local state of emergency may be declared by a person authorized under section 25 if an emergency has occurred or may occur within the area. Further Information.

TGDL	Technical Guidelines for Disposal to Land provides guidance for the management of a range of waste streams (including land disposal, asbestos containing materials, organics, surplus soil, tar in roading, compostables and recyclables).
Transition Period	A formally declared phase between response and recovery, which provides CDEM groups with emergency and remedial powers following expiry of a state of emergency. Further information available in this NEMA Fact Sheet.
Transfer station	Community-based facility for temporary storage of solid waste and recyclable materials pending transfer to a disposal facility or other waste management facility.
Waste	Anything disposed of or discarded; and is defined by its composition or source (e.g., organic, inorganic, electronic, hazardous) and includes any component or element of diverted material, if the component or element is disposed of or discarded. Waste is generated from domestic, commercial, and industrial sources.
Waste Minimisation	Activities to reduce waste or to reuse, recycle or recover diverted material.
Waste Diversion	Recovery and source reduction activities to reduce the quantity of waste sent for disposal.
Waste Disposal Levy	A government-imposed fee charged on arrival at a disposal site. Waste disposal levy receipts fund: • Waste minimisation and environmental improvement activities. • Territorial authority efforts to manage disaster waste. • Repair or replacement of waste infrastructure damaged by an emergency. MfE's projects for vulnerable disposal facilities and contaminated sites.
Waste sector	Encompasses a range of organisations involved in waste management activities, including strategy, planning, waste minimisation, collection, storage, recovery and disposal, and site remediation.
Woody debris	Includes debris occurring naturally from trees (indigenous or exotic), or from commercial forestry activities in commercial forests. This may include slash but is not exclusively slash.

Appendix F Emergency waste management examples

The following examples summarise the nature, scale, and diversity of waste management challenges arising from previous disasters.

F.1 New Zealand examples

Hawkes Bay silt disposal (2023)

Flooding during Cyclone Gabrielle led to major silt accumulations on roads, rail, orchards, farms, and private property, damaging thousands of hectares of highly productive land. Government provided $63 million toward the clean-up in Hawkes Bay and Tairāwhiti. Early waste management efforts were compromised by damage to roads, power, telecommunications and water services. The regional council actively supported waste management, including sourcing sites for mass livestock burial and silt removal. Local councils focused on community waste removal for flood damaged items, silt and woody waste and demolition materials.

Local government collaborated with contractors and residents to establish a Silt & Debris Recovery Taskforce which secured government funding to deliver a two-year clean-up operation. Waste management activity involved waste removal, screening and consolidation at 17 new deposit sites (established via Orders in Council) before sorting at processing sites in Esk and Pākōwhai. This involved 250,000 truck movements to remove five million tonnes (2.76 million m3) of silt and 165,000 tonnes of woody debris from 7,000 hectares of agricultural land. Approximately 80% of the silt deposited by flood waters was retained in the landscape to minimise disposal cost. Cleared sites were then levelled to reinstate natural drainage and seeded where required. Silt was tested for contamination before final disposal to clean fill or recycled into basecourse applications, including the expressway development project. Around 125,000m3 of the waste was recycled or reused, with tanalised timber posts recovered from orchards recycled to create 15,000 fence posts, while other timber debris was chipped, mulched, and composted. The recovery effort supported 1,184 properties and created over 1,000 jobs in the region.

Auckland Floods (2023)

Flooding of residential areas affected up to 10.000 properties, caused 4 deaths, and initiated a property buy-out scheme whereby territorial authorities helped households to move from flood prone sites. The flooding also led to around 10,000 cars being written off. Around 90% of affected cars were insured & insurers arranged de-registration and disposal, with written-off vehicles stripped of useable parts for resale and the reminder going to car yards for metal recovery. Some uninsured flood-damaged cars were repaired, re-registered and sold without write-off declarations.

East Cape woody debris clean-up (2023)

Heavy rainfall from Cyclones Hale (2023) and Gabrielle (2023) washed large quantities of woody debris and sediment into watercourses across the East Cape. As debris was washed downstream, it damaged fences and bridges, blocked drainage networks contributing to local flooding, and caused major timber waste accumulations on riverbanks and beaches. Two storms in 2018 deposited around one million tonnes of logs and debris onto Tolaga Bay properties and beaches. Woody debris washed from catchments during 2021/22 required Gisborne City Council to mobilise three beach clean ups at a cost of $360,000. Extreme weather events in 2023 caused the government to establish a $10 million fund to clean up 70,000 tonnes of woody debris, and $202 million for silt and debris removal across Hawkes Bay and Tairāwhiti. A further $27 million has since been allocated from Budget 2024 for the removal and treatment of woody debris in Tairāwhiti that presents an ongoing risk to life, infrastructure and properties.

