EMERGENCY SHELTER CLUSTER

QUICK GUIDE POST-DISASTER DEBRIS MANAGEMENT

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INTRODUCTION

Debris created in a disaster poses significant challenges to relief and recovery operations and to a rapid return to normal. Disaster debris needs to be removed from roads, homes and public facilities before survivors can begin rebuilding normal lives. Yet, if in the haste to recover, disaster debris is disposed of improperly it will cause future hardships for the disaster-affected population.

At the same time, disaster debris is one of the first sources of emergency shelter, or fuel for heating, for cooking food or boiling water. Further, most disaster debris has intrinsic value to the owner and considerable use in the recovery effort. 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.

As a result of the dual demands (1) to clear debris as quickly as possible, but also (2) to use the debris in post-disaster recovery, the effective management of post-disaster debris is one of the first requirements following a search and rescue phase of a disaster[1].

The process of collecting, sorting and reusing debris following a disaster also provides a way to immediately provide funds and other resources into a disaster-affected community, for instance through labor-intensive public works cleanup programs. This input of resources assists disaster survivors in financing grassroots post-disaster recovery.

This **Quick Guide** focuses on disaster debris, or the physical items which have been damaged as a result of the disaster and can no longer be used as originally intended. Disaster debris can include:

- Household items,
- Vehicles,
- Personal possessions,
- Damaged or destroyed buildings, including bricks, broken concrete, reinforcing iron, wood, roofing, electrical wiring and piping,
- Materials from damage to roads, railways and other infrastructure,
- Materials collected in irrigation canals, water ponds, lagoons and rivers,
- Hazardous materials, and,
- Sand, gravel and wood and other vegetative matter transported by disaster agents.

Using Disaster Debris to Reduce Environmental Impacts

Disasters often destroy physical infrastructure (buildings, roads, bridges) which has taken decades to create. Relief and recovery efforts often plan to replace the loss of infrastructure in a year or two. The result can be a significant increase in the rate of resource extraction, with consequent damage to the environment. The rate of extraction, and consequent damage to the environment, is reduced to the extent that debris created by a disaster is used in recovery efforts.

Sewage is not normally considered disaster debris. But cleaning septic systems and similar locations needs to take place at the same time as debris clearance. For efficiency, and to avoid negative environmental outcomes, sewage clearance and debris clearance need to operate in a cooperative, if not integrated, manned.

1 The Guide focuses on debris management efforts after immediate life saving and rescue operations are completed.

PURPOSE

This **Post-disaster Debris Management Quick Guide** provides disaster response personnel with general guidance for the effective and environmentally sensitive management of debris created by a disaster[2]. The **Quick Guide**:

- Outlines key concepts of debris management,
- Sets out a conceptual process for effective debris management,
- Outlines the key elements for planning a debris management effort, and,
- Provides further sources of information and expertise useful in developing full scale disaster debris management operations.

The **Quick Guide** focuses on debris management following "natural" disasters. The document can be used following conflicts if unexploded munitions are removed before debris clearance work begins.

The scale of debris management operations can vary considerably, from ad hoc household level clean-up to project-based large scale debris processing using heavy equipment. This **Quick Guide** will aid field staff to:

1. Design and implement small scale debris management efforts, and,
2. Define the preliminary requirements for large scale debris management efforts as the first step in requesting further technical support to design and implement large scale operations.

The **References** section of the **Quick Guide** provides additional information on developing and implementing debris management programs, as well as sources of technical advice and support.

A large number of small ad hoc debris management efforts will, in terms of impact and overall effort, constitute a large scale debris management operation. Where numerous small scale clean-up efforts are underway, an aggregate debris management program should be established. An aggregate program ensures that the impact of numerous small operations do not together lead to significant negative environmental impacts.

DEBRIS MANAGEMENT PROCESS

Conceptually, disaster debris management is based on (1) returning usable resources to productive use and (2) disposing of unusable resources in an environmentally sound manner. The key elements of the debris management process are to:

1. Identify the nature of the debris.
2. Identify possible uses of the debris.
3. Develop a program to collect and process the debris.
4. Implement the program in a phased manner, in many cases involving a series of collection and processing activities.

