

Drivers and barriers to the adoption of sustainable materials

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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 the universities of Leeds, Bath, Cardiff and Nottingham Trent, plus contributions from the Green Alliance



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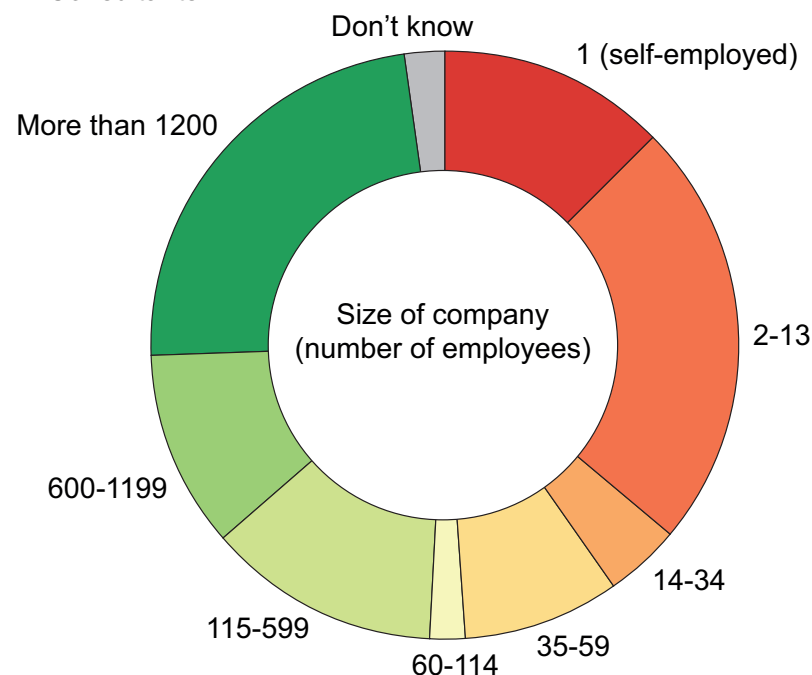
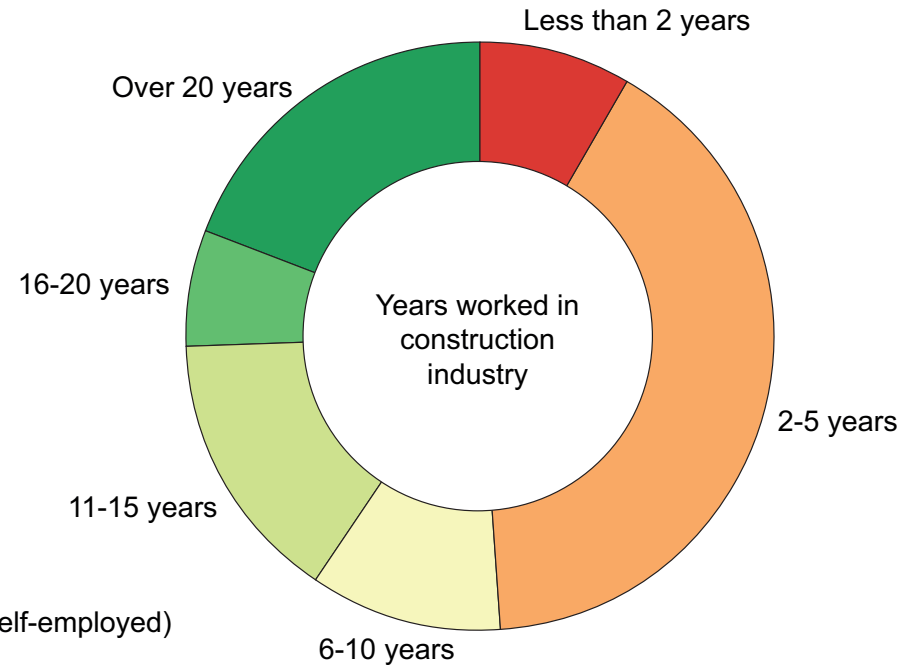
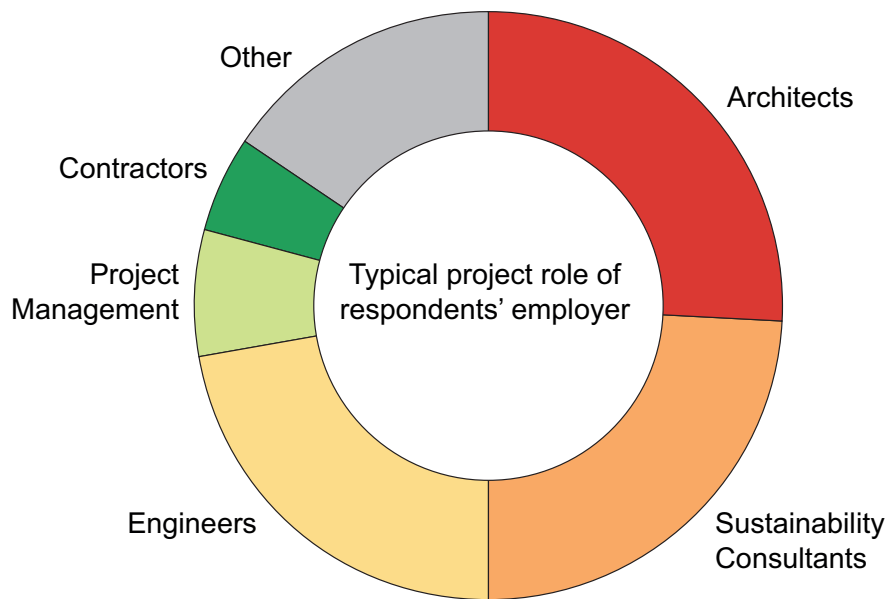
Barriers to use of low carbon materials

According to the literature

Institutional and Habitual	Economic	Technical and Performance-related	Knowledge and Perceptions
<p>Institutional culture and established practice promotes preferred material palette</p> <p>Focussed training and recruitment results in departmental lock in to familiar materials</p> <p>Time constraints incentivise familiar 'copy-paste' designs</p> <p>Lack of established advocacy groups</p> <p>Lack of effective marketing from producers</p> <p>Lack of user-producer relationships</p> <p>Influence of industry trends</p> <p>Habitual specification and historic practice of individual practitioners</p> <p>Viewed as outwith responsibility or remit of any individual</p> <p>High level of design inconvenience</p>	<p>High cost of new products</p> <p>Market externalises cost of embedded emissions</p> <p>Uncertainty premium placed on novel options</p> <p>High transaction costs of additional professional training and research</p> <p>Money sunk in existing materials (in terms of training, establishing relations with supply chains etc.)</p> <p>Lower design:fee ratio because of increased detailing</p> <p>Insufficient comparative information on costs</p> <p>Unwillingness to accept risk</p> <p>Project financing incompatible with time constraints</p> <p>Anticipated increase in lead times</p> <p>Small industries producing alternatives cannot compete against established industries' economies of scale</p>	<p>Lack of established standards, design guides and tools, and standardised details</p> <p>Lack of material performance data</p> <p>Lack of full-scale demonstration projects</p> <p>Policy and regulatory limitations and restrictions</p> <p>Lack of confidence in contractor ability and availability of skilled labour prevents inclusion in design</p> <p>Shortage of specialist skills prevents installation</p> <p>Insufficiently developed supply chains</p> <p>Local availability of materials and technologies</p>	<p>Lack of awareness and practical knowledge of alternatives amongst practitioners</p> <p>Lack of client knowledge of alternatives</p> <p>Negative perceptions amongst practitioners based on past experiences</p> <p>Negative perceptions held by clients</p> <p>Insufficient fit with the culture of the clients/inhabitants</p> <p>Perceived unreliability or risk of new alternatives</p> <p>Perceived concerns about material sourcing prevent selection</p> <p>Policy uncertainty</p> <p>Regarded as low priority and other considerations take precedence</p>

