

From Paris to projects: Aligning carbon targets in construction

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CIE-MAP publications

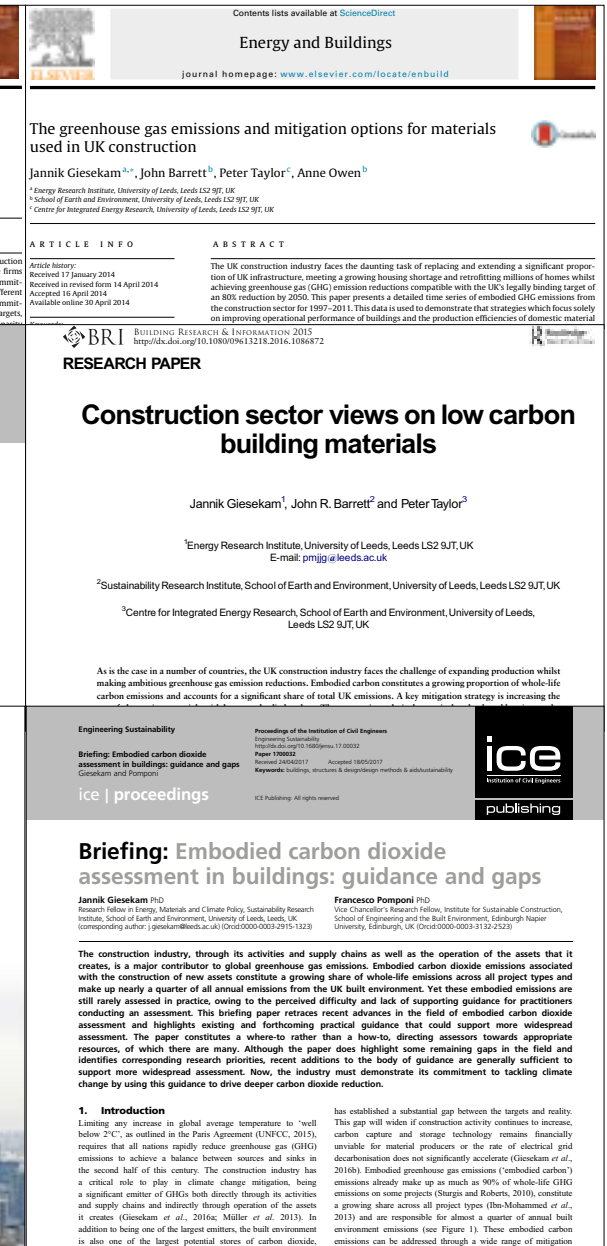
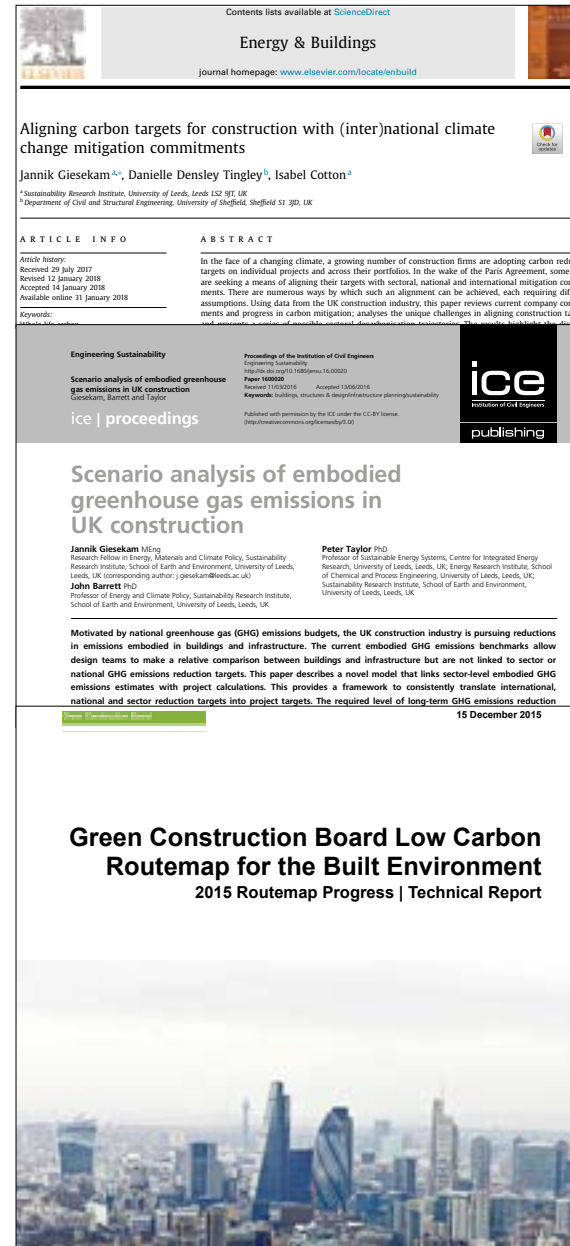
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On embodied/whole life carbon reduction in the built environment

- » Mitigation options and barriers
- » Scenario analyses and the use of project/company carbon targets
- » Reporting progress against the Green Construction Board's Low Carbon Routemap
- » Practitioner and public perceptions of low carbon building materials

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Agenda

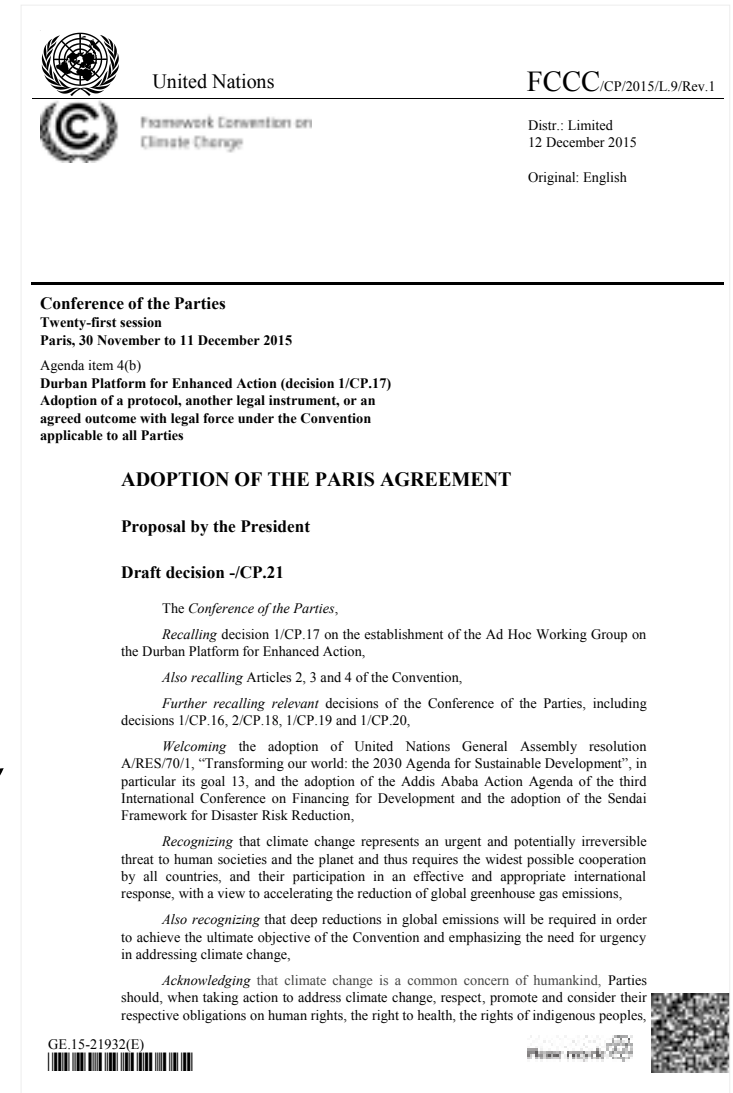
Few slides on

- » Implications of the Paris Agreement
- » Progress in carbon reduction – global picture & UK built environment
- » Current targets for carbon reduction within UK industry
- » Uptake of Science Based Targets
- » Delivering effective and collective target alignment

