Better risk assessment for lower carbon developments

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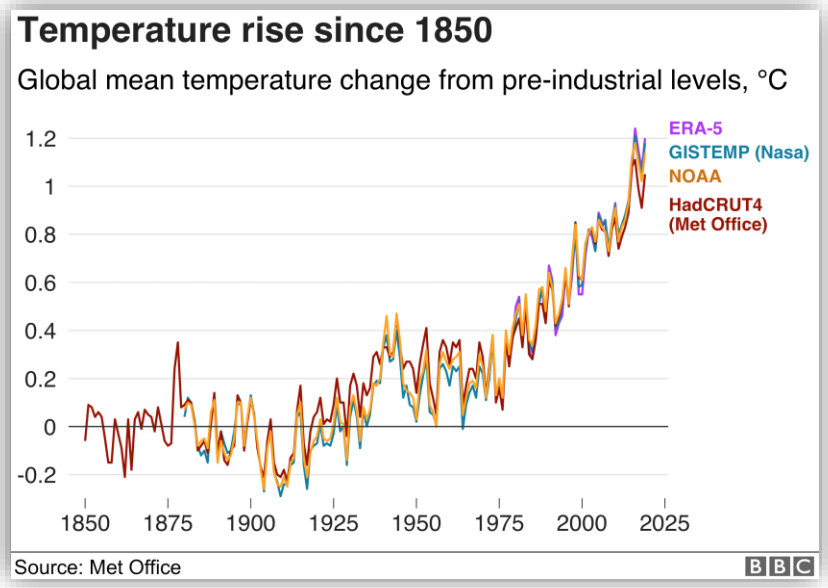
The climate emergency

- Climate change costs lives, about 300,000 per year currently
- Heatwaves, flooding, wild fires, crop failures, conflict and mass migration
- Carbon cost of a life?



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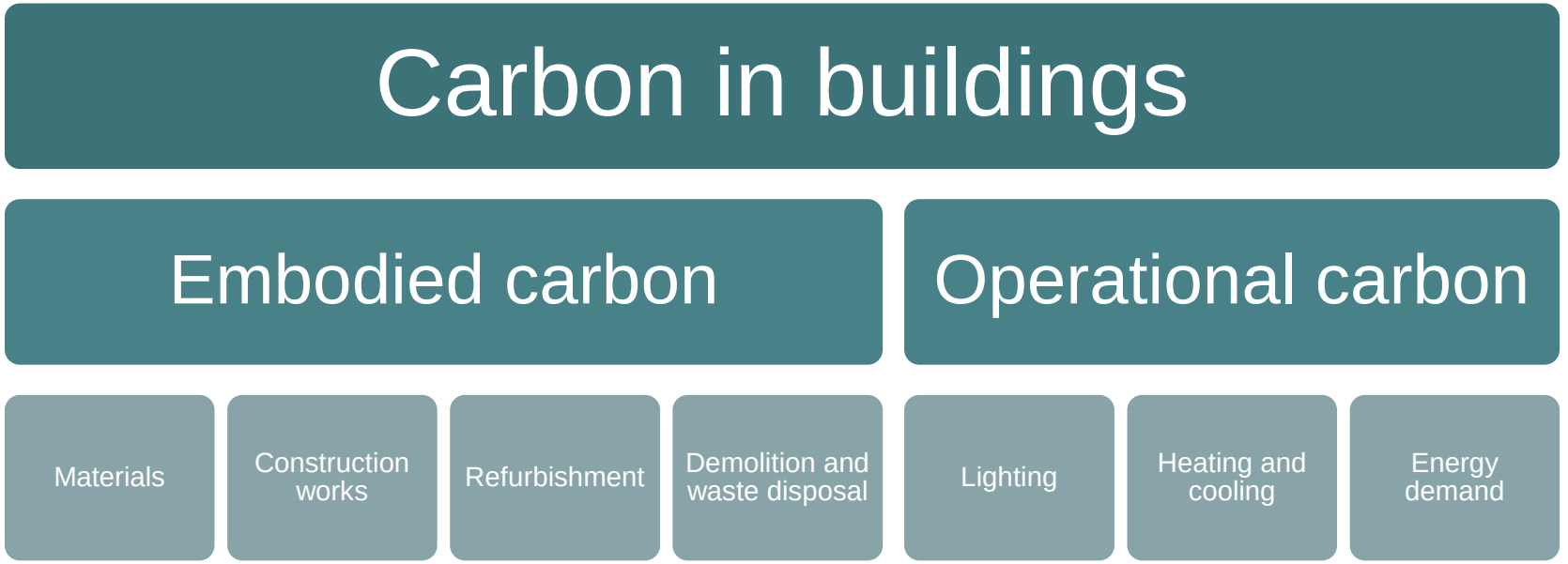
Carbon in construction

