Mainstreaming Environment into Early Recovery: Debris Management

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GCER Global Cluster for Early Recovery
Smarter Response, Resilient Communities.

1. Introduction

This paper presents a proposed debris management tool with the objective of supporting Early Recovery practitioners in understanding key environmental concepts relating to debris management as well as provide clear indications on how effective debris management can support increased environmental benefits in Early Recovery. In addition, the debris tool supports longer term improved natural resource management through reducing the burden on quarries and minimizing transport requirements.

The paper is part of a suite of tools and guidance prepared for the UNDP Crisis Interface Team (Geneva) focused on mainstreaming environmental issues into Early Recovery. The two other papers concern disaster waste management and rehabilitation of damaged industry with a focus on improving their environmental impact.

2. Objective

The objective of the proposed debris tool is to provide a clear manner by which to demonstrate the environmental advantages from effective debris management, thereby enabling those involved in the planning, design and implementation of debris management programs to use the tool in their own programs.

The debris tool will need to achieve this by:

- Comparing different debris scenarios ranging from disposal of all debris to optimum recycling of the debris;
- Include key indicators such as:
    - Transport demand (number of truck trips required);
    - Debris processing space required (site requirements for sorting and recycling the debris);
    - Livelihoods opportunities (number of workers and jobs needed to run the debris programme);
    - Costs for the debris management; and,
    - Disposal space required for debris that is not being recycled.
- Be robust by drawing on data and information from past projects.

The tool should be easy to use as a demonstrator and may be most applicable on a tablet for ease of demonstration.

3. Debris Tool Structure and Content

Appendix A of this paper provides an overview of the envisaged debris tool which provides the basis for the development of the tool in latter stages of development.

The presentation has been developed in PowerPoint to enable sharing with other colleagues in order to test the concept and communicate the design.

The structure and content build in iterations from the initial scenario of all debris going to disposal (which is the default scenario) and gradually as more and more of the debris is sorted for reuse/recycling, subsequently less is sent to disposal.

For each of the scenarios then a results page can be developed as illustrated in Appendix B, which contains screen shots from a simple demonstrator model built for the purpose of illustrating key functions.

This simple demonstrator tool uses Homs (Syria) as an example and the results page compares the various scenarios along the same parameters as truck movements, cost, time and total for disposal. Each of these parameters has an environmental element:

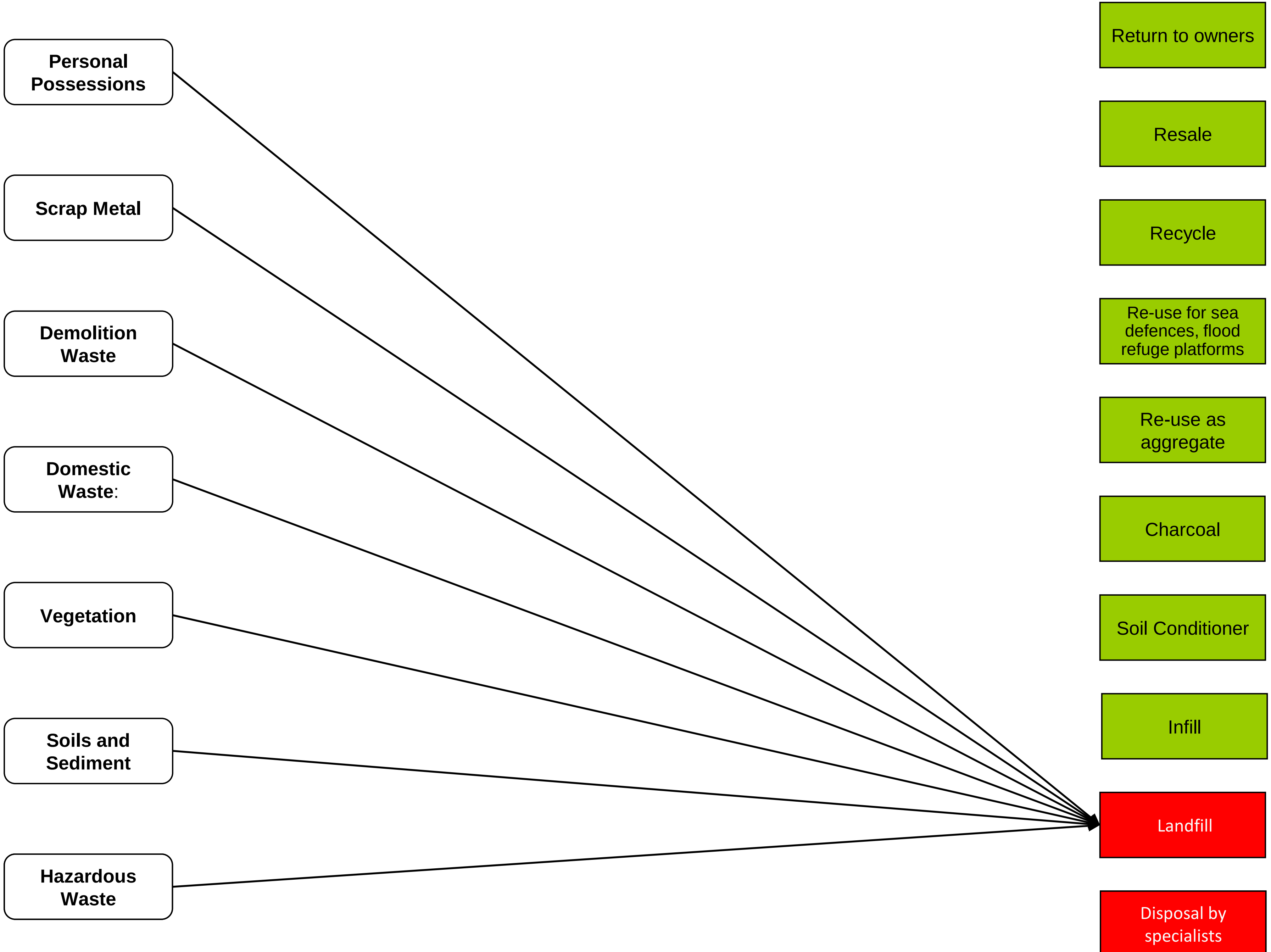
- **Haulage** of debris is a significant part of any debris project (and where the highest cost often lies) and has a negative impact on the environment through exhaust fumes, use of diesel and impact on roads and safety of people. Any reductions in trucking debris, for example by use of more locally placed debris recycling sites compared to out of town disposal sites, will reduce negative environmental impacts;
- **Recycling** of the debris leads to less debris being disposed of in the land surrounding the towns and cities affected by the disaster. This reduced disposal has a positive environmental outcome since uncontrolled dumping of debris can lead to significant negative impacts through contamination of groundwater and attraction of vermin and vectors;
- **Recycling** of the debris also leads to reduced need for extraction of (re)construction materials from quarries which has a positive impact on natural resource management;
- **Reuse** of Timber from the debris portion if separated out in a consistent and controlled manner leads to increased timber being available for heating and cooking in the local communities. This in turn leads to reduced need for communities to harvest wood from often depleted woodland areas where reduced deforestation can lead to reduced risk of floods and land erosion.

