Recovery Handbooks: their application and future development

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Overview

- Recovery options
- Recovery handbooks
  - Development
  - Structure and Content
- Application
- Future development
  - Updates
  - Recovery decision support tool

Recovery options

Purpose

- Reduce external exposure and inhalation of resuspended material
- Reduce exposure from the consumption of contaminated foodstuffs and drinking water
- Provide reassurance about exposures
- Maintain consumer confidence
- Promote return to “normal living”

Recovery options

Inhabited areas

Food production

Drinking water

Inhabited areas

Shielding options

- Remove people
- Restrict access
- Dilution
- Use shielding material
- “Tie-down”

Inhabited areas (2)

Removal options

Do no clean up and monitor

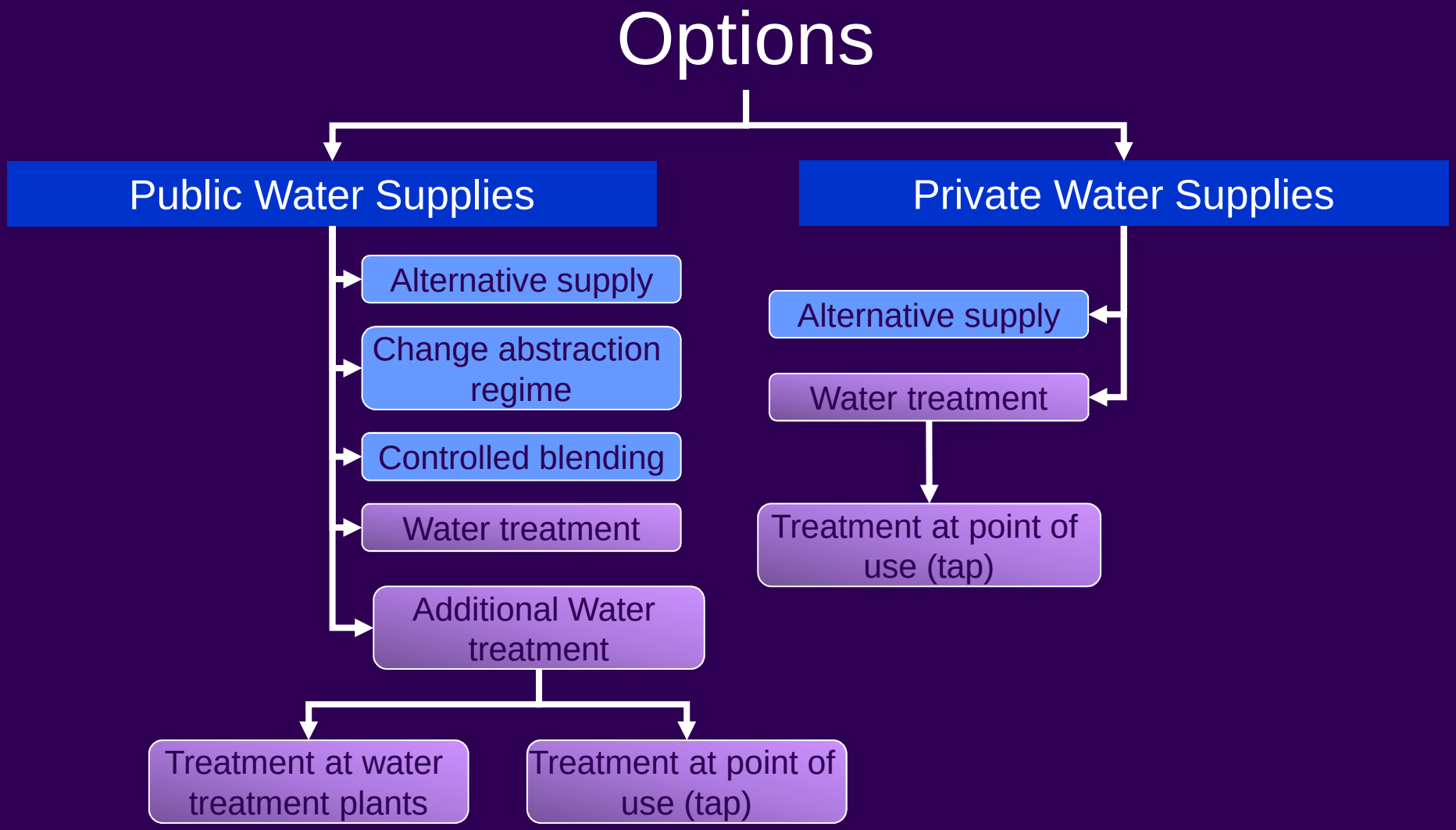
Self-help options

Food production

Options

- Pre-deposition
- Early→ Long-term
  - Soil-crop/grassland
