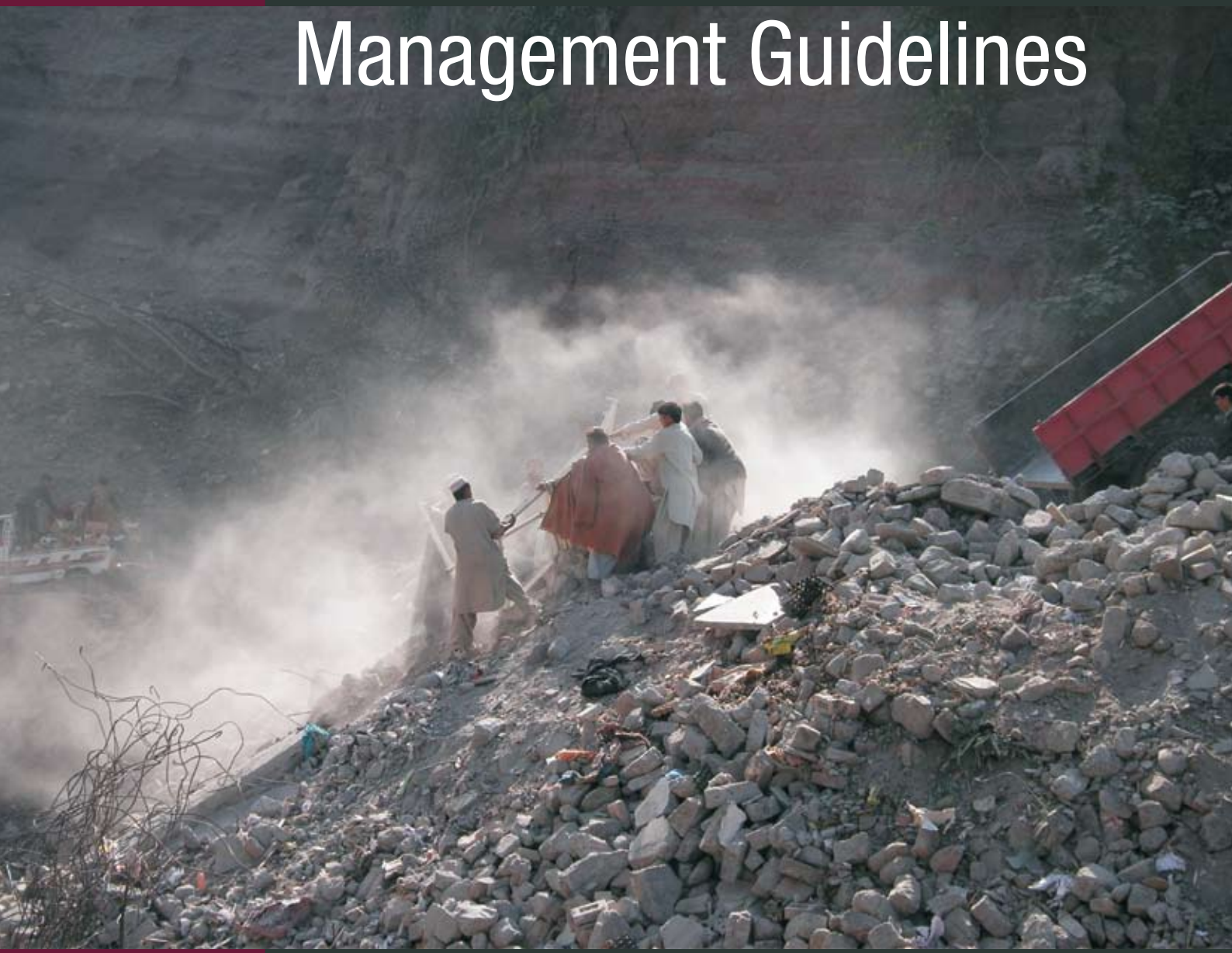
UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS
ENVIRONMENTAL EMERGENCIES SECTION

Disaster Waste Management Guidelines



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Cover photo: Salvaging scrap metal from post-earthquake debris, Muzaffarabad (source: MSB and JEU)

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Foreword

Disaster waste is a well-recognized threat to health, safety and the environment, and can also be a major impediment to post-disaster rescue operations.

Experience shows that disaster waste is often managed in an ad hoc manner, however, and that substantial improvements can be made in future response efforts.

These guidelines, developed collaboratively by the Swedish Civil Contingencies Agency – or MSB for short – and the Joint UNEP/OCHA Environment Unit, aim to do just that. They represent much of the best current knowledge and lessons learned on disaster waste management, and provide national authorities and international relief experts alike with sound and practical advice to help them manage disaster waste. They were developed following a request by governments at the international Advisory Group on Environment Emergencies, and are based on extensive consultations with national and international stakeholders.

These guidelines are an important start to improving the management of disaster waste. They must be complemented by efforts to ensure their uptake and regular use through a range of disaster management mechanisms. We look forward to working with a wide range of stakeholders to achieve this.

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Introduction

Disasters and conflicts can generate large quantities of solid and liquid waste that threaten public health, hinder reconstruction and impact the environment. Disaster waste (DW) can be generated by the actual disaster and later during the response and recovery phases.

Public health risks can arise from: direct contact with waste accumulated in the streets, hazardous wastes such as asbestos, pesticides, oils and solvents, and indirectly from vectors such as flies and rodents, and from post-disaster collapse of unstable structures.

Relief and reconstruction efforts can be hindered when DW blocks access to affected populations and areas.

Environmental impacts, which are closely associated with human impacts, can include waterways, agricultural areas and communities contaminated by chemicals and heavy metals. Physical obstruction of waterways can also occur.

In most cases, DW places more burdens on communities already struggling to cope with catastrophe.

DW also presents opportunities: it may contain valuable material such as concrete, steel, and timber as well as organics for composting. This value can be realized as either a source of income or as a reconstruction material, and reduce burdens on natural resources that might otherwise be harvested for reconstruction.

Safe handling, removal and management of DW are therefore important issues in disaster response and recovery. Effective approaches can help **manage DW risks to life and health and seize opportunities from the waste to support recovery and development outcomes.**

Unfortunately, current DW management practice often involves either **no action**, in which the waste is left to accumulate and decompose, or **improper action**, in which the waste is removed and dumped in an uncontrolled

Typical hurricane debris where roof has been blown off and debris spread over area in post-hurricane Turks and Caicos Island 2008. *Source: MSB and Anttilator*

manner. In the latter case, improper dumping may create long-term environmental problems that affect the community or occur on economically significant land and require the waste to be moved again, creating additional costs.

Although national authorities have the primary responsibility for dealing with DW, when they are overwhelmed during disasters it is unclear which international assistance agencies can provide which types of assistance to them.

These guidelines provide advice and tools to overcome these challenges and manage DW in emergency and early recovery phases. They are targeted at implementers of disaster waste management projects. Their objective is to i) minimize risks to human life and health ii) reduce risks to the environment and iii) ensure that any value in the DW is realized, to the benefit of affected communities. A wide range of stakeholders have been consulted in the development of these guidelines. They are not highly technical, but rather, a common-sense compilation of good practice drawn from experienced disaster waste managers and existing material. National authorities have primary responsibility for DW management, consequently where these guidelines are being used by parties other than national authorities it is assumed that they have an official national request for assistance.

Structure of guidelines

The guidelines are in four parts:

1. Introduction and overview.
2. General guidance divided into the immediate response phase, early recovery phase and recovery phases. The latter includes information on contingency planning.
3. Key considerations that are important throughout the process – for example, health and safety.
4. Tools and checklists for implementing the guidance provided. These are in the attached Annexes.

Typical disaster waste issues and their effects

In these guidelines, **disaster waste** means solid and liquid waste generated from a disaster.

Common examples include: concrete, steel, wood, clay and tar elements from damaged buildings and infrastructures; household furnishings; parts from the power and telephone grids such as electrical poles, wire, electronic equipment, transformers; parts from water and sewage distribution systems; natural debris such as clay, mud, trees, branches, bushes, palm tree leaves; chemicals, dyes and other raw materials from industries and workshops; waste from relief operations; damaged boats, cars, buses, bicycles; unexploded ordnance (e.g. landmines); waste from disaster settlements and camps including food waste, packaging materials, excreta and other wastes from relief supplies; pesticides and fertilizers; household cleaners; paint, varnish and solvents; and healthcare waste.

For the purpose of these guidelines, disaster waste does not include: human corpses, animal carcasses, faecal material and urine disposed of in functioning latrines or contaminated land. Human corpses obviously require sensitive handling that respects local culture and communities and are addressed elsewhere.[1]

[1] *Management of Dead Bodies after Disasters: A Field Manual for First Responders* (Editors: Oliver Morgan, Morris Tidball-Binz and Dana Van Alphen).