4. Way Forward

In order to deliver on the envisaged debris management tool, it is proposed to seek funding which will allow for the development of the debris tool into an Early Recovery Advisor (ERA) tool which can be adopted and used by the ERA to demonstrate the environmental advantages (as well as economical and time benefits) of effective debris management.

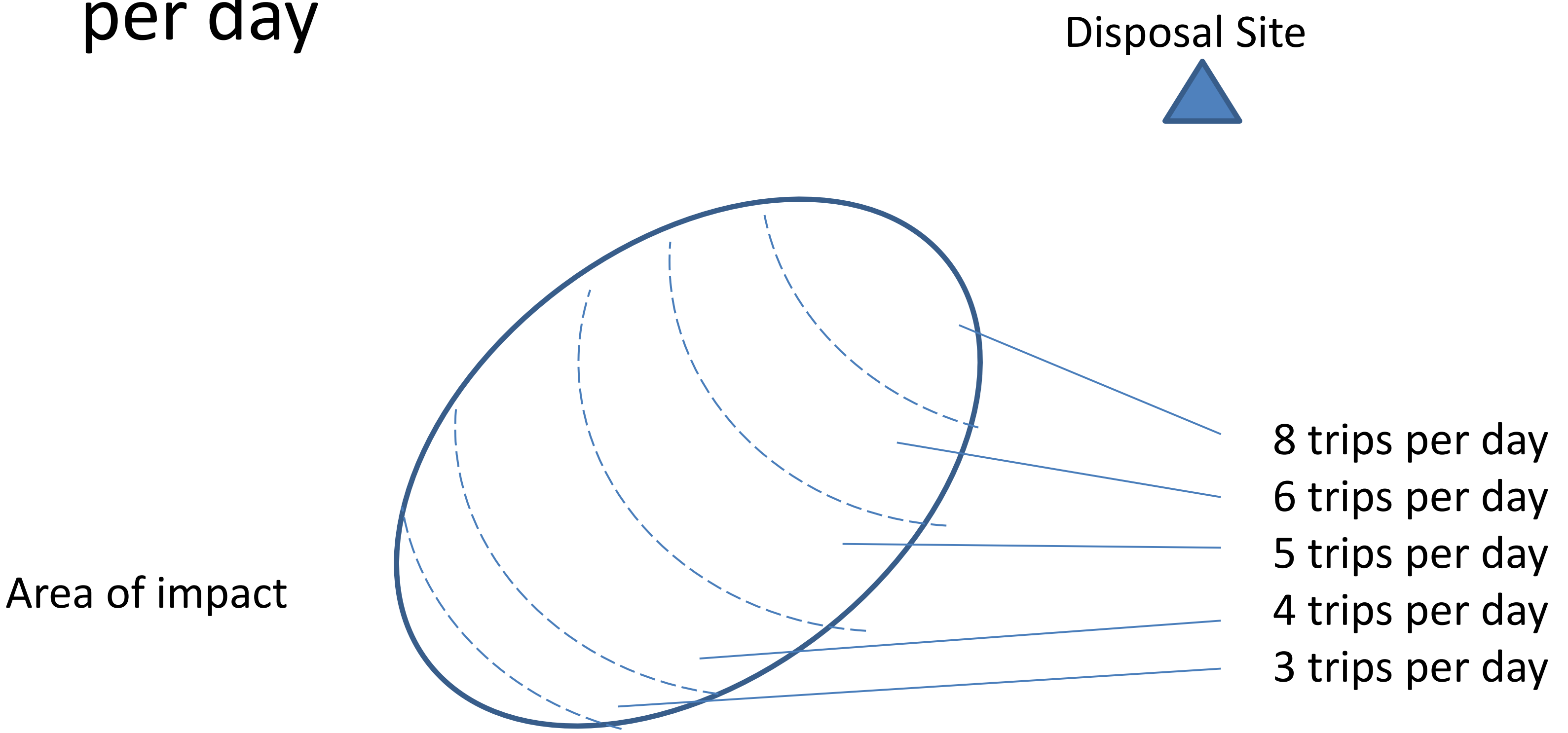
APPENDIX A

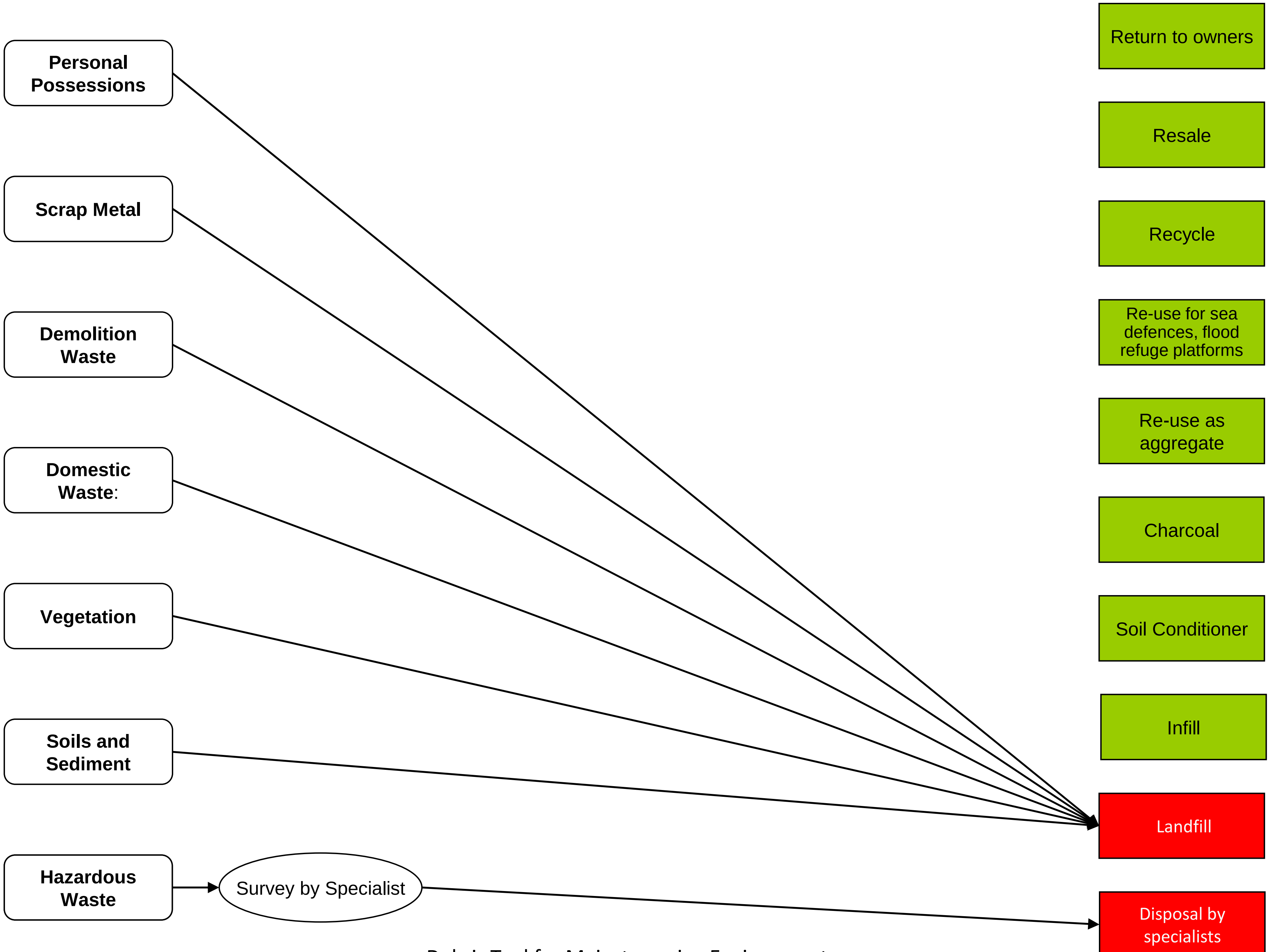
Outline Structure and Content of Debris Tool


Personal Possessions
Scrap Metal
Demolition Waste
Domestic Waste:
Vegetation
Soils and Sediment
Hazardous Waste
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
Landfill
Disposal by specialists

Dispose of everything

- Transport cost based on distance to disposal site
- Different strata should be drawn up based on cost per truck load to dumpsite and number of trips per day



