Disaster waste management perceptions survey

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1. Introduction

Over the course of the author's PhD research into Disaster Waste Management, a series of seminars were conducted by the author and the author's primary supervisor, Associate Professor Mark Milke. The seminars aimed to present an overview of the issues faced by disaster waste managers. In particular the seminars emphasised the trade-offs between social, economic and environmental objectives. Seminar participants were largely academic staff and students from universities in the US, UK and New Zealand with an interest in waste management and emergency management. A list of seminar locations, dates and the survey participants is shown in Table 1.

Table 1 Disaster waste management survey participants

Location	Date	Number of participants
University of Canterbury, NZ	August 2010	16
University of Illinois, Chicago, US	October 2010	5
Imperial College, London, UK	November 2010	22
Johns Hopkins University, Maryland, US	December 2010	11
University of Delaware, US	December 2010	18
	TOTAL	**72**

To aid understanding during the seminar, participants were asked to fill in a worksheet covering a series of post-disaster waste management dilemmas.

The worksheet presented the following disaster scenario:

What would you do?

Assume that you are in charge of managing the waste following an earthquake in your coastal community (assume developed country unless stated otherwise). The earthquake has generated 5 years' worth of municipal waste volume. 90% of the community has been directly affected and 30% of structures must be demolished.

Using this scenario participants were asked to respond to five questions about managing disaster waste. The following sections discuss the responses. Note that not all participants responded to all questions.

2. Survey responses

2.1 Organisational responsibility

The first question related to overall governance of disaster waste management. The question was:

Which organisation should take overall responsibility for managing the waste?

Participants responded as shown in Table 2.

Table 2 Preferred organisational responsibility for management of disaster waste

Management options	Number of responses
Emergency / recovery management organisation	35
Local waste management authority	16
National waste management authority	20

A number of comments were provided with responses:

- It depends on the scale of impact of the disaster (if local capacity is overwhelmed then national response is more appropriate).
- Local authorities need to maintain control of their own assets.
- Local management of waste may help in psychological recovery from the disaster.
- A combination is important, in particular liaison with local authorities. Each has their own expertise.

- Planning should be done by emergency organisation and implementation should be by waste management authorities.
- Emergency management organisations are fast acting, low bureaucracy and high efficiency.
- Emergency management authority can link local authority (which may be overwhelmed) with national authority (which may be too far removed).
- There may be several local authorities affected – in which case an holistic approach is needed.
- National accountability is important.
- Local authorities may act more quickly than others.
- It depends who is paying.

Overall it appears that participants believed that strategic management would be best led by the emergency response authority. Based on the comments, it could also be added that implementation may be best managed by national authorities (due to capacity availability), with local authorities providing as much as their capacity allows due to their local knowledge and on-going ownership and operation of the waste management system.

2.2 Environmental risk management –land reclamation

The second question related to environmental risk management: in particular land reclamation (note the New Zealand version of the survey did not include this question):

> *Coastal land reclamation is an option for inert construction and demolition waste; however, there will be aesthetic impacts and a risk of marine contamination due to hazardous materials in the debris. Under what conditions would you consider land reclamation? Tick all those that apply.*

Participants responded as shown in Table 3.

Table 3 Acceptable land reclamation activities post-disaster

	Impact on fisheries and coastal environment				You would not consider this
	< 1 year	1-5 years	5-10 years	Permanent	
Number of responses	16	17	3	1	15

Participants qualified their response with a number of comments. The preferred approaches depended on:

- The ability to separate and control hazardous substances in the waste.
- Local expertise / experience in land reclamation activities using waste products (e.g. peace-time land reclamation in Kobe, Manhattan)
- The likely economic impact on fisheries.
- The feasibility of other options (environmental issues, transportation distances).
- The value of resources in waste and scarcity of equivalent raw materials.

As the results show, 15 out of the 52 respondents, or 29%, indicated that they would not consider land reclamation at all. While 44% indicated a temporary (less than 5 year effect on fisheries and coastal environment) would be acceptable.

2.3 Environmental impact – recycling versus disposal

The third question also looked at environmental impacts of disaster waste management: in particular recycling and disposal options:

> *Assume the existing landfill can only take 50% of the waste and that 90% of the debris is recyclable. A new low-standard landfill could be constructed. There is no time to conduct a detailed environmental risk assessment; however, a very rough study suggests that the environmental risk is low to medium. How much waste will you recycle and how will you dispose of the remainder of material?*

Participants responded as shown in Table 4.

Table 4 Preferred recycling and disposal options post-disaster

Recycle	Existing standard landfill	New low-standard engineered fill	Time	Number of responses
90%	10%	-	3 years	10
50%	50%	-	1.5 years	38
50%	-	50%	2 years	13
-	50%	50%	1 year	6

Participants provided the following comments for this question:

- Response depends on the benefit of doing the clean-up faster.
- Desired speed would be inversely related to the impact of the disaster (i.e. larger disasters should be dealt with more efficiently than smaller disasters / with lower emphasis on environmental outcomes).
- Time is the major criterion.
- Depends on net cost of recycling.
- Landfilling provides the option of future mining of resources.
- Existing waste management practices should not be reduced if possible.

38 of the 58 responses, or 66%, selected the second most expedient option of recycling 50% of the waste and disposing of the remaining 50% at an existing, standard landfill.

Without knowing the participants' peace-time position on environmental risk management, it is not possible to determine whether a relaxation in standards is considered acceptable post-disaster. Generally however, the responses to the two previous questions indicate that participants did not select the 'optimum environmentally beneficial' option. In both the land reclamation and the recycling and disposal question, the majority of respondents selected an option with a degree of environmental impact.