Paris Agreement on climate change

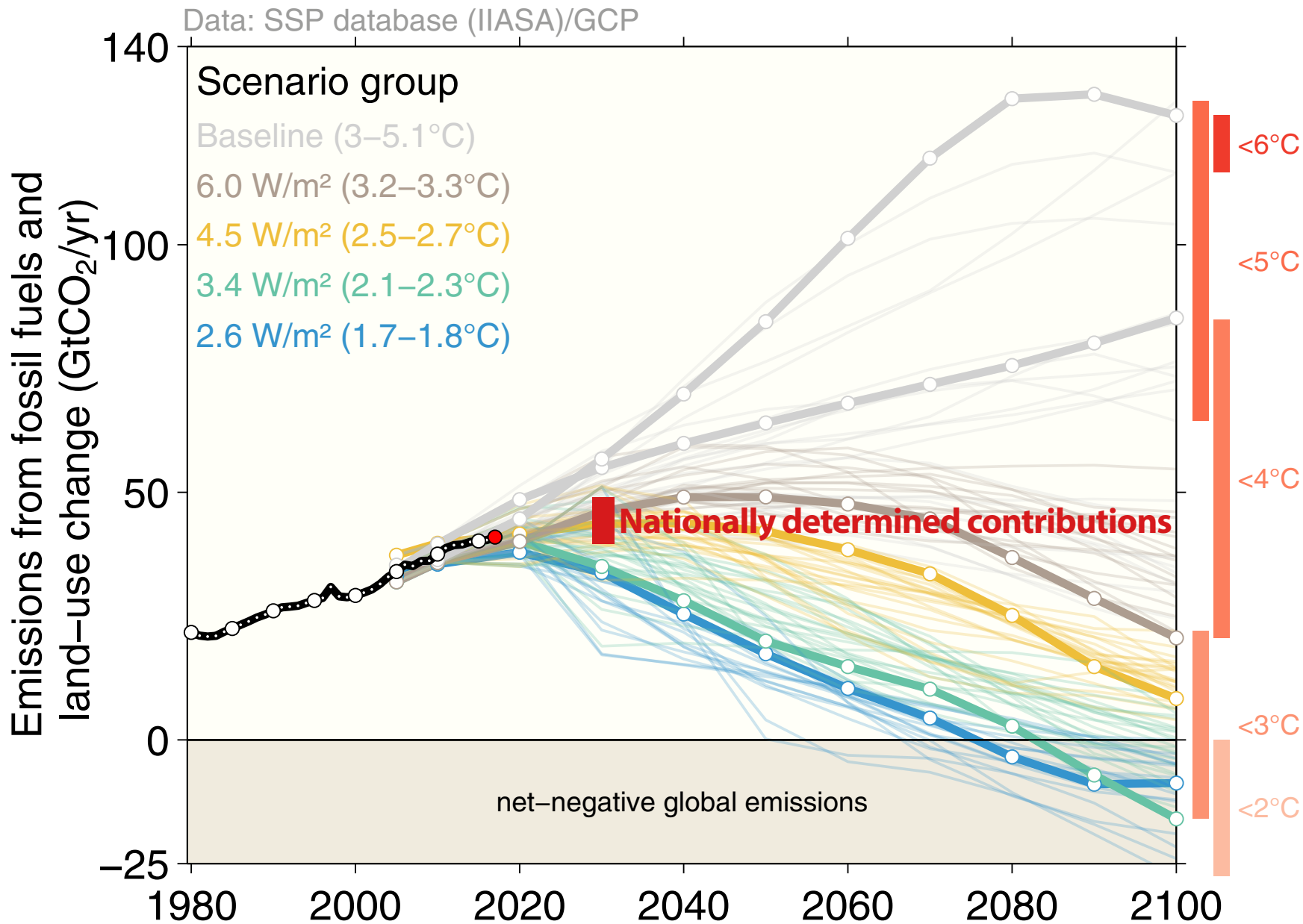
Global agreement made in December 2015

- » Came into force on 4th November 2016
- » 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”*
- » 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
- » Recognises *“common but differentiated responsibilities”*
i.e. developed countries, such as EU28, should lead on carbon reduction and adopt more ambitious targets
- » Commits parties to global stock-take and ratcheting up of ambitions every 5 years



Emissions scenarios to 2100

Current commitments likely to yield around 3°C increase



UK carbon targets will be reviewed

Probably near end of 2018

- » On Tuesday, Minister of State for Energy and Clean Growth: *"I am pleased to announce that after the IPCC report later this year, we will be seeking advice from the UK's independent advisers, the Committee on Climate Change, on the implications of the Paris Agreement for the UK's long-term emissions reduction targets."*
- » In 2016 the UK Government already intimated that the net zero goal must enter UK law: *"The question is not whether but how we do it"*