Survey demographics

47 responses; range of professions, companies and experience

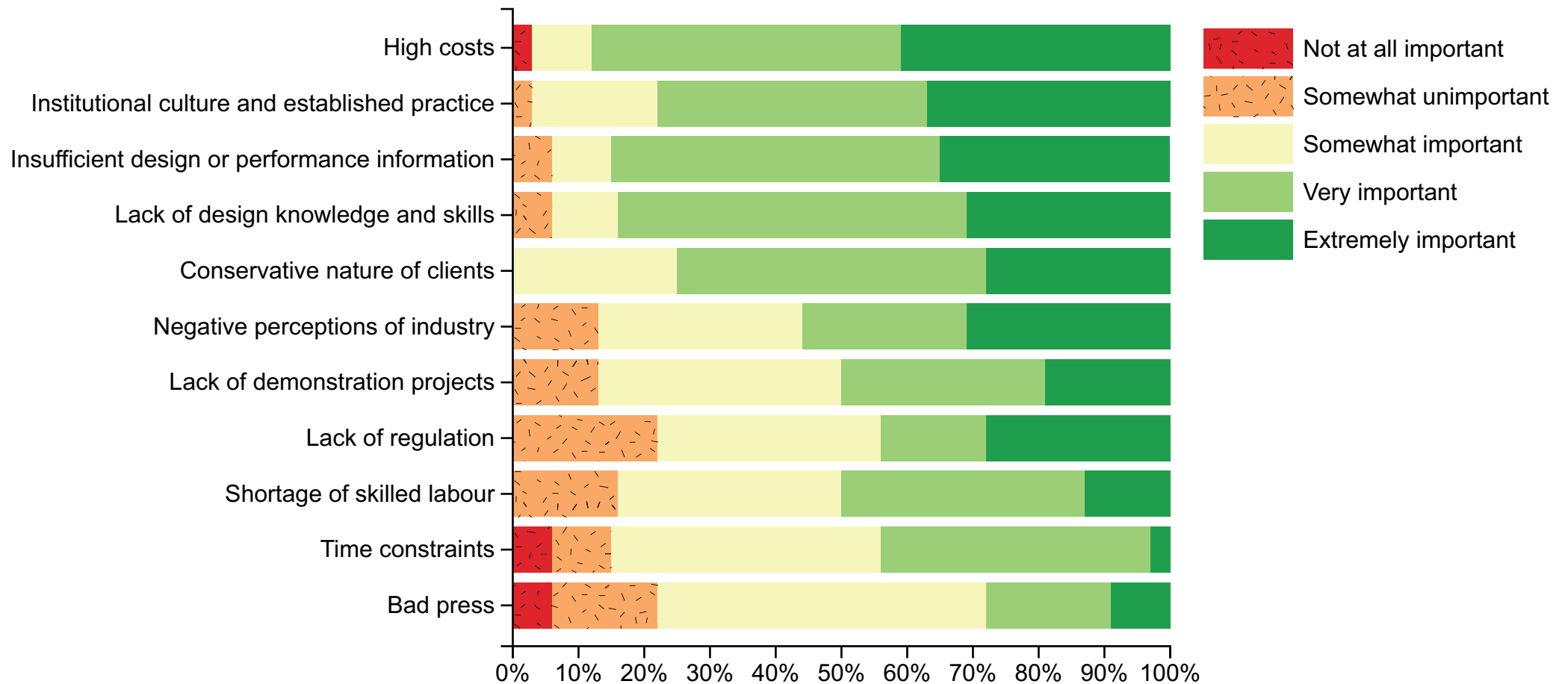


Survey results

General barriers

Responses to survey question #19:

Thinking more generally about alternative materials in construction, how important do you believe the following factors are in preventing their use?

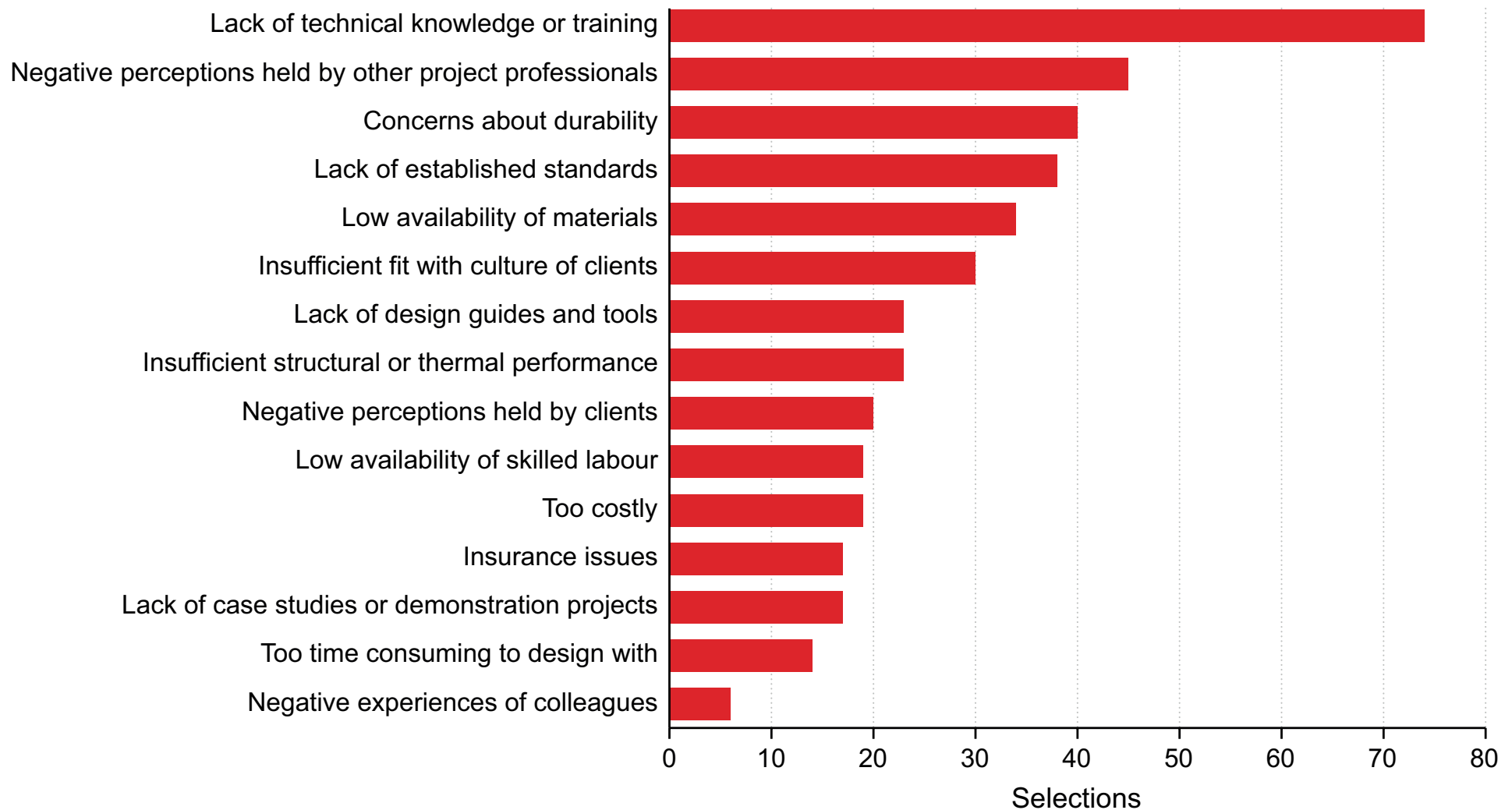


Survey results

Specific experiences

Responses to survey question #17:

You stated that you are aware of but have not used the following materials on a project. Why have you chosen not to use these materials?



