CIE-MAP

Centre for Industrial Energy, Materials and Products

Research Councils UK Energy For a Low Carbon Future

Healthy Planet: A resource efficient future

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CIEMAP

Our mission

» ***Working closely with government and industry, CIEMAP conducts research to identify all the opportunities along the product supply chain that ultimately deliver a reduction in industrial energy use***

» One of 6 RCUK funded centres focussing on end use energy demand in the UK

» Interdisciplinary team from 4 universities plus contributions from the Green Alliance

CIE-MAP

Centre for Industrial Energy, Materials and Products

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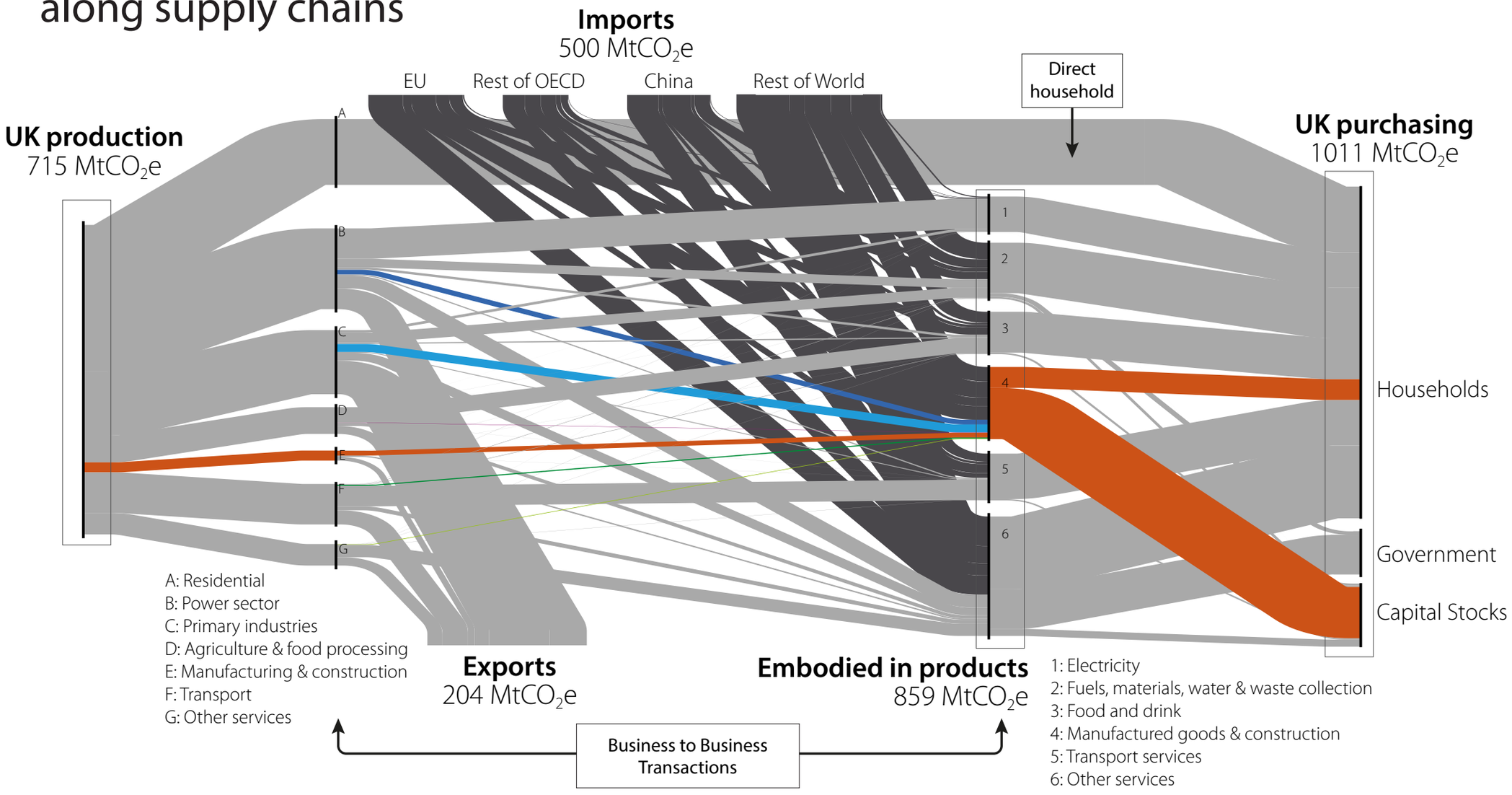
CIEMAP

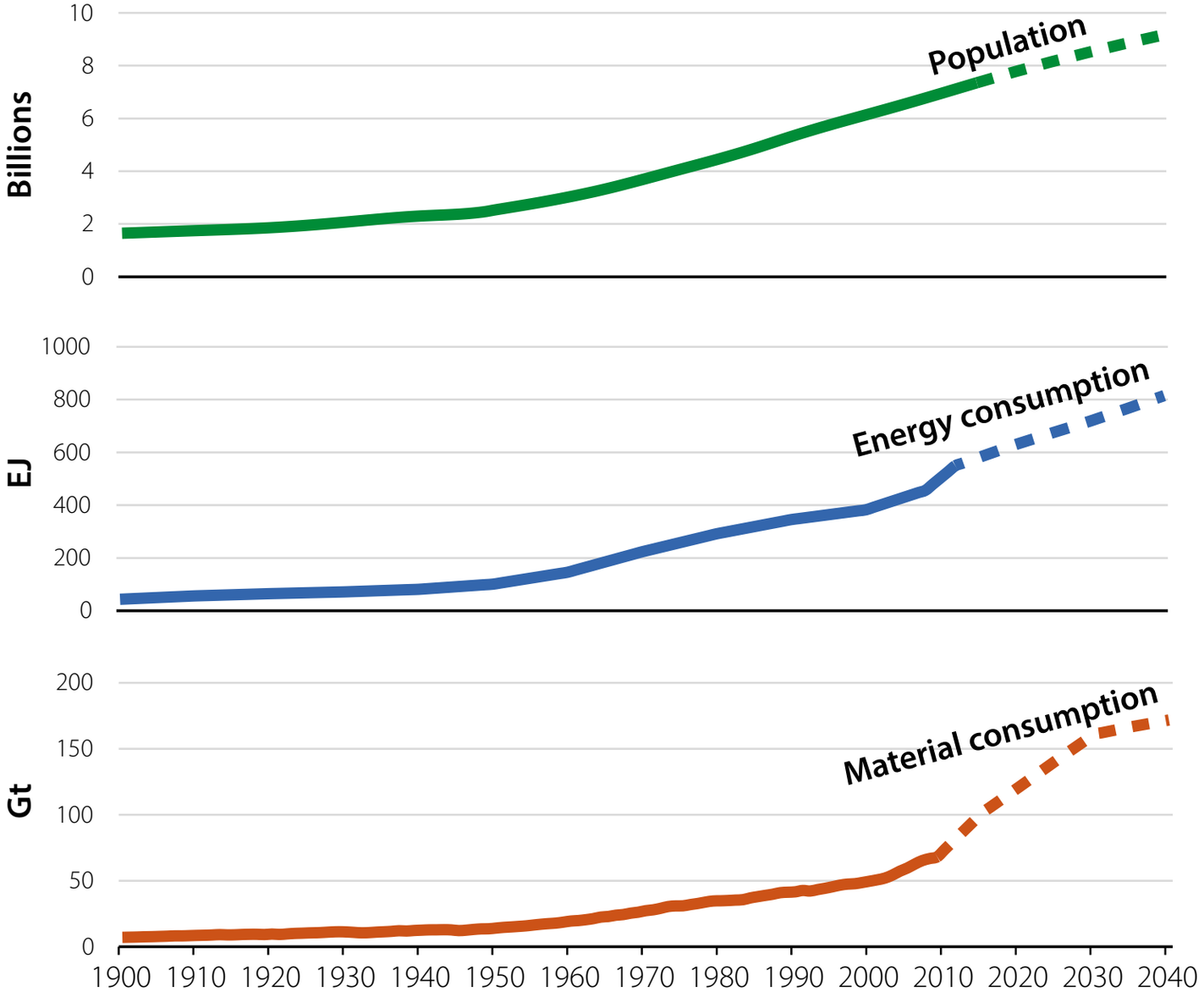
Our approach

» Combining economy wide and sector specific analyses to identify opportunities along supply chains