- Construction industry contributes 39% of global carbon



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Whole life carbon

Figure 4: Estimated distribution of carbon emissions per life cycle stage

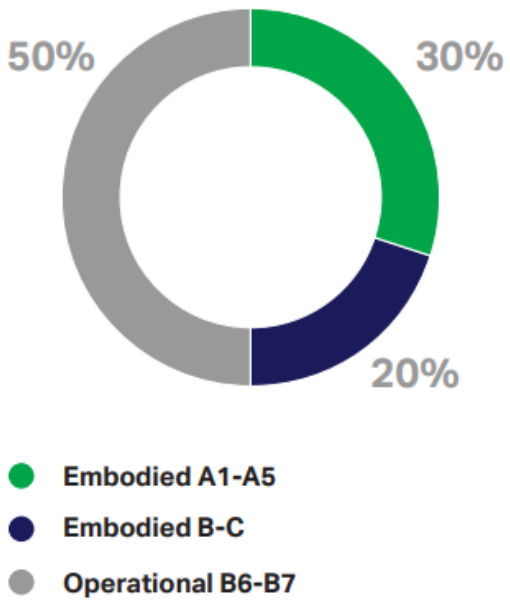
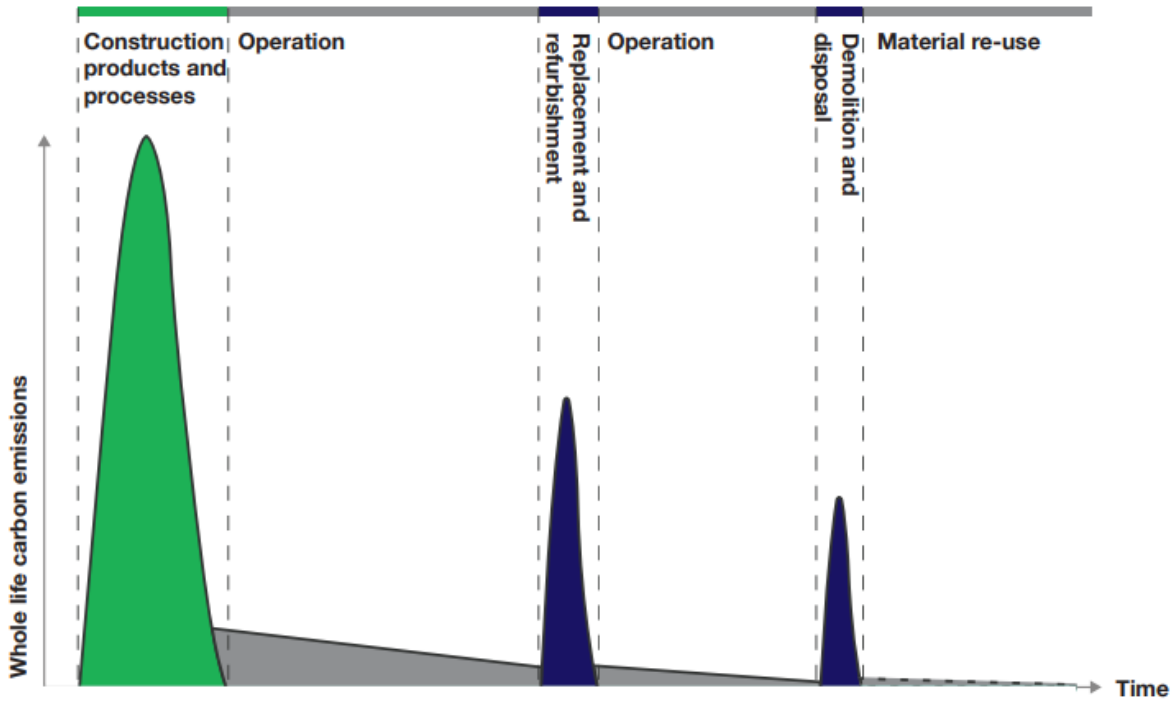