Long term UK goal is net zero emissions

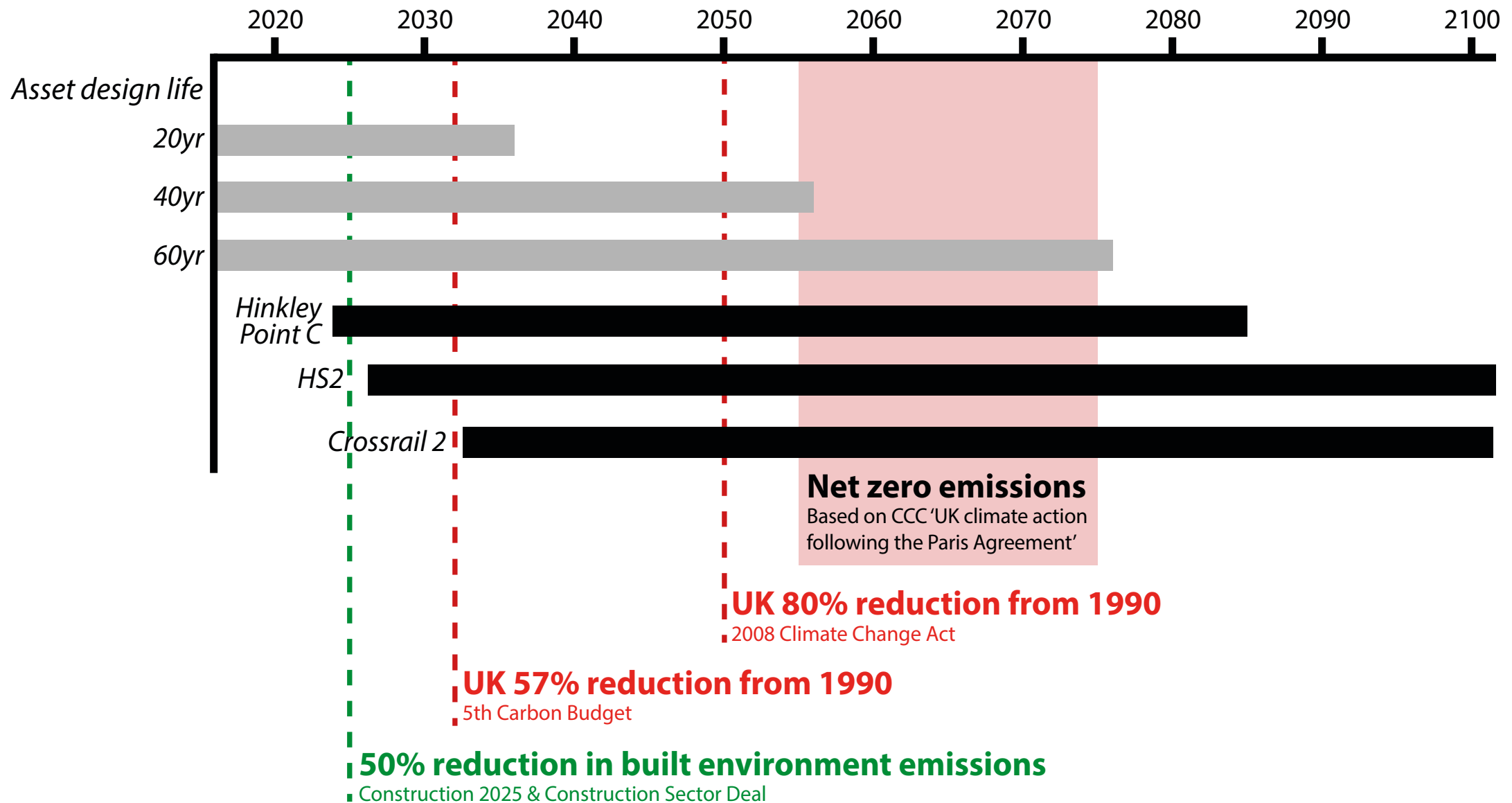
Near the middle of this century

- » In 2016 CCC acknowledged that UK targets will need to be revised in future and that *“the UK’s current emissions targets are not aimed at limiting global temperature to as low a level as in the Agreement”*.
- » CCC advised that the UK must be net zero CO₂ by 2055-2075 for >66% chance of achieving 2°C or before 2050 for 1.5°C



Implications for the built environment

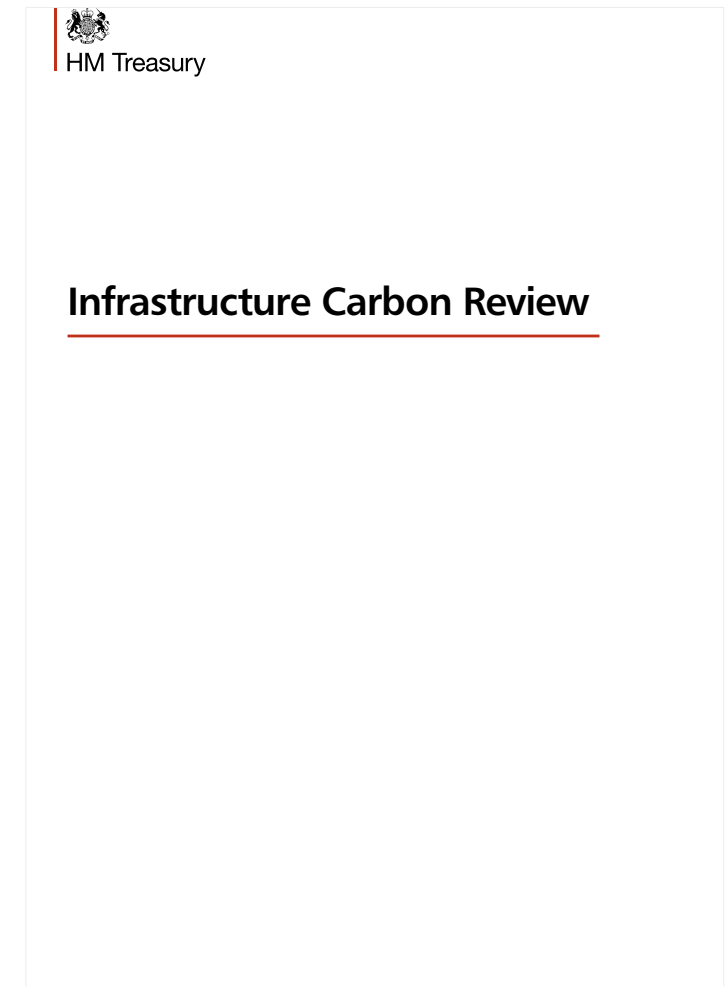
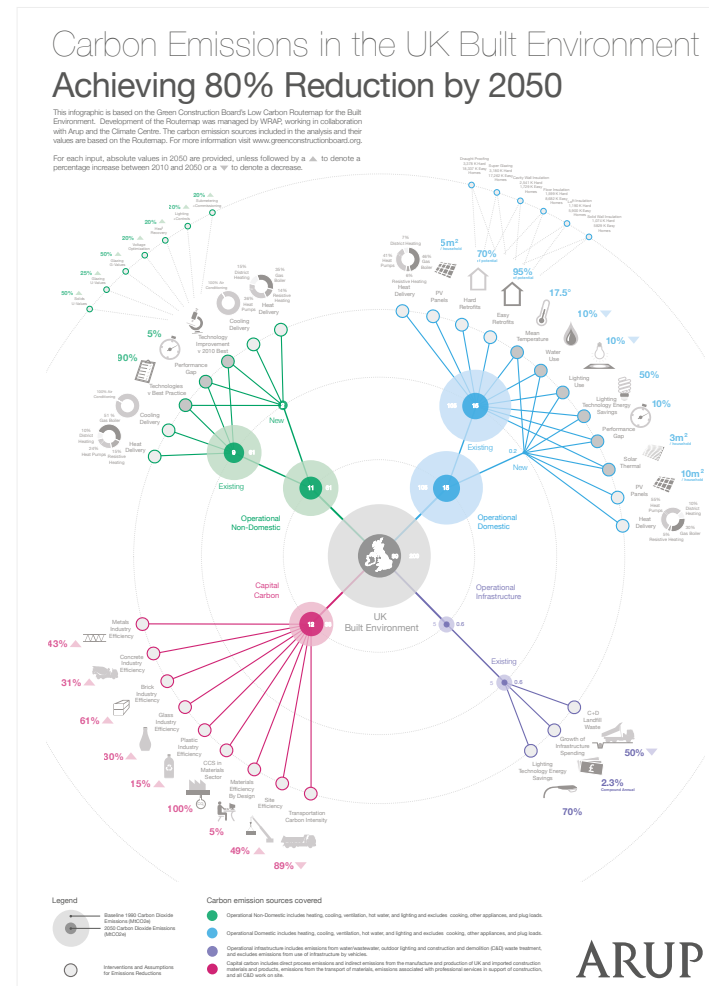
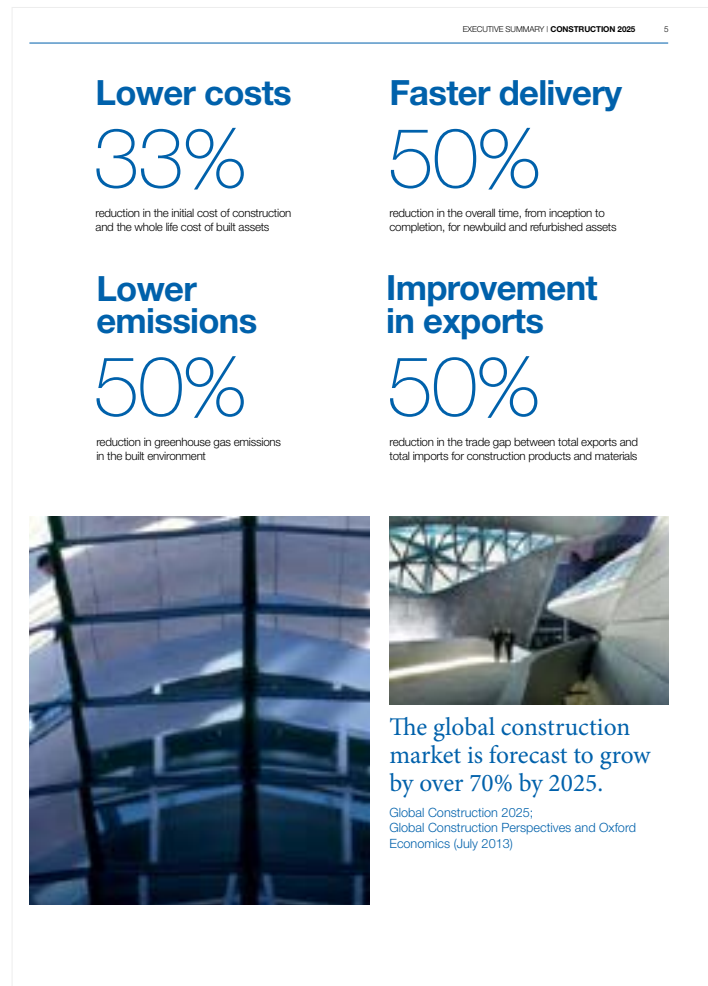
Most assets under design now must operate in a net zero nation



