



Public Health
England

Decontamination & Recovery in PACE

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PACE: Recovery options

- PACE can consider:
 - ❖ relocation on its own,
 - ❖ clean-up on its own or
 - ❖ relocation and clean-up together
- Options are triggered if user defined values of effective dose from deposited gamma emitters and resuspension doses after the emergency phase are exceeded.
- Clean-up decisions are complex involving many different actors

PACE applies simple rules for two composite options:

Package 1: Low impact actions that are quick and simple

Package 2: More costly and disruptive actions that are more effective at reducing doses than those in Package 1

Package 2 has a higher trigger dose than Package 1.

Testing for return

The Relocation and return criteria are assessed against the projected annual committed dose estimated at different times after the emergency end time

Relocation and return test times:

1, 2, 3, 5, 7, 14, 30, 45, 60, 75, 90 days

½, 1, 2, 5, 10, 20, 30, 40, 50, 70 years

Times cannot be altered by the user. However, the emergency phase end time is also included with all times before then omitted.

PACE Environments 1

Complex environments give rise to a variety of doses because of the range of shielding properties created by buildings and their mix of different surfaces each with their own retention properties.

The buildings and surfaces also have particular responses to clean-up countermeasures. The differences between environments are captured by using different sets of location factors, population densities, clean-up dose reduction factors and costs.

Environment 1:

Suburban area of brick houses and parkland.

Environment 2

Urban area of flats within multi-storey apartment buildings with some parks

PACE calculates the dose in open countryside, Environment 1, and Environment 2

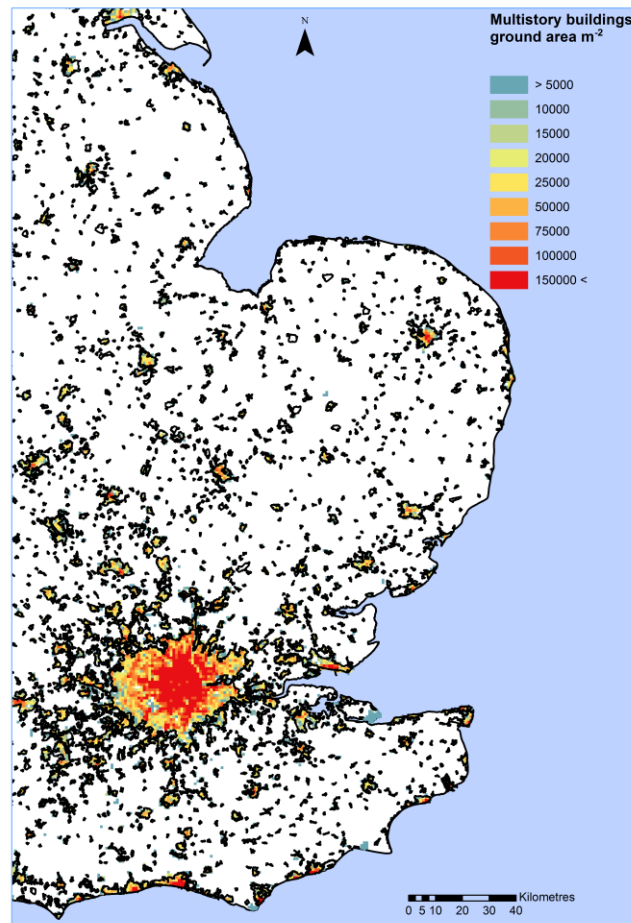
PACE Environments 2

Gamma doses from deposition in model built environments were calculated using MCNP modelling.