Figure 5: Whole life carbon emissions, Arup (2020)[7]



Zero Buildings Where do we stand (Arup, 2021)

Legislation drivers for change

- Drive for net zero buildings
- Whole life carbon assessments
- Environment Act 2021
- Outcomes focused reporting

Environmental Outcomes Reports

How we assess the impacts of development, plans and policies, otherwise known as Environmental Assessment, is going to change with the introduction of Environmental Outcome Reports (EOR). What can we identify and learn from the current Sustainability Appraisal, Strategic Environmental Assessment and Environment Impact Assessment processes? And how do ensure that the new system of assessment and the preparation of EORs works better?

Whole life carbon assessments are on their way

Government response to report on climate and the built environment includes encouraging commitments, says parliamentary committee.

12 October 2022 / Energy in buildings, Net zero, Sustainable building, UK

BY IAN GRANT

Parliament's Environmental Audit Committee (EAC) has welcomed the government's response to its Building to Net Zero report, praising the government's backing for Whole Life Carbon Assessments (WLCAs) and progressively ratcheted carbon targets for the built environment.

House of Commons
Environmental Audit Committee

Building to net zero: costing carbon in construction

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Carbon emissions from remediation

- Soil transport via HGVs
- Excavation plant operation on site
- Import of aggregates and soils
- Disposal of soil to landfill, or reuse and recovery
- Soil degradation and carbon release
- Installation of gas barrier or venting systems
- Operation of remediation technologies on site
- Chemicals, products and ancillary activities associated with remediation

Estimating the impact

carbon emission factor x quantity = CO_2 e kg

- https://circularecology.com/carbon-footprint-calculators-for-construction.html
- Defra carbon emission factors for businesses: transport, waste disposal, energy supply https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020
- ICE inventory of carbon and energy V3.0 (2019) for construction materials in super and sub-structure

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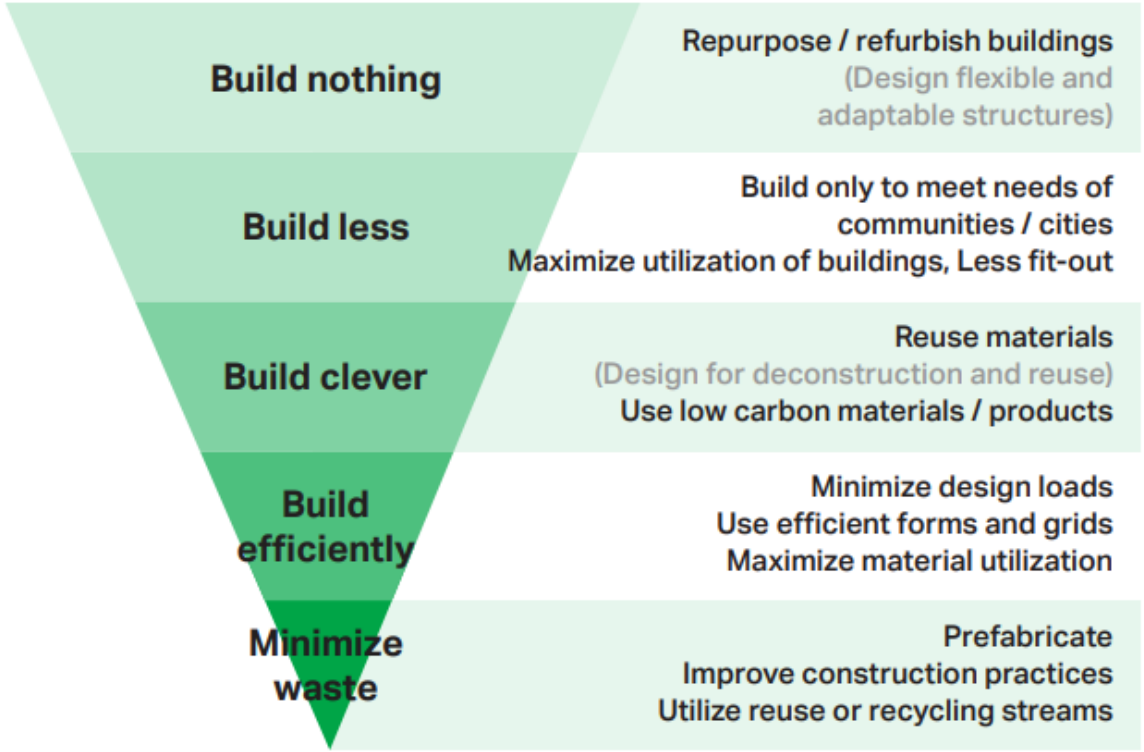
Where can we start?