A century of growth

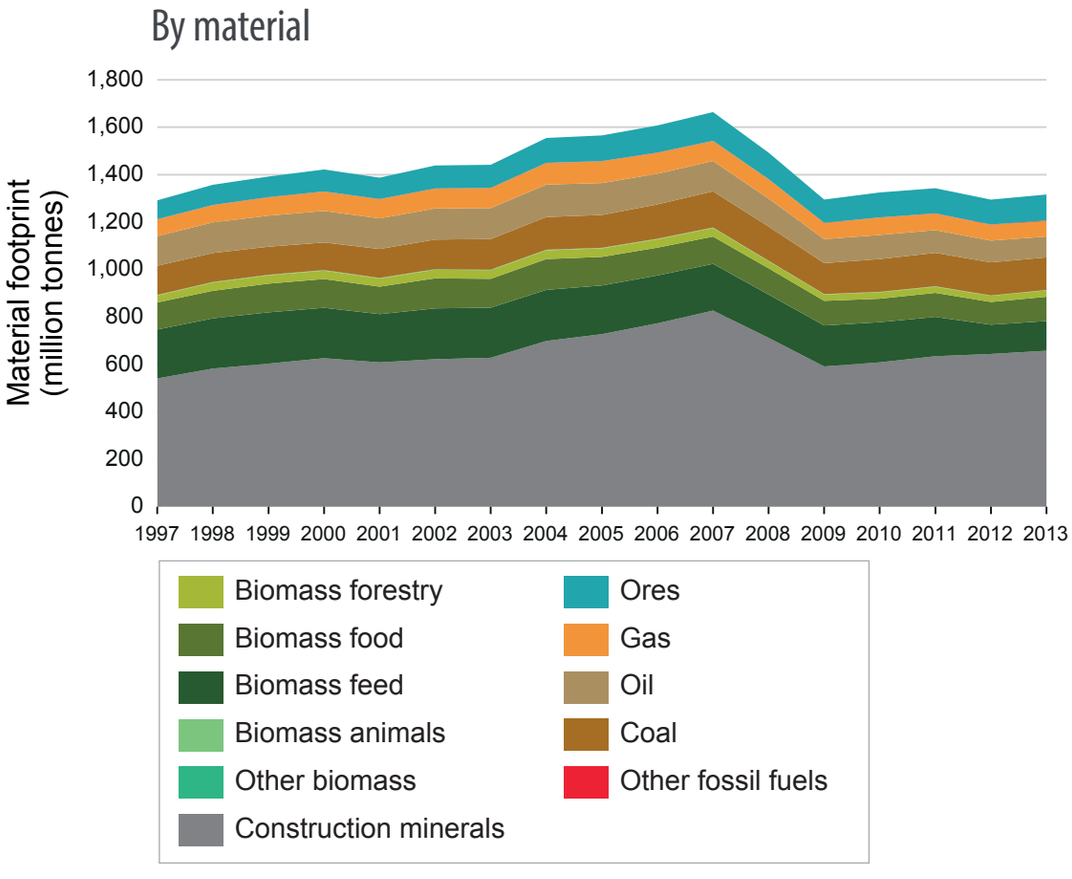
In population, energy and material consumption

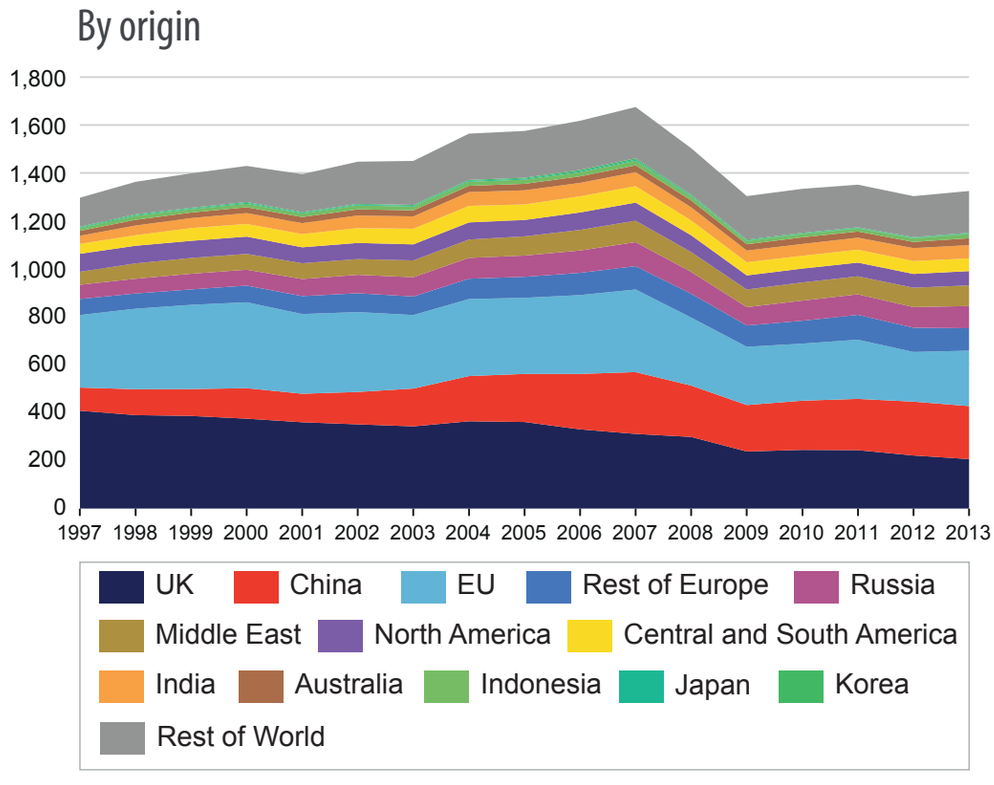


Historic data and future projections from UN (2016), Smil (2010), Krausmann et al. (2009), SERI (2012), EIA (2016)

Material footprint of UK consumption

Over 1 billion tonnes of materials per year, mostly imported





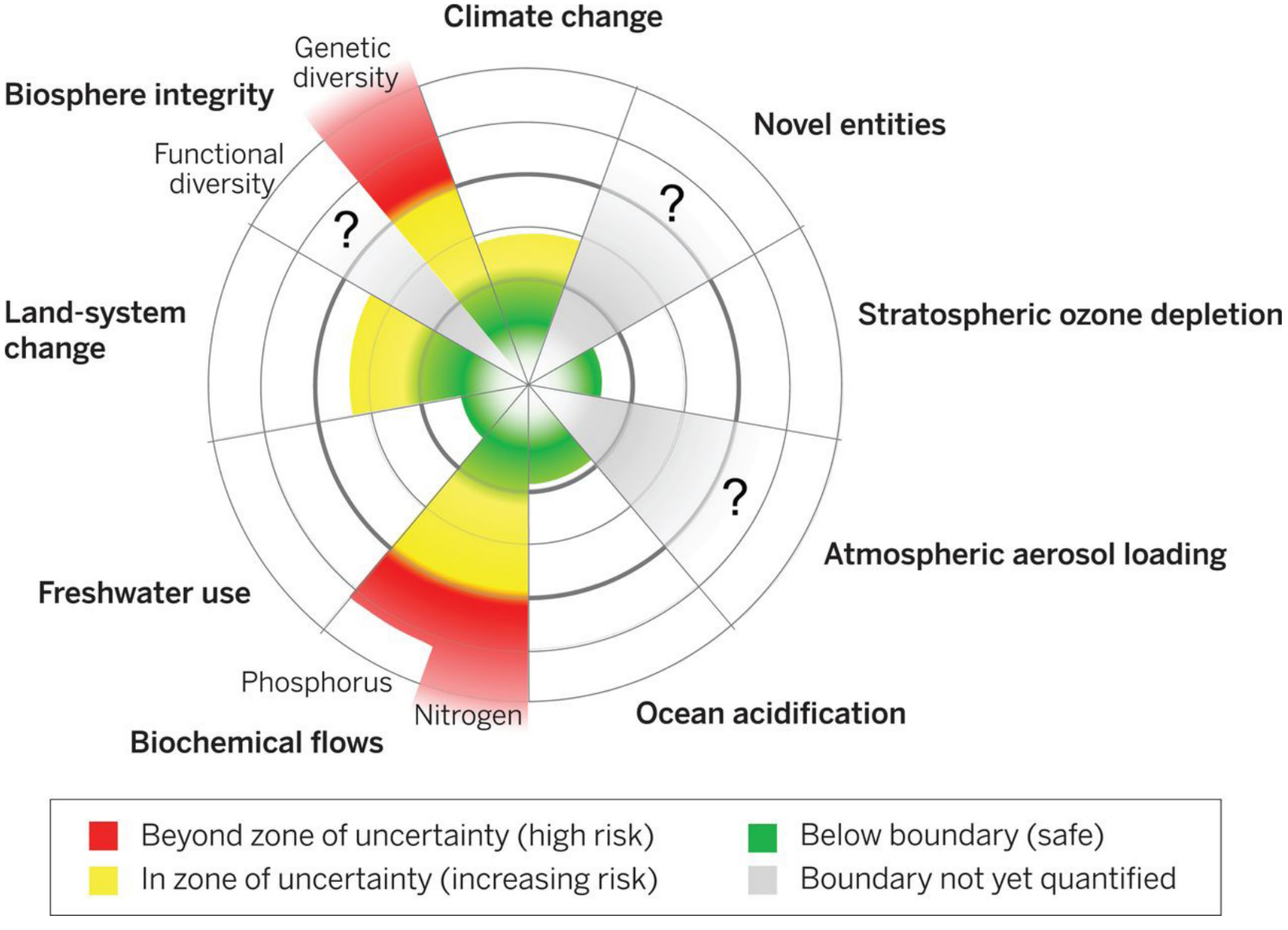
The global technosphere

~30 trillion tonnes of stuff we've created

Photo of Tokyo courtesy of CTG/SF: https://www.flickr.com/photos/27966213@N08/13987969379/

