Forest & Wood Products Australia

ENVIRONMENTAL PRODUCT DECLARATION

# Softwood Glued Laminated Timber (Glulam)

| | | | |
|---|---|---|---|
| **Type of EPD** | Sector EPD based on an average product, for Forest & Wood Products Australia | | |
| **Programme:** | The International EPD System \| www.environdec.com | | |
| | In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 | | |
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EPD INTERNATIONAL EPD SYSTEM

AUSTRALASIA EPD® INTERNATIONAL EPD SYSTEM

ECO PLATFORM EPD VERIFIED

An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

## What is an Environmental Product Declaration?

An Environmental Product Declaration (EPD) tells the environmental story of a product over its life cycle in a format that is clear and transparent. It is science-based, independently verified and publicly available.

EPDs help manufacturers translate complex sustainability information about their product's environmental footprint into simpler information that governments, companies, industry associations and end consumers can trust to make decisions.

An EPD communicates the environmental impacts at different stages in a product's life cycle. This may include the carbon emitted when it's made, and any emissions that pollute the air, land or waterways during its use.



# Contents

# Information about EPD owner

Partnering with the Australian Government, FWPA is one of 15 not-for-profit Rural Research and Development Corporation (RDC) and is the nominated industry-owned services company under the Forestry Research and Development and Marketing Act 2007.

FWPA is funded via the Australian Government levies, paid by qualifying industry participants to fund FWPA in accordance with a Statutory Funding Agreement. FWPA's levy payers are wood processors, forest growers and Australian importers of forest products. Additionally, eligible expenditure on research, development and extension initiatives by FWPA receive matching funds from the Commonwealth.

Through these funds, FWPA manage WoodSolutions, which is a collaborative effort between FWPA members, industry peak bodies and technical associations.

WoodSolutions supports industry by providing independent, non-proprietary information about timber and wood products to professionals and companies involved in building design and construction.

**FWPA | Forest & Wood Products Australia**,
Level 6/36 Wellington St, Collingwood VIC 3066, Australia, as the EPD owner has the sole ownership, liability, and responsibility for the EPD.
Contact: info@fwpa.com.au

**thinkstep Pty Ltd**,
25 Jubilee Street, South Perth, WA 6151, is the LCA practitioner commissioned by the EPD owner.
Contact: info@thinkstep-anz.com



## Supporting innovation & sustainability

FWPA and WoodSolutions are committed to strengthening the sustainability credentials of Australia's forest and wood products sector and ensuring the industry can meet the growing expectations of designers, builders, policymakers and the community.

Working with industry partners, they endeavour to improve data quality, support life-cycle assessment research, and make sustainability information more accessible to those specifying timber in construction.

These initiatives are helping industry demonstrate the measurable environmental benefits of responsibly sourced timber, including renewable resource use and the role wood products can play in storing carbon. This work forms part of a broader commitment to continuous improvement across the sector.

Together, these efforts are helping position timber as a trusted, future-focused material choice for low-carbon buildings and sustainable development.

# Information related to Sector EPD

The following manufacturers contributed data to the EPD:

| Manufacturer | Location |
|---|---|
| **Hyne Timber** | Maryborough (QLD) |
| **Vicbeam** | Stanbridge (NSW) |
| **WTIBeam** | Dennington (VIC) |

- The environmental data presented in this document are primarily derived from surveys of industry members conducted by thinkstep-anz on behalf of FWPA. One member submitted data collected for the calendar year 2022. Two members confirmed that the data collected for the previous study remained reflective of their current operating conditions.
- The EPD provides weighted average values for approximately 50% of total glulam production in Australia. As such, the declared product is an average that is not available for purchase on the market; therefore, this Sector EPD is not representative of an individual manufacturer or its products.

# Product information

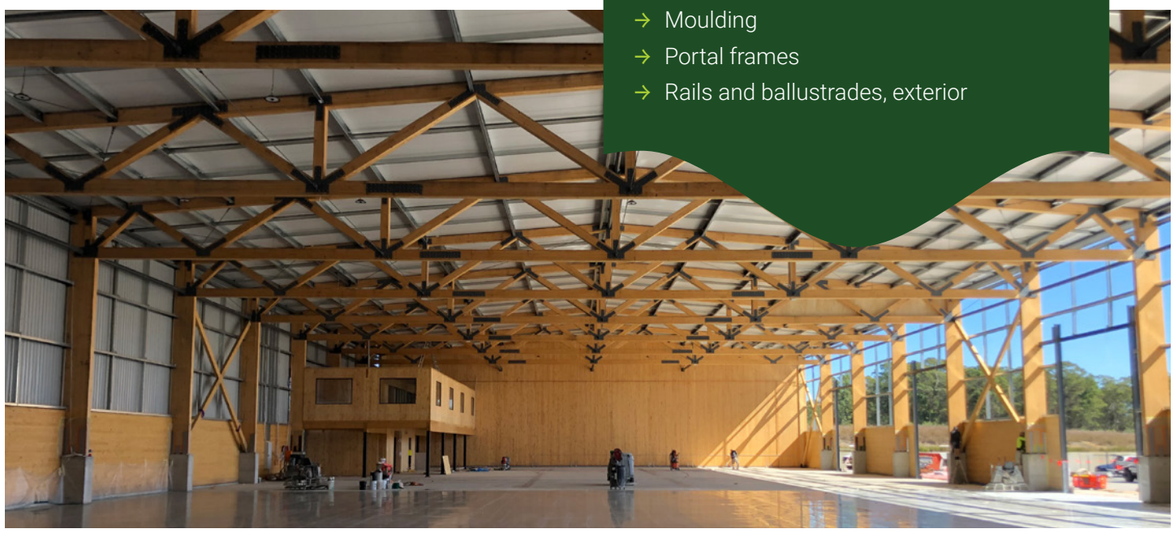
Softwood glulam, short for glued laminated timber, is an engineered wood product manufactured by gluing together pieces of softwood timber, known as laminates. This process produces larger size and longer length members, which can be curved or straight.

Glulam offers many benefits when it comes to structural applications:

- **Large section sizes and long lengths** - glulam can be manufactured curved or straight and is often used as structural beams. Finger jointing allows for long lengths.
- **Increased strength due to the laminating process** - glulam is stronger than solid timber as it has fewer natural defects and a wider distribution. It is also comparable to steel in strength but is much lighter.
- **A high degree of dimensional stability** - glulam is manufactured from seasoned timber and is therefore less prone to movement caused by changes in moisture content. However, care needs to be taken if they are used externally or in an environment with rapidly changing humidity (such as an indoor swimming pool). Swelling and shrinkage may lead to splitting or, in an extreme event, delamination of the beam.
- **Reliability** - glulam is manufactured to strict quality requirements from stress- graded timber of known structural capacity. There are glulam quality assurance programs operating in Australia, but not all manufacturers may belong to them.
- **Chemical resistance** - glulam is resistant to most acids, rust and other corrosive agents. Typical uses in corrosive situations include animal hide curing complexes, fellmongerys, fertiliser storage and swimming pools.

