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Environmental Product Declaration
Particleboard

Environmental Product Declaration (EPD)
in accordance with ISO 14025 and EN 15804

EPD Registration No. S-P-00562 | Version 1
Issued 21 October 2015 | Valid until 21 October 2020

Geographical Scope: Australia

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

Environmental Product Declarations

WoodSolutions has developed a suite of EPDs for industry-average, Australian-produced timber products.

These EPDs help to showcase the environmental credentials of Australian wood products. They also provide life cycle data for calculating the impacts of wood products at a building level.

EPDs include:

#01 Softwood Timber

#02 Hardwood Timber

#03 Particleboard

#04 Medium Density Fibreboard (MDF)

#05 Plywood

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WoodSolutions is an industry initiative designed to provide independent, non-proprietary information about timber and wood products to professionals and companies involved in building design and construction.

WoodSolutions is resourced by Forest and Wood Products Australia (FWPA). It is a collaborative effort between FWPA members and levy payers, supported by industry peak bodies and technical associations.

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Produced: September 2015

EPD Details

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).

Environmental product declarations within the same product category from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

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CEN standard EN 15804 served as the core PCR

PCR:
PCR 2012:01 Construction products and Construction services, Version 2.0, 2015-03-03

PCR review was conducted by:
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Independent verification of the declaration and data, according to ISO 14025:
☐ EPD process certification (Internal)
☑ EPD verification (External)

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Introduction

This Environmental Product Declaration presents the average performance of particleboard manufactured in Australia from Australian grown wood residues by members of Forest and Wood Products Australia (FWPA). It recognises the importance of transparency by providing information on the raw materials, production and environmental impacts of Australian particleboard.

This EPD has been prepared in accordance with ISO 14025:2006, EN 15804:2013, PCR 2012:01 and AEPDP (2015). It covers standard and moisture resistant particleboard panels that have a decorative overlay and flooring products produced in accordance with the following standards:

- AS/NZS 1859.1:2004 Reconstituted wood-based panels – Specifications – Particleboard
- AS/NZS 1859.3:2005 Reconstituted wood-based panels – Specifications – Decorative and overlaid wood panels
- AS/NZS 1860.1:2002 Particleboard flooring – Specifications.

The environmental data presented in this document were largely from a survey of industry members conducted by CSIRO on behalf of FWPA (CSIRO 2009). This study covered 64% of total particleboard production in Australia. Production of the EPD and validation of the data have been facilitated by FWPA with participation of its current particleboard producer members (listed at the end of this section) and the Engineered Wood Products Association of Australasia (EWPAA).

Description of the Australian Particleboard Industry

The Australian particleboard industry is an important contributor to the Australian economy – particularly to the regional economies where mills are based. The overall contribution of the wood products industries to the Australian GDP in 2010-11 was 0.59% (or $8.3 billion added value) (ABARES 2013). In 2013-14, Australian particleboard manufacturers produced 855,000 cubic metres of particleboard products (ABARES 2014) in six different facilities.

Description of Particleboard Products

Particleboard production uses wood residues as its main input. These include forest thinnings, log harvesting waste and co-products of sawmilling.

Particleboard is a composite panel that can be engineered for specific applications. It is widely used to manufacture kitchens, wardrobes, laundries, furniture, wall panels, architectural joinery and flooring in retail fit outs, multi-residential buildings, hotels and housing projects.

Use of EPDs within Green Star

This document complies with the requirements for an industry-wide EPD under the Green Building Council of Australia's Green Star rating system given that:

1. It conforms with ISO 14025 and EN 15804.
2. It has been verified by an independent third party.
3. It has at least a cradle-to-gate scope.
4. The participants in the EPD are listed (see below).

It may be used by project teams to obtain points under the Materials category of the current *Design & As Built* and *Interiors* rating tools, as well as under the Innovation Challenge category of the legacy Green Star rating tools.

It can also help project teams conduct a Green Star compliant, whole-of-building, whole-of-life Life Cycle Assessment to obtain additional points under the Materials category of the current *Design & As Built* and *Interiors* rating tools as well as under the Innovation Challenge category of the legacy Green Star rating tools.

This EPD applies to the following companies:

- Carter Holt Harvey Woodproducts Australia (Tumut and Oberon, New South Wales; Gympie, Queensland; and Mt Gambier, South Australia)
- D&R Henderson (Benalla, Victoria)
- Laminex Group (Darndanup, Western Australia).

Scope

Products

This Sector EPD describes the following average products (declared units) manufactured in Australia by the FWPA members listed in the Introduction:

- 1m^2 of particleboard, 16 mm E1 standard melamine coated
- 1m^2 of particleboard, 18 mm E1 standard melamine coated
- 1m^2 of particleboard, 16 mm E1 moisture resistant (MR) melamine coated
- 1m^2 of particleboard, 18 mm E1 moisture resistant (MR) melamine coated
- 1m^2 of particleboard, 19 mm flooring (tongue & groove)
- 1m^2 of particleboard, 22 mm flooring (tongue & groove)
- 1m^2 of particleboard, 25 mm flooring (tongue & groove)

All wood used in these products is from Australian native and exotic (non-native) softwood species grown in plantations. The dominant softwood species used to produce particleboard in Australia is *Pinus radiata* (radiata pine). Other softwood species used are *Araucaria cunninghami* (hoop pine), *Pinus pinaster* (maritime pine) and the Southern Pines: *Pinus elliottii* (slash pine), *Pinus caribaea* (Caribbean pine) and hybrids thereof.

The properties and material composition of these particleboard products are defined in Table 1 and Table 2 below.

Table 1: Properties of particleboard products included in this EPD.

Properties	Std 16 mm	Std 18 mm	MR 16 mm	MR 18 mm	Floor 19 mm	Floor 22 mm	Floor 25 mm
Area density (kg per m^2)	9.82	10.8	10.2	11.2	13.0	14.8	16.6
Density (kg per m^3)	614	601	636	621	685	674	665
Moisture content (dry basis)	10%	10%	10%	10%	10%	10%	10%
Gross calorific value (MJ/kg)	19.7	19.7	20.0	20.0	20.3	20.3	20.3
Net calorific value (MJ/kg)	16.7	16.7	17.1	17.2	17.4	17.3	17.3
CO2 sequestered (kg CO_2e)	13.5	14.9	13.3	14.7	17.6	20.1	22.5

Table 2: Composition of particleboard products included in this EPD.

Materials	Std 16 mm	Std 18 mm	MR 16 mm	MR 18 mm	Floor 19 mm	Floor 22 mm	Floor 25 mm
Board: Softwood (dry)	73.1%	73.6%	69.9%	70.3%	73.9%	73.9%	74.0%
Board: Urea formaldehyde	10.8%	10.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Board: Melamine urea formaldehyde	0.0%	0.0%	13.4%	13.5%	14.9%	14.9%	14.9%
Board: Paraffin wax	0.8%	0.8%	1.6%	1.6%	1.7%	1.7%	1.7%
Lamination: Paper (dry)	1.8%	1.6%	1.7%	1.6%	0.0%	0.0%	0.0%
Lamination: Melamine formaldehyde	4.4%	4.0%	4.3%	3.9%	0.0%	0.0%	0.0%
Tongue: Polypropylene	0.0%	0.0%	0.0%	0.0%	0.5%	0.4%	0.4%
Water	9.1%	9.1%	9.1%	9.1%	9.0%	9.1%	9.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The declared units above represent an entire product category rather than a specific product from a specific manufacturer. As such, a specific product purchased on the market may have a lesser or greater environmental impact than the average presented in this EPD. Some products may also undergo further processing (e.g. sawing) before being used in a building.

Representativeness

Approximately 64% of particleboard production in Australia was covered in the original survey (CSIRO 2009).

Data from the CSIRO study were predominantly from the 2005-06 financial year. Since this time, the number of particleboard mills in Australia has decreased from eight to six. The reduction in producer numbers has seen the larger producers remain due to their economies of scale. However, all mills use fundamentally the same production processes that they did at the time of the original study. As such, TDA and FWPA consider the 2005-06 data to be a good representation of today's conditions. FWPA will monitor for any major changes within the industry during the period of validity of this EPD (2015 to 2020) and update or withdraw this EPD should any such changes occur.

