

## Decoding Carbon in Real Estate: Strategic implications of taking a whole lifecycle approach

### IN A NUTSHELL

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- A focus on minimising operational emissions from buildings is unlikely to be sufficient to meet Paris Agreement carbon reduction targets.
  - Emissions associated with the extraction, manufacturing, construction, and demolition of buildings (embodied carbon) represents close to 11% of all global emissions and is therefore an important factor to address.<sup>1</sup>
  - Regulatory and voluntary standards are now bringing embodied carbon into focus.
  - Refurbishment is a key way to keep embodied carbon emissions low while making major reductions in operational emissions.
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### 1. Introduction

In the race to reach 'net zero' carbon emissions, much effort has been directed towards reducing the carbon produced in operating buildings. Yet while this accounts for the majority of emissions, between 10% and 20% of a building's total carbon footprint is attributable to embodied emissions.<sup>2</sup>

Embodied carbon emissions have so far received little attention. Over half the participants in the RICS Sustainability Survey in 2021 stated that they do not measure embodied carbon emissions.<sup>3</sup> No respondents to CRREM's latest investor survey measure the trade-off between embodied and operational carbon.<sup>4</sup>

Now that stricter building codes, greater energy efficiency in design briefs, and a shift towards renewable energy production both on and off-site are reducing operational carbon, the proportional contribution of embodied carbon is growing. Increasingly, investors and developers are likely to be held accountable for carbon emissions on a whole-lifecycle basis.

<sup>1</sup> Global Alliance on Buildings and construction/IEA/UNEP, 2019

<sup>2</sup> International Energy Agency (2020)

<sup>3</sup> RICS, 2021

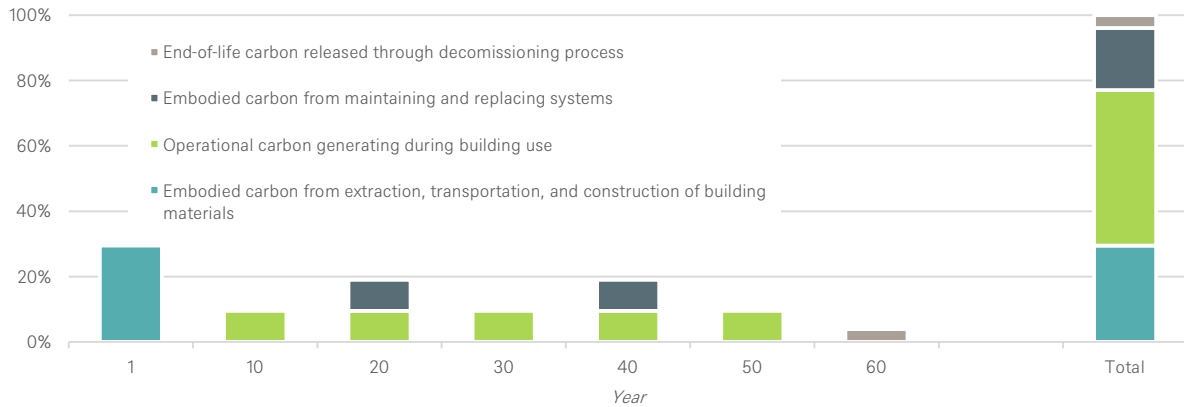
<sup>4</sup> CRREM, 2023.

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Estimated distribution of carbon emissions by lifecycle stage.



Source: WBCSD, 2021

## 2. Why should investors consider 'whole lifecycle carbon'?

### 2.1. Tighter regulation

With the Paris Agreement requiring emissions to reach net zero by 2050<sup>5</sup>, municipal, national and international governments are taking action. Guided by the World Green Building Council's (WGBC) work to bring embodied carbon more into focus<sup>6</sup>, the revised EU Energy Performance of Buildings Directive (EPBD) is moving towards the concluding stages of the EU legislative process. Under the current version of the Directive, new buildings are required to achieve net zero on a whole lifecycle basis and existing buildings must meet certain minimum energy performance standards by 2030. If and when the updated EPBD becomes EU law (the increasingly complex politics around the law may cause some delay), all EU states will be required to pass national laws implementing this legislation. Five European countries (Denmark, Finland, France, the Netherlands, and Sweden) have frontrun the legislation by introducing laws aimed at reducing whole lifecycle carbon (WLC).