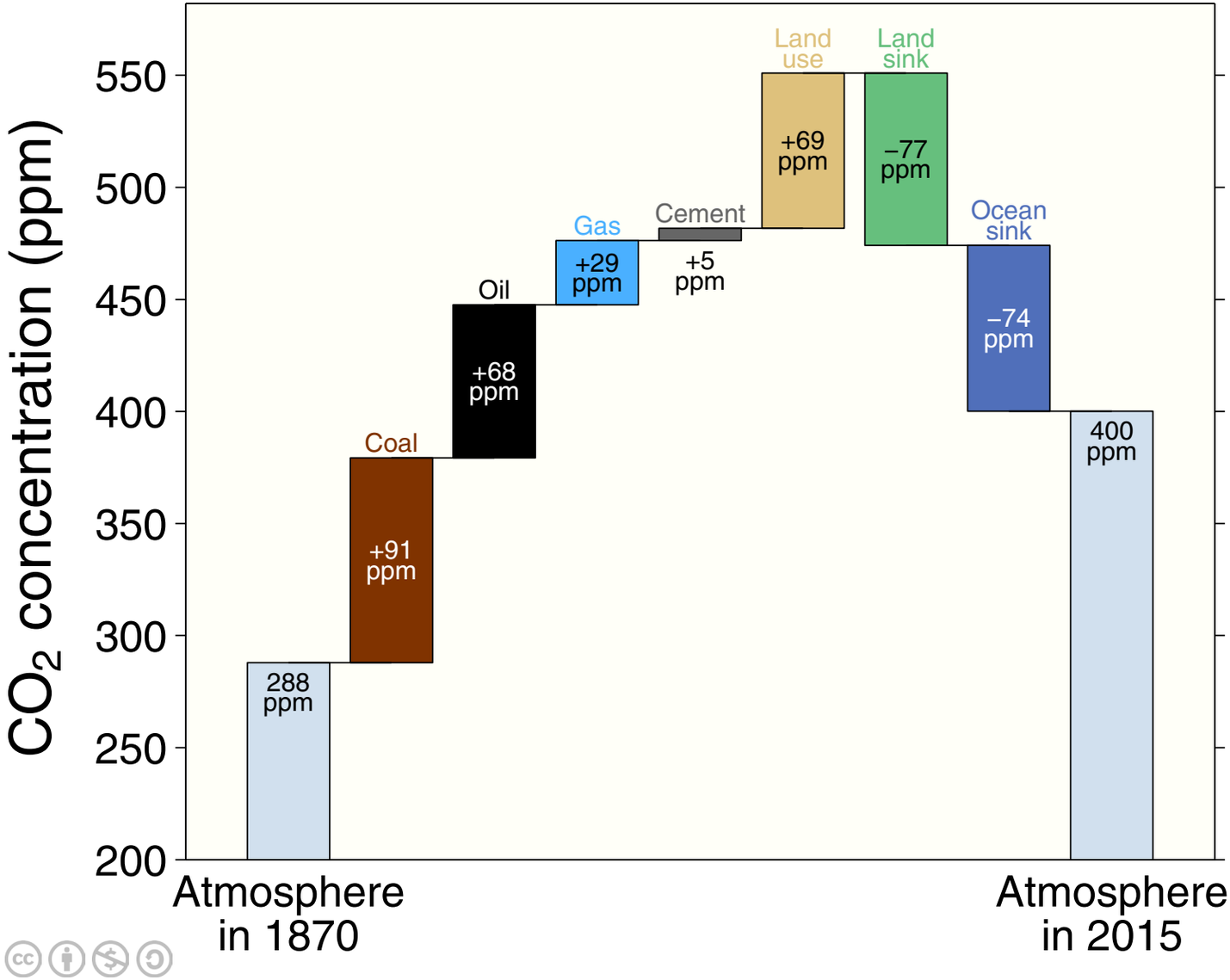
Planetary boundaries

Current practices exceed the 'safe operating space' for humanity



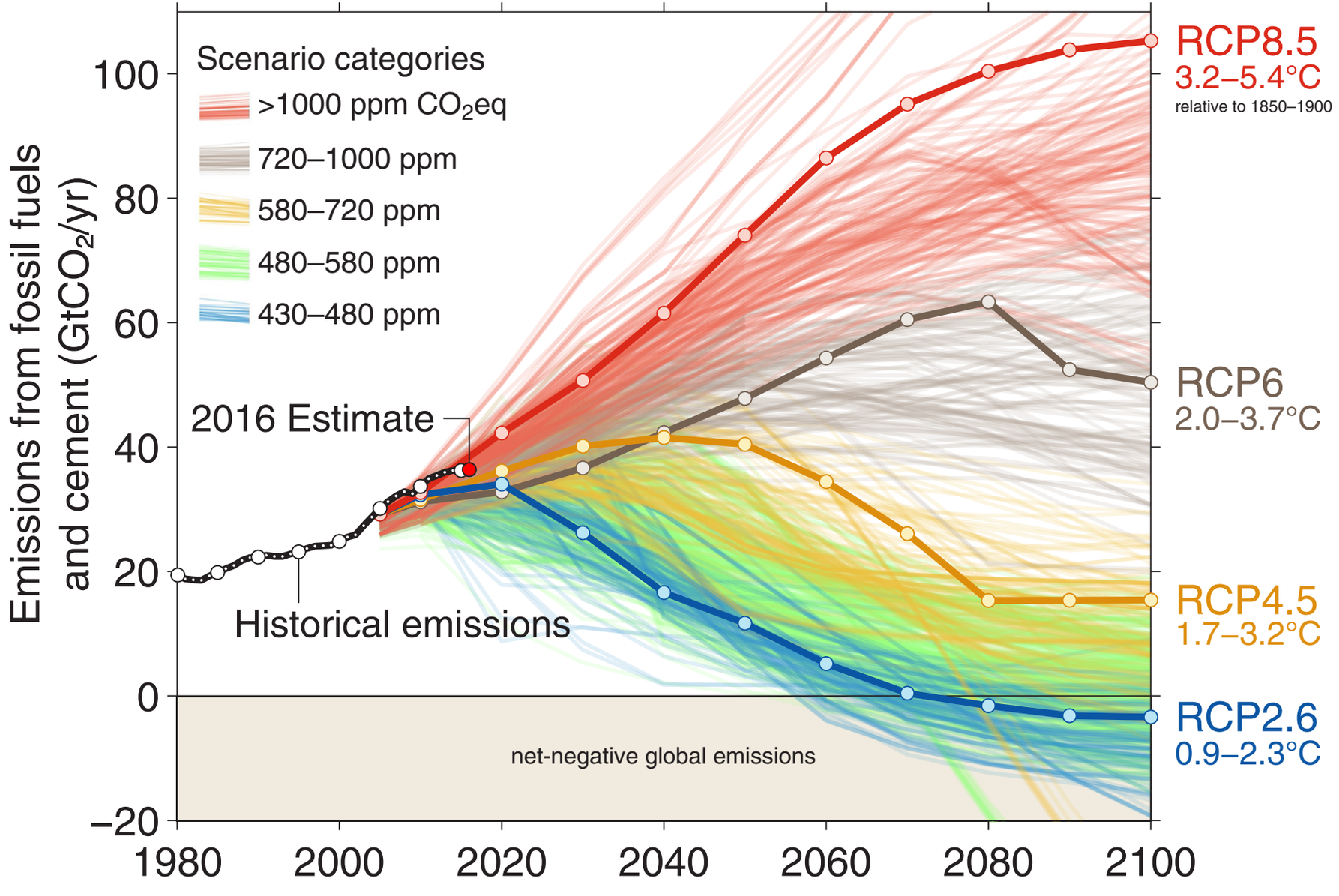
Consequences for the climate

Current CO_2, CH_4 & N_2O concentrations unprecedented in >800,000 years



Emissions scenarios to 2100

Current commitments likely to yield around 3°C increase



Global impacts of climate change

Will be "severe, pervasive and irreversible"

Image from Tuvalu courtesy of Climate Visuals. Quote from IPCC 2014 Synthesis Report.

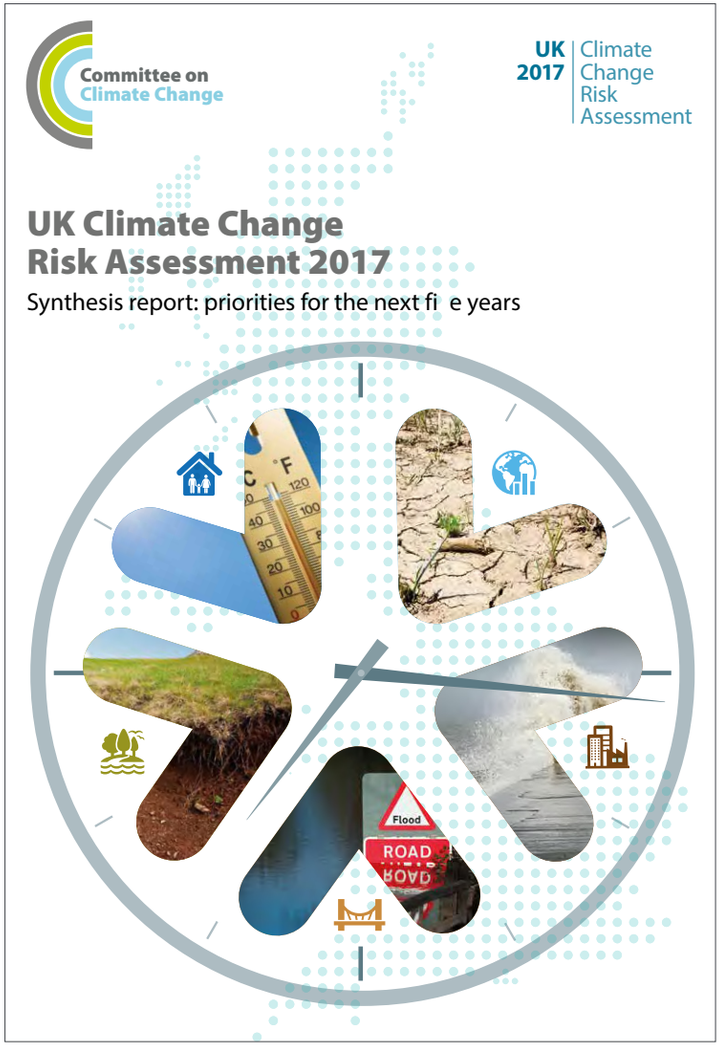
Climate impacts in the UK

Over 20 areas identified where greater action is needed

Figure SR.1: Top six areas of inter-related climate change risks for the United Kingdom

