

BUILT ENVIRONMENT ECONOMIST

AUSTRALIA AND NEW ZEALAND



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About

Built Environment Economist is the flagship publication of Australian Institute of Quantity Surveyors (AIQS). Produced quarterly, Built Environment Economist seeks to provide information that is relevant for quantity surveying, cost management and construction professionals.

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ISSN

2652-4023



SUSTAINABILITY



STRENGTH IN NUMBERS

THE RACE TO REDUCE EMBODIED CARBON

By Stephen Ballesty FAIQS, CQS with
Sarah Slattery MAIQS, Jeffery Robinson, Steven Peters and Stephen Mitchell



Embodied carbon refers to the greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.

Embodied carbon is a significant percentage of global emissions and requires urgent action to address it. Overall, buildings accounted for 36% of global energy demand and 37% of energy-related CO₂ emissions in 2020.

AIQS assembled a panel of industry leaders in Melbourne at the BE Summit on 13 May 2022. This article summarised the panel's discussion in taking us beyond the rhetoric and highlighting how we can dramatically reduce embodied carbon in our built environment.

Should wish to contribute to this important and continuing discussion please contact AIQS.

ADOPTING A 'RACE' ANALOGY

Our panel had a challenging topic and only limited time to achieve AIQS's objective.

We addressed three questions:

1. The starting line, how do we begin?
2. Is it a sprint or a marathon, or a steeplechase?
3. What's the finish line look like?

Embodied carbon is greenhouse gas (GHG) emissions associated with materials and construction processes throughout the whole life cycle of a building or infrastructure being the sum of upfront embodied carbon, in-use embodied carbon, and end-of-life embodied carbon, measured by CO₂-e.

The embodied carbon challenge impacts on the design, delivery, and management of the built environment. Our industry

needs to lead the widespread transformation that is required to achieve better decision-making and asset performance in terms of sustainability, resilience, affordability, and liveability in support of improved quality of life.

READY: WHERE TO START?

Understanding the carbon footprint issue: operational vs embodied carbon.

Currently 35-45% embodied, with the rest from operational carbon. According to our panel much of our market's focus has to date on operational emissions, e.g., energy efficiency. Without collaborative action, embodied carbon is forecast to account for 85% of Australian buildings' total carbon emissions by 2050. Hence, we are at the start of an important 'race' to embrace change.

AIQS is currently working with the Materials and Embodied Carbon Leaders Alliance (MECLA), the Green Building Council of Australia (GBCA), National Australian Built Environment Rating System (NABERS), and other organisations in support of a range of measurement methodologies and assessment tools.

Further AIQS's Information Paper: Life Cycle Cost Analysis (1st edition, 2022) provides a valuable comparative and management tool that can influence the design, specification, construction, operations, and sustainability performance.

Quality information for improved decision-making. Increasingly we are seeing Environmental Product Declarations (EPDs) and climate declarations. These need to be independently verified and registered to communicate transparent and comparable data and other relevant



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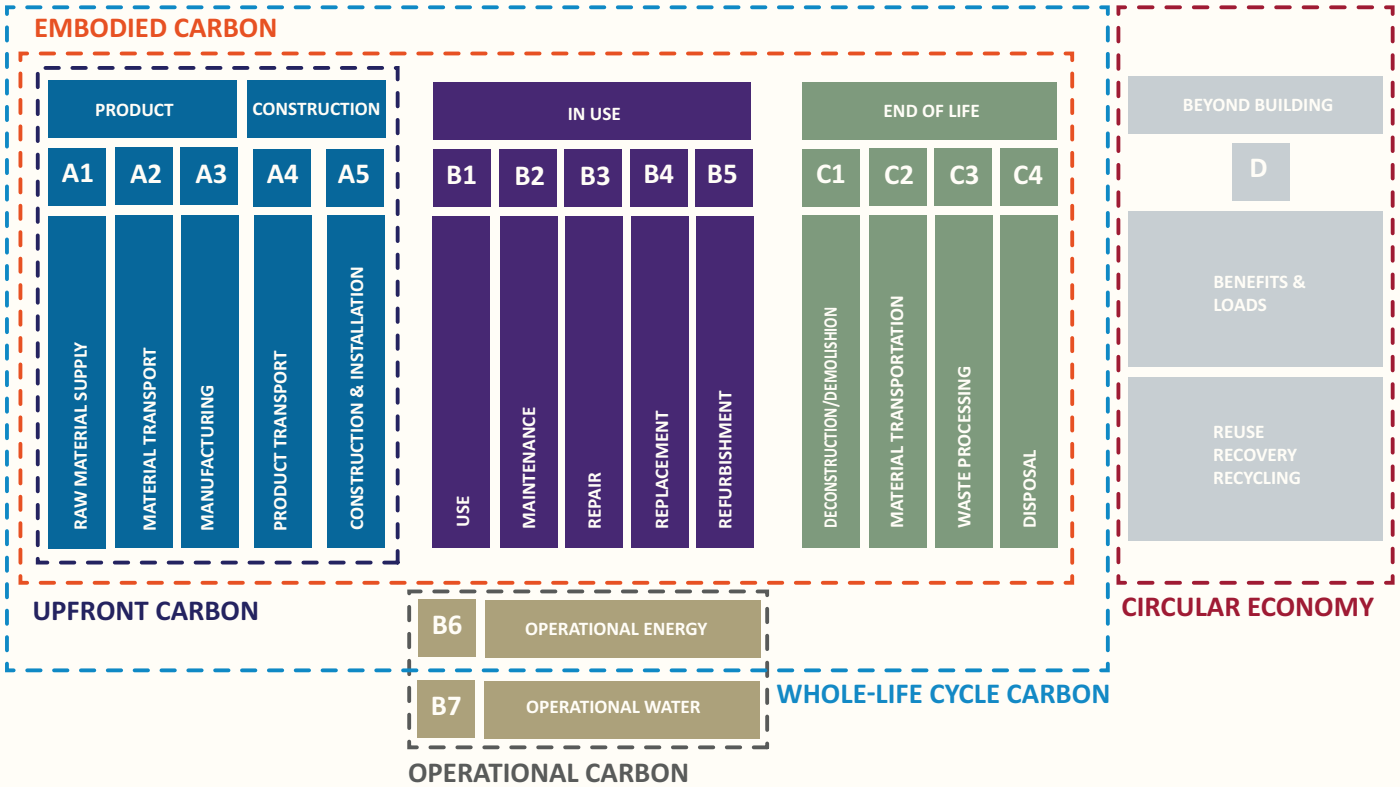