Survey results

Principal barriers

- » Perception of high costs
- » Dearth of knowledge, understanding and skills
- » Lack of quality benchmark data
- » Availability of product carbon information
- » Insufficient allocation of responsibility for embodied carbon reduction
- » Industry culture
- » Low value of materials
- » Negative perceptions of low carbon materials
- » Lack of demonstration projects and product testing

Survey results

Features of projects with successful adoption of novel materials

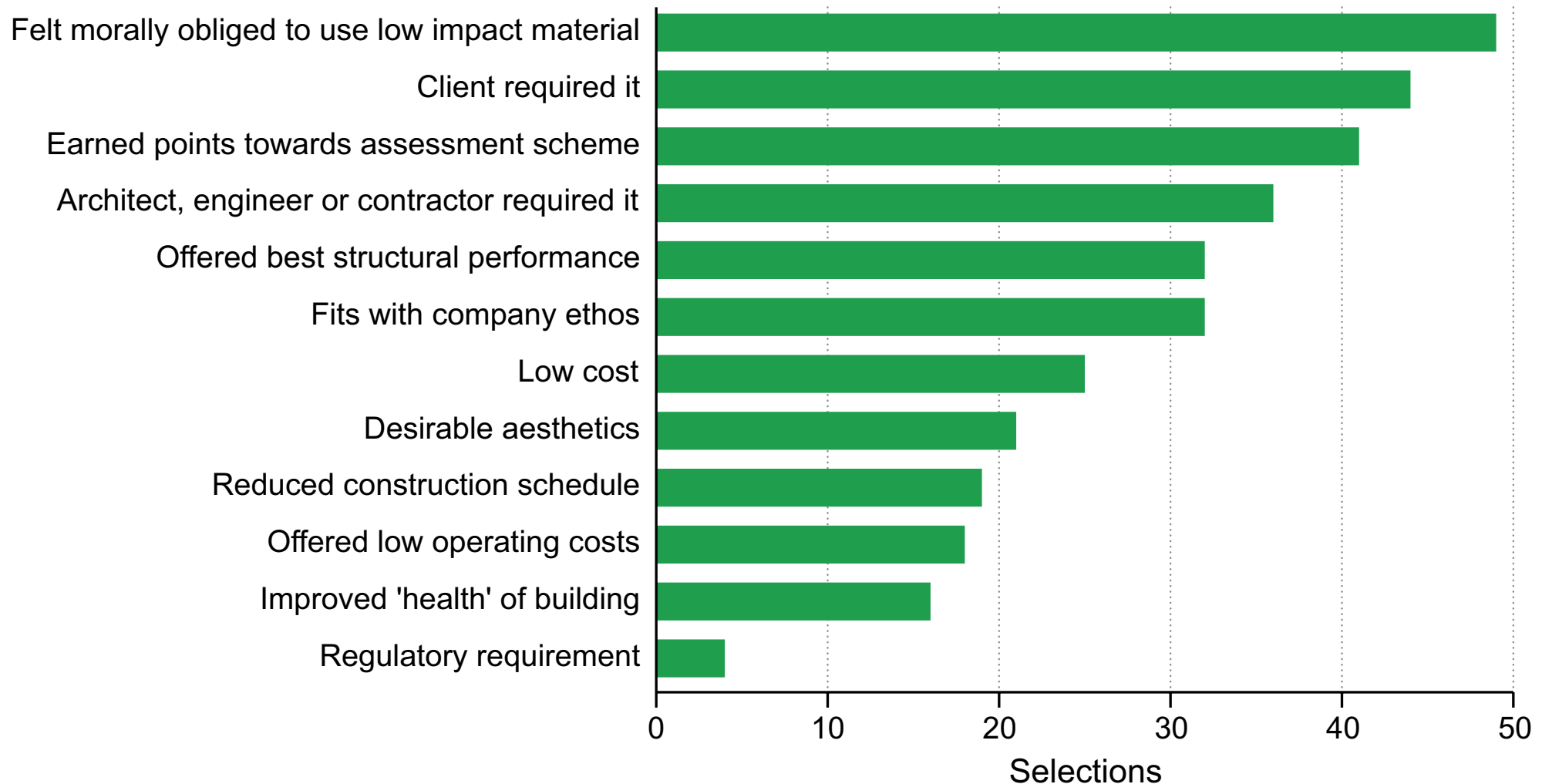
- » Highly motivated client
- » Early engagement of full supply chain
- » Targets and contractual obligations that ensure alignment of value chain
- » Novel materials positioned as integral to satisfaction of project constraints
- » Frequent communication and knowledge shared across project team

Survey results

Current drivers

Responses to survey question #13:

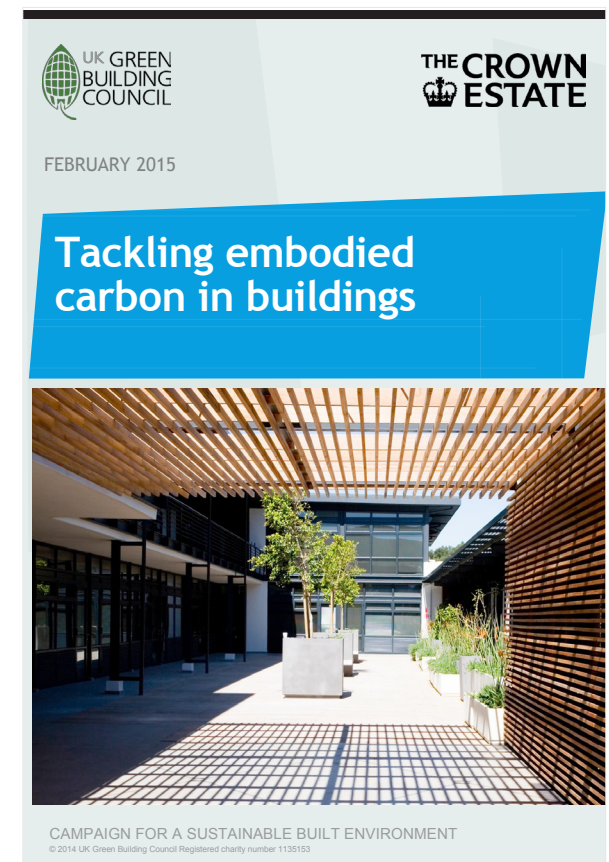
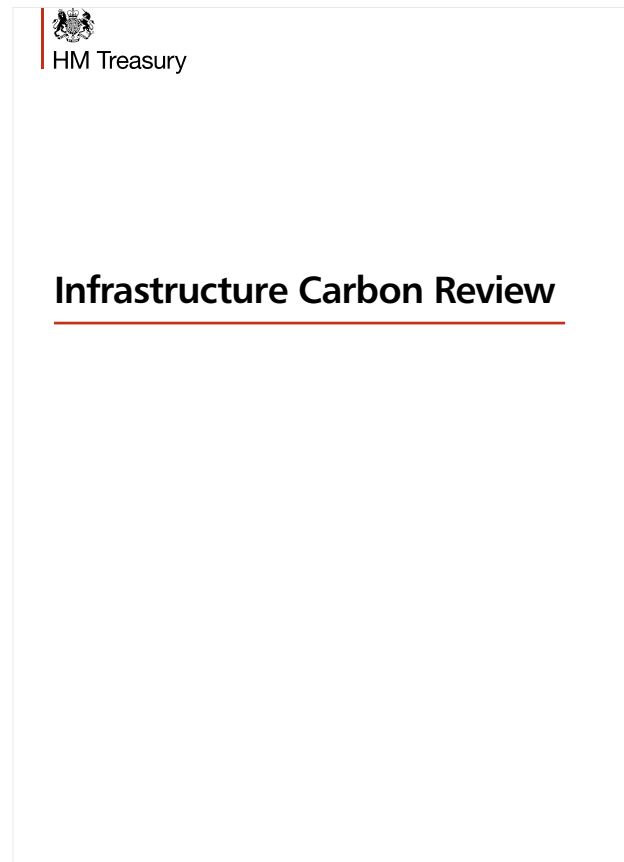
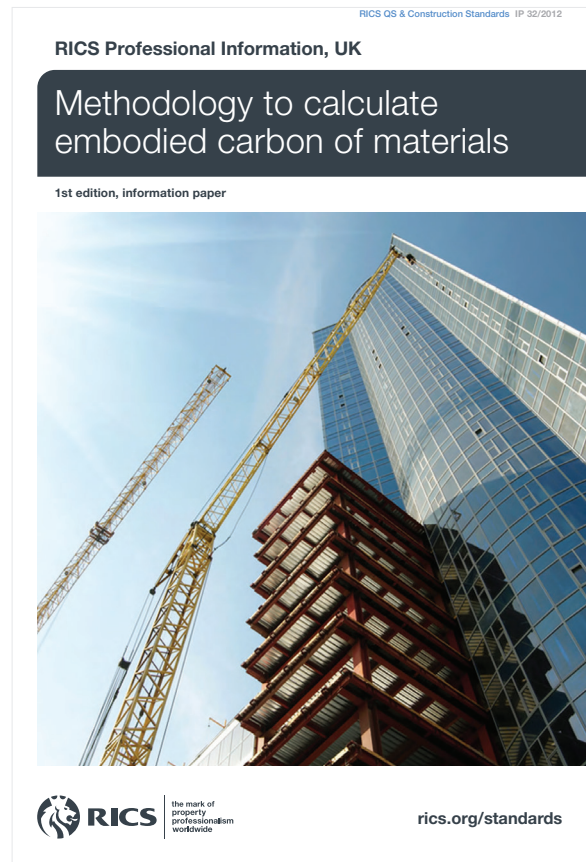
Thinking about the projects on which you used these materials. Why did you choose to use each material?