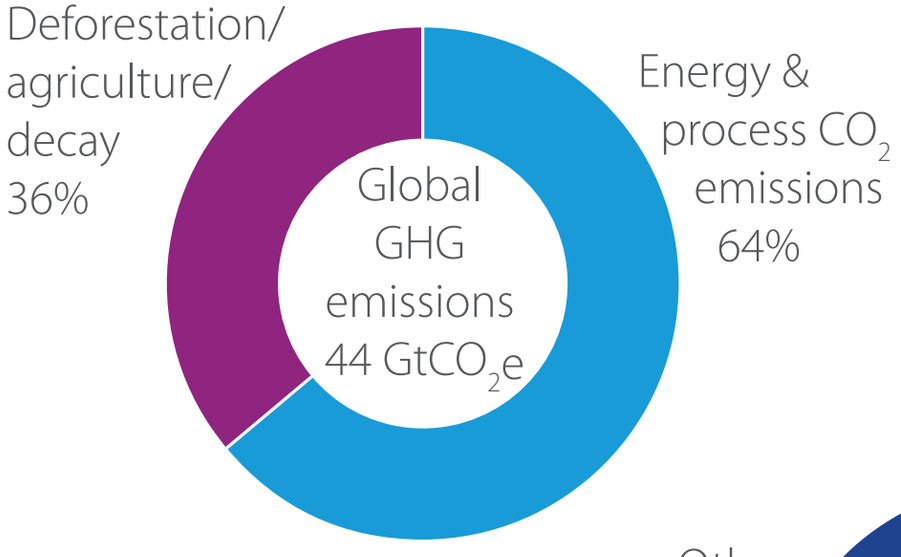
Flooding and coastal change risks to communities, businesses and infrastructure (Ch3, Ch4 **Ch5**, Ch6)	**MORE ACTION NEEDED**
Risks to health, well-being and productivity from high temperatures (**Ch5**, Ch6)	
Risk of shortages in the public water supply, and for agriculture, energy generation and industry (Ch3, **Ch4**, Ch5, Ch6)	
Risks to natural capital, including terrestrial, coastal, marine and freshwater ecosystems, soils and biodiversity (**Ch3**)	
Risks to domestic and international food production and trade (Ch3, Ch6, **Ch7**)	
New and emerging pests and diseases, and invasive non-native species, affecting people, plants and animals (Ch3, **Ch5**, Ch7)	**RESEARCH PRIORITY**
NOW ----→ RISK MAGNITUDE ----→ **FUTURE**	**LOW** **MEDIUM** **HIGH**

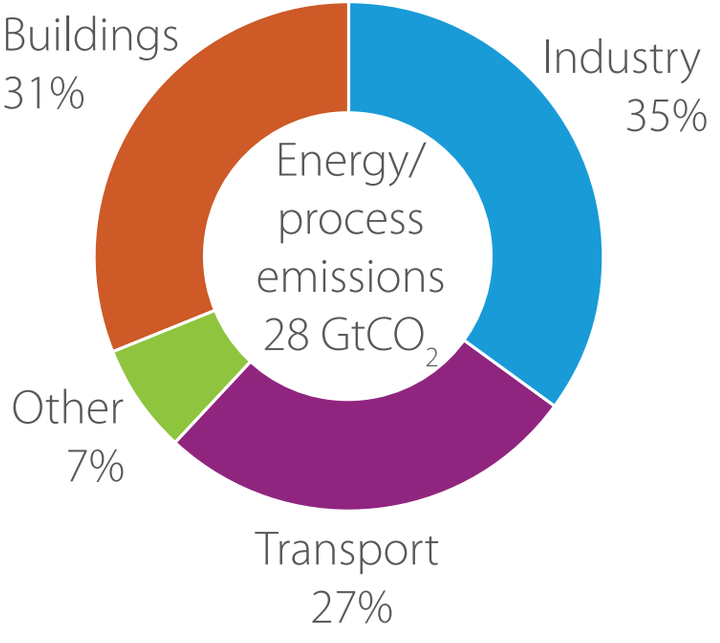
Source: ASC synthesis of the main areas of risk and opportunity within the chapters of the Evidence Report.
Notes: Future magnitude is based on a combination of climate change and other drivers of risk (e.g. demographic change), taking account of how current adaptation policies and plans across the UK are likely to reduce risks.

