Proposal for Change

National Construction Code

Subject/topic: Embedding whole lifecycle carbon assessments in the NCC

Volume/standard	Provision
NCC Volume One	Clause J1O1 Clause J1F1 Clause J1P Clause J1V
NCC Volume Two	Clause H6O1 Clause H6F1 Clause H6P Clause H6V Clause H6D1 Clause H6D2
NCC Volume Three	N/A
ABCB standard	N/A

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The proposal

What is the proposal?

This proposal is one of two Proposals for Change which comprise the submission from Climateworks Centre. The contents of this document are to be considered alongside our supplementary proposal on embedding a definition of zero carbon buildings in the NCC.

Climateworks Centre proposes that considerations for embodied carbon emissions and whole lifecycle assessments be embedded in the NCC 2025 update via:

- Objectives
- Functional Statements
- Performance Requirements
- Verification Methods
- Deemed-to-Satisfy Provisions, to apply to all residential and non-residential Building Classes, including mixed-use buildings, and buildings with multiple classifications
- any updated referenced documents, such as the Australian Standards.

To achieve this outcome, Climateworks proposes the following modifications and/or additions to existing NCC provisions highlighted in green text:

Vol 1, Clause J1O1

Modify:

(b) reduce greenhouse gas emissions for all stages of the lifecycle of a building, including reducing upfront embodied energy and carbon emissions, with zero greenhouse gas emissions from a building's operational phase; and

Vol 1, Clause J1F1

Modify:

(b) reduce embodied energy and greenhouse gas emissions that occur as a result of a building's construction and demolition, along with zero emissions from a building's operational energy consumption and energy sources; and

Vol 1, Clause J1P

Add new Clause J1P5:

J1P5 Whole lifecycle carbon assessment

Decisions made through the design, construction and demolition phase of a building's lifecycle must reduce greenhouse gas emissions resulting from:

(a) stationary combustion of fuels, with all buildings being all-electric
(b) combustion of fossil fuels from transportation
(c) direct process emissions
(d) purchased energy
(e) purchased goods and services.

Vol 1, Clause J1V

Add new Clause J1V5:

J1V5 NABERS Embodied emissions initiative

Compliance with J1P5 is verified through the NABERS Embodied emissions initiative framework* or other alternative verification.

** Note: the NABERS Embodied emissions initiative framework is currently in development. This clause can therefore be expanded upon when details of the framework have been confirmed.*

Vol 2, Clause H6O1 - Objective

Modify:

(b) reduce greenhouse gas emissions for all stages of the lifecycle of a building, including reducing upfront embodied energy and carbon emissions, with zero greenhouse gas emissions from a building's operational phase; and

Vol 2, Clause H6F1

Modify:

> **(b)** reduce embodied energy and greenhouse gas emissions that occur as a result of a building's construction and demolition, along with zero emissions from a building's operational energy consumption and energy sources; and

Vol 2, Clause H6P

Add new Clause H6P3:

H6P3 Whole lifecycle carbon assessment

Decisions made through the design, construction and demolition phase of a building's lifecycle must reduce greenhouse gas emissions resulting from:

(a) stationary combustion of fuels, with all buildings being all-electric
(b) mobile combustion of fuel in vehicles
(c) direct process emissions
(d) purchased energy
(e) purchased goods and services.

Vol 2, Clause H6V

Add new Clause H6V4:

H6V4 NABERS Embodied emissions initiative

Compliance with H6P3 is verified through the NABERS Embodied emissions initiative framework.*

** Note: the NABERS Embodied emissions initiative framework is currently in development. This clause can therefore be expanded upon when details of the framework have been confirmed.*

Vol 2, Clause H6D1

Modify:

(1) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirements H6P1, ~~and~~ H6P2 and H6P3 are satisfied by complying with H6D2.

Vol 2, Clause H6D2

Modify:

(3) Performance Requirement H6P3 for whole lifecycle carbon assessment is satisfied by complying with the NABERS Embodied emissions initiative framework*.

** Note: the NABERS Embodied emissions initiative framework is currently in development. This clause can therefore be expanded upon when details of the framework have been confirmed.*

The current problem

What problem is the proposal designed to solve?

As the electricity grid decarbonises, embodied carbon emissions and energy will make up an increasingly greater share of the building sector's emissions under business-as-usual (BAU) activities (World Green Building Council 2019:7), while operational emissions will continue to decrease as Australia moves to decarbonising its electricity grid and buildings move to being fully electrified. Embodied carbon emissions and energy in buildings will likely double from 2019 levels by 2050, from 213 to 401 PJ under BAU (Green Building Council of Australia & thinkstep-anz 2021). As embodied carbon emissions and energy will comprise a greater proportion of the building sector's emissions over time, embodied emissions should be considered now to reach a net zero carbon future.