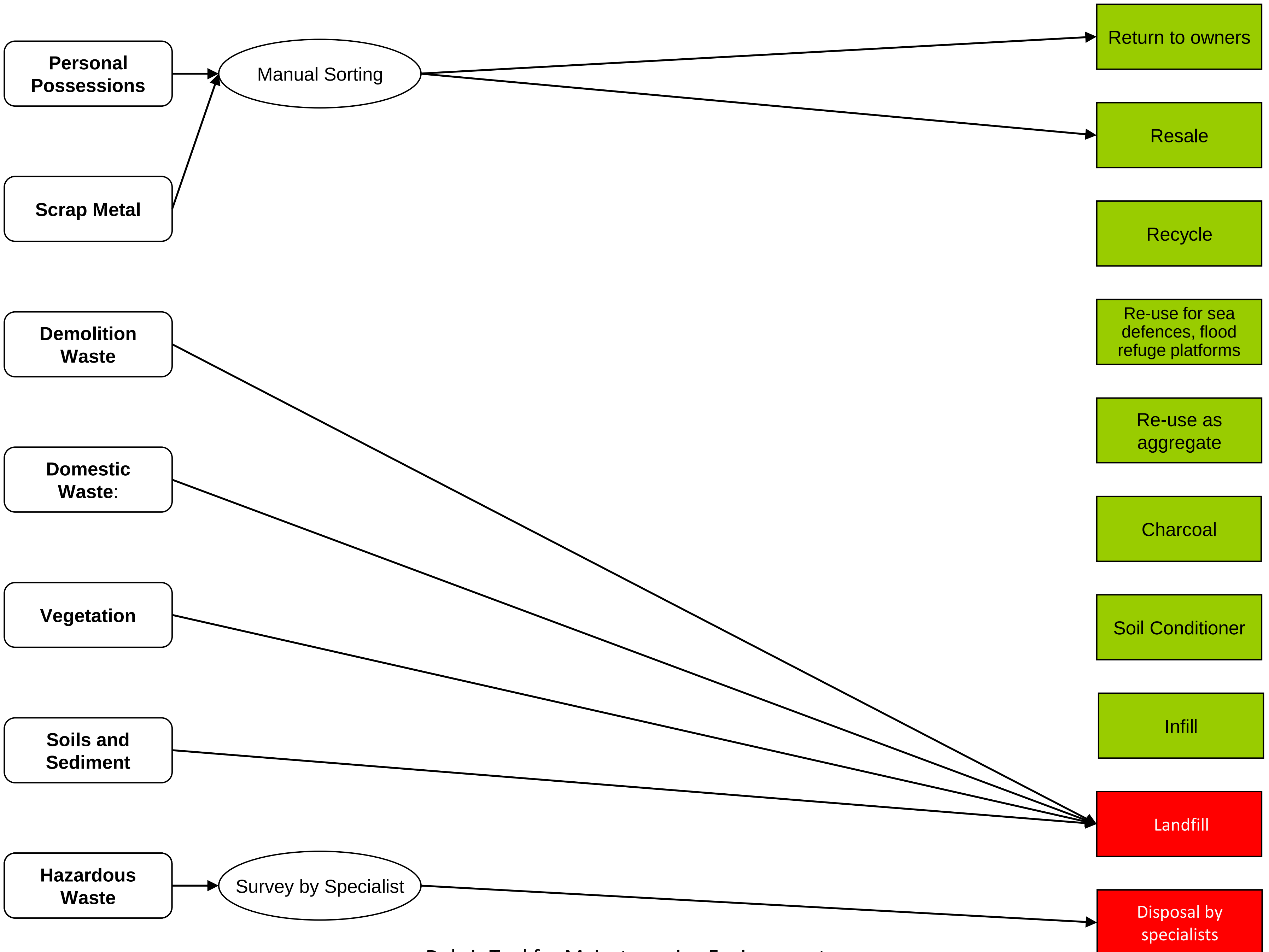

Personal Possessions
Scrap Metal
Demolition Waste
Domestic Waste:
Vegetation
Soils and Sediment
Hazardous Waste
Survey by Specialist
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
Landfill
Disposal by specialists

Survey by specialist

- Specialist to oversee survey
- Skilled surveyors
- Unskilled surveyors
- GPS marking of “hotspots” and “cleanspots” where rest of work can start
- Training of sorters to remove low risk hazards
  - Chemicals
  - E-waste
  - White goods
  - Expired pharmaceuticals LPG canisters etc

Survey by specialist

- Time variable should be determined by estimate of contamination of waste
- Depth/ accessibility of debris for survey
  - Possible that two or more sweeps required for certain contaminants, such as UXO
- Overall volume of waste
- Should be very clear that cost may be huge, but cost of not doing often huge-er