Industry Classifications

Product	Classification	Code	Category
All	UN CPC Ver.2	31430	Particle board and similar board of wood or other ligneous materials
All	ANZSIC 2006	1494	Reconstituted Wood Product Manufacturing

LCA Calculation Rules

System Boundary

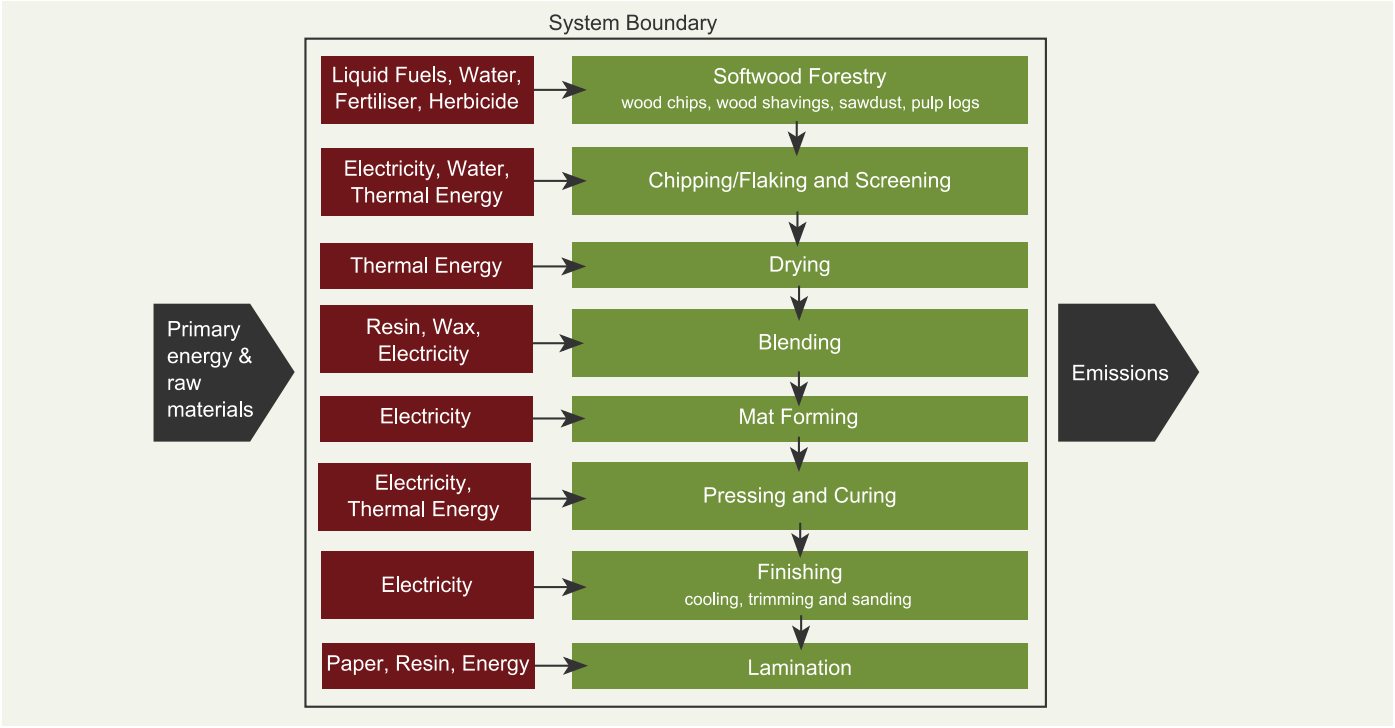
This EPD is of the 'cradle-to-gate' type with options. The options include the end-of-life stage, which is modelled through the use of scenarios.

Product stage			**Con-struction process stage**		**Use stage**							**End-of-life stage**				**Benefits and loads beyond the system boundary**
Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to waste processing	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X

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

Production

The production stage includes growth and harvesting of wood inputs, production of resin and wax, blending of wood particles with resin and wax, pressing of the mixture to create the particleboard substrate, cutting, sanding and – if applied – adding a melamine-impregnated layer to the top and bottom surfaces.



End-of-Life

When a wood product reaches the end of its useful life, it may either be reused, recycled, landfilled or combusted to produce energy. Landfill is currently the most common end-of-life route for wood products in Australia. Reuse is not included in this EPD as it is not common for particleboard. All other scenarios are in use in certain regions (Forsythe Consultants 2007; National Timber Product Stewardship Group) and have been included within this EPD.

Each scenario assumes that 100% of the wood is sent to that scenario. To create an end-of-life mix for a given region or end use, the reader should take a weighted sum of these scenarios. Where no data are available, the 'landfill (typical)' scenario should be used for 100% of the waste.

Landfill

This EPD includes two scenarios for landfill, each with a different value for the degradable organic carbon fraction (DOCf) of wood. The two values are based on bioreactor laboratory research. This experimental work involves the testing of a range of waste types in reactors operated to obtain maximum methane yields. As the laboratory work optimises the conditions for anaerobic decay, the results can be considered as true estimates of the DOCf value that would apply over very long time horizons (Australian Government 2014a, p.17).

- **Landfill (typical):** DOCf = 1.6%. This is based on bioreactor laboratory research by Ximenes *et al.* (2013). This value can be considered as an upper limit for degradation of carbon in particleboard placed in a landfill.
- **Landfill (NGA)**: DOCf = 23%. This is the value chosen for Australia's National Greenhouse Accounts (NGA). It was derived from early bioreactor laboratory research from the 1990s (e.g. Barlaz 1998) that investigated the degradability of wood tree branches ground to a fine powder under anaerobic conditions (Australian Government 2014a, p. 17). This value can be considered as an upper limit for degradation of carbon in finely ground timber placed in a landfill.

The impacts associated with the landfill are declared in module C4. All landfill gas that is combusted for energy recovery (module C4) is assumed to occur in a power plant with an electrical conversion efficiency of 36% (Australian Government 2014c, p. 189) and the resulting electricity receives a credit for offsetting average electricity from the Australian grid (module D) in line with EN 16485:2014 (Section 6.3.4.5).

Both landfill scenarios assume the following for carbon emissions:

- Of the gases formed from any degradation of wood in landfill, 50% is methane and 50% is carbon dioxide (Australian Government 2014b).
- All carbon dioxide is released directly to the atmosphere.
- 36% of the methane is captured, based on forecasted average methane capture in Australian landfills by 2020 (Hyder Consulting 2007). Of this, one-quarter (9% of the total) is flared and three-quarters (27% of the total) are used for energy recovery (Carre 2011).
- Of the 64% of methane that is not captured, 10% (6.4% of the total) is oxidised (Australian Government 2014b) and 90% (57.6%) is released to the atmosphere.
- In summary, for every kilogram of carbon converted to landfill gas, 71.2% is released as carbon dioxide and 28.8% is released as methane.

Energy recovery

This scenario includes shredding and combustion (module C3) with recovered energy offset against average electricity from the Australian grid and thermal energy from natural gas (module D) in line with EN 16485:2014 (Section 6.3.4.5).

Recycling

Particleboard may be recycled in many different ways. This scenario considers shredding and effectively downcycling into wood chips. Wood waste is chipped (module C3) and assigned credits relative to the avoided production of woodchips from virgin softwood (module D). The sequestered CO_2 and the energy content of the wood are assumed to leave the system boundary at C3 so that future product systems can also claim these without double-counting (EN 16485: 2014, Section 6.3.4.2).

Key Assumptions

Energy: All electricity and thermal energy inputs have been modelled as the Australian average (see thinkstep 2014 for documentation) rather than state-specific energy mixes. This is because the life cycle inventory data from the CSIRO study were aggregated and could not be split by state.

Cut-off Criteria

Environmental impacts relating to personnel, infrastructure, and production equipment not directly consumed in the process are excluded from the system boundary as per the PCR (IEPDS 2015, Section 6.5.4). Packaging is relatively minimal and has been excluded from the EPD. All other reported data were incorporated and modelled using the best available life cycle inventory data.

