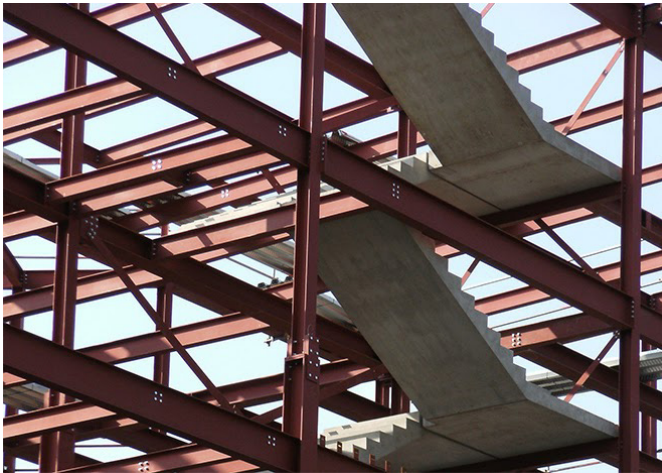




The Carbon Footprint of Construction

The case for regulating embodied carbon emissions



Greenhouse gas emissions caused by the construction of buildings and infrastructure assets, known as 'embodied carbon emissions', are a significant driver of climate change. **These emissions are associated with the materials and processes throughout the whole life-cycle of an asset** including extraction, processing and manufacture; transport, assembly and installation on-site; replacement, refurbishment and maintenance; demolition and disposal. This briefing note summarises recommendations of policy and regulation required to meet the UK's climate obligations.

Background

In July 2019, the UK legislated for a target of net-zero national GHG emissions by 2050.¹⁵ Analysis by the UK's independent Climate Change Committee indicates that rapid emissions reductions are needed from the manufacturing and construction industries.¹⁶ The study explicitly recommended that the Government legislates for embodied carbon assessment and reductions.¹⁷

The Institution of Civil Engineers (ICE) calculates that the total embodied carbon emissions of new buildings and infrastructure in the UK account for around 49 Mt CO₂e,¹⁸ a figure in excess of 10% of our national territorial emissions.¹⁹

Key Facts

- Embodied carbon emissions account for up to **75% of a building's total emissions** over its lifespan.^{1,2}
- Total embodied carbon emissions of new buildings & infrastructure in the UK accounts for around **49 Mt CO₂e**,³ a figure in excess of **10% of our national territorial emissions**.⁴
- Addressing embodied carbon is **widely agreed to be necessary** to meet 2050 net zero emissions targets.^{5, 6, 7, 8, 9}
- There is **industry consensus**; with the major professional bodies providing guidance on assessment; RICS,¹⁰ RIBA¹¹, IStructE¹² & CIBSE.¹³
- A **standard assessment methodology exists**; ('Whole Life-Cycle Carbon Assessment') as set out in BS EN 19578.¹⁴
- The major constraint on reductions to embodied carbon is that there is currently **no requirement within Building Regulations, or within National Planning Policy, for emissions to be measured, reported or reduced**.

Regulation has been successful in driving reductions in the carbon emissions that arise from energy use in buildings (operational carbon), primarily through requirements in Part L of The Building Regulations (England & Wales).²⁰

However, embodied carbon emissions are not subject to any such regulation, nor are they covered by planning policy at a national level. Measurement only occurs on a voluntary basis. Only some local authorities have introduced policies: The New London Plan Policy SI2 is considered the UK's foremost policy initiative.²¹ Until the Government introduces national regulations, there is a limited commercial case for developers and housebuilders to reduce embodied carbon emissions.²²

An Industry-wide Consensus

Design and construction professionals have reached a broad consensus on how to assess & reduce embodied carbon emissions, as demonstrated in the publication of several authoritative studies, professional guidance notes and reports by a range of industry bodies; RICS²³, ICE²⁴, RIBA²⁵, IStructE²⁶, UKGBC²⁷, CIBSE²⁸.