Construction 2025, GCB Routemap and ICR

2013 reports set out required changes and target trajectory to 2050

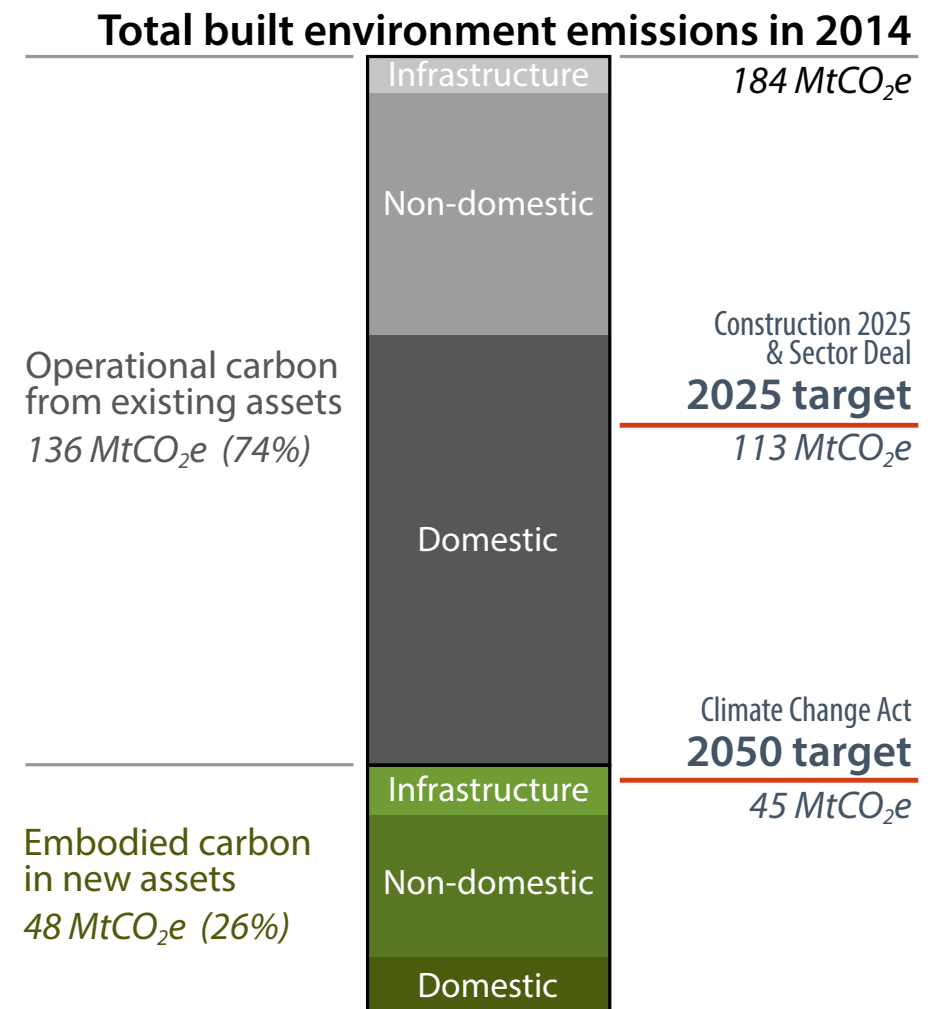
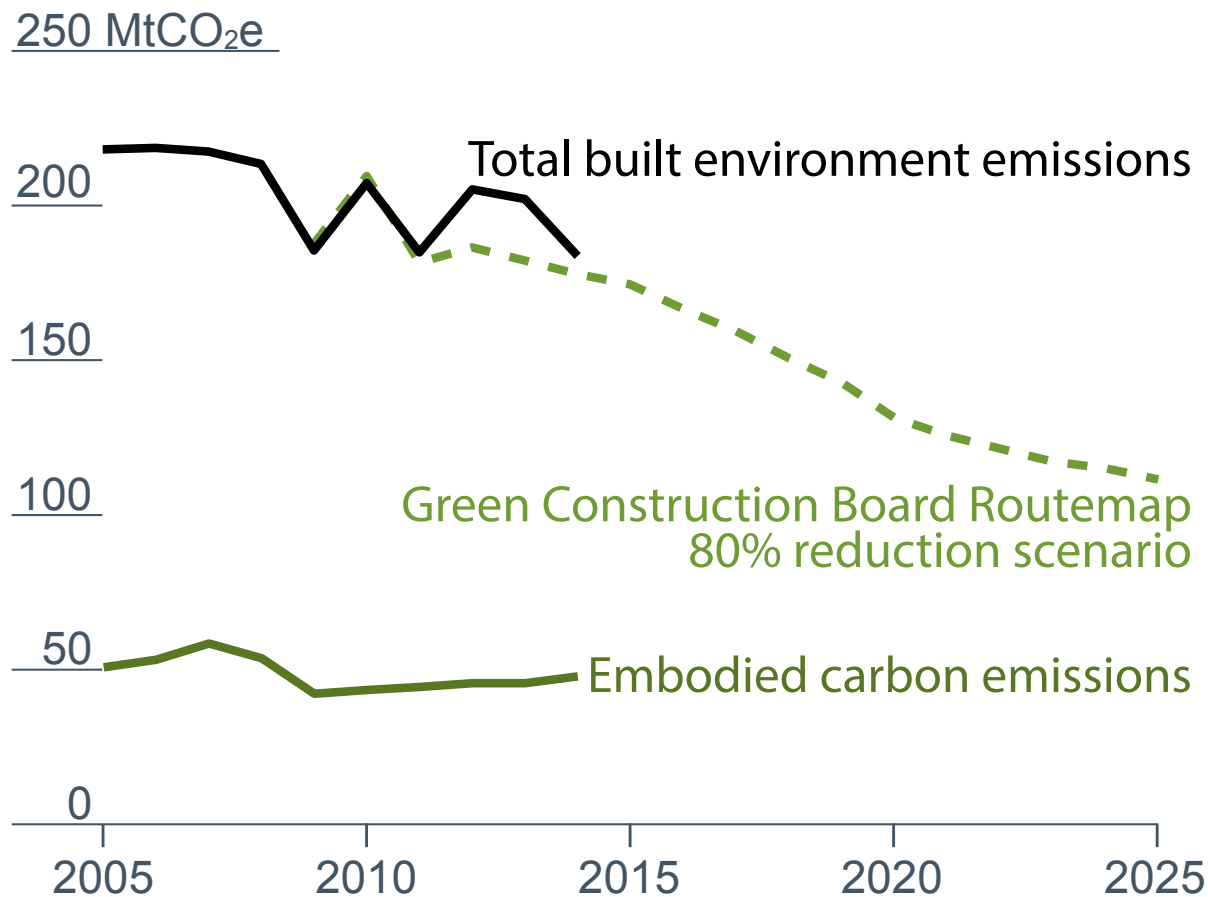
- » Set ambitious carbon reduction targets
- » Provided baselines for 'built environment' and 'infrastructure' carbon emissions



