Infrastructure and Transport Ministers

Guidance Note: Embodied Carbon Databook

May 2026

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Contents

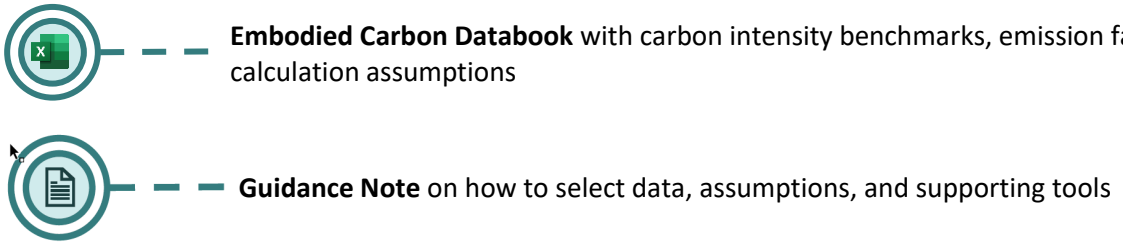
Section 1: Purpose and overview

1.1. What is the ECD?

The *Embodied Carbon Databook* (ECD) provides carbon intensity benchmarks,[1] emission factors, and calculation assumptions to support embodied carbon measurement for infrastructure and buildings, with a focus on transport infrastructure.

The ECD is supported by this accompanying Guidance Note (both shown in Figure 1 below) explaining the content of the ECD, how to select the right data for your project, and aligned measurement tools that can be used to measure and report carbon.

Figure 1. The Guidance Note and ECD overview



1.2. Purpose

The ECD and this accompanying Guidance Note aim to enable more accurate and consistent measurement of embodied carbon across public infrastructure around Australia, with a focus on government transport and infrastructure authorities represented through the Infrastructure and Transport Ministers' Meeting (ITMM).

This will support jurisdictions to meet mandatory Commonwealth funding and reporting requirements and provide a fairer evaluation of infrastructure projects across jurisdictions.

The data can be used by others in government and industry working across the built environment, as many of the construction materials and products are common across sectors.

1.3. Context

In 2023, the ITMM agreed to a nationally consistent approach for measuring embodied carbon in government infrastructure projects, outlined in the *ITMM Embodied Carbon Measurement for Infrastructure: Technical Guidance* (Measurement Guidance).

In 2024, ITMM agreed that all infrastructure projects that received over $250 million of Commonwealth funding, must value their carbon emissions in business case cost benefit analysis when being evaluated by Infrastructure Australia, see *Valuing emissions for economic analysis*.

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[1] Benchmark here refers to "estimates of carbon emissions for an asset, element or process which is based on actual data from comparable projects or aligned with specifications". It is not intended to be a level of performance against which emissions reductions are to be compared.

Under the new 2024-2029 *Federation Funding Agreement Schedule on Land Transport Projects*, jurisdictions must now advise on efforts to reduce transport and infrastructure embodied emissions and report on the consideration of National Carbon Values within infrastructure business cases.

Further, government infrastructure bodies across Australia have begun to adopt policies that require the measurement and management of embodied carbon in the delivery of buildings and infrastructure, and most of these refer to the Measurement Guidance.

1.4. Navigating the ECD

The ECD workbook consolidates a range of emission factor and calculation assumptions. These are organised as shown in Table 1 that provides an overview of the content in each tab.

Table 1. Overview of the ECD structure and content

Tab name	Description	Relevant reporting modules
1. Default Emission Factors		
1.1 Product Stage EFs	Default emission factors for the product stage	A1-A3
1.2 Transport EFs	Default emission factors for the transport stage	A4
1.3 Fuel EFs	Default fuel emission factors and associated standard conversion factors	A5
1.4 Electricity EFs and calculator	Default electricity emission factors and a simple market-based accounting calculator	A5
1.5 Land use EFs	Default land use emission factors	A5
1.6 Waste treatment EFs	Waste treatment emission factors	A5 and C3-C4
1.7 Concrete EF calculator	Calculator to determine initial concrete emission factors based on a known mix design, in the absence of a product-specific EPD or PCF value.	A1-A3
2. Asset-level carbon intensity benchmarks		
2.1 Benchmarks - physical unit	Emission intensities based on asset typecast unit where available (i.e. GFA and kW)	A1-A5
2.2 Benchmarks - material spend	Emission intensities based on material spend	A1-A5
3. Default calculation assumptions		
3.1 Transport Distances	Default transport distance assumptions for the transport of materials and waste	A4-A5
3.2 Wastage and End-of-Life (EOL) rates	Default assumptions for waste generation during construction and construction waste treatment assumptions	A5 and C1-C4

1.5. Data management and update cycles

The ECD is expected to be updated annually, however, projects should use data from updated versions of underlying sources where they are available in-between the ECD updates.