Further reading

Buller Floods (2021 & 2022)

Westport was affected by flooding in July 2021 and February 2022, where the Buller River overflowed into the town and surrounding areas. Up to 23% of the housing stock was damaged, with 71 homes red stickered as unsafe and 384 deemed uninhabitable. The clean-up generated 2,120 tonnes (1,200 cubic metres) of household waste including carpets and furniture and cost the council $0.85 million for collection and disposal. Waste was stored at temporary transfer sites around town before going for sorting at Westport and Reefton transfer stations. Hazardous waste was stockpiled at the Holcim site and residual waste landfilled in Greymouth and Hokitika. The council also waived landfill fees to speed the removal of debris.

M.bovis stock disposal (2021)

Stock disposal can be a significant waste disposal challenge following flood, drought, or infectious disease outbreaks. Carcass burial may not always be an option, requiring on farm disposal of dead animals. The M.bovis response in 2021 resulted in culling of 172,422 cattle across 267 farms. The MPI-led the programme for eradication and compensation for verifiable losses, which ran for 4 years and cost $30 million. The response generated liquid waste from the disinfection of farm facilities, solid waste from chemical containers and disposable overalls. Milk from affected farms was disposed of via land irrigation or effluent ponds.

Historic landfill exposure (March 2019)

Flood flows in the Fox River exposed a historic landfill site and washed waste downstream and out to sea. This resulted in large quantities of mainly plastic waste accumulating along the coastline, causing a major clean-up operation over three years. A total of 15,750 tonnes of waste was transferred to Butlers Landfill, at a total cost of $3 million. The government is investing $6.6 million to clean up four historic dump sites where erosion risks exposing deposited waste. The sites are at Tokomaru Bay, Bluecliffs in Southland, St Andrews Beach near Timaru, and Tāhunanui Beach in Nelson.

Further Reading

Kaikoura Earthquake (November 2016)

The M7.8 earthquake in November 2016 caused 200 valley-blocking landslides while 1 million tonnes of rockfall closed 29km of state highway & the main trunk line. Restoration of road and rail links cost$1.3 billion and was expedited via emergency relief legislation allowing rockfall debris to be dumped into the ocean. The earthquake also generated four million tonnes of debris from demolition and repair works and dredging of the harbour to enable boat access. Asbestos containing material required hazardous substance management. The Waste Minimisation Fund granted $2.6 million to repair and expand waste facilities and manage hazardous waste arising from the recovery (including asbestos, pesticides, and fuels). Insurers paid out $1.8 billion to cover commercial and residential loss. It proved expensive to police dumping at the authorized disposal site.

Further reading

MV Rena grounding (2011)

The Rena cargo vessel struck the Astrolabe Reef in 2011. Maritime NZ led the clean-up which lasted for seven months, followed by salvage of the wreck and cargo over the next 3 years. The owner funded salvage operations ($700 million) and contributed $29 million to the NZ Government's $47 million clean-up cost. Salvors recovered 999 of the 1,368 containers from onboard and the ocean floor, while twenty-three were washed ashore. Salvors recovered 1,300 tonnes of heavy fuel oil from the wreck, but 350 tonnes leaked into the sea, requiring 1,000 tonnes of contaminated sand to be removed from local beaches. Disposal was also required for container contents, with thirty-two containers holding hazardous substances and 121 holding perishable foodstuffs. Response operations also generated a significant amount of waste, including packaging, soiled overalls, and toilet waste.

Further Reading

Canterbury earthquakes (2010-2011)

Two major earthquakes (M7.1 and M6.3) generated huge quantities of debris, with a clean-up cost in the order of $1 billion. Response and recovery efforts involved the demolition of 7,500 homes and 1,400 commercial properties which generated 8.75 million tonnes of construction and demolition waste (equivalent to 40 years of normal waste production). The response also involved removal, stockpiling and disposal of 500,000 tonnes of silt and sand liquefaction waste removed from streets and properties, at a cost of $25 million. The removal of hazardous substances from the red zone cost an additional $1.16 million. The Canterbury Earthquake Recovery Authority used Orders in Council (under the Canterbury Earthquake Recovery Act) to expedite resource consenting for waste handling facilities, waste transportation and demolition of dangerous buildings. Concrete, brick and rock waste was used to reclaim land for a consented wharf at the Port of Lyttleton.