Allocation

Upstream data: For refinery products, allocation is done by mass and net calorific value. Inventories for electricity and thermal energy generation include allocation by economic value for some by-products (e.g. gypsum, boiler ash and fly ash). Allocation by energy is applied for co-generation of heat and power. For materials and chemicals, the allocation rule most suitable for the product is applied (see thinkstep 2014).

Co-products (i.e. different particleboard products): Wood particles and energy are allocated per cubic metre of board produced. Decorative overlays are allocated by square metre applied. The polypropylene tongue in flooring is allocated based on square metres of board. Resins and waxes are allocated based on the dry mass required in average recipes supplied by manufacturers.

Background Data

Data for wood inputs (softwood wood chips and softwood pulp log) come from CSIRO (2009) and use the same forestry data as FWPA EPD #01 for Softwood Timber, but with different economic allocation factors.

Data for all energy inputs, transport processes and raw materials are from GaBi Databases 2014 (thinkstep 2014). Most datasets have a reference year between 2011 and 2013 and all fall within the 10-year limit allowable for generic data under EN 15804 (Section 6.3.7).

All Australian electricity is assumed to be the 2011 national average with a Global Warming Potential of 1,004 g CO_2e/kWh, made up of 90% fossil fuel energy (46.6% hard coal, 21.9% lignite, 19.7% natural gas, 1.6% heavy fuel oil, 0.2% coal gases) and 10% renewable energy (6.7% hydro, 2.3% wind, 0.4% biomass, 0.4% biogas, 0.3% photovoltaic) (thinkstep 2014).

EPD Results

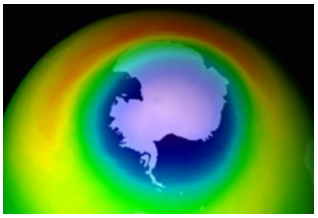
Note: these tables show the impacts associated with production and end-of-life.
Any potential credits to future products from recycling or energy recovery are presented in the Other Environmental Information section.

Environmental Impact Indicators

An introduction to each environmental impact indicator is provided below.
The best-known effect of each indicator is listed to the right of its name.

Global Warming Potential (GWP) → Climate Change
A measure of greenhouse gas emissions, such as carbon dioxide and methane. These emissions increase absorption of radiation emitted by the earth, intensifying the natural greenhouse effect. Contributions to GWP can come from either fossil or biogenic sources, e.g. burning fossil fuels or burning wood. GWP is reported both including biogenic carbon (GWPIB) and excluding biogenic carbon (GWPEB).

Ozone Depletion Potential (ODP) → Ozone Hole
A measure of air emissions that contribute to the depletion of the stratospheric ozone layer, causing higher levels of ultraviolet B (UVB) to reach the earth's surface with detrimental effects on humans, animals and plants.



Acidification Potential (AP) → Acid Rain
A measure of emissions that cause acidifying effects to the environment. Acidification potential is a measure of a molecule's 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) → Algal Blooms
A measure of nutrient enrichment that may cause an undesirable shift in species composition and elevated biomass production in both aquatic and terrestrial ecosystems. It includes potential impacts of excessively high levels of macronutrients, the most important of which are nitrogen (N) and phosphorus (P).

Photochemical Ozone Creation Potential (POCP) → Smog
A measure of emissions of precursors that contribute to ground level smog formation (mainly ozone O_3), produced by the reaction of VOCs and carbon monoxide in the presence of nitrogen oxides under the influence of UV light. Ground level ozone may be harmful to human and ecosystem health and may also damage crops.

Abiotic Depletion Potential → Resource Consumption
The consumption of non-renewable resources leads to a decrease in the future availability of the functions supplied by these resources. Depletion of mineral resource elements (ADPE) and non-renewable fossil energy resources (ADPF) are reported separately.

Table 3: Environmental impacts, 1 m² of particleboard, 16 mm E1 standard melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-4.58E+00	1.74E+00	1.26E+01	1.57E+01	1.36E+01
GWPEB [kg CO_2-eq.]	8.89E+00	1.53E+00	9.41E+00	2.28E+00	1.00E-01
ODP [kg CFC11-eq.]	8.69E-11	8.43E-12	8.43E-12	7.21E-11	3.18E-12
AP [kg SO_2-eq.]	3.29E-02	3.01E-03	3.72E-03	6.71E-03	6.38E-04
EP [kg PO_4^{3-}-eq.]	6.83E-03	2.35E-03	2.88E-02	1.60E-03	1.51E-04
POCP [kg C_2H_4-eq.]	5.95E-03	4.21E-04	2.53E-03	4.79E-04	6.75E-05
ADPE [kg Sb-eq.]	1.50E-06	1.80E-07	1.80E-07	1.57E-07	1.68E-09
ADPF [MJ]	1.43E+02	1.35E+01	1.35E+01	2.84E+01	1.29E+00

Table 4: Environmental impacts, 1 m² of particleboard, 18 mm E1 standard melamine coated

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-5.27E+00	1.94E+00	1.39E+01	1.74E+01	1.50E+01
GWPEB [kg CO_2-eq.]	9.63E+00	1.70E+00	1.04E+01	2.46E+00	1.11E-01
ODP [kg CFC11-eq.]	9.26E-11	9.49E-12	9.49E-12	7.95E-11	3.50E-12
AP [kg SO_2-eq.]	3.61E-02	3.38E-03	4.16E-03	7.40E-03	7.03E-04
EP [kg PO_4^{3-}-eq.]	7.48E-03	2.56E-03	3.11E-02	1.77E-03	1.66E-04
POCP [kg C_2H_4-eq.]	6.49E-03	4.70E-04	2.80E-03	5.28E-04	7.43E-05
ADPE [kg Sb-eq.]	1.60E-06	2.03E-07	2.03E-07	1.73E-07	1.85E-09
ADPF [MJ]	1.54E+02	1.52E+01	1.52E+01	3.08E+01	1.42E+00

Table 5: Environmental impacts, 1 m² of particleboard, 16 mm E1 moisture resistant (MR) melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-1.29E+00	1.78E+00	1.31E+01	1.64E+01	1.34E+01
GWPEB [kg CO_2-eq.]	1.20E+01	1.56E+00	9.87E+00	3.07E+00	1.04E-01
ODP [kg CFC11-eq.]	1.34E-10	8.44E-12	8.44E-12	7.47E-11	3.29E-12
AP [kg SO_2-eq.]	3.49E-02	3.02E-03	3.76E-03	6.95E-03	6.61E-04
EP [kg PO_4^{3-}-eq.]	9.01E-03	3.05E-03	3.88E-02	1.66E-03	1.56E-04
POCP [kg C_2H_4-eq.]	4.72E-03	4.30E-04	2.63E-03	4.97E-04	6.99E-05
ADPE [kg Sb-eq.]	4.26E-06	1.80E-07	1.80E-07	1.63E-07	1.74E-09
ADPF [MJ]	1.93E+02	1.35E+01	1.35E+01	3.92E+01	1.34E+01

Table 6: Environmental impacts, 1 m² of particleboard, 18 mm E1 moisture resistant (MR) melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-1.63E+00	1.98E+00	1.44E+01	1.80E+01	1.48E+01
GWPEB [kg CO_2-eq.]	1.31E+01	1.74E+00	1.09E+01	3.33E+00	1.14E-01
ODP [kg CFC11-eq.]	1.44E-10	9.49E-12	9.49E-12	8.20E-11	3.62E-12
AP [kg SO_2-eq.]	3.84E-02	3.39E-03	4.20E-03	7.64E-03	7.26E-04
EP [kg PO_4^{3-}-eq.]	9.86E-03	3.33E-03	4.22E-02	1.82E-03	1.72E-04
POCP [kg C_2H_4-eq.]	5.15E-03	4.78E-04	2.90E-03	5.45E-04	7.67E-05
ADPE [kg Sb-eq.]	4.64E-06	2.03E-07	2.03E-07	1.79E-07	1.91E-09
ADPF [MJ]	2.09E+02	1.52E+01	1.52E+01	4.24E+01	1.47E+00