Figure 1: Embodied Carbon, MECLA Dictionary of Carbon (2022) per BS EN 15978:2011

environmental information about the life-cycle environmental impact of a wide range of products.

To date a great deal of industry emphasis, based on the owner's focus, has been on operational carbon reporting, e.g., energy efficiency performance. In addition to expanding this effort as a priority to measuring embodied carbon of structures (concrete, steel, masonry, timber, etc.), there is increasing need to broaden our understanding on the greater contribution of improved building services.

SET: WHERE ARE WE UP TO?

We are modifying and broadening our performance metrics for property assets and facilities.

"If concrete were a country, it would be the third largest emitter of greenhouse gases on earth, behind only China and the United States."

It is clear that more needs to be done to address embodied carbon, and that our industry must take the lead in doing more. This will include verification protocols and greater supply chain transparency than has been the case in the past.

The World Green Building Council has provided a 2019 reportⁱⁱ on how we as an industry can reduce our embodied carbon footprint:

- measure embodied carbon emissions across the entire construction life cycle
- establish a baseline of current contributions and reduction targets
- adopt best practices for material selection based on lowest embodied carbon impacts
- design with a low carbon approach in mind, and a life cycle assessment (LCA) approach throughout

ⁱ <https://phys.org/news/2021-10-concrete-world-3rd-largest-co2.html>

ⁱⁱ https://www.worldgbc.org/sites/default/files/WorldGBC_Bringing_Embodied_Carbon_Upfront.pdf



- decision makers need to lead by example in requiring all projects to be net-zero embodied carbon.

Given the embodied carbon of building elements and materials for new construction projects, it is also worth thinking about the potential for avoiding these emissions by retaining existing buildings and redeveloping rather than knocking it down and starting again.

The use of EPD statements from material manufacturers should be used in the materials selection process. EPDs for specific products compliant with ISO14025 and EN15804 have been assessed as the highest level (preferred) of quality data. For example this is reflected in the New Zealand Government's 2022 Whole-of-Life Embodied Carbon Assessment: Technical Methodologyⁱⁱⁱ for assessing the embodied carbon of new buildings.

The new Green Star tool also now provides a basis for rewarding embodied carbon reduction. By way of example, the 500 Bourke Street refurbishment experience, in the project feasibility ISPT faced this choice to demolish and start with a blank canvas, or to retain the building and refurbish preserving the existing embodied carbon. Opting for the latter, ISPT avoided the carbon generated through the construction and manufacturing of a new concrete and steel structure. In addition, ISPT also made a commitment to save and rehome furniture and other materials. Through the project we were able to save for reuse over 15,000 furniture items, and 42,000 ceiling tiles plus whitegoods and blinds. Of course, where possible the project's preferred the use low carbon materials for all new works involved in the refurbishment.

The preliminary life cycle assessment showed that the decision made resulted in the avoidance of approximately 57,000 tonnes of carbon equivalents (CO₂e),

including 40,000 tonnes attributed to the structure alone. To put this into context – the total annual operational carbon emissions across ISPT portfolio is about 52,000 tonnes of CO₂e. So, we were able to avoid more than the total annual emissions of our whole portfolio.

