

Embodied Carbon: Tackling the Hidden Emissions in the Built Environment

2024

Our solutions to helping you cut
carbon across the real asset lifecycle

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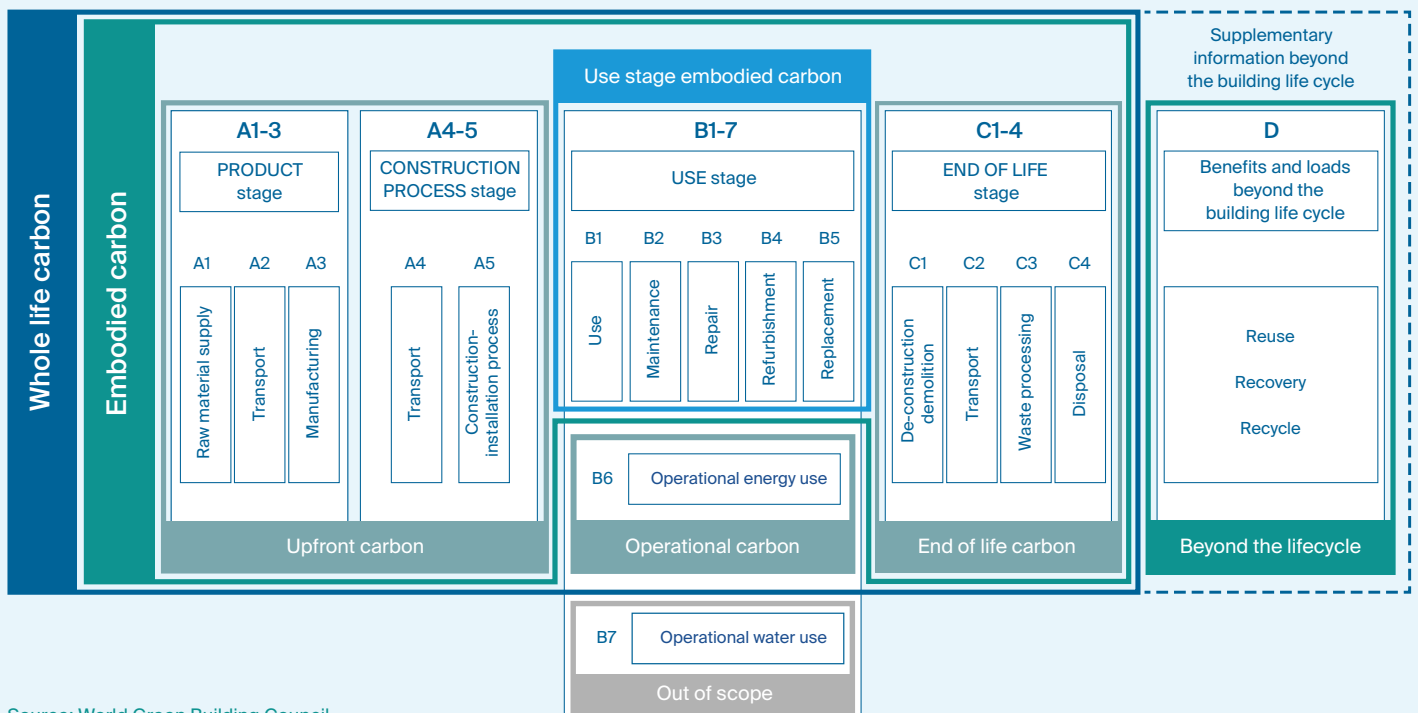


The challenge facing the built environment sector

The built environment sector plays a critical role in addressing the climate emergency. Responsible for a staggering 39% of global carbon emissions, the built environment faces a long and challenging road to decarbonisation. As urban areas are projected to double in size by 2060, **this growth is expected to generate 100–200 billion tons of carbon emissions** solely from construction materials. In just 2-3 years, this impact will be akin to building a new New York City every month until 2060. This rapid urban growth presents an urgent environmental challenge: the need to effectively measure and limit the carbon impact of the materials and construction processes.

While the sector has made strides in reducing operational carbon through improved energy efficiencies and the adoption of renewable energy, the issue of embodied carbon has been largely overlooked. Embodied carbon is defined by the World Green Building Council (WGBC) as the emissions associated with the materials and construction processes throughout the entire lifecycle of a building or infrastructure, encompassing modules A0–A5, B1–B5, and C1–C4 (see Figure 1).

Figure 1: The carbon impacts across built asset lifecycle stages



Source: World Green Building Council.