## Applications

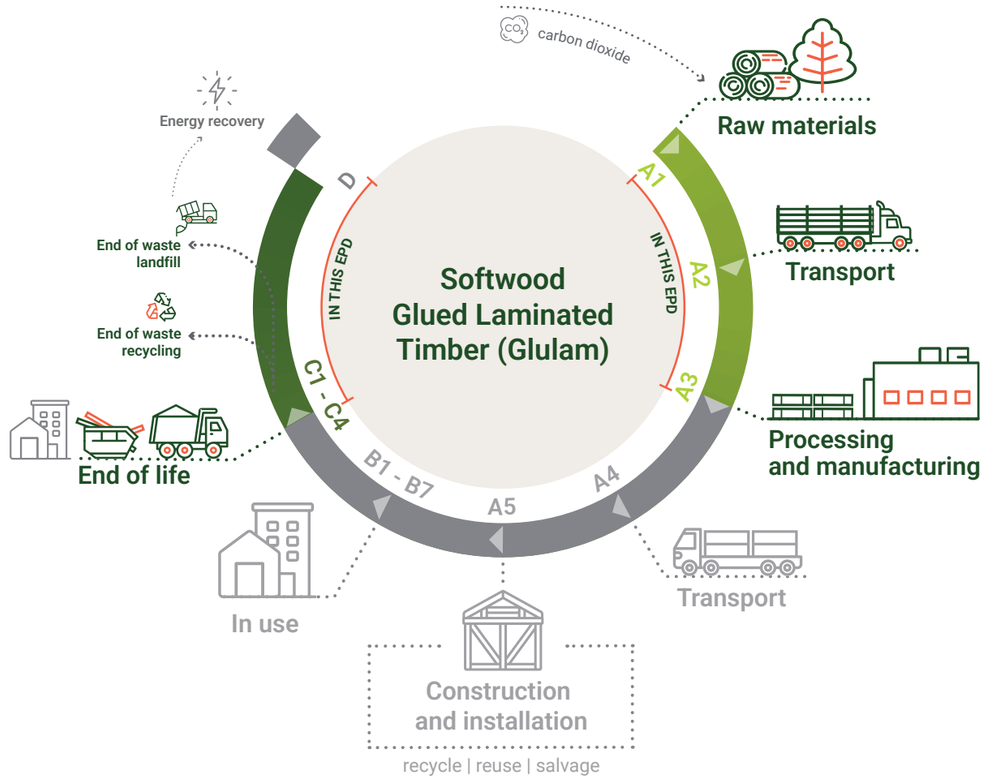
- Architectural roof trusses
- Flooring
- Framing
- Joinery
- Moulding
- Portal frames
- Rails and ballustrades, exterior



## Product life cycle

This EPD looks at the environmental impacts of extracting and processing raw materials, transporting these to the manufacturing facilities and fabricating glulam. It also includes the end-of-life environmental impacts and its recovery and recycling potential.

Figure 1. Life cycle Glulam and modules included in this EPD




## Classification

These tables show the relevant Australian standard and application for the products in this EPD.

Table 1. Industry classification

| Product | Classification | Category | |
|---|---|---|---|
| **Glulam** | UN CPC Ver.3 | 3162 | Engineered structural products |
| | ANZSIC 2006 | 1493 | Veneer and Plywood Manufacturing |

Table 2. Technical specifications

| Product group | Relevant standards | Applications |
|---|---|---|
| **Glulam** | AS/NZS 1328.1:2025 Glued laminated structural timber - Performance requirements and minimum production requirements | Structural applications, e.g. beams, joists, columns, portal frames |

# How to use this EPD

FWPA has developed this EPD to help to showcase the environmental credentials of their products.

This independently verified EPD provides environmental performance information from cradle to gate (modules A1-A3), plus end of life modules C1-C4 and module D (reuse-recovery-recycling-potential).

The results are presented for declared unit of 1 $m^3$ of average softwood Glulam, 12.2% moisture content (dry basis), with density of 639 kg/$m^3$, plus its packaging at the factory gate.

The results may be used by specifiers and developers to calculate and present the environmental impacts of particular construction projects.

## EPDs are not always comparable

An EPD is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

It's important to note that EPDs within the same product category but from different programs may not be directly comparable. Construction products can only be compared if the EPDs comply with the EN 15804 standard. EPDs of construction products from a group of manufacturers (e.g. a sector EPD) may not be directly comparable to an EPD of a similar construction product that a single manufacturer has generated.

Understanding the detail is important in comparisons. Expert analysis is required to ensure data is truly comparable to avoid unintended misrepresentations.

Furthermore, this EPD conforms to EN 15804+A2. EPDs conforming to EN 15804+A1 are not directly comparable with those conforming to EN 15804+A2 due to differences in methodologies.



# Content declaration

The content declaration of softwood Glulam, per 1 $m^3$ of average product, is presented in Table 3.

The content declaration for softwood Glulam packaging, per 1 $m^3$ of average product, is presented in Table 4.

Table 3. Content declaration

| Product components | Mass, kg | Post-consumer recycled material, mass-% of product | Biogenic material, mass-% of product | Biogenic material, kg C/product or declared unit |
|---|---|---|---|---|
| **Softwood Timber** | 633 (507-700) | 0 | 99% | 282 |
| **Resin** | 3.41 (0-5.81) | 0 | 0% | 0 |
| **Polyurethane** | 3.13 (1.25-5.6) | 0 | 0% | 0 |
| **Total** | 639 (507-706) | 0 | 99% | 282 |

Table 4. Content declaration of packaging

| Packaging materials | Mass, kg | Mass-% (versus the product) | Biogenic material, kg C/product or declared unit |
|---|---|---|---|
| **LDPE Wrap** | 0.11 | 0.02% | 0.00 |
| **Paint** | 0.10 | 0.01% | 0.00 |
| **Paper** | 0.018 | 0.003% | 0.0079 |
| **Plastic strapping** | 0.10 | 0.02% | 0.00 |
| **SW Gluts** | 1.27 | 0.20% | 0.56 |
| **Total** | 1.62 | 0.25% | 0.56 |

## Dangerous substances from the candidate list of SVHC for authorisation

The product declared within this EPD:

- Does not release dangerous substances to soil and water.
- Does not contain hazardous substances requiring labelling.
- Does not contain materials identified in the European Chemicals Agency's Candidate List of Substances of Very High Concern in the products at a concentration greater than 0.1% (ECHA, 2025).