The following flow chart summarizes a simple on-site (e.g., household level) processing of debris. In an off-site operation, the debris is collected and transported to a processing site and the same general procedure of sorting and processing is followed as set out in the flow chart. However, items which would be left on-site in the following schema would, in an off-site operation, either be sold or transferred to another party for eventual reuse.

2 This document is based, in part, on A Brief Guide Building Waste Materials Management in Emergencies (ProAct Network and the Shelter Centre) which should be consulted for further information in debris management options.

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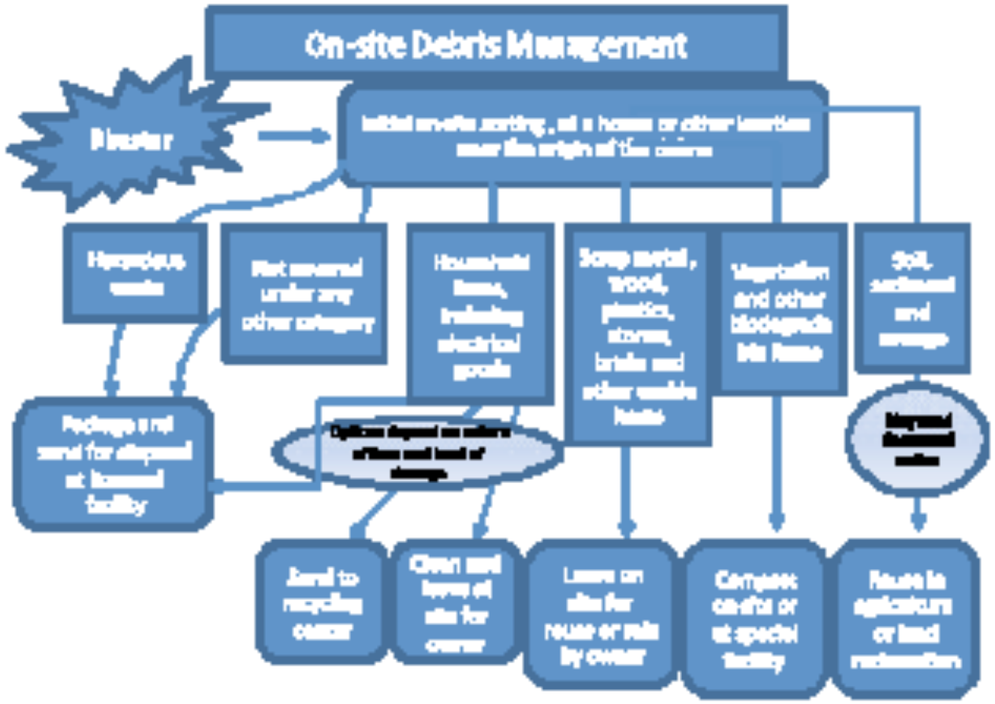
Most small scale debris management operations, and some large scale operations involving labor intensive publics works, will focus on on-site management of the debris. On-site operations have lower logistics costs, but can have greater management requirements. The trade-off between these two factors can only be decided based on each specific debris management effort.

Note that on-site labor intensive efforts are generally more effective at transferring resources to a larger number of disaster survivors (as payment for work) than for off-site operations. Funders may not initially consider debris management as a post-disaster priority. They will, however, often have a strong interest in supporting labor intensive projects and have less concern as to the purpose for which the labor is being used.



Given the importance of debris management to emergency, transitional and permanent shelter, dealing with debris often comes under the Shelter Cluster. Managing waste, for instance the sewage or trash generated by disaster survivors and relief personnel following a disaster, normally comes under the Water, Sanitation and Hygiene Cluster.

However, there is not always a clear line between operational management of debris and waste. The actual division of responsibilities between debris and waste management needs to be confirmed on-site following each disaster.

LEGAL ISSUES

Three sets of legal issues usually arise in disaster debris management: Value and Ownership, Access and Safety. These issues are discussed further below:

Value and Ownership:

All disaster debris had some value before the disaster, and some of this value may remain after the disaster. For instance, the person who owns a damaged building may want to retain ownership of the bricks from the building because of their value in off-setting a need to purchase bricks with which to rebuild. It is not appropriate for debris management operations to deprive an owner of items which, while damaged by a disaster, still are of value.