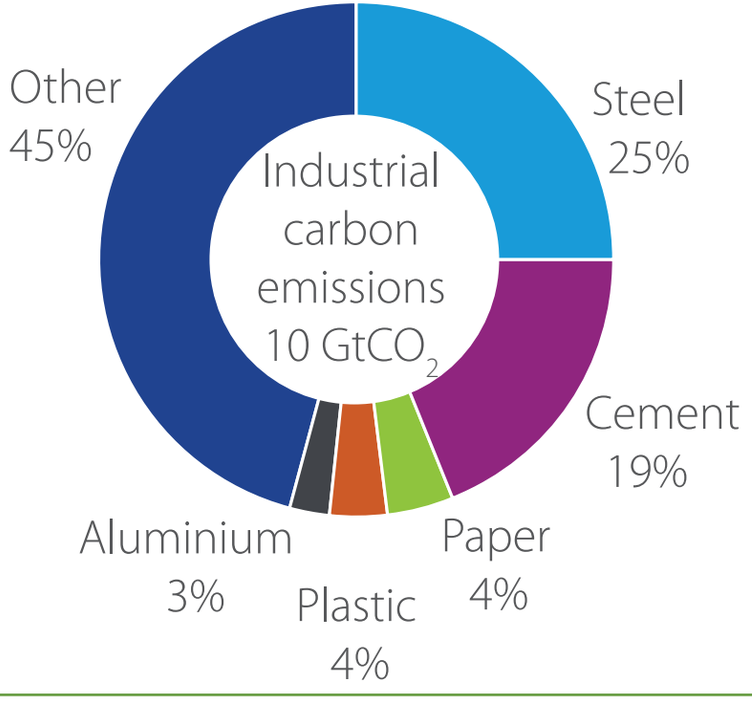


Industrial carbon emissions

Majority are associated with production of materials

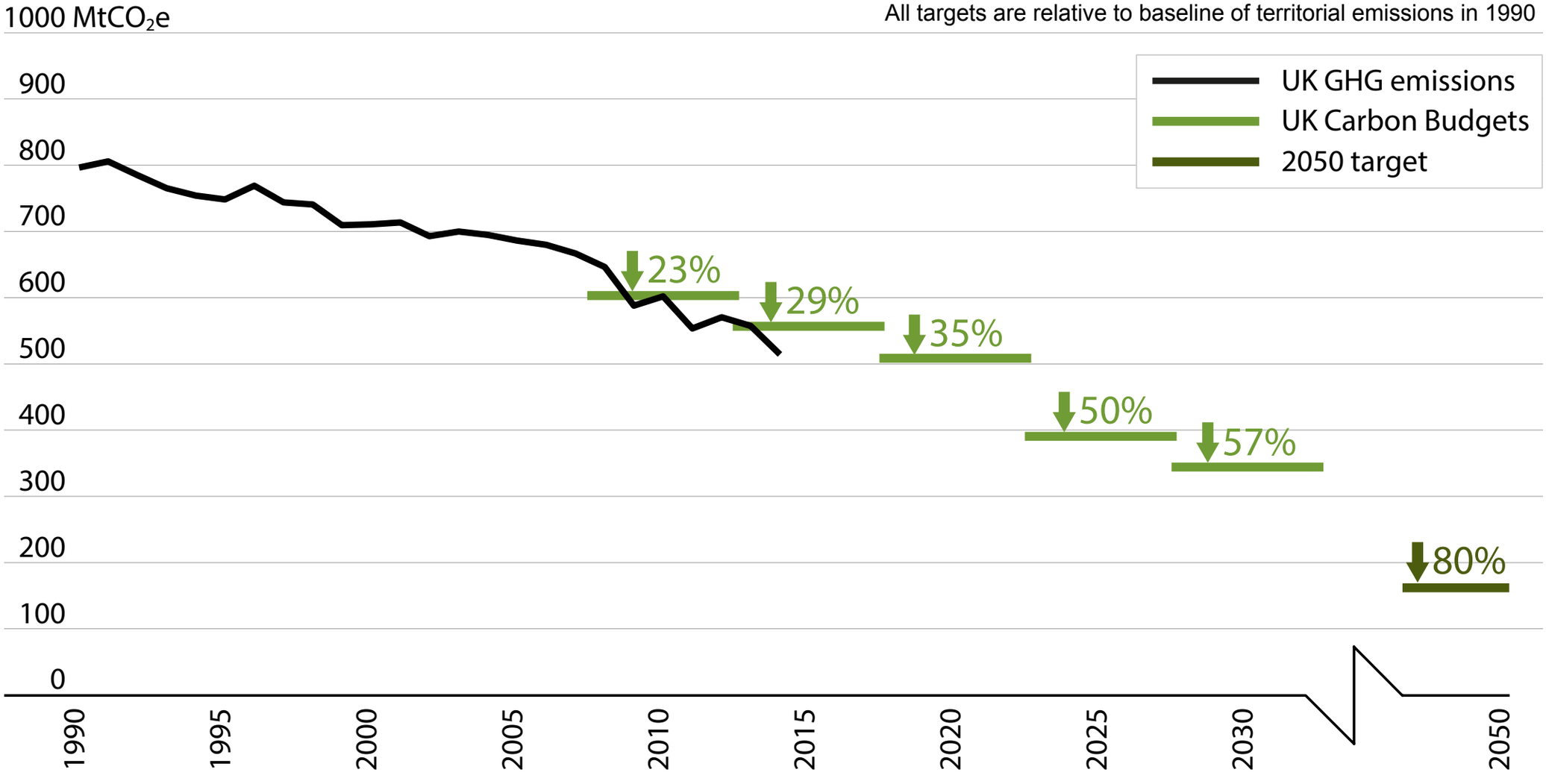






Current UK GHG emissions targets

Based on series of legally binding 5 year carbon budgets

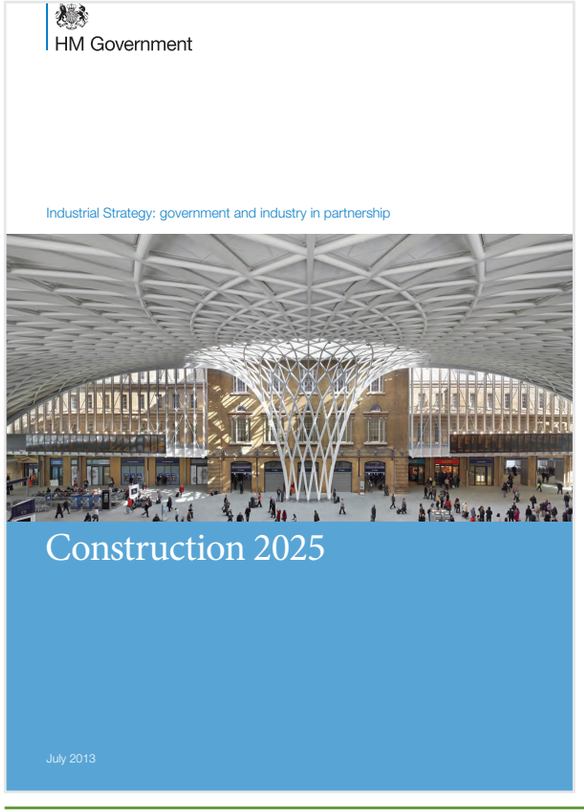


The UK construction industry

Directly or indirectly influences most of UK GHG emissions

» Has ambitious targets for cost, delivery, exports and emissions

» Spends £3500 per second on procurement


HM Government

Industrial Strategy: government and industry in partnership

Construction 2025

July 2013


EXECUTIVE SUMMARY | CONSTRUCTION 2025 5

Lower costs

33%

reduction in the initial cost of construction and the whole life cost of built assets

Faster delivery

50%

reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Lower emissions

50%

reduction in greenhouse gas emissions in the built environment

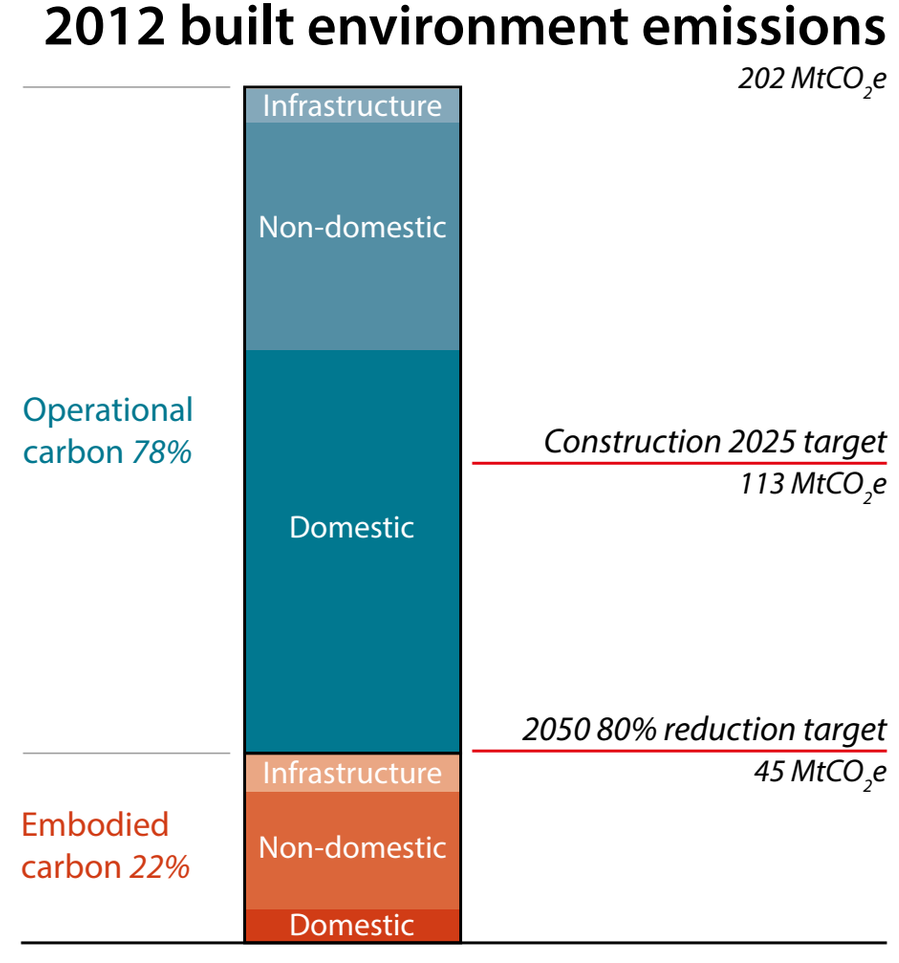
Improvement in exports

50%

reduction in the trade gap between total exports and total imports for construction products and materials

The global construction market is forecast to grow by over 70% by 2025.

Global Construction 2025; Global Construction Perspectives and Oxford Economics (July 2013)



For a more detailed explanation watch 'Where is the carbon in construction?': https://www.youtube.com/watch?v=QPIUrdgrkYI