Table 7: Environmental impacts, 1 m² of particleboard, 19 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-5.45E+00	2.21E+00	1.68E+01	2.12E+01	1.78E+01
GWPEB [kg CO_2-eq.]	1.23E+01	1.91E+00	1.26E+01	3.49E+00	1.33E-01
ODP [kg CFC11-eq.]	1.34E-10	1.00E-11	1.00E-11	9.54E-11	4.21E-12
AP [kg SO_2-eq.]	3.68E-02	3.62E-03	4.57E-03	8.88E-03	8.45E-04
EP [kg PO_4^{3-}-eq.]	1.02E-02	3.34E-03	4.20E-02	2.12E-03	2.00E-04
POCP [kg C_2H_4-eq.]	4.78E-03	5.31E-04	3.38E-03	6.34E-04	8.93E-05
ADPE [kg Sb-eq.]	5.03E-06	2.14E-07	2.14E-07	2.08E-07	2.22E-09
ADPF [MJ]	1.92E+02	1.61E+01	1.61E+01	4.45E+01	1.71E+00

Table 8: Environmental impacts, 1 m² of particleboard, 22 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-6.11E+00	2.53E+00	1.92E+01	2.41E+01	2.03E+01
GWPEB [kg CO_2-eq.]	1.41E+01	2.20E+00	1.44E+01	3.97E+00	1.51E-01
ODP [kg CFC11-eq.]	1.53E-10	1.16E-11	1.16E-11	1.09E-10	4.79E-12
AP [kg SO_2-eq.]	4.23E-02	4.18E-03	5.27E-03	1.01E-02	9.62E-04
EP [kg PO_4^{3-}-eq.]	1.17E-02	3.83E-03	4.80E-02	2.41E-03	2.27E-04
POCP [kg C_2H_4-eq.]	5.49E-03	6.10E-04	3.85E-03	7.22E-04	1.02E-04
ADPE [kg Sb-eq.]	5.74E-06	2.48E-07	2.48E-07	2.37E-07	2.53E-09
ADPF [MJ]	2.20E+02	1.86E+01	1.86E+01	5.07E+01	1.95E+00

Table 9: Environmental impacts, 1 m² of particleboard, 25 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
GWPIB [kg CO_2-eq.]	-6.76E+00	2.86E+00	2.15E+01	2.71E+01	2.28E+01
GWPEB [kg CO_2-eq.]	1.58E+01	2.49E+00	1.61E+01	4.45E+00	1.70E-01
ODP [kg CFC11-eq.]	1.72E-10	1.32E-11	1.32E-11	1.22E-10	5.37E-12
AP [kg SO_2-eq.]	4.79E-02	4.75E-03	5.96E-03	1.13E-02	1.08E-03
EP [kg PO_4^{3-}-eq.]	1.31E-02	4.31E-03	5.39E-02	2.71E-03	2.55E-04
POCP [kg C_2H_4-eq.]	6.20E-03	6.88E-04	4.32E-03	8.10E-04	1.14E-04
ADPE [kg Sb-eq.]	6.45E-06	2.82E-07	2.82E-07	2.65E-07	2.84E-09
ADPF [MJ]	2.47E+02	2.12E+01	2.12E+01	5.68E+01	2.18E+00

Resource Use

Table 10: Resource use, 1 m² of particleboard, 16 mm E1 standard melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	3.85E+01	6.76E-01	6.76E-01	1.27E+02	3.10E-02
PERM [MJ]	1.27E+02	0.00E+00	0.00E+00	-1.27E+02	-1.27E+02
PERT [MJ]	1.65E+02	6.76E-01	6.76E-01	4.47E-01	-1.27E+02
PENRE [MJ]	1.45E+02	1.38E+01	1.38E+01	2.91E+01	1.29E+00
PENRM [MJ]	2.26E+01	0.00E+00	0.00E+00	-2.26E+01	-2.26E+01
PENRT [MJ]	1.68E+02	1.38E+01	1.38E+01	6.42E+00	-2.13E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	4.14E-02	1.83E-04	1.39E-03	4.03E-02	2.69E-05
FWG [m^3]	5.68E-01	3.91E-03	3.91E-03	9.31E-04	5.13E-04
FWT [m^3]	6.09E-01	4.09E-03	5.29E-03	4.12E-02	5.40E-04

***PERE** = Use of renewable primary energy excluding renewable primary energy resources used as raw materials;*
***PERM** = Use of renewable primary energy resources used as raw materials; **PERT** = Total use of renewable primary energy resources;*
***PENRE** = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;*
***PENRM** = Use of non-renewable primary energy resources used as raw materials; **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;*
***FWB** = Use of net blue water, i.e. water from rivers, lakes and aquifers; **FWG** = Use of net green water, i.e. rain water;*
***FWT** = Total use of net fresh water*

Table 11: Resource use, 1 m² of particleboard, 18 mm E1 standard melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	4.22E+01	7.60E-01	7.60E-01	1.41E+02	3.50E-02
PERM [MJ]	1.40E+02	0.00E+00	0.00E+00	-1.40E+02	-1.40E+02
PERT [MJ]	1.82E+02	7.60E-01	7.60E-01	4.92E-01	-1.40E+02
PENRE [MJ]	1.56E+02	1.55E+01	1.55E+01	3.15E+01	1.43E+00
PENRM [MJ]	2.44E+01	0.00E+00	0.00E+00	-2.44E+01	-2.44E+01
PENRT [MJ]	1.81E+02	1.55E+01	1.55E+01	7.07E+00	-2.30E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	4.52E-02	2.03E-04	1.53E-03	4.44E-02	2.96E-05
FWG [m^3]	6.38E-01	4.38E-03	4.38E-03	1.03E-03	5.65E-04
FWT [m^3]	6.84E-01	4.58E-03	5.91E-03	4.54E-02	5.95E-04

Table 12: Resource use, 1 m² of particleboard, 16 mm E1 moisture resistant (MR) melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	4.03E+01	6.77E-01	6.77E-01	1.26E+02	3.20E-02
PERM [MJ]	1.25E+02	0.00E+00	0.00E+00	-1.25E+02	-1.25E+02
PERT [MJ]	1.66E+02	6.77E-01	6.77E-01	4.63E-01	-1.25E+02
PENRE [MJ]	1.97E+02	1.38E+01	1.38E+01	3.99E+01	1.34E+00
PENRM [MJ]	3.32E+01	0.00E+00	0.00E+00	-3.32E+01	-3.32E+01
PENRT [MJ]	2.30E+02	1.38E+01	1.38E+01	6.64E+00	-3.19E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	6.91E-02	1.88E-04	1.45E-03	4.17E-02	2.78E-05
FWG [m^3]	5.70E-01	3.93E-03	3.93E-03	9.64E-04	5.31E-04
FWT [m^3]	6.39E-01	4.12E-03	5.38E-03	4.27E-02	5.59E-04

Table 13: Resource use, 1 m² of particleboard, 18 mm E1 moisture resistant (MR) melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	4.41E+01	7.61E-01	7.61E-01	1.39E+02	3.60E-02
PERM [MJ]	1.38E+02	0.00E+00	0.00E+00	-1.38E+02	-1.38E+02
PERT [MJ]	1.82E+02	7.61E-01	7.61E-01	5.08E-01	-1.38E+02
PENRE [MJ]	2.13E+02	1.56E+01	1.56E+01	4.32E+01	1.47E+00
PENRM [MJ]	3.59E+01	0.00E+00	0.00E+00	-3.59E+01	-3.59E+01
PENRT [MJ]	2.49E+02	1.56E+01	1.56E+01	7.30E+00	-3.44E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	7.55E-02	2.08E-04	1.59E-03	4.58E-02	3.05E-05
FWG [m^3]	6.41E-01	4.40E-03	4.40E-03	1.06E-03	5.84E-04
FWT [m^3]	7.16E-01	4.61E-03	5.99E-03	4.68E-02	6.14E-04