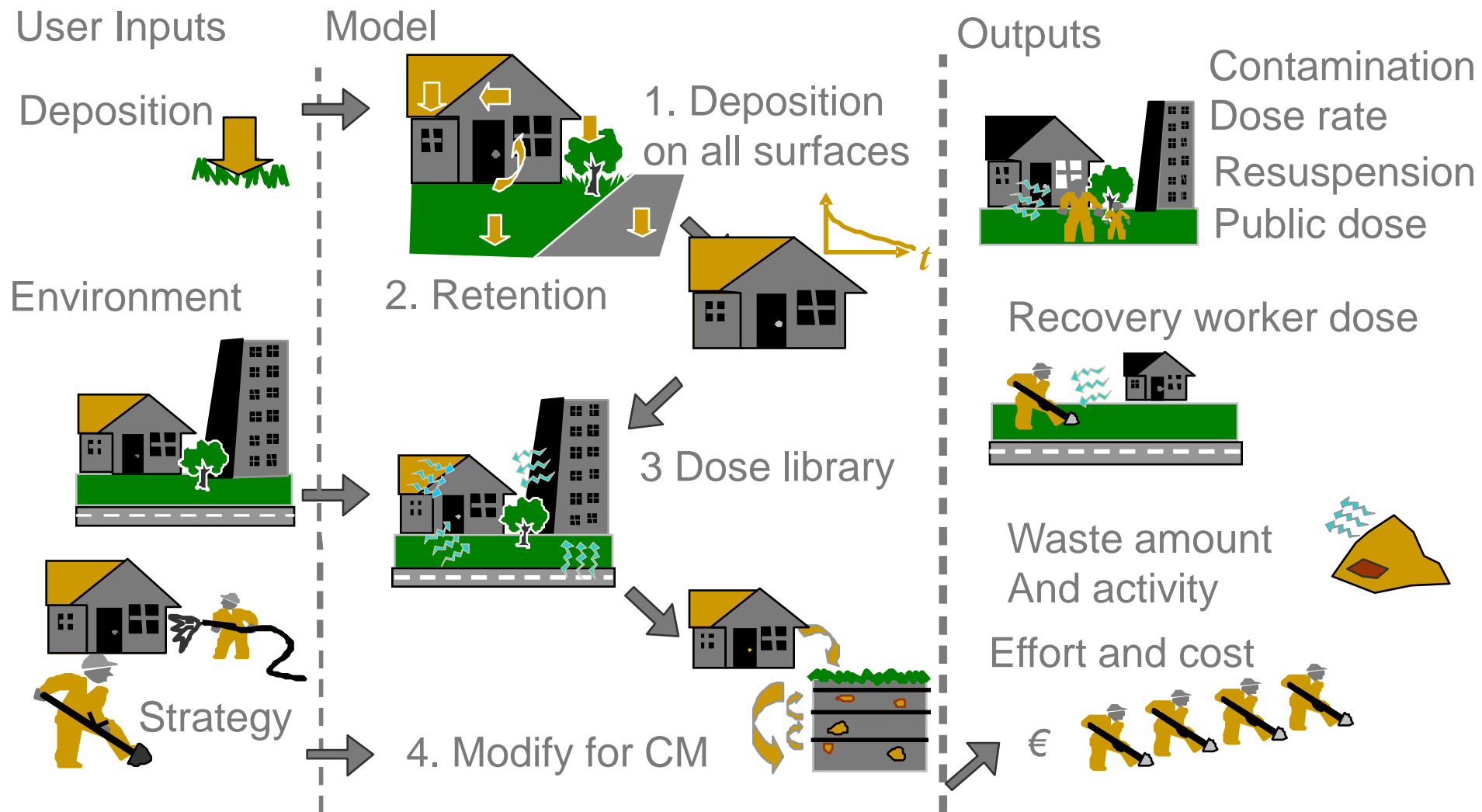
Locations factors, dose reduction factors and clean-up costs then calculated using the ERMIN model ([Jones et al., 2007b](#)) assuming a unit deposition of ^{137}Cs to a lawn surface for each of the two built environments used by PACE.

The spatial distribution of the different environments is derived from the generalised land use database which in turn is derived from the Ordnance Survey MasterMap product a comprehensive dataset of all real world fixed objects in the country larger than a few metres in size.

Distribution of Environment 2: multistorey buildings



The ERMIN model



Built Environment Countermeasures

Countermeasure package	ERMIN countermeasures applied	Timing
Package 1	Grass cutting large and small areas	At 7 days
	Vacuum sweeping all paved surfaces	At 7 days
Package 2	Tree removal/pruning	At 30 days
	Vacuuming indoors	At 15 days
	High pressure hosing roofs and walls	At 30 days
	High pressure hosing all paved areas	At 14 days
	Soil removal all grass, soil and plant areas	At 30 days

Clean-up option cost rates extracted from UK Recovery handbook: 2008

	Data sheet	Equipment cost	Material Cost	Labour cost	Total	Notes
Package 1						
Grass cutting small areas	32	0.0008	0	0.0001	0.1008	
Grass cutting large areas	32	0.007	0	0.002	0.009	
Vacuum sweeping small areas of paved ^a	24	0.001	0	0.005	0.006	Assuming dry surface and waste collected
Vacuum sweeping large areas of paved ^b	24	0.0008	0	0.001	0.0018	Assuming dry surface and waste collected
Package 2						
Tree removal	43	0.2	0	1	1.2	Felling only
Vacuuming indoors	3	0.004	0	0.04	0.044	Using costs for rugs and carpet
High pressure hosing roofs and walls	10	0.4	0.	2	2.4	Assuming a large area and waste filtered
High pressure hosing paved areas ^c	27	0.2	0	1	1.2	Assuming waste filtered
Removal of soil and grass small areas	35	0.6	0	2	2.6	
Removal of soil and grass large areas	35	0.06	0	0.1	0.16	

a) Taken to apply to pavements and other paved areas but not roads, b) Taken to apply to roads. C) Taken to apply to all paved areas

Default clean-up costs

Applying Environment 1 and 2 proportions of building type and layout

Cost factors £/m²	Package 1	Package 2
Environment 1	0.023	3.5
Environment 2	0.011	4.0

Result: approximate, defensible and extendable if required in the future

Acknowledgements

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