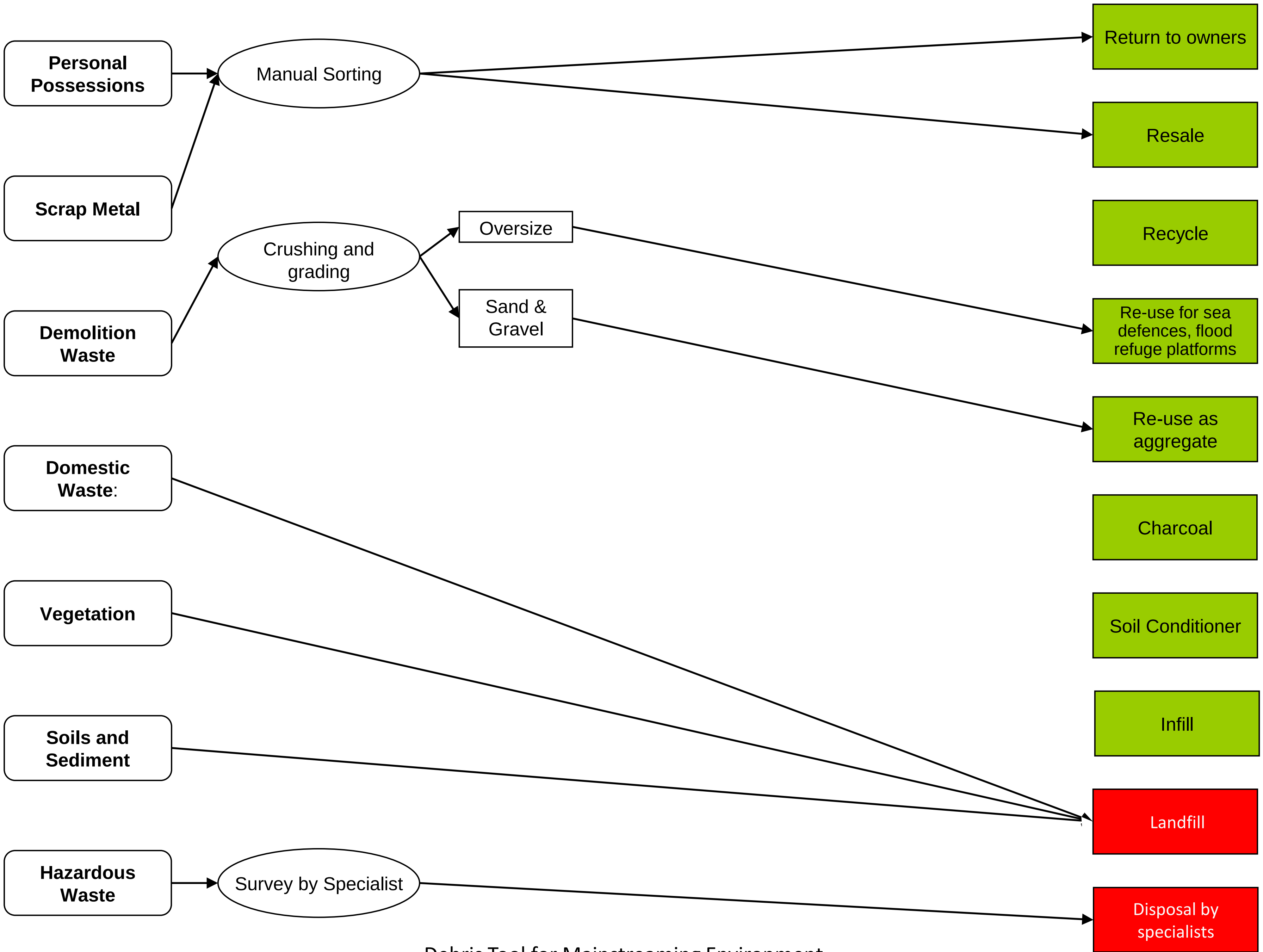

Personal Possessions
Scrap Metal
Manual Sorting
Demolition Waste
Domestic Waste:
Vegetation
Soils and Sediment
Hazardous Waste
Survey by Specialist
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
Landfill
Disposal by specialists

Manual Sorting

- Cash-for-work
- Creating a viable market for sorted products very efficient and sustainable
- Costs therefore dependent on
  - implementation plan
  - Number of people
  - Volume of waste
  - Availability of market