Measures that can reduce embodied carbon emissions are widely understood, as initially outlined by the Green Construction Board²⁹ and updated by London Energy Transformation Initiative in 2020³⁰:

1. **Build less: reuse existing buildings.**
2. **Build smart: using low carbon materials.**
3. **Build efficiently: use fewer resources, waste less.**
4. **Build circular: design for reuse & recycle**
5. **Build durable: design for longevity**

However, these measures are not applied in the vast majority of building and infrastructure projects due to lack of incentive. As BEIS reported in 2019, "with profit margins and shareholder returns the overriding priority for the majority of large housebuilders, they will not upgrade their standards without being required to do so by regulation."³¹

International Policy Examples

Several countries have started introducing embodied carbon regulations. These examples are particularly relevant, providing a blueprint for implementation in the UK:

Netherlands

Since 2013, to obtain a building permit for buildings over 100m², a whole life-cycle carbon assessment must be submitted. Assessment is made possible by the Dutch National Environmental database.³²

Finland

By 2025, whole life-cycle carbon assessments will be required with strict limits on embodied carbon emissions set by building type. The Government will establish a national database of environmental product declarations (EPD). The limits will be lowered every couple of years.³³

France

In 2021, France will introduce 'RE2020'; a regulation requiring assessment & reporting of embodied carbon emissions for all new buildings. In 2024, strict limits will be brought in and gradually reduced. By 2030, a reduction of 30-40% will be required. The regulation will reward the use of timber and other bio-based materials.³⁴ This new regulation follows a four-year policy trial period that started in 2016.

Wider Benefits

- **Support the creation of green jobs in UK manufacturing by stimulating demand for sustainable building products.**
- **Support the upcoming England Tree Strategy³⁵ by boosting the UK's timber industries.³⁶**
- **Kick-start the nascent construction materials recycling industry - creating up to 290,000 jobs.³⁷**
- **Incentivise the renewal of the British Steel and concrete industries.³⁸**
- **Provide an incentive for the retention of existing buildings over demolition.³⁹**
- **Provide businesses with the clear timeline they need to adapt to a net-zero future.**
- **Stimulate innovation in the development of new materials with a lower carbon footprint.**

Recommendations for the UK

Government and local authorities should act on the following;

2021

- **Regulation 7** to be revised to introduce carbon limits on specific materials.
- **New London Plan Policy SI2 to be adopted** by local authorities around the UK.
- **Establish a freely accessible database for anonymised Whole Life-Cycle Carbon Assessment data of new buildings**, to ensure lessons are widely learnt.
- **Create, or adopt, a freely accessible UK Environmental Product Declaration (EPD) database**, to ensure consistent and reliable assessments.

2022

- **Expand The Building Regulations** to include requirements to assess, report & reduce embodied carbon, within a new part: "**Part Z: Embodied Carbon Emissions.**"
- **Introduce clauses to the National Planning Policy Framework** with requirements for Whole Life-Cycle Carbon Assessments to be submitted as part of pre-application enquiries, full planning submissions, and at practical completion.

2025

- **Introduce strict limit values** on embodied carbon emissions for all developments.

About the Report Team

Architects Climate Action Network (ACAN) is a group of 500+ built environment professionals taking action to address the climate emergency. This briefing note & accompanying technical report has been written by members of the ACAN Embodied Carbon Thematic Group;

Joe Giddings, Joe Penn, Matteo Sarno, Rachael Owens, Seb Laan Lomas, Sophia Ceneda, Andrew Barrington, Dominic Eley, Etienne Marès, Eugenia Mompò, Finbar Charleson, Kerry Watton, Matt Rosier.