Drivers of low carbon construction

Client demands

- » 50+ organisations signed up to Infrastructure Carbon Review
- » 30+ organisations with commitments to measure or reduce embodied carbon in buildings
- » 10+ Local Authorities interested

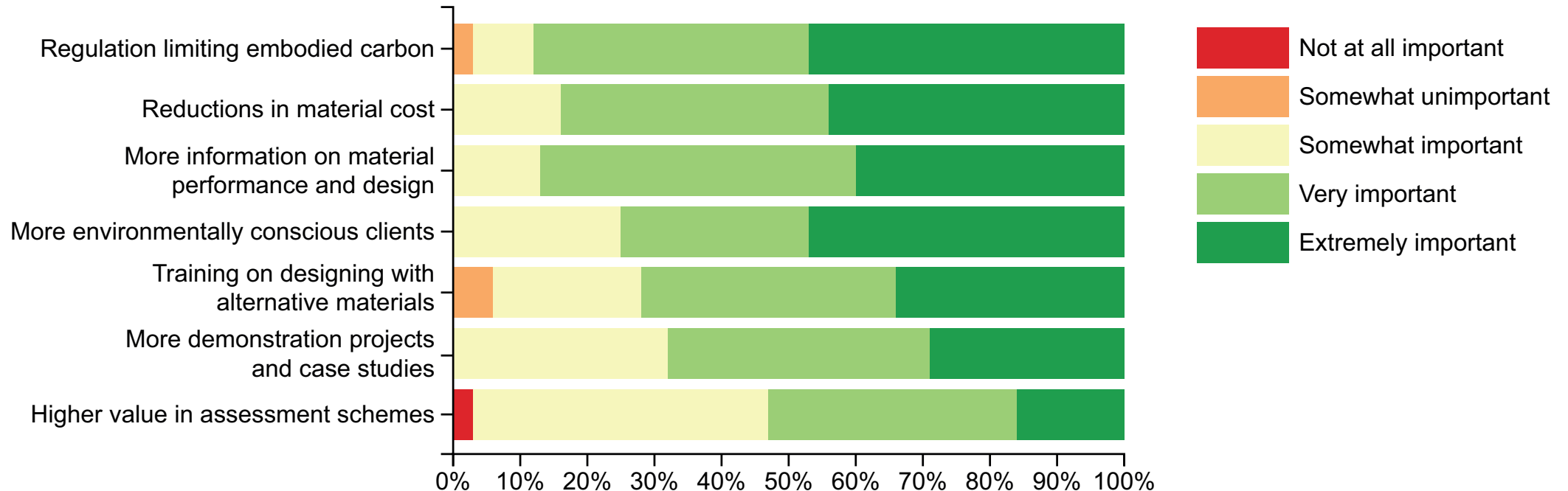


Survey results

Potential drivers

Responses to survey question #21:

How important do you believe the following developments could be in encouraging greater use of alternative materials and construction products?



Interview results

The importance of drivers

*“Architects and engineers want to produce better buildings. If by managing embodied carbon, as well as operational carbon, you’re producing a better building then there’ll be no resistance at all. But you’ve got to think about the drivers for that. The drivers need to be cost and regulatory. **If you’ve got the drivers there it’ll just get done.** No-one will even begin to question it.”*

Chair of embodied carbon task force

Why use sustainable materials?

Potential benefits

- » Improved resource efficiency
- » Embodied/capital carbon reduction
- » Improved air quality and occupant health
- » Better resource security
- » Greater energy efficiency
- » Improved social sustainability (e.g. local employment) etc.

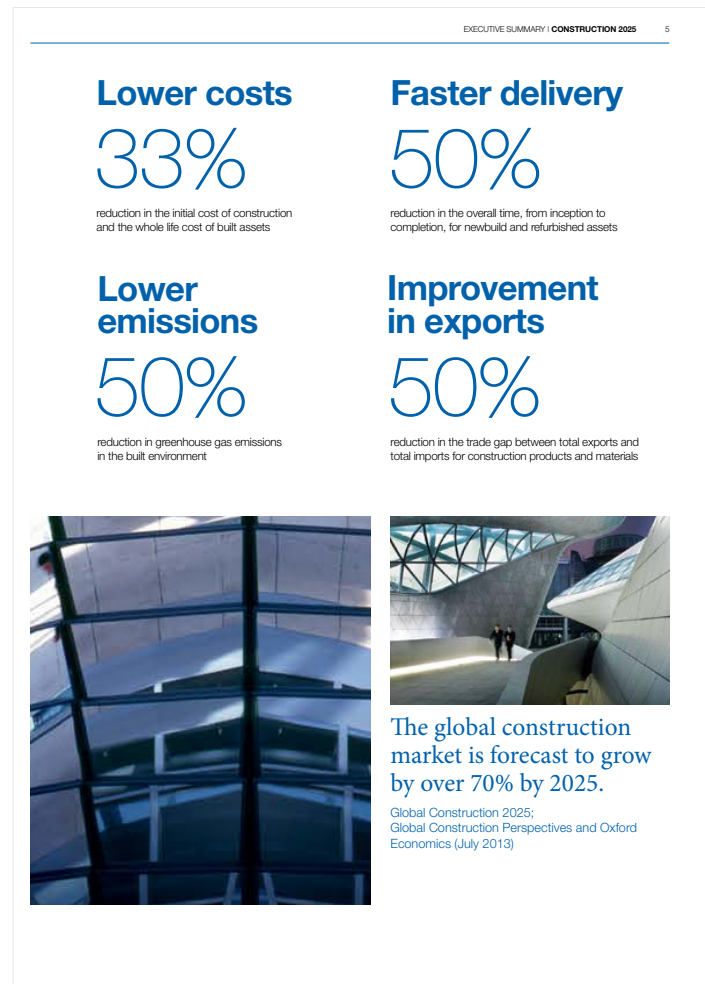
Drivers and incentives

- » Cost savings
- » Client demands
- » Credits in environmental assessment schemes (BREEAM, LEED etc.)
- » Green reputation
- » Moral convictions