On any given project

Embodied carbon is a growing share of whole life carbon

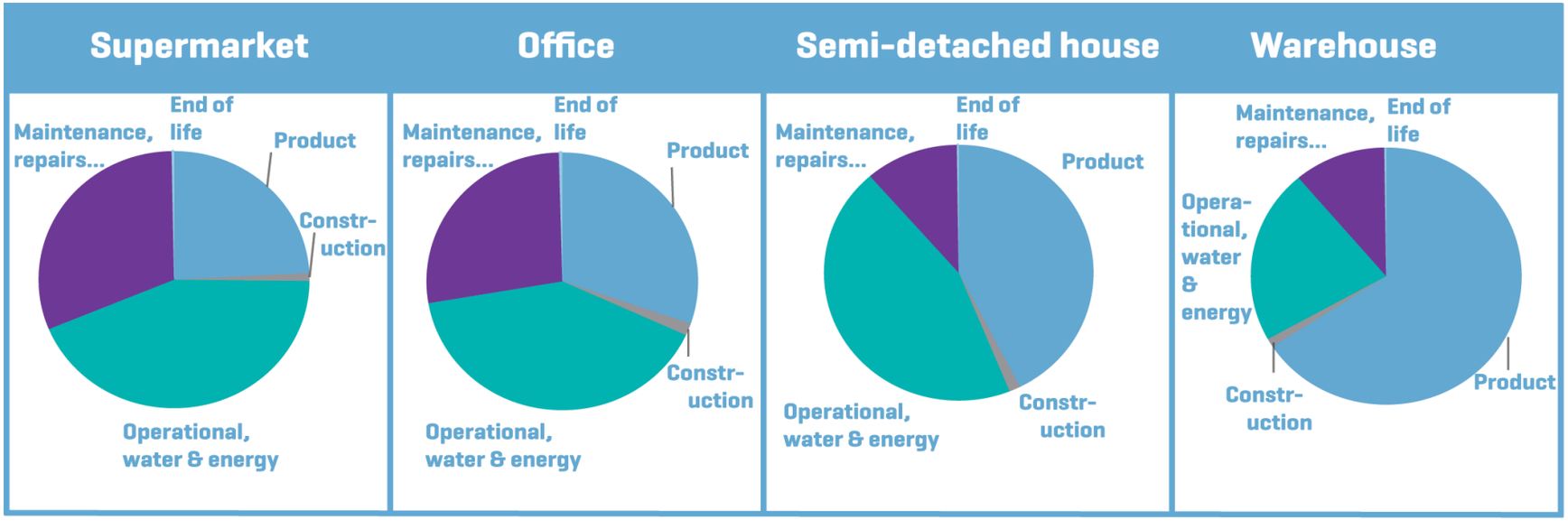
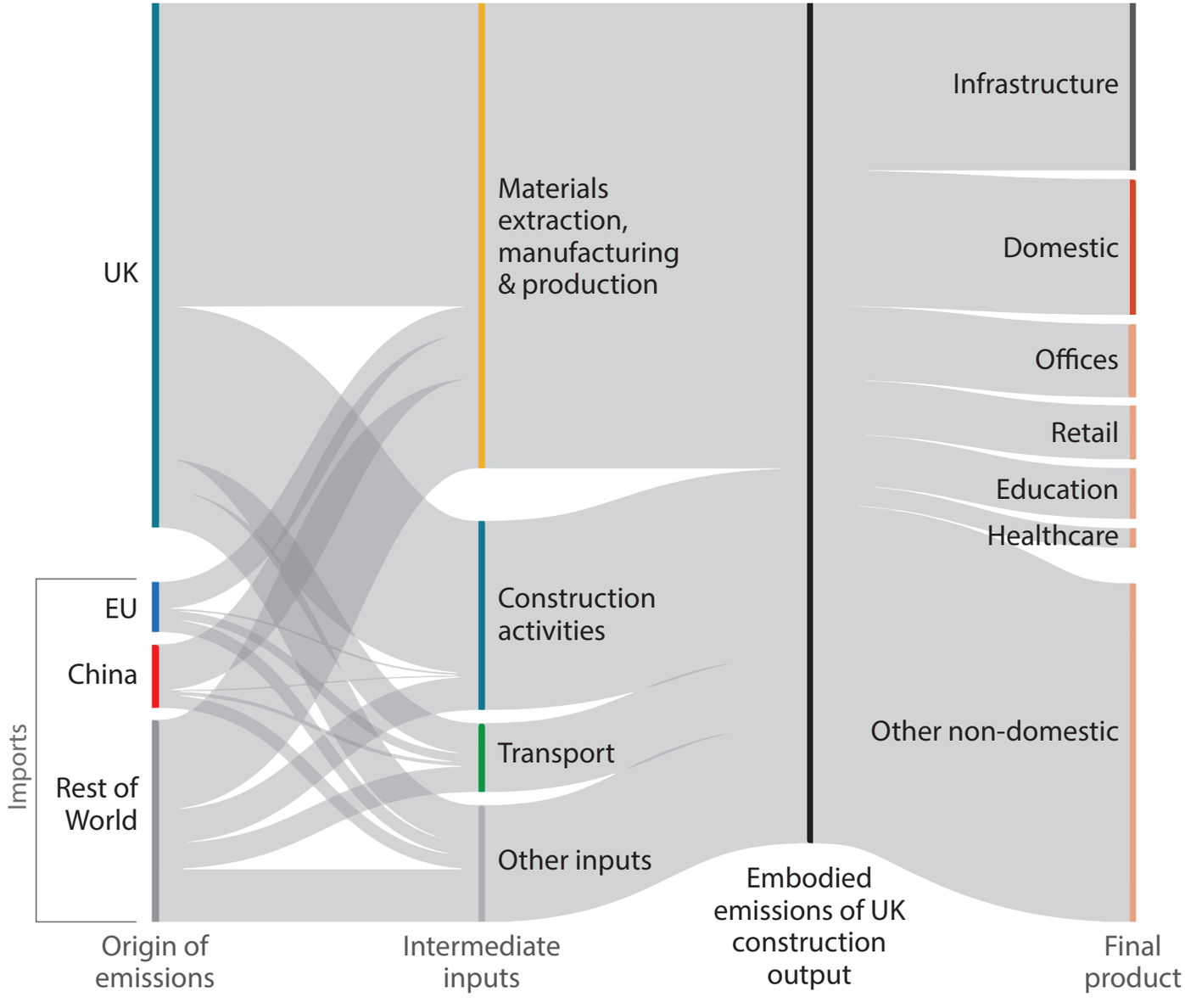


Figure 4: Relative impact of the consequent life cycle stages on the overall carbon footprint for different types of buildings, calculated over 30 years (the energy results have been based on the Building Regulations)

Embodied carbon in the built environment

Estimated carbon footprint of UK construction supply chains



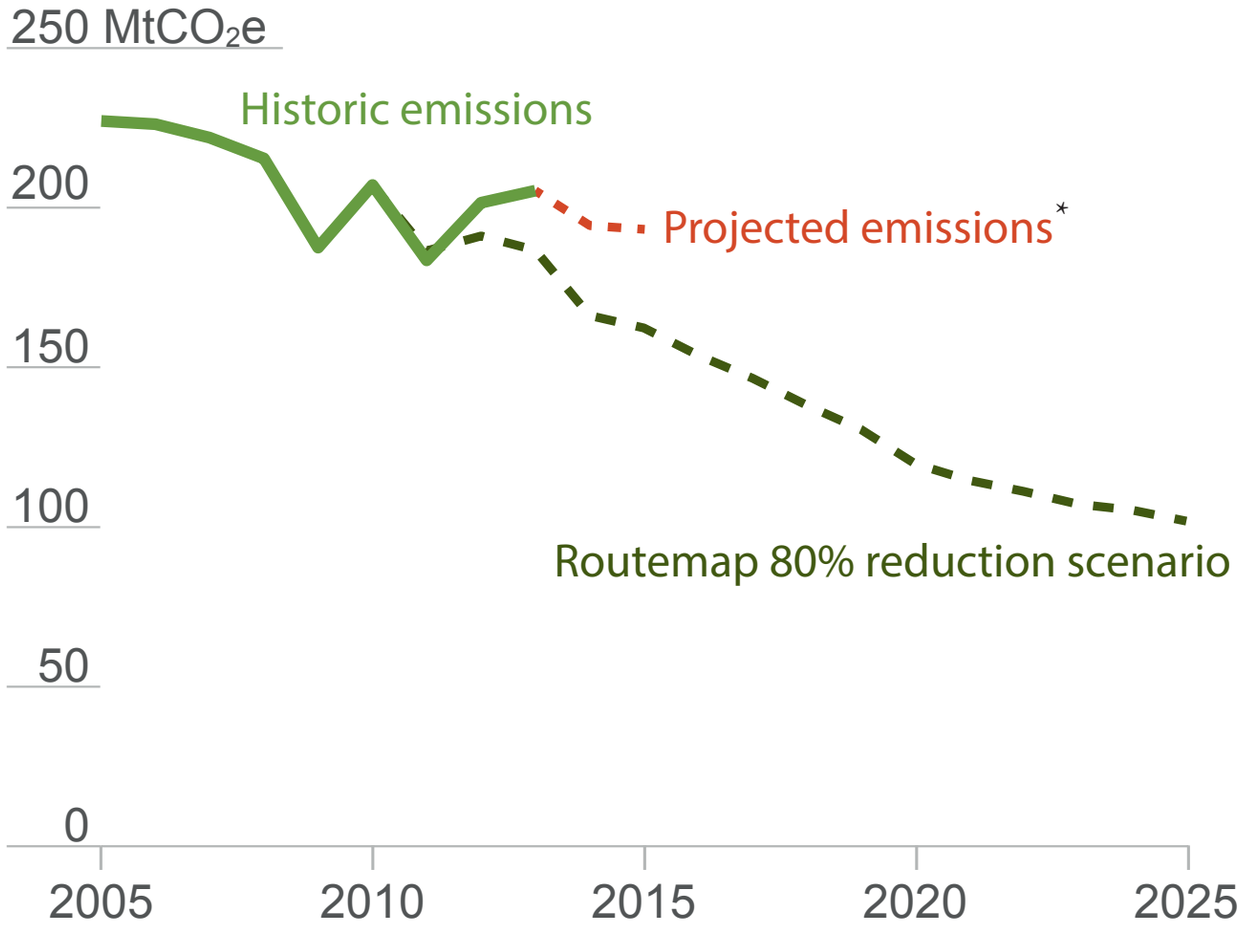
Based on 2011 data from Giesekam et al. (2014) *Energy and Buildings* 78 pp202-214

Progress so far

Last GCB Routemap progress report produced in December 2015

» Progress to 2013 suggests we are not on trend to meet 2025 ambitions

» Capital/embodied carbon emissions have increased since 2013 Routemap report



* 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)