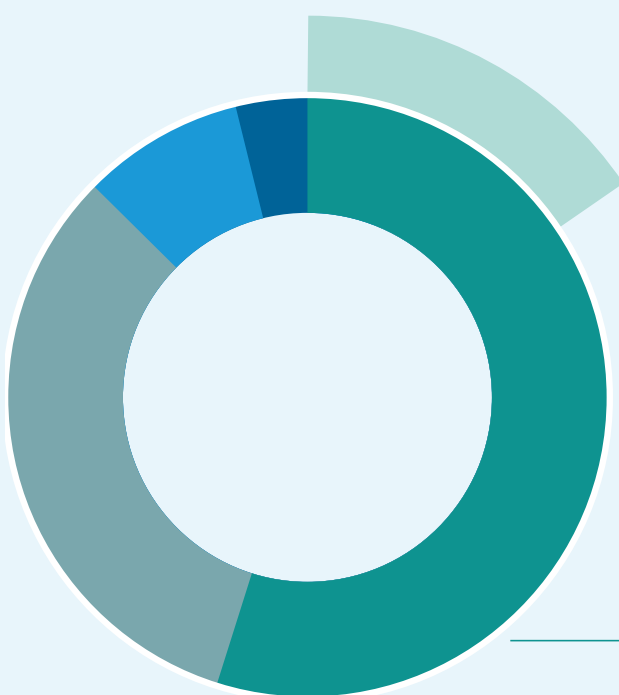
Embodied carbon emissions can account for up to 50% of a building's total emissions before it even becomes operational (see Figure 2). To accelerate decarbonisation of the sector, the WGBC has called for a 40% reduction in embodied carbon across all buildings and infrastructure projects by 2030. Addressing embodied carbon will be necessary to meet decarbonisation goals at an organisational, country, and global level.

Despite its significant role in overall emissions, embodied carbon has historically received less attention. This is driven by stricter regulations requiring tenants and landlords to report on operational carbon, as well

as the cost benefits associated with measuring and reducing these emissions. Traditionally, the construction industry has not monitored embodied carbon emissions, largely due to limited knowledge on how to effectively track them and a lack of demand from clients. Yet, the relative importance of embodied carbon will continue to grow as operational emissions reduce, making it a critical area of focus for the industry moving forward. If the sector fails to address embodied carbon, it jeopardizes its ability to fully decarbonise across the built asset lifecycle stages.



Figure 2: The carbon impacts across built asset lifecycle stages



Typically +/-50% of all GWP (Upfront Carbon)

Source: Beyond h/w.

A1–A3: Product Stage

- A1 Raw material extraction
- A2 Transport to manufacturing
- A3 Manufacturing

A4–A5: Construction Stage

- A4 Transport to construction site
- A5 Installation / Assembly

B1–B5: Use Stage

- B1 Use
- B2 Maintenance
- B3 Repair
- B4 Replacement
- B5 Refurbishment

C1–C4: End of Life Stage

- C1 Deconstruction & demolition
- C2 Transport
- C3 Waste processing
- C4 Disposal

D: Reuse, Recover & Recycling Potential

Counts the benefits and burdens of disposal after demolition.

The use of Module D is consistent with a cradle-to-cradle approach.

Key Standards and Regulations for Reporting Embodied Carbon

Measuring and reporting embodied carbon levels has become essential to meet several key market standards and regulatory requirements, including:

						
Certifications				Regulations		



The Energy Performance of Buildings Directive (EPBD) is an EU legislative instrument which requires Member States to report lifecycle GHG emissions through an Energy Performance Certificate for all new buildings from 2030. The goal of this Directive is to achieve a fully decarbonised building stock by 2050. The Directive underwent revision in the summer of 2024 to reflect heightened climate ambitions, updating the existing regulatory framework (agreed in 2018) to include corporate embodied carbon and lifecycle assessments.

Effective from July 1, 2024, the RICS published the 2nd edition of the Whole Life Carbon Assessment for the Built Environment, which sets the global standard for whole life carbon assessments. While it builds on the foundational principles of the first edition, which was primarily UK-focused, this new edition takes a broader, more global approach. This standard aims to create consistency in how carbon is calculated and reported, with a special focus on including embodied carbon. The updated guidelines apply to a wide range of projects, including new construction, retrofits, refurbishments, fit-outs, as well as demolition and reconstruction.

Additionally, certifications like BREEAM assess embodied carbon and reward actions that contribute towards minimising carbon emissions in the new development, refurbishment, and operation of assets. BREEAM also promotes methodologies that account for carbon emissions, including embodied carbon, thereby encouraging more sustainable practices in the construction and management of buildings.

There is also greater demand from occupiers for heightened measurement and transparency of embodied carbon as part of site selection, driven by the need for comprehensive Scope 3 reporting on the whole life carbon of their office spaces. Moreover, understanding baseline embodied carbon levels allows for more informed material choices in future construction and refurbishment projects, driving continuous improvements in sustainability.