Construction 2025

Targets 50% reduction in greenhouse gas emissions

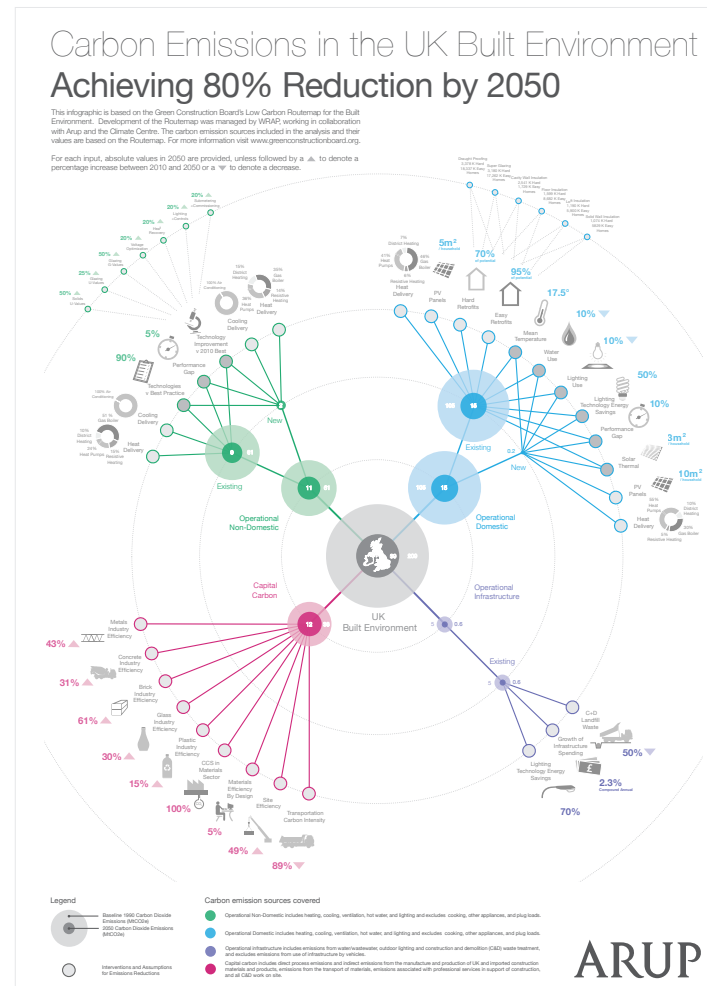
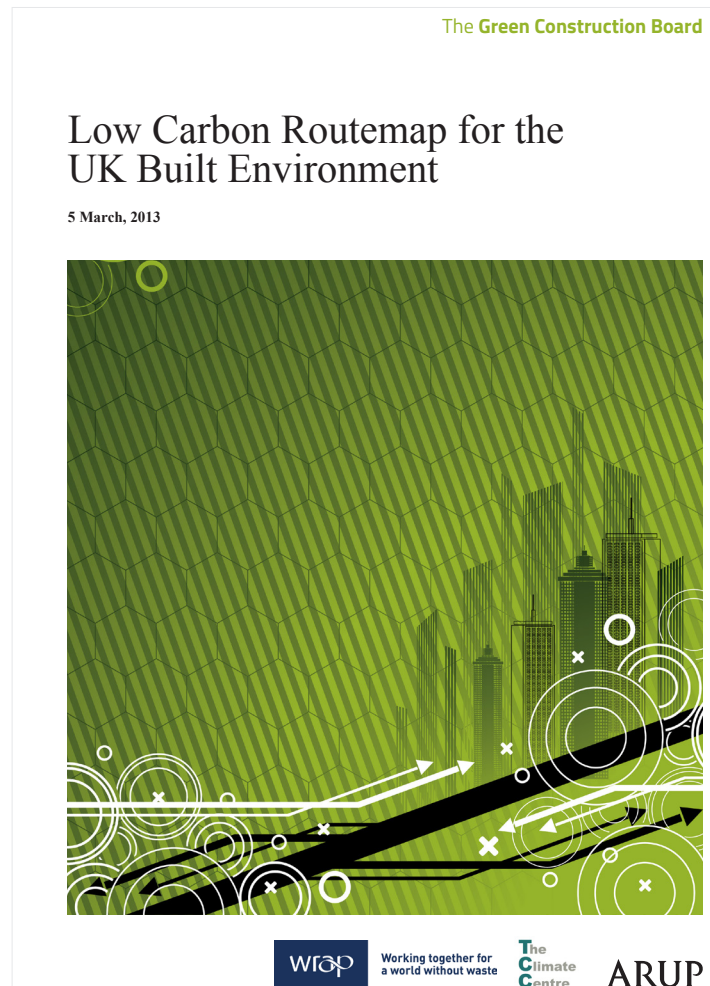
» Envisages a sustainable industry that *“leads the world in low-carbon and green construction exports”*



Low Carbon Routemap

Initial report set out target trajectory to 2050

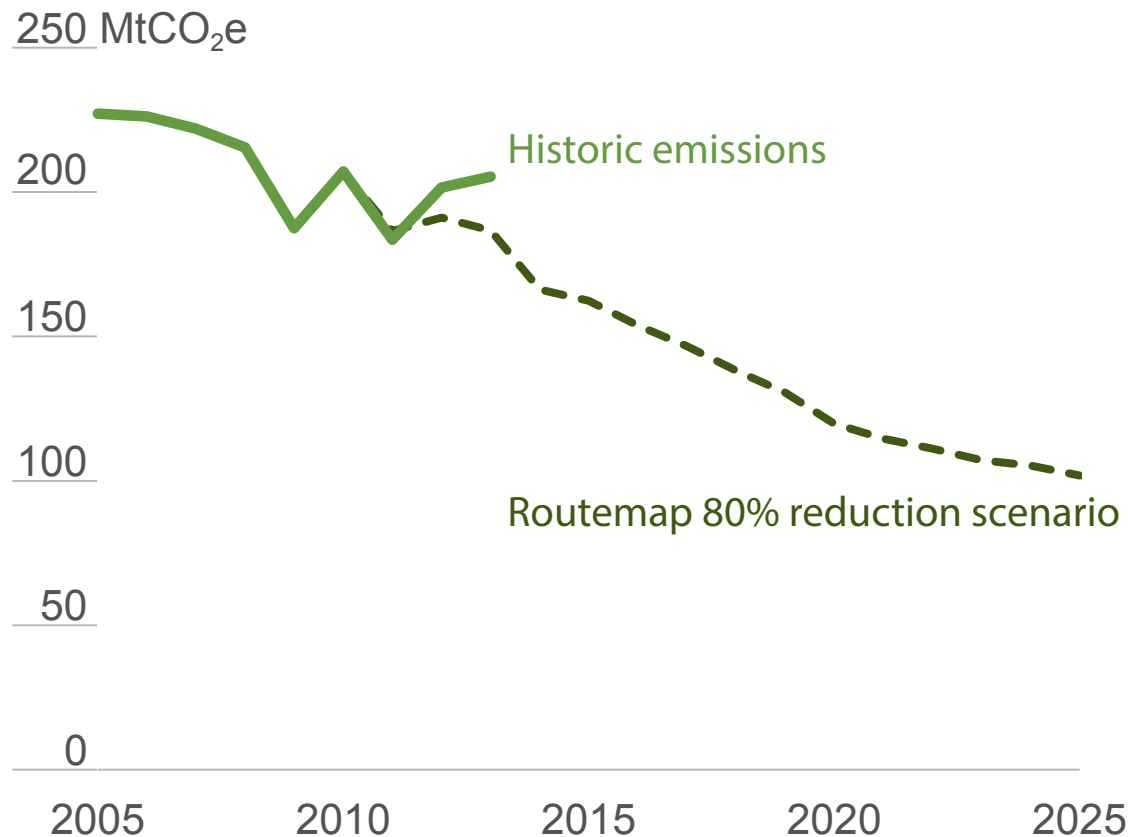
- » 2013 routemap showed substantial reductions in capital carbon required **in addition to** operational reductions