GCB Low Carbon Routemap progress

Progress updates from December 2015 & September 2017

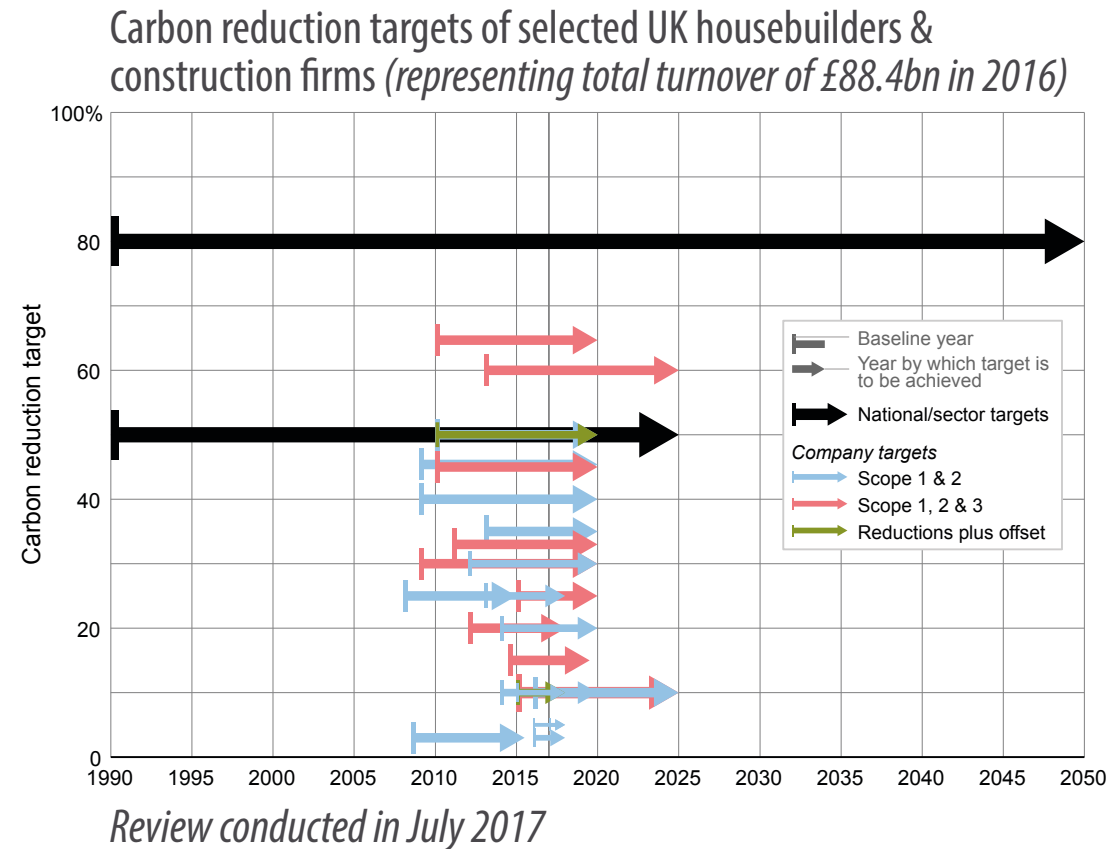
- » We are falling behind the target trajectory partly because of a failure to address embodied carbon emissions



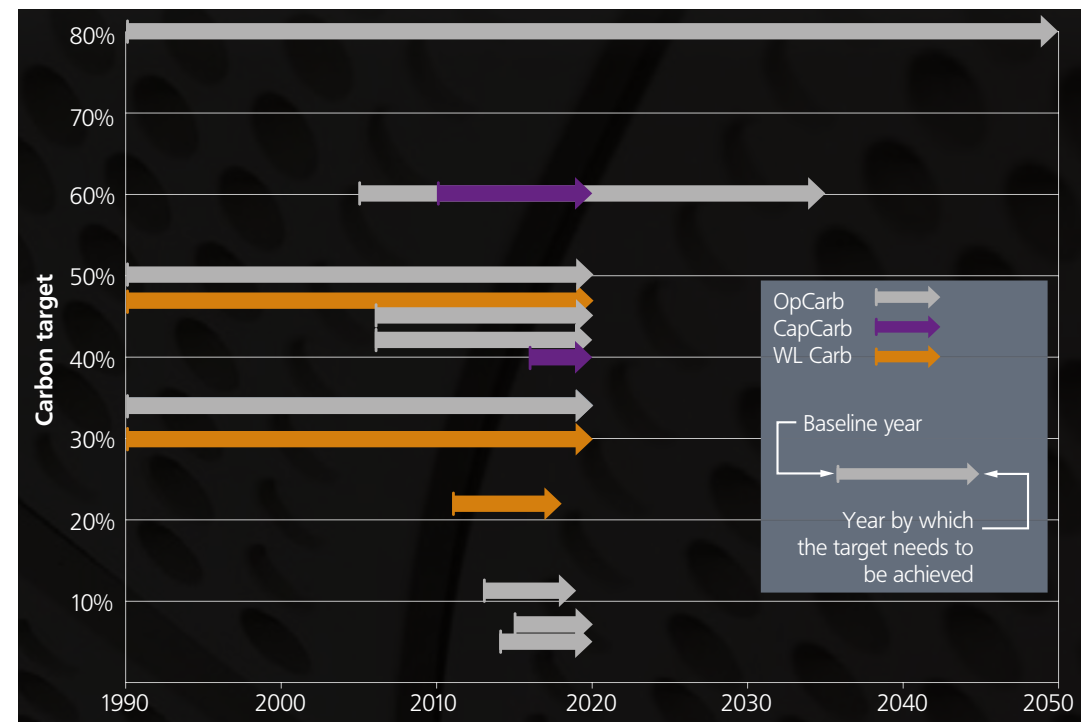
Current company carbon targets

Mostly insufficient but many up for renewal

- » Most firms setting modest short-term targets focussed on Scope 1 & 2
- » Growing minority of firms also targeting Scope 3 reductions



