

Embodied Emissions Reporting

This note sets out the proposed methodology for assessing the embodied emissions of residential and non-residential development in NSW to satisfy the Sustainable Buildings SEPP requirements.

The NSW government's *State Environmental Planning Policy (Sustainable Buildings SEPP) 2022* (SB SEPP) is a policy framework aimed at promoting sustainable building practices and reducing the environmental impact of the built environment in NSW. To help achieve this, the SB SEPP introduces embodied emissions measurement and reporting for all building types and associated materials.

Research commissioned in 2021 by the federal government and done by Green Building Council of Australia found embodied emissions made up 16% of Australia's built environment footprint in 2019. Without deliberate action, this could increase to 85% by 2050 as buildings become more efficient and the power grid decarbonises through increased renewables¹. To achieve Australia's net zero emissions target by 2050, we must begin measuring and managing embodied emissions in buildings.

Scope of emissions reporting

When is reporting required?

From 1 October 2023, all new residential and all non-residential developments must report on embodied emissions under the SB SEPP.

Applicants are required to disclose the quantities of key materials and associated embodied emissions at the development application and construction certificate stages, or when applying for a residential complying development certificate.

How are emissions reported?

Two reporting methodologies have been tailored to residential and non-residential development types.

The new BASIX Materials Index is integrated with the BASIX online tool to streamline measurement for residential developments. The NABERS Embodied Emissions Tool will be the required format for non-residential

reporting when the NABERS framework is released in mid-2024. In the interim, a NABERS Embodied Emissions Materials Form must be completed. Further details on these tools can be found later in this document.

What must be reported?

The SB SEPP targets upfront embodied emissions, often referred to as cradle-to-gate emissions or stages A1-A3 of a building's life cycle. These are emissions associated with the manufacturing of a product and will be responsible for around half of the entire carbon footprint of new construction between now and 2050².

While the SB SEPP does not require reporting on the full life cycle impacts of building materials, proponents are encouraged to consider factors such as construction, transport of materials to site and durability in the design.

Data capture and frameworks

Reporting embodied emissions will enable important data to be captured on quantities of key materials and construction practices. This will inform benchmarks and future targets.

The NABERS emissions framework is in development and will be integrated when available to support national consistency.

Residential building emissions reporting

This section focuses on the methodology to report on embodied emissions for residential development under BASIX.

How are embodied emissions reported?

A new Materials Index has been introduced to the Building Sustainability Index (BASIX) to calculate and report on the embodied emissions of construction materials in new residential developments.

How will the Materials Index work?

The Materials Index requires applicants to enter data on the size of the development and select what materials the floors, walls, ceiling, roof and glazing are to be constructed from.

The BASIX calculator will then determine the volume of each material and its associated embodied emissions. The sum of embodied emissions from all materials entered is calculated to determine the total embodied emissions for the development.

The total embodied emissions are then divided by the assumed number of occupants. This per capita value is compared with the average emissions, specific to different development types, to produce a score showing the percentage reduction of emissions compared to the average.

The assumed number of occupants is calculated by correlating occupancy data to floor area from the NatHERS whole-of-home calculations.

What materials are included?

Only the residential parts of the building will be measured for embodied emissions. Components include floors, walls (external and internal), ceilings, roof and glazing. Embodied emissions associated with the building site, interior finishes, fit-outs and services are excluded from reporting.

Emission factors of materials

The Materials Index includes default emissions factors for many materials, either taken directly from or determined using the same method as the Environmental Performance in Construction (EPiC) database which measures A1-A3 emissions for Australian building materials or from Environmental Product Declarations (EPDs).

If a specific material is not included in the BASIX Materials Index, applicants can use the BASIX alternative assessment process to submit information verifying the emissions factor of a material. The BASIX team will review the documentation and if approved, will modify the emissions factor in the calculation for the applicant.

Will the selected materials be checked?

Materials selected are included as commitments on the BASIX certificate. The certifying authority will check the emissions reporting and commitments from the Materials Index on a BASIX certificate at the development application, construction certificate and occupation certificate stages.

To access the Materials Index log in to the BASIX online tool on the [NSW Planning Portal](#).

Non-residential building emissions reporting

This section focuses on the methodology to report on embodied emissions for non-residential buildings as per Chapter 3 of the SB SEPP and amendments to Section 35B of the EP&A Regulation and Section 10A of the EP&A (Development Certification and Fire Safety) Regulation.

How are embodied emissions reported?

From 1 October 2023, applicants for non-residential development types must complete the NABERS Embodied Emissions Material Form. This is an interim reporting tool, designed for ease of transition to the NABERS Embodied Emissions Framework when it and the related online tool is released in mid-2024.

The NABERS Embodied Emissions Materials Form can be downloaded from the [NABERS website](#).

Material quantities (and later embodied emissions) will be calculated at the development application stage and again at construction certificate stage.

The actual material quantities must be determined through an itemised list of building materials (such as a bill of quantities) and certified by a quantity surveyor, designer, engineer or NABERS assessor.

NABERS Embodied Emissions Material Form

The NABERS Embodied Emissions Material Form has been developed by the National Australian Built Environment Rating System [NABERS] team to enable Applicants to input quantities of key construction materials used in a development. Until mid-2024, this form will be considered satisfactory for meeting the requirements of sections 35B clause (3) and 10A clause (4) of the EP&A Regulations.

While the initial form does not provide a quantification of the embodied emissions of developments, it will offer valuable data for benchmarking and future targets.

