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CIE-MAP

Centre for Industrial Energy, Materials and Products

CONSTRUCTION CLIMATE CHALLENGE

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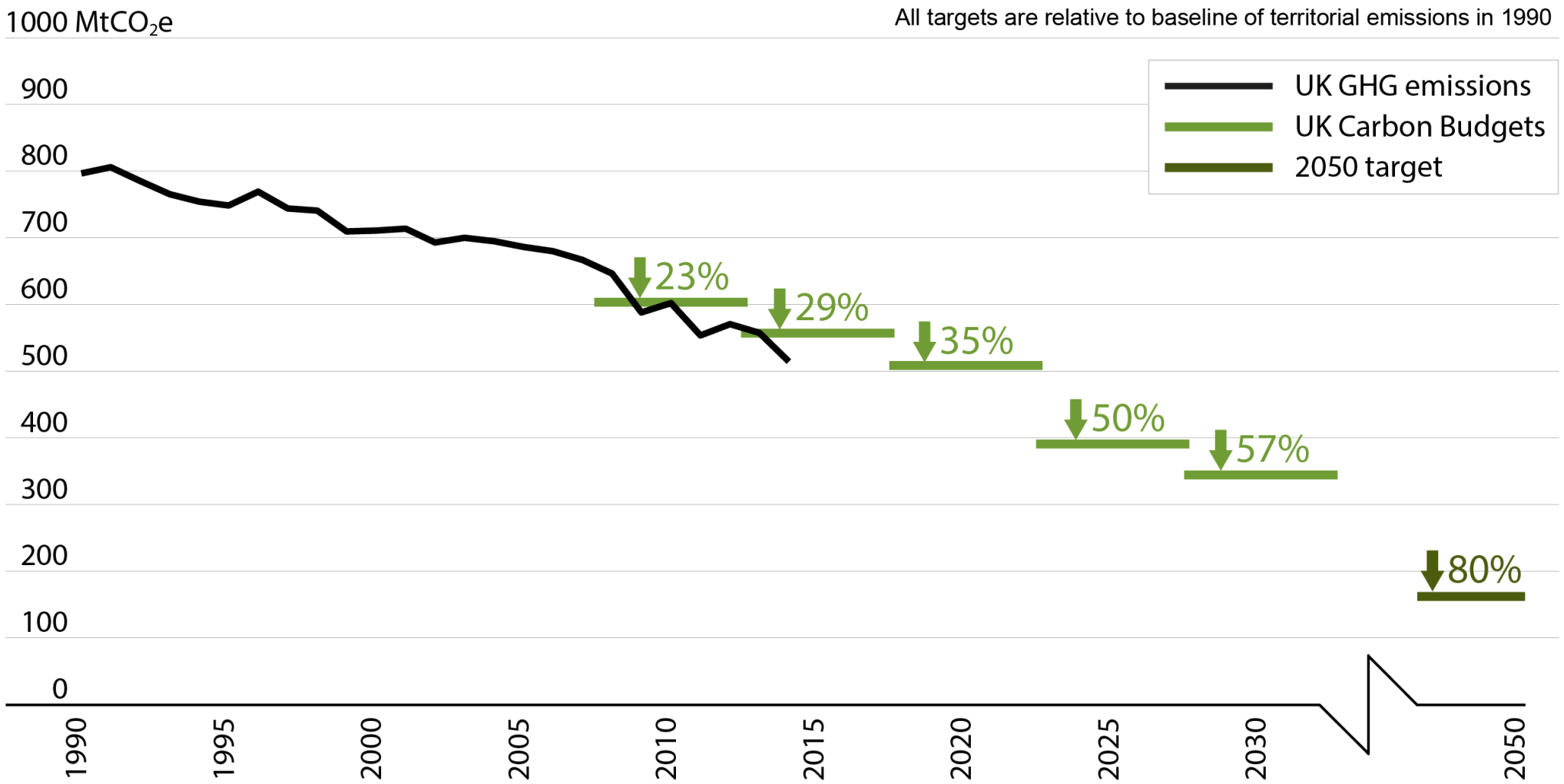
Agenda

- The challenge – understanding the new carbon context post Paris
- Where is the carbon in construction?
- What progress has been made in reducing emissions?
- Where will the carbon be in future?
- The opportunity – the international scope for carbon mitigation in construction

The challenge

Understanding the new carbon context

UK climate targets before the Paris Agreement



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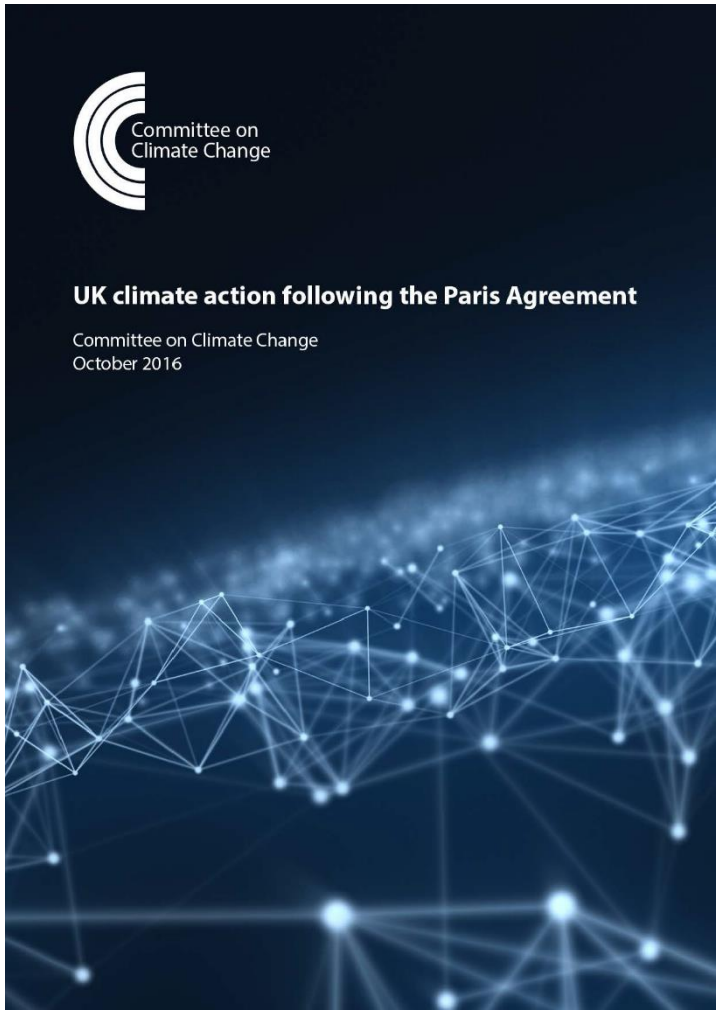
After Paris Agreement the goal is net zero emissions



- Paris agreement includes goal of achieving *"a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century"*
  i.e. net zero emissions
- UK Government has intimated that this will enter UK law:
  "*The question is not whether but how we do it"*
- CCC advise Paris goal means UK must be net zero CO_2 by mid century (2055-2075 for >66% chance of 2°C, before 2050 for 1.5°C)

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Quote from Andrea Leadsom – Minister of State for Energy - Hansard HC Deb vol 607 col 725 (14 March 2016)