Table 1. Typical disaster waste issues and their impacts

Issue	Typical human and environmental impacts
Uncollected building rubble from damaged buildings	Impeded access and constrained rehabilitation & reconstruction activities. Waste tends to attract more waste since the site is already considered a dumping site.
Dumping in inappropriate areas and/or proliferation of scattered dump sites	Potential human health and injury risks from dump sites too close to settlements, especially from hazardous materials. Destruction of valuable land. Impacts on drinking water supplies and damage to valuable fisheries. Additional costs if waste must be moved later. Increase in disease vectors (flies, mosquitoes, rats, etc.). Risk of waste piles collapsing. Risk of fires. Risk of cuts from sharp materials, including used syringes.
Collapse of municipal solid waste services, including possible loss of experienced waste managers	Lack of collection service and uncontrolled dumping of waste.
Uncontrolled dumping of healthcare waste from hospitals and clinics	Serious health risks to local populations including the spread of disease and infection, for example from used syringes; odour problems.
Asbestos sheet exposure in collapsed structures or in re-use of asbestos for reconstruction	Health risks associated with inhalation.

Mixed healthcare waste, including red bags indicating infectious waste, disposed of openly in post-hurricane Turks and Caicos Island 2008. *Source: MSB and Anttilator*

Table 2. Hazard types and their waste characteristics

Earthquakes	Structures collapse 'in-situ', i.e. floor slabs collapse on top of each other, trapping waste within damaged buildings and structures. This can lead to challenges in sorting out hazardous waste (e.g. asbestos) from non-hazardous (e.g. general building rubble). Handling waste often requires heavy machinery, which communities may not be able to afford or have difficulty to access. Collapsed buildings may overlap across streets, making access difficult for the search and rescue and relief operations. Quantities of waste are high compared to other disaster types since all building contents normally become waste.
Flooding	Floods often lead to mass displacement, which in turn requires shelters and camps and leads to large volumes of household wastes. Initial damage depends on the structural integrity of infrastructure, while building contents are normally damaged extensively. Mould may be present and timber may have begun to rot. Buildings are typically stripped by owners and waste placed on roads for collection. Waste is often mixed with hazardous materials such as household cleaning products and electronic goods. Flooding may bring mud, clay and gravel into affected areas, making access difficult once the floodwater recedes. Removal may be required for relief and recovery operations. The mud, clay and gravel may be mixed with hazardous materials, requiring further assessment before dumping.
Tsunami	Strong tsunamis can cause widespread damage to infrastructure, spreading debris over large areas. Debris is often be mixed with soils, trees, bushes and other loose objects such as vehicles. This makes waste difficult to handle and segregate.
Hurricanes typhoons cyclones	Strong winds can tear the roof off buildings, after which walls may collapse. Poorly constructed houses and huts can 'fold' under roof tops. Even brick and concrete walls may collapse. Waste is spread over open land, streets, and marketplaces. This would include roofing materials, small items and dust carried by the wind. This may cause serious problems where asbestos is present Ships and boats are often thrown ashore and destroyed, requiring specialized waste management. Vessels that sink in harbours need to be removed. Electrical and telephone grids as well as transformers containing oil and PCBs may be destroyed.
Conflict – short-term	Intense, short-term conflicts can involve rockets, missiles and bombs, which, combined with land combat, result in damage to buildings and infrastructure, key strategic installations being bombed and/or widespread damage to industrial and residential areas. Damaged infrastructure is often burnt, resulting in the destruction of most internal furnishings and fittings. This reduces the quantities of debris to be managed and leaves primarily non-flammable items such as concrete, bricks and stones. Bridges, roadways, railway structures etc. are often targeted. Their clearing requires heavy machinery such as excavators and bulldozers. Waste collection vehicles may be damaged or be commandeered for military purposes. Unexploded ordnance (UXO) including undetonated landmines may be present among waste.
Conflict – protracted	Protracted conflicts share similarities with short-term, intense conflicts but there is often more widespread damage to building and infrastructure, and increased use of landmines on or near strategic roadways and facilities.

Guidance

Framework for disaster waste management

For waste to pose a risk to human health or the local environment, three conditions must be met: it must be (1) **hazardous** (i.e. toxic to human health) or present a hazard; there must be (2) a **route** or **'pathway'** by which the hazardous waste can (3) impact a **'receptor'**, for example a person or a water source.

Where these three elements of risk are present, the waste can have a negative impact and must be considered a potential priority.

For the purpose of this framework the response to, and preparedness for, the disaster could be divided into four phases.

PHASE 1: EMERGENCY PHASE

Phase 1 addresses the most acute waste issues required to save lives, alleviate suffering and facilitate rescue operations. Any other considerations at this stage are secondary. Use the tools and checklists noted below to support your work.

0-72 hours: immediate actions

Often initiated within hours of the disaster event:

Create a hazard ranking using the following steps to identify most urgent priorities:

- **Identify waste issues.** Determine geographic presence of the waste through governmental sources, HIT[2], Geographical Information System, news, and information gathered from local agencies.
- **Characterize waste.** Quantify composition and quality of the identified waste streams and dumps/landfills through site visits and waste sampling/analysis, even if this is cursory.
- **Map waste.** Use above data in a waste map of the affected area. The map will be a valuable tool throughout the process, and can be updated as information becomes available.
- **Assess waste.** Allow for a prioritization of action to be developed. This requires the use of the framework noted above: where waste is present, determine if there is also a 'pathway' and 'receptor'.
- **Prioritize actions.** Each identified waste streams and/or issue is given a 'common sense' ranking based on the following as a guide:
  - Appropriate disposal sites are to be identified for the disposal of the different types of waste collected in the emergency phase. If an existing disposal site is available, it should be rapidly assessed for environmental compliance before use. Where no existing disposal site is available, a temporary disposal site or engineered dumpsite should be identified and established. See Annex IV for more details.
  - Main streets are to be cleared to provide access for search and rescue efforts and relief provisions. Any DW moved should, if possible, stay in the emergency area. **It should not be moved out** before appropriate disposal site(s) have been identified.
  - All available equipment and stakeholders should be used. Wheelbarrows and wooden carts pulled by animals can be used where excavators, trucks and skips do not have access.
  - If hospital and clinics are affected by the disaster, they should be encouraged to separate infectious and/or healthcare waste, store it separately and

[2] *HIT is Hazards Identification: http://ochaonline.un.org/OCHAHome/AboutUs/Coordination/EnvironmentalEmergencies/ToolandGuidelines/HazardIdentificationTools/tabid/6458/language/en-US/Default.aspx. This desk-based evaluation is normally carried out by the JEU and provided to relevant responders.*

transport it to temporary special treatment or disposal sites.

- Whatever resources that are available to address those issues identified in the above analysis as most pressing should be marshalled.

72 hours onwards: short term actions

Often initiated within days of the disaster event:

- If people remain in the disaster area, the collection of their household waste should be carried out where possible.
- At this stage a rapid DW assessment should be carried out to inform further decision-making. Exact data is not required, but reasonable ideas about the status of waste, the ability of local authorities to handle the situation, and the need for any international assistance should be provided.

Other considerations:

- Wastes from IDP camps should be managed in coordination with general solid waste management services, and thus integrated with the local waste collection services.
- Ownership of waste, in particular reusable waste, is an important issue to clarify to avoid later conflicts.

The **output** from these actions should be an understanding of the basic DW issues, and a series of actions to address the most urgent of these.

PHASE 2: EARLY RECOVERY PHASE

Phase 2 lays the groundwork for a disaster waste management programme to be implemented during the recovery phase. It also continues to address key issues such as the location of a disposal site for the different types of waste, streamlining logistics for waste collection, transportation and reuse/recycling activities.

Efforts here build on the initial Phase 1 assessment but go into greater depth, with an emphasis on longer-term solutions. Required actions normally include:

Assessments

- Continue to assess the disaster waste (extent of waste generation, locations, types of waste, regulatory understanding, etc.).

Table 3. Emergency phase tools and steps

Annex I	Waste needs assessment	Use this checklist to identify what different types of waste are present, where and in what condition.
Annex II	Hazard ranking tool	Fill this table with all waste streams and associated hazards/risks.
Annex III	Waste handling matrix	Refer to this for options on handling, treating and disposing each disaster waste type.
Annex IV	Disposal site guidelines	Select emergency dumpsites using these guidelines.

- Assess locations for medium term temporary disposal and waste separation sites for unsorted rubble and municipal waste. This may entail upgrading or improving current dumpsites.
- Assess requirements to close current dumpsites if these pose a threat to human health or the environment.
- Identify and assess other waste management facilities in or near to the disaster affected area.
- Assess local capacities for addressing disaster waste and identify gaps/needs for additional assistance.

Operations

- Establish temporary storage sites for debris and regular waste.
- Initiate collection and transportation of waste and debris, with the goal of expanding this in the full recovery phase.
- Prepare practical advice and guidance for local authorities on interim solutions to minimize environmental and health impacts of disaster waste.

Planning

- Implement a communications plan for affected communities with a focus on opportunities (i.e. reuse and recycling), risks (i.e. human health risks) and collection schemes.
- Develop a plan for healthcare waste. This may entail the construction of a temporary incinerator for healthcare waste; develop a special plan for hazardous waste (including asbestos) collection and treatment.
- Consult affected communities on issues relating to public health, wastes, livelihoods and the environment.
- Identify exit strategies and handover options for the disaster waste management systems planned for establishment.

Communication and reporting

- Communicate rapidly and regularly regarding all findings to the local authorities, the United Nations Resident Coordinator, UN Disaster Assessment and Coordination teams, the Joint UNEP/OCHA Environment Unit and other international response mechanisms as appropriate.
- Document in electronic form the assessment results, recommendations, and mitigation measures implemented.