Low Carbon Routemap

Progress report produced in December 2015

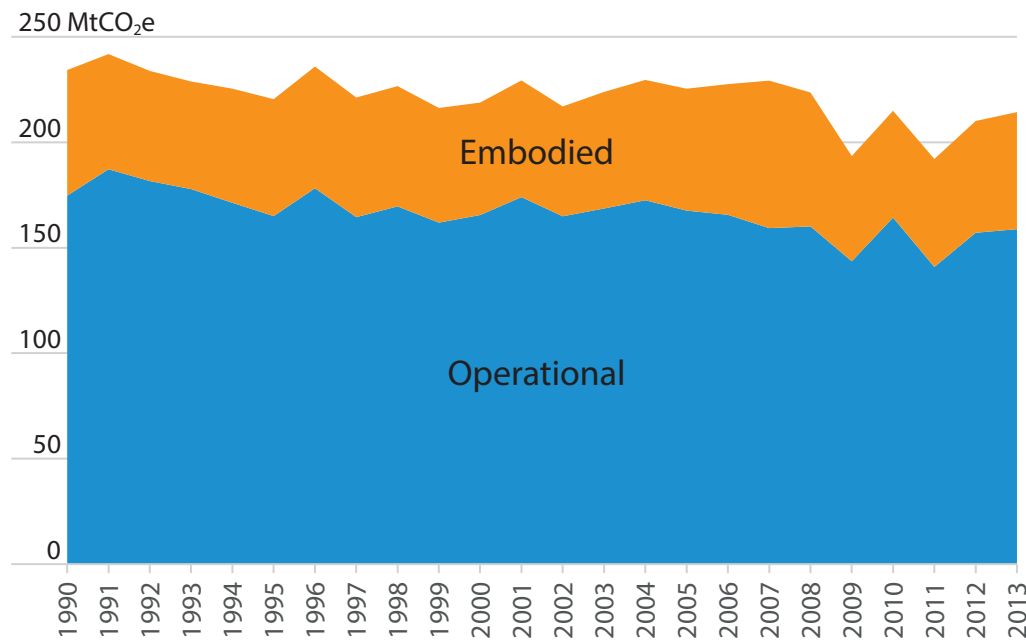
- » Capital carbon emissions have increased since original report
- » Progress to 2013 suggests we are not on trend to meet 2025 ambitions