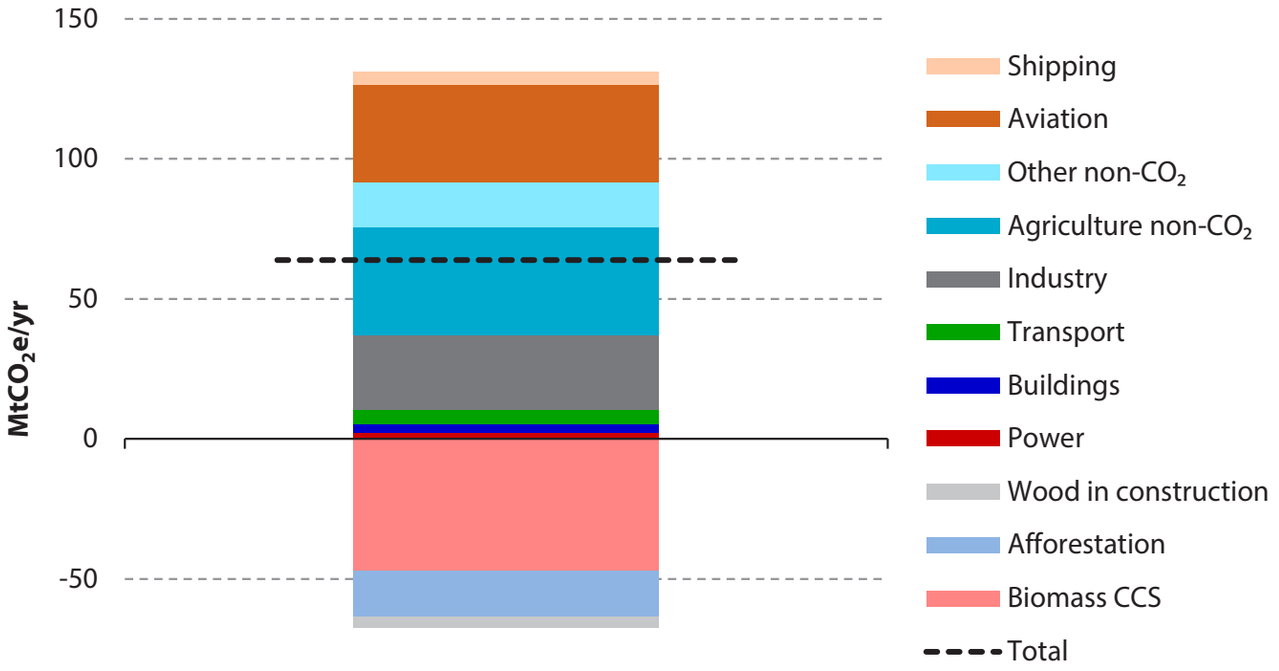
New UK goal is net zero emissions

Shortly after the middle of this century

» CCC advise goal means UK must be net zero CO_2 by 2055-2075 for >66% chance of achieving 2°C or before 2050 for 1.5°C

» UK Government has already intimated that the net zero goal must enter UK law: *"The question is not whether but how we do it"*

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

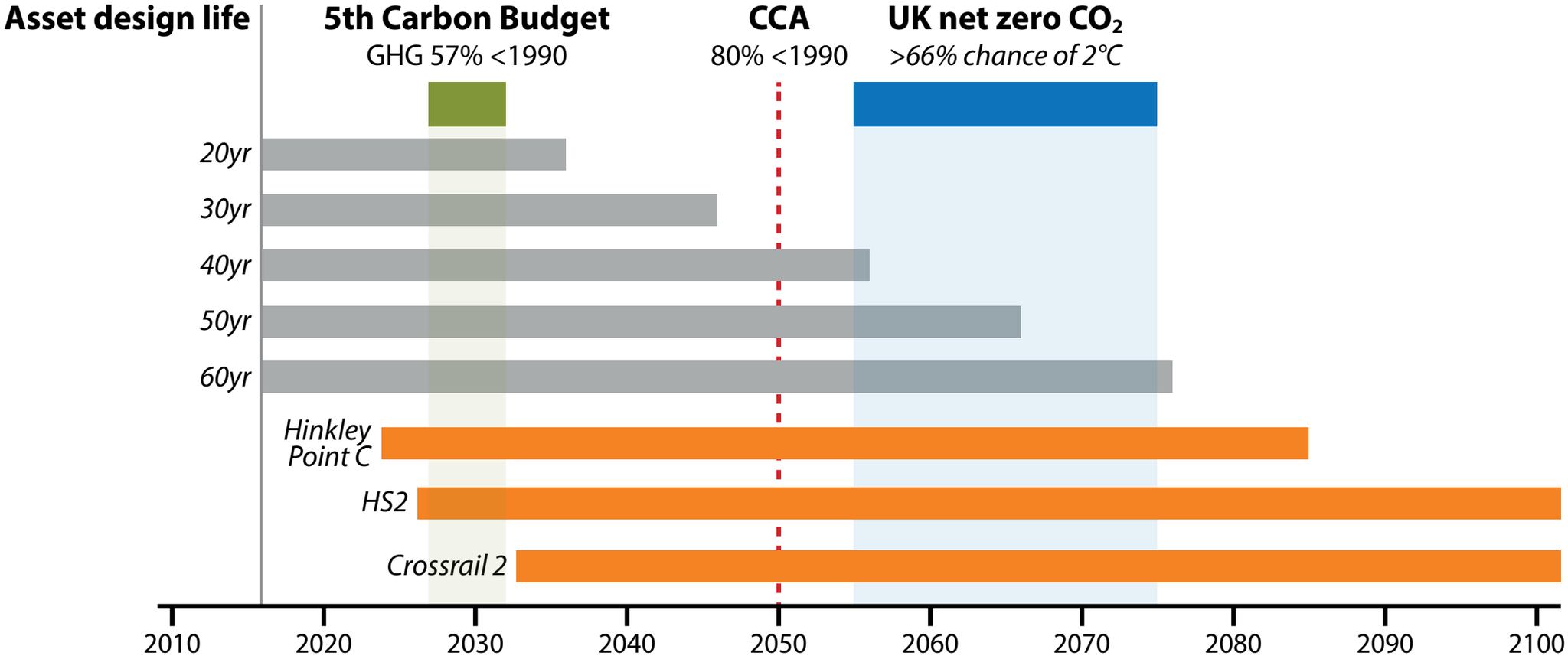


Quote from Andrea Leadsom – Minister of State for Energy - Hansard HC Deb vol 607 col 725 (14 March 2016)

CCC (2016) UK climate action following the Paris Agreement

The implications for construction

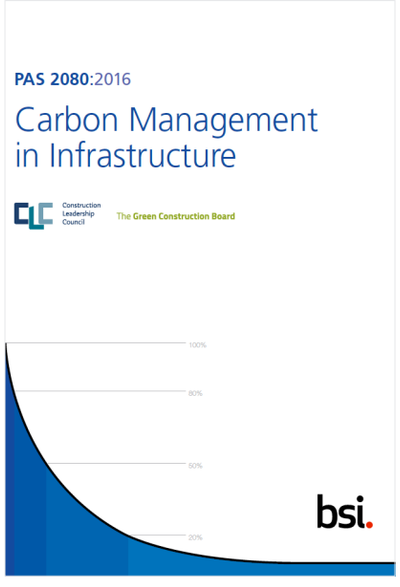
Most assets under design now must operate in a net zero nation

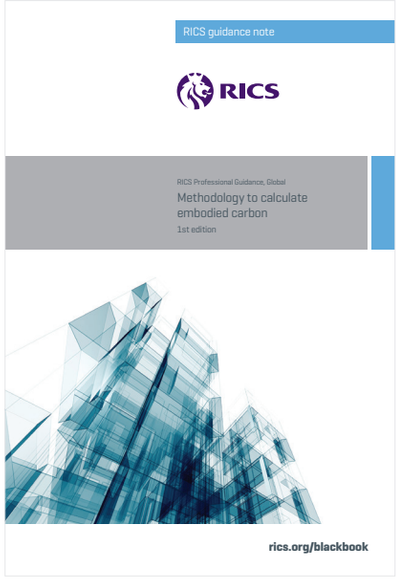


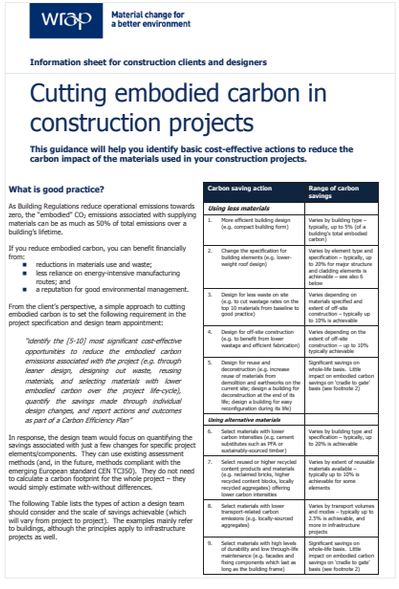
» Construction products could also play a key role in sequestering carbon