Table 14: Resource use, 1 m² of particleboard, 19 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	3.82E+01	8.06E-01	8.06E-01	1.67E+02	4.20E-02
PERM [MJ]	1.67E+02	0.00E+00	0.00E+00	-1.67E+02	-1.67E+02
PERT [MJ]	2.05E+02	8.06E-01	8.06E-01	5.91E-01	-1.67E+02
PENRE [MJ]	1.96E+02	1.65E+01	1.65E+01	4.54E+01	1.71E+00
PENRM [MJ]	3.69E+01	0.00E+00	0.00E+00	-3.69E+01	-3.69E+01
PENRT [MJ]	2.33E+02	1.65E+01	1.65E+01	8.49E+00	-3.52E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	7.70E-02	2.37E-04	1.86E-03	5.33E-02	3.55E-05
FWG [m^3]	6.72E-01	4.74E-03	4.74E-03	1.23E-03	6.79E-04
FWT [m^3]	7.49E-01	4.98E-03	6.61E-03	5.45E-02	7.15E-04

Table 15: Resource use, 1 m² of particleboard, 22 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	4.41E+01	9.33E-01	9.33E-01	1.90E+02	4.80E-02
PERM [MJ]	1.90E+02	0.00E+00	0.00E+00	-1.90E+02	-1.90E+02
PERT [MJ]	2.34E+02	9.33E-01	9.33E-01	6.73E-01	-1.90E+02
PENRE [MJ]	2.24E+02	1.91E+01	1.91E+01	5.17E+01	1.95E+00
PENRM [MJ]	4.20E+01	0.00E+00	0.00E+00	-4.20E+01	-4.20E+01
PENRT [MJ]	2.66E+02	1.91E+01	1.91E+01	9.66E+00	-4.01E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	8.82E-02	2.71E-04	2.12E-03	6.06E-02	4.04E-05
FWG [m^3]	7.78E-01	5.47E-03	5.47E-03	1.40E-03	7.73E-04
FWT [m^3]	8.66E-01	5.74E-03	7.60E-03	6.20E-02	8.14E-04

Table 16: Resource use, 1 m² of particleboard, 19 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
PERE [MJ]	5.01E+01	1.06E+00	1.06E+00	2.13E+02	5.40E-02
PERM [MJ]	2.13E+02	0.00E+00	0.00E+00	-2.13E+02	-2.13E+02
PERT [MJ]	2.63E+02	1.06E+00	1.06E+00	7.55E-01	-2.13E+02
PENRE [MJ]	2.53E+02	2.16E+01	2.16E+01	5.80E+01	2.19E+00
PENRM [MJ]	4.71E+01	0.00E+00	0.00E+00	-4.71E+01	-4.71E+01
PENRT [MJ]	3.00E+02	2.16E+01	2.16E+01	1.08E+01	-4.50E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	9.94E-02	3.05E-04	2.38E-03	6.80E-02	4.54E-05
FWG [m^3]	8.84E-01	6.20E-03	6.20E-03	1.57E-03	8.67E-04
FWT [m^3]	9.84E-01	6.51E-03	8.58E-03	6.96E-02	9.13E-04

Table 17: Waste categories, 1 m² of particleboard, 16 mm E1 standard melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	6.79E-05	2.28E-06	2.28E-06	1.52E-06	2.23E-07
NHWD [kg]	1.11E-01	9.62E+00	6.31E+00	3.73E-02	7.62E-05
RWD [kg]	8.89E-04	1.17E-04	1.17E-04	2.69E-04	2.01E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.82E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	2.16E-01	3.11E+00	1.73E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	4.03E+01	0.00E+00

***HWD** = Hazardous waste disposed; **NHWD** = Non-hazardous waste disposed; **RWD** = Radioactive waste disposed;*
***CRU** = Components for reuse; **MFR** = Materials for recycling; **MER** = Materials for energy recovery;*
***EEE** = Exported electrical energy; **EET** = Exported thermal energy*

Table 18: Waste categories, 1 m² of particleboard, 18 mm E1 standard melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	7.55E-05	2.56E-06	2.56E-06	1.68E-06	2.46E-07
NHWD [kg]	1.24E-01	1.06E+01	6.96E+00	4.11E-02	8.39E-05
RWD [kg]	9.49E-04	1.31E-04	1.31E-04	2.96E-04	2.22E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E+01
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	2.39E-01	3.43E+00	1.91E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	4.44E+01	0.00E+00

Table 19: Waste categories, 1 m² of particleboard, 16mm E1 moisture resistant (MR) melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	7.68E-05	2.29E-06	2.29E-06	1.58E-06	2.31E-07
NHWD [kg]	1.92E-01	9.96E+00	6.46E+00	3.86E-02	7.89E-05
RWD [kg]	1.54E-03	1.17E-04	1.17E-04	2.78E-04	2.08E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E+01
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	2.26E-01	3.24E+00	1.79E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	4.17E+01	0.00E+00

Table 20: Waste categories, 1 m² of particleboard, 18 mm E1 moisture resistant (MR) melamine coated.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	8.52E-05	2.57E-06	2.57E-06	1.73E-06	2.53E-07
NHWD [kg]	2.13E-01	1.09E+01	7.10E+00	4.24E-02	8.66E-05
RWD [kg]	1.66E-03	1.31E-04	1.31E-04	3.06E-04	2.29E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E+01
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	2.48E-01	3.57E+00	1.97E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	4.58E+01	0.00E+00

Table 21: Waste categories, 1 m² of particleboard, 19 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	8.67E-05	2.74E-06	2.74E-06	2.01E-06	2.95E-07
NHWD [kg]	2.30E-01	1.27E+01	8.24E+00	4.93E-02	1.01E-04
RWD [kg]	1.66E-03	1.39E-04	1.39E-04	3.56E-04	2.66E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+01
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	2.92E-01	4.19E+00	2.29E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	5.33E+01	0.00E+00

Table 22: Waste categories, 1 m² of particleboard, 22 mm flooring.

	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	1.00E-04	3.17E-06	3.17E-06	2.29E-06	3.36E-07
NHWD [kg]	2.64E-01	1.45E+01	9.38E+00	5.62E-02	1.15E-04
RWD [kg]	1.89E-03	1.61E-04	1.61E-04	4.05E-04	3.03E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E+01
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	3.32E-01	4.78E+00	2.61E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	6.07E+01	0.00E+00

Table 23: Waste categories, 1 m² of particleboard, 25 mm flooring.