  - Animal product
  - General applicability
  - Societal relevance
  - Waste disposal

Drinking Water



Factors influencing

- Location and timing
- Effectiveness
- Technical feasibility and capacity
- Economic cost
- Legislation
- Waste disposal
- Environmental issues
- Radiological impact
- Impact on people
- Information and communication

Why handbooks?

- There are more than 100 recovery options
- Decision makers need guidance on selecting one or more options according to:
  - Radionuclide(s) and deposition levels; scale and timing of release; land use affected; timescales for implementation; constraints; acceptability
- Impossible to have one generic strategy to cover all accident scenarios!

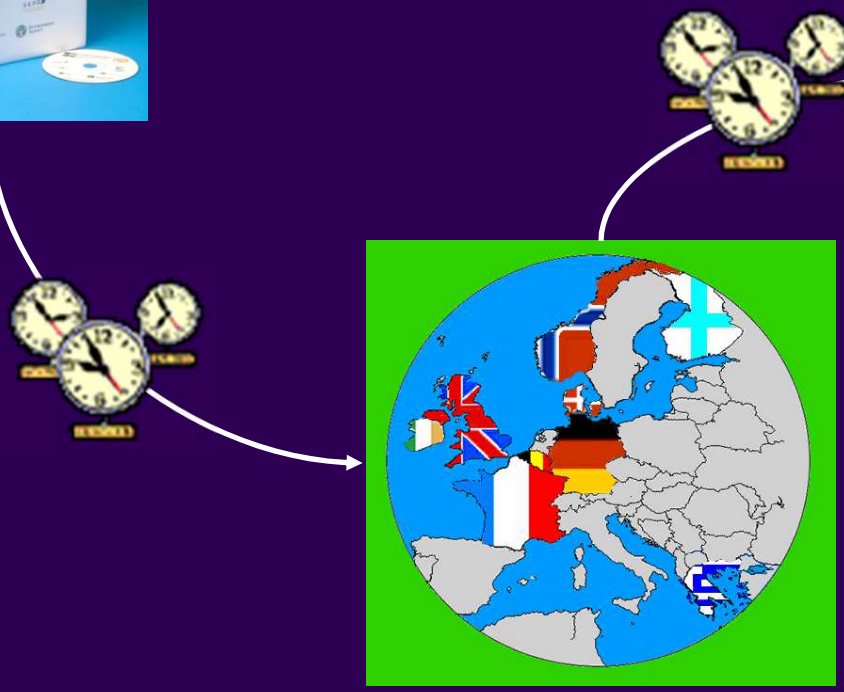
Development

UK Recovery handbook v1

2005

EURANOS generic handbooks v1

2006/7



European stakeholder networks e.g. FARMING

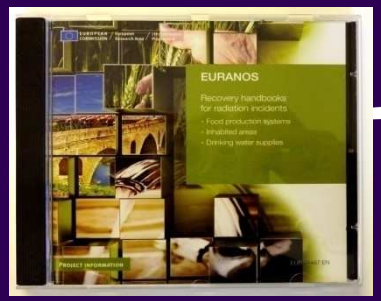
Development (2)

EURANOS generic handbooks v1

‘Demonstration’