Debris management efforts should take steps to ensure that debris items with value remain accessible to the original owner. If return is not possible, then the owner should be compensated at fair market value for the items which are taken and used for another purpose (e.g., bricks from damaged buildings being used for road sub-surface).

Addressing ownership and value issues needs to be planned out in advance of debris removal. Disaster survivors will need to be consulted to the degree possible.

Legal actions by government authorities are also be needed to avoid disputes over ownership. This is particularly the case where previous owners of disaster debris may have been killed during the disaster, or where the clearance activities uncover objects of value (e.g., currency, gold) or of sentimental value.

Reducing the Cost of Rebuilding

In many locations, the pre-disaster value of a house represents decades of small investments. It is likely impossible for the house owner to acquire a similar level of capital to immediately rebuild. However, the use of recovered disaster debris can contribute to lowering the capital needed for rebuilding, and, as the materials are immediately available, assist in jump-starting reconstruction

Access:

It is generally unacceptable to enter property and remove items without permission. Yet, for debris management to be effective after a disaster, operations may need to extend onto private property, including the removal and disposal of personal possessions (e.g., clothes, damaged electronic goods).

Local government authorities and disaster survivors should be consulted on the necessary legal and social steps required to permit access to private property. These procedures should be in place before debris clearance begins, and include how to handle valuables and personal possession which may have sentimental value.

Access is also an issue when establishing temporary processing areas or permanent disposal sites. In the case of the latter, some level of environmental review should occur, and the use of the land for disposal legalized through the normal (but expedited) administrative process. In the case of the former, temporary authorization should be received from the site owner, and this authorization should specify the condition of the site before use, and what condition it will be in when returned to the owner.

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Safety:

Debris clearance often involves working in locations which are hazardous, and can involve contact with hazardous materials. Clearing debris in or near damaged structures may result in the further collapse and put workers and bystanders at risk.

Debris management operations need to ensure that:

1. Local health and safety codes are being followed.
2. Workers have appropriate safety equipment and training in the tools they are using.
3. First aid services are available on-site or in the immediate proximity.
4. A safety plan has been developed and all worker and supervisors are aware of it.
5. Hazardous structures are identified and experts (usually engineers) conduct stability assessments before work begins.
6. The potential for hazardous materials has been assessed and containment and disposal procedures are in place, including proper protection equipment and training.
7. Where there is a risk of unexploded munitions in the areas to be processed, these munitions are removed before debris clearance begins. All staff are aware of what possible munitions look like, and receive instructions to stop debris clearance when possibility unexploded munitions have been identified.

PLANNING A DEBRIS MANAGEMENT PROGRAM

The following bullet points summarize the key points to be considered in planning a debris management program.

1. Assess the post-disaster debris situation and determine the:
   - **a.** Types of debris involved, e.g., household items, vehicles, personal possessions, bricks, broken concrete, reinforcing iron, wood, roofing, electrical wiring and piping, vegetative matter, other types of waste.
   - **b.** Presence of hazardous materials, by type.
   - **c.** Quantities (volumes) of different types of materials. (See box below.)
   - **d.** Location of different types of materials, e. g., whether the debris is located in houses, in factories or on public space.

   A summary of the assessment information above can be assembled into a matrix by location, and be supported by a detailed notation (e.g., a site report) as to the types and volumes of debris at each location.
2. Determine the scope of debris management efforts, specifically whether these efforts will be limited to:
   - **a.** Certain types of debris (e.g., only the removal of sediment from roads),
   - **b.** Specific locations or,
   - **c.** Specific types of beneficiaries, e.g., the elderly or single parent families.
3. Determine whether sewage removal is necessary and how it will be handled. (Sewage management is likely to be a task which the WASH Cluster should manage.)
4. Determine the legal requirements and social norms pertaining to accessing private property and collecting debris.