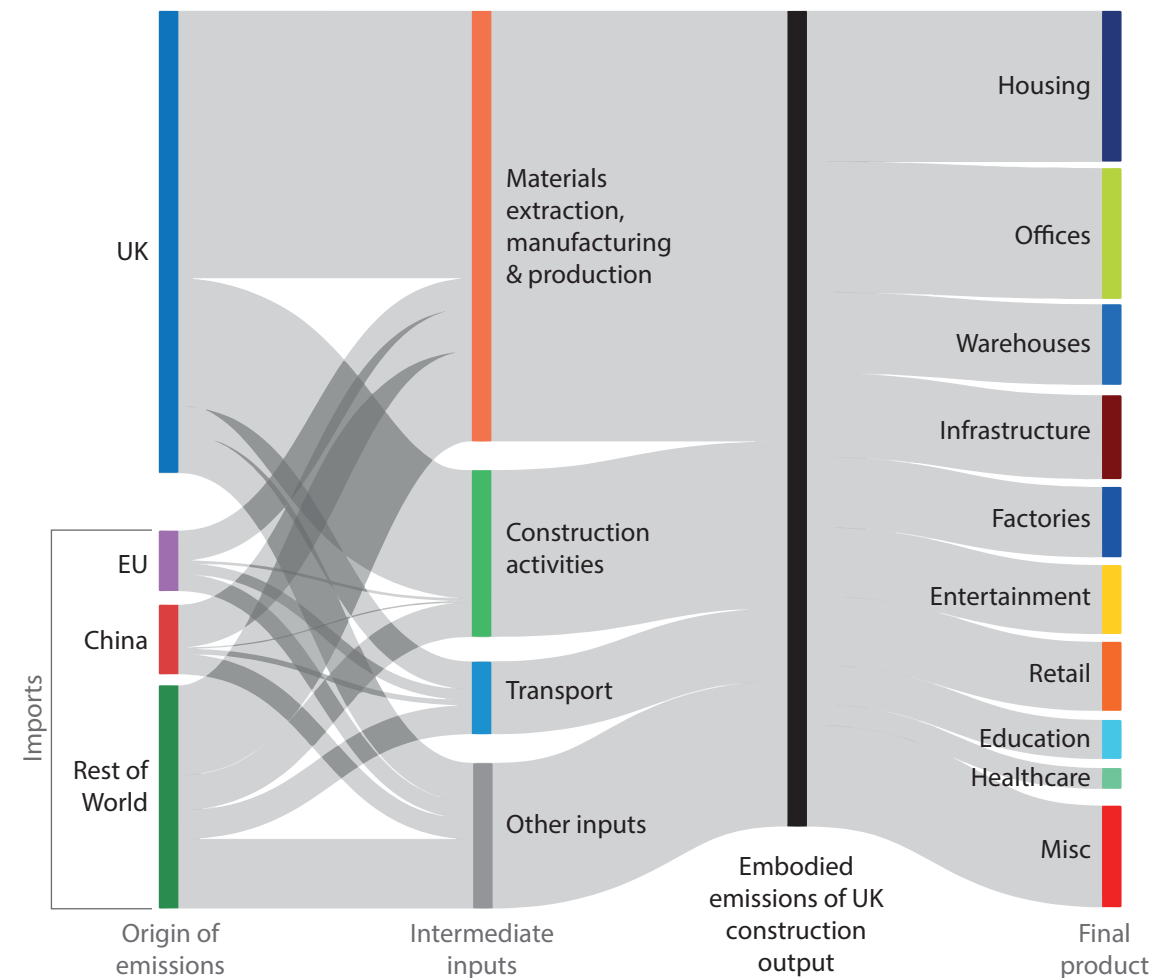
Embodied carbon in construction

Estimated carbon footprint of UK construction supply chain

» Built environment emissions 1990-2013



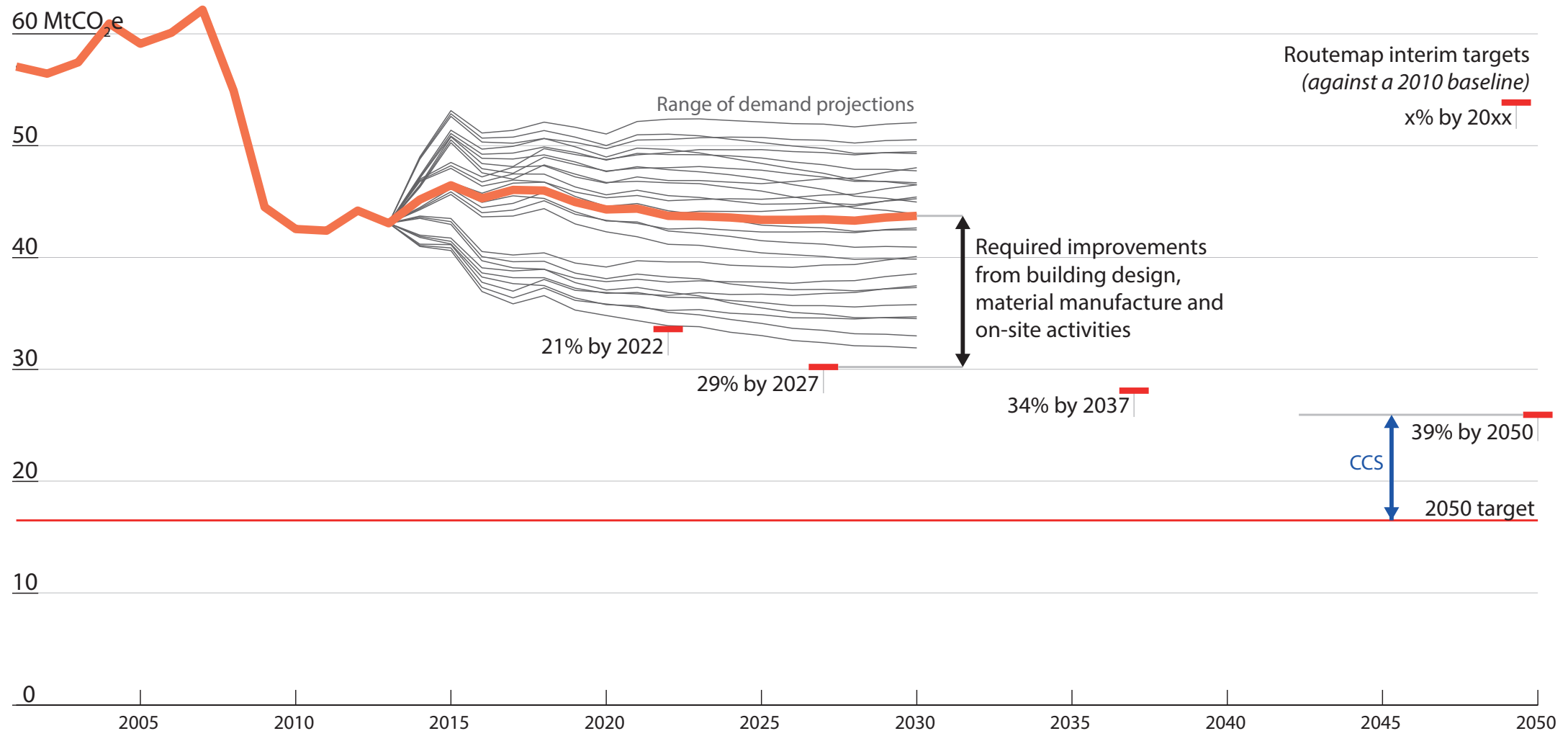
» Embodied emissions in 2007



Required reductions

Anticipated embodied emissions of UK construction 2001-2030

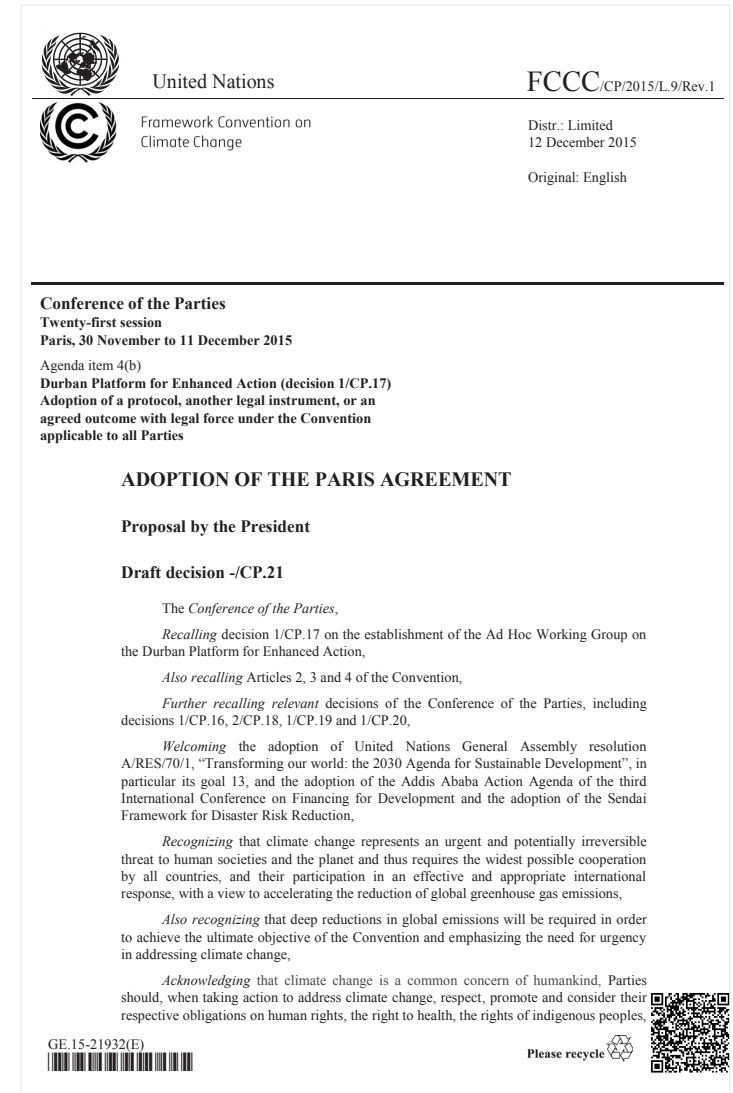
- » 27 scenarios using UK Buildings and Infrastructure Embodied Carbon model
- » **Including** improvements in grid intensity from DECC