The **outputs** from these planning actions include data and information to design a disaster waste management programme to be implemented in the recovery phase.

Table 4. Early recovery phase tools and steps

Annex V	Waste needs assessment	Revisit current waste activities and ensure different types of waste are being accounted for.
Annex III	Waste handling matrix	Review options for the handling, treatment and disposal of each disaster waste stream.
Annex VI	Fundraising	Hold consultations on the development of disaster waste management project proposals and/or funding requests.
Annex VII	Dumpsite closure guidelines	Use these to close unmanaged dumpsites.

PHASE 3: RECOVERY PHASE

Phase 3 includes implementation of disaster waste management projects designed in Phase 2, and continued monitoring and evaluation of the disaster waste situation.

The following main actions should be considered:

- Develop and implement a communications plan for the key stakeholders to ensure the disaster waste management programme is aligned with community expectations and needs.
- Procure or repair required waste management plant, machinery and equipment.
- Train waste management operators if required.
- Support the implementation of disaster waste management systems by supporting waste management operators/operatives or local authorities.
- Hand over disaster waste management systems into a normalized and improved solid waste management system.

The **output** of this phase should be having all disaster waste addressed either through disposal, incineration, re-use or recycling.

Table 5. Recovery phase tools and steps

Annex VIII	Technology resources	Consult list for machinery suppliers, organizations, consultants, and contractors to help with the implementation.
Annex IX	Exit strategies	Develop exit strategies and handover of disaster waste management projects.

Salvaging scrap metal from post-earthquake debris, Muzaffarabad. *Source: MSB and JEU*

PHASE 4: CONTINGENCY PLANNING

Phase 4 is not, strictly speaking, part of emergency response. However, it does help bridge the gap between response, recovery, and longer-term development and is therefore an important investment. Contingency planning can be conducted during the recovery phase or as a pre-paredness measure prior to disaster.

The objective is to develop a Disaster Waste Management Contingency Plan (DWMCP) to aid communities in determining appropriate management options **in advance** of a disaster.

A plan identifying cost-effective disaster waste management options and resources can save money, increase control over waste management and improve administrative efficiency.

The plan may also serve as a resource document in negotiating technical and financial assistance.

An effective DWMCP addresses issues well beyond initial removal and should include a strategy for recycling and reuse of materials (including composting). There are many possible components of a DWMCP, including:

- Pre-planning activities;

Clearing hurricane debris in post-hurricane Turks and Caicos Island 2008. Note the lack of appropriate equipment to segregate roofing and reusable boards. *Source: MSB and Anttilator*

- Secondary activities
  - Establish governmental coordination.
  - Identify likely waste and debris types.
  - Forecast amounts of waste and debris.
  - List applicable national, and local environmental regulations.
  - Inventory current capacity for waste and debris management and determine waste and debris tracking mechanisms.
  - Pre-select temporary waste and debris storage sites.
  - Identify equipment and administrative needs.
  - Pre-negotiate contracts.
  - Develop a communications plan.
  - Create a disaster debris prevention strategy.
  - Create a debris removal strategy.
- Harmful materials identification and hazardous waste management recommendations
- Recycling options
- Waste-to-energy options
- Disposal options
- Open burning options

Table 6. Contingency planning tools and steps

Complete contingency planning guidelines are available at

http://ochanet.unocha.org/p/Documents/DWMG_Annex%20XII.pdf

Programme sustainability

It is important to have an exit strategy from the recovery phase onwards to ensure sustainability. Key to this is local engagement in all activities, including:

- **Ensuring technical abilities**: local capacities must be built such that once the project is completed there remains adequate technical capability to carry on any waste management systems;
- **Financial self-sufficiency**: any waste management system must continue to function past the recovery phase with fees and/or public sector funds to ensure sustainability;

Effective handover is also important. Options include:

- **private sector handover**, where the system established is passed on to a private sector company which continues to operate as a for-profit service. This can be a direct handover to the current management team or follow a tendering process;
- **public sector handover**, where the system is handed over to the local authority or another governmental department for continued operations as part of a public sector service;
- **community-based organization** (local NGO), where the system is taken over by a local NGO to continue operations with national or international funding; or
- **public / private hybrid handover,** where a public sector organization can function as a commercial entity providing services back to either the public sector or directly into the marketplace.

Suggested contents for a Disaster Waste Management Contingency Plan

1. Coordination
   - Governmental coordination
   - Coordination with other stakeholders
   - Coordination with international assistance
2. Types of waste and debris after a disaster
3. Disaster debris and rubble prevention strategy
4. Forecast of amounts of waste and debris
5. Harmful materials identification – potential hazardous waste
6. Applicable national and local environmental regulations
7. Current capacity for waste and debris management. Determine waste and debris tracking mechanisms
8. Equipment and administrative needs
9. Hazardous waste management
   - Industrial HW
   - Household HW
10. Healthcare waste management
    - Infectious waste
    - Hazardous substances
    - Conventional waste
11. Clean up and Debris removal strategy
    - Street clean up priority
    - Other open space priority
    - Business and work clean up priority
    - Implementation of pre-negotiated contracts
12. Selection of temporary waste and debris storage sites
13. Management of temporary waste and debris storage sites
14. Recycling options
    - Steel and other metals
    - Concrete, bricks and other construction material
    - Wood and board
    - Paper, plastics, glass and other packaging material
    - Composting and bio-gas production
15. Disposal options
    - Temporary disposal
    - Landfilling (permanent)
16. Incineration options
17. Open burning options
18. Communication plan

Key considerations

This section presents considerations that are important throughout the process: health and safety, stakeholder management, communications and coordination, and common risks from disaster types.

Health and safety in disaster waste management

Health and safety (H&S) of personnel is paramount to the success of any disaster waste management initiative and must be integrated from day one. Minimum requirements include:

- Ensuring that all personnel managing and overseeing DW efforts are experienced and implement appropriate safety systems;
- Ensuring the greatest possible use of personal protective equipment (PPE), including for casual labour staff (i.e. those involved in cash-for-work) from the local communities in debris clearance schemes. Typical PPE includes adapted footwear (hard boots to prevent spikes entering the sole and minimise the risk of harm from heavy materials dropping onto feet), hard hats, gloves, overalls and masks;
- At the new waste handling site, laying out the site to take into account H&S, for example one way traffic systems and limited cross over between vehicles and humans at the site. People working with the waste should have access to proper and clean changing and washing facilities for use during and after waste handling and processing works; and
- Having adequate dust suppression where rubble is being crushed or waste is being processed (e.g. using water spraying). Facilities and equipment should be fitted with noise, vibration and harmful emission reduction mechanisms, as well as machinery guards to prevent accidents.

Hazardous waste (car batteries and LPG cylinder) mixed with debris, Balakot 2005. *Source: MSB and JEU*

It should be noted that there are increasing cases of legal action relating to exposure to hazardous substances during disaster clean-up works.

Further guidance on H&S in waste management can be found in the World Bank Group's *Environmental, Health and Safety Guidelines: Waste Management Facilities* (www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines).

Stakeholder management

The groups listed below should be kept in mind and involved/engaged as appropriate in the development and implementation of any actions. It is assumed that all activities occur under the overall direction of responsible national and local authorities:

Beneficiaries/target groups

The following beneficiary and target groups should be taken into account and involved from the early stages of DW waste assessment, planning, programme design and management:

- Disaster affected communities and populations requiring support in clearing their property of disaster wastes and removing waste generated by households. This group may include those residing in refugee / camps and camps for Internally Displaced People (IDP);
- The informal waste sector, e.g. scavengers, waste pickers or recyclers who may have networks for reuse and recycling;
- Solid waste management service companies and their employees who may require rehabilitation support;
- Private sector and non-governmental waste organizations that may have been affected by the disaster;
- Hospitals and clinics affected by the disaster; and
- Local authorities responsible for the collection and treatment or disposal of solid wastes.

Local level administration

Local waste management organizations can benefit from assistance provided in a disaster waste management programme.

Administrators

Local authorities must often make decisions concerning future waste management in the disaster area. They should be kept informed fully and wherever possible involved in the decision-making.

Practitioners

In some places local government executes waste collection and in other places collection is done by a contractor. In either case they must be engaged in DW management.

Regional administration

When there is a regional government, there are also administrators at national and local levels. They should be directly involved and at a minimum receive DW reports.

Donors

Donors have a key role in any disaster waste management programme, especially for allocation of funds and specifying minimum requirements for design and implementation of a disaster waste management projects. Interested ones should be kept engaged and informed.

Communication and coordination

Effective communication and coordination with stakeholders is essential.

Key issues include:

- Sending consistent messages to support DW clean-up, for example using radio slots to inform on planned clean-up campaigns or advise on specific types of hazardous waste;

- Ensuring national authorities have information that spells out who does what, which data/information has been collated and the results of any waste assessment and planning mission. There are often a large number of NGOs and implementing agencies active in post-disaster works. The "Who does What Where" tool at **http://oneresponse.info/Pages/default.aspx?** can be helpful; and

- Supporting local authorities to provide clear and transparent information about cleanup progress, future schedules etc. Information relating to the clearing of streets also gives the local community time to plan for the recovery of their homes and decide on emptying their buildings of damaged furnishings and items.

