



Modelling the Consequences of a Hypothetical Large Nuclear Accident in the United Kingdom

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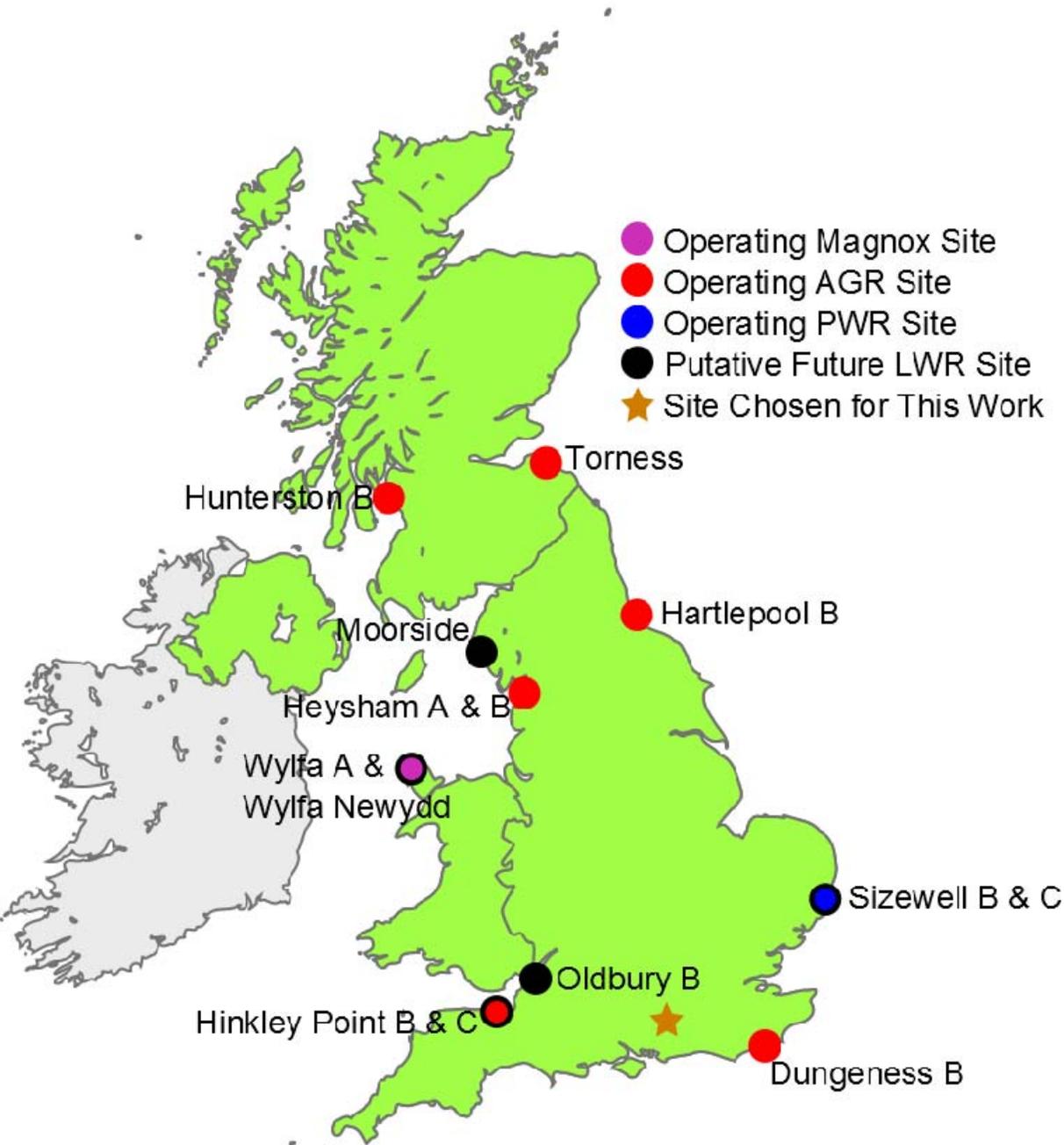
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What economic costs would be incurred by a large nuclear accident within the United Kingdom?