Handbook Users Group

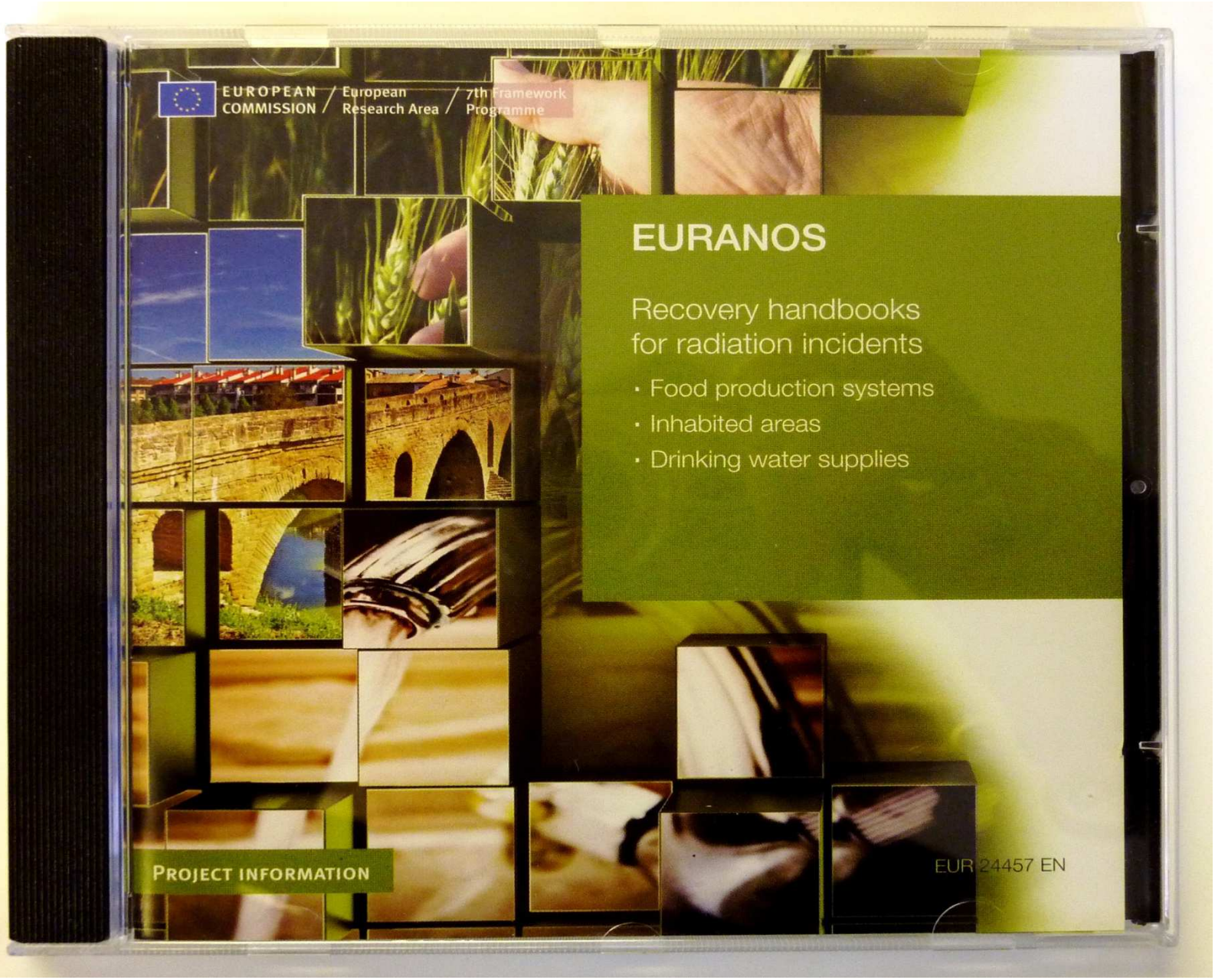
EURANOS generic handbooks v2

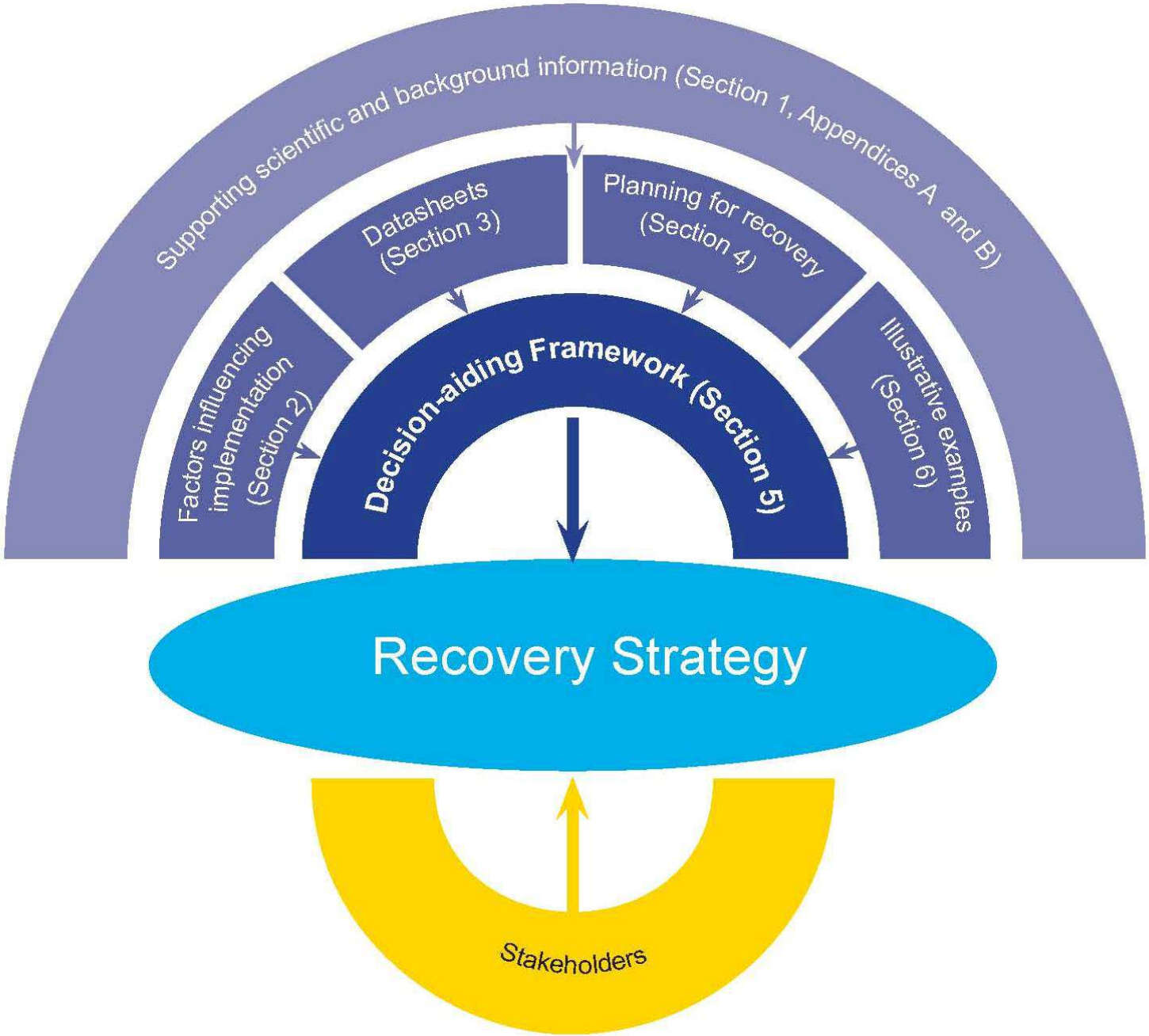


UK Recovery handbook v3

2009


Food Production Systems
Inhabited Areas
Drinking Water Supplies
Version 3
UK Recovery Handbooks for Radiation Incidents: 2009
Version 3
Food Production Systems
Inhabited Areas
Drinking Water Supplies
Health Protection Agency