Implementing agencies must coordinate and communicate to streamline waste assessment missions and projects and programmes. These guidelines are one tool that can be used in order to avoid duplication and ensure coordination.

Developing information exchange and coordination mechanisms to facilitate dialogue and consensus between government, civil society, cooperation agencies, donors and leading institutions.

Ensuring that a comprehensive communications plan exists as a part of a larger disaster waste management plan. A GIS Information Management System should be used to capture data and act as a central repository for information about current status, work achieved and planned next steps.

Healthcare waste is segregated and stored in clearly distinguished yellow container awaiting disposal. *Source: UNEP*

Common risks by disaster waste hazard type

The following generic risks from various waste types are useful to prioritize DW actions:

Chemical risks[3]

The following chemical risks arise from some types of waste:

- Direct dermal (skin) contact with contaminants such as pesticides, oils and acids
- Inhalation of:
  - Hazardous chemicals or products like pesticides
  - Products of incomplete combustion including dioxins/furans, poly aromatic hydrocarbons (PAH), volatilized heavy metals from uncontrolled waste burning
  - Dust, including small particulate matter (PM10)[4] and asbestos fibres
- Ingestion of surface/groundwater contaminated by leachate from waste. This can contain high levels of organics, ammonium, heavy metals, trace organics such as PCBs, and volatile organic compounds (VOCs)
- Nuisance from odours arising from chemicals in the waste or decomposition of some waste types

Biological risks

The following are examples of biological risks:

- Dermal (skin) contact/ingestion of faecal matter/body fluids
- Direct exposure to healthcare waste
- Disease vectors from animals that congregate on or near waste:
  - Rat excreta – hanta virus, leptospirosis, plague, scrub typhus
  - Mosquitoes – malaria, dengue fever
  - Flies – bacterial infections
- Nuisance from insects, birds and rodents which are attracted to and feed on waste

Physical risks

- Collapse of waste piles, such as large piles of rubble that have been pushed to the side of a road
- Cuts and abrasions from sharp objects in waste, for example where healthcare waste has been mixed with general household waste
- Uncontrolled fires in piles of waste
- Vehicle accidents from trucks picking up, transporting and dumping waste in urban or rural areas; and
- Nuisance from smoke plumes and/or wind or wave-blown litter

Local environmental risks

The following can negatively affect the local surrounding environment

- Waste that contaminates soils, rendering it hazardous to humans and animals, and/or making it unsuitable for agriculture
- Leachate from fluids passing through waste and subsequently contaminating water
- Landfill gas from decomposing organic waste, which can pose risks to humans and animals
- Infestation of rodents and insects feeding on waste
- Windblown and wave transported litter which can impact an area

[3] A more comprehensive overview of risks with different chemicals can be found in reference "The Emergency Response Guidebook (ERG2008) " http://www.tc.gc.ca/eng/canutec/guide-menu-227.htm
[4] PM10 is used to describe particles with a size less than 10 micrometres.

Annex I. Waste needs assessment - emergency phase

People in the affected area				Comments
Estimate percentage			%	
IDP camps				
How many IDP camps are established?			Nos	
Estimate percentage of population staying in the camps			%	
How is waste management arranged?			Nos	
Collection				Bins___ Street Pile____ Others - what_____
Treatment				Dumpsites___ Open burning___ Others - what_____
Estimate the amount of IDP waste collected			%	
Immediate needs				
Condition of buildings				Comments
Estimate total destruction as percentage			%	
Estimate intact buildings as percentage			%	
Which is the main construction material used in the disaster area?				Concrete___ Bricks____ Board____ Tins_____
Estimate the total amount of rubble and debris from buildings			m3	Square metres covered x height
Immediate needs				
Conditions of other infrastructure. Are:	Yes	No		Comments
Roads and streets functioning?			%	If not, describe damage and debris potential in separate sheet
Water distribution functioning?			%	
Waste water collection and drainage functioning?			%	
Land line telecommunications functioning?			%	
Mobile telephones functioning?			%	
Internet functioning?			%	
Electricity distribution functioning?			%	
Immediate needs				

Continued...

Annex I. Waste needs assessment - emergency phase, continued				
Hospitals and health care centers	Yes	No		Comments
Are hospitals and clinics functioning?				
Is their waste being managed?				If yes go to healthcare sheet
Is there information about infectious waste?				If yes go to healthcare sheet
Is there information about other healthcare waste?				
Are there temporary clinics/hospitals?				If yes go to healthcare sheet
If so, many beds (capacity)do they have?				
Is there any information about waste collection from the temporary hospitals/clinics				If yes go to healthcare sheet
Immediate needs				
Industries and other commercial activities	Yes	No		Comments
What kind of industries were located in the disaster area?				Give details on the industrial waste sheet!
Are they intact?				
Is there any information about input chemicals?				Give details on the industrial waste sheet!
Is there any information about hazardous waste?				Give details on the industrial waste sheet!
Immediate needs				
Municipal waste management	Yes	No		Comments
To what extent has it recovered and is it functioning?			%	
Are waste management vehicles intact?			Nos	If not, describe the problems
Are employees alive and still in the area?				
Is there fuel available for the vehicles?				
Is the dumpsite intact?				If no: describe the problems
Are the access-roads to the dumpsite intact?				If no: describe the problems
Are there any temporary dumpsites?				
If so, where are they located?				
Are there any other waste treatment plants in the area?				If yes: describe
Immediate needs				
Hazardous waste	Yes	No		
HW among industrial debris and rubble				Be aware of the risk for asbestos!
HW from industries				
Hazardous and electronic waste from telecom				
Hazardous and electronic waste from electrical grid				
Hazardous and electronic waste from municipal waste				Be aware of “under the sink items”
Prompt needs				

Continued...

Annex I. Waste needs assessment - emergency phase, continued

Infrastructure debris assessment

	Notes
Roads	
Tar road debris	
Dirt road debris	
Streets	
Tar street debris	
Mud street debris	
Water distribution system	
Debris from water works	
Pipes	
Wastewater collection system	
Debris from waste waster treatment plants	
Pipes	
Other drainage systems	
Debris from broken drains	
Waste clogging the drains	
Landline telecommunication	
Poles	
Dig down cable	
Open hanging cable	
Mobile telecommunication	
Antenna masts	Electronic waste on downed masts
Others	
Internet	
Dig down cable	
Open hanging cable	
Electricity grid	
Poles	
Dig down cable	
Open hanging cable	
Transformers	Electronic waste, transformer oil

Continued...

Annex I. Waste needs assessment - emergency phase, continued

Healthcare waste assessment

Estimate from a few hospitals/clinics	Notes
Is the waste taken care of?	
Segregation?	
Collection?	
Treatment?	Dumpsites____ Engineered dumpsites____ Incineration____
Is there any information about infectious waste?	
Segregation?	
Collection?	
Treatment?	Dumpsites____ Engineered dumpsites____ Incineration____
Is there any information about other waste from hospitals and clinics?	
Segregation?	
Collection?	
Treatment?	Dumpsites____ Engineered dumpsites____ Incineration____
Are there any temporary clinics/hospitals?	
How many beds do they cover?	
Estimate the generation of healthcare waste	
Estimate the composition of the waste	
Is there any information about waste collection from the temporary hospitals/clinics	
Segregation?	
Collection?	
Treatment?	Dumpsites____ Engineered dumpsites____ Incineration____

Continued...

Annex I. Waste needs assessment - emergency phase, continued

Industrial waste assessment

This form is to map the most immediate facts about the industries. Fill in for all facilities for which you can gather details.
The information will serve as indications for waste prioritization.
There might be fluids stored in tanks or oil drums. Such fluids should be considered hazardous until more is known.
Rubble from collapsed industries may be contaminated with hazardous material such as asbestos and chemicals.

	Yes	No	Indication	Part of disaster waste	List
Name of the plant/equivalent					
Used raw material					
Used energy sources					
Products					
Normal flow of waste					
Composition					
Known generation of hazardous waste					
Source of disaster waste?			m^3		
Disaster rubble			m^3		
Name of the plant/equivalent					
Used raw material					
Used energy sources					
Products					
Normal flow of waste					
Composition					
Known generation of hazardous waste					
Source of disaster waste?			m^3		
Disaster rubble			m^3		
Name of the plant/equivalent					
Used raw material					
Used energy sources					
Products					
Normal flow of waste					
Composition					
Known generation of hazardous waste					
Source of disaster waste?			m^3		
Disaster rubble			m^3		
Name of the plant/equivalent					
Used raw material					
Used energy sources					
Products					
Normal flow of waste					
Composition					
Known generation of hazardous waste					
Source of disaster waste?			m^3		
Disaster rubble			m^3		

Annex II. Waste hazard ranking tool

This table presents typical disaster waste streams with corresponding possible hazards and respective priorities for the emergency and early recovery phases.