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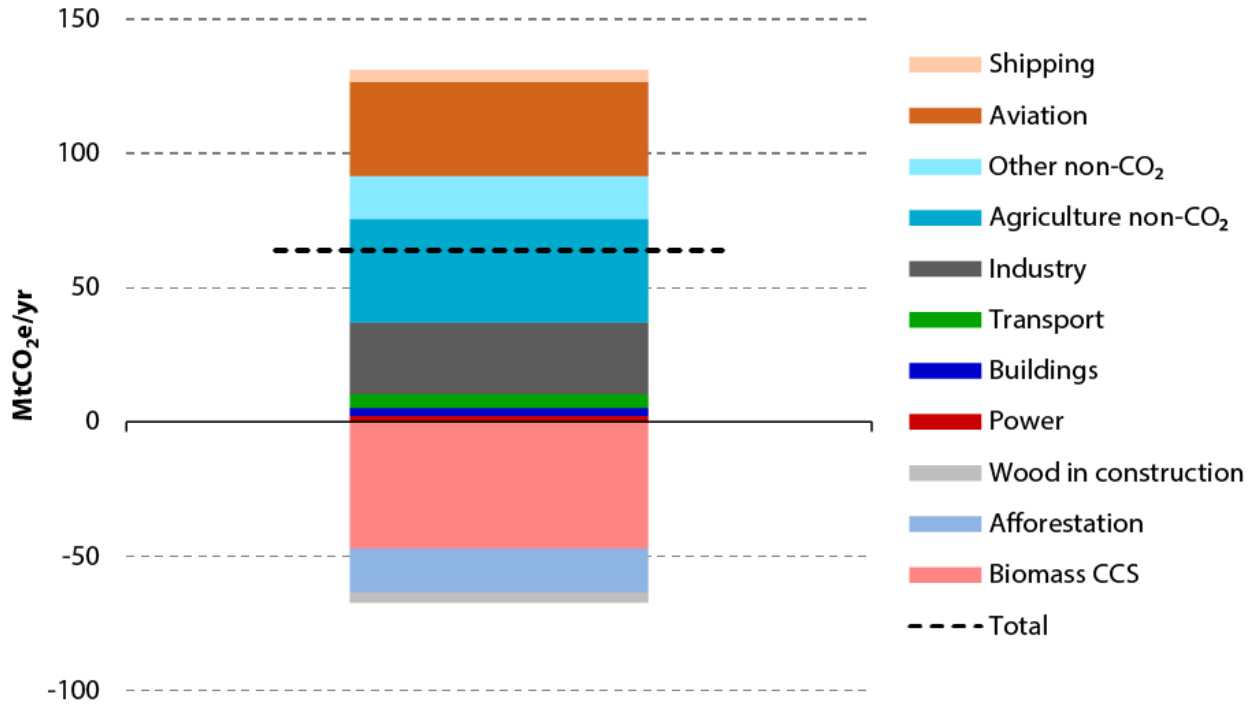
Achieving net zero in the UK

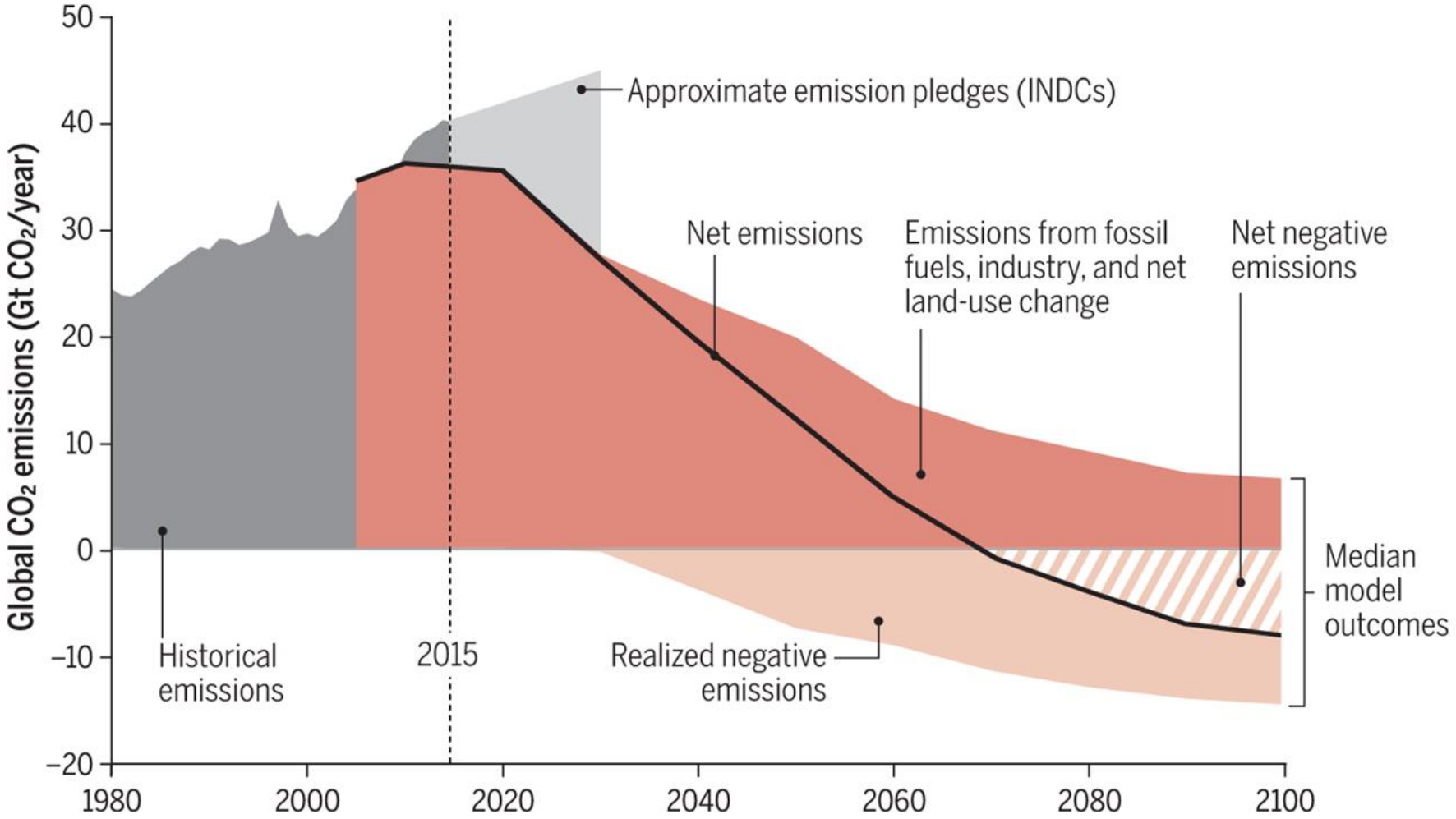
- Will require maximum deployment of all identified mitigation options
- Plus sizeable deployment of negative emissions technologies (maximum capacity of ~100 $MtCO_2e/yr$)
- Plus further offsetting elsewhere
- Remaining emissions in CCC scenarios are predominantly from aviation, agriculture and industry (mainly materials production i.e. construction products)

Figure 3.1. Residual UK greenhouse gas emissions in 2050 under Max deployment across all sectors



Source: CCC calculations.

Current models for >66% chance of 2°C



Anderson & Peters (2016) The trouble with negative emissions *Science* 354:182-183