EUROPEAN COMMISSION / European Research Area / 7th Framework Programme
EURANOS
Recovery handbooks for radiation incidents
· Food production systems
· Inhabited areas
· Drinking water supplies
PROJECT INFORMATION
EUR 24457 EN


Supporting scientific and background information (Section 1, Appendices A and B)
Datasheets (Section 3)
Planning for recovery (Section 4)
Factors influencing implementation (Section 2)
Decision-aiding Framework (Section 5)
Illustrative examples (Section 6)
Recovery Strategy
Stakeholders

Datasheets

Health Protection Agency

Name of managemer	
Objective	
Other benefits	
Management option description	
Target	
Targeted radionuclides	
Scale of application	
Contamination pathway	
Exposure pathway pre intervention	
Time of application	
Constraints	Provides informati that have to be cor option.
Legal constraints	
Social constraints	
Environmental constraints	
Effectiveness	Provides informa management optio
Management option effectiveness	
Factors influencing effectiveness of procedure	
Feasibility	Provides informati required to carry o
Required specific equipment	
Required ancillary equipment	
Required utilities and infrastructure	
Required consumables	
Required skills	
Required safety precautions	
Other limitations	

Name of management option	
Waste	Some management options create waste, the management of which must be carefully considered at the time the option is selected.
Amount and type	
Possible transport, treatment and storage routes	
Factors influencing waste issues	
Doses	Provides information on how the management option leads to changes in the distribution of dose to individuals and populations.
Incremental dose	
Intervention Costs	Provides information on the direct costs that may be incurred from implementing the management option.
Equipment	
Consumables	
Operator time	
Factors influencing costs	
Compensation costs	
Waste cost	
Assumptions	
Communication needs	
Side effect evaluation	Provides information on side-effects incurred following implementation of the management option.
Ethical considerations	
Environmental impact	
Agricultural impact	
Social impact	
Other side effects	
UK Stakeholder opinion	
Practical experience	
Key references	

Steps for selecting and combining options

Step 1: Identify contaminated production system(s) or inhabited area surface(s)

Step 2: Refer to selection tables for these systems or surfaces

Step 3: Refer to look-up tables showing applicability of options according to radionuclide

Step 4: Refer to look-up tables of checklists of key constraints for each option

Steps for selecting and combining options

Step 5: Refer to look-up tables of effectiveness

Step 6: Refer to look-up tables to identify options incurring additional doses to implementers

Step 7: Refer to datasheets for remaining options and note other constraints

Step 8: Based on outputs from Steps 1-7, select and combine options to build recovery strategy