# LCA information

## Declared unit

The declared unit for the EPD is:

**1 m³ of average softwood Glulam, 12.2% moisture content (dry basis), with density of 639 kg/m³, plus its packaging at the factory gate.**

Product packaging includes timber gluts, plastic wrap (LDPE), plastic strapping and labels.

Conversion factor to mass is 639 kg per 1 m³ of average product.

## System Boundaries

In Life Cycle Assessments (LCA), the system boundary is a line that divides the processes which are included from those which are excluded.

As shown in the table below, this EPD is of the type cradle to gate with modules C1–C4 and module D (A1–A3 + C + D). Other life cycle stages (Modules A4-A5, B1-B7) are not included as they are dependent on particular scenarios and best modelled at the building level.

Table 5. Modules included in the scope of the EPD

| | Product stage | | | Construction stage | | Use stage | | | | | | | End-of-life | | | | Recovery |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Raw material supply | Transport | Manufacturing | Transport | Construction Installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction / demolition | Transport | Waste processing | Disposal | Future reuse, recycling or energy recovery potential |
| **Module** | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **B7** | **C1** | **C2** | **C3** | **C4** | **D** |
| **Modules declared** | X | X | X | ND | ND | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| **Geography** | AU* | AU* | AU | - | - | - | - | - | - | - | - | - | AU | AU | AU | AU | AU |

X = included in the EPD; ND = Module not declared (such a declaration shall not be regarded as an indicator result of zero)

*minor materials may be imported from global suppliers, e.g. resins or glues

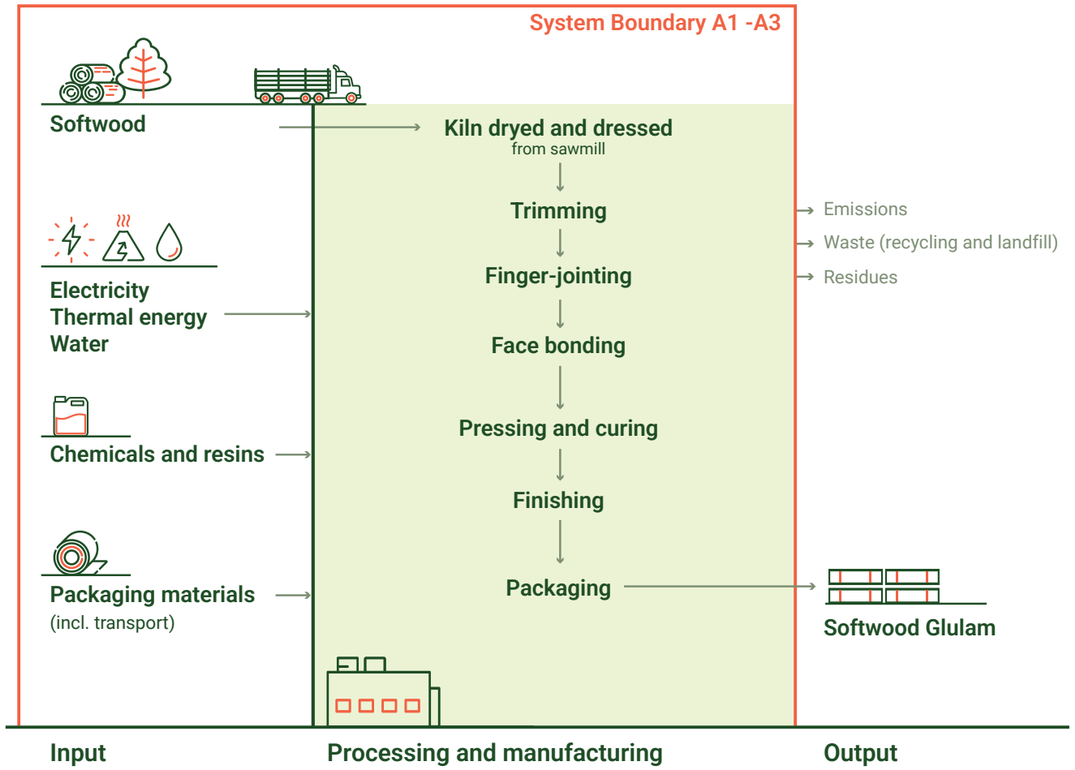
## Product stage

Softwood Glulam is an engineered wood product, made to standardised structural properties, such as strength, stiffness, dimensional stability and reliability characteristics. It consists of lengths of softwood timber, stacked and laminated using water-resistant resins. Glulam may be produced as standard straight dimensions, or custom made in various shapes and profiles.

The production of glulam starts with transport of kiln-dried, dressed softwood from an Australian sawmill (see the FWPA softwood EPD for details of processing from forestry to dressed product) and resins from an Australian supplier. The glulam manufacturing process includes trimming, finger-jointing, face bonding, pressing and curing, finishing, and packaging, as shown in Figure 2.

Glulam products may also be treated to protect the wood from moisture, rot and insect damage. However, this EPD covers only untreated softwood glulam.

Figure 2. Manufacturing process - system boundary A1-A3



## LCA software and database

The LCA model was created using the Life Cycle for Experts (LCA FE) (formerly known as GaBi) Software for life cycle engineering, developed by Sphera Solutions, Inc. The Managed LCA Content (MLC) database CUP2025.1 (Sphera, 2025), formerly known as GaBi LCI database, provides the life cycle inventory data for several of the raw and process materials obtained from the background system.

## Electricity

The average softwood Glulam product is based on a production-weighted average of products manufactured in New South Wales, Victoria and Queensland.

The composition of the residual electricity grid of New South Wales mix is modelled in LCA FE based on published data of the generation per fuel type, and the national electricity mix trade between states for the financial year 1st July 2022 – 30st June 2023 (Australian Government, 2024). The New South Wales residual electricity mix is made up of Black coal 65.6%, Solar 11.1%, Wind 5.03%, Hydro 4.74%, Natural gas 2.01%, Biomass 0.633%, Biogas 0.379%, Oil Products 0.114%, and Coal seam methane 0.00228%. The remaining electricity is imported: 5.29% is imported from Victoria, and 5.16% is imported from Queensland. The emission factor for the New South Wales mix residual grid mix for the GWP-GHG indicator is 0.858 kg $CO_2$-eq /kWh (based on EF3.1).

The composition of the residual electricity grid mix of Victoria is modelled in LCA FE based on published data of the generation per fuel type, and the national electricity mix trade between states for the financial year 1st July 2022 – 30st June 2023 (Australian Government, 2024). The Victorian residual electricity mix is made up of Brown coal 64.2%, Wind 14.4%, Solar 7.41%, Hydro 5.83%, Natural gas 2.15%, Biogas 0.662%, and Biomass 0.0391%. The remaining electricity is imported: 2.38% is imported from Southern Australia, 1.56% is imported from Tasmania, and 1.43% is imported from New South Wales. The emission factor for the Victoria residual grid mix for the GWP-GHG indicator is 1.04 kg $CO_2$-eq /kWh (based on EF3.1).