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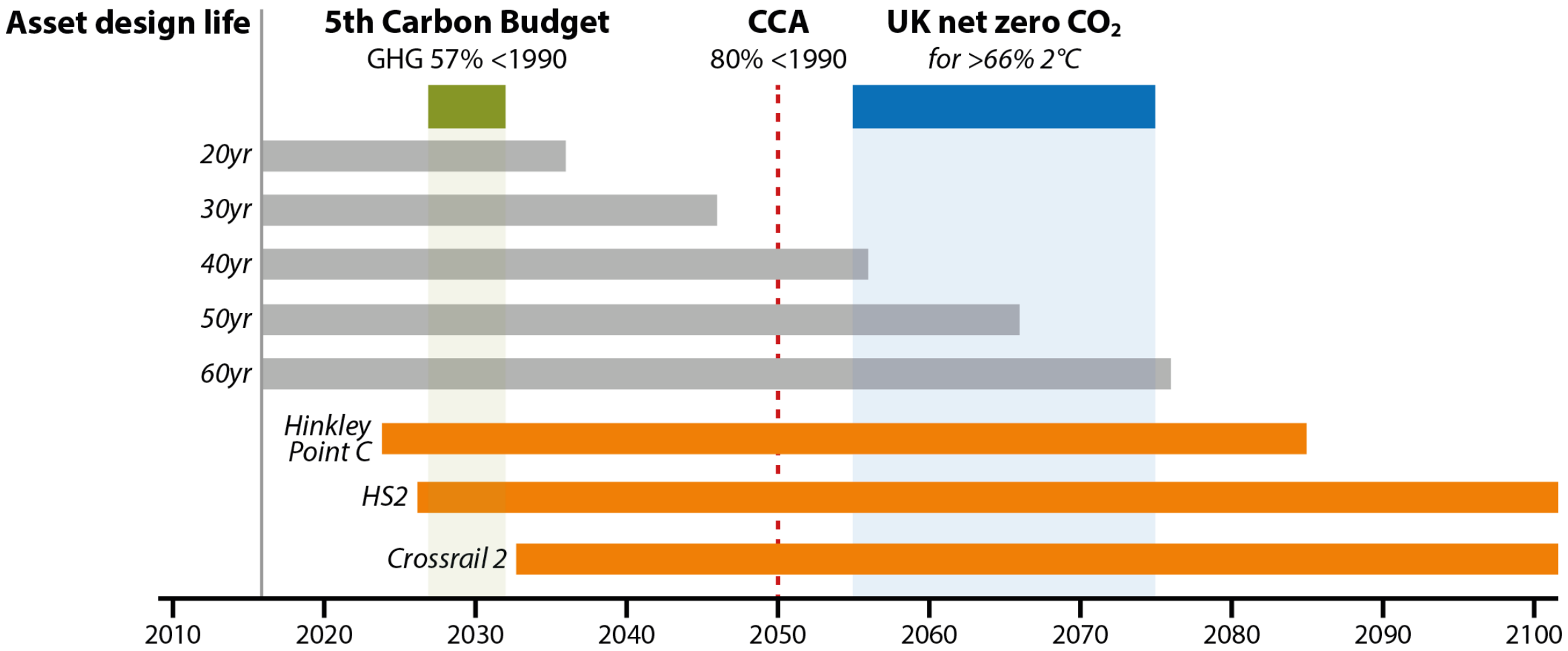
The implications of net zero for construction



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Where is the carbon in construction?

Baseline and opportunities identified in 2013

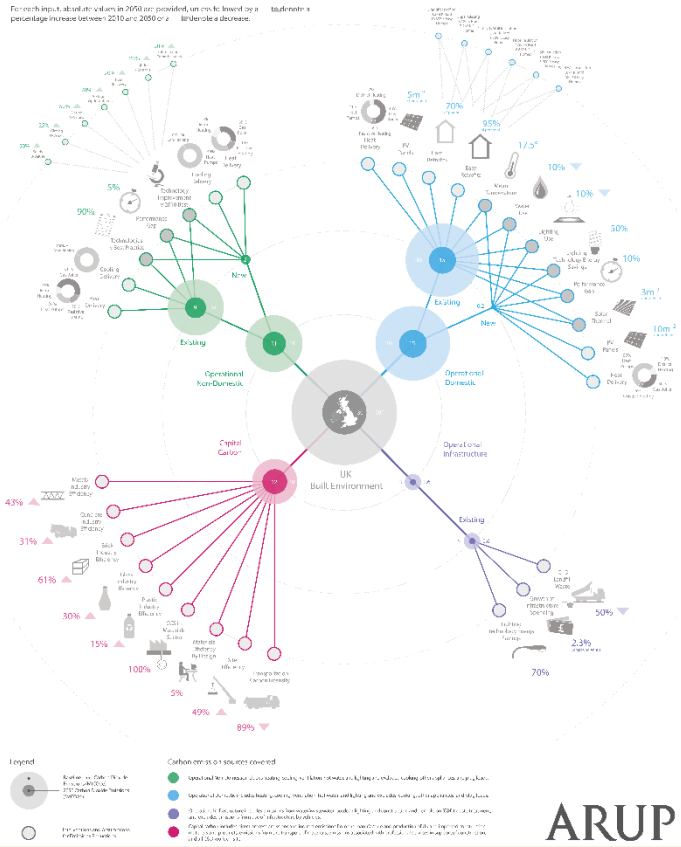
The Green Construction Board

Low Carbon Routemap for the UK Built Environment

5 March, 2013

wrap Working together for a world without waste The Climate Centre ARUP

Carbon Emissions in the UK Built Environment Achieving 80% Reduction by 2050



ARUP

HM Treasury

Infrastructure Carbon Review

November 2013

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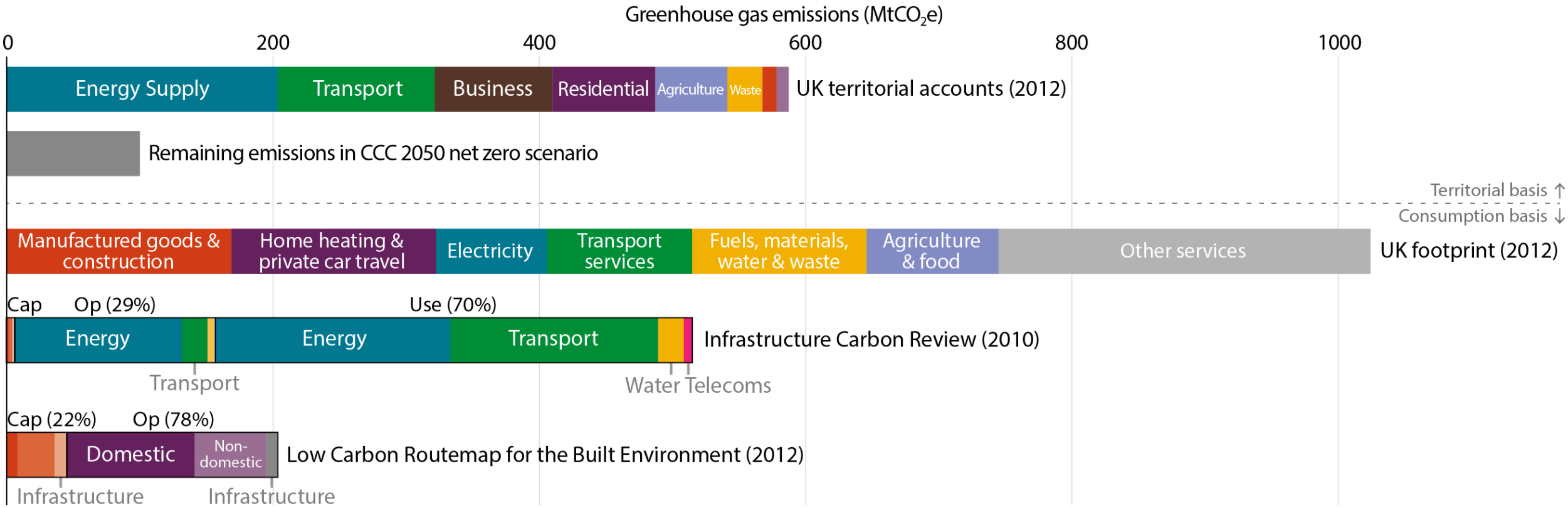
The devil is in the detail

- Numerous means of dividing the data (summarised on following slides)
- Methodologies still under development and dependent upon coarse data
- More collaboration and sharing of data will be crucial in improving understanding
- Important to consider whether industry has *control* or *influence* over the carbon, *when* the emissions will occur, and what the *realistic scope for mitigation* is
- **Goal is reducing whole life carbon** (made up of *Capital Carbon*, *Operational Carbon* and *Use Carbon* – though the precise definitions vary between reports)
- The distribution of carbon varies widely between projects, the following is an industry overview

Snapshot of the big picture

- Priorities are energy and transport
- However long term targets will require substantial reductions across the board, including capital carbon