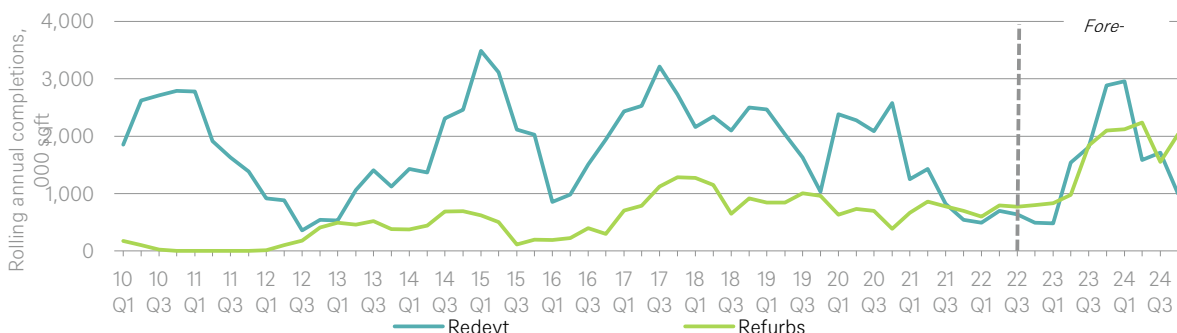
Action is also visible at a city level. The latest London and Paris Urban Plans require development proposals to prioritise refurbishment over knock-down and rebuild strategies. London's Mayor recently rejected the "Tulip" skyscraper development (20 Bury Street) with high embodied carbon intensity cited as one of the reasons for the decision.<sup>7</sup> Supply data for London shows that the market is already prioritizing refurbishments over new development. 2021 was the first in over ten years when refurbishments overtook redevelopments and this trend is likely to continue into 2024.

<sup>5</sup> This includes both operational and embodied emissions.

<sup>6</sup> See WGBC, 'Bringing Embodied Carbon Upfront', September 2019

<sup>7</sup> Green Street, March 2022

### Refurbishments now more common than new developments in driving office supply in Central London



Source: PMA, July 2023

#### 2.2. Voluntary standards are incorporating whole life carbon

Both CRREM (widely used carbon transition risk monitor) and GRESB (global ESG performance benchmark for real estate portfolios), are considering integrating embodied carbon into their 2024 assessments in an effort to encourage real estate players to reduce their embodied carbon emissions.

Finally, both LEED and BREEAM, the most widely-used voluntary ESG certifications in Europe, now include assessments of carbon on a whole lifecycle basis. BREEAM, for instance, for both the 'refurbishment' and 'new construction' modules, scores projects according to how carbon intensive the materials used are and incentivizes re-use of materials. However, given the main weighting (19%) in the BREEAM scoring is on minimizing energy use at the operational stage, participants are incentivized to prioritise operational energy savings over embodied.

#### 2.3. Whole life carbon is becoming essential to net zero industry guidance

Measuring and managing WLC is becoming more transparent. SBTi (Science Based Targets Initiative), is an initiative encompassing over 4,000 companies (including listed real estate companies and asset managers) with the aim of guiding the private sector in reducing carbon emissions. It is in the process of concluding a public consultation regarding the guidance they have developed with Ramboll (an architecture and engineering consultancy) on target-setting for embodied carbon emissions reductions and pathways to achieve these targets. The results are due for launch in Q4 2023.

This is not the only guidance in the market. The RICS, a key professional body regulating real estate valuations, has issued a Professional Statement (i.e. compulsory for members to follow) providing specific methodology for reporting WLC. A total of eight other industry associations have issued similar reports for their members including RIBA and the Urban Land Institute. In addition, Environmental Product Declarations (EPD) are quickly developing to improve transparency on the embodied carbon in widely-used construction materials.

Despite this progress, there is some way to go. There is not yet a complete database in the industry detailing the embodied carbon for typical construction materials by country. While databases exist for the UK, US, Australia, and EU, these often include different materials, assumptions, units of measurement, and standards of data verification, making the data difficult to compare.

#### 2.4. Innovation is driving decarbonization in the production of carbon-intensive building materials

Steel, aluminium and concrete together account for 68% of the embodied energy sources in building materials.<sup>8</sup> Yet significantly reducing the carbon emissions involved in their production is often considered unfeasible for technical or financial reasons.

To help build the market signal for innovative emission reduction technologies in these manufacturing sectors, the First Movers Coalition was created by the US State Department and World Economic Forum.<sup>9</sup> The public-private partnership harnesses collective purchasing power from companies to send a clear demand signal to scale up critical emerging technologies essential for the net zero transition. For example, purchasers of aluminium commit that at least 10% of their annual primary aluminum procurement volumes by 2030 to meet the First Movers Coalition definition for low-CO<sub>2</sub> primary aluminium. So far, 86 major corporations such as in the automotive, and aviation industries have made commitments regarding the procurement of aluminium and steel.