The response to the recycling and disposal question is particularly interesting where the options included both time and environmental dimensions. The majority of participants favoured neither the quickest nor the most environmentally friendly option (90% recycling). Participants clearly tried to balance the environmental objectives with the social objective of a more expedient recovery process.

No cost information was given so it is unknown whether participants included cost considerations in their responses.

2.4 Human health risk management – asbestos

The fourth question addressed human health risk management. The question related to the management of asbestos for private property demolition:

> *Assuming there are funds for all demolition works and the property owner has agreed for the works to be completed, for each scenario (a-c) indicate who should carry out the demolition works? Assume that individual site testing is too time consuming and will not be carried out.*

Participants responded as shown in Table 5. The numbers of participant responses are in italics.

Table 5 Preferred management of private property demolition where asbestos is present

	Central contractor(s)	**Individual property owner (or appointed contractor)**
Estimated 10% of properties have asbestos	*20*	*48*
Estimated 50% of properties have asbestos	*63*	*5*
Estimated 90% of properties have asbestos	*67*	*1*

The following comments were made regarding this dilemma:

- This depends on legal framework and responsibilities.
- This depends on the prevalent type of asbestos (non-friable asbestos posing a much reduced risk).
- This depends on the availability of a suitably qualified contractor with sufficient capacity (multiple contractors could be used with uniform guidelines).
- Central contractor approach might not be popular with householders
- Central contractor allows consistent safety standards and time scales to be applied.
- If not centralised, owners may look for cheapest contractor (with improper practices)
- Individuals do not have the capacity or ability to organise and supervise demolition.
- Too complex for everyone to find their own contractor.

- Economies of scale are possible with central contractor.
- Future financial risk (health care and legal action) if asbestos is improperly managed by individuals.

As the results show, there is a significant shift in risk management approach as the level of asbestos increases. For small amounts of asbestos, participants were generally willing to leave property clearance (and resulting risk of asbestos exposure) to individual property owners. For larger asbestos volumes (50% of properties and above), more control over individuals actions was desired and central control of the demolitions was desired.

2.5 Human health management – increasing asbestos removal capacity

The last question also investigated human health risk management: in particular management of asbestos in a time and resource constrained post-disaster environment:

> *Assuming asbestos is present in 50% of structures to be demolished and that under accepted peace-time practice it will take on average 4 days to demolish each structure by certified contractors (of which there are 5). Indicate (one tick per row) whether you would reduce peace-time demolition procedures (such that demolition takes 1 day per house) or contractor certification (to increase contractor numbers to 20)?*

Participants responded as shown in Table 6. The numbers of participant responses are in italics.

Table 6 Preferred method of increasing asbestos removal capacity.

	Maintain peace-time standard	Reduce standards
Demolition procedures	*29*	*35*
Contractor certification	*35*	*31*

The responses were qualified by the following responses:

- Standards could only be reduced if workers and public are properly protected.
- It depends on the level of reduction in contractor certification.
- Contractors should be trained pre-disaster if asbestos is a known problem.

- Contractors with existing asbestos management skills will be more efficient at reducing demolition procedures / times (will be aware of health and safety and environmental standards).
- Reduced contractor certification may be difficult to rescind after the disaster.
- There are too many liability issues to reduce standards.
- Asbestos health risks are dose related [therefore global good practice is necessary].
- It is necessary to maintain a minimum standard (compared with peace-time 'maximum' standard).
- It is best to get things done quickly [reduction in both standards is ok].
- Unmanaged damaged structures will cause more public health hazard than reducing standards.
- Contractors could be brought in from unaffected areas.
- It depends on size of town and disaster impact (standards can be reduced if the town is large or disaster impacts are large) [i.e. speed is the imperative].

As the results show there was no clearly preferred management option for increasing asbestos management removal capacities. While most participants indicated that one or other could be reduced (to allow for a more expedient recovery) 15 out of 36 (42%) indicated that it was acceptable to reduce both standards. 11 out of 36 (31%) indicated neither standard should be reduced.

Compared to the responses to the environmental risk management questions, the preferred approach to public health risk management post-disaster is much less clear. The first question indicates that, not surprisingly, the level of hazard should have a direct impact on the public health approach taken. Where a higher level of hazard exists, greater regulatory and organisational controls are desired. The second question, however, indicates that the dilemma of how to maintain these controls within a resource and time constrained situation is more challenging. Both responses perhaps indicate that people are much less willing to compromise human health than environmental health.

3. Survey limitations

While the above results give an indication of preferred disaster waste management practices, it should be noted that there are a number of limitations to these results:

- The given scenario information was limited.
- Expertise in waste or emergency management was not recorded.
- It is unknown whether respondents have experienced a disaster event before (availability bias).
- Information given by the presenter may have influenced responses (framing bias).
- Peace-time preferences were not recorded.
- Cultural and institutional beliefs / reference frames may have influenced people's responses.
- Results have been aggregated and do not show any differences in response cross culturally.
- Cost / economic dimensions were not included in any of the questions.
- Discrete responses were elicited, where a Likert or similar sliding scale may have provided more insight.
- The participants were predominantly engineers who may not be representative of the general public or decision-makers.

4. Summary

The results from this survey are not statistically representative. The results, however, give an indication as to professional attitudes toward post-disaster waste management. They act as a potential pilot study for future similar research. The responses have been used anecdotally to support the analysis in the author's PhD research into Disaster Waste Management.

Should future research be planned using this approach, it would be useful to gather baseline data for each participant, this includes: expertise and experience in waste and emergency management; and peace-time environmental and public health risk perceptions. This would enable cross contextual comparisons to also be made.