UK's carbon footprint published by DEFRA (1997-2013) based on CIEMAP data

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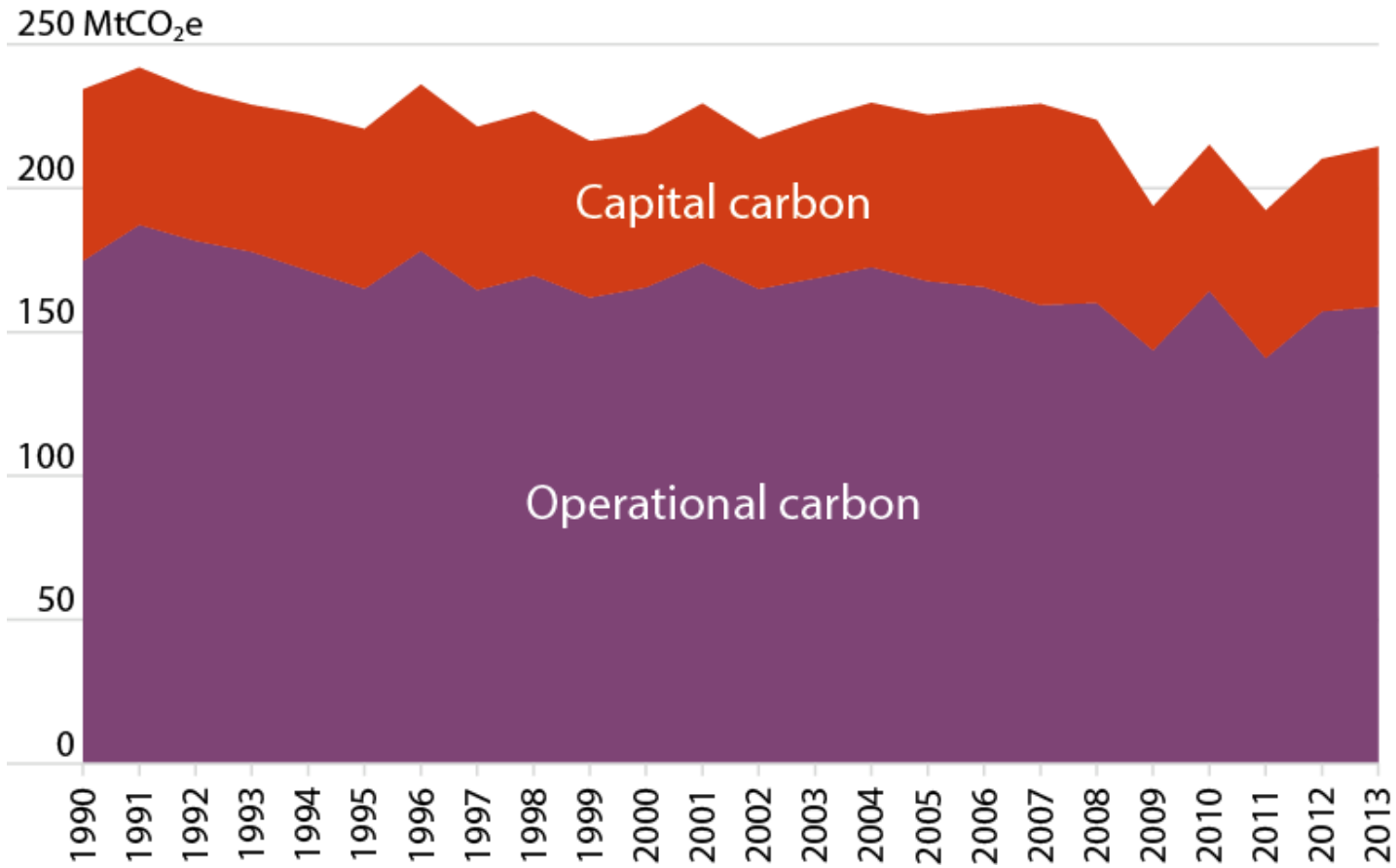
Trend for the built environment

- Slowly reducing operational carbon & increasing capital carbon



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Based on GCB Routemap definitions and latest data from Arup & CIEMAP

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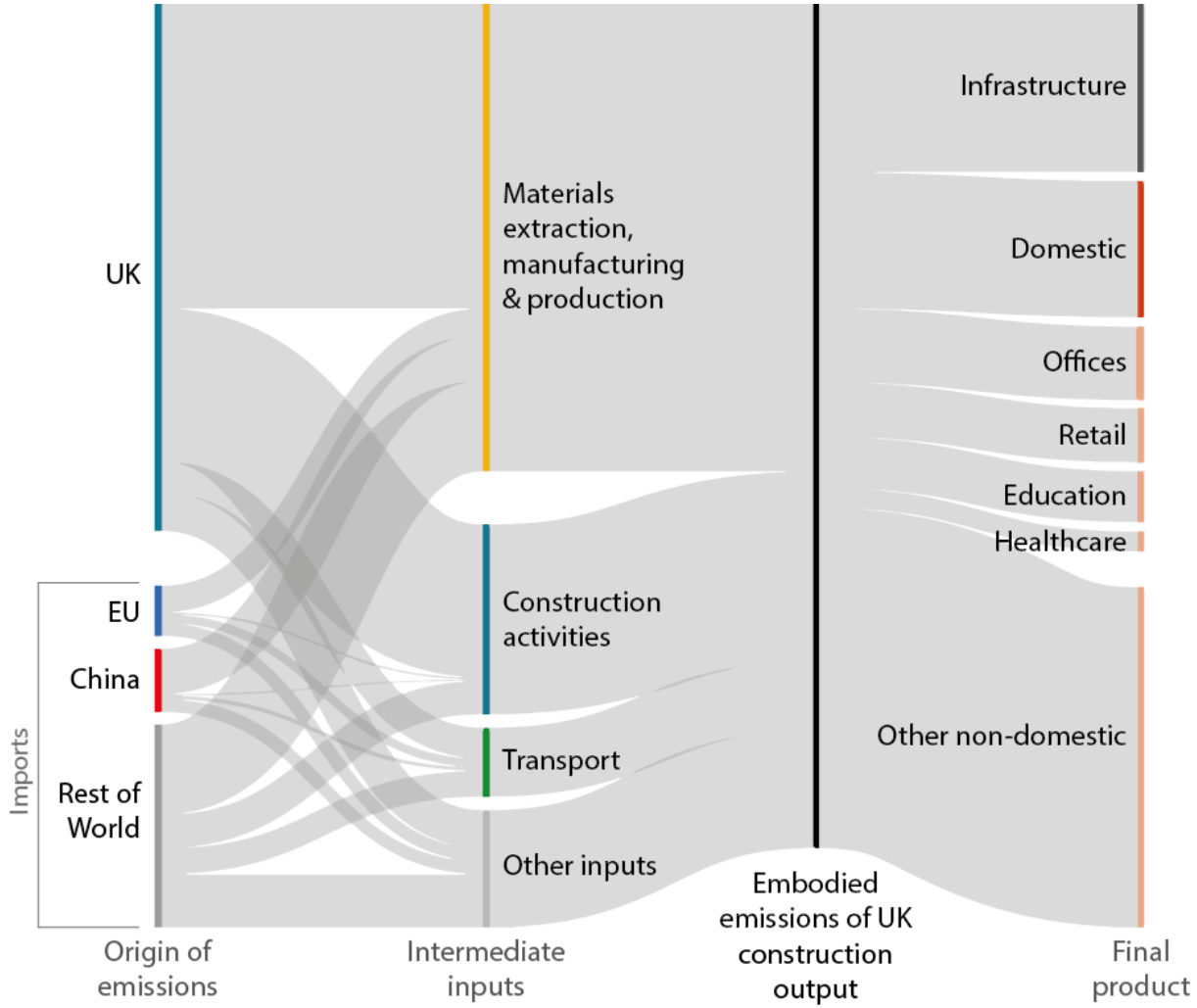
Capital carbon distribution in the built environment