Waste stream	Is it old waste, e.g. more than one week?	Is the waste close to residential areas?	Is the waste close to streams, rivers or other water sources?
Food waste			
Packaging materials			
Excreta			
Wastes from relief supplies			
Concrete/bricks			
Household furnishings and belongings			
Other wastes such as plastics, cardboard, paper			
Timber			
Cables, etc.			
Soils and sediments			
Bulky items			
Waste with potential hazardous properties			
Hydrocarbons such as oil and fuel			
Paint, varnishes and solvents			
Pesticides and fertilizers			
Household cleaning products			
Medical waste in debris			
Healthcare risk waste			
Other potential infectious waste			
Household wastes			
Camp waste			
UN/military/NGO waste			
Commercial wastes			
Industrial wastes			
Unexploded ordnance (UXO)			
Landmines and ammunition within the debris			
Military vehicles			
Phosphorus and other weapon contamination			
Phosphorus and other weapon contaminates			

High priority | **Medium priority** | **Low priority**

Annex III. Waste-handling matrix

This matrix lists typical post-disaster waste streams and corresponding possible handling and management options for both the emergency phase (the first 8 weeks of disaster response) and the early recovery phase (2-6 months following the emergency phase).

Waste stream	Cash for work	Transportation options	Disposal options	Recycling	Reuse
Waste from IDP camps and shelters					
Food waste	Manual collection possible	Wheel barrow offload into skip for truck haulage	Disposal at dumpsite or landfill under controlled management	Not in Emergency Phase	No
Packaging materials					
Excreta	Manual collection not possible, use mechanical means where possible	Use appropriate trucks if removal is required	Disposal at sanitary dumpsite/landfill under controlled management		
Waste from relief supplies	Manual collection possible	Wheel barrow offload into skip for truck haulage	Disposal at dumpsite or landfill under controlled management		
Debris					
Concrete/bricks	Manual collection possible	Wheel barrow or excavator/ bulldozer offload into truck for haulage	Disposal at temporary site for future recycling if uncontaminated debris. Otherwise disposal at dumpsite/ landfill to be used as cover material	Attempt to store for future recycling. If not possible, then limited options for recycling in emergency phase	Can extract bricks, steel etc. for reuse
Household furnishings and belongings			Mixed debris disposal at dumpsite/landfill	Not in emergency phase	Not in emergency phase
Other wastes such plastics, cardboard, paper					
Timber	Manual sorting possible		If separated, reuse. Otherwise dispose at dumpsite/landfill	Possible to separate timber for heating, cooking, shelter	Can extract for heating, cooking, shelter
Cables etc.	Manual sorting possible		Mixed debris disposal at dumpsite/landfill	Not in emergency phase	No
Soils and sediments	Mechanical means are often most appropriate but can use manual				
Bulky items	Mechanical means most appropriate				

Waste stream	Cash for work	Transportation options	Disposal options	Recycling	Reuse
Hazardous materials and substances					
Heavy metal contaminated materials	Manual collection possible but with PPE	Put in proper drums, bins or other container before loading onto trucks for haulage	Dispose at sanitary landfill under controlled management. If no controlled disposal available, store until sanitary landfill available.	No	No
Hydrocarbons such as oil and fuel					
Paint, varnishes and solvents					
Pesticides and fertilizers					
Household cleaning products					
Medical waste in the debris					
Healthcare risk waste					
Healthcare waste (from clinics and hospitals - not considered as risk waste)					
Other potential infectious waste	Manual collection possible but with PPE	Put in proper drums, bins or other container before loading onto trucks for haulage	Dispose at sanitary landfill under controlled management. If no controlled disposal available, store until sanitary landfill available.	No	No
Household wastes					
Camp waste					
UN/Military/NGO waste					
Commercial and industrial waste					
Commercial waste	Mechanical means most appropriate, can use manual	Excavator/bulldozer offload into truck for haulage	If hazardous, dispose of at sanitary dumpsite/landfill. Otherwise it can be disposed of at controlled dumpsite/ landfill	No	No
Industrial waste					
In post-conflict areas					
Unexploded Ordnance (UXO)	Handling by specialists. Incorporate SOPs for work where these may be encountered	Under controlled measures by specialists	N/A	N/A	N/A
Landmines and ammunition within the debris					
Military vehicles					
Phosphorus and other weapon contaminates					

Annex IV. Developing temporary disposal sites

Information gathered during preliminary damage assessments should give a good indication of the types and amounts of debris handled. From this information local authorities may be able to determine whether existing recycling facilities and dumpsites/landfills are sufficient for the expected volumes of debris.

If sufficient capacity is not available, local authorities must make other plans including:

- expanding existing recycling, processing and disposal facilities to handle the increased demands;
- hauling waste to intermediate sites and reducing the amounts of debris through recycling;
- identifying a temporary storage area at a landfill or vacant lot for recycling operations; and
- establishing recycling, processing mechanisms / facilities.

General considerations

- Temporary storage sites should be a last resort. Time and money can be saved by taking materials directly to recyclers /processors and paying for transportation and labour only once.
- Nevertheless, sometimes temporary storage sites are still required and can be located in or near the affected area. The best way to select a temporary storage site that incorporates environment, public health and other issues is to conduct a full Rapid Environmental Impact Assessment (REA).
- Consider setting up sites for specific materials that do not threaten public health and safety, e.g. concrete, bricks, metal, asphalt etc.
- Start a public information programme immediately to notify the public and contractors of the site, the materials accepted, and the hours of operation.
- Ensure the site can hold rubble, natural debris like trees, branches and palm leaves as well as conventional waste.

Sites should:

- be sufficient in size with appropriate topography and soil type (if possible, work with national and local environmental agencies to determine this);
- be located away from potable water wells and rivers, lakes, streams and drainage channels. If possible work with national and local environmental agencies to determine appropriate setback distances;
- not be located in a floodplain or wetland or on agricultural land;
- have controls to mitigate storm water runoff, erosion, fires and dust if possible;
- be free from obstructions such as power lines and pipelines;
- have limited access with only certain areas open to the public;
- be located close to the affected area, but far enough away from residences, infrastructure, and businesses that could be affected by site operations during the recovery period;
- be on public lands because approval for this use is generally easier to obtain. However private land may be more convenient and logistically necessary; and
- be appropriate relative to the scale of debris. Large equipment requires large areas for storage. When planning for small scale equipment, more but smaller sites are needed. Conveniently located sites will reduce travel time when transferring debris to processing or management facilities and result in expedited debris clean-up. Communities can also use these sites to distribute reusable or recycled products. As a rule of thumb, 400 000 square metres of land are needed to process one million cubic metre of debris.

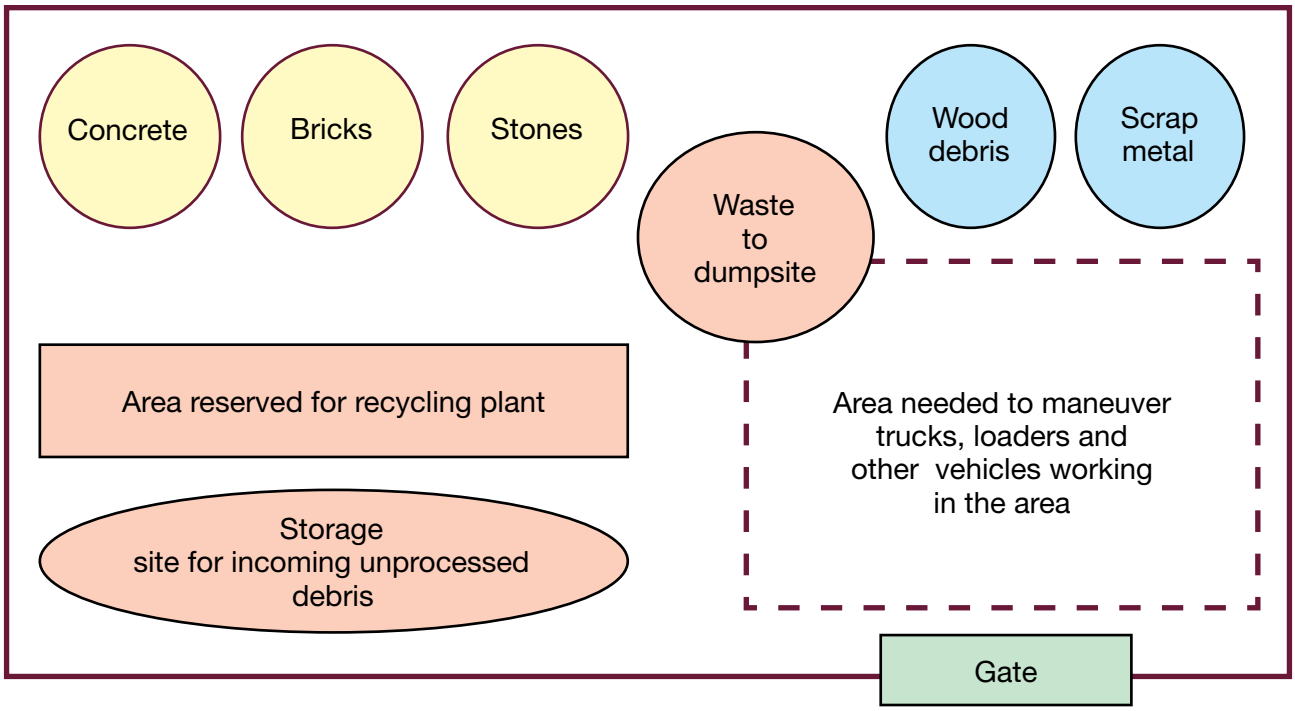
Operational considerations

The condition of the temporary disposal sites should be documented in print and photos prior to use. Depending on the debris to be staged there, it is advisable to assess the soil, groundwater and/or surface water at a proposed staging area prior to receiving debris and to re-establish pre-existing conditions.