Paris Agreement on climate change

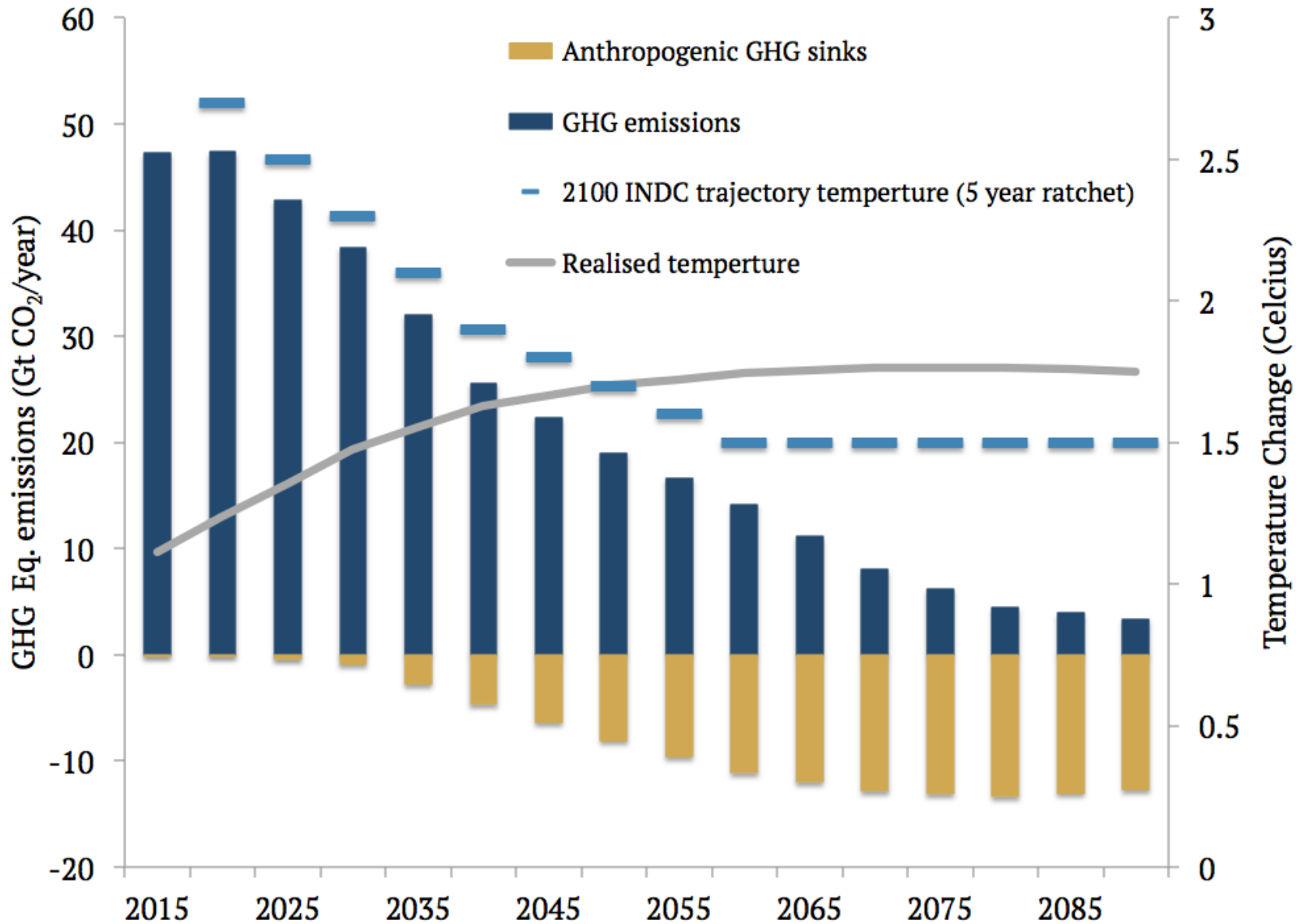
Global agreement in December 2015

- » Commits to *“holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels”*
- » With goal of achieving *“a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century”*



What might this look like?

One potential pathway



Targets not yet translated into policy

And it may be some time until they are

“The government believes that we will need to take the step of enshrining the Paris goal for net zero emissions in UK law. The question is not whether but how we do it.”

Andrea Leadsome (on 14th March)

“I am not prepared to look back at my time here in this Parliament, doing this job and say to my children’s generation: I’m sorry - we knew there was a problem...but we ducked the difficult decisions and we did nothing”

George Osborne (on 16th March)

How to turn targets into drivers?

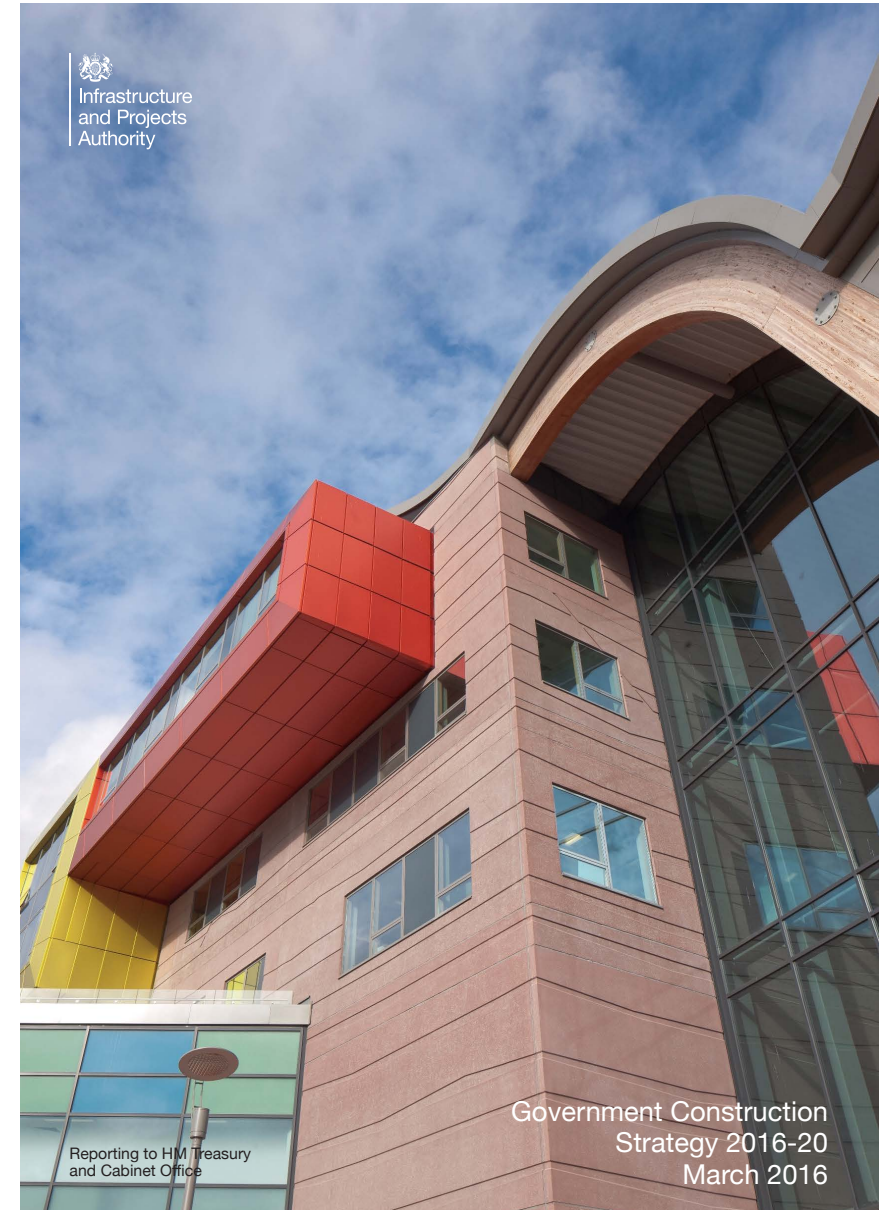
Industry and academia must address the following

- » Ownership of the issue (within industry and within government)
- » Advocacy
- » Evidence gathering
- » Developing the narrative
- » Demonstrating leadership

Government Construction Strategy

For the current parliament

- » One of the principal objectives is to *“enable and drive whole-life approaches to cost and carbon reduction”*
- » Objective 3.6 is to *“Develop data requirements and benchmarks for measurement of whole-life cost and whole-life carbon (embodied and operational).”*
- » *“Government contracts will encourage innovative sustainability solutions on carbon reduction where value can be demonstrated.”*
- » Ultimately forming *“recommendations for a future approach”*



Other signs of progress

Domestic

- » PAS 2080 Carbon Management in Infrastructure
- » Ongoing Innovate UK funded project on 'Implementing Whole Life Carbon In Buildings'
- » Number of recently produced EPDs
- » Variety of guidance documents (from UKGBC, RICS, WRAP etc.)

International

- » EC proposals for common indicators in assessing the environmental performance of buildings
- » Mandatory measurement of embodied carbon on residential and office developments over 100m² in the Netherlands and on public projects in Germany (similar requirements proposed for Singapore)
- » Product level regulations in France and Belgium requiring EPDs to support environmental claims

Upcoming project

Public perceptions and experiences of low carbon materials

- » Recently received funds to run a series of workshops assessing 'public perceptions and experiences of low carbon building materials'
- » Collaboration between universities of York, Sheffield and Leeds
- » Project inception meeting later this year will bring together experts from industry, public policy and academia
- » For more info please contact J.Giesekeam@leeds.ac.uk



Scope for mitigation in infrastructure

Assessment of embodied carbon in NIP for CCC

- » High level assessment projected ~244 MtCO₂e associated with 2014 NIP
- » Next step is to integrate embodied carbon into asset level demand projections



Summary

Drivers and barriers to sustainable material use

- » Many potential benefits but few strong drivers for sustainable material use
- » Uptake currently driven by moral convictions and a limited business case
- » Long term carbon reduction targets imply greater uptake is essential
- » Modelling shows the significant role sustainable materials must play
- » Industry, academia and government must work together to translate ambitious targets into robust drivers