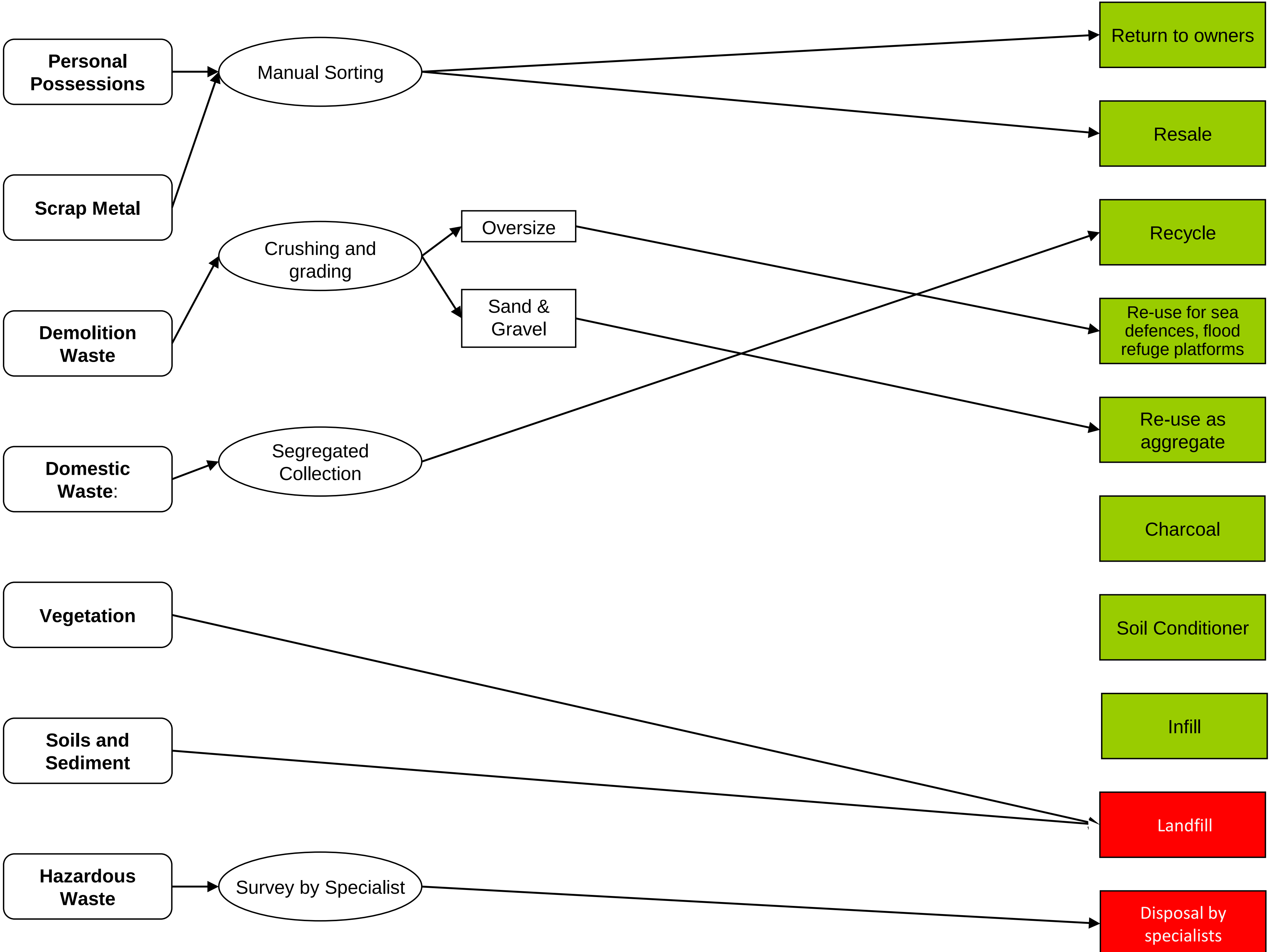
Manual Sorting

- Time dependent on:
  - Volume of waste
  - Accessibility to markets (a highly sought after material will be processed much faster)
  - Number of workers (not all easily counted)
    - Emergency employment
    - Informal workers
    - Local people recovering their own goods


Personal Possessions
Scrap Metal
Demolition Waste
Domestic Waste:
Vegetation
Soils and Sediment
Hazardous Waste
Manual Sorting
Crushing and grading
Survey by Specialist
Oversize
Sand & Gravel
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
Landfill
Disposal by specialists

Crushing and grading