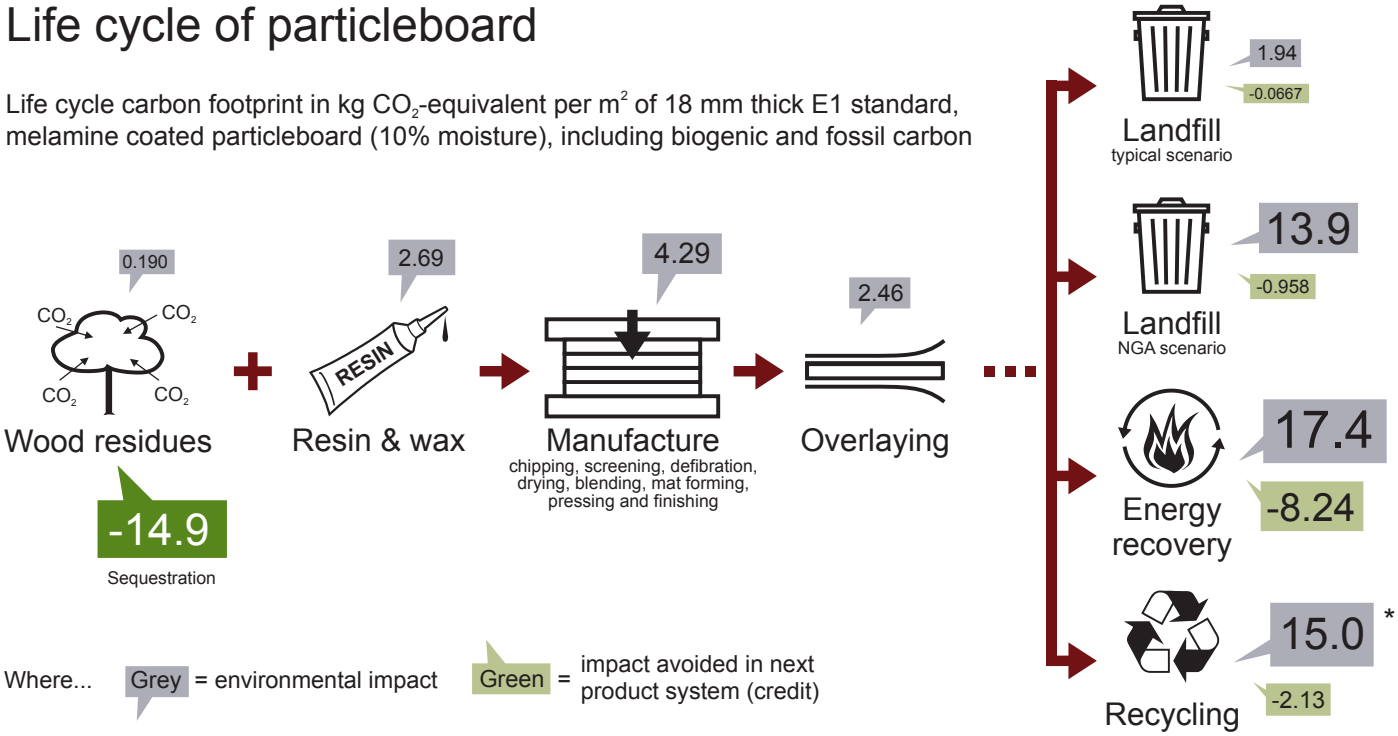
	Production	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Parameter [Unit]	**A1-A3**	**C4**	**C4**	**C3**	**C3**
HWD [kg]	1.13E-04	3.59E-06	3.59E-06	2.57E-06	3.77E-07
NHWD [kg]	2.99E-01	1.62E+01	1.05E+01	6.30E-02	1.29E-04
RWD [kg]	2.12E-03	1.83E-04	1.83E-04	4.54E-04	3.40E-07
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E+01
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	3.73E-01	5.36E+00	2.93E+01	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	6.81E+01	0.00E+00

Interpretation

Understanding the Life Cycle of Particleboard

Life cycle of particleboard

Life cycle carbon footprint in kg CO_2-equivalent per m^2 of 18 mm thick E1 standard, melamine coated particleboard (10% moisture), including biogenic and fossil carbon



Where... Grey = environmental impact Green = impact avoided in next product system (credit)

* While carbon is not released directly through recycling, it is passed to another product system and is therefore counted as being released

Variation in Results

The data in this EPD are an average from multiple producers; however, there can be considerable variation between producers. Please contact your timber supplier if you require data on a specific product from that supplier.

Carbon Dioxide Sequestration

During growth, trees absorb carbon dioxide (CO_2) from the atmosphere through the process of photosynthesis and convert this into carbon-based compounds that constitute various components of a tree, including wood. On average, half the dry weight of all wood is made up of the element carbon. An Australian study (Gifford 2000) confirmed that 50±2% of the dry weight of the wood of native species and non-native *Pinus radiata* is carbon.

The CO_2 sequestered per cubic metre of wood was calculated using the formula specified in European standard EN 16449:2014:

$$P_{CO_2} = \frac{44}{12} \times cf \times \frac{\rho_\omega \times V_\omega}{1 + \frac{\omega}{100}}$$

Where:

- P_{CO_2} is the biogenic carbon sequestered in the wood that can be oxidised to a carbon dioxide emission to air
- $\frac{44}{12}$ is the molecular weight of carbon dioxide divided by the atomic weight of carbon
- cf is the carbon fraction of oven dry mass of woody biomass (0.5 is the default value)
- ω is the moisture content of the product on a dry basis (see Table 1)
- ρ_ω is the density of woody biomass at that moisture content (kg/m^3) (539 kg/m^3 for average Australian softwood at 10% moisture content)
- V_ω is the volume of the solid wood product at that moisture content (m3) (note that only the softwood fraction from Table 2 should be included)

All major Australian production forests and plantations are independently certified to one or both of the internationally recognised forest management certification systems: the Australian Standard for Sustainable Forest Management (AS 4708), which is recognised under the Programme for the Endorsement of Forest Certification (PEFC), and/or one of the Forest Stewardship Council's (FSC®) interim forest management standards. It is therefore appropriate to include biogenic CO_2 sequestration in this EPD in line with EN 16485 (Section 6.3.4.2). For more information on certification by forest owner or manager please see www.forestrystandard.org.au/find-certified/certified-forest-managers and info.fsc.org/certificate.php.

Water Consumption

Freshwater consumption is included in this EPD as required by PCR 2012:01. It has been split into blue water (i.e. water from lakes, rivers and aquifers) and green water (i.e. rain water). Blue water is usually metered and consumption is therefore based on physical measurements.

Green water consumption is difficult to quantify. The data included in this EPD are based on calculated differences in water flow between plantations and a base case land use (pasture) from the original CSIRO LCI study (CSIRO 2009). The reader should be aware that these figures are uncertain and also provide no information about the impacts of water consumption, such as relative water stress in a given catchment where forest is harvested.

Changes to *Life Cycle Inventory of Australian Forestry and Wood Products*

The data in this EPD have been based on the *Life Cycle Inventory of Australian Forestry and Wood Products* (CSIRO 2009) with the underlying LCA models completely rebuilt in the GaBi LCA software and aligned with the modular structure of EN 15804. Through this process, assumptions in the CSIRO study have been re-examined, discrepancies corrected, consistency improved and data gaps filled. As such, the results in this EPD do not completely match those in the original CSIRO study. Furthermore, all end-of-life scenarios are new and were developed specifically for the Australian timber and wood product EPDs produced in this series.

