

Centre for Industrial Energy, Materials and Products



What is the role of the construction sector and the National Infrastructure Plan in delivering material efficiency?

Jannik Giesekam

Research Fellow in Energy, Materials and Climate Policy University of Leeds

CIEMAP work in construction

Two key areas

© 2015 Taylor & Francis

- » Assessing current and future material use and embodied carbon emissions
- » Understanding the barriers to greater material efficiency and the use of low carbon materials

BRI BUILDING RESEARCH & INFORMATION 2015 http://dx.doi.org/10.1080/09613218.2016.1086872 Routledge 15 December 2015 RESEARCH PAPER **Meeting Carbon Budgets - Progress** in reducing the UK's emissions Construction sector views on low carbon building materials **Green Construction Board Low Carbon Routemap for the Built Environment** Jannik Giesekam¹, John R. Barrett² and Peter Taylor³ 2015 Routemap Progress | Technical Report ¹Energy Research Institute, University of Leeds, Leeds LS2 9JT, UK E-mail: pmjjg@leeds.ac.uk ²Sustainability Research Institute, School of Earth and Environment, University of Leeds, Leeds LS2 9JT, UK ³Centre for Integrated Energy Research, School of Earth and Environment, University of Leeds, Leeds LS2 9JT. UK As is the case in a number of countries, the UK construction industry faces the challenge of expanding production whilst making ambitious greenhouse gas emission reductions. Embodied carbon constitutes a growing proportion of whole-life carbon emissions and accounts for a significant share of total UK emissions. A key mitigation strategy is increasing the use of alternative materials with lower embodied carbon. The economic, technical, practical and cultural barriers to the uptake of these alternatives are explored through a survey of construction professionals and interviews with industry leaders. Perceptions of high cost, ineffective allocation of responsibility, industry culture, and the poor availability of product and building-level carbon data and benchmarks constitute significant barriers. Opportunities to overcome these barriers include earlier engagement of professionals along the supply chain, effective use of whole-life costing, and changes to contract and tender documents. A mounting business case exists for addressing embodied carbon, but has yet to be effectively disseminated. In the meantime, the moral convictions of individual clients and practitioners ve driven early progress. However, this research underscores the need for new regulatory drivers to complement changing attitudes if embodied carbon is to be established as a mainstream construction industry concern. Keywords: alternative materials, CO2 reduction, construction sector, embodied carbon, greenhouse gas emissions, market acceptance, professional knowledge Introduction associated with energy use in activities such as space The construction sector is the largest global consumer heating, cooling and lighting. However, these regulatof materials, and buildings are the sector with the ory drivers have not extended to the embodied largest single energy use worldwide (Krausmann carbon1 associated with the initial production of strucet al., 2009; De Ia Rue du Can & Price, 2008). Consetures (Figure 1). quently, buildings are also responsible for 19% of global greenhouse gas (GHG) emissions (Intergovern-A recent review of building life cycle assessments mental Panel on Climate Change (IPCC), 2014). demonstrated that embodied carbon can account for anywhere between 2% and 80% of whole-life carbon Recent studies have suggested that buildings offer the emissions (Ibn-Mohammed, Greenough, Taylor, greatest abatement opportunities for reducing GHG emissions in the short-term (IPCC, 2014: McKinsey Ozawa-Meida, & Acquave, 2013). The precise pro-ARUP & Co., 2009). Policy-makers have responded to this portion depends upon a number of characteristics through the introduction of regulation requiring including building use, location, material palette, and improvements in building fabric and performance. assumptions about the service life and future energy such as the European Union (EU) Energy Performance supply. The proportion tends to be higher in certain of Buildings Directive. These regulations have princistructure types, such as industrial warehousing, where embodied emissions can contribute up to 90% pally focused on the operational GHG emissions

Construction 2025

Targets 50% reduction in greenhouse gas emissions

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



HM Government (2013) Construction 2025

Low Carbon Routemap

Set trajectory for 80% reduction by 2050

» Emphasised that "capital carbon must start to be addressed in tandem with operational carbon"



Green Construction Board (2013) Low Carbon Routemap for the UK Built Environment

Low Carbon Routemap update

Progress report produced in December 2015

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



Green Construction Board (2015) Low Carbon Routemap for the UK Built Environment. Routemap Progress Technical Report Slide 5 of 12

Embodied carbon in construction

Estimated carbon footprint of UK construction supply chain



Giesekam et al. (2014) The GHG emissions and mitigation options for materials used in UK construction *Energy and Buildings* **Sli** Giesekam et al. (Under review) Building on the Paris Agreement: making the case for embodied carbon intensity targets in construction

Slide 6 of 12

Future projections

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



Giesekam et al. (Under review) Scenario analysis of embodied carbon in UK construction

Slide 7 of 12

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 wholelife carbon (embodied and operational)"
- » "Government contracts will encourage innovative sustainability solutions on carbon reduction where value can be demonstrated"
- » Aim of ultimately forming *"recommendations for a future approach"*



Drivers of low carbon construction

Client demands and leadership from industry

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



Understanding the barriers

Within the industry

- » Conducted surveys and interviews and a policy workshop at the Royal Academy of Engineering
- » Ongoing programme of stakeholder engagement

And with end users

» Upcoming collaboration between universities of York, Sheffield and Leeds assessing 'public perceptions and experiences of low carbon building materials'



Giesekam et al. (2014) The GHG emissions and mitigation options for materials used in UK construction *Energy and Buildings* Giesekam et al. (2015) Construction sector views on low carbon building materials *Building Research & Information*

Slide 10 of 12

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

<section-header><section-header><section-header>



Infrastructure and Projects Authority Reporting to HM Treasury and Cabinet Office

National Infrastructure Delivery Plan 2016–2021



Assessment reported in CCC (2015) Meeting Carbon Budgets Report to Parliament

Questions for the panel

For starters

- » With an infrastructure project pipeline exceeding £483bn, what more can be done to ensure material efficiency is a key consideration on these projects?
- » How can the industry work with Government to implement effective drivers for material efficiency and whole life carbon reduction?
- » What can the construction sector do to support clients in driving change?
- » What more could professional institutions do to support this transition?
- » What role should more heavily regulated sectors play in driving best practice?
- » What lessons from the infrastructure sector can be transferred to the broader construction industry?