- Highly variable cost and time associated. Function of:
  - Volume
  - Size and number of crushers used
  - Location of crusher(s) and transport associated (still use the same calculator as for disposal)
- Cost recovery associated a function of
  - Type of debris
  - Market for different products


Personal Possessions
Scrap Metal
Demolition Waste
Domestic Waste:
Vegetation
Soils and Sediment
Hazardous Waste
Manual Sorting
Crushing and grading
Segregated Collection
Survey by Specialist
Oversize
Sand & Gravel
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
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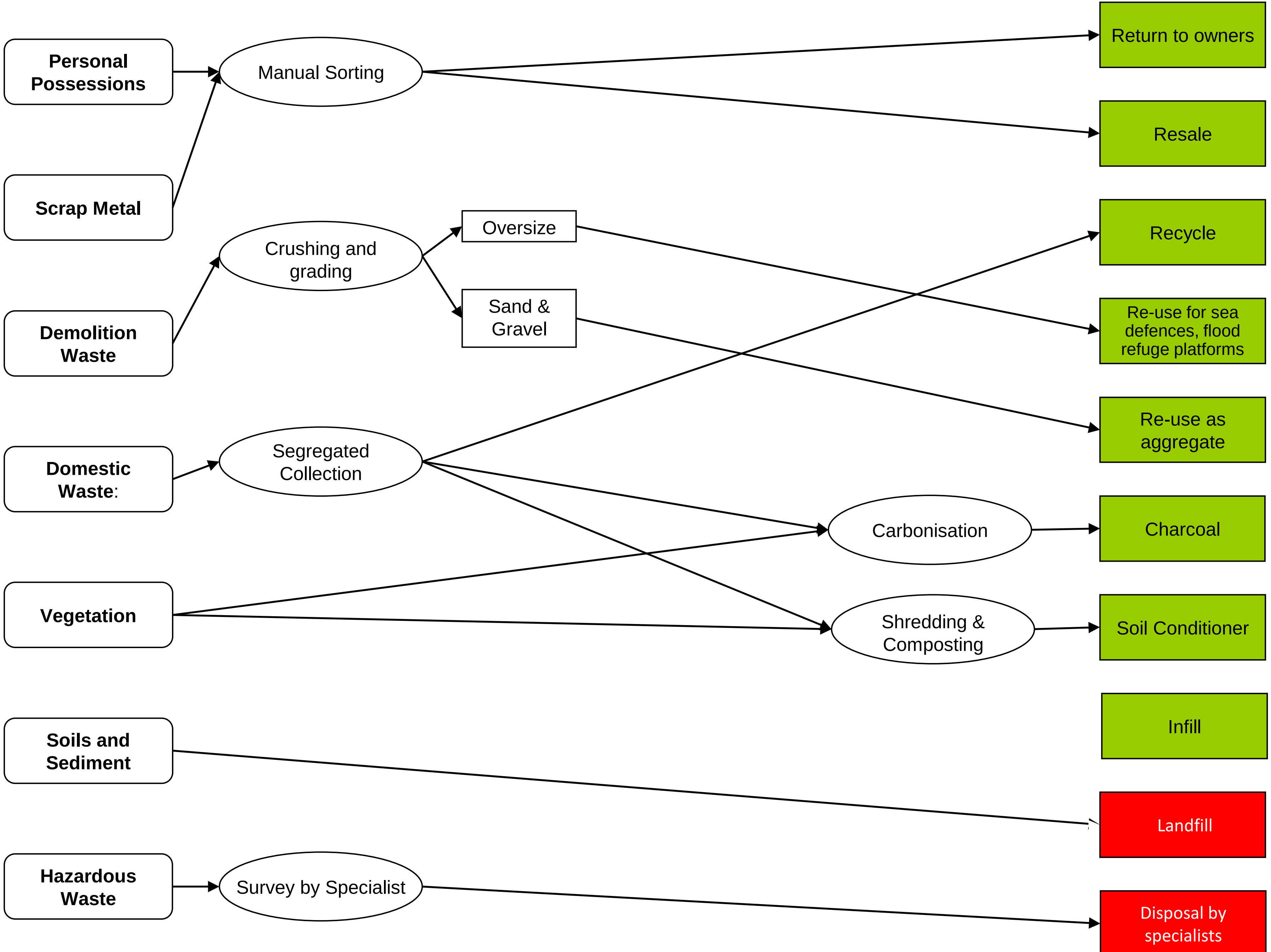
Disposal by specialists