Module D: Recycling, Reuse and Recovery Potentials

Table 24: Module D, 1 m² of particleboard, 16 mm E1 standard melamine coated.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-6.04E-02	-8.68E-01	-7.48E+00	-1.93E+00
GWPEB [kg CO_2-eq.]	-6.04E-02	-8.69E-01	-7.48E+00	-1.94E+00
ODP [kg CFC11-eq.]	-4.67E-14	-6.71E-13	-3.87E-12	-1.86E-11
AP [kg SO_2-eq.]	-2.65E-04	-3.80E-03	-2.51E-02	-1.68E-02
EP [kg PO_4^{3-}-eq.]	-2.22E-05	-3.19E-04	-2.73E-03	-3.31E-03
POCP [kg C_2H_4-eq.]	-1.43E-05	-2.06E-04	-1.50E-03	-2.12E-03
ADPE [kg Sb-eq.]	-1.59E-09	-2.29E-08	-2.89E-07	-1.19E-07
ADPF [MJ]	-6.82E-01	-9.80E+00	-9.91E+01	-2.59E+01
Resource Use				
PERE [MJ]	-4.47E-02	-6.43E-01	-3.58E+00	-5.11E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-4.47E-02	-6.43E-01	-3.58E+00	-5.11E+01
PENRE [MJ]	-6.82E-01	-9.80E+00	-9.91E+01	-2.60E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-6.82E-01	-9.80E+00	-9.91E+01	-2.60E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	9.82E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-3.37E-04	-4.84E-03	-2.69E-02	-1.38E-02
FWG [m^3]	-3.58E-05	-5.15E-04	-2.99E-03	-6.16E-01
FWT [m^3]	-3.72E-04	-5.35E-03	-2.99E-02	-6.30E-01
Wastes and Outputs				
HWD [kg]	-1.20E-07	-1.72E-06	-1.38E-05	-9.46E-05
NHWD [kg]	-1.60E-04	-2.30E-03	-2.04E-02	-1.07E-01
RWD [kg]	-2.01E-07	-2.88E-06	-1.79E-05	-5.97E-05
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 25: Module D, 1 m² of particleboard, 18 mm E1 standard melamine coated.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-6.66E-02	-9.58E-01	-8.24E+00	-2.13E+00
GWPEB [kg CO_2-eq.]	-6.67E-02	-9.59E-01	-8.25E+00	-2.14E+00
ODP [kg CFC11-eq.]	-5.15E-14	-7.40E-13	-4.26E-12	-2.05E-11
AP [kg SO_2-eq.]	-2.92E-04	-4.20E-03	-2.76E-02	-1.85E-02
EP [kg PO_4^{3-}-eq.]	-2.45E-05	-3.52E-04	-3.01E-03	-3.65E-03
POCP [kg C_2H_4-eq.]	-1.58E-05	-2.27E-04	-1.66E-03	-2.33E-03
ADPE [kg Sb-eq.]	-1.76E-09	-2.52E-08	-3.18E-07	-1.32E-07
ADPF [MJ]	-7.52E-01	-1.08E+01	-1.09E+02	-2.85E+01
Resource Use				
PERE [MJ]	-4.93E-02	-7.09E-01	-3.95E+00	-5.63E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-4.93E-02	-7.09E-01	-3.95E+00	-5.63E+01
PENRE [MJ]	-7.52E-01	-1.08E+01	-1.09E+02	-2.87E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-7.52E-01	-1.08E+01	-1.09E+02	-2.87E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	1.08E+01
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-3.71E-04	-5.34E-03	-2.97E-02	-1.52E-02
FWG [m^3]	-3.95E-05	-5.68E-04	-3.30E-03	-6.79E-01
FWT [m^3]	-4.11E-04	-5.90E-03	-3.30E-02	-6.94E-01
Wastes and Outputs				
HWD [kg]	-1.32E-07	-1.90E-06	-1.53E-05	-1.04E-04
NHWD [kg]	-1.76E-04	-2.53E-03	-2.25E-02	-1.18E-01
RWD [kg]	-2.21E-07	-3.18E-06	-1.98E-05	-6.58E-05
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 26: Module D, 1 m² of particleboard, 16 mm E1 moisture resistant (MR) melamine coated.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-6.30E-02	-9.05E-01	-7.75E+00	-2.00E+00
GWPEB [kg CO_2-eq.]	-6.30E-02	-9.06E-01	-7.75E+00	-2.01E+00
ODP [kg CFC11-eq.]	-4.87E-14	-7.00E-13	-4.01E-12	-1.93E-11
AP [kg SO_2-eq.]	-2.76E-04	-3.97E-03	-2.60E-02	-1.74E-02
EP [kg PO_4^{3-}-eq.]	-2.31E-05	-3.33E-04	-2.83E-03	-3.43E-03
POCP [kg C_2H_4-eq.]	-1.49E-05	-2.15E-04	-1.56E-03	-2.19E-03
ADPE [kg Sb-eq.]	-1.66E-09	-2.39E-08	-2.99E-07	-1.24E-07
ADPF [MJ]	-7.11E-01	-1.02E+01	-1.03E+02	-2.68E+01
Resource Use				
PERE [MJ]	-4.66E-02	-6.70E-01	-3.71E+00	-5.29E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-4.66E-02	-6.70E-01	-3.71E+00	-5.29E+01
PENRE [MJ]	-7.11E-01	-1.02E+01	-1.03E+02	-2.70E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-7.11E-01	-1.02E+01	-1.03E+02	-2.70E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	1.02E+01
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-3.51E-04	-5.04E-03	-2.79E-02	-1.43E-02
FWG [m^3]	-3.73E-05	-5.37E-04	-3.10E-03	-6.38E-01
FWT [m^3]	-3.88E-04	-5.58E-03	-3.10E-02	-6.53E-01
Wastes and Outputs				
HWD [kg]	-1.25E-07	-1.80E-06	-1.43E-05	-9.79E-05
NHWD [kg]	-1.67E-04	-2.39E-03	-2.11E-02	-1.11E-01
RWD [kg]	-2.09E-07	-3.01E-06	-1.86E-05	-6.18E-05
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 27: Module D, 1 m² of particleboard, 18 mm E1 moisture resistant (MR) melamine coated.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-6.92E-02	-9.95E-01	-8.51E+00	-2.20E+00
GWPEB [kg CO_2-eq.]	-6.93E-02	-9.96E-01	-8.51E+00	-2.21E+00
ODP [kg CFC11-eq.]	-5.35E-14	-7.69E-13	-4.40E-12	-2.12E-11
AP [kg SO_2-eq.]	-3.03E-04	-4.36E-03	-2.85E-02	-1.91E-02
EP [kg PO_4^{3-}-eq.]	-2.54E-05	-3.66E-04	-3.11E-03	-3.77E-03
POCP [kg C_2H_4-eq.]	-1.64E-05	-2.36E-04	-1.71E-03	-2.41E-03
ADPE [kg Sb-eq.]	-1.82E-09	-2.62E-08	-3.28E-07	-1.36E-07
ADPF [MJ]	-7.81E-01	-1.12E+01	-1.13E+02	-2.95E+01
Resource Use				
PERE [MJ]	-5.13E-02	-7.37E-01	-4.08E+00	-5.81E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-5.13E-02	-7.37E-01	-4.08E+00	-5.81E+01
PENRE [MJ]	-7.82E-01	-1.12E+01	-1.13E+02	-2.96E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-7.82E-01	-1.12E+01	-1.13E+02	-2.96E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	1.12E+01
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-3.86E-04	-5.55E-03	-3.07E-02	-1.57E-02
FWG [m^3]	-4.11E-05	-5.90E-04	-3.40E-03	-7.01E-01
FWT [m^3]	-4.27E-04	-6.14E-03	-3.41E-02	-7.17E-01
Wastes and Outputs				
HWD [kg]	-1.37E-07	-1.98E-06	-1.57E-05	-1.08E-04
NHWD [kg]	-1.83E-04	-2.63E-03	-2.32E-02	-1.22E-01
RWD [kg]	-2.30E-07	-3.31E-06	-2.04E-05	-6.79E-05
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 28: Module D, 1 m² of particleboard, 19 mm flooring.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-8.14E-02	-1.17E+00	-9.90E+00	-2.56E+00
GWPEB [kg CO_2-eq.]	-8.15E-02	-1.17E+00	-9.90E+00	-2.57E+00
ODP [kg CFC11-eq.]	-6.29E-14	-9.05E-13	-5.12E-12	-2.46E-11
AP [kg SO_2-eq.]	-3.57E-04	-5.13E-03	-3.32E-02	-2.22E-02
EP [kg PO_4^{3-}-eq.]	-2.99E-05	-4.30E-04	-3.62E-03	-4.38E-03
POCP [kg C_2H_4-eq.]	-1.93E-05	-2.78E-04	-1.99E-03	-2.80E-03
ADPE [kg Sb-eq.]	-2.15E-09	-3.08E-08	-3.82E-07	-1.58E-07
ADPF [MJ]	-9.19E-01	-1.32E+01	-1.31E+02	-3.43E+01
Resource Use				
PERE [MJ]	-6.03E-02	-8.66E-01	-4.74E+00	-6.76E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-6.03E-02	-8.66E-01	-4.74E+00	-6.76E+01
PENRE [MJ]	-9.19E-01	-1.32E+01	-1.31E+02	-3.45E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-9.19E-01	-1.32E+01	-1.31E+02	-3.45E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	1.30E+01
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-4.54E-04	-6.52E-03	-3.57E-02	-1.83E-02
FWG [m^3]	-4.83E-05	-6.94E-04	-3.96E-03	-8.15E-01
FWT [m^3]	-5.02E-04	-7.21E-03	-3.96E-02	-8.34E-01
Wastes and Outputs				
HWD [kg]	-6.03E-02	-8.66E-01	-4.74E+00	-6.76E+01
NHWD [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RWD [kg]	-6.03E-02	-8.66E-01	-4.74E+00	-6.76E+01
CRU [kg]	-9.19E-01	-1.32E+01	-1.31E+02	-3.45E+01
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	-9.19E-01	-1.32E+01	-1.31E+02	-3.45E+01
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	1.30E+01
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 29: Module D, 1 m² of particleboard, 22 mm flooring.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-9.27E-02	-1.33E+00	-1.13E+01	-2.91E+00
GWPEB [kg CO_2-eq.]	-9.28E-02	-1.33E+00	-1.13E+01	-2.93E+00
ODP [kg CFC11-eq.]	-7.16E-14	-1.03E-12	-5.83E-12	-2.80E-11
AP [kg SO_2-eq.]	-4.06E-04	-5.84E-03	-3.78E-02	-2.53E-02
EP [kg PO_4^{3-}-eq.]	-3.40E-05	-4.89E-04	-4.12E-03	-4.99E-03
POCP [kg C_2H_4-eq.]	-2.20E-05	-3.16E-04	-2.27E-03	-3.19E-03
ADPE [kg Sb-eq.]	-2.44E-09	-3.51E-08	-4.35E-07	-1.80E-07
ADPF [MJ]	-1.05E+00	-1.50E+01	-1.49E+02	-3.90E+01
Resource Use				
PERE [MJ]	-6.86E-02	-9.86E-01	-5.40E+00	-7.70E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-6.86E-02	-9.86E-01	-5.40E+00	-7.70E+01
PENRE [MJ]	-1.05E+00	-1.50E+01	-1.49E+02	-3.92E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-1.05E+00	-1.50E+01	-1.49E+02	-3.92E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	1.48E+01
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-5.16E-04	-7.42E-03	-4.06E-02	-2.08E-02
FWG [m^3]	-5.50E-05	-7.90E-04	-4.51E-03	-9.28E-01
FWT [m^3]	-5.71E-04	-8.21E-03	-4.51E-02	-9.49E-01
Wastes and Outputs				
HWD [kg]	-1.84E-07	-2.64E-06	-2.09E-05	-1.42E-04
NHWD [kg]	-2.45E-04	-3.52E-03	-3.07E-02	-1.62E-01
RWD [kg]	-3.08E-07	-4.43E-06	-2.70E-05	-8.99E-05
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 30: Module D, 1 m² of particleboard, 25 mm flooring.