- We have a responsibility to design out carbon

Figure 9: Embodied carbon reduction strategy



Waste management hierarchy

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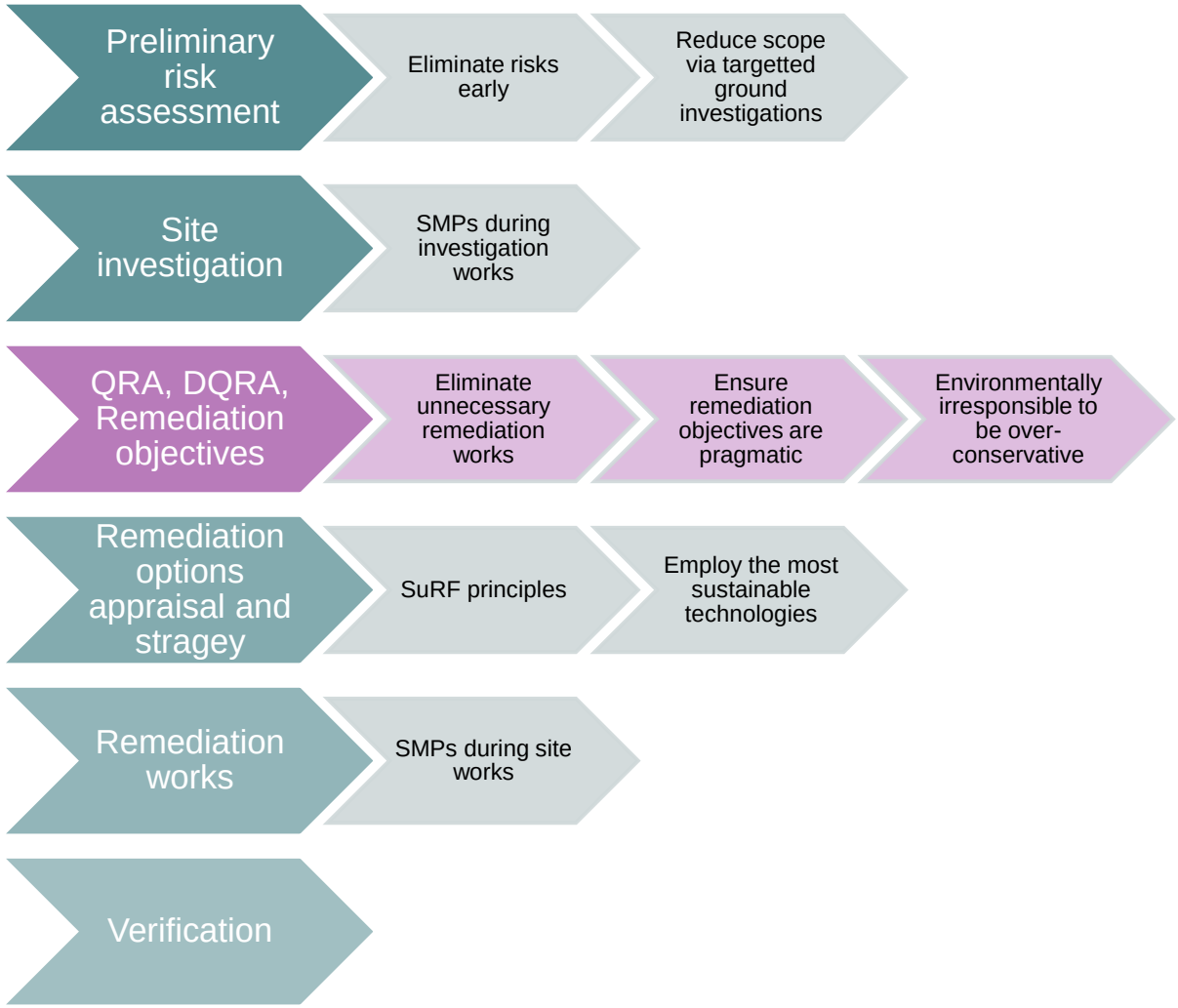
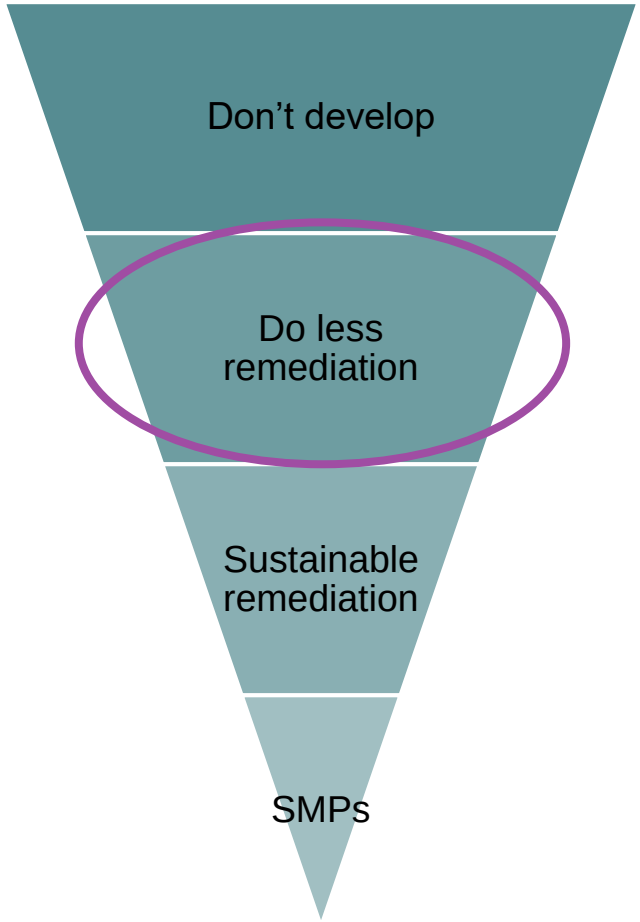
Maximise our impact