NABERS Embodied Emissions Tool

Once the NABERS Embodied Emissions Framework is released in mid-2024, Applicants must use the online NABERS Embodied Emissions Tool to disclose embodied emissions attributable to the development. The building components and key construction materials to be reported on will be itemised in the tool which will automatically convert the quantities into embodied emissions factors.

The total embodied emissions for the development, measured in $\text{kgCO}_2\text{-e/m}^2$, will be calculated by summing up the emissions from the provided materials. These emissions factors are derived from Environmental Product Declaration (EPDs). Emissions factors for materials that don't have EPDs will be conservative estimates, based on a review of available data. It will preference process life cycle assessment data from EPDs where this is available (e.g. timber concrete, steel). Hybrid data will be considered where there is a lack of suitable process data (e.g. facade assemblies and building services).

The NABERS Embodied Emissions Tool, including the reporting certification and itemised list of building materials, must be uploaded to the NSW Planning Portal at the relevant stages.

Applicants who have previously lodged the NABERS Embodied Emissions Material Form with their development application should check when preparing their construction certificate if the NABERS Embodied Emissions Tool is live, and if so should use that tool for the construction certificate stage emissions report.

NABERS Agreement to Rate

Large commercial developments seeking to demonstrate good as-built performance for embodied emissions, can opt to enter a NABERS Agreement to Rate relating to embodied emissions. Agreements can combine embodied emissions, energy and water ratings for each development type.

What materials are included?

Embodied emissions reporting for non-residential development encompasses the whole building. At a minimum, 80% of materials must be quantified, including:

- Substructure (foundations, ground-bearing slabs, basement retaining walls etc)
- Superstructure (suspended floors, structural walls, columns, beams etc)
- Envelope (cladding, curtain walls, roofing, windows, doors etc)
- Permanent internal walls and doors.
- External works (hard landscaping and vehicle trafficable surfaces).

In addition, cost material amounts (excluding labour, plant, equipment, margins and taxes) must be entered for:

- Fit-out, for items delivered as part of the primary building contract
- Core services (mechanical, electrical, plumbing etc) required to run the core building services.

Low emissions construction technology

In addition to the reporting form, applicants for non-residential development will also be required to answer questions on the NSW planning portal about any low-emission construction technology used in the development when applying for a DA.

This is to prompt consideration of such construction techniques at the design phase and to capture data on any emerging trends.

Low emissions construction technologies are techniques, tools and systems used during the manufacture of materials and during construction to reduce greenhouse gas emissions and pollutants, minimise waste and optimise energy efficiency in construction.

Examples include modular construction systems, parametric design to optimise structures, robotic fabrication to reduce product waste, carbon neutral manufacturing practices or materials that include recycled content and locally sourced materials.

Considering materials

This section focuses on practical actions that designers and developers can take to reduce embodied emissions in buildings and demonstrate leadership.

With embodied emissions from construction materials predicted to be the largest source of emissions in the built sector in coming decades, it is crucial to select materials low in embodied emissions.

Applicants can demonstrate leadership by considering the following strategies:³ -

Retain existing building – Re-use an existing building, or maximise the reuse of existing components, with a focus on retaining structure and envelopes.

Use salvaged and/or recycled materials - Use salvaged or recycled materials whenever possible to eliminate the emissions associated with manufacturing new materials.

Optimise systems for material efficiency - Specify higher grade options, such as higher grade strength steel, to reduce material quantity. Don't use material if it isn't needed.

Specify low carbon concrete – choose concrete that replaces the carbon-intensive Portland cement component with lower carbon cementitious alternatives such as fly ash and ground granulated blast furnace slag (GGBFS).

Specify materials that naturally sequester carbon – Consider timber for the superstructure. Materials such as timber naturally sequester carbon and store it for their useful life.

Specify materials manufactured with renewable energy - Materials manufactured with renewable energy, such as aluminium produced with renewable electricity, have a greatly reduced embodied carbon impact as compared to materials manufactured with fossil fuel energy.

Design for durability - Use the appropriate product to withstand the wear and tear of the space to ensure that the material will last the lifespan of the building.

Get to know the supply chain for your specific project - Understand where the materials for your project come from and the carbon implications of their manufacturing and transportation. Design to use the lowest carbon systems and materials. Seek Environmental Product Declarations (EPDs) where available.

Source locally where possible - Knowing what materials are available in your region is key to specifying local materials. Additionally, using local resources and materials reduces transportation emissions.

Further information

Useful links:

[Sustainable Buildings SEPP, NSW Government.](#)

[NSW Planning Portal](#)

[BASIX development and assessment](#)

[NABERS website](#)

[NABERS Embodied Emissions Materials Form](#)

[Materials and Embodied Carbon Leaders' Alliance \(MECLA\)](#)

[EPD Australasia](#)

Useful publications:

[World Green Building Council Bringing Embodied Carbon Upfront](#)

[Embodied Carbon and Embodied Energy in Australia's Buildings](#)

[A practical guide to upfront carbon reductions. For new buildings and major refurbishments](#)

1 Green Building Council of Australia, Embodied Carbon & Embodied Energy in Australia's Buildings, 2021 <https://new.gbca.org.au/news/gbca-news/gbca-and-thinkstep-release-embodied-carbon-report/>

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

3 Architecture 2030 – Carbon Materials Palette <https://materialpalette.org/whole-building/>