- Still limited understanding - more information required to provide finer detail
- Previous approaches (e.g. Infrastructure Carbon Review) have mostly relied on financial proxies, disregarding the carbon intensity of different asset types
- Inclusion of more asset level data and sectoral projections (such as those for water) will improve understanding

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Based on 2011 data from Giesekam et al. (2014) The greenhouse gas emissions and mitigation options for materials used in UK construction *Energy & Buildings* 78:202-214

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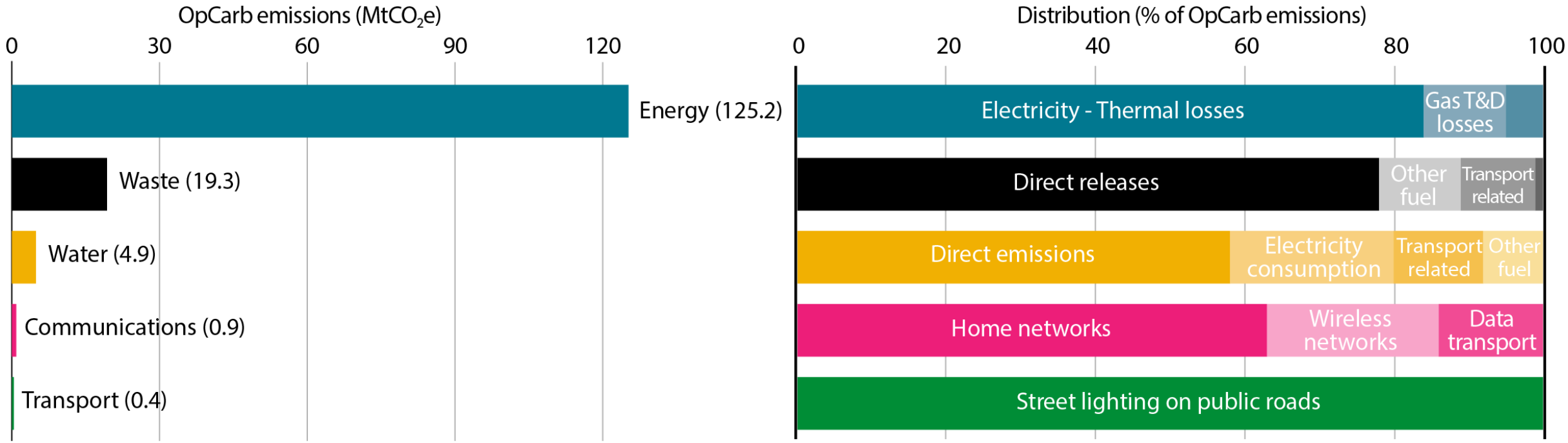
Operational carbon for infrastructure



Based on 2010 data from Infrastructure Carbon Review

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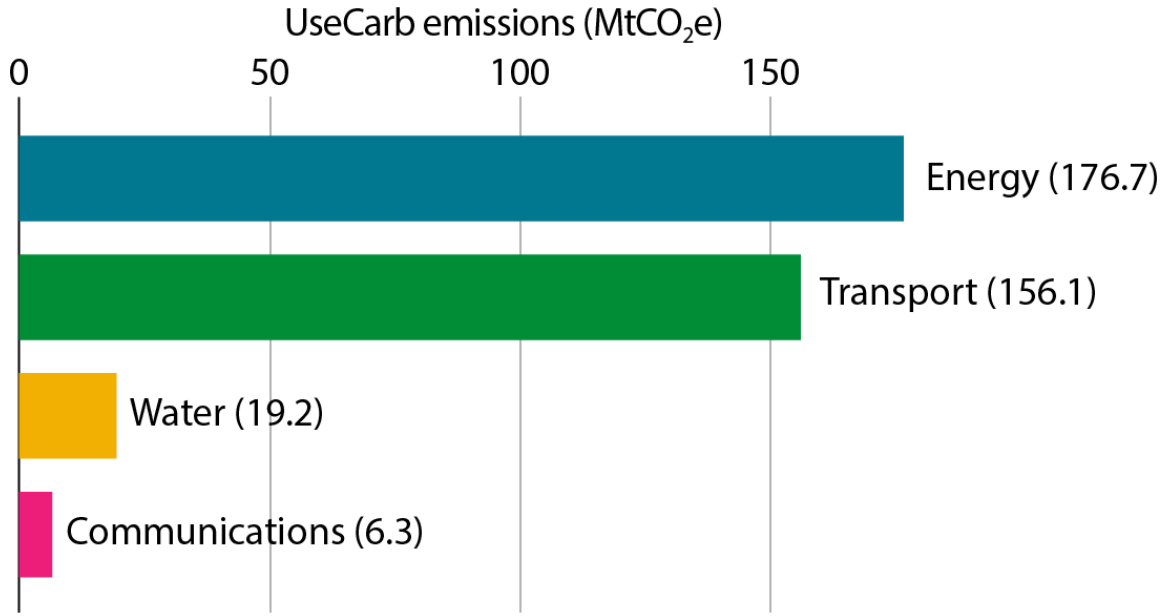
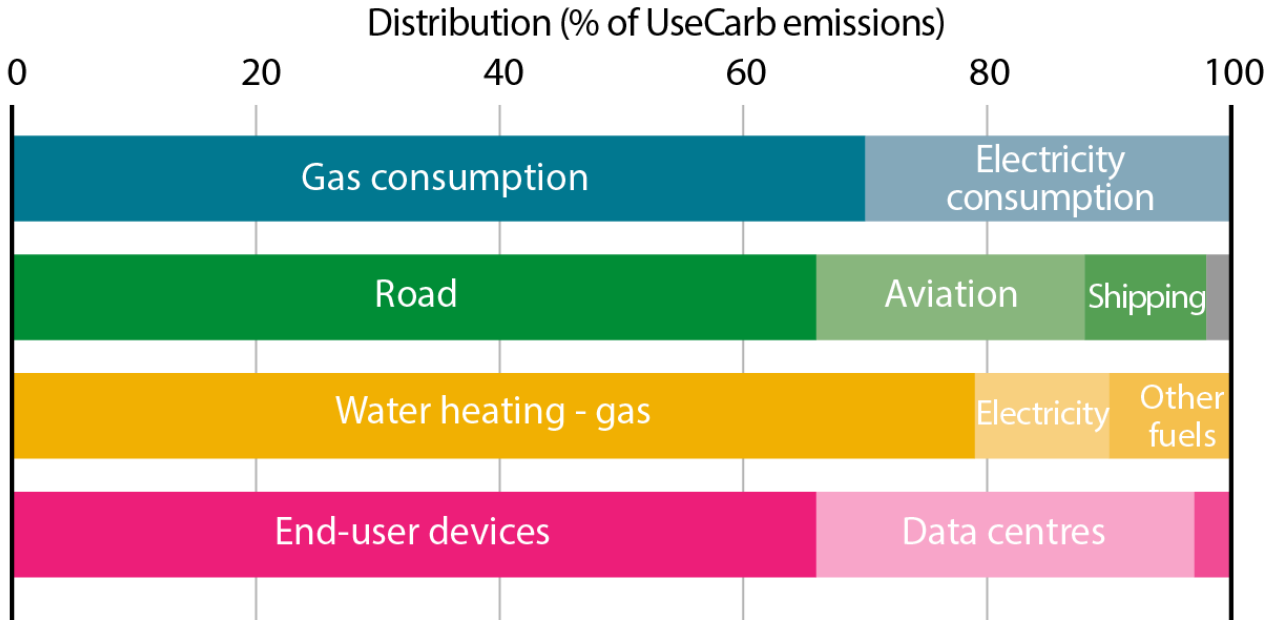
Use carbon for infrastructure