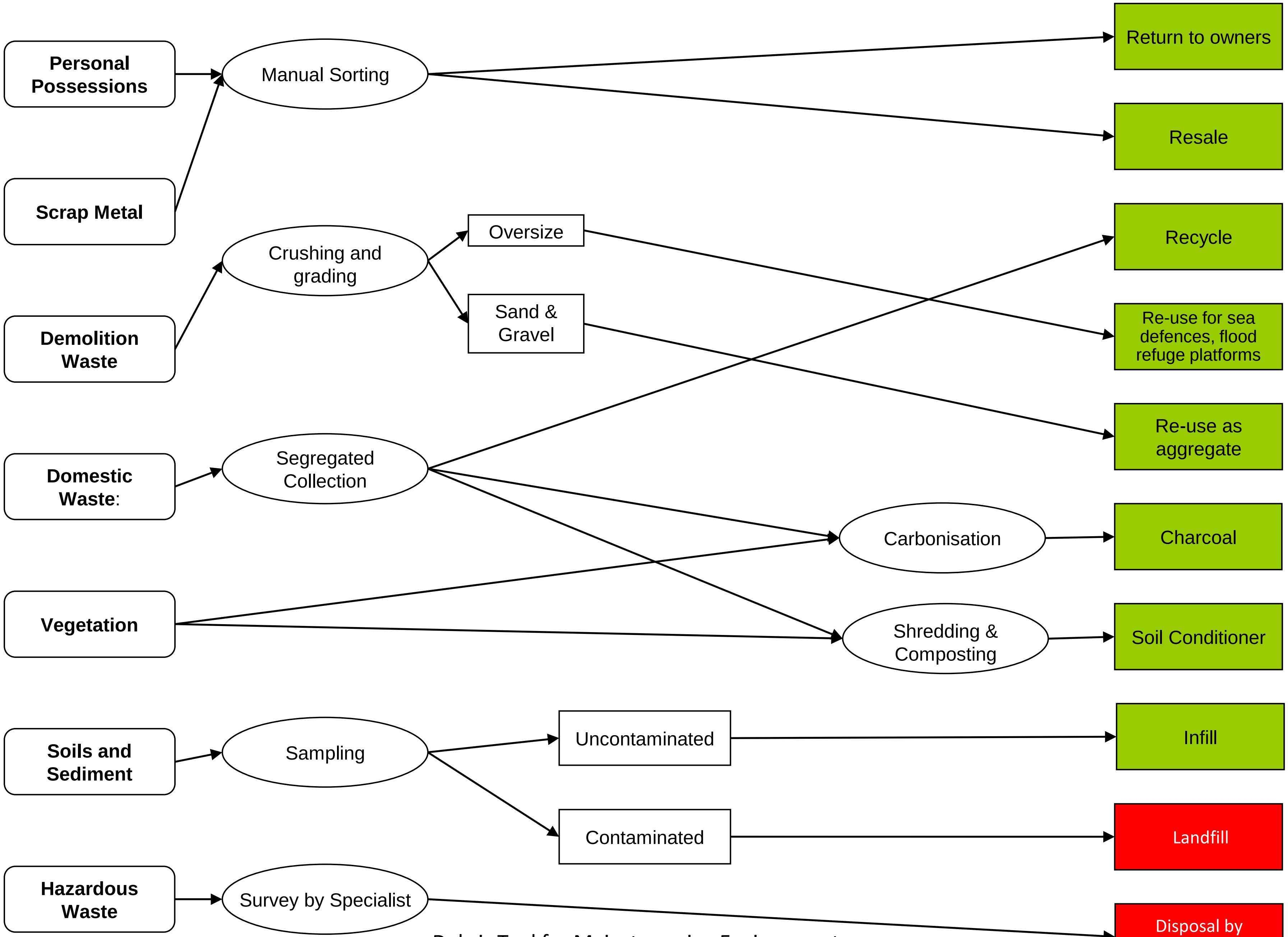
Segregated collection of domestic waste

- May be better not to budget as part of debris mgt
- However has an impact on debris mgt costs as can contaminate and devalue debris outcomes
- Costs are a factor of IDPs/refugees/host population numbers
- Should not have an impact on time of recovery


Personal Possessions
Scrap Metal
Demolition Waste
Domestic Waste:
Vegetation
Soils and Sediment
Hazardous Waste
Manual Sorting
Crushing and grading
Oversize
Sand & Gravel
Segregated Collection
Carbonisation
Shredding & Composting
Survey by Specialist
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
Landfill
Disposal by specialists

Shredding composting and carbonisation

- Not part of urban debris mgt
- Can have great cost recovery/ reductions in terms of disposal site diversion
- Again, similar variation in costs and times based on machine used, centralised vs decentralised, etc.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Hazardous Waste
Manual Sorting
Crushing and grading
Oversize
Sand & Gravel
Segregated Collection
Carbonisation
Shredding & Composting
Sampling
Uncontaminated
Contaminated
Survey by Specialist
Return to owners
Resale
Recycle
Re-use for sea defences, flood refuge platforms
Re-use as aggregate
Charcoal
Soil Conditioner
Infill
Landfill
Disposal by specialists