The composition of the residual electricity grid mix of Queensland is modelled in LCA FE based on published data of the generation per fuel type, and the national electricity mix trade between states for the financial year 1st July 2022 – 30st June 2023 (Australian Government, 2024) . The Queensland residual electricity mix is made up of Black coal 69.2%, Solar 12.9%, Natural gas 9.54%, Wind 3.22%, Hydro 1.90%, Coal seam methane 0.898%, Biomass 0.742%, Biogas 0.296%, and Oil Products 0.0274%. The remaining 1.24% is imported from New South Wales.

The emission factor for the Queensland residual grid mix for the GWP-GHG indicator is 0.904 kg $CO_2$-eq /kWh (based on EF3.1).

Location-based grid mix EFs (using the published grid mix) is used for other electricity consumption including modules C and D.

## Modelling of infrastructure and capital goods

In general, the production and end-of-life processes of infrastructure and capital goods used in the product system are not included within the system boundary. An exception is for capital goods for electricity generation, where the capital goods are very important for modelling of changes towards more renewable generation. Capital goods related to electricity generation is included in all electricity datasets used in this study. This is not regarded as limiting the scope of the inventory or as an incomplete inventory (i.e. a cut-off).

## Allocation

Allocation generally follows the requirements of PCR 2019:14 v2.0.1 (EPD International, 2025a). When allocation becomes necessary during the data collection phase, the allocation rule most suitable for the respective process step is applied.

Irrespective of any allocation between product systems, the inherent properties of the product and the packaging, such as calorific content or biogenic or fossil carbon content are not allocated away and always follow the physical downstream flow and the product system that finally uses it.

## Allocation of site data

### Allocation of co-products

Softwood glulam production may occur in a manufacturing site that also produces hardwood glulam. Where a manufacturing site makes both, resources are divided based on the volume of each glulam type produced (i.e. using physical allocation).

The glulam production process does not produce any other valuable co-products, since all residues include resin. The upstream production of kiln-dried, dressed softwood does have co-products (including bark, sawdust and woodchip). Allocation for these is described in the FWPA softwood EPD:

- Impacts from multifunctional processes, such as sawmilling, are allocated to co-products according to their economic value because their values differ substantially (>25%)
- Inherent properties such as carbon and energy content are always allocated according to physical flows, such as mass.

### Allocation of waste

Allocation of waste, following the requirements of PCR 2019:14 v2.0.1 section 4.5.2 (EPD International, 2025b) and the system boundary is set where the waste reaches the end-of-waste state. Process material wastes (sludge and yard scrapings, unusable resin residues, contaminated offcuts, input packaging, and staff wastes) do not fulfil end-of-waste criteria. Transport of the waste to a disposal (landfill) facility and the disposal (landfill) of the material is included.

### Recycling and recycled inputs

There are no inputs of recycled material into the softwood Glulam production process.

For the waste for recycling from the production process the end-of-waste state is reached when it arrives at the sorting/recycling facility. Transport to sorting/recycling facility is included. Cut-off allocation is applied at the system boundary.

## Data Quality Assessment

The data quality information has been provided according to the requirements of EN 15941:2024 (CEN, 2024) and utilises the system for "Data quality level and criteria of the UN Environment Global Guidance on LCA database development", according to EN 15804+A2, Annex E, Table E.1 (CEN, 2019/2021).

This EPD covers an average softwood glulam product in Australia, a production-weighted average of 3 sites, one with 2022 data (2022-01-01 to 2022-12-31) and 2 with 2016 data from the previous FWPA glulam study, which has been confirmed to still be representative by the data suppliers. The sites use grid electricity (see the Electricity section). It covers production and end of life in Australia. Background data is from the Managed LCA Content (MLC) database CUP2025.1.

The data has very good geographical representativeness, good technological representativeness, and fair temporal representativeness.

The total share of primary data of the GWP-GHG results for A1-A3 is 85%. This indicator was assessed per process category: The softwood sawn timber input (from the FWPA Softwood Timber LCA model) contributes 51%. Generation of electricity used in manufacturing of the product contributes 32%, fuels used in the manufacturing of the product 1.2% and transport to manufacturing 0.2%. These are based on data collected from the EPD owner for 2015/16 and 2022, combined with background datasets, and cover both primary and secondary data. Production of packaging and other processes are based on secondary data and contribute 0%.

A large part of the total share of primary data comes from softwood production, published in the FWPA Softwood Timber EPD (FWPA, 2022), via the FWPA Softwood Timber LCA model. The softwood Timber EPD was published before this requirement was applied, so no share was declared there. To solve that, every input of each process, from forestry to glulam production, was taken from the LCA model and classified as primary data (energy and transport datasets driven by activity data collected for this study) or secondary data (all other background datasets, including purchased materials). The share of primary data comes from this classification. GWP-GHG share of primary data is a simplified indicator that supports more primary data to improve representativeness and comparability between EPDs. It does not capture all aspects of data quality and is not comparable across product categories.

The life cycle inventory data for softwood sawn timber input (from the FWPA Softwood Timber LCA model) has fair temporal representativeness because its primary data dates to 2015 and 2016 for some sites. It contributes more than 30% to some core indicators, about 77% of abiotic depletion of minerals and metals and 55% of photochemical ozone formation. No other fair data source contributes more than 30% to any core indicator.

Some European MLC proxies were used where Australian data was unavailable, with poor geographical and technological representativeness. Most contribute little. The main one is the production waste to landfill (RER: Municipal solid waste on landfill), at about 11% of freshwater eutrophication. The adhesives contribute under 1% of any core indicator; they are DE: Adhesive system PRF (phenol resorcinol formaldehyde) and DE: Adhesive system polyurethane-prepolymer. The packaging proxies, including the polyethylene film, also stay under about 1%. Proxies use recent (2024) data, so temporal representativeness is very good. No closer geographical or technological match was available for these proxies.



## Modelling of downstream stages

The processes below are included in the product system to be studied. For modules beyond A3, the scenarios included are currently in use and are representative for one of the most probable alternatives.

### End of Life (Modules C1-C4)

The end-of-life processes include deconstruction/demolition of the product (C1), transport of the discarded product (C2), waste processing (C3), and landfilling (C4).

The end-of-life stage (Modules C1-C4), for softwood Glulam, is modelled using 100% landfill scenario. This reflects end-of-life landfilling rate for treated timber and engineered wood products in the construction sector (Table 6). This scenario is currently in use and is representative for one of the most likely scenario alternatives. Since this scenario is 100% landfill there are no alternative end-of-life scenarios modelled.