Buildings contribute around a fifth of Australia's greenhouse gas emissions and 55 per cent of Australia's total electricity consumption (Climateworks Australia 2020; Harrington & Toller 2017). As Australia decarbonises in line with the Paris Agreement and its Nationally Determined Contribution targets, the building sector has an opportunity to play a significant enabling role by reducing energy demand across the economy.

What are embodied carbon emissions and embodied energy?

Embodied carbon emissions are defined as the sum of 'carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure' (World Green Building Council 2019:5). This includes extracting resources, manufacturing processes, transporting construction materials to site, and the energy needed for assembly, construction, demolition and disposal.

Embodied energy represents the sum of the energy use associated with the production of materials, construction, and end-of-life stages of a building (Green Building Council of Australia & thinkstep-anz, 2021).

Embodied energy and embodied carbon emissions often involve harder-to-abate sources of energy and emissions which are locked-in upfront in the design and construction stages. Consideration of embodied energy and whole lifecycle carbon assessments is therefore crucial to decarbonising the building sector, and to discourage excessive and unnecessary use of resources within the built environment and the greenhouse gas emissions associated with these.

There is current development of embodied carbon emissions calculation and lifecycle assessments in non-residential buildings through the National Australian Built Environment Rating System (NABERS) nationally adopted certification. There is currently no consideration of embodied carbon emissions and energy and whole lifecycle analysis as part of the NCC. This proposal calls for the adoption of a national method for measuring and evaluating a building's upfront embodied carbon emissions and energy, and the setting of standards of efficiency and reduction in line with Australia's Trajectory for Low Energy Buildings.

What evidence exists to show there is a problem?

As Australia's electricity grid continues to decarbonise, operational emissions from all-electric buildings will decrease accordingly. Embodied emissions will form up to 85 per cent of emissions from Australia's building sector by 2050 without intervention (Green Building Council of Australia & thinkstep-anz 2021). Most energy efficiency standards and voluntary schemes currently only focus on operational energy. Methods to measure embodied carbon emissions and energy are not as advanced as the measurement of operational energy. However, this is

changing, and there are calls from industry to quantify embodied carbon emissions and energy, and to set targets for reducing embodied carbon emissions and energy. In addition, the federal government has announced that a clean energy transition is a national priority. A cost-effective clean energy transition requires a reduction in energy demand, and including the carbon emitted in the manufacturing of building materials and construction of new buildings will make an important contribution. Regulatory intervention is required to ensure that embodied emissions for the building sector are measured through a standardised national framework, and subsequently reduced in future updates through the regulatory measures in the NCC.

The objective

How will the proposal solve the problem?

Climateworks proposes the NCC adopts the NABERS framework to measure embodied emissions, and use this as the basis to set national minimum standards to reduce embodied carbon emissions. Doing so will ensure a consistent framework is applied throughout Australia when considering greenhouse gas emissions across a building's entire lifecycle. We also propose ensuring that embodied carbon emissions are assessed on all projects as part of a comprehensive whole lifecycle carbon assessment, drawing on the industry-led Part Z movement in the UK. A framework for measuring embodied carbon emissions and energy and setting minimum standards is essential to ensure all new buildings in all States and Territories make their contributions for Australia to meet its emissions reduction targets.

More specifically, the proposal expands the remit of the NCC to consider emissions beyond a building's operational phase, by explicitly expanding the Energy Efficiency Part of the NCC to include emissions during construction and demolition, for all Building Classes. The proposal also adds clauses where appropriate to note that compliance with energy efficiency Performance Requirements can be met through meeting the NABERS Embodied emissions initiative framework; these clauses can be expanded when the framework has been developed to include more details on how the framework can be complied with.

What alternatives to the proposal (regulatory and non-regulatory) have been considered and why are they not recommended?

Mandatory regulation is a powerful tool that governments can deploy to effectively, efficiently and fairly drive change. Regulation is particularly helpful to provide necessary frameworks and rules to achieve a desired goal or objective, establishing the institutional infrastructure required

to drive successful, coordinated transition in line with legislated emissions reduction targets, and setting timelines across industry.

Three alternatives to the proposed update are: promoting whole lifecycle carbon assessments through voluntary guidance, leaving the transition to whole lifecycle carbon assessments up to the market without regulation, or incorporating whole lifecycle carbon assessments only through the Trajectory for Low Energy Buildings (the 'Trajectory') in the 2024 update. These alternatives are all insufficient to reach the scale necessary to decarbonise the building sector.

1) Voluntary guidance for whole lifecycle assessments will not create a mandate for consistent change across the industry, and is therefore unlikely to result in the necessary trajectory for change to reduce embodied carbon emissions and energy at scale.
2) Without any incentives for industry to move towards whole lifecycle assessments, it is unlikely the market will shift towards considering embodied emissions.
3) Climateworks considers that embedding whole lifecycle carbon assessments in associated documents such as the Trajectory would be beneficial. Incorporating requirements for whole lifecycle carbon assessments in the NCC, aligned with the Trajectory, would provide certainty for industry and promote standardisation across jurisdictions.