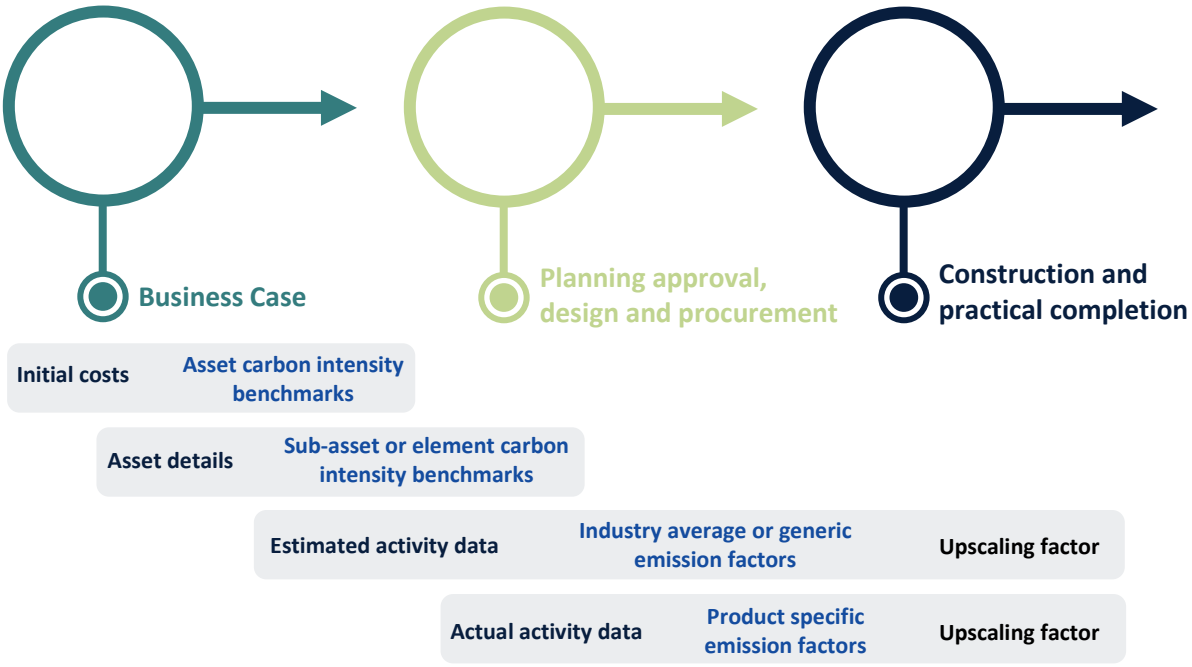
Any tool seeking to align with the ECD should regularly check availability of new data within the ECD and update to ensure continued alignment.

Section 2: Which data should you use for your project?

2.1. When to use data from the ECD?

Data suitability and availability changes over the lifecycle of the project. Figure 2 below summarises what calculation method to use as the project progresses.

Figure 2. Suitable emission calculation approaches at each project stage (from Measurement Guidance, Table 5.1, p. 22)



You should primarily use industry average data in the earlier stages such as planning and design. The ECD provides default industry-average emission factors and assumptions that are suitable for use when product-specific emission factor data and project-specific assumptions are not available.

In the later stages of design and construction, when products are specified and procured, you should prioritise use of independently verified data from Environmental Product Declarations (EPDs) and Product Carbon Footprints (PCFs) where available. In these later stages, transport distance to site and other construction quantities will also be better known and should be used over the default values within the ECD. The ECD should be used in conjunction with the Measurement Guidance, particularly Section 5, which provides further information on data selection.