Table 6. End of life scenarios for products

| Process | Unit (expressed per $m^3$) |
|---|---|
| **Scenario** | Main (100% landfilling) |
| **Collection process specified by type** | 1 $m^3$ of product collected with mixed construction waste |
| **Recovery system specified by type** | 0 $m^3$ |
| **Disposal specified by type** | 1 $m^3$ modelled as a combination of wood on landfill, and inert materials at landfill |
| **Assumptions for scenario development** | |
| C1: | Demolition/deconstruction – diesel use of 1.1 kWh/tonne |
| C2: | 80 km of transport by 16-32 tonne lorry (EURO 5), 50% load factor |
| C3: | n/a |
| C4: | → The timber portion of glulam sent to landfill is modelled using a landfill of wood products MLC dataset.<br>→ The resin portion is modelled using an inert materials at landfill MLC dataset.<br>→ Biogenic carbon emissions from biogenic material deposited on landfill are also modelled according to EN 16485:2014 (CEN, 2014). |

The type(s) and quantity of energy and transport used for modelling end-of-life processes, in modules C1 and C2, are the default values required by the PCR (EPD International, 2025b), since no more specific data is available.

The choice of modelling for the 100% landfill end-of-life scenario (module C4) is consistent with the recommendation in EN 16485:2014 (CEN, 2014) for EPDs for wood products.

The degradable organic carbon fraction (DOCf), for softwood is 0.1%. This value is based on bioreactor laboratory research by Wang et al. (2011) and Ximenes et al. (2013). These values can be considered as an upper limit for degradation of carbon in solid wood products placed in a landfill (and is applied to the EN 15804+A1 results also included in the EPD as information for comparison to earlier studies).

The landfill scenario assumed the following for carbon emissions:

- Decomposition rate of organic carbon to landfill gas is 0.1% (DOCf) softwood in the average product.
- Of the gases formed from any degradation of wood in landfill, 50% is methane and 50% is carbon dioxide (Australian Government, 2016a, p. Table 43).
- All carbon dioxide is released directly into the atmosphere.
- 68% of the methane is captured, based on landfills with gas capture in Australia and on methane capture efficiency (Hyder Consulting, 2007).
- Of this, one quarter (17% of the total) is flared, and three quarters (51% of the total) is used for energy recovery (Carre, 2011).
- Of the 32% of methane that is not captured, 10% (3.2% of the total) is oxidised (released as carbon dioxide) (Australian Government, 2016a) and 90% (28.8% of the total) is released into the atmosphere as methane.
- In summary, for every kilogram of carbon converted to landfill gas, 85.6% is released as carbon dioxide and 14.4% is released as methane.

In accordance with EN 15804+A2, any remaining biogenic carbon not degraded (99.9% of the carbon in the wood) is modelled as an emission of biogenic $CO_2$ to the air.

The emission of biogenic $CO_2$ in landfill is calculated, following EN15804, which does not allow consideration of permanent storage. The biogenic carbon balances in A1-A3 and C4, but due to methane emissions during production and landfill the GWP-biogenic values do not balance.

### Recovery and Recycling potential (Module D )

Module D starts at the 'end-of-life' when the softwood Glulam average product is no longer a product in its first life cycle and start to be a potential input for its second life cycle.

For softwood Glulam the end-of-life is reached when product is landfilled. Landfill gas is combusted in an engine with an efficiency of 36% (module C) to generate electricity to be supplied to the Australian national grid mix (Australian Government, 2016b). Therefore, in module D, the resulting electricity receives a credit for offsetting average electricity from the Australian grid (module D) in line with EN 16485:14 (CEN, 2014).

## Cut off criteria

No cut-off criteria are defined for this study. The system boundary was defined based on relevance to the goal of the study. For the processes within the system boundary, all available energy and material flow data have been included in the model. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts.

Infrastructure used in electricity generation is included as standard in the MLC datasets, as this is important for renewable generation.

## Key assumptions

The following assumptions were made that can affect the results of the EPD:

- Assumptions for kiln-dried, dressed softwood are stated in the FWPA Softwood EPD.
- The biogenic carbon and the calorific value are calculated from wood properties.
- Manufacturing (A3) uses specific residual electricity state-based grid mix data, based on the location of the manufacturing sites. For end-of-life processes, a location-based Australian average grid mix is used because the product end-of-life location is unknown.
- Information provided by manufacturers is assumed to be accurate (after cross-checks for mass balance, plausibility, etc.)
- Results represent a "weighted average" based on input and output data for total production volumes across all participating Australian manufacturers.
- Energy used is reported by energy source (e.g. coal, diesel fuel and electricity) by sites, but the background environmental impact of producing those fuels is based on Australian averages.
- Where a water input exceeded water discharged to a drain or treatment facility (water imbalance), remaining water is assumed to be evaporated, including water contained in wood and residue inputs.
- Both softwood and hardwood glulam types are treated as using the same amount of energy and water. If a manufacturing site makes both, resources are divided based on the volume of each glulam type produced.
- Biogenic carbon stored in wooden packaging is treated as "neutral" (balanced out), in module A1-A3, because the installation phase (module A5), where that carbon would be released, is not included in this study.



# Assessment indicators

An introduction to the core environmental impact indicators is provided below.
The best-known effect of each indicator is listed in the descriptions and the abbreviations, in brackets, correspond to the labels in the following results tables.

### Climate change (global warming potential)

(GWP-total, GWP-fossil, GWP-biogenic, GWP-luluc)

A measure of greenhouse gas emissions, such as $CO_2$ and methane. These emissions are causing an increase in the absorption of radiation emitted by the earth, increasing the natural greenhouse effect. This may in turn have adverse impacts on ecosystem health, human health and material welfare. GWP is split into three sub-indicators: fossil, biogenic, and land-use and land-use change.

### Ozone depletion potential

(ODP)

Depletion of the ozone leads to higher levels of UVB ultraviolet rays reaching the earth's surface with detrimental effects on humans and plants. The ozone depletion potential is a measure of air emissions that contribute to the depletion of the stratospheric ozone layer.

### Acidification potential

(AP)

Acidification potential is a measure of emissions that cause acidifying effects to the environment. A molecule's acidification potential indicates its capacity to increase the hydrogen ion (H+) concentration in the presence of water, thus decreasing the pH value. Potential effects include fish mortality, forest decline, and the deterioration of building materials.

### Eutrophication potential

(EP-freshwater, EP-marine, EP-terrestrial)

Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which are nitrogen (N)and phosphorus (P). In aquatic ecosystems where this term is mostly applied, this typically describes a degradation in water quality. Eutrophication can result in an undesirable change in the type of species that flourish and an increase in the production of biomass. As the decomposition of biomass consumes oxygen, eutrophication may decrease the available oxygen level in the water column and threaten fish in their ability to respire.

### Photochemical ozone formation potential

(POCP)

Photochemical ozone formation potential gives an indication of the emissions from precursors that contribute to ground level smog formation, mainly ozone ($O_3$). Ground level ozone may be harmful to human health and ecosystems and may also damage crops. These emissions are produced by the reaction of volatile organic compounds (VOCs) and carbon monoxide in the presence of nitrogen oxides and UV light.