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Risk assessment guidance

- Risk assessment is where we have the greatest opportunity to design out carbon from construction
- LCRM encourages a tiered approach to risk assessment and sustainable remediation solutions
- It is environmentally irresponsible to specify unnecessary remediation works

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Intelligent risk assessment

- Soil
  - Zoning of the site due to history/geology
  - Statistical analysis
  - Bioavailability
  - CLEA model exposure assumptions and site specific criteria selection
  - Asbestos DQRA based on SoBRA toolbox and method in CIRIA C733
- Groundwater and vapour
  - Measure rather than model if possible
  - Obtain site specific input parameters
  - Calibrate models with site measurements

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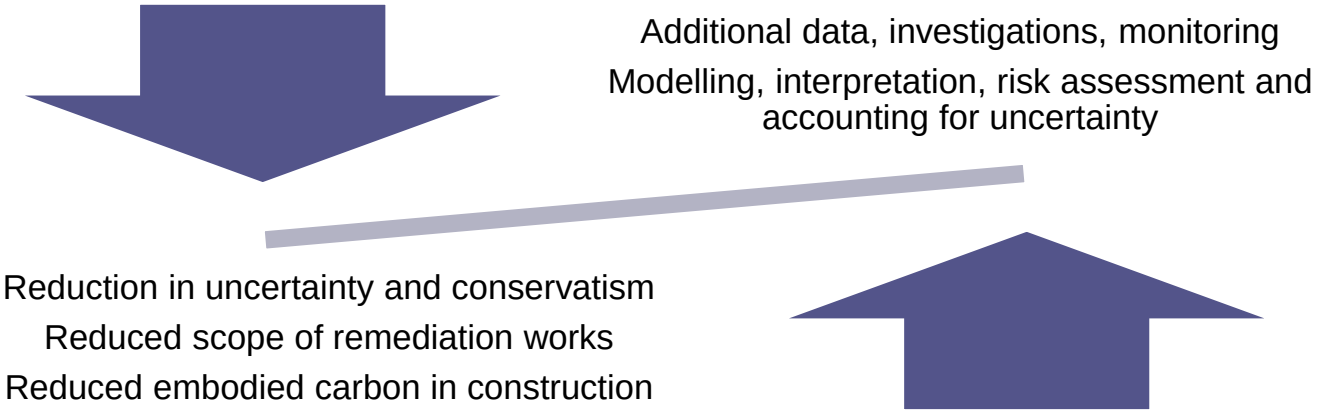
Intelligent risk assessment