Please take note of the following when using the ECD:

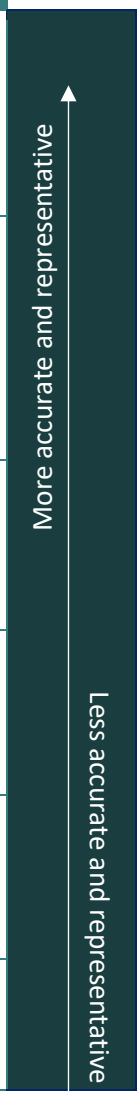
- The ECD does not intend to replace tools to measure carbon on projects but provides a consistent basis on which tools and models can be developed using the same underlying data and assumptions.
- The ECD data and assumptions are default values to inform decision-making and are not intended to represent a business-as-usual scenario, or to measure emissions reductions against a baseline.
- The Measurement Guidance requires consistency in calculation methods and data quality for comparative carbon assessment. A direct comparison of more accurate assumptions (e.g. transport distances to a selected supplier) back to the data in the ECD would **not** satisfy this requirement.
- The ECD is intended to enable comparison of options where all consistency requirements of the Measurement Guidance are fulfilled (e.g. a Stage 1 comparison of a timber frame to a steel frame option, both using emission factors from the ECD with consistent scope, function, etc).

2.2. Selecting the right emission factor data for your project

The ECD acts as a directory to underlying industry-average and generic emission factor data (as shown in Table 2). Where available, project teams should use other sources of product-specific emission factor data. The Emission Factor Hierarchy below summarises which sources to preference as more detail becomes available to project teams. Note that this table supersedes Table 5.2 from the Measurement Guidance, which is planned for update in 2026.

Table 2. Emission factor and carbon intensity benchmark hierarchy to be applied when calculating embodied carbon (updated from Measurement Guidance, Table 5.2, p 18)

Emission factor type and hierarchy		Supported data sources
1	**Product-specific emission factor**	• Environmental Product Declaration (EPD) for specific products and suppliers • Climate Active carbon footprint data • Product Carbon Footprint (PCF) • Other jurisdiction-specific tools or product factors*
2	**Industry-average emission factor***	• Australian National Greenhouse Account Factors • Industry-average EPD for a product type • NABERS National Emission Factor Database • TAGG – Land clearing emission factors from Appendix E in Greenhouse Gas Assessment Workbook for Road Projects • Other jurisdiction-specific tools or product factors*
3	**Generic emission factor from database**	• AusLCI • ICM database (process-based data) • Inventory of Carbon & Energy (ICE) Database • Other jurisdiction-specific tools or product factors*
4	**Generic emission factor from global literature scan**	• Generic emission factors from global literature or proxy product-specific factors, where the highest emissions intensity found for the product type should be used (only where above emission factor sources do not provide coverage)
5	**Sub-asset or element level carbon intensity benchmark**	• There are currently no suitable published data sources available in Australia, and agencies and industry bodies are encouraged to develop benchmarks specific to asset types.
6	**Asset level carbon intensity benchmark**	• Asset level carbon intensity benchmarks are provided in the ECD • Agencies and industry bodies are encouraged to further develop benchmarks specific to asset types.



Notes:

Product Carbon Footprint data, ICE Database, ICM database, and TAGG have been added to the table since the release of the Measurement Guidance. Infrastructure Australia's industry average emission factors from the Embodied Carbon Projections for Australian Infrastructure and Buildings has been removed.

** Refer to Appendix D for relevant tools that are aligned with the ECD*

One exception to the hierarchy is that it may be preferable to use a generic emission factor (Tier 3) that better represents the project-specific conditions once known, over an industry-average value (Tier 2) that is more general. Some common examples of this may include:

1. Using an asphalt factor that corresponds with the projects specified mix composition from a generic database (e.g. *Warm mix asphalt, 3.75% virgin bitumen (35% RAP)*) instead of *General Asphalt* from NABERS)
2. Using a value derived from the *Concrete EF Calculator* sheet based on the projects specified mix, rather than a generic strength range from NABERS (e.g. *Normal class: Concrete in-situ, >25 MPa to ≤32 MPa*).

Note that a PCF must be consistent with the requirements of the NABERS Embodied Carbon Rules for *conforming carbon footprint declarations*[2], in that:

a) It must be compliant with ISO 14067 or PAS 2050.
b) It must be equivalent in system boundary to EN 15804 or ISO 21930.
c) It must refer directly to the material either by unique product name or code.
d) It must be independently verified. This is sometimes referred to as third-party verified.
e) It must be dated within five years before the last delivery of the product to site.

Refer to Appendix C for further information on emissions factors and calculation methods for electricity.

Where a suitable emission factor is not available from a specific supplier or within the ECD, an emission factor can be sourced from a literature scan. This could be from a research paper or from an EPD or PCF for a similar product to be used as a proxy. Further guidance on selecting emission factors from literature is provided in Appendix 6 of the Measurement Guidance.