Two computer programmes from Public Health England, “PACE” and “COCO-2” were used to:

1. Simulate a hypothetical nuclear accident in the UK.
2. Provide an initial estimate of the costs incurred to people, businesses and agriculture.

The Hypothetical Site



A fictional reactor was imagined to be located on the South Downs, reasonably close to large population centres (Southampton, London).

3.5 million people live within 50 km of the site.

The Scale of the Imaginary Accident



- After two hours warning, a severe, core-damaging accident occurs at the fictional reactor.
- Radionuclides are released from the reactor core in an uncontrolled way for four hours.
- The quantity of radionuclides released is roughly equivalent to the amount given out by one of the four reactors in the Fukushima Dai-ichi accident of 2011.

Intervention Levels for Triggering Countermeasures

Countermeasure	Dose equivalent level (mSv)	
	Lower Level (LIL)	Upper Level (UIL)
Sheltering	3	30
Evacuation	30	300
Taking iodine tablets	30 (thyroid)	300 (thyroid)
Relocation (mSv per year)	10	10

Assumptions on the effectiveness of the early countermeasures are included in the calculation.

Fewer people are included in the countermeasures if the **UIL** is chosen rather than the **LIL**.

Factors excluded from the calculation



- Physical harm including mortality arising from evacuation and relocation policies.
- Psychological harm arising from the social disruption inherent in evacuation and relocation.
- Economic Blight – i.e. loss of property and business asset value arising from purely social effects.

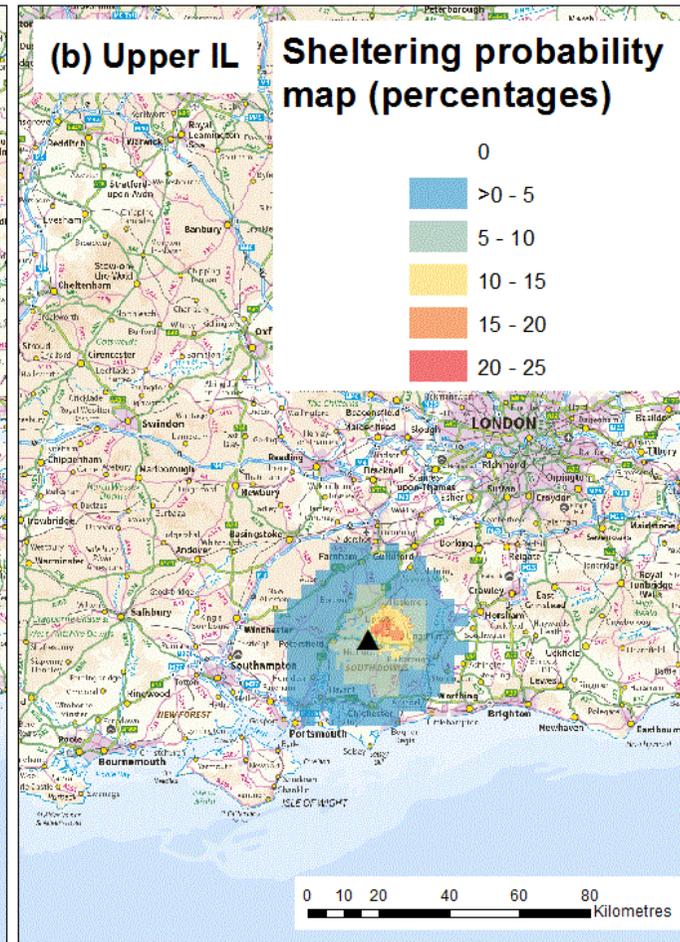
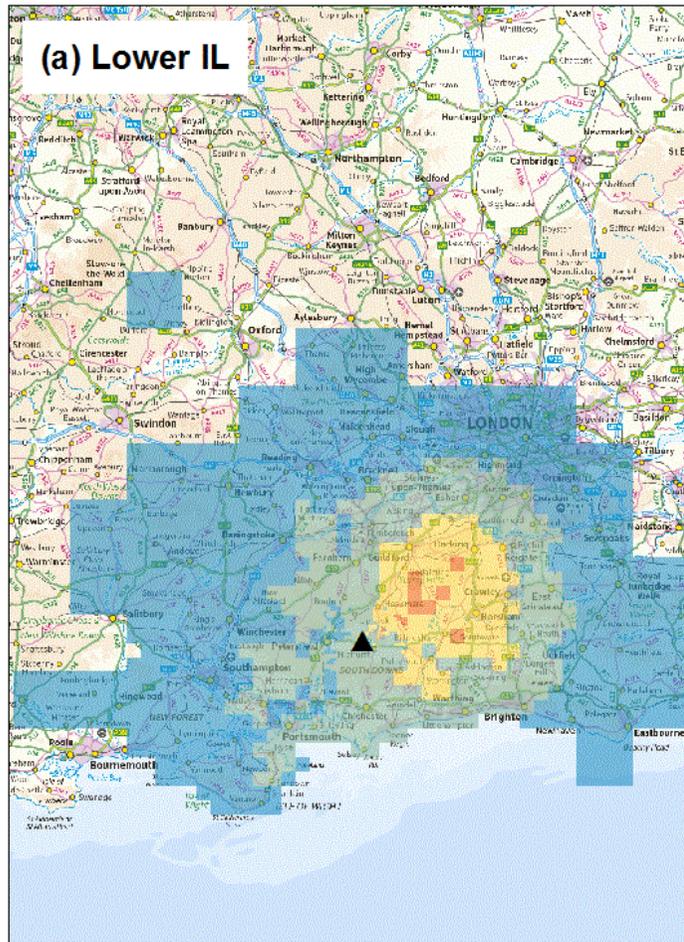
The factors listed above can be expected to be minimised when evacuation/relocation zones are minimised. Other excluded factors include:

- Psychological harm arising from a disproportionate but genuine fear of radiation
- Material damage to the Nuclear Power Plant

Probability of Needing to Shelter

Lower IL

Upper IL



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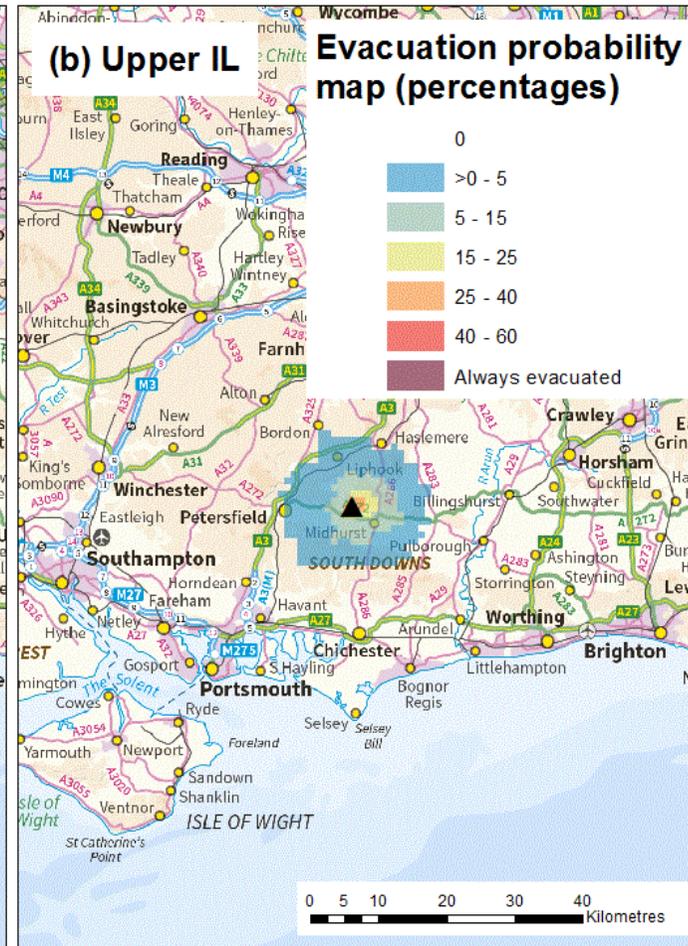
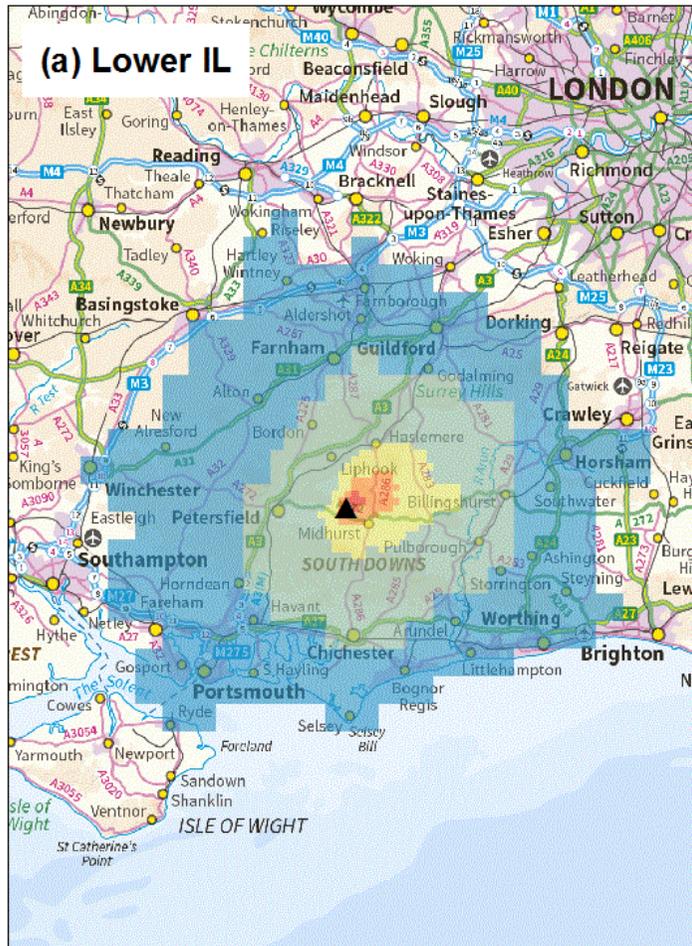
Mean: 410,000
(36,000–1,300,000)

Mean: 13,000
(450–42,000)