ACAN's full report on regulating embodied carbon emissions:

www.architectscan.org/embodiedcarbon

The group can be contacted on:
embodiedcarbon@architectscan.org

For more information on ACAN visit
www.architectscan.org

Footnotes:

1. RICS, (2017) "Whole life carbon assessment for the built environment"
2. Akbarnezhad, A. & Xiao, J., (2017) "Estimation and Minimization of Embodied Carbon of Buildings: A Review." Buildings 2017, 7, 5.
3. ICE, (2020) "Infrastructure Carbon Review 2020 Data Update v1.1."
4. HM Government DEFRA (2020) UK's Carbon Footprint 1997-2017
5. Committee on Climate Change (2020) "Reducing UK emissions Progress Report to Parliament"
6. Aecom, for the Committee on Climate Change, (2019) "Options for incorporating embodied and sequestered carbon into the building standards framework"
7. World Green Building Council (2019) "Bringing embodied carbon up front"
8. Bernadino D'Amico, Francesco Pomponi, Jim Hart & Jannik Giesekam, for Zero Waste Scotland, (2020) "Embodied Carbon. Status Quo & Suggested Roadmap"
9. Kate Scott, Katy Roelich, Anne Owen & John Barrett (2018) "Extending European energy efficiency standards to include material use: an analysis" Climate Policy, 18:5, 627-641.
10. RICS, (2017) "Whole life carbon assessment for the built environment"
11. RIBA, (2019); "Embodied and Whole Life Carbon Assessment for Architects."
12. IStructE, (2020); "How to calculate embodied carbon"
13. CIBSE, (2021) "TM56: Resource efficiency of building services"
14. The British Standards Institution (2011); "BS EN 15978:2011 Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method"
15. BEIS (2019). "UK becomes first major economy to pass net zero emissions law."
16. Committee on Climate Change (2020) "The Sixth Carbon Budget - Sector Summary Manufacturing & Construction"
17. Committee on Climate Change (2020) "Policies for the Sixth Carbon Budget and Net Zero"
18. Institution of Civil Engineers (2020) "Infrastructure Carbon Review 2020 Data Update"
19. DEFRA (2020) UK's Carbon Footprint 1997-2017
20. Aecom, for the Committee on Climate Change, (2019) "Options for incorporating embodied and sequestered carbon into the building standards framework"
21. Greater London Authority (2020) "Whole Life-Cycle Carbon Assessments guidance. Pre-consultation draft"
22. BEIS (2019) "Energy efficiency: building towards net zero"
23. RICS, (2017) "Whole life carbon assessment for the built environment"
24. Institution of Civil Engineers (2020) "Carbon in Infrastructure - where and how much?"
25. RIBA, (2019); "Embodied and Whole Life Carbon Assessment for Architects."
26. IStructE, (2020); "How to calculate embodied carbon"
27. UK Green Building Council (2015) "Tackling Embodied Carbon in Buildings"
28. CIBSE, (2021) "TM56: Resource efficiency of building services"
29. HM Treasury (2013) "Infrastructure Carbon Review"
30. LETI (2020) "Climate Emergency Design Guide"
31. BEIS (2019) "Energy efficiency: building towards net zero"
32. Bionova Ltd, (2018) "The Embodied Carbon Review. Embodied Carbon Reduction in 100+ Regulations & Rating Systems Globally"
33. Bionova Ltd,(2017) "Roadmap for building life cycle to take into account the carbon footprint of construction control" (Finland)
34. Ministère de la Transition Ecologique (2021) "Règlementation Environnementale RE2020; Éco-construire pour le confort de tous"
35. DEFRA (2020) "England's Tree Strategy"
36. All Party Parliamentary Group for the Timber Industries (2019), "How the timber industries can help solve the housing crisis"
37. Julian Morgan & Peter Mitchell, for Wrap & Green Alliance (2015) "Employment and the circular economy; Job creation in a more resource efficient Britain"
38. Committee on Climate Change (2020) "Policies for the Sixth Carbon Budget and Net Zero"
39. Adam Branson (2020) "RetroFirst: Can policy change encourage more retrofitting?" The Architects Journal