Carbon reduction targets of selected infrastructure clients



Science based targets



Gaining momentum

- » 380 companies globally taking action through SBT initiative (103 with approved targets)
- » >50 companies in construction, real estate and related industries
- » 38 companies with headquarters in UK
- » 17 involved in UK built environment
- » Discussions emerging around collective science based targets for UK sectors (e.g. rail), UK infrastructure or UK built environment as a whole

Delivering low carbon infrastructure

Report assessing current use of carbon targets in infrastructure

*“UKGBC is recommending the establishment of a **whole life carbon target for the infrastructure industry based on climate science** and from which organisations can derive commensurate targets. The monitoring of such a target, and the reporting of progress against it, will be crucial.”*



Delivering Low Carbon Infrastructure



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Questions

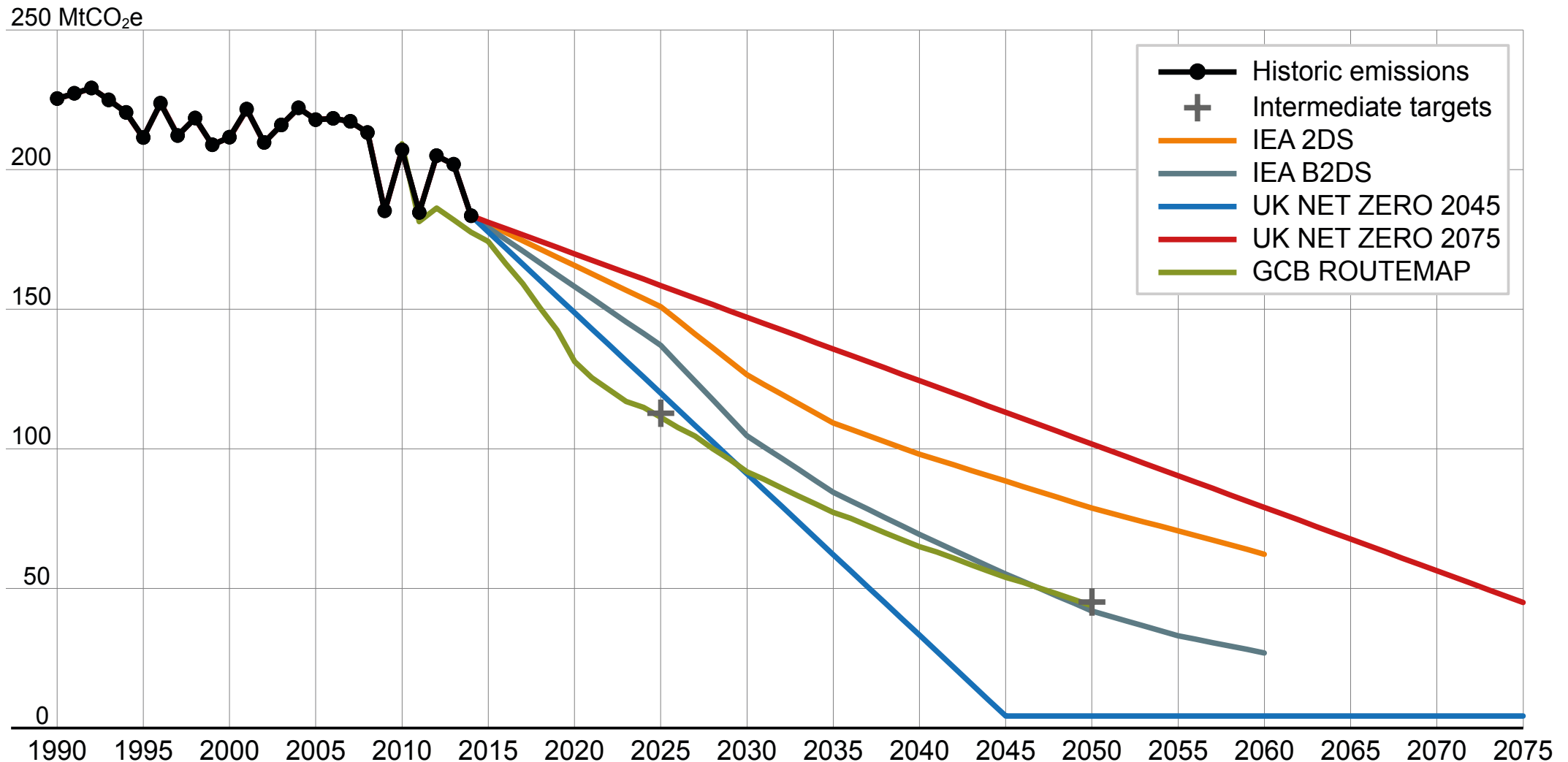
For us all

- » Do we need a collective target trajectory for the UK built environment?
- » What is our vision for the built environment in a net zero carbon UK?
- » Who will deliver the carbon sinks required in a net zero carbon UK?
- » How can we ensure firms that are currently setting new targets are sufficiently ambitious?