- Gas
  - Proper conceptualisation, consider: topography, inherent mitigation by the development, gas generation potential, flooded wells
  - For low risk sources: continuous monitoring and use of GE 2019 paper
  - High gas concentrations do not necessarily represent large volumes of gas needed to cause high fluxes
  - Diffusion and advection modelling – as a line of evidence

Cost benefit of further assessment

- Determine the cost of additional investigations and assessment (environmental and financial)
- Use professional judgement to determine if findings are likely to be favourable
- Will the techniques available reduce the uncertainty, or add valuable lines of evidence?
- Small scale vs large scale developments



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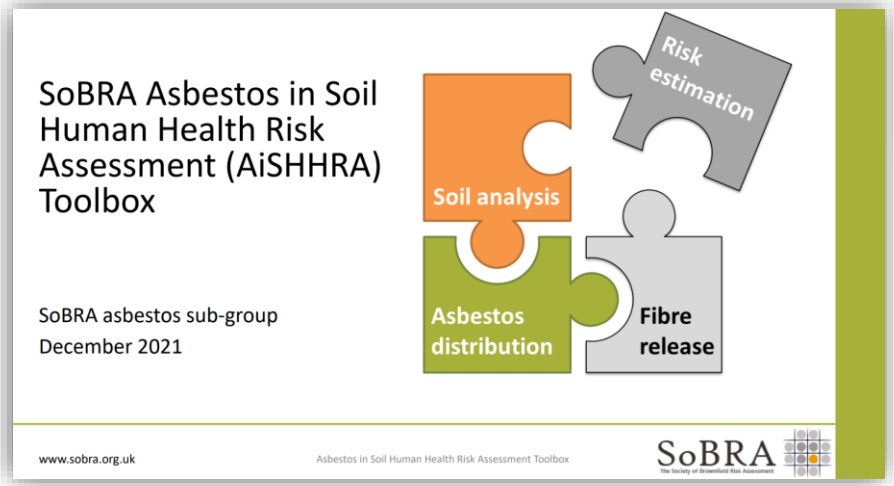
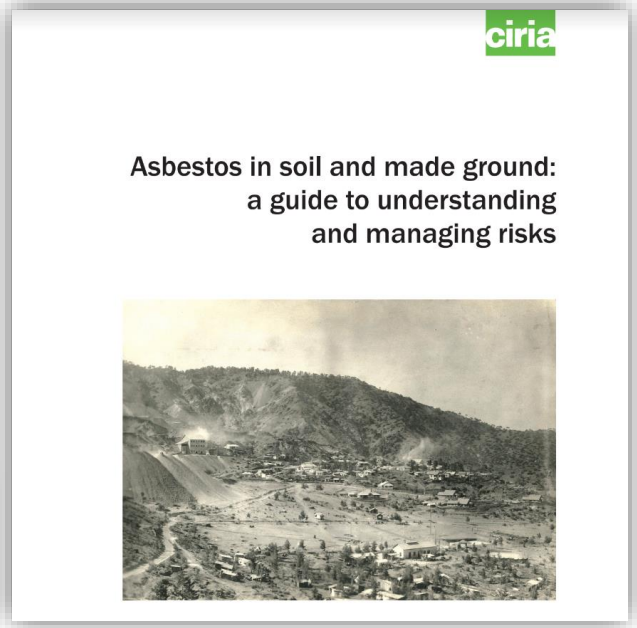
Example – Asbestos DQRA