2.3. Using the default calculation assumptions

As per the Measurement Guidance (Section 5), the calculations for key activities should be updated with project-specific information, where available. The ECD assumptions in relation to transport to site and construction wastage rates are generally intended to be used in early stages only and should be estimated in design and monitored in construction to facilitate updates.

Transport to site

Once the information on where materials will likely be sourced from becomes available, this information should be used to calculate project-specific distance to site in place of the default assumptions.

For some materials that are only used in small quantities, it may be appropriate to continue to use default assumptions if the project's overall footprint is not significantly affected by the associated emissions.

Construction wastage rates

Once the estimated or actual data on construction waste quantities and their treatment type become available, this information should be used in place of the default assumptions.

2.3.1 Sources for the ECD

The ECD uses data from 2 and 3 of the hierarchy in Table 2.
Emission factor and carbon intensity benchmark hierarchy to be applied when calculating embodied carbon (updated from Measurement Guidance, Table 5.2, p 18) but also includes additional data from:

- The Commonwealth Scientific and Industrial Research Organisation (CSIRO) traNSIT Supply Chain Transport[3]
- UK Government (2025) GHG Conversion Factors for Company Reporting[4]

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[2] NABERS, The Rules – Embodied Carbon Version 2.0 (2025), Section 9.4.4.1, NSW Government, 2025
[3] CSIRO, Transport logistics-TraNSIT, CSIRO website, n.d.
[4] UK Government, Greenhouse gas reporting: conversion factors 2025, UK Government Website, 2025

- Royal Institution of Chartered Surveyors (RICS) (2023) Whole life carbon assessment for the built environment, 2nd edition[5]
- BRANZ Environment & Zero Carbon Research Framework Data[6]
- Department of Climate Change Energy Environment and Water (DCCEEW) National Waste Database 2022[7]
- NABERS industry engagement.

The data used within the ECD is intended to be nationally representative rather than catered to individual states.

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[5] Royal Institute of Chartered Surveyors (RICS), Whole life carbon assessment for the built environment (2nd Ed.), Glossary, RICS, 2023
[6] BRANZ, Environment & Zero Carbon Research Framework Data, BRANZ website, 2023
[7] DCCEEW, National Waste Database 2022 (2022)

Section 3: When to use supporting carbon tools?

There will likely be other carbon tools that are available and suitable to be used on projects. As there can be multiple tools that apply at each stage, the agency representatives from project teams should be consulted on which tool to use for specific projects. This Guidance Note is not intended to supersede any existing contractual agreements for projects underway at the time of the ECD release unless otherwise agreed within project teams.

Some of the key existing tools being used on building and infrastructure projects across Australia are:

- NABERS Embodied Carbon Calculator
- Green Star Buildings Upfront Carbon Calculator
- Infrastructure Sustainability Materials Calculator

Jurisdictional specific tools include:

- QLD and WA: Sustainability Assessment Tool for Pavements (SAT4P)
- NSW: Transport for NSW Engineering Cost and Carbon Library (TfNSW ECCL)

Further detail on these tools is provided in Appendix D.

ITMM Infrastructure Decarbonisation Working Group (IDWG) representatives have engaged with these tool providers on the alignment of underlying common emission factors and assumptions for these tools. Note that some of the underlying data in each tool remain different, due to the unique scope, scale and purpose of each tool.