Target trajectories

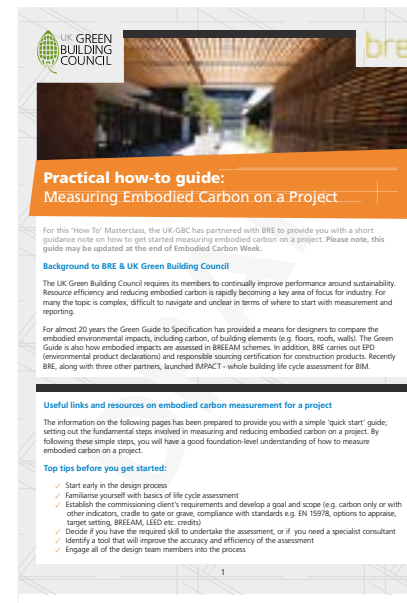
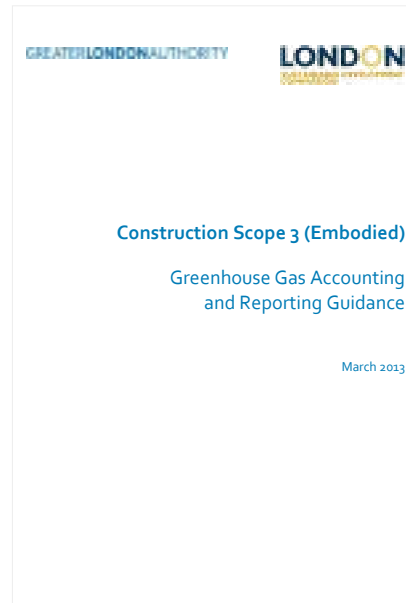
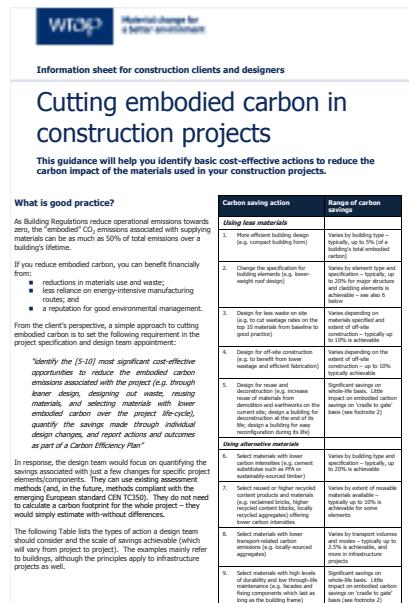
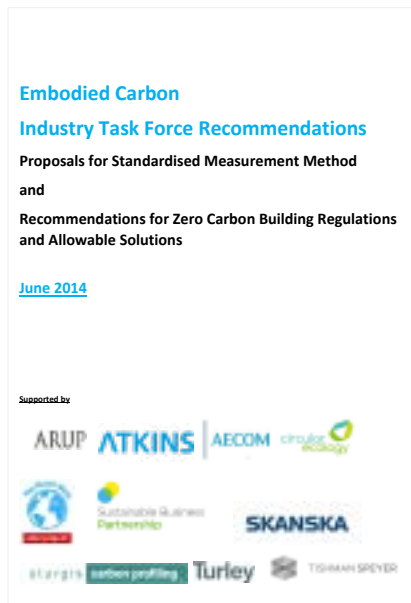
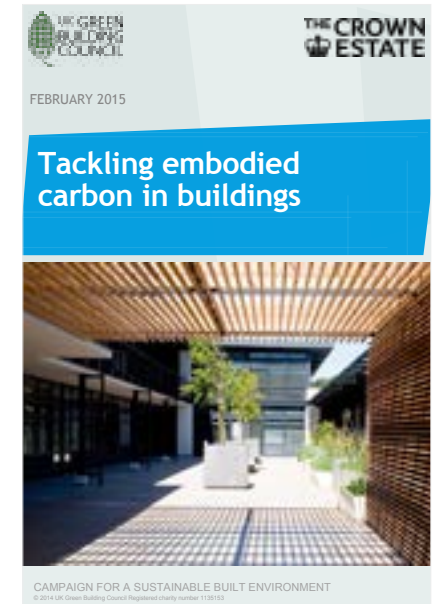
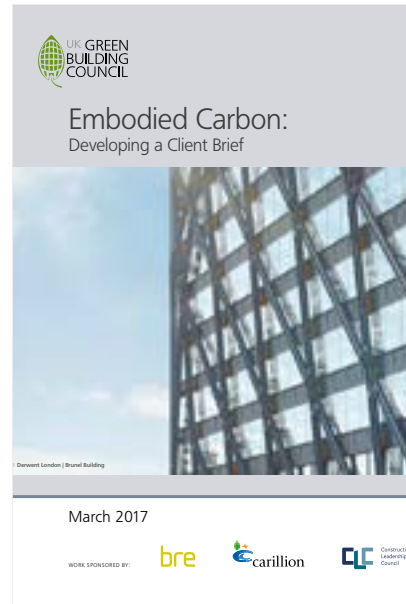
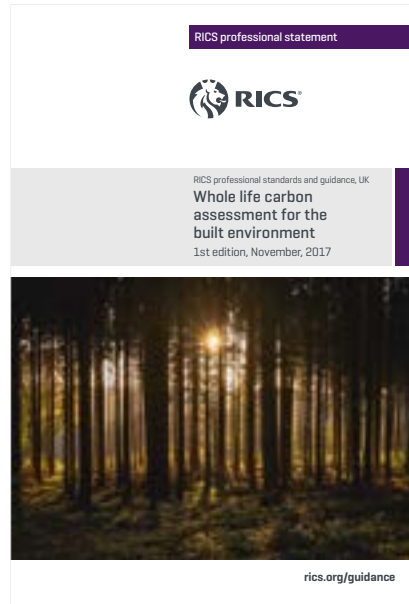
Should align with the end goal & achieve interim targets

» Alignment with IEA 2DS (as per most built environment SBT to date) would miss UK targets and result in an extra gigatonne of cumulative emissions by 2050



Reducing embodied/whole life carbon

Array of recent guidance documents but limited supporting policy



New CIE-MAP briefing note

Summary of status quo and recommendations

Centre for Industrial Energy, Materials and Products

Reducing carbon in construction: a whole life approach

The UK construction sector is failing to meet its carbon reduction targets and needs to explore additional mitigation options. Addressing the growing carbon emissions associated with constructing new assets is essential in meeting this shortfall. Extending the focus of project carbon assessments and targets from operational to whole life emissions presents clients with a broader range of mitigation options. However, many clients will not adopt such boundaries without additional regulation or incentives. Targeted intervention from national and local government could drive innovation in design teams and supply chains, improve sector productivity, reduce the costs of UK buildings and infrastructure, create employment opportunities and boost export markets.

Recommendations for Government, local authorities and business

1. Require a whole life carbon assessment on all publicly funded building projects and implement whole life carbon targets where project benchmarks can be established.
2. Require Environmental Product Declarations to support the environmental claims of product manufacturers.
3. Establish a public league table of carbon reduction commitments from construction firms to improve transparency and encourage competition.
4. Extend greenhouse gas emission reporting requirements for quoted companies to include the scope 3 embodied emissions associated with developing new facilities.
5. Establish a well resourced independent body to take ownership of the construction sector's decarbonisation agenda. Their initial tasks should include: developing and maintaining a common sectoral carbon reduction trajectory from which commensurate company or project targets can be derived; compiling a national database of life cycle assessment data and Environmental Product Declarations; and developing a low carbon building skills plan.
6. Local authorities require assessment of whole life carbon on significant schemes.
7. Progressive commercial clients introduce whole life carbon targets to drive innovation.

Challenges facing UK construction
The National Infrastructure Commission has highlighted three key challenges facing the construction sector: congestion, capacity and carbon¹. By 2050 there are expected to be an extra 14 million people living in the UK and the construction sector must deliver the housing and infrastructure that will underpin future prosperity. Domestically that requires dramatically increasing housebuilding, retrofitting one existing home every minute, and delivering an infrastructure pipeline worth in excess of £600bn. Internationally, UK firms are expected to capture an increasing share of the global market for sustainable construction and be at the forefront of delivering the Government's Clean Growth ambitions². Meanwhile by 2025 the industry is expected to have delivery time, cut costs by a third, halve the trade gap between exports and imports of construction products, and halve carbon

emissions from the built environment³. All of this must be achieved by a highly fragmented sector with low financial margins and declining labour availability⁴. None of these targets will be met under business as usual conditions⁵. Therefore the construction sector must undergo a radical transformation over the next decade.
The Government has already set out some measures to transform infrastructure performance⁶, and modernise the industry through the Construction Sector Deal as part of the Industrial Strategy⁷. This transformation must focus on reducing carbon whilst improving sector productivity through the adoption of more resource efficient designs, novel materials and delivery models. The successful transformation of this industry will be critical to achieving the Government's target of doubling resource productivity over the next 25 years⁸ and meeting carbon targets.

Sector progress in cutting carbon

In 2013 the Green Construction Board (GCB) set out a Routemap to deliver an 80% reduction in built environment emissions by 2050⁹. Unfortunately the sector has already fallen behind the target trajectory (Fig 1). Built environment emissions are typically split into operational and embodied emissions. Embodied emissions are those associated with producing building products, constructing and maintaining an asset and completing end of life disposal. Operational emissions are primarily those associated with the space heating and lighting of buildings and the operation of infrastructure assets. By 2014 the industry had achieved a 32% reduction in operational emissions compared with 1990 but only a 6% reduction in embodied emissions have steadily increased.