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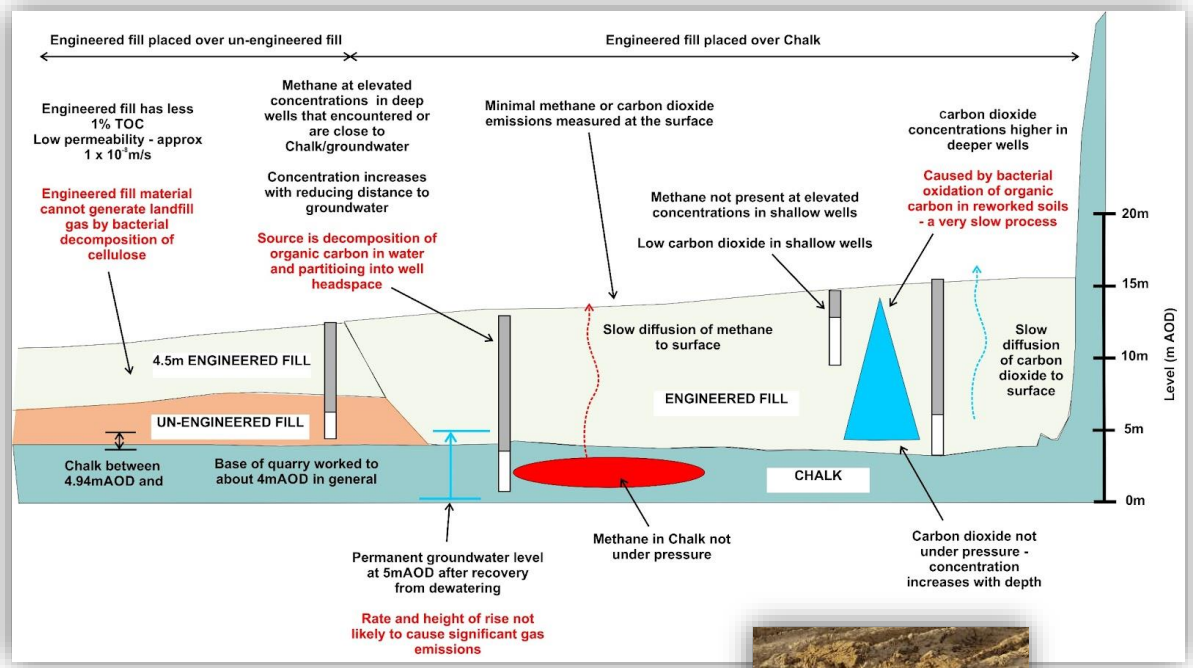
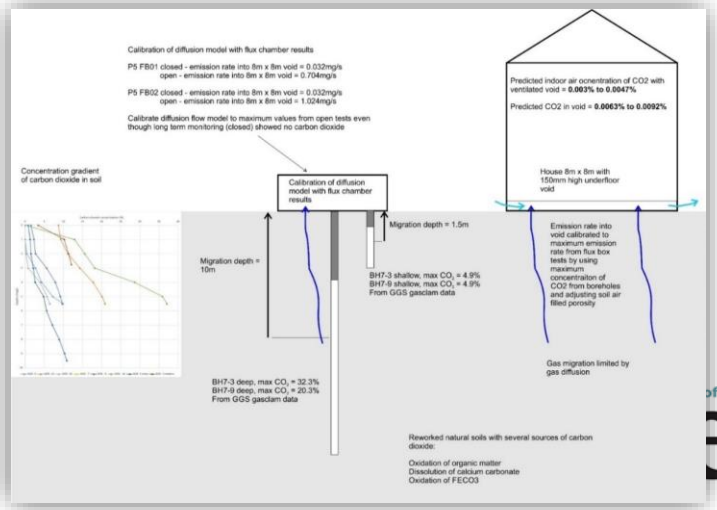
Example – Gas risk assessment





Summary

- Embodied carbon in the construction industry needs to be reduced
- Our best opportunity for this is at early stages
- We have the framework and tools for undertaking detailed risk assessments
- Low carbon solutions are preferable to all parties
- Good science, cheaper, greener

- Why are we still not doing it?

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Barriers to better risk assessment

- Clients
- Programme
- Risk
- Lack of competence and/or training
- Regulators
- Laziness
- Regulations

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Questions for the future

- Within current regulations and guidance there is more we can do
  - Work to overcome the barriers
- Counting the carbon cost of remediation schemes will soon be a requirement
  - Gap in the market for carbon calculators for this
- However, do we need a radical rethink of the approach to risk?

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A tale of two sites….

- Greenfield, arable land
- Monoculture, low biodiversity, poor soil quality
- No remediation required
- Simple foundation solution
- No gas protection

- Brownfield, former landfill or industrial works
- Overgrown, providing varied habitats
- Significant remediation required
- Difficult ground conditions
- Gas protection

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Thank you

- Any questions?

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