4.3 Debris and disaster waste management

After a rapid-onset urban disaster such as an earthquake, landslide or tsunami, millions of tons of rubble need clearing and, where possible, reusing. Large amounts of rubble and debris also must be cleared during and after armed conflict, as well as unexploded bombs, munitions and booby traps, known as explosive remnants of war (ERWs).

This section defines debris and disaster waste; identifies hazard types and the kinds of waste that can result from disasters and conflict; and key actors and good practice in debris clearance. The section ends with a discussion of ERWs.

4.3.1 Defining debris and disaster waste

Debris can be defined as ‘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’. The broader term ‘disaster waste’ includes ‘all solid and liquid waste generated from a disaster, not limited to debris’. Within humanitarian response, debris clearance is often coordinated by the shelter cluster, while waste management falls under WASH (see Section 4.4).

Table 4.2 identifies some of the types of waste that can result from disasters and armed conflict.

4.3.2 Key actors

A wide range of actors are engaged/can engage in debris management, including:

- People working in the informal economy collecting and recycling waste – in many cities, waste picking and recycling is a large factor in the lives of many poorer people.

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36 The full list is: ‘concrete, steel, wood, clay, tar elements from damaged buildings, infrastructure, household furnishings, parts from power and telephone grids such as electrical poles, wire, electronic equipment, transformers, parts from water and sewage distribution centres, natural debris such as trees, mud and plants, chemicals, dyes and other raw materials from industries and workshops, waste from relief operations, damaged boats, cars, buses, bicycles, unexploded ordnances (UX), packaging materials, pesticides and fertilizers, paint, varnish and solvents and healthcare waste’.
## Table 4.2 Hazard types and waste

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquakes</td>
<td>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 accessing. Collapsed buildings may overlap across streets, making access difficult for search and rescue and relief operations. Quantities of waste are high compared to other disaster types since all building contents normally become waste.</td>
</tr>
<tr>
<td>Flooding</td>
<td>Floods often lead to mass displacement, which in turn requires shelters and camps and leads to large volumes of household waste. 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.</td>
</tr>
<tr>
<td>Tsunamis</td>
<td>Strong tsunamis can cause widespread damage to infrastructure, spreading debris over large areas. Debris is often mixed with soil, trees, bushes and other loose objects such as vehicles. This makes waste difficult to handle and segregate.</td>
</tr>
<tr>
<td>Hurricanes, typhoons, cyclones</td>
<td>Strong winds can tear the roofs off buildings, after which they 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 specialised 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.</td>
</tr>
<tr>
<td>Conflict – short-term</td>
<td>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 clearance requires heavy machinery such as excavators and bulldozers. Waste collection vehicles may be damaged or commandeered for military purposes. Unexploded ordnance (UXO) including undetonated landmines may be present among waste.</td>
</tr>
<tr>
<td>Conflict – protracted</td>
<td>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.</td>
</tr>
</tbody>
</table>

• Public and private sector solid waste management service companies.
• Specialist organisations dealing in hazardous waste removal (see below).
• Local authorities responsible for waste management.
• National and city governments.
• In armed conflict situations, specialist organisations experienced in the disposal of explosive materials (see below).

4.3.3 Good practice in debris clearance

A UNDP review of debris management\(^{37}\) in disaster and armed conflict situations identified the following key lessons.

Put people at the centre of debris clearance efforts. In contexts without hazardous materials, the review notes that ‘debris removal and recycling is inextricably linked to getting the community back onto its feet in the often slow and painstaking job of returning to normalcy’.

Start clearance immediately, given that a comprehensive debris management plan may take several months to formulate and adopt. Main arteries should be cleared first, followed by markets and schools. Hazardous sites should be cleared last, to discourage people from moving to them.\(^{38}\)

Balance the above with a recognition of the value of debris. Debris provides materials for emergency shelter as well as fuel for heating and cooking food or boiling water. Much debris has value to the owner and considerable use in the recovery effort. As CARE notes, ‘Simply collecting and disposing of all debris without taking these factors into account will make the recovery process more costly and more difficult than if the debris is transformed into a positive contribution to recovery’.\(^{39}\) Studies indicate that 30%–40% of urban debris is recyclable, and metals and plastics can be sold both locally and internationally. Debris removal also provides an opportunity to build capacity through coordination, communication and partnerships between the private sector, NGOs and local authorities. Debris clearance is also an opportunity for cash for work programmes.

Be respectful of personal belongings, which may be mixed up with rubble. Rubble itself may be seen as a personal possession, for instance where it demarks a residence. In a number


of instances in Haiti after the 2010 earthquake, the presence of rubble was the only proof of land ownership (see Section 4.1 on HLP rights).

Be mindful of health and safety – such as safety clothing for people working on clearance. UNDP recommends a group health insurance scheme for workers, including those engaged in cash for work programmes.

