Public Health England

Protecting and improving the nation's health

Recovering from a chemical, biological or radiation incident

This factsheet provides important advice and information about how to recover from a chemical, biological or radiation (CBRN) incident (including HazMat).

What is recovery?

Recovery is defined as the process of rebuilding, restoring and rehabilitating the community following an emergency. The recovery phase should begin at the earliest opportunity following an emergency, running in tandem with the emergency response. The recovery phase continues until the disruption has been rectified, demands on services have returned to normal and the needs of those affected (directly and indirectly) have been met.

Emergencies affect communities in a wide variety of ways. It is important to understand how an emergency has affected individuals and their communities to be able to prioritise and scope the recovery effort[1]. Some types of issues encountered are given in Table 1.

Table 1: Types of issues encountered in emergencies

Issue	Impact
Humanitarian (eg health)	Physical impacts (eg individuals' health, housing and financial needs) Psychological impacts Deaths Community displacement
Economic	Economic and business recovery
Infrastructure	Disruption to daily life (eg schools, welfare services and public transport) Disruption to utilities/essential services Damage to residential properties and security of empty premises
Environmental	Pollution and decontamination Waste Natural resources and habitats

The best recovery outcomes are achieved when recovery is considered at the start of the incident. Ideally a recovery coordinating group (RCG) should be established and set up on the first day of the emergency and run in parallel to the strategic coordinating group (SCG).

While the response phase to an emergency can be relatively short, recovery is a complex and long-running process that may involve many more agencies and participants[2] than the

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response phase, including specialists that can undertake decontamination and remediation[3], depending on the nature of the incident.

The recovery phase is likely to require more resources than the response phase and may be subject to close scrutiny from the community, media and politicians. Therefore it is essential that decisions on how best to remediate the affected environment are based on a robust evaluation of available options.

Public Health England has developed the UK recovery handbooks and interactive support tools to help with the decision-making process for developing a recovery strategy following a chemical, biological or radiation incident. PHE has also published guidance and templates for recording and reporting decisions on recovery. These resources enable the user to evaluate recovery options (remediation techniques) that are likely to be the most appropriate, applicable and effective on a site- and incident-specific basis. Recovery options are remediation techniques that may be applicable to facilitate the return to normal. PHE has grouped options into the following categories:

Protection – actions to protect human health and the environment
Remediation – actions to get the affected environment back to normal
Fate of affected produce or waste disposal – actions to manage waste produced, including appropriate disposal and treatment

The recovery resources developed by PHE are primarily aimed at national and local authorities, central government departments and agencies, environmental and health protection experts. They are available to download from the gov.uk website[4,5,6]. Please check the website for the latest versions of PHE tools and guidance for recovery, including:

- the UK Recovery Handbook for Chemical Incidents
- the UK Recovery Handbook for Biological Incidents
- the UK Recovery Handbook for Radiation Incidents
- chemical recovery navigation tool
- chemical recovery record form
- radiation recovery navigation tool (inhabited areas, food, drinking water)
- radiation recovery record form
- e-learning module: principles of recovery and remediation
- guidance on recovery from flooding: essential information for frontline responders

Why did PHE develop these tools and guidance?

These resources have been developed to enable those involved in developing a recovery strategy to evaluate recovery options (remediation techniques) that are likely to be the most appropriate, applicable and effective on a site- and incident-specific basis.

Decision aiding frameworks for developing a recovery strategy

A common theme between the recovery handbooks is the decision-aiding framework (see Table 2) that the user is prompted to work through when developing a recovery strategy.

Table 2: Steps in the decision-aiding framework for developing a recovery strategy	
Step	**Description**
1	Obtain information relevant to the incident; identify environment/area contaminated and physicochemical (chemical or radiation incident) or physiological properties (biological incident) of the contaminant
2	Identify potentially applicable recovery options for the contaminated environment/ area/surface type. Some options can be eliminated at this stage based on common sense (ie snow and ice removal is a recovery option following a chemical or radiation incident that would not necessarily be applicable during summertime)
3	Consider the applicability of the recovery options for the contaminant in the affected environment/surface type. Some recovery options may be eliminated at this stage if they are applicable for persistent contaminants (years) and the agent involved in the incident has a short persistence (days)
4	Consider key considerations and constraints. Some recovery options may be eliminated during this step if the constraints outweigh the benefits of implementing the option
5	Consider the effectiveness of options. Some recovery options may be eliminated during this step if there is limited efficacy for the agent involved (this will be influenced by how the agent behaves in the affected environment, and by its physicochemical or physiological properties)
6	Consider detailed information on the remaining options, including how much waste is generated when implementing the option, as the generation of waste is an important factor to be considered. The potential volume of waste produced by implementing a recovery option needs to be carefully considered as disposal and treatment of the contaminated waste would also incur costs
7	Consider all information in the recovery options datasheet and determine if the recovery option is still applicable (on a site- and incident-specific basis)
8	Select and combine options to develop recovery strategy
Steps 4–6 are combined in the decision-aiding framework for the chemical and biological recovery handbooks	