The prime time to measure embodied carbon

The earlier, the better. The 2nd edition of the RICS methodology emphasises the importance of conducting whole lifecycle assessments from the earliest stages of the concept design phase. By establishing an understanding of embodied carbon emissions early on, projects can identify opportunities for carbon reduction while there is still time to influence decisions. The further into the project, the more difficult it will be to implement carbon saving measures, and the cost of implementing changes can rise.

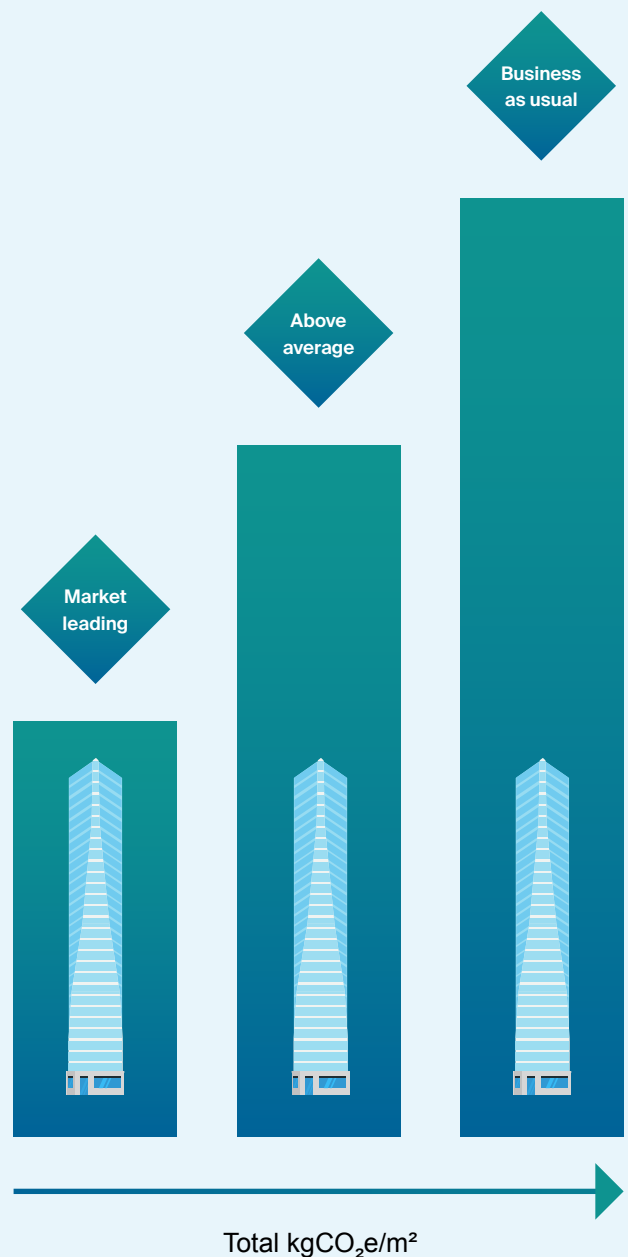
Our carbon reporting and assessment services

At Knight Frank, our ESG Consulting team offers specialised support in embodied carbon reporting and assessment across the RICS stages A0–A5, B1–B5, and C1–C4. Using a market-leading international lifecycle analysis and Environmental Product Declaration (EPD) software platform, our team customises embodied carbon assessments to meet your specific framework requirements. These assessments are summarised and delivered via detailed reports that pinpoint the most carbon-intensive areas and materials used during the early design and construction phases, informed by EPDs. Additionally, we model various building scenarios to evaluate the embodied carbon impact of different materials, identifying opportunities for carbon reduction. Our analysis includes benchmarking across three scenarios: business as usual (standard practice), above average (enhanced performance), and market leading (best-in-class), (see Figure 3).

Owners, investors, and occupiers can leverage this sustainability performance data to benchmark projects, set portfolio-wide targets, and accurately report corporate greenhouse gas emissions. By pinpointing these critical factors, we advise clients on how to strategically reduce carbon footprints and align with embodied carbon reduction targets.

We will help you manage regulatory compliance across the early-phase design and construction phases and help inform key decisions that can reduce embodied carbon emissions.

Figure 3: Embodied carbon scenario analysis





How can we support you?

We will assist you in reporting embodied carbon emissions, benchmarking your projects, and complying with regulatory requirements. Our findings will provide critical insights to guide decisions aimed at reducing embodied carbon emissions.

For more information about our embodied carbon services and pricing, please contact:



Jonathan Hale
Partner, ESG Consulting
+44 7815 461 428
jonathan.hale@knightfrank.com



Olivia McCue
Senior ESG Consultant
+44 7977 714 062
olivia.mccue@knightfrank.com



Marina Campbell
Surveyor, ESG Specialist
+44 7814 067 404
marina.campbell@knightfrank.com

www.knightfrank.co.uk

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