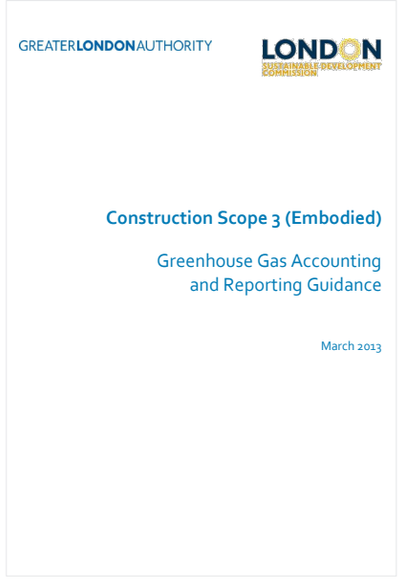
Existing guidance on carbon reduction

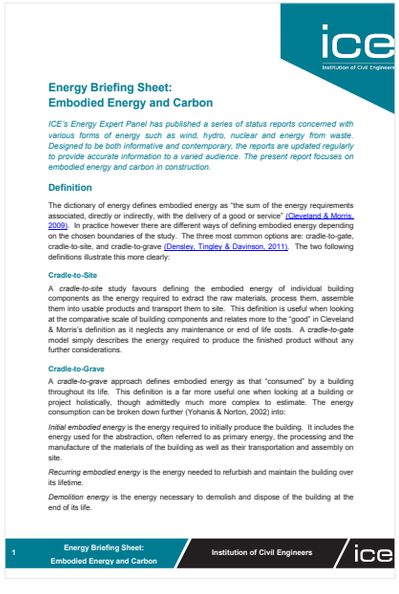
Array of recent publications

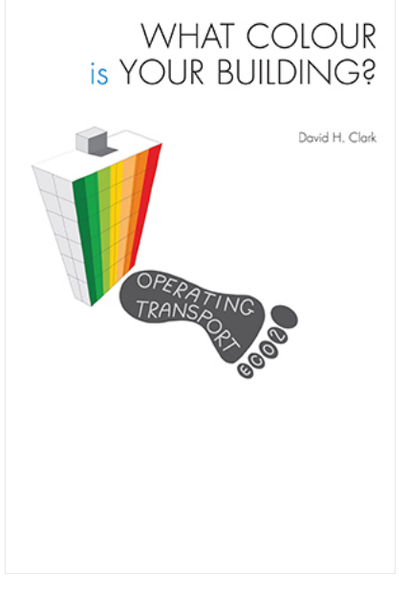


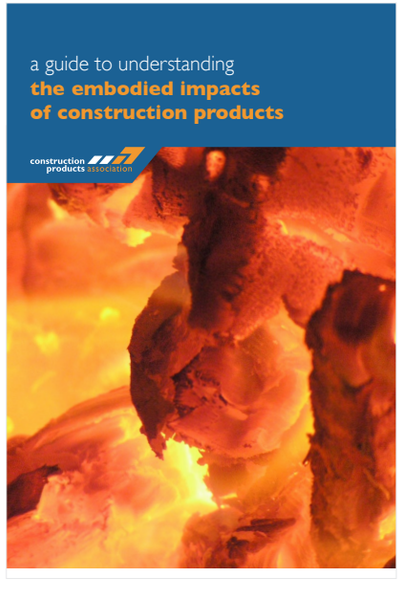










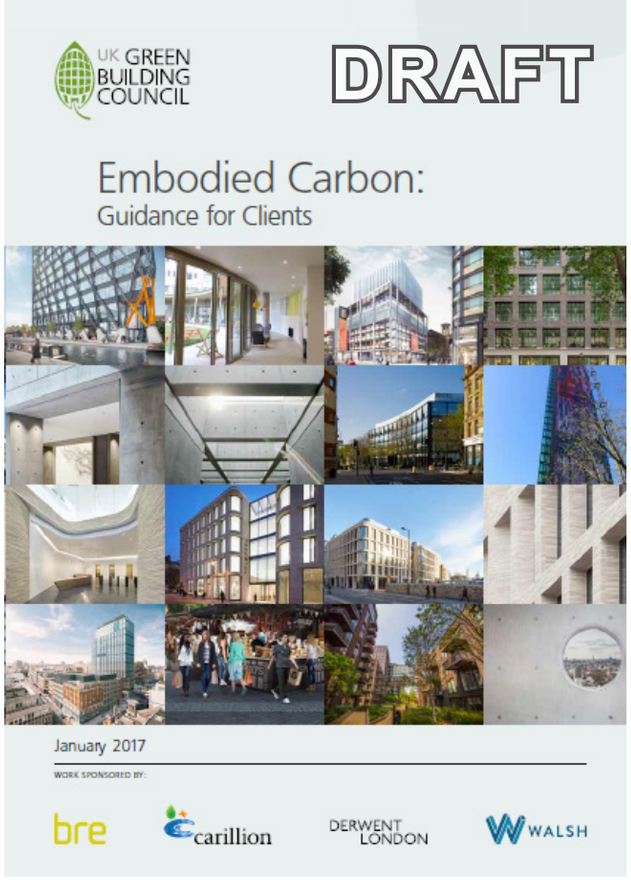


GCB & CLC (2016); RICS (2014); UKGBC (2015); WRAP (2014); GLA(2013); Battle et al. (2014); ICE (2011); Clark (2013); CPA (2012)

Upcoming guidance

Due out later this year

- UKGBC 'Embodied Carbon: Guidance for Clients' guidance document and supporting information
- Outputs of Innovate UK Implementing Whole Life Carbon in Buildings project including RICS Professional Statement
- Springer book on 'Embodied Carbon in Buildings'
- and many more...
- *UKGBC guidance will be launched at Ecobuild City Hall Session: Embodied Carbon – developing a client brief. Tuesday, 7th March, 16:30 - 17:45*



Cross-industry collaboration is required

Securing additional drivers will require

» Gathering more data on the link between cost & carbon

» Sharing carbon data to facilitate benchmarking

» Effectively expressing co-benefits (such as health and productivity gains)

» Inserting better incentives in environmental assessment schemes (e.g. BREEAM)

» Taking ownership of these issues within industry and within Government

» Developing a range of appealing narratives

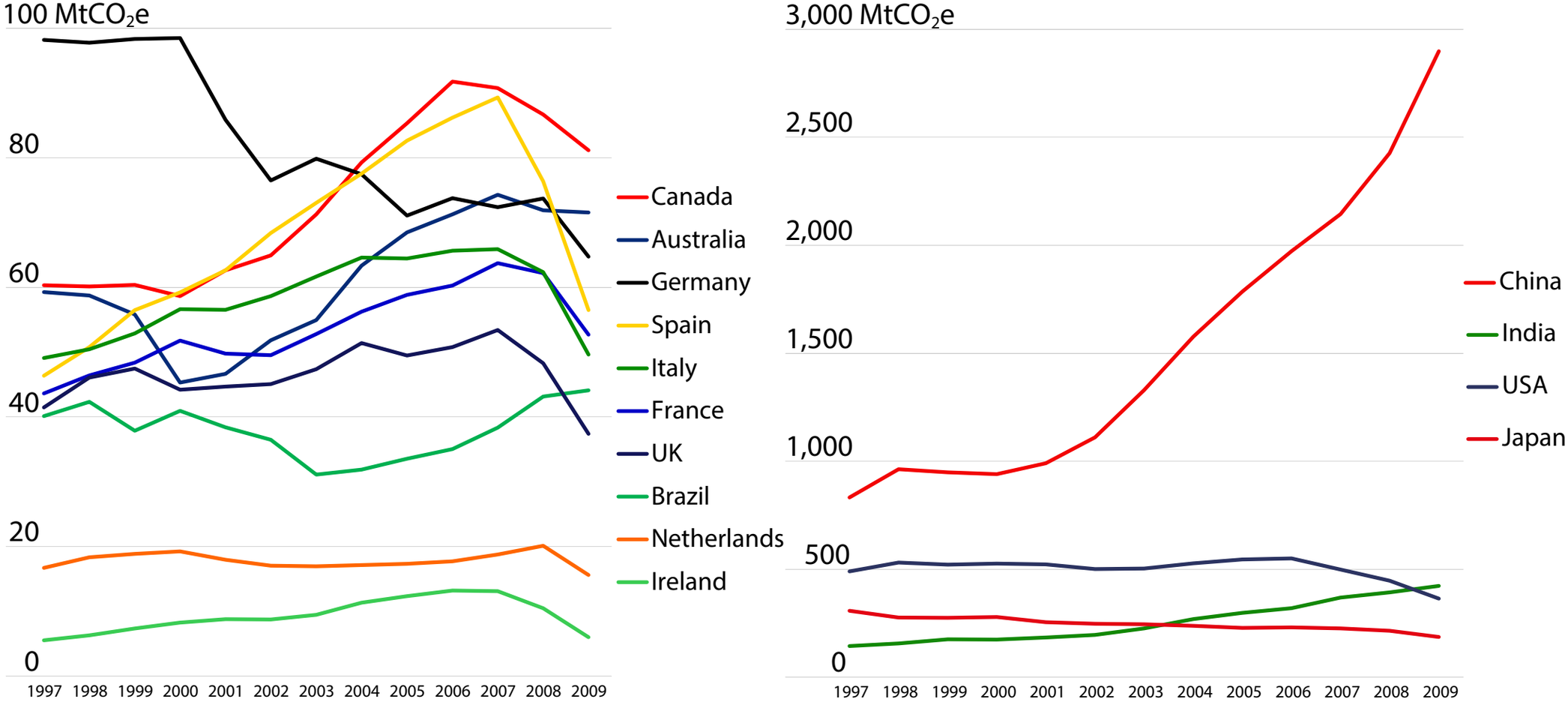
» Co-ordinated advocacy for change

» Proactive efforts to push information up the supply chain

» Recognising the importance of individuals in each project and organisation

Vast global potential

GHG emissions of construction sector supply chain by country



» 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'

Summary

Achieving net zero CO_2 later this century requires urgent action now

» Current consumption of resources is unsustainable

» The net zero emissions goal of the Paris Agreement creates a new carbon context

» Earlier mitigation will be more cost effective and reduces dependence upon unproven negative emissions technologies

» Faster progress is needed to get the construction industry back on a trajectory that is consistent with national mitigation targets

» There is a growing body of guidance on measuring and mitigating the embodied impacts of construction products

» 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 now.

» Delivering a healthy planet will require healthy building products