Delivering sector carbon targets

Delivering an 80% reduction in built environment emissions by 2050 will require reductions in both operational and embodied carbon emissions (Fig 2). CE-MAP scenario analysis shows that anticipated reductions in the carbon intensity of the electricity supply are unlikely to offset the impacts of increasing construction activity¹⁰. Consequently, sizeable reductions in embodied carbon intensity will need to be achieved within supply chains and through design changes. Given the current distribution of embodied emissions (Fig 3), reductions across projects of all types will be required if industry targets are to be met¹¹. That means the current focus on whole life carbon reduction must extend beyond infrastructure projects to domestic and non-domestic buildings.
In the longer term, the Paris Agreement implies achieving a net zero carbon UK by 2055-2075. That means that many projects under design now will need to be compatible with a net zero scenario. Therefore construction clients, designers and contractors must be ready to deliver net zero projects within the next few years. Under any net zero scenario minimising embodied emissions in the built environment will reduce the need to adopt expensive negative emissions technologies, such as BECCS, to achieve the net zero goal.

Figure 3: Distribution of embodied carbon emissions in 2011

Aligning company targets

Despite the urgent need for carbon reduction, as of July 2017 less than half of the top 70 UK construction firms by turnover had public carbon reduction targets. Those targets that have been established are mostly short term (typically out to 2020) and below the rates of reduction required by the sector as a whole¹². In the past two years a few UK firms, such as Landsec, Lang O'Rourke and Bennetts Associates, have sought to align their targets with international climate commitments through schemes such as the Science Based Targets initiative. This has led to a recent cross-industry call for the development of a common sectoral carbon reduction trajectory, consistent with the Paris Agreement, from which commensurate company and project targets can be derived¹³. The development of such a trajectory presents a number of challenges and, at minimum, will require significant adaptation of the current Science Based Targets methodologies¹⁴.

Maintaining a common trajectory

If such a common trajectory is to be developed then it must be accompanied by a credible action plan to instil confidence that the trajectory is deliverable. Unlike the GCB Routemap and Construction 2025 targets, a formal process for monitoring progress against the trajectory should also be established in advance. To ensure that this trajectory is maintained in the long term, CE-MAP recommends that a permanent, well resourced and independent body is established to undertake its development and take ownership of the industry's carbon reduction agenda. This new body would also undertake other tasks that support carbon reduction, such as compiling a central national database of life cycle assessment data and Environmental Product Declarations, and developing a low carbon building skills plan. This body should also establish a public league table of carbon reduction commitments from firms operating in the UK to encourage greater competition, skills, perceptions of high costs, and a shortage of product carbon data and project benchmarks¹⁵. These have been compounded by a general lack of drivers for assessment, with most commitments to date driven by client requirements or the moral convictions of individual practitioners. Though some of these barriers remain, there has been much progress in recent years. For instance the stock of Environmental Product Declarations is growing rapidly with over 6000 now published and, with the RCS set to gather project data in a granular standardised form¹⁶, accurate benchmarking of projects will soon be possible. As life cycle costing becomes

the use of alternative low carbon materials, more efficient structural design, or the increased use of recycled or re-used components, taking a whole life perspective offers a broader choice to designers trying to deliver low carbon solutions. On many projects savings in embodied emissions are associated with reduced capital costs, as embodied emissions are often a proxy for material and fuel use. The carbon savings from reduced embodied emissions are also more immediate and predictable than anticipated future savings in operational emissions.

Supporting guidance & standards

There is a mounting body of guidance and standards supporting whole life carbon assessment and mitigation¹⁷. In November 2017 the Royal Institution of Chartered Surveyors (RICS) launched a new Professional Statement¹⁸ that standardises whole life carbon assessment in the built environment. This will be mandatory for RICS members from May 2018 and provides a framework for consistent assessment and reporting across the industry. Clients will be able to request assessments to this standard, with a 2017 guidance package from the UK Green Building Council clearly explaining how to develop an effective brief incorporating embodied emissions¹⁹. Using these documents, clients should feel comfortable commissioning and responding to whole life carbon assessments. CE-MAP recommends that progressive clients go one step further and introduce embodied or whole life carbon targets on their projects at the earliest possible stage. This has already been done successfully on many projects and is now a routine feature of sustainability briefs for commercial developers such as British Land and Berwett London²⁰.

Barriers and benefits

In the past common barriers to more widespread whole life carbon assessment have included a lack of industry skills, perceptions of high costs, and a shortage of product carbon data and project benchmarks²¹. These have been compounded by a general lack of drivers for assessment, with most commitments to date driven by client requirements or the moral convictions of individual practitioners. Though some of these barriers remain, there has been much progress in recent years. For instance the stock of Environmental Product Declarations is growing rapidly with over 6000 now published and, with the RCS set to gather project data in a granular standardised form²², accurate benchmarking of projects will soon be possible. As life cycle costing becomes

more prevalent it is also becoming easier to make the business case for a broader set of solutions.
More widespread assessment could yield a range of benefits. For instance the introduction of whole life carbon targets could increase competition between design teams to deliver the lowest carbon solutions, and increased competition within the supply chain should drive innovation as suppliers compete to provide lower carbon products. All of these low carbon products and design skills will have significant export potential as many other nations pursue deeper carbon reduction. Indeed with incoming legislation such as the Buy Clean California Act, it may soon be essential to have low carbon credentials to export into certain markets.
Encouraging assessment
A number of actions could encourage more widespread whole life assessment and carbon reduction. CE-MAP recommends that local authorities should require whole life carbon assessments on all 'significant' schemes as part of the planning application process. The definition of a significant scheme will vary between authorities. For instance the Greater London Authority may interpret this as applying to planning applications for schemes referable to the Mayor. Comparable requirements are already in place in nations such as the Netherlands and cities such as Zurich²³. CE-MAP also recommends that all publicly funded projects should seek to introduce whole life carbon targets where project benchmarks can be established. The UK's mandatory greenhouse gas emission reporting requirements for quoted companies should be extended to include the scope 3 embodied emissions associated with developing new facilities. To prevent potential greenwashing, all construction product manufacturers should be required to produce an Environmental Product Declaration to support any quantifiable sustainability claims made in the marketing of their products. Equivalent requirements are already in place in France and Belgium²⁴.
Interventions such as these could motivate more widespread whole life carbon assessment. This in turn would support the development of low carbon expertise, accelerate data gathering and the growth of an industry with significant export potential. With design teams targeting whole life carbon reduction in countries such as Australia, Canada, China, Norway, Sweden, France, Germany, the Netherlands and even some projects in Qatar, there is growing global demand and competition to develop low carbon construction solutions. There is a clear opportunity for the UK to become world leaders in this growing industry that will support skilled jobs, develop the market for low carbon products and achieve significant reductions in carbon emissions. However, this will only be possible if swift action is taken to stimulate more widespread assessment.

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CIE-MAP

Working closely with government and industry, CIE-MAP conducts research to identify all the opportunities along the product supply chain that ultimately deliver a reduction in industrial energy use. CE-MAP brings together the four leading UK universities of Bath, Cardiff, Leeds and Nottingham Trent with a range of expertise in engineering, economics, psychology, design, political science and governance. Funded by the Research Council's Energy Programme, CE-MAP forms one of six centres focused on reducing energy demand in the UK.

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Brief prepared in April 2018

Available soon at ciemap.ac.uk

» Research started by CIE-MAP will continue under the recently launched £19m UK Centre for Research in Energy Demand UK CRED

» Get in touch now if you would like to be involved in, or shape, our research programme for next 5 years (J.Giesekam@leeds.ac.uk)

Summary

In short

- » The Paris Agreement means UK carbon targets must be strengthened
- » The new goal will be net zero emissions near mid century
- » The UK built environment is decarbonising at a slower rate than is required
- » Current company targets are insufficient to deliver sector and national goals
- » There is growing momentum around Science Based Targets
- » Do we need a collective industry Routemap/trajectory/targets?