The government agencies involved may be responsible for returning these sites to their original condition. Therefore, guidelines could be developed and established for the return of property to the owners.

A typical depot site will include areas for: unloading and storing hauled debris, a mobile or stationary processing

Suggested layout for a temporary disposal site.



plant and storage for recycled material and waste to be transferred to permanent sites.

Incoming loads should be inspected to ensure materials are handled properly and directed properly. Estimate quantities of incoming materials based on type of haul vehicle and capacity.

All recoverable materials should be separated into major categories such as concrete, bricks, stones, metals, green waste, wood debris, white goods etc. Keep materials as free from contamination as possible to increase reuse and recycling potential.

General environmental, safety, and logistical considerations

- Areas to be used to process vegetation debris do not typically require groundwater monitoring, but should be monitored for fires. Areas for mixed rubble, or hazardous wastes may need more extensive monitoring. Consult with the national authorities for recommendations.
- Removal of debris from the site in a timely manner. Biodegradeable, mixed, harmful, and hazardous waste should not be stored for extended periods.
- Limit access to ensure that the site is secure. Some types of waste that present higher levels of concern should have additional storage controls and security measures.
- Evaluate traffic logistics on and around the storage site.
- Restrict noise disruptions to acceptable hours.

Security

Consider the following safeguards for hazardous waste bulking sites:

- Cover areas with two layers of plastic sheeting, tarps, or a concrete pad.
- Fence off area with T-posts and orange barricade fencing.
- If possible, surround fenced off-area with absorbent booms and/or sandbags to absorb potential leaks and prevent spills from seeping into the ground.
- Use wooden pallets to raise collection bins off the ground, which helps to determine if there are leaks.
- Provide adequate space for walking/carrying items between pallets.
- Segregate containerized gases, liquids, or solids by material type (e.g. corrosive waste, reactive waste), place each material type in a separate bin or barrel, and label the bin or barrel appropriately.
- Cover collection bins or barrels with plastic liners/lids or cover the entire hazardous waste collection site with a tent to prevent water collecting in bins.
- Place cylinders containing compressed gas upright with cap on and secured in place.
- Provide sufficient fire extinguishers for the site in case fire breaks out. Four fire extinguishers per 1000 square metres are recommended, placed at the corners or in easily accessible locations.

Annex V. Waste needs assessment - early recovery phase

This may be the second assessment of the disaster waste situation. There is a need of details enough for making a Disaster Waste Management Plan for the Recovery of the area affected. It is important to have a good overview of the waste management situation, as well as presenting detail enough for planning.

Remember:	This may be the second assessment of the disaster waste situation. There is a need of details enough for making a Disaster Waste Management Plan for the Recovery of the area affected. It is important to have a good overview of the waste management situation, as well as presenting detail enough for planning.
Take photos of:	IDP camps and waste collection system Regular waste collection systems, where possible Overview pictures showing the conditions of the buildings and especially typical damaged buildings Temporary and informal dumpsites as well as formal ones Access roads to dump sites Health care waste management if available Hazardous waste management if available Damage infrastructure if present
In your photos remember the following:	Include a person, a car or something well known in the picture in order to give perspective of size Mark all photos with GPS coordinates and photographer
Take GPS coordinates of at least:	Waste Management sites Damaged infrastructure Damaged industries

Pages 31-39 are forms to be reproduced and used one by one for each facility assessed.

Continued...

Annex V. Waste needs assessment - early recovery phase, continued				
Do people stay in the disaster area?				Comments
Estimate percentage			%	
IDP camps				
How many IDP camps are established?			Nos	
Estimate percentage of population staying in the camps			%	
How is waste management arranged?				
Collection				Bins___ Street pile____ Others - what____
Treatment				Dumpsites___ Open burning___ Others - what____
Is all waste collected?				If not, why and with which consequences
Estimate the amount of waste generated in the IDP camps				
Estimate the composition of the IDP waste	Volume		%	Biodegradables____ Plastic____ Metal____ Glass____ Paper____ Inert____
When this is filled in go to separate sheet on IDP camps				
Condition of buildings (may be changed since emergency phase)				Comments
What are the conditions of the buildings?				
Estimate total destruction as percentage			%	
Estimate intact percentage			%	
Which is the main construction material used in the disaster area?				Concrete____ Bricks____ Board____ Tins____
Estimate the total amount of rubble and debris from buildings			m^3	Square metres covered x height
	Alternative		m^3	Calculations based on enclosed guidance for rubble amounts from different kinds of buildings
Conditions of other infrastructure.	Yes	No		Comments
Roads and streets functioning?				If not, describe damage and debris potential in separate sheet
Water distribution functioning?				
Waste water collection and drainage functioning?				
Land line telecommunications functioning?				
Mobile telephones functioning?				
Internet functioning?				
Electricity distribution functioning?				
When this is filled in go to separate sheet on infrastructure				

Continued...

Annex V. Waste needs assessment - early recovery phase, continued				
Hospitals and healthcare centres	Yes	No		Comments
Do hospitals and clinics function?				
Is the waste taken care of?				
Is there any information about infectous waste?				
Is there any information about other clinical waste?				
Are there any temporary clinics/hospitals?				
How many beds do they contain?				
Is there any information about waste collection from the temporary hospitals/ clinics?				
Any arrangements for infectious waste?				
For planning go to separate healthcare waste sheet				
Industries and other commercial activities	Yes	No		Comments
What kind of industries were located in the disaster area?				Details to be given on a separate page
Are they intact?				
Is there any information about input chemicals?				Details to be given on a separate page
Is there any indication of hazardous waste				Details to be given on a separate page
Municipal solid waste management	Yes	No		Comments
To what extent has it recovered and regained function?			%	
Are the vehicles intact?			Nos	Describe the problems
Are the employee alive and still in the area?				
Is there fuel available for the vehicles?				
Is the dumpsite intact?				
Are access roads to the dumpsite intact?				
Are there any temporary dumpsites?				
If so, where are they located?				
Are there any other waste treatment plants in the area?				If yes, describe
For planning go to separate healthcare waste sheet				

Continued...

Annex V. Waste needs assessment - early recovery phase, continued

IDP camps

Name and location of the IDP camp:				
Waste collection methods				Bins___ Street pile____ Others - what_____
Waste collection efficiency		%		Handcarts____ Ox-carts____ Open trucks____ Compactors____
Waste to recycling				
Metal		%	of available	Name of provider, who does the collection, trade and processing
Plastics		%	of available	Name of provider
Glass		%	of available	Name of provider
Paper		%	of available	Name of provider
Biodegradables		%	of available	Name of provider
Waste disposal				
Established dumpsite/landfills(s)		Tons/ day	Since then?	
Temporary dumpsite/landfills(s)		Tons/ day	Since then?	
Unauthorized dumpsite/ landfills(s)		Tons/ day	Since then?	Location, size, obvious environmental impact
	Yes	No		
Composting/biogas production				Estimate m^3 treated
Hazardous waste	Yes	No		
Separate collection?				
Treatment?				

Continued...

Annex V. Waste needs assessment - early recovery phase, continued

Healthcare waste assessment

			Notes
Name of the hospital/clinic/field hospital			
Location			
Waste generation		**Tons/day**	
Waste composition			
Is the waste taken care of?			
Segregation?		**Tons/day**	
Collection?		**Tons/day**	
Treatment?		**Tons/day**	
Infectious waste			
Segregation?		Kg/day	
Collection?		Kg/day	
Treatment?		Kg/day	
Other healthcare risk waste			
Segregation?			
Collection?			
Treatment?			
Is there a need of assistance regarding infectious waste?			Comment
Is there a need of assistance regarding other healthcare waste?			Comment

Continued...

Annex V. Waste needs assessment - early recovery phase, continued

Infrastructure debris assessment

		Notes
Roads		
Tar road debris	Tons	Recyclable?
Mud road debris	Tons	Recyclable?
Additional comments		Coordinates, etc.
Streets		
Tar street debris	Tons	Recyclable?
Mud street debris	Tons	Recyclable?
Additional comments		Coordinates, etc.
Water distribution system		
Debris from water works	Tons	
Chemicals in water works	Tons	
Debris from water distribution system		
Plastic pipes	Metres	
Ceramic pipes	Metres	
Iron pipes	Metres	
Additional comments		Coordinates, etc.
Wastewater collection system		
Debris from waste water treatment plants (WWTP)	Tons	
Chemicals in the WWTP	Tons	
Debris from waste water collection system		
Plastic pipes	Metres	
Ceramic piples	Metres	
Iron pipes	Metres	
Additional comments		Coordinates, etc.
Other drainage systems		
Debris from broken drains	Tons	
Waste clogging the drains	Tons	
Additional comments		Coordinates, etc.
Landline telecommunication		
Poles	Nos	
Dig down cable	Metres	
Open hanging cable	Metres	
Additional comments		Coordinates, etc.
Mobile telecommunication		
Antenna masts	Nos	
Electronic waste on downed masts	Tons	
Others	Tons	Specify
Additional comments		Coordinates, etc.
Internet		
Dig down cable	Metres	
Open hanging cable	Metres	
Additional comments		Coordinates, etc.
Electricity grid		
Poles		If not already calculated in landline telecommunication section, above
Dig down cable		
Open hanging cable		
Transformers		Electronic waste, transformer oil
Additional comments		Coordinates, etc.