Cement is another key yet carbon intensive building material where recent advances in technology have made reductions of up to 70% in carbon emissions possible. The key is reducing or replacing the high-carbon hardening component clinker with supplementary cementing materials such as ash, clays and fillers.<sup>10</sup> More widespread use of clinker replacement technologies could result in a significant reduction in the embodied carbon of modern buildings.

### 3. What are the implications for asset management strategy of taking a whole lifecycle approach?

An exclusive focus on either embodied or operational carbon can lead to widely divergent outcomes. Plate glass, for example, is often the second most carbon-intensive material involved in building or retrofitting commercial buildings after aluminium. Minimising embodied emissions would therefore entail keeping glass use as low as possible. Yet triple glazing, which carries more embodied carbon than double glazing makes the building 40% more thermally efficient, reducing operational carbon.

There is no 'one size fits all' approach to minimizing WLC. However, in many instances retrofits will result in the best WLC outcome, as upfront greenhouse gas emissions psm are generally lower for renovation than for new construction.<sup>11</sup> This is illustrated in a series of projects undertaken by Arup and disclosed to the World Business Council for Sustainable Development (WBCSD). Savings in embodied carbon from retaining existing structures while improving operational performance meant that the refurbishment could outperform the new builds on a WLC basis.

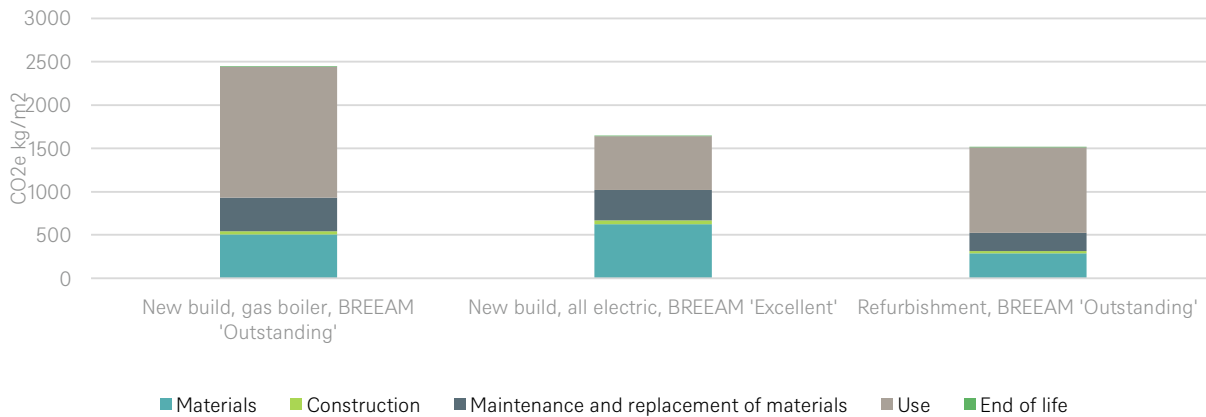
<sup>8</sup> Ecorys, 2014

<sup>9</sup> World Economic Forum, 2023

<sup>10</sup> Ecocem, November 2022

<sup>11</sup> Ramboll, May 2023

### Whole lifecycle carbon emissions, three London office projects



Source: WBCSD, Arup, 2021

## 4. Conclusion

A knock-down and rebuild approach is no longer sufficient to achieve the dramatic reductions in operational carbon emissions needed to meet Paris Agreement commitments. To take this approach as standard would risk failure to achieve planning permission on new developments or refurbishments in many key markets in Europe.

Even though regulatory and voluntary standards have moved on significantly and embodied emissions are increasingly accounted for, there is still work to be done. WLC assessments can be prone to wide variations in outcomes depending on the assumptions used. This is best illustrated in the planning difficulties of the Marks & Spencer store redevelopment on Oxford Street, London, where the carbon lifecycle assessment included in the store's planning submission was challenged by heritage groups on the basis that flawed assumptions were used to portray a new building as the lower carbon option.<sup>12</sup> Without a clearer playbook for assessments such as these, planning applications are open to challenge. The unintended consequence may be lack of investment where it is most needed – in lifting the standard of existing real estate to reduce overall emissions from the sector.

There is also some way to go in addressing end-of-life carbon emissions. This area is still very much out of focus and there are very few examples of buildings which have been built with a view to recycling a significant proportion of the materials used. However, the broadening of effort from reducing operational to embodied emissions suggests that end-of-life emissions will be the next frontier.

<sup>12</sup> The Guardian, July 2023

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