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Based on 2010 data from Infrastructure Carbon Review

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Progress so far

In reducing emissions from the built environment

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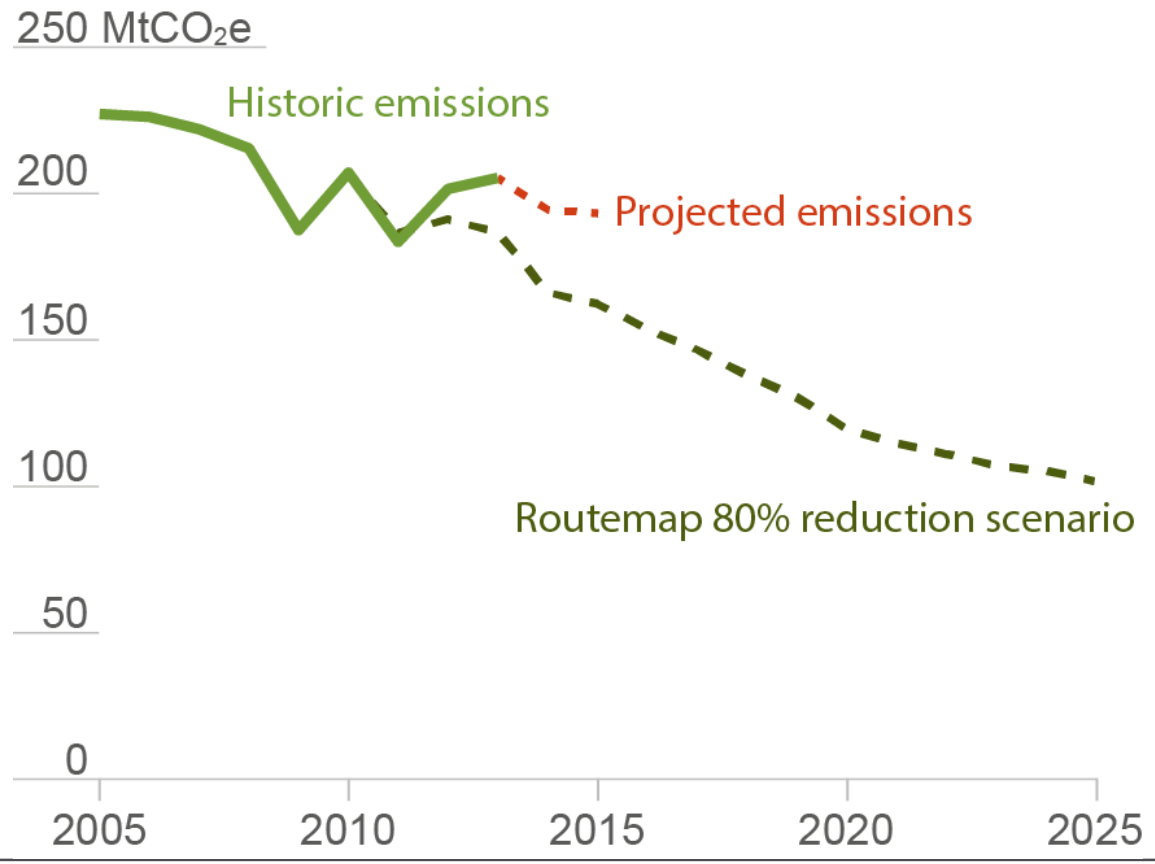
Routemap progress

- Capital carbon emissions have increased since original Routemap report
- Progress to 2013 suggests we are not on trend to meet 2025 ambitions



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Projected emissions based upon analysis by presenter using reported OpCarb (including provisional statistics for 2015) and projected CapCarb (using reported financial value of output and extrapolating historic emissions intensity trend)

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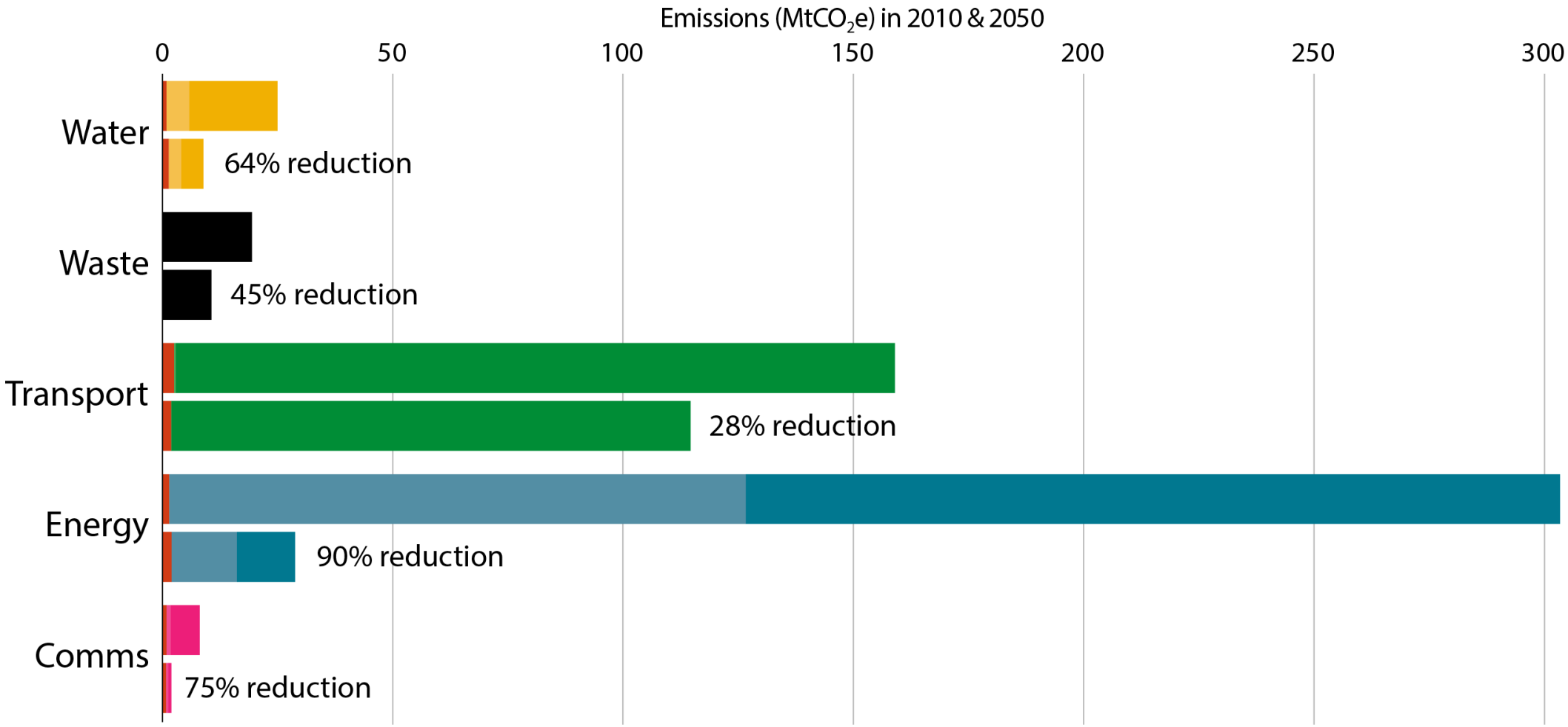
Progress in carbon assessment practice

- Assessment routine in some sectors, non-existent in others
- Extensive (and growing) array of guidance available
- PAS 2080 provides common framework and language; challenge is securing demand
- Best practice yet to be effectively shared between infrastructure and buildings
- Increasing availability of product data (e.g. EPDs) but still high dependency on generic data
- Benchmark data emerging for some project types
- Project carbon intensity targets introduced by some clients but project targets are not yet consistent with sectoral or national targets
- Precedents outside the UK of using carbon criteria to assess tenders in public procurement; the introduction of regulations requiring whole life carbon measurement and reporting; and regulation of environmental claims from product manufacturers

Where will the carbon be in future?