An inter-agency Waste and Environment Management Team (WEMT) was set up to manage waste containment, collection and disposal on behalf of territorial authorities over a six-year period. Waste from the CBD was aggregated at the Burwood Resource Recovery Park -BRRP (a public private partnership which operated for a decade to sort and recycle debris, with residues dumped at Burwood disposal facility. Inert waste was also directed to the Lyttleton Port reclamation. Disposal fees assumed revenue from recovery and resale, but revenues were undermined by ‘cherry picking’ of valuable items prior to receipt. Illegal dumping also occurred at remote sites to avoid disposal fees for household and commercial waste.

Further Reading

F.2 International examples

Tohoku Tsunami, Japan (2011)

In March 2011, a M9.0 earthquake generated a 40m tsunami that devastated coastal towns and riverine communities up to 10km inland. Over 0.3 million buildings collapsed, and coastal forests were felled, generating 223.7 million tonnes of debris in Iwate, Miiyagi and Fukushima. The recovery cost was estimated at US$210 billion. Waste streams were segregated for reuse, and incinerators used to dispose of combustible debris. Saltwater contamination reduced waste recovery and processing. The tsunami also created a nuclear waste disposal issue at the Fukushima power plant, where 0.5 million tonnes of radioactive cooling water drained into the ocean, while 1.3 million tonnes of treated water was held in 1,000 storage tanks prior to ocean disposal (commenced in 2023).

Further reading

Black Saturday Bushfires, Victoria, Australia (2009)

Over 400 individual bushfires affected 430,000 hectares, causing severe property damage in regional towns and small communities. Fires destroyed 3,500 buildings (including 2,000 homes), killing 173 people and up to 1,000 wild and domesticated animals. The Victorian Bushfire Recovery & Reconstruction Authority managed demolition and recovery and established a single managing contract to coordinate subcontractors involved in waste collection and disposal, sourcing labour from local communities. A new landfill cell was built in 10-days to accommodate 31,000 tonnes of fire waste and enable rebuilding, although consents imposed a 30-year site maintenance obligation on the local council. All waste was given a single ‘Bushfire Waste’ classification to expedite removal and disposal. The EPA assessed that hazardous substances would have volatilised in the fire while asbestos would have become non-friable, reducing the risk to waste handling. Resource recovery reduced transportation and disposal costs. Concrete was crushed for use as aggregate, steel was recovered, and green waste was mulched and stockpiled pending burning.

Further Reading

Hurricane Katrina (August 2005)

Hurricane winds and flooding from levee breaches caused widespread property damage, costing US$4 billion over 3 years to deal with 87 million cubic metres of disaster debris and silt across Louisiana, Mississippi, and Alabama. Around 24,000 homes were demolished in New Orleans, while 350,000 cars and 60,000 small boats were damaged or destroyed. Sediment and construction and demolition waste was landfilled, though there were many examples of asbestos containing material slowing waste management, hazardous waste dumping in cleanfills, open burning and uncontrolled dumping. Power outages also led to large quantities of rotting food. Debris removal from sensitive marsh ecosystems also required use of low impact methods. The wastewater system was severely impacted, leading to sewage ponding in urban areas. Sewage disposal also failed at Louisiana Superdome, exposing 30,000 people to unsanitary conditions.

Further reading

Great Hansin Earthquake, Kobe (Jan 17, 1995)

This M7.2 earthquake affected densely developed urban centres in Kansai region, killing 6,300 people, collapsing 200,000 buildings, severely affecting network utilities, generating 18 million tonnes of disaster waste. Shortage of available land led to C&D waste being used for coastal reclamation in Kobe Harbour, with other wastes going to disposal facilities designated to accept waste types of stable (e.g. construction waste), unstable or hazardous. Municipalities used their own disposal sites, but a new common landfill (the Phoenix Center) was also established in Hanshin to support the affected region. Waste segregation and volume reduction was done at temporary storage locations. Refuse collection was inoperable for several days, leading to waste stockpiles in streets. Damage to water networks and growth of large refugee camps required deployment of temporary toilets and collection of sanitary waste. Waste co-mingling presented a particular problem in damaged timber properties, hampering on-site separation and leading to load rejection at the Phoenix Center. Some waste contractors also illegally incinerated waste, leading to odour and some issues.

Further Reading