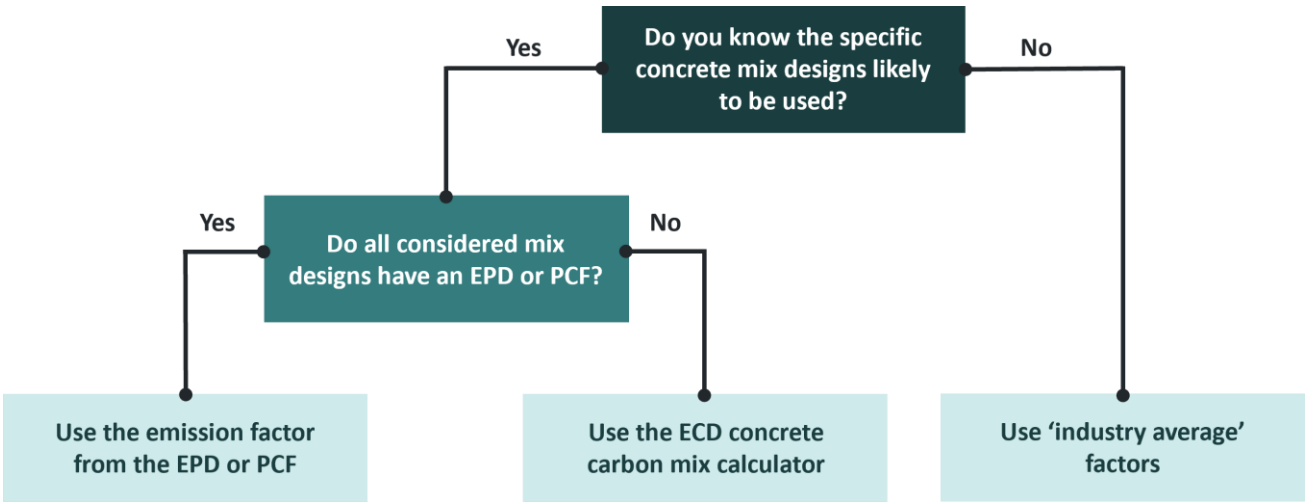
Appendix A: Selecting concrete mix emission factors

For concrete emission factors, there are 3 main sources that project teams can use. Project teams should apply the emission factor hierarchy when selecting sources. Figure 3 shows the decision process for selecting an approach and data sources for concrete mix emission factors.

If a project team does not yet know the specific concrete mix designs that are likely to be used, the industry average emission factors provided in the NABERS Tool or ECD should be used.

If the project team knows the mix design but the product does not have an EPD or PCF, or if concrete mix options are being compared, the ECD's concrete emission factor calculator should be used (*tab 1.7*).

Figure 3. Decision process to take when selecting emissions factor data for concrete



Note that the concrete emission factor calculator is not appropriate for comparison with emission factors from product-specific EPDs or PCFs, as data quality and background data are likely to differ. Care should also be taken when comparing between different supplier mix designs, which may have varying data quality and completeness e.g. if some admixtures are not provided in the mix design information.

To enable a consistent comparison of the emissions intensity of concrete mixes across ready-mix and precast uses, reinforcement (bars, fibres, etc) should be estimated separately using the appropriate factors from (*tab 1.1*).

Where a supplier provides a range for the quantities of concrete mix components, the project team should take a conservative approach and use the upper ranges provided.

Appendix B: ECD Concrete Emission Factor Calculator Methodology

The methodology used within the concrete emission factor calculator (*tab 1.7 in the ECD*) draws on background emission factor data and assumptions from the ECD. It aims to balance completeness and accuracy with ease of use and data availability limitations.

The calculator includes the impacts associated with raw material supply of concrete components (A1), upstream transport of concrete components to batching plants (A2), and concrete manufacturing (A3). The Construction Stage (A4 - A5) impacts from transporting the concrete to site and concrete placement (e.g. pumping) are not covered and must be accounted for separately within the project's upfront carbon calculations. The methodology for each lifecycle module is summarised below:

Raw Material Supply (A1) - for each component, the user inputs a mass which is combined with the corresponding emission factor from the ECD (*tab 1.1*). The sum of emissions from each component is the total A1 emissions for the concrete mix. Reinforcement is not included within the concrete calculator and must be included separately within the project's upfront carbon calculations.

Upstream transport of concrete components (A2) - the mass of each concrete component is multiplied with a default transportation distance for road, rail and sea (*from tab 3.1 of the ECD*) and a corresponding transport emission factor (*from tab 1.2*). The sum of emissions from transporting each component to the batch plant is the total A2 emissions for the concrete mix.

Concrete manufacturing process (A3) - default activity data (energy use, water use, waste quantities) for the batching process is applied using assumptions from AusLCI concrete process data, applying emission factors consistent with the ECD (*tabs 1.3, 1.4 and 1.6*). The sum of emissions from each activity at the batch plant is the total A3 emissions for the concrete mix.

Appendix C: Selecting an electricity accounting approach

There are two recognised approaches for calculating emissions from electricity use:

- The **location-based approach** estimates emissions based on the average emissions intensity of the electricity grid in the region where the electricity is consumed. This method reflects the broader energy mix of the regional grid, providing a geographic perspective on emissions.
- The **market-based approach** accounts for emissions based on the specific electricity products or contractual instruments an organisation purchases. This includes emissions associated with renewable energy certificates, power purchase agreements, and participation in schemes such as the Large-scale Renewable Energy Target (LRET). It reflects the emissions profile of the electricity an organisation has chosen to support through its procurement decisions.