### Abiotic resource depletion

(ADP-m&m, ADP-fossil)

The consumption of non-renewable resources decreases the availability of these resources and their associated functions in the future. Depletion of mineral resources and non-renewable energy resources are reported separately. Depletion of mineral resources is assessed based on total reserves.

### Water use

(WDP)

Water scarcity is a measure of the stress on a region due to water consumption.

# Environmental performance

The following tables show the results for one $m^3$ of average softwood Glulam.

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The EN 15804 reference package based on EF 3.1, February 2023 is used.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

For packaging, biogenic carbon and/or recovered energy leaving the product system in module A5 has been balanced out already in modules A1-A3.

The use of primary energy is separated into energy used as raw material and energy used as energy carrier as per option C in Annex 3 in the PCR (EPD International, 2025b).

Energy indicators (MJ) are always given as net calorific value.

The three significant figures are used for all values in the EPD, including results. The three significant figures are used to maintain consistency across published EPDs.

## Results for primary scenario

These results show environmental impacts, including global warming potential and other factors. Some indicators have endnotes linking through to disclaimers- see page 21 for more details.

### Environmental impact indicators

The core environmental impact indicators in accordance with EN 15804:2012+A2:2019, describing the potential environmental impacts of the product.

Table 7. Abbreviations for EN15804+A2 core environmental impact indicators

| Abbr | Indicator |
|---|---|
| **GWP-total** | Climate change (total) |
| **GWP-fossil** | Climate change (fossil) |
| **GWP-biogenic** | Climate change (biogenic) |
| **GWP-luluc** | Climate change (land use and land use change) |
| **ODP** | Depletion potential of the stratospheric ozone layer |
| **AP** | Acidification potential |
| **EP-freshwater** | Eutrophication potential (freshwater) |
| **EP-marine** | Eutrophication aquatic (marine) |
| **EP-terrestrial** | Eutrophication (terrestrial) |
| **POCP** | Formation potential of tropospheric ozone |
| **ADP-m&m** | Depletion abiotic resources – minerals & metals |
| **ADP-fossil** | Depletion abiotic resources – fossil fuels |
| **WDP** | Water (user) deprivation potential, deprivation-weighted water consumption |

Table 8. EN15804+A2 core environmental impact indicators

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D | A-C variation |
|---|---|---|---|---|---|---|---|---|
| **GWP-total** | **kg $CO_2$ eq.** | -5.67E+02 | 6.82E-01 | 5.11E+00 | 0 | 1.09E+03 | -3.18E-01 | -32%/+15% |
| **GWP-fossil** | **kg $CO_2$ eq.** | 4.26E+02 | 6.82E-01 | 5.10E+00 | 0 | 5.67E+01 | -3.18E-01 | -34%/+16% |
| **GWP-biogenic** | **kg $CO_2$ eq.** | -9.94E+02 | 4.62E-04 | 1.01E-03 | 0 | 1.03E+03 | -2.18E-04 | -12%/+5.6% |
| **GWP-luluc** | **kg $CO_2$ eq.** | 3.33E-02 | 1.62E-05 | 1.21E-04 | 0 | 3.90E-02 | -2.39E-04 | -20%/+12% |
| **ODP** | **kg CFC 11 eq.** | 3.70E-09 | 9.77E-14 | 7.30E-13 | 0 | 1.42E-10 | -4.30E-12 | -73%/+40% |
| **AP** | **Mol H+ eq.** | 2.63E+00 | 3.98E-03 | 1.96E-02 | 0 | 2.21E-01 | -1.69E-03 | -41%/+26% |
| **EP-freshwater** | **kg P eq.** | 4.07E-04 | 1.04E-07 | 7.74E-07 | 0 | 2.69E-05 | -1.08E-07 | -29%/+15% |
| **EP-marine** | **kg N eq.** | 1.11E+00 | 2.00E-03 | 9.54E-03 | 0 | 6.35E-02 | -3.64E-04 | -25%/+15% |
| **EP-terrestrial** | **Mole N eq.** | 9.33E+00 | 2.19E-02 | 1.05E-01 | 0 | 6.94E-01 | -3.99E-03 | -29%/+18% |
| **POCP** | **kg NMVOC eq.** | 4.77E+00 | 5.38E-03 | 2.06E-02 | 0 | 1.81E-01 | -1.01E-03 | -21%/+13% |
| **ADP-m&m**[1] | **kg Sb eq.** | 1.31E-04 | 6.68E-09 | 5.00E-08 | 0 | 2.50E-06 | -2.50E-08 | -15%/+9.7% |
| **ADP-fossil**[1] | **MJ** | 5.41E+03 | 9.02E+00 | 6.74E+01 | 0 | 8.23E+02 | -3.65E+00 | -38%/+20% |
| **WDP**[1] | **$m^3$ world eq.** | 1.29E+02 | 2.49E-03 | 1.86E-02 | 0 | 3.24E+01 | -1.33E-01 | -16%/+0.0% |



## Additional environmental impact indicators

Optional environmental impact categories provide further information on environmental impacts - in accordance with EN 15804:2012+A2:2019.

Table 9. Abbreviations for EN15804+A2 additional environmental impact indicators

| Abbr | Indicator |
|---|---|
| **GWP-GHG** | Global warming potential |
| **GWP-GHG (IPCC AR5)** | IPCC AR5 GWP-GHG |
| **PM** | Respiratory inorganics |
| **IRP** | Ionising Radiation – human health |
| **ETP-fw** | Ecotoxicity – freshwater |
| **HTPc** | Human Toxicity, cancer |
| **HTPnc** | Human Toxicity, non-cancer |
| **SQP** | Land use related impacts / soil quality |

Table 10. EN15804+A2 additional environmental impact indicators

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D | |
|---|---|---|---|---|---|---|---|---|
| **GWP-GHG**[2] | **kg $CO_2$ eq.** | 4.60E+02 | 6.82E-01 | 5.11E+00 | 0 | 5.85E+01 | -3.19E-01 | -32%/+15% |
| **GWP-GHG (IPCC AR5)**[3] | **kg $CO_2$ eq.** | 4.57E+02 | 6.82E-01 | 5.11E+00 | 0 | 5.84E+01 | -3.18E-01 | -32%/+15% |
| **PM** | **Disease incidences** | 3.28E-05 | 8.07E-08 | 1.73E-07 | 0 | 1.92E-06 | -1.65E-08 | -27%/+14% |
| **IRP**[4] | **kBq U235-eq.** | 1.21E+00 | 2.17E-04 | 1.62E-03 | 0 | 4.27E-01 | -1.14E-04 | -42%/+17% |
| **ETP-fw**[1] | **CTUe** | 1.83E+03 | 3.51E+00 | 2.63E+01 | 0 | 3.46E+02 | -8.52E-01 | -20%/+1.1% |
| **HTPc**[1] | **CTUh** | 1.34E-07 | 5.50E-11 | 4.11E-10 | 0 | 7.49E-09 | -3.79E-11 | -12%/+0.0% |
| **HTPnc**[1] | **CTUh** | 7.69E-06 | 9.15E-10 | 6.85E-09 | 0 | 1.33E-07 | -8.54E-10 | <10% |
| **SQP**[1] | **Dimensionless** | 2.61E+04 | 1.59E-02 | 1.19E-01 | 0 | 4.32E+01 | -4.05E-01 | -12%/+6.2% |

## Resource use indicators

The resource use indicators describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy and water.

