

Whole-lifecycle carbon key to unlocking net zero

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 most emissions, between 10 percent and 20 percent of a building's total carbon footprint is attributable to embodied emissions.¹

Embodied carbon emissions have so far received little attention. More than half the participants in the RICS Sustainability Survey in 2021 stated that they do not measure embodied carbon emissions.² No respondents to CRREM's latest investor survey measure the trade-off between embodied and operational carbon.³

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.

Why is whole-lifecycle carbon important?

Whole-life carbon is essential to reaching net zero

With the Paris Agreement requiring greenhouse-gas emissions to reach net zero by 2050⁴, municipal, national and international governments are taking action. The European Union is in the concluding stages of revising its Energy Performance of Buildings Directive (EPBD), a key piece of legislation that is likely to require new buildings to achieve net zero on a whole-lifecycle basis and existing buildings to meet certain minimum energy-performance standards by 2030. If and when the updated EPBD becomes EU law (the increasingly complex politics around it 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 front-run 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.⁵ Supply data for London shows the market is already prioritising refurbishments over new development. 2021 was the first in more than 10 years when

refurbishments overtook redevelopments, and this trend is likely to continue into 2024.

With regulation requiring WLC assessments, guidance on how to measure and manage WLC is proliferating. 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 Royal Institute of British Architects (RIBA), which has established clear targets for embodied emissions reductions for new buildings. 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 United Kingdom, the United States, Australia and the European Union, these often include different materials, assumptions, units of measurement and standards of data verification, making the data difficult to compare.

Voluntary standards are increasingly incorporating WLC

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.

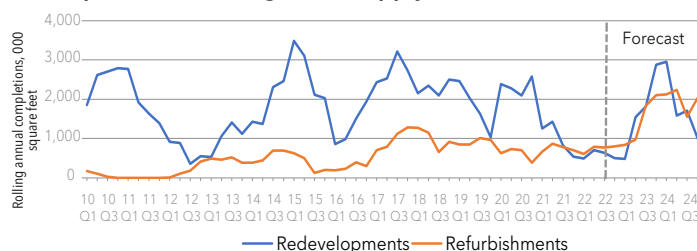
Finally, both LEED and BREEAM, the most widely used voluntary ESG certifications in Europe, now include assessments of carbon on a whole-lifecycle basis. BREEAM, for instance, for both the "refurbishment" and "new construction" modules, scores projects according to how carbon intensive the materials used are and incentivises reuse of materials. Given the main weighting (19 percent) in the BREEAM scoring is on minimising energy use at the operational stage, however, participants are incentivised to prioritise operational energy savings over embodied.

Innovation is driving decarbonisation in the production of carbon-intensive building materials

Steel, aluminium and concrete together account for 68 percent of the embodied energy sources in building materials.⁶ 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.⁷ 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 to at least 10 percent of their annual primary aluminium procurement volumes by 2030 meeting the First Movers Coalition's definition for low-carbon dioxide primary aluminium. So far, 86 major corporations, in industries such as

Figure 1: Refurbishments now more common than new developments in driving office supply in Central London



Source: PMA, July 2023

automotive and aviation, have made commitments regarding the procurement of aluminium and steel.

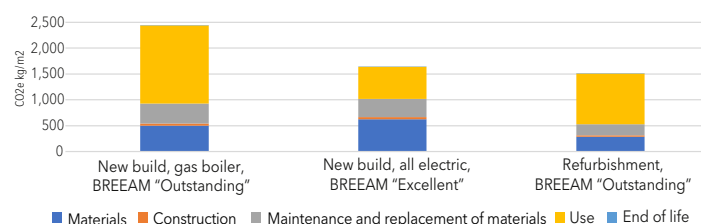
Cement is another key, yet carbon-intensive, building material for which recent advances in technology have made reductions of up to 70 percent in carbon emissions possible. The key is reducing or replacing the high-carbon hardening component clinker with supplementary cementing materials such as ash, clays and fillers.⁸ More widespread use of clinker-replacement technologies could result in a significant reduction in the embodied carbon of modern buildings.

What are the implications for the 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 percent more thermally efficient, reducing operational carbon.

There is no “one size fits all” approach to minimising WLC. In many instances, however, retrofits will result in the best WLC outcome, as upfront greenhouse-gas emissions per square metre are generally lower for renovation than for new construction.⁹ 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 the refurbishment could outperform the new builds on a WLC basis.

Figure 2: Whole-lifecycle carbon emissions, three London office projects



Sources: WBCSD, Arup, 2021

Case Study – The Northcliffe

The Northcliffe is a former industrial building in the City of London. It is one of just 3 percent of refurbished buildings to achieve the highest BREEAM rating and, in doing so, exceeds RIBA's 2030 targets for embodied emissions for offices. Before undertaking the work, DWS carried out a WLC analysis. This revealed that by refurbishing rather than rebuilding, a 53 percent saving in greenhouse-gas emissions could be achieved. At the same time, investing in energy efficiency and renewable energy sources meant that operational emissions during the remainder of the building's lifetime were considerably reduced.



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 forwards 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.¹⁰ 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.

Notes: ¹ International Energy Agency (2020); ² RICS, 2021; ³ CRREM, 2023; ⁴ This includes both operational and embodied emissions; ⁵ Green Street, March 2022; ⁶ Ecorys, 2014; ⁷ World Economic Forum, 2023; ⁸ Ecocem, November 2022; ⁹ Ramboll, May 2023; ¹⁰ The Guardian, July 2023

COMPANY PROFILE

DWS Real Estate has been investing in real estate assets for more than 50 years. The business has nearly 350 employees in more than 20 cities around the world and almost €80 billion in real estate assets under management (as of 30 September 2023). We offer a diverse range of strategies and solutions across the risk/return and geographic spectrums, including core, value-added and opportunistic real estate, real estate debt, real estate securities and opportunistic real estate.



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