Using both methods offers complementary insights into the emissions linked to an organisation's electricity consumption.

By default, accounting for emissions from electricity should utilise a location-based approach, however, projects can opt-in to sensitivity testing through market-based measurement. This is recommended in the following scenarios:

1. electricity is a significant proportion of the project's total emissions
2. the project will be creating or purchasing Renewable Energy Certificates (RECs)
3. the project is planning to use contractual mechanisms as a mitigation measure and needs to understand the associated impact.

Calculating location-based emissions should be based on **Equation 1** below.

Equation 1: $Y = Q \times EF$

Where:

Y = The location-based emissions measured in $kgCO_2e$

Q = The quantity of electricity purchased, acquired or lost in kWh

EF = The emission factor provided in the ECD in $kgCO_2e/kWh$ (which includes both the Scope 2 and Scope 3 location-based emission factors)

Projects that use market-based measurement should measure using both approaches, to enable transparency and comparability amongst projects for consistent benchmarking.

A market-based electricity accounting calculator has also been provided within the ECD for those projects that opt-in to voluntary sensitivity testing through this method.

For further details please refer to the Clean Energy Regulator (CER) *Voluntary market-based scope 2 emissions guideline*[8] and *Estimating emissions and energy from electricity production and consumption guideline*[9]. Projects should keep in mind that market-based emissions calculations are much more complex than location-based and should review the rules closely if opting into this approach.

When estimating emissions from electricity for the construction period, projects are expected to use a static estimate of the emissions intensity of the electrical grid based on the latest available emissions intensity factors at the time of assessment.

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[8] Clean Energy Regulator, Voluntary market-based scope 2 emission factors, Australian Government, 2025
[9] Clean Energy Regulator, Estimating emissions and energy electricity production and consumption guideline, Australian Government, 2025

If using emissions estimates for other purposes,[10] organisations should confirm the appropriate accounting approach to adopt (location vs market-based) given variation in acceptability of market-based claims within the value chain.

For estimating the impact of electricity emissions for operation, or for projects with construction periods that extend beyond 5 years from when the measurement is being undertaken, projects are expected to use future projections of the emissions intensity of the grid, in accordance with the latest Department of Climate Change, Energy, the Environment and Water (DCCEEW) *Australian Emission Projections*[11].

The following Table 3 shows the treatment of different types of electricity under each method.

Table 3. Treatment of different forms of renewable electricity under location-based and market-based accounting rules

Electricity type / instrument	Location-based treatment	Market-based treatment
Regular purchased electricity	Emissions are based on the location-based emission factor which reflects the average emissions intensity of electricity generation within the state or territory where it is consumed.	Emissions are based on a residual mix factor that is adjusted to remove the emissions benefit of all claimable renewable generation, and hence is higher than the location-based factor.
On-site renewable energy generation (consumed)	Attributed with zero emissions.	Attributed with zero emissions. If the renewable energy has Large-Scale Generation Certificates (LGCs) associated with it, these must be surrendered to be recognised as zero emissions.
On-site renewable energy generation (exported)	No attributable emissions or benefit. Cannot be used to reduce the emissions from regular purchased electricity.	If the exported renewable energy has Large-Scale Generation Certificates (LGCs) associated with it, these can be surrendered to reduce overall electricity emissions (as per LGCs below). Exported renewable energy without LGCs is treated as per the location-based approach (no emissions or benefit).
Large-scale renewable energy certificates (LGCs)	Emissions are treated equivalent to regular purchased electricity, there is no associated reduction in emissions.	Surrendered LGCs can be used to reduce the emissions of purchased electricity and are treated as zero emissions. Refer to the CER Guideline.
GreenPower	Emissions are treated equivalent to regular purchased electricity, there is no associated reduction in emissions.	Treated as equivalent to the surrender of LGCs, see LGCs above.

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[10] Other purposes may include Scope 3 reporting aligned with the Greenhouse Gas Protocol, Science Based Targets initiative (SBTi), Global Real Estate Sustainability Benchmark (GRESB), etc

[11] The projections are consistent and suitable for use under a location-based approach. At this point in time, there are no publicly available estimates of residual mix factors to enable future projections under a market-based approach. Projects seeking to estimate future market-based emissions (other than those fully covered by renewable energy certificates with market-based emissions of zero), must prepare their own suitable residual mix factor projections.

