

Towards zero-carbon building

Eliminating carbon from the building and construction sector by mid-century will require radical transformation

By **Cristina Gamboa**, CEO, World Green Building Council

n its 2018 landmark report, *Global Warming of 1.5°C*, the UN Intergovernmental Panel on Climate Change warned of a catastrophic climate breakdown if global average temperatures rose by 2°C. Negative consequences for our communities and planet would be long-lasting and, in some cases, irreversible. Recent events in countries like Australia have shown us a glimpse of the future and that the worst, if we do not act now, is yet to come.

Faced with our current state of climate emergency, science and data have already established the role and potential of the building and construction sector in helping to map a pathway to 1.5°C in line with the more progressive ambitions of the Paris Agreement.

▲ Avoiding carbon-intensive materials: the seven-storey T3 office building in Minneapolis is North America's largest contemporary wooden building. Only the ground floor and the central access core use reinforced concrete, while the top six storeys have been built with woodframe techniques

39

Underpinning those ambitions is a projected transition to net-zero carbon emissions with specific transformations to be met by 2030 and 2050. It is imperative that the sector steps up its climate action, as we know that the path of its decarbonisation is one of the most cost-effective ways to rescue our planet from the worst effects of climate breakdown.

As the world's population increases, the global building stock is expected to double in size by 2060. Without drastic changes to the way our sector operates, this expansion will fuel an expected doubling of the total global consumption of raw materials (according to predictions by the Organisation for Economic Co-operation and Development). This will significantly increase the construction sector's emissions and climate impact.

A wake-up call? Absolutely. That's why at the World Green Building Council (WorldGBC) we see the need to go further and faster to decarbonise. And we want to take the whole sector with us.

Bringing embodied carbon upfront

Carbon emissions are released not only during the operation of buildings but also during the manufacturing and transportation of materials, construction and end-of-life phases of all built assets buildings and infrastructure alike. Largely overlooked historically, these embodied carbon emissions account for around 11 per cent of all carbon emissions worldwide.

If we drill down further, we see that carbon emissions released before a building or infrastructure enters use (so-called 'upfront' carbon) will account for half of the entire carbon footprint of new construction between now and 2050. This upfront carbon therefore threatens a large chunk of our residual carbon budget, and it's occurring right now.

As steps to reduce operational carbon take effect, embodied carbon will grow in both size and importance as a proportion of total emissions. While we continue to focus on addressing operational carbon, we must now also rapidly increase our efforts to tackle embodied carbon emissions on a global scale.

Our 2019 report Bringing Embodied Carbon Upfront describes goal-based steps that stakeholders across our sector can take to meet global climate targets against a staged timeline using a whole-lifecycle approach. The report - both a roadmap and call to action - is especially meaningful, as it is endorsed by some 85 organisations: from financial institutions and policymakers to developers and manufacturers.

These organisations join our global network of Green Building Councils, demonstrating leadership through global initiatives like our Advancing Net Zero programme, which targets full-sector decarbonisation by 2050. Our ambitious

boundaries are being crossed. Building design can therefore be part of a bigger picture that also takes in transport and urban planning.

It is worth reminding ourselves that low-carbon building design also considers future-use and end-of-life scenarios, maximising the potential for maintenance, repair, renovation and adaptation. Smart design for disassembly and deconstruction chooses and uses materials which can be recycled, or which can be extracted and separated easily for processing.

Meanwhile, latest-generation, performance-based metrics are raising the bar for design standards within new builds

Performance-based metrics are raising the bar for design standards within new builds in a bid to eliminate the carbon emissions associated with operating costs

vision for the sector sees a highly connected value chain radically reducing both embodied and operational carbon emissions, improving wider lifecycle environmental impacts, and contributing as effectively as possible to the UN's Sustainable Development Goals.