Probability of Needing to Evacuate

Lower IL

Upper IL



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Mean: 44,000

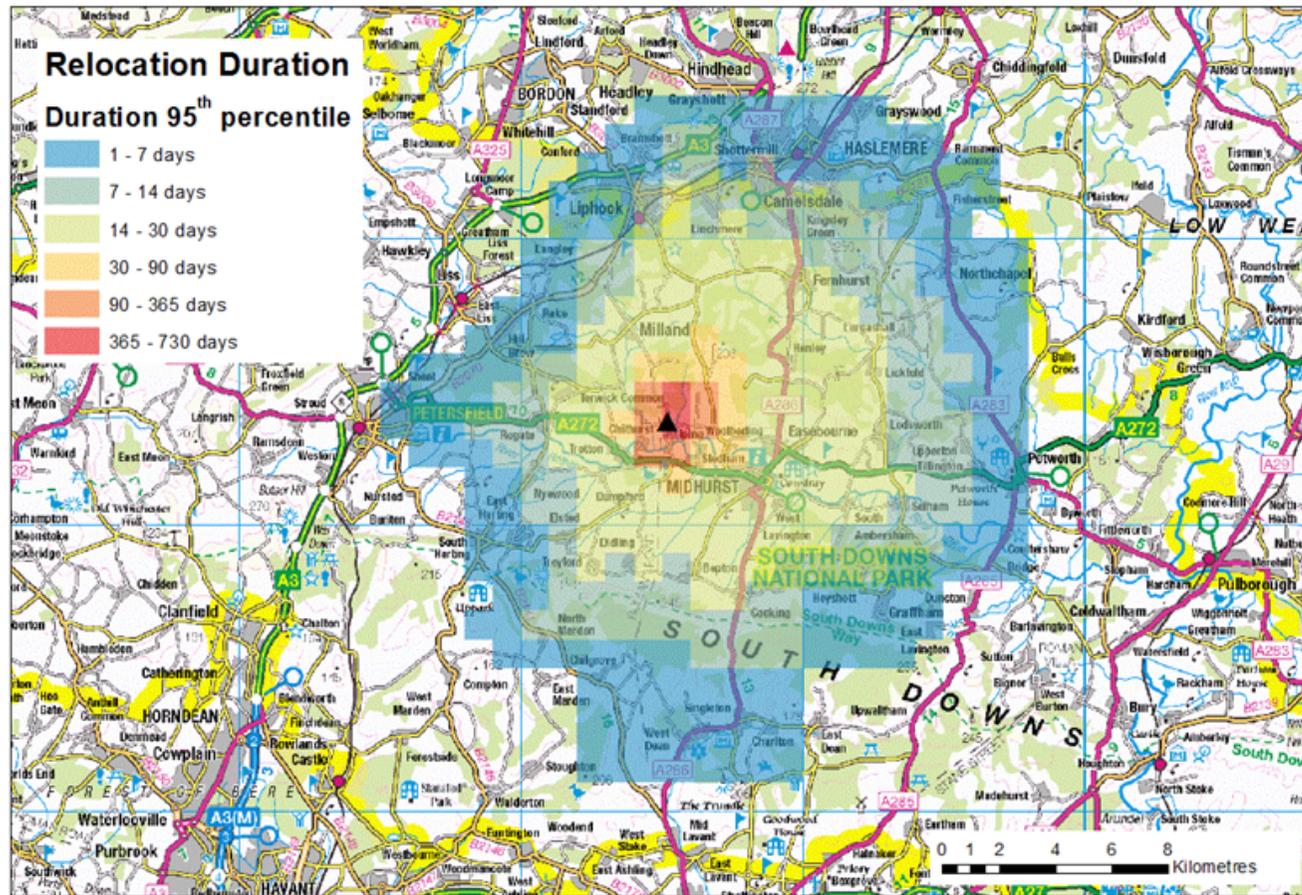
(1,600–150,000)

Mean: 1,500

(69–6,600)

Duration Needed for Relocation

Both **Lower IL** and **Upper IL**



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Temporary relocation [mean]: 12,000 (310–36,000)

Permanent relocation [mean]: 620 (0–2,300)

Total Costs of the Accident



- The mean total cost of the accident if the **Upper Intervention Level** is £**800** million (£**74** M to £**2.8** bn)
- The cost is almost unchanged if the **Lower Intervention Level** is applied at £**780** million (£**58** M to £**2.8** bn).
- The **Lower Intervention Level** has lower health costs but higher disruption costs than the **Upper Intervention Level**.
- 8% more people (**40**) are calculated to die from a radiation-induced cancer over all time when the **Upper Intervention Level** is used (520 **UIL** cf. 480 **LIL**), but these must be balanced against the risk of harm induced by evacuation and relocation policies (including mortality)
- The figure may also be compared with the **160,000** cancer deaths occurring in the UK each year.

Acknowledgements

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