Infrastructure Carbon Review ‘best case’ scenarios



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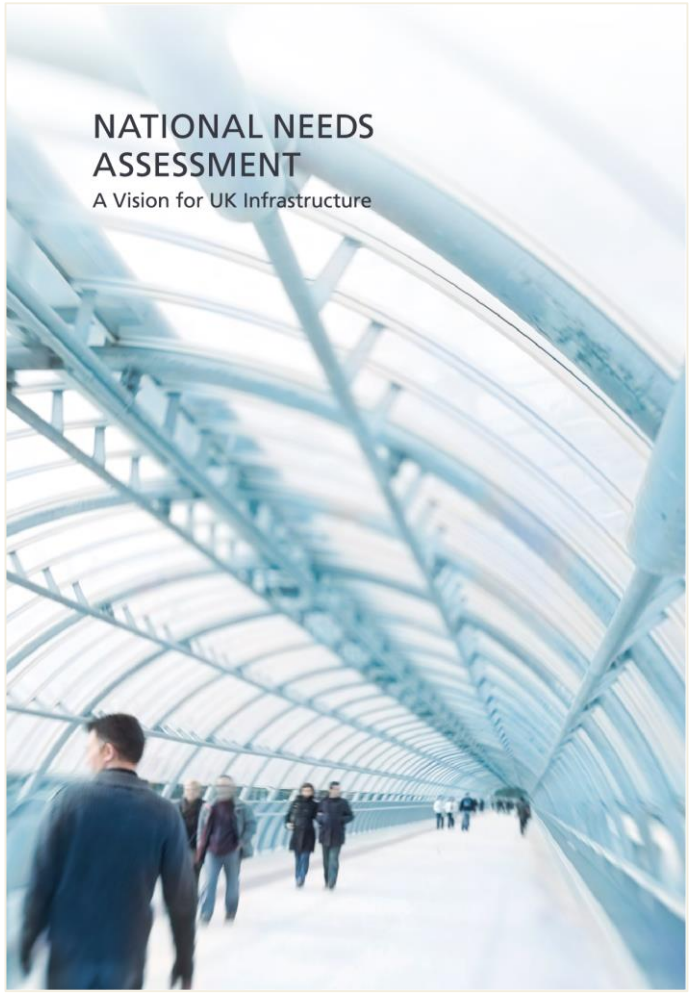
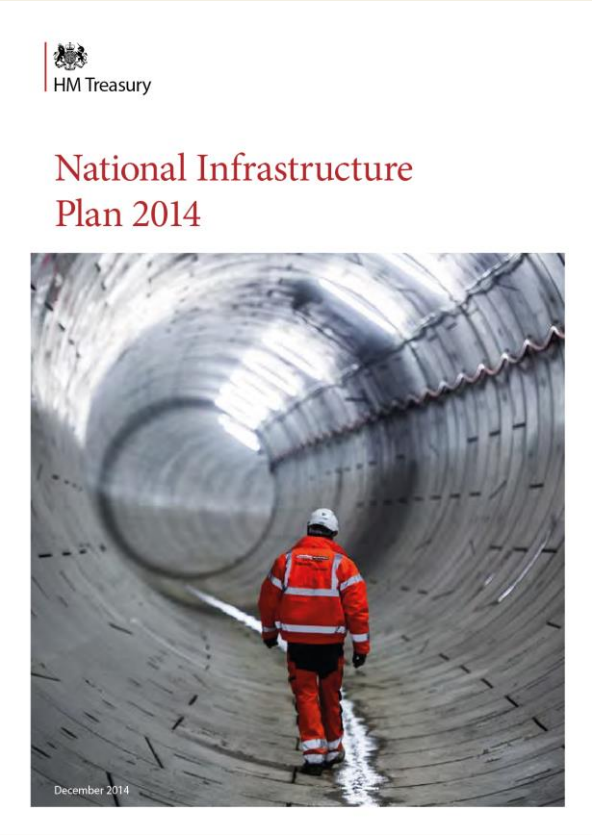
National Needs Assessment

- Projected population of 75 million by 2050
- Need 300,000 new homes per year for foreseeable future
- Traffic growth of up to 50% in some regions
- High projected costs of flood risk management
- Total energy demand may increase from 900 to 1200 TWh/year
- Supporting ITRC analysis sets out carbon implications for a range of scenarios



National Infrastructure Pipeline analysis

- CIEMAP assessment projected ~244 $MtCO_2e$ CapCarb in 2014 National Infrastructure Pipeline



Included in 2015 CCC Report to Parliament

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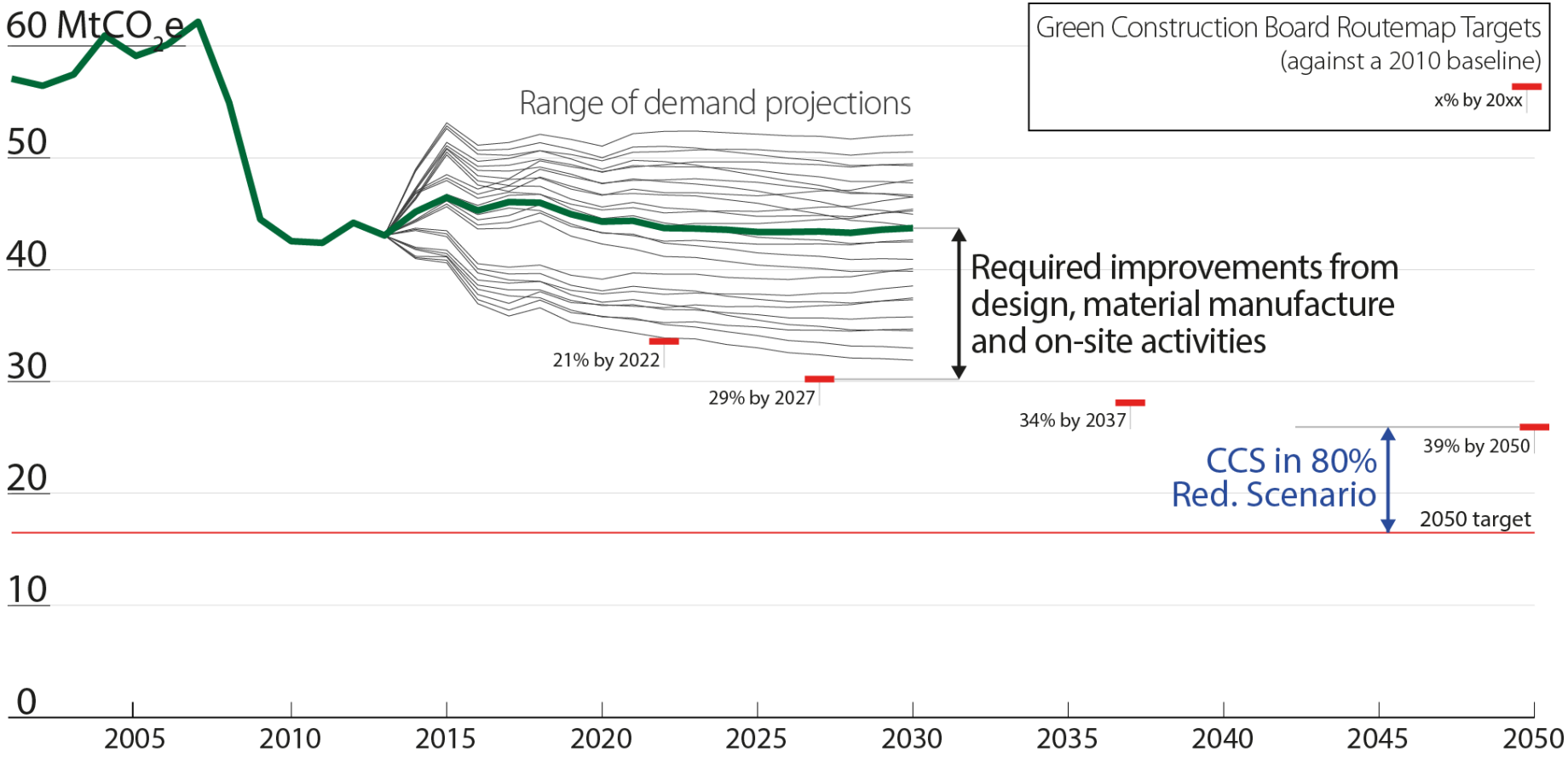
Anticipated capital carbon 2001-2030