Achieving our vision means taking urgent action to tackle upfront carbon, while planning with whole-life carbon in mind. It means 'designing out' carbon using more robust metrics and methodologies. It means innovating in materials to improve procurement options and maximise circularity. And it means initiating a fresh conversation between investors, policymakers, planners, developers, manufacturers and designers to better manage the supply- and demand-side influences on the built environment.

Designing for better outcomes

Today, increasingly smarter urban planning is maximising opportunities for low-carbon design in buildings and surrounding infrastructure.

When buildings are viewed as, for example, an energy source for electric vehicles, it's clear that interdisciplinary in a bid to eliminate the carbon emissions associated with operating costs. Here, the focus is on monitoring and measuring outcomes with greater reliability and rigour, and on using integrated design solutions to achieve net-zero emissions today while future-proofing for tomorrow.

In this context, our Green Building Councils are playing an increasingly active and important role. We recognise the value that rating tools and certification schemes have in different markets in support of performance standards that exceed local regulatory minimums. That's why our Green Building Councils are already developing their own net-zero carbon building certification programmes tailored to local needs.

Such schemes help quantify reduced impacts while encouraging participants to consider enhanced sustainability criteria. Green Building Councils are also rolling out training and education programmes to develop market capacity and support delivery.

Material innovation

Materials are the principal source of embodied carbon emissions from buildings

41

and infrastructure, particularly the upfront carbon being released right now. Winning the support of manufacturers and creating the right conditions for them to take radical action today and tomorrow are crucial.

Materials producers will need finance, and supportive policy frameworks, plus an adequate market demand for their low-carbon products. That is why the coordination of our efforts across the widest possible range of stakeholders is an urgent priority.

Highly carbon-intensive materials such as concrete and steel play a key role in shaping the built environment that we live in. They will continue to do so. Today, our focus must be on identifying and evaluating the best low-carbon solution for a building's needs. That said, the good news is that forward-thinking manufacturers of our most carbon-intensive materials are leading the way in innovating for impact.

HeidelbergCement, the world's fourth largest cement group, is the first company in this sector to design a carbon reduction strategy that is certified to be in line with the Paris Agreement. Dalmia, one of India's top cement manufacturers, has made a commitment to becoming carbon negative by 2040. In steel, ArcelorMittal and SSAB are among manufacturers working to meet the Paris targets by, for example, using cleaner power, by exploiting circular carbon models, and by prioritising carbon capture and storage.

These types of innovations that reduce emissions from materials mean designers have better options. Indeed, the knock-on effect of advances in materials ripples out right across the sector.

Opportunity and challenge

Instilling a better understanding of best practice and the potential for change is key to embedding systemic progress towards our objectives – not just within our sector but across the entire planning and regulatory landscape. When so much of our attention is on the path ahead, it is vital not to underestimate the opportunities associated with our existing building stock – opportunities to upgrade, renovate and retrofit to improve performance across the whole lifecycle.

We can help buildings reach net-zero readiness via efficient on-site electrification – for example, in anticipation of a decarbonised grid. Nature-based solutions and offsets, too, can help shrink residual emissions.

Our vision is one of radical transformation for our sector. To deliver it requires much more market demand as

well as a rapid scaling up of solutions by the supply chain. Demand-side actors within the production chain, including investors and developers, must work together with their counterparts on the supply side – the contractors and materials manufacturers.

By stimulating demand, we accelerate investment in actions that lead to increased competitiveness, improve access to innovative solutions, and stimulate action across a broader range of integrated strategies for achieving net-zero carbon – and for securing a safer future for both our generation and those to come.

Net zero is our goal. What does it really mean for us, if not the chance to transform our sector from a major cause of the climate emergency into a major solution to it? •



[►] The Edge in Amsterdam is rated by BREEAM as one of the world's most sustainable office buildings. Among its features, it uses 70 per cent less electricity than comparable buildings, has the largest array of PV panels of any European office building, and uses an aquifer thermal energy storage system for heating and cooling