Continued...

Annex V. Waste needs assessment - early recovery phase, continued

Industrial waste assessment

This form is to map the most immediate facts about the industries, where quality is put ahead of quantity.
The information will serve as indications for waste prioritization, and will later be supplemented if needed.
Be aware that there might be fluids stored in tanks or oil drums, and that such liquids normally are regarded as potentially hazardous waste until more is known.

Even sludges found in different places in the plant may be rearded as potentially hazardous waste.

Rubble from collapsed industries may, if nothing more is known, be understood as potentially contaminated with hazardous material such as asbestos and chemicals which could affect human health and the environment.

	List	Comments
Name of the plant/equivalent		
Used raw material		
Used energy sources		
Products		
Normal flow of waste		
Amount		
Composition		
Hazardous waste		
Treatment	If there is a special dumpsite for the industrial waste it must be assessed!	
Disaster waste		
Amount	If nothing else: high, medium or low	
Composition		
Hazardous waste		
Name of the plant/equivalent		
Used raw material		
Used energy sources		
Products		
Normal flow of waste		
Amount	I	
Composition		
Hazardous waste		
Treatment	If there is a special dumpsite for the industrial waste it must be assessed!	
Disaster waste		
Amount	If nothing else: high, medium or low	
Composition		
Hazardous waste		

Continued...

Annex V. Waste needs assessment - early recovery phase, continued	
Conclusions: waste management needs	
	Comments
IDP camps	
Waste collection	
Waste treatment	
Building rubble and debris	
Waste collection	
Waste treatment	
Infrastructure	
Road and street rubble	
Water distribution rubble	
Waste water collection and drainage	
Rubble	
Treatment chemicals	
Landline telecom	
Mobile telecome	
Internet infrastructure	
Electricity distribution grid	
Healthcare waste	
Genral healthcare waste	
Wsste collection	
Waste treatment	
Healthcare risk waste	
Waste collection	
Waste treatment	
Industries and other commercial activities	
Waste collection	
Waste treatment	
Municipal solid waste management	
Waste collection	
Waste treatment	
Other waste treatment plants in the area	

Annex VI. Fundraising project template

The following is based on the Flash Appeal Template and can be used to gather the information necessary to produce a project according to donor guidelines (most have their own templates), or to be presented to a donor as is. More specific information may be required depending on the donor.

If you use this template to present the project, add a table of contents, and a cover page with a smart title.

1. EXECUTIVE SUMMARY (1 PAGE)

This is a summary of what you will write below. It may be easier to write this last.

Brief summary of:

- This emergency
- Priority needs and humanitarian/environmental response plan
- Amount of money needed in US$
- Time span covered by this project (dates and number of days)

2. CONTEXT AND HUMANITARIAN CONSEQUENCES (1.5 PAGES)

This is the background, explaining the situation as it is. Gives donor a picture of what you want to change.

2.1 Context

- What happened?
- Where?
- What has happened since the crisis? (e.g. information gathered, assessments done, government OK for international assistance)

2.2 Humanitarian consequences

- Who is most affected? E.g., specific community/ group, gender, etc. Provide number of people if possible.
- What are the needs as a direct and immediate result of this crisis?

3. RESPONSE PLANS (1 PAGE)

This is the actual project, what you plan to do to bring about a change, for which you are requesting funding. Be as clear as possible.

3.1 Objectives

No more than two, should be specific and measurable. Projects have two types of objectives:

- An overall objective which is broad. Ex. “To reduce incidences of water/soil contamination in Switzerland.”
- Specific objective which is narrow. Ex. “To build 3 medical waste incinerators in the vicinity of Geneva Hospital by the year 2012.”

3.2 Activities

You can have as many activities as are necessary to reach the objectives set out in 3.1.

List proposed activities which can be implemented within the overall time span of the project. Remember to include monitoring and final evaluation.

3.3 Expected impact and results

- Include indicators and verifiable means to demonstrate measure your objectives later on.
- List any milestones or concrete/tangible deliverables (reports; built infrastructure; user/community surveys. etc.)

4. ROLES AND RESPONSIBILITIES (0.5 PAGE)

- Maximum 5 lines on how the response is being coordinated and who is responsible within the government and the UN. Remember to include the role of local population and community!
- Table indicating the major humanitarian stakeholders (government, UN, Red Cross, NGOs) that are responding to the crisis in affected regions, by sector. This may help to identify possible partners as well.

5. PROJECT TABLES

For each project, complete the following table. Do not write more. Be concise and brief.

SECTOR (e.g. Environment)			US$
INSERT NAME OF AGENCY (e.g. UNEP)	**1.1.1 Beneficiaries** Total: Women: Children:	Partners:	e.g. 837,500
	Project title:		
	Aim: [take text from Section 3: Objectives]		

Annex VII. Guidelines for closure of temporary disposal sites

Temporary disposal and processing sites should be used only for short periods, on average 0-12 months. Temporary disposal and processing sites can either be reinstated to their original status or developed into a new function such as a park, sports area or some other purpose. Sometimes this can be done simply by removing machinery and processed debris and cleaning the site from debris residues and litter. In other instances the site must be restored, for example if the site was used as a park, sport fields etc before it became a storage site. Closure and restoration of sites must include sampling of soil and, if applicable, ground water. A site visit should also be carried out prior to closure.

A restoration plan can be useful in ensuring appropriate closure. It should address:

- processing and removal of the remaining material from the site;
- transfer of all household waste and the like to the ordinary landfill or dumpsite;
- removal and adequate treatment of all hazardous waste that may have appeared on the site;
- an environmental monitoring plan, including the baseline monitored or estimated before use, sampling points and time schedule for sampling, testing for contamination etc.; and
- restoration of site to its original condition. If the site is on private land, final restoration must be accepted by the landowner.

Future liability for site contamination can be mitigated by having a baseline environmental assessment performed before the disaster debris is deposited at the site.

Annex VIII. Resources to support implementation of disaster waste projects

This Annex lists machinery suppliers, organizations, consultants, contractors that may be able to help with the implementation of disaster waste management projects and programmes. The list is indicative only and not an endorsement of any organization.

Machinery suppliers

Specific organizations that provide waste management and recycling machinery to disaster waste management programmes include:

- Meldgaard (Denmark) – www.meldgaard.com
- BOMAG for landfill equipment – www.bomag.com
- De Mobiele Fabriek (Netherlands) – www.demobielefabr iek.nl

The International Solid Waste Association (ISWA on www.iswa.org) can provide supplier details for machinery suppliers.

Organizations

There are numerous NGOs that work with disaster waste management, although few that specialize in this field. Examples include:

- Oxfam GB
  - Implements disaster waste management projects (i.e. Indonesia (Banda Aceh), Haiti and Grenada)
  - Developed a suite of Technical Briefs for DWM
- MSF
  - Healthcare waste management focus
  - Typically establishes healthcare waste handling systems and constructs small-scale incinerators
- Islamic Relief
  - Implements debris recycling projects
- Cash-for-work
  - Several INGOs implement cash-for-work programmes with focus on removing wastes, i.e. CARE, Oxfam and World Vision.
- National NGOs
  - Local and national NGOs can often help implement disaster waste projects;
  - Often supported by INGOs through funding
  - Useful implementing partners.

The following NGOs specialize in disaster waste management:

- Disaster Waste Recovery (www.disasterwaste.org)
  - NGO established specifically for DWM
  - Waste assessment and recommendations
  - Disaster waste management workshops
  - Implementation of DWM
- ProAct Network (www.proactnetwork.org)
  - Environmental NGO with network of professionals
  - Experience in developing and implementing waste capacity building and management
- Promise Consulting (www.promiseconsulting.org.uk)
  - Environmental NGO with a focus on developing countries and some post-disaster situations

Consultants

There are several international environmental consultants who address disaster waste management, among these:

- Ramboll (Denmark) – www.ramboll.com
- Golder Associates (UK) – www.golder.com
- ERM (UK) – www.erm.com
- NIRAS (Denmark) – www.niras.com
- SWECO – www.sweco.se
- TBS (Austria) – www.tbspitaler.at

Contractors

Local and national contractors from the affected country are typically used in disaster waste programmes. When their capacities are exceeded, international contractors can be considered. Examples include:

- Veolia (France) – www.veolia.com
- SITA (France) – www.sita.fr
- Phillips & Jordan (US) – www.pandj.com

Annex IX. Exit strategies

INTRODUCTION

This outlines three exit strategies in disaster waste management projects and programmes:

- private sector handover;
- public sector handover; and
- public/private hybrid handover.

The final sub-section discusses the procedure for carrying through a handover.