Strike a balance between the social benefits of labour-intensive rubble removal involving local communities and engaging private companies, which may utilise heavy machinery, for example bulldozers, and get the job done much more quickly.

Assess the quantity of rubble to be removed in order to plan the work at hand: the timeframe, equipment and labour needed and the means of removal and disposal. Debris removal should take into account traffic conditions and the time it is likely to take. Unusable rubble needs to be transported to areas where it will not cause problems later. This needs planning.

Additional good practice includes:

Recycling opportunities exist for plastic sheeting. Plastic sheeting is one of the most common items of emergency assistance following a rapid-onset disaster. Given the volume of such assistance, recycling and reusing these materials present opportunities for local entrepreneurs and others. A Global Shelter Cluster Operational Guidance Note provides advice on the repair, reuse and disposal of plastic sheeting – see www.sheltercluster.org/sites/default/files/docs/recycling_reuse_and_disposal_of_plastic_sheeting.pdf.

Hazardous materials need specialist clearance. Often, debris can include toxic elements, for instance composites of construction materials. These should be analysed at an early stage through rapid assessments. Once hazardous materials are found, they should be managed according to best practice and the legal framework in the location concerned. Asbestos is a common problem after disasters and requires special attention due to its impact on health. For further information, see www.sheltercluster.org/sites/default/files/docs/Asbestos%20in%20Emergencies%202010.pdf.

### 4.3.4 Explosive remnants of war

Explosive remnants of war (ERWs) are a common danger during and after conflict. ERWs include landmines, booby traps, cluster munitions and unexploded ordnance, which can explode at any time. ERWs can stay in place for decades. Children are particularly vulnerable ‘given their propensity to play with foreign objects that may look like toys or otherwise

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40 OCHA, Disaster Waste Management Guidelines.
Box 4.10 Debris removal after the Haiti earthquake

The earthquake in Haiti in 2010 produced around 10 million cubic metres of debris. In its aftermath, the government and the UN implemented an Action Plan for National Recovery and Development (PARDN), which included debris clearance and the demolition of dangerous buildings. Lessons include:

- Ensure clarity on neighbourhood expectations, capacities and constraints.
- Coordinate between key actors at all levels – between different parts of government, and between neighbourhood leaders and other organisations, such as NGOs and other civil society organisations.
- Set up community platforms: ‘The effective participation of the population through community platforms must take place in the early stages of the programme and must consider gender and generational equity issues’.


attract their attention’. Contamination can also ‘contribute to population displacement, loss of livelihoods, impeded or obstructed access to essential infrastructure and services, and increased vulnerability’. ERWs may be within collapsed buildings, making them harder to detect, and finding ERWs and making them safe slows down reconstruction. Following Israeli airstrikes in Gaza in 2014, for example, some 7,000 ERWs were left in damaged buildings. In such instances, ‘the process of removing contaminated rubble is often dangerous in itself as unexploded ordnance can detonate and injure clearance teams’.


43 ICRC and InterAction, When War Moves to Cities, p. 11.
A number of specialist humanitarian organisations work in this area, including the Mines Advisory Group (MAG)\textsuperscript{44} and the Halo Trust.\textsuperscript{45} At the time of writing the Halo Trust was piloting a project for more effective urban demining, which aims to ‘assess the level and nature of explosive contamination in post-conflict urban environments, primarily in the Middle East, and develop new clearance methods’.\textsuperscript{46} Civilians may also sometimes engage in clearing ERWs:

\textit{In Aleppo, the Syrian Civil Defense, or White Helmets, works to clear rubble and detonate ERW using nonexplosive methods. This group of volunteers also disseminates information about the dangers of ERW to people through discussions in schools, mosques, and other public spaces. When surveyed, Gazans, having experienced three conflicts between 2008 and 2014, were well aware of methods for reporting ERW to the proper authorities; this is likely attributable to mine risk education efforts.}\textsuperscript{47}

Projects relating to ERWs also include risk awareness training, victim assistance and support for protection needs. Examples can be found on the database managed by UN Mine Action (www.mineaction.org/en/portfolio-of-mine-action-projects). International Mine Action Standards (IMAS) provides ‘criteria for all aspects of demining’, including guiding principles, legal requirements and responsibilities of respective actors. Further information can be found at: www.mineactionstandards.org/standards/international-mine-action-standards-imas/imas-in-english/.

\textsuperscript{44} See www.maginternational.org/.

\textsuperscript{45} See www.halotrust.org/.

\textsuperscript{46} The pilot, ‘Clearing Explosive Hazards in Post-conflict Environments’, is being hosted at (www.elrha.org/map-location/clearing-explosive-hazards-in-post-conflict-environments/).

\textsuperscript{47} ICRC and InterAction, \textit{When War Moves to Cities}, p. 11.