GO: LESSONS LEARNT, AND THE BUSINESS CASE FOR CHANGE?

Until now, there was no published embodied carbon benchmarking data based on real projects available in the Australian marketplace. Without benchmarking embodied carbon, net zero emissions targets will remain elusive. Slattery has developed our methodology, informed by international frameworks, to ensure data is consistent, comparable, reproducible, precise, and complete. The release of the 'Slattery Upfront Embodied Carbon Benchmarks' in May 2022, during the BE Summit, is in recognition of the importance of this issue as part of

retrospective reporting, and Whole Life Cost (WLC) considerations.

The calculation of embodied carbon needs to become standard practice. Currently the industry leaders have the opportunity to explore voluntary initiatives, but our panel felt that this would be increasingly, beyond investment mandates and ESG reporting, that embodied carbon disclosures would be regulated. Examples in Europe and the USA were cited.

In practical terms, it will be about taking a holistic approach and prioritising items with the most 'bang for the buck' in carbon contribution and considering the life extension of future assets and existing facilities. This will include abandoning short-term focused and wasteful practices, and embracing the circular economy, accountability and demarcation responsibility for all life cycle costs. Examples include extended service life expectations and more use of 'cold-shell' fitouts. Such principles can readily be reflected now in Fitout Guides issued

LEVEL OF DATA QUALITY	MATERIAL OR PRODUCT SPECIFICATION AND QUANTITY DATA	MATERIAL OR PRODUCT EMBODIED CARBON DATA
HIGHEST (PREFERRED) 5	As-built information for material/product specifications and quantities, that include allowances for site waste	Benchmarked material quantity data from similar building types
4	Detailed Schedule of Quantities, reflecting amounts and specifications of materials included in the building contract	New Zealand sector EN 15804 compliant EPD for product type
3	Quantities take-off from a BIM model used in the design process	Global EN 15804 compliant EPD for product type
2	Rough estimates of material quantities and material types at early stage/concept design	Embodied carbon data for product type from non-EN 15804 compliant EPD, or other databases
1 LOWEST (TO BE AVOIDED)	Benchmarked material quantity data from similar building types	Default values

Figure 2: NZ Whole-of-Life Embodied Carbon Assessment: Technical Methodology (2022)

ⁱⁱⁱ <https://www.building.govt.nz/assets/Uploads/getting-started/building-for-climate-change/whole-of-life-embodied-carbon-assessment-technical-methodology.pdf>



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to managers and tenants on new and existing leases, to improve the selection of materials and to be mindful of any stripped out and makegood works at the end of the lease. Our industry can reduce waste and enhance its re-use / recycling practices, to meet embodied carbon targets as part of the circular economy.

Of course, all panelists agreed that there are considerable benefits of regulating disclosure, not the least of which is the standardisation of reporting requirements and as a basis for performance benchmarking. Interestingly, Green Star in Australia and New Zealand have recently upgraded with a greater focus on reducing embodied carbon.

Global warming potential (GWP) / CO₂e metrics will be the common basis for reporting. However, this the growing number of criteria and metrics that our industry will need to embrace to describe future project and facility risks, the impact of the circular economy concept, various types of obsolescence and support of the UN's 17 sustainable development goals (SDGs)^{iv}.

STRENGTH IN NUMBERS

Achieving net zero embodied carbon for the entire built environment will require widespread transformation and collaboration across the whole life cycle to support the decarbonisation of our industry's practices and outputs embracing the circular economy and deploying more low embodied carbon alternatives. Such action should deliver a variety of environmental, social, and financial benefits of taking a leadership position within transition to a decarbonised the built environment.

This transition will involve all sectors and requires leadership and innovation from all stakeholders –investors, developers, designers, suppliers, constructors and managers of our built environment. There will need to be stronger policy and regulatory support from governments and access to finance.

In conclusion our Panelists were realistic and optimistic, underscoring the focus on a “whole of life” approach and the need to “just do it”. Our “strength in numbers” means that our industry can address the big issues and contribute to more sustainable developments and the “quality of life” for all.

This article has been written and Stephen Ballesty FAIQS, CQS, Director at In-Touch Advisory and was panel moderator for this event. Stephen is the AIQS's representative to Standards Australia for FM standards.

Our expert panellists included Sarah Slattery MAIQS, Managing Director at Slattery Australia; Jeffery Robinson of Global Sustainable Design Expertise Leader at Aurecon; Steven Peters, Senior Manager, Sustainability at ISPT; and Stephen Mitchell is the Past Chair and Advocacy and Marketing Director of EPD Australasia.



^{iv} <https://sdgs.un.org/goals>