Based on the above points, Climateworks believes that regulation via the NCC will be the most effective option, as mandatory minimum regulatory standards will ensure all permitted developments are built to a minimum legal standard.

The impacts

Who will be affected by the proposal?

The groups affected by the proposal are: the mining and manufacturing industries; construction and development industry; supply chain and distribution industry; training organisations; professionals involved in architecture and engineering design processes; real-estate professionals; financial institutions; and consumers.

In what way and to what extent will they be affected by the proposal?

The inclusion of whole lifecycle carbon assessments will likely require additional information from industry stakeholders to measure and evaluate embodied carbon emissions and energy. This would require product specifiers, estimating valuers, and purchasers to undergo training to enable them to evaluate embodied carbon information, and gain knowledge about alternative materials that are fit-for-purpose and can reduce embodied carbon emissions and energy.

Industry processors, manufacturers, suppliers, and fitters may need to change their processes, materials, and technical guidance to reduce embodied carbon emissions. A negative impact may include writing off sunk costs for capital in existing processes with high energy and carbon intensity. For some carbon intensive industries, their current market demand would reduce, or they may face costs for shifting to new processes or technologies. Depending on the material inputs, supply chains may be impacted, which may affect other industries which rely on the same materials. Skills to apply and use low-carbon alternatives may be required, and retraining for construction trades may be necessary.

Mainstreaming products with lower embodied carbon emissions can also help foster demand for growing green industries across Australia such as green steel and aluminium. This will result in economy-wide benefits, allowing for more employment opportunities in supply chains and helping to boost economic activity in regional areas, as well as leading to positive economic impacts for Australian-based industry looking to expand and export products internationally. For other existing low-carbon industries, demand would increase and their market would expand, requiring further investment as growth occurs. Consumers are likely to be indirectly affected by the proposal. They may face higher prices if increased economic costs are passed on by the industry, and potential delays to their builds if supply chains are impacted or there are time lags as builders become proficient in new processes or technologies.

However, the inclusion of a clear framework for whole lifecycle carbon assessments in the NCC will provide nationally consistent guidance for industry stakeholders who are looking to reduce their emissions, and will provide guidance to consumers that they can use to base their new builds around. A similar framework is currently being developed in other markets including in the EU; adopting these practices in Australia will therefore enable Australian industries to remain competitive on the international stage.

Training organisations, as well as professional bodies who set standards for education and professional development requirements, will be affected by the need to upskill workers to have sufficient knowledge about embodied carbon emissions and energy. With the government regulating embodied carbon emissions and energy, financial institutions are likely to have more confidence to invest in lower emissions infrastructure and their supply chains, at a time in which there is already pressure for financial institutions to reduce financed emissions (World Green Building Council 2019:36).

Consultation

Who has been consulted and what are their views?

This proposal draws upon research conducted by the Green Building Council of Australia and thinkstep-anz (2021). As part of this research, the Green Building Council of Australia and thinkstep-anz consulted with industry, including representatives from peak bodies, construction companies, and government departments. These include:

- Australian Aluminium Council (AAC)
- Australian Glass and Window Association (AGWA)
- Australian (iron & steel) Slag Association (ASA)
- Australian Steel Institute (ASI)
- BlueScope Steel
- Brickworks
- Cement Industry Federation (CIF)
- Cement, Concrete & Aggregates Australia (CCAA)
- CSR Gyprock
- Department of Industry, Science, Energy and Resources (DISER)
- Frasers Property
- Gypsum Board Manufacturers of Australasia (GBMA)
- Hanson Australia
- InfraBuild
- Knauf Plasterboard
- Lendlease Group
- NSW Department of Planning, Industry and Government
- Stockland
- USG Boral.

References

Climateworks Australia (2020) *Decarbonisation futures: solutions, actions and benchmarks for a net zero emissions Australia*, Climateworks Australia, accessed 21 June 2023. https://www.climateworkscentre.org/resource/decarbonisation-futures-solutions-actions-and-benchmarks-for-a-net-zero-emissions-australia/

Green Building Council of Australia & thinkstep-anz (2021) *Embodied carbon and embodied energy in Australia's buildings,* Green Building Council of Australia & thinkstep-anz, accessed 27 June 2023. https://www.thinkstep-anz.com/assets/Whitepapers-Reports/Embodied-Carbon-Embodied-Energy-in-Australias-Buildings-2021-07-22-FINAL-PUBLIC.pdf

Harrington P & Toller V (2017) *Best practice policy and regulation for low carbon outcomes in the built environment*, Cooperative Research Centre for Low Carbon Living, accessed 12 July 2023. https://apo.org.au/sites/default/files/resource-files/2017-04/apo-nid232106.pdf

World Green Building Council (2019) *Bringing embodied carbon upfront*, World Green Building Council, accessed 27 June 2023. https://worldgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2022/09/22123951/WorldGBC_Bringing_Embodied_Carbon_Upfront.pdf