Table 11. Abbreviations for use of resources

| Abbr | Indicator |
|---|---|
| **PERE** | Renewable primary energy as energy carrier |
| **PERM** | Renewable primary energy resources as material utilization |
| **PERT** | Total use of renewable primary energy resources |
| **PENRE** | Non-renewable primary energy as energy carrier |
| **PENRM** | Non-renewable primary energy as material utilization |
| **PENRT** | Total use of non-renewable primary energy resources |
| **SM** | Use of secondary material |
| **RSF** | Use of renewable secondary fuels |
| **NRSF** | Use of non-renewable secondary fuels |
| **FW** | Use of net fresh water |

Table 12. Use of resources

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **PERE** | **MJ** | 4.12E+03 | 3.99E-02 | 2.99E-01 | 0 | 8.63E+01 | -1.55E+00 |
| **PERM** | **MJ** | 1.04E+04 | 0 | 0 | 0 | 0 | 0 |
| **PERT** | **MJ** | 1.45E+04 | 3.99E-02 | 2.99E-01 | 0 | 8.63E+01 | -1.55E+00 |
| **PENRE** | **MJ** | 5.32E+03 | 9.02E+00 | 6.74E+01 | 0 | 8.23E+02 | -3.65E+00 |
| **PENRM** | **MJ** | 9.69E+01 | 0 | 0 | 0 | 0 | 0 |
| **PENRT** | **MJ** | 5.41E+03 | 9.02E+00 | 6.74E+01 | 0 | 8.23E+02 | -3.65E+00 |
| **SM** | **kg** | 0 | 0 | 0 | 0 | 0 | 0 |
| **RSF** | **MJ** | 0 | 0 | 0 | 0 | 0 | 0 |
| **NRSF** | **MJ** | 0 | 0 | 0 | 0 | 0 | 0 |
| **FW** | **$m^3$** | 2.71E+00 | 5.04E-05 | 3.77E-04 | 0 | 4.98E-01 | -1.87E-03 |

## Waste material and output flow indicators

Waste indicators describe waste generated within the life cycle of the product. Waste is categorised by hazard class, end-of-life fate and exported energy content.

Table 13. Abbreviations for waste production and output flows

| Abbr | Indicator |
|---|---|
| **HWD** | Hazardous waste disposed |
| **NHWD** | Non-hazardous waste disposed |
| **RWD** | Radioactive waste disposed |
| **CRU** | Components for re-use |
| **MFR** | Materials for recycling |
| **MER** | Materials for energy recovery |
| **EEE** | Exported electrical energy |
| **EET** | Exported thermal energy |

Table 14. Waste production and output flows

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **HWD** | **kg** | 4.94E-07 | 1.19E-10 | 8.88E-10 | 0 | 1.27E-07 | -2.00E-09 |
| **NHWD** | **kg** | 4.05E+01 | 0 | 0 | 0 | 6.39E+02 | 0 |
| **RWD** | **kg** | 1.12E-02 | 1.74E-06 | 1.30E-05 | 0 | 4.27E-03 | -8.15E-07 |
| **CRU** | **kg** | 0 | 0 | 0 | 0 | 0 | 0 |
| **MFR** | **kg** | 4.43E-02 | 0 | 0 | 0 | 0 | 0 |
| **MER** | **kg** | 0 | 0 | 0 | 0 | 0 | 0 |
| **EEE** | **MJ** | 0 | 0 | 0 | 0 | 1.73E+00 | 0 |
| **EET** | **MJ** | 0 | 0 | 0 | 0 | 0 | 0 |

## Biogenic carbon content

Biogenic carbon refers to the carbon stored in organic materials. This is sequestered during growth and released at end of life. EN15804+A2 requires the declaration of biogenic carbon content of the product and its packaging.

Table 15. Abbreviations for biogenic carbon content

| Abbr | Indicator |
|---|---|
| **BCC-prod** | Biogenic carbon content – product |
| **BCC-pack** | Biogenic carbon content – packaging |

Table 16. Biogenic carbon content results

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **BCC-prod** | **kg** | 2.82E+02 | 0 | 0 | 0 | 0 | 0 |
| **BCC-pack** | **kg** | 6.00E-01 | 0 | 0 | 0 | 0 | 0 |

1 kg biogenic carbon is equivalent to xxxx kg $CO_2$.



## Additional environmental impact indicators[5]

Results for environmental impact indicators in accordance with EN 15804:2012+A1:2013 to aid backward comparability.

Table 17. Abbreviations for EN15804+A1 environmental impact indicators

| Abbr | Indicator |
|---|---|
| **GWP (EN15804+A1)** | Global warming potential (total) |
| **ODP (EN15804+A1)** | Depletion potential of the stratospheric ozone layer |
| **AP (EN15804+A1)** | Acidification potential of land and water |
| **EP (EN15804+A1)** | Eutrophication potential |
| **POCP (EN15804+A1)** | Photochemical ozone creation potential |
| **ADPE (EN15804+A1)** | Abiotic depletion potential – elements |
| **ADPF (EN15804+A1)** | Abiotic depletion potential – fossil fuels |

Table 18. EN15804+A1 environmental indicator results

| Indicator | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **GWP (EN15804+A1)** | **kg $CO_2$-eq.** | -5.61E+02 | 6.76E-01 | 5.06E+00 | 0 | 1.09E+03 | -3.16E-01 |
| **ODP (EN15804+A1)** | **kg CFC11-eq.** | 4.36E-09 | 1.17E-13 | 8.72E-13 | 0 | 1.67E-10 | -5.06E-12 |
| **AP (EN15804+A1)** | **kg $SO_2$-eq.** | 2.01E+00 | 2.73E-03 | 1.35E-02 | 0 | 1.73E-01 | -1.38E-03 |
| **EP (EN15804+A1)** | **kg $PO_4^{3-}$-eq.** | 4.12E-01 | 6.69E-04 | 3.23E-03 | 0 | 2.19E-02 | -1.26E-04 |
| **POCP (EN15804+A1)** | **kg $C_2H_4$-eq.** | 9.70E-01 | 3.01E-04 | -3.67E-03 | 0 | 1.15E-02 | -7.44E-05 |
| **ADPE (EN15804+A1)** | **kg Sb-eq.** | 1.31E-04 | 6.70E-09 | 5.01E-08 | 0 | 2.53E-06 | -2.50E-08 |
| **ADPF (EN15804+A1)** | **MJ** | 5.35E+03 | 8.97E+00 | 6.71E+01 | 0 | 8.06E+02 | -3.65E+00 |

## Variation in results

The results show variation higher than 10% across the product group for modules A-C as shown in the results tables above for multiple indicators. This EPD does not claim compliance with ISO 21930:2017. The variation above 10% of modules A-C is due to the variation in manufacturing processes from data providers.