Electricity type / instrument	Location-based treatment	Market-based treatment
Renewable Power Purchase Agreement	Emissions are treated equivalent to regular purchased electricity, there is no associated reduction in emissions.	The emissions benefits are typically provided through the transfer and/or surrender of LGCs, see LGCs above.
Mandatory retailer retirements under the LRET (Renewable Power Percentage)	Emissions are treated equivalent to regular purchased electricity, there is no associated reduction in emissions.	Treated as zero emissions. Refer to the CER Guideline.
Jurisdiction renewable power percentage (e.g. ACT)	Emissions are treated equivalent to regular purchased electricity, there is no associated reduction in emissions.	Treated as zero emissions. Refer to the CER Guideline.

Appendix D: Overview of aligned carbon measurement tools

Table 4. Overview of tools available to infrastructure and building projects

Tool	Asset type	Project Stages	Overview and reference documents
Tools used nationally			
NABERS Embodied Carbon Calculator	Buildings	Design Construction & Practical Completion	This tool measures embodied carbon in new buildings and major refurbishments. Measurement must be in line with the Embodied Carbon Rules.[12] The underlying emission factors and calculation assumptions for the tool are documented in the NABERS National Emission Factors Database.
Green Star Buildings	Buildings	Design Construction & Practical Completion	The Green Star Buildings v1.1 update provides a pathway for the Upfront Carbon credit to align with the NABERS methodology, rules, and default emission values.
Infrastructure Sustainability Materials Calculator	Infrastructure assets	Design Construction & Practical Completion	ISC is developing an Alignment Note and has committed to undertaking updates to the IS Materials Calculator to align with the ITMM ECD and Measurement Guidance.
Austroads Carbon Measurement and Reporting Tool	Roads	Business Case Planning approval, design and procurement Construction & Practical Completion	This tool will be a web-based tool for Austroads members to use in measuring emissions through all project stages across Modules A – C, as well as ongoing monitoring of emissions from maintenance activities at an organisational level. It is expected to align with the Measurement Guidance and ECD. It is currently under development with initial release expected in late 2026.

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[12] NABERS, NABERS Embodied Carbon Rules, NABERS website, 2025

Tool	Asset type	Project Stages	Overview and reference documents
Jurisdiction specific tools			
QLD and WA: Sustainability Assessment Tool for Pavements (SAT4P)	Road projects	Business Case Planning approval Design	The Western Australian Road Research and Innovation Program (WARRIP) and the Queensland National Asset Centre of Excellence (NACOE) have developed a detailed road carbon assessment tool for use by staff in WA and QLD agencies. This tool is focused on pavements, hence projects with broader infrastructure components may need to supplement the use of this tool with additional assessment using the National ECD to ensure boundary coverage consistent with the National Measurement Guidance.
NSW: Transport for NSW Engineering Cost and Carbon Library (TfNSW ECCL)[13]	Transport assets	Business Case Planning approval, design and procurement	This tool includes cost and baseline carbon rates with consistent units of measurement and classification. The tool contains benchmark rates for approximately 5,000 resources (plant, labour, materials, fuels), items and assets. The tool has been mapped to the Digital Engineering Framework,[14] engineering standards,[15] and ICMS3.[16] It is currently being aligned to TfNSW's supply chain registers for carbon management.[17] The TfNSW ECCL will be progressively rolled out for use by external contractors from 2026.
NSW: TfNSW Carbon Tool	Transport assets	Business Case Planning approval, design and procurement Construction & Practical Completion	This is a calculator for the measurement and management of carbon emissions during design phases and construction of TfNSW projects. This tool is provided to TfNSW project partners to complete.

Noting other third-party carbon and life cycle assessment tools may adopt data from the ECD, supporting measurement in line with this guidance.

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[13] Transport for NSW, Sustainable Infrastructure Program, Transport for NSW website, 2025
[14] Transport for NSW, The Digital Engineering Framework, Transport for NSW website, 2025
[15] Transport for NSW, Transport Standards, Transport for NSW website, 2025
[16] International Cost Management Standard (ICMS) Coalition, ICMS: Global Consistency in Presenting Construction Life Cycle Costs and Carbon Emissions 3rd edition, 2021
[17] Transport for NSW, Sustainable Infrastructure Program Concrete Mix Register, 2024