Decision-aiding: Selection table

STEP 2 – Selection table of management options for milk to continue production

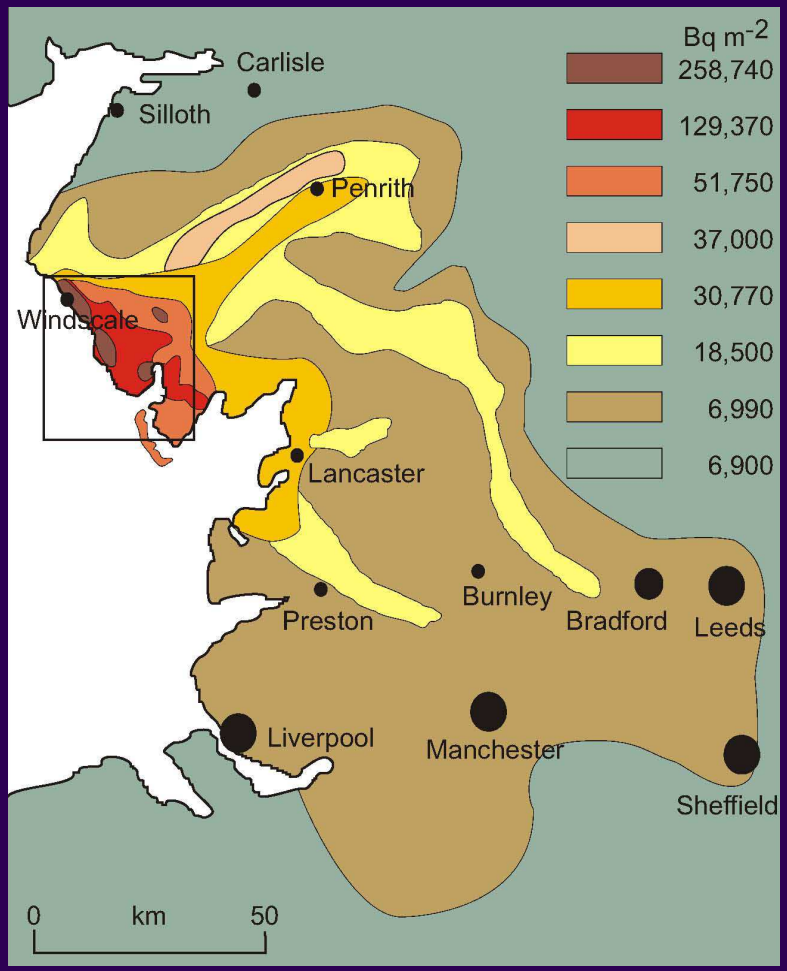
When to apply	Pre-deposition (P)	Early (E) (hours-days)	Medium (M) (weeks-months)	Late (L) (more than a year)	When to decide
Options for maintaining production					
Close air intake systems at processing plants (1)					P
Short-term sheltering of dairy animals (5)					P
Administration of AFCF to concentrate ration (16)					E-M-L
Administration of calcium to concentrate ration (17)					E-M-L
Administration of clay minerals to feed (19)					E-M-L
Clean feeding (20)					E-M-L
Selection of alternative land use (7)					L
Selective grazing regime (23)					E-M-L
Slaughtering of dairy livestock (24)					M-L
Suppression of lactation before slaughter (25)					M-L
Options of general applicability or societal relevance					
Restriction on the entry of food into the foodchain (6)					E-M-L

Key:

	Recommended with few constraints.
	Recommended but requires further analysis to overcome some constraints.
	Economic or social constraints exist, requiring full analysis and consultation period.
	Technical or logistical constraints may exist, or the option may only be appropriate on a site specific basis or for a particular time-phase.

Worked examples

Windscale fire, UK (October 1957)



Deposition (Bq m^{-2})	Area (ha)	Duration (d)	Volume (l)
6,990	$7\ 10^5$	11	$7\ 10^6$
51,750	$4\ 10^4$	23	$4\ 10^5$
258,740	$1\ 10^4$	44	$6\ 10^4$

Total volume of milk $8.6\ 10^7$ litres

Decision-aiding: Selection table (2)

Health Protection Agency

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Cs-specific

Group II specific

Short ½ life

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Handbook application

- Post-accident phase:
  - decision-aiding with stakeholders as part of the optimisation process
- Preparation phase:
  - to engage stakeholders and develop plans
  - emergency exercises
  - training

Optimisation process

NCRP, 2013

Future development

- Include additional environments
  - Transportation systems, coastal waters
- Build the evidence base
  - Previous radiological incidents
- Design a recovery decision support tool
  - Navigation and interrogation

Decision support tool

- To enhance, not replace, the recovery handbooks
- Interactive – provides audit trail
- Developed by HPA, using purchased software applications
- Compatible with computers and web-enabled devices
- Hosted by HPA - good compliance
  - Meets data protection act requirements
  - Secure
- Perpetual licence – no time limit

Decision support tool (2)

- Feasibility study for Chemical Handbook (Jun 2013)
- Tool for Chemical Handbook (Jul 2014)
- Tool for Radiation Handbook (May 2015)
- Final combined tool for Radiation and Chemical Recovery Handbooks (June 2015)