The decision-aiding framework helps to identify and evaluate recovery options, enabling the user to eliminate options which, although they may be effective, may not be the most appropriate. Working through the steps (in either the handbooks or the recovery tools) enables the user to develop a recovery strategy on a site- and incident-specific basis.

A key factor that will influence the recovery strategy is how the chemical, biological agent or radionuclide behaves in the environment. The novel approach developed by PHE is the framework for the recovery working group to work through to help interpret and evaluate the physicochemical, physiological and toxicological properties of an agent. Equally, recovery is also affected by the type of environment and surface (or sub-surface) that has been contaminated, and the recovery guidance and tools help the user evaluate the applicability of recovery options. The characteristics of the radionuclide, chemical or biological agent are considered on a site- and incident-specific basis (eg what, where), taking into consideration a range of factors (eg who, when) shown in Table 3.

There are a range of factors[1] (shown in Table 4) that may need to be considered, evaluated or addressed by decision makers prior to undertaking remediation.

Table 3: Factors to consider when developing a recovery strategy	
What are the properties of the agent, how does it behave in the environment?	Is it a solid/liquid or gas? How long is it likely to persist? What is the biological half-life?
What type of area has been affected?	Urban (residential), rural, agricultural, recreational or drinking water?
What surface has been contaminated?	Internal or external building surfaces? Vehicles? Semi-enclosed spaces (eg train station), sensitive items like computers or electrical items
Are there any public health considerations associated with recovery?	What are the public health effects of implementing the recovery technique, is special PPE required? Is there likely to be residual contamination?
Are there environmental constraints associated with implementing the option?	Will there be a significant amount of waste produced? Is leaching of contamination likely? How will waste be stored/managed and dealt with?
Are there any social constraints?	Is the recovery strategy acceptable to those affected? Are they going to lose access to public areas, or will it cause social disruption?
Are there technical issues?	Is specialist equipment required? Are specialist trained personnel needed to do the recovery works?

Table 4: Factors influencing recovery and restoration	
Temporal and spatial factors	What agents are involved? (Is there a mixture of contaminants) When did the incident occur? (Time is important when implementing some recovery options) What are the background levels of contaminants? (This information is not often available and may compound the issue of what are acceptable levels to clean down to) What are the weather conditions? (Will natural weathering help with recovery) Essentially, the sooner an incident is declared and relevant services notified, the sooner an appropriate response can be implemented
Technical factors	What is the agent and how does it behave in the environment? Is specialist equipment required? Is it available? Is the affected area accessible? Can recovery personnel get to the affected site? Are specialist personnel required?
Social factors	Develop and maintain an effective, credible, open and transparent communication strategy with those involved on what to do and how to proceed, especially regarding the nature of risk (or perceived risk) and responsive regulations. All of these are crucial for implementing an effective remedial response and help to alleviate anxiety and return to normality
Ethical factors	Consider the health impact, economic and ecological effects of implementing the recovery strategy on the affected population. Work with the community and local authorities to highlight potential problems and identify solutions

Conclusion

The resources for recovery developed by PHE are robust and practicable guidance, based on an evaluation of the evidence base. The handbooks and interactive tools have been designed to be user-friendly guidance documents to aid the decision-making process for the implementation of a recovery strategy in the aftermath of a chemical, biological or radiation incident.

References

[1] Cabinet Office 2013. Emergency response and recovery guidance (version 5: October 2013). Available at www.gov.uk/government/publications/emergency-response-and-recovery

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[3] Government Decontamination Service 2014. CBRN and HazMat incidents: specialist suppliers that deal with decontamination. Available at www.gov.uk/cbrn-and-hazmat-incidents-specialist-suppliers-that-deal-with-decontamination

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