PRIVATE SECTOR HANDOVER

Potential mechanisms for handover to the private sector include:

- **in trust,** i.e. the beneficiary has to comply with certain conditions on use of machinery. During period of trust, the donor maintains overall ownership and right to re-take machinery if conditions are broken. Upon end of trust period, full ownership passes to the beneficiary; or,
- **bidding**, i.e. private companies bid for the machinery, with conditions and minimum payment being equal to the cost of import duties.

Emphasis can be placed on a procedure that allows donors to maintain ownership of the equipment until the beneficiary has proven its professionalism and positive intent.

Option 1 – In Trust with Management contract

The current (or new management) team of the project establishes a company that signs a management contract with the donor for operations and maintenance of the equipment. This allows the donor to maintain ownership of the equipment while the beneficiary (new company) operates the equipment. A community-based organization can also be set up for this purpose and continue operations as a non-for profit organization.

The contract would typically stipulate that the beneficiary must comply with requirements including:

- equipment must only be used for those purposes described in the contract;
- equipment is to be maintained in accordance with the manufacturer's guidelines;
- donor has the right to regain operational control of the equipment at any time should any of the requirements not be met by the beneficiary;
- income generated from the equipment accrues to the beneficiary; and
- the beneficiary is responsible for all operational costs during the contract.

Option 2 – Bidding

The operations team with plant and equipment is intended for sale as a 'going operation' where private companies are invited to bid for the continued operations of the debris management system for a set number of years. After this period ownership can revert to the company.

For bidding procedures, the evaluation criteria can include: price willing to pay, demonstration of a good business plan, understanding of the market, plans for management of the company.

In the past, bid documents included a requirement for the bidder to include the following for continued operations:

- marketing plan;
- business plan;
- operations plan;
- maintenance plan; and
- financing plan.

This option allows for a financial return to the donor for the project implemented, where these funds can then be used to supervise and monitor the successful company in their continued operations of the debris management system, or the funds can be used for subsequent environmental programmes.

PUBLIC SECTOR HANDOVER

If the donor wishes to handover debris management operations to a public sector organization such an office of public works, the handover procedure can be simplified. Focus should be on ensuring that the public sector organization has the required skills and capacity to continue operations. Supplementary training and support may be required.

PUBLIC / PRIVATE HYBRID HANDOVER

This option incorporates private and public sector options to assist the public sector of the affected community in rehabilitating services and supporting economic development.

Handover is to a private company that is obliged to provide services to the public sector. Spare capacity after the fulfilment of such obligations can be used by the recipient organization to perform commercial works for a profit. Financial contributions are expected from the public sector to cover running costs.

Alternatively, a diminishing service contract starting at 100% service to the identified public body, and gradually decreasing to 0% over 12 to 18 months, can be considered.

Such a management contract is similar to that for private handover, with the addition of public sector obligations.

With this option, the service contract is to be included in the tender documents for the selection of new organization, thus making the public sector service contract open to public tendering.

PROCEDURES FOR HANDOVER

The first step in handover procedures is to describe the plant and equipment to be handed over. A valuation of the plant and equipment may be needed. This should take into account custom duties, excise tax or VAT on material brought into the country by/for the donor.

A Memorandum of Understanding (MoU) between the donor and the recipient country's relevant Government Ministry/Department is often required. This is one of the more complicated actions in the handover procedure.

Annex X. Terminology

These guidelines follow ISWA's *1000 terms in solid waste management* as far as possible. However, some terms have been modified as there are differences between 'normal' solid waste management and disaster waste management. Additional disaster waste terminology has been introduced that is not in ISWA's 1000 terms. The following overarching terms have been used in these guidelines.

Clinical waste – see healthcare waste. These guidelines follow the World Health Organization (WHO) terminology.

Compost is a rich, fertile soil enhancement material produced from food and garden waste which has undergone a composting process, typically microbial degradation in presence of oxygen and at temperatures between 35°c and 70°c.

Conflict relates to armed hostilities between two or more factions which lead to damage to both the built environment as well as facilities, systems and organizational set-ups.

Debris is a mixture of building waste and rubble typically arising from damaged buildings and their demolition. This waste stream can include natural materials such as clay and mud, trees, branches, bushes, etc.

Disaster waste is the waste that is generated by the impact of a disaster, both as a direct effect of the disaster as well as in the post-disaster phase as a result of poor waste management.

Disaster waste management is the sorting, collection, handling, transportation and treatment (recovery as well as disposal) of disaster waste.

Disaster waste management planning is the process by which a plan for the management of the disaster waste is developed, through the different phases of relief and recovery. The process consists of: determining the appropriate response and recovery strategies to be implemented after a disaster (based on assessments of vulnerability); identifying and agreeing responsibility for the implementation of strategies; preparing the management structure required to implement the plan with resource requirements, and gaining the approval for the disaster waste management plan developed.

Disposal site – dee dumpsite, engineered dumpsite, landfill and temporary disposal site.

Dumpsite is an uncontrolled disposal site for waste, where gas emissions, liquid leakage and solids contamination of the surrounding environment is not controlled or managed. See also Engineered Dumpsite.

Environment is defined by the Sphere Standards as "'the physical, chemical and biological surroundings in which disaster-affected and local communities live and develop their livelihoods. It provides the natural resources that sustain individuals, and determines the quality of the surroundings in which they live."

Emergencies are situations that arise out of disasters in which the affected community's ability to cope has been overwhelmed, and where rapid and effective action is required to prevent further loss of life and livelihood.

Engineered dumpsite is a dumpsite where there is a degree of technical control such as fencing of the site with a gate to control what wastes are disposed of, one or several bulldozers or tractors are employed to move and compact the waste, ditches for leachate collection have been dug and where special arrangements in place for the disposal of infectious and/or hazardous waste. See also Landfill.

Hazardous waste is waste that has physical, chemical, or biological characteristics such that it requires special handling and disposal procedures to avoid risk to health, adverse environmental effects or both. "Hazardous" relates to the situation and circumstances as well as the properties of waste materials. Typical characteristics include: oxidizing, explosive, flammable, irritant, corrosive, toxic, ecotoxic, carcinogenic, infectious, toxic for reproduction and/or mutagenic. It is noted that toxic wastes may produce toxic gases when in contact with water, air or acid which can subsequently produce hazardous substances after disposal.

Healthcare waste is a term often used for clinical waste or hospital waste. The World Health Organization (WHO) uses 10 categories of healthcare waste. The risk part of healthcare waste is normally a minor part of this waste stream. The other parts of healthcare waste (e.g. food waste and packaging waste from wards and staff, ashes and rubble etc) can, if properly segregated, be managed similar to ordinary household waste.

Healthcare risk waste is the hazardous part of healthcare waste and contains infectious agents, sharp objects, hazardous chemicals or pharmaceuticals, genotoxic or radioactive substances and anatomical waste. This waste needs special attention and treatment.

Hospital waste is waste from hospitals and similar establishments, see Healthcare waste above. An Incinerator is a device wherein waste can be burned under controlled circumstances in terms of temperature, turbulence, retention time and oxygen supply. Incinerators are commonly used for destruction of infectious waste and, with advanced flue gas treatment, hazardous waste.

Landfill is a controlled disposal site for waste, where all emissions of gases, liquids and solid materials are controlled and not allowed to contaminate the surrounding environment.

Packaging waste is packaging materials such as cardboard, corrugated cardboard, glass, tins, plastic bags and other soft plastics, plastic bottles and other harder plastics. Most types of packaging waste, with a few exceptions, are attractive to the recycling market.

Resilience is a community's ability to withstand the damage caused by emergencies and disasters; it is a function of the various factors that allow a community to recover from emergencies.

Rubble is waste from damaged and destroyed buildings and infrastructure, and can include wastes from (re)construction works.

Temporary disposal site is a place where disaster waste is safely placed, stored and processed for a pre-defined period after a disaster. The site would be selected following a rapid environmental assessment, and the emissions should be minimized in relation to appropriate and available technology.

Vulnerability is the degree to which a population or an individual is unable to anticipate, cope with, resist and recover from the impacts of disaster.

Annex XI. Acronymns

BCPR	Bureau for Crisis Prevention and Recovery of UNDP
DRR	Disaster Risk Reduction
DW	Disaster Waste
DWM	Disaster Waste Management
DWMCP	Disaster Waste Management Contingency Plan
DWR	Disaster Waste Recovery
ER	Early Recovery
FEAT	Flash Environmental Assessment Tool
GIS	Geographic Information System
HCW	Healthcare Waste
HIT	Hazards Identification Tool (carried out by JEU)
IASC	Inter-Agency Standing Committee
IDP	Internally Displaced Persons
ISWA	International Solid Waste Association
JEU	Joint UNEP/OCHA Environment Unit
LEMA	Local Emergency Management Agency
MSB	Swedish Civil Contingencies Agency
MSF	Médecins Sans Frontières (Doctors Without Borders)
NEMA	National Emergency Management Agency
OCHA	UN Office for the Coordination of Humanitarian Affairs
PAHO	Pan American Health Organization
PCB	Polychlorinated biphenyl
PCDMB	Post-Conflict and Disaster Management Branch of UNEP
PDNA	Post Disaster Need Assessment
RF	Recovery Framework
SW	Solid Waste
SWM	Solid Waste Management
UNDAC	United Nations Disaster Assessment and Coordination team
UNDP	United Nations Development Programme
UNEP	United Nations Environment Program
UNICEF	The United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

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