5. Determine whether unexploded munitions need to be removed and who will undertake this tasks. (Munitions removal is not normally part of the debris clearance operation and is handled by specialized government or non-governmental organizations.)
6. Determine whether debris processing will take place at the site of collection or will debris be transported to a central processing site. On-site processing should be used if most of the processed debris will be left at the collection site for use by the owner. Off-site processing should be used if debris is to be eventually sold or not intended to be used by the original owner.
7. Determine whether processing will be done through labor intensive, machine intensive or a combination of methods. Labor intensive, or a combination of labor and machine intensive methods, can be applied for either on-site or off-site processing. Machine intensive efforts are usually done only off-site processing.
8. Determine levels of compensation to be paid for debris which does not remained at the original owner's location, and how this compensation will be paid. (Compensation is not normally paid if processing is done on-site.)
9. Establish a protocol for handling valuables and personal effects collected.
10. Establish the personnel and equipment requirements for debris processing.
11. Define management and reporting requirements for the debris collection and processing activities.
12. Identify procedures and locations for the handling and disposal of hazardous waste. These activities may require specialized personnel and government approvals.
13. Identify locations for the environmentally sound disposal of debris which cannot be reused or recycled. These locations will need to be approved by the appropriate governmental authorities, and may require an environmental screening and formal review[3].
14. Develop a safety plan. The plan should include safety equipment requirements and procedures.
15. Develop a training plan for personnel involve in the operation, including the handling of hazardous materials, valuables and personal possessions, safety and any special skills needed in collecting or processing the debris.
16. Develop a budget covering labor, equipment, machinery, transport, management tasks, and compensation requirements, and safety requirements.
17. Develop an operations schedule for the debris disposal operation.
18. Develop an exit plan for debris management operations, setting targets which are realistic and verifiable and includes a transition of operations to existing government or private sector waste management capacities, or to longer term recovery programs. (Post-disaster debris management is often an incremental process. Operations soon after a disaster focus on providing space for shelter or other basic needs. Subsequent operations cover larger areas and provide more extensive removal and processing of all disaster debris.)
19. Secure funding and begin implementation.

3 Where the environmental screening process delays selection of a permanent disposal site a temporary holding site may be established.

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As noted earlier, large scale debris management operations should be developed with appropriate technical support. To this end, the preceding bullet points constitute the cost tasks of a generic terms of reference for technical assistance to design a debris management program.

ENVIRONMENTAL NGOS AND LOCAL RECYCLING COMPANIES

Environmental NGOs can be of considerable assistance in identifying the best ways to manage disaster debris, and in understanding local issues about safe and environmentally sound disposal. Local NGOs and local companies involved in recycling and waste disposal before a disaster and can be valuable collaborators in the post-disaster management of debris. Using these local partners will facilitate operations and strengthen local capacity to manage waste and debris in the future.

Assessing Quantities

Defining the quantity or volume of debris is critical to understanding the amount of work needed to clear and process the debris, whether labor intensive or machine intensive modes of operation should be used and in calculating the cost of labor, transport and equipment which is required.

Because buildings and other structures differ greatly in construction materials and contents, no rule-of-thumb is possible when assessing quantities of debris. As a result, field visits are needed to select sample sites and physically measure the volumes involved. These sample-based numbers can be multiplied by the number of units (e.g., houses) to be treated to arrive at a volume of debris to be processed.

The sampling process is best accomplished by breaking down the object (house, school, factory) being assessed into discrete elements and then physically measuring these elements and calculating their volume. For instance, a damaged four room house can be broken down to foundation, floor, walls, roof tiles, roof rood, doors, windows, electrical appliances, furnishings and cloths and other personal effects. The resulting three dimension measurements (height, width, length) of each object should be accurate but do not need to be precise.

One option in assessing volumes is to contact local engineers or building contractors who likely have already developed tables of quantities for typical buildings in a disaster affected area. If this information is available, then sampling need only focus on elements not in the tables, e.g., furnishings, electrical appliances and personal effects.

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- **After the Tsunami: Solid Waste Management, Information Paper No. 5, Series of Best** Practice Guidelines (Sri Lanka), IUCN/The World Conservation Union.

DISASTER BUILDING WASTE MANAGEMENT GUIDANCE

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- **Integrated Waste Management Disaster Plan Guidance for local government on disaster debris management**, California Integrated Waste Management Board http://www.ciwmb.ca.gov/disaster/disasterplan/
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