Sampling of soils and sediments for reuse

- Only viable in “wet” disasters such as tsunami or flood situations
- Can have considerable cost recovery implications depending on cost of disposal site and value of final product

APPENDIX B

Screenshot from Debris Tool demonstrator

Debris Tool: Assumptions

Beta/Demonstration version using Homs, Syria as an example

Adjustable Assumptions:

Average Commuter Speed: **20kmph**

Cost per KM per te: **$5**

Diversion Site Recycle Rate: **70%**

Average Truck Capacity: **10 te**

Hour(s) Worked per Day: **10 hour(s)**

Day(s) Worked per Week: **6 day(s)**

Debris Tool: Data Entry for Disposal and Recycling Sites

Data Entry:

Disposal Site:

Disposal Site Name: Site 2

Diversion Sites:

Diversion Site Name:	Distance Diversion Site to Disposal Site (km) one way:
Site 1	23.18
Site 3	15.12
Site 4	18.2

Debris Tool: Data Entry for Debris Quantities

Debris Sites:

Debris Site Name:	Quantity of Debris (te):	Distance Debris Site to Disposal Site (km) one way:	Designated Diversion Site:	Distance Debris Site to Diversion Site (km) one way:	Distance Diversion Site to Disposal Site (km) one way:
Al-Abbasiya	12348	22.53	Site 4	4.39	18.2
Al-Armn	30117	24.4	Site 4	6.64	18.2
Al-Ba'ath University	20817	17.75	Site 3	3.93	15.12
Al-Bayada	2458	21.68	Site 4	3.49	18.2
Al-Ghouta (1)	9783	17.12	Site 4	1.38	18.2
Al-Ghouta (2)	23456	17.81	Site 4	0.66	18.2
Al-Hamiydieh	23481	19.81	Site 4	2.13	18.2
Al-Haswiyeh	14716	18.09	Site 4	2.21	18.2
Al-Iddikhar Housing	22477	16.93	Site 3	1.81	15.12
Al-Insha'at	23619	16.94	Site 4	3.07	18.2
Al-Karajat Area (1)	11396	22.95	Site 4	5.53	18.2
Al-Karajat Area (2)	10921	21.97	Site 4	5.45	18.2
Al-Khaldiyeh	16658	20.05	Site 4	1.89	18.2
Al-Khdr	20798	19.29	Site 4	3.85	18.2
Al-Mahata	19927	17.75	Site 4	2.35	18.2
Al-Mazra's	10089	10.77	Site 3	6.51	15.12
Al-Mimas	5028	15.29	Site 4	3.44	18.2
Al-Mouhajereen	20126	23.05	Site 4	5.05	18.2
Al-Naziheen (1)	20740	20.54	Site 1	4	23.18
Al-Naziheen (2)	15832	21.5	Site 1	3.86	23.18
Al-Sabil	15387	21.49	Site 4	3.47	18.2
Al-Shammas (1)	30526	17.91	Site 3	3.08	15.12
Al-Shammas (2)	7739	16.31	Site 3	1.73	15.12
Al-Sina'a/Industrial Zone	16635	19.78	Site 4	2.78	18.2
Al-Tawzia'a Al-Ijjbari (1)	25598	15.9	Site 3	2.97	15.12

Debris Tool: Summary Results page

Option A (baseline - based on assumptions and data provided):

Quantity of debris at Debris Sites: **900000 te**

Cost to move all debris from Debris Sites to Disposal Site: **$84600789**

Person hours total to move all debris from Debris Sites to Disposal Site: **169202 hour(s)**

Person days total to move all debris from Debris Sites to Disposal Site: **16920 day(s)**

Person weeks total to move all debris from Debris Sites to Disposal Site: **2820 week(s)**

Option B (all waste processed at designated diversion site - based on assumptions and data provided):

Electing to use Option B instead of Option A would yield the following efficiency saving: **52.45%**

Quantity of debris recycled at Diversion Sites: **630000 te**
Quantity of debris not recycled at Diversion Sites and transferred to Disposal Site: **270000 te**

Cost to move all debris from Debris Sites to Diversion Sites: **$16390735**
Cost to move all non-recycled debris from Diversion Sites to Disposal Site: **$23835786**
Total cost to move all debris from Debris Sites to Diversion Sites + move all non-recycled debris from Diversion Sites to Disposal Site: **$40226521**
Cost saving Option A vs. Option B: **$44374268**

Person hours total to move all debris from Debris Sites to Diversion Site: **32781 hour(s)**
Person hours total to move all non-recycled debris from Diversion Sites to Disposal Site: **47672 hour(s)**
Total person hours to move all debris from Debris Sites to Diversion Sites + move all non-recycled debris from Diversion Sites to Disposal Site: **80453 hour(s)**
Person hours saving Option A vs. Option B: **88749 hour(s)**

Person days total to move all debris from Debris Sites to Diversion Site: **3278 day(s)**
Person days total to move all non-recycled debris from Diversion Sites to Disposal Site: **4767 day(s)**
Total person days to move all debris from Debris Sites to Diversion Sites + move all non-recycled debris from Diversion Sites to Disposal Site: **8045 day(s)**
Person days saving Option A vs. Option B: **8875 day(s)**

Person weeks total to move all debris from Debris Sites to Diversion Site: **546 week(s)**
Person weeks total to move all non-recycled debris from Diversion Sites to Disposal Site: **795 week(s)**
Total person weeks to move all debris from Debris Sites to Diversion Sites + move all non-recycled debris from Diversion Sites to Disposal Site: **1341 week(s)**

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