Parameter [Unit]	Landfill (typical)	Landfill (NGA)	Energy recovery	Recycling
Environmental Impact				
GWPIB [kg CO_2-eq.]	-1.04E-01	-1.49E+00	-1.26E+01	-3.26E+00
GWPEB [kg CO_2-eq.]	-1.04E-01	-1.50E+00	-1.26E+01	-3.29E+00
ODP [kg CFC11-eq.]	-8.03E-14	-1.15E-12	-6.54E-12	-3.15E-11
AP [kg SO_2-eq.]	-4.55E-04	-6.55E-03	-4.23E-02	-2.84E-02
EP [kg PO_43^--eq.]	-3.82E-05	-5.49E-04	-4.62E-03	-5.60E-03
POCP [kg C_2H_4-eq.]	-2.47E-05	-3.54E-04	-2.54E-03	-3.58E-03
ADPE [kg Sb-eq.]	-2.74E-09	-3.94E-08	-4.88E-07	-2.02E-07
ADPF [MJ]	-1.17E+00	-1.69E+01	-1.67E+02	-4.38E+01
Resource Use				
PERE [MJ]	-7.70E-02	-1.11E+00	-6.06E+00	-8.64E+01
PERM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	-7.70E-02	-1.11E+00	-6.06E+00	-8.64E+01
PENRE [MJ]	-1.17E+00	-1.69E+01	-1.67E+02	-4.40E+01
PENRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	-1.17E+00	-1.69E+01	-1.67E+02	-4.40E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	1.66E+01
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWB [m^3]	-5.79E-04	-8.33E-03	-4.55E-02	-2.34E-02
FWG [m^3]	-6.16E-05	-8.86E-04	-5.06E-03	-1.04E+00
FWT [m^3]	-6.41E-04	-9.21E-03	-5.06E-02	-1.06E+00
Wastes and Outputs				
HWD [kg]	-2.06E-07	-2.97E-06	-2.34E-05	-1.60E-04
NHWD [kg]	-2.75E-04	-3.95E-03	-3.45E-02	-1.81E-01
RWD [kg]	-3.45E-07	-4.96E-06	-3.03E-05	-1.01E-04
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Timber & Forest Certification

Many Australian timber and reconstituted wood products are certified to a forest certification scheme. This certification is an independent auditing process that provides:

- Assurance that the timber is from well-managed forests certified to internationally and nationally accepted forest management standards
- Assurance that the timber is from legally harvested sources
- Chain of custody (CoC) certification extending from the forest to the end user, which is traceable throughout the supply chain.

Two schemes apply to Australian wood production forests. One is administered by the Australian Forestry Standard Ltd (AFS). The AFS scheme is also endorsed by the international Programme for Endorsement of Forest Certification (PEFC). The other scheme is administered by the Forest Stewardship Council (FSC®) Australia.

If a Green Star project elects to use the timber credit as part of their Green Star submission, the Green Building Council of Australia recognises PEFC-endorsed forest certification schemes (such as the Australian Forest Certification Scheme, AFCS) as well as FSC®. Compliance with the CoC certification rules of either forest certification scheme for at least 95% by value of timber products used in the project will meet the requirements for this credit point (GBCA 2014).

As of 2015, there are approximately 10.6 million hectares of native and plantation forests certified in Australia, consisting of 10.1 million hectares certified under AFS and 900,000 hectares certified under FSC® (Australian Government 2015); 400,000 hectares are certified under both schemes.

In addition many Australian softwood manufacturers' premises listed in this EPD are CoC certified so they can supply products with CoC certification.

Land Use and Biodiversity

Like other land uses, forestry operations for timber and wood production can have both positive and negative effects on biodiversity. However, as biodiversity varies considerably by region and as data are often limited, assessing potential biodiversity impacts within LCA is challenging.

A recent Australian study (Turner *et al*. 2014) demonstrated a new method – BioImpact – to discern the biodiversity impacts of different land uses. A trial of this method was conducted using case studies in three different regions and four production systems in New South Wales: native hardwood forestry, plantation softwood forestry, mixed cropping and rangeland grazing. The results showed that the biodiversity impacts of native hardwood production in the region studied were significantly lower than the land uses in the other regions. The management of planted softwood forests resulted in similar biodiversity impacts to those of the cropping/grazing systems.

Indoor Environment Quality – Formaldehyde Emissions Minimisation

Formaldehyde is a colourless, strong-smelling gas that occurs naturally in the environment. It is present in the air that we breathe at natural background levels of about 0.03 parts per million (ppm) with recent studies showing formaldehyde concentrations often up to 0.08 ppm in outdoor urban air (EWPAA 2012). Formaldehyde is used as an ingredient in synthetic resins, industrial chemicals and preservatives, and in the production of paper, textiles, cosmetics, disinfectants, medicines, paints, varnishes and lubricants.

Particleboard manufactured in Australia uses one of two modern low formaldehyde emitting amino plastics: urea formaldehyde (UF) or melamine urea formaldehyde (MUF).

To assure end users that their particleboard has the lowest possible formaldehyde emissions, an industry-wide formaldehyde testing and labelling program is run by the Engineered Wood Products Association of Australasia. All mills are required to forward samples to EWPAA's National Laboratory on a regular basis for formaldehyde emission testing. On the basis of laboratory tests all Australian particleboard mills are permitted to brand a formaldehyde emission class on their particleboard products as detailed in Table 31 below.

Table 31: Formaldehyde emission classes for Australian manufactured particleboard

Emission Class	Emission Limit (mg/litre)	Emission Limit (ppm)*
E0	Less than or equal to 0.5	Less than or equal to 0.04
E1	Less than or equal to 1.0	Less than or equal to 0.08

** Based on a test chamber volume of 10litre, zero airflow during the 24hr test cycle, molecular weight of formaldehyde 30.03 and the number of microlitres of formaldehyde gas in 1 micromole at 101KPa and 298K.*

All Australian manufacturers listed in this EPD can supply test certificates that support the Emission Class.

Particleboard with formaldehyde emissions of less than or equal to E1 are compliant with the Green Star Formaldehyde credit. To achieve credit points all engineered wood products such as particleboard, MDF and plywood used in the construction project must be in accordance with these requirements.

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