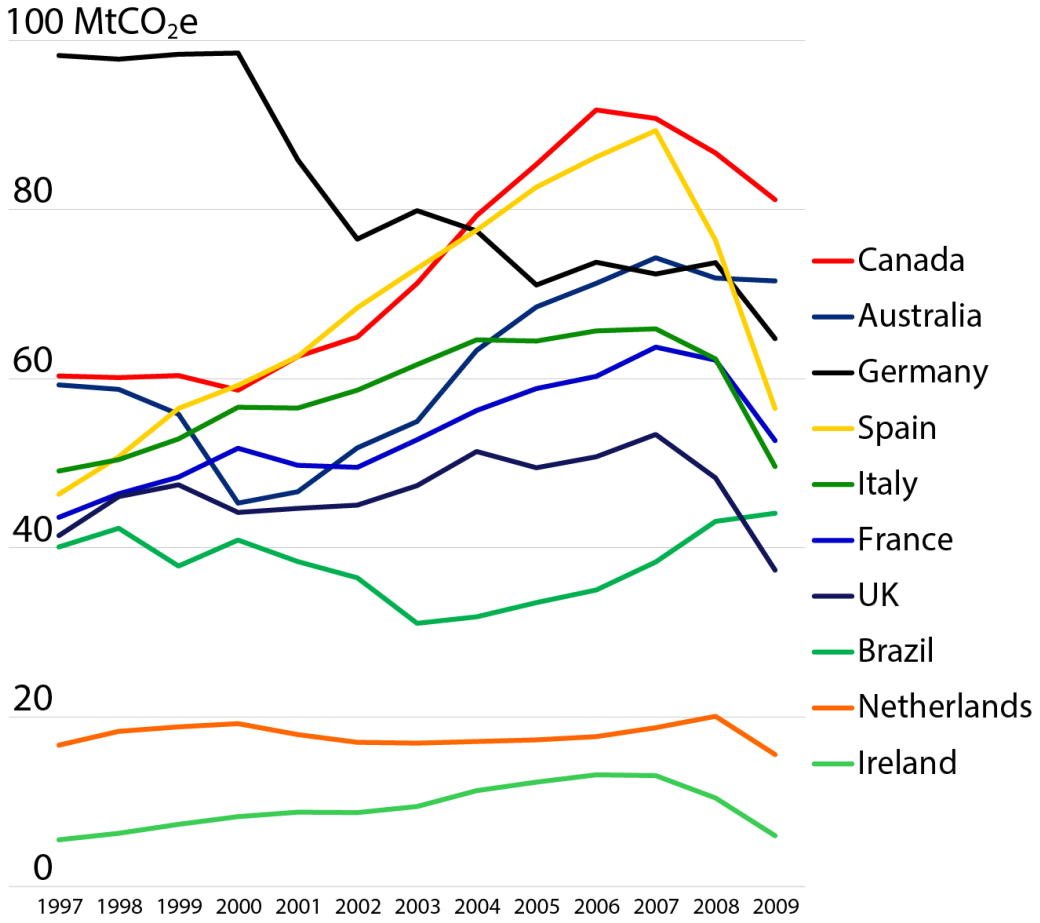
- 27 scenarios using UK Buildings and Infrastructure Embodied Carbon model
- **Including** improvements in grid intensity from DECC (2014 projections)

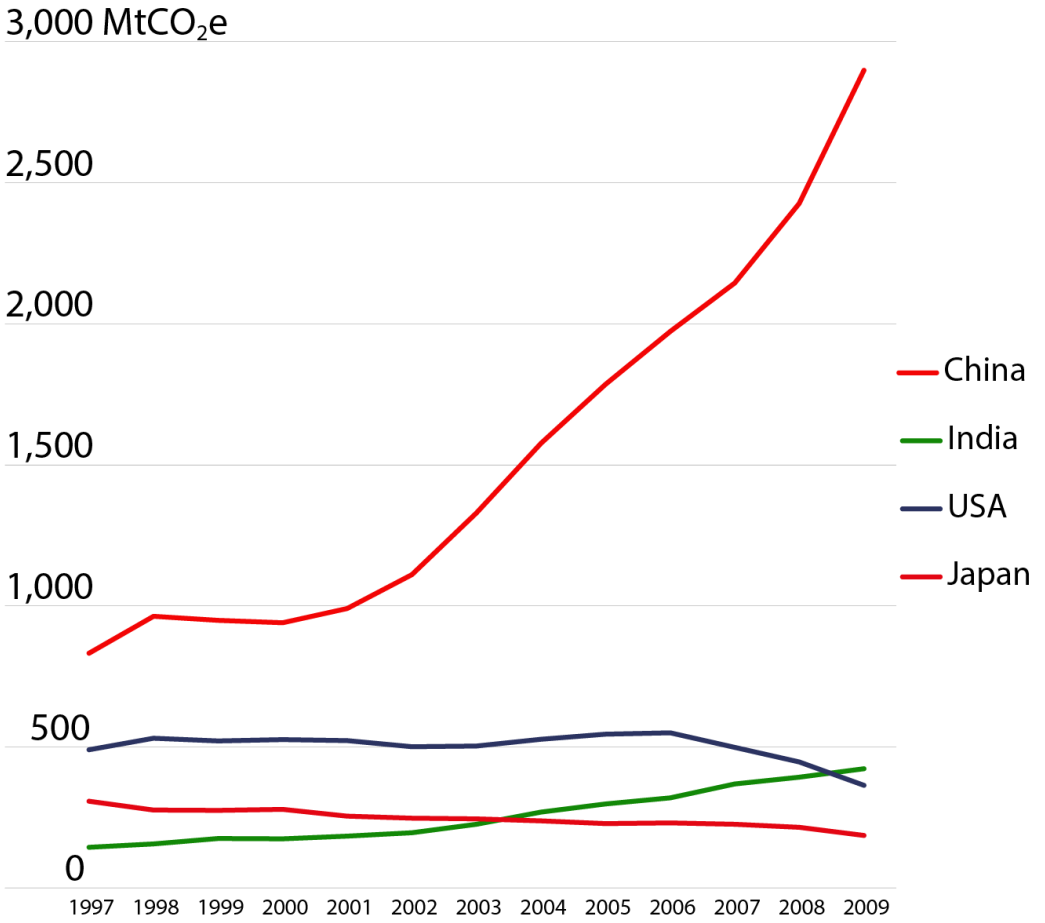
The opportunity

An international market for low carbon skills & products

The international scope for mitigation in construction

- Construction firms in these 14 countries alone influence 4.4 $GtCO_2e$ of supply chain emissions





Based upon CIEMAP MRIO analysis using WIOD data for 40 countries plus 'rest of world'

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Summary

- The net zero goal creates a new carbon context
- Earlier mitigation will be more cost effective and reduces dependence upon unproven technologies
- Faster progress is needed to get the industry back on a trajectory that is consistent with national targets
- Collaboration is needed to improve our understanding of how carbon is distributed
- Scenarios show the likely impact of demographic trends and increasing significance of CapCarb
- The substantial global scope for mitigation in construction means there will be a market for low carbon skills, products and expertise
- The UK is well positioned to tap into this market but needs to stay ahead of the competition. That means driving best practice at home.