The variation in GWP-GHG at the production stage (A1-A3) is -40%/+18% because of site variation. Variation of sites is calculated based on identical products manufactured at different sites. As per PCR 2019:14, variations (in %) between two numbers are calculated by dividing the absolute difference of the numbers by their average and then multiplying the result by 100.

### Endnotes

1 The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

2 This indicator is identical to GWP-total except that the CF for biogenic $CO_2$ is set to zero. It has been included in the EPD following the PCR.

3 GWP-GHG (IPCC AR5) is an additional GWP100 indicator that is aligned with the Intergovernmental Panel on Climate Change (IPCC) 2013 Fifth Assessment Report (AR5) (IPCC 2013), national greenhouse gas reporting frameworks in Australia and New Zealand and previous versions of the Construction Products PCR (PCR2019:14v1.11). It excludes biogenic carbon and indirect radiative forcing.

4 This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is also not measured by this indicator.

5 While the indicators and characterisation methods are from EN15804:2012+A1:2013, other LCA rules for the study (system boundaries, allocation, etc.) are according to EN15804:2012+A2:2019; i.e. this study does not claim that the results for the "A1 indicators" are compliant with EN15804:2012+A1:2013.

# Abbreviations

| | |
|---|---|
| ADP | Abiotic Depletion Potential |
| AP | Acidification Potential, Accumulated Exceedance |
| BCC-prod | Biogenic Carbon Content - product |
| BCC-pack | Biogenic Carbon Content - packaging |
| CEN | European Committee for Standardization |
| CML | Centre of Environmental Science at Leiden |
| CRU | Components for Re-Use |
| DOCf | Degradable Organic Carbon Fraction |
| DQA | Data Quality Assessment |
| EEE | Exported Energy, Electrical |
| EET | Exported Energy, Thermal |
| EoL | End-of-Life |
| EP | Eutrophication Potential |
| ETP | Potential Comparative Toxic Unit for ecosystems |
| ff | fossil fuels |
| FW | Net use of Fresh Water |
| GaBi | Ganzheitliche Bilanzierung (German for holistic balancing) |
| GCV | Gross Calorific Value |
| GHG | Greenhouse Gas |
| GWP | Global Warming Potential (Climate Change) |
| HTP | Potential Comparative Toxic Unit for humans |
| HWD | Hazardous Waste Disposed |
| ILCD | International Cycle Data System |
| IPCC | Intergovernmental Panel on Climate Change |
| IRP | Potential Human exposure efficiency relative to U235 |
| ISO | International Organization for Standardization |
| LCA | Life Cycle Assessment |
| LCI | Life Cycle Inventory |
| LCIA | Life Cycle Impact Assessment |
| LCA FE | Life Cycle Assessment for Experts (software) |
| luluc | Land use and land use change |
| MC | Moisture content |
| MLC | Managed LCA Content database |
| MER | Materials for Energy Recovery |
| MFR | Materials for Recycling |
| NCV | Net Calorific Value |
| NHWD | Non-Hazardous waste disposal |
| NMVOC | Non-Methane Volatile Organic Compound |
| NRSF | Use of Non-Renewable Secondary Fuels |
| ODP | Depletion potential of the stratospheric ozone layer |
| PCR | Product Category Rules |
| PENRE | Use of Primary Energy (Non-Renewable) as Energy |
| PENRM | Use of Primary Energy (Non-Renewable) as Material |
| PENRT | Use of Primary Energy (Non-Renewable) in Total |
| PERE | Use of Primary Energy (Renewable) as Energy |
| PERM | Use of Primary Energy (Renewable) as Material |
| PERT | Use of Primary Energy (Renewable) in Total |
| PF | Phenol Formaldehyde resin |
| PRF | Phenol Resorcinol Formaldehyde resin |
| PM | Potential incidence of disease due to PM emissions |
| POCP | Formation potential of tropospheric ozone |
| RSF | Use of Renewable Secondary Fuels |
| RWD | Radioactive Waste Disposed |
| SM | Use of Secondary Material |
| SQP | Land use related impacts / soil quality |
| VOC | Volatile Organic Compound |
| WDP | Water (user) deprivation potential, deprivation-weighted water consumption |

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# General information

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules). The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but published in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different. To support backwards comparability and compatibility, environmental performance results have also been provided for the indicators required in EN15804+A1, although the study does not claim compliance with this standard.

## Programme information

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| | | |
|---|---|---|
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| **Geographical scope** | Australia | |
| **Reference year** | 2022-01-01 to 2022-12-31 | |

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## Verification

External and independent ('third-party') verification of the declaration and data, according to ISO 14025:2006, via EPD verification through:

☑ Individual EPD verification without a pre-verified LCA/EPD tool

| | |
|---|---|
| **Third party verifier** | Andrew D Moore, Life Cycle Logic Pty Ltd |
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| **Verifier approved by** | EPD Australasia and The International EPD System |

☐ Yes ☑ No Procedure for follow-up of data during EPD validity involves third-party verifier

## Product Category Rules (PCR)

CEN standard EN 15804+A2 served as the core Product Category Rules.

| | |
|---|---|
| **PCR** | PCR 2019.14 Construction Products, version 2.0.1 (published on 2025-06-05, valid until 2030-04-07)<br>C-PCR-006 Wood and wood-based products for use in construction (EN16485:2026), (published on 2026-07-06) |
| **PCR review conducted by** | The Technical Committee of the International EPD® System.<br>See www.environdec.com for a list of members. |
| **Review Chairs** | Rob Rouwette, start2see Pty Ltd (chair),<br>Noa Meron, thinkstep Ltd (co-chair).<br>The review panel may be contacted via the Secretariat<br>www.environdec.com/support |

## Version history

| | | |
|---|---|---|
| 001 | 2026-08-19 | Original version of EPD-IES-0026836:001<br>This represents an updated based on data from the reference period 2022-01-01 to 2022-12-31.<br>This EPD partially replaces the earlier EPD, registration number: S-P-00565, published on 2017-1208, which has been split out to separate hardwood and softwood glulam products. |


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