weathertex

Weathertex Pty Ltd

Trimtec Underlay

470 Masonite Rd, Heatherbrae New South Wales
Australia 2324

Version Number: 2.0
Date Updated: 05 November 2024

Global GreenTag International EPD Program

EPD Environmental Product Declaration

Compliant to ISO14025 & EN15804 + A2 2019

EPD No. WXN082024EP
Issue Date 15 Oct 2024
Valid to 15 Oct 2029

ECO PLATFORM

ECO PLATFORM EPD VERIFIED

Mandatory Disclosures

EPD type	Cradle to grave	**Issue Date**	15 Oct 2024
Range Name	Trimtec Underlay	**Valid Until**	15 Oct 2029
Product Name	Underlay 5.5 mm		
EPD Number	WXN082024EP		
Objectives	To show improved, net-zero, net-positive and regenerative results and timely imperatives to secure viable climate and biodiversity on earth against a background of increasing disasters attributable to anthropogenic climate change.		
Communication	This EPD discloses potential environmental outcomes compliant with ISO14025:2010 and independent external verification of this declaration and data[a] ensures it is fit for business-to-consumer communication. [1]		
Product Category Rules (PCR)	Global GreenTag International Platform EPD compliant with ISO14025 standard [1] impact assessment methodology in reference EN15804 [2] and Sub-PCR FC:2022 V1 Interior Flooring V1 [3]		
Explanations	Further explanatory information is available at info@globalgreentag.com or by contacting certification1@globalgreentag.com.		
Comparability	Different program EPDs may not be comparable. Comparability is further dependent on the product category rules and data source used.		
Reliability	LCIA results are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins or risks.		
EPD Owner	This EPD is the property of the declared manufacturer tabled below.		

EPD Program Operator	LCA and EPD Producer	Declaration Owner
Global GreenTag International Pty Ltd L38, 71 Eagle St., Brisbane QLD 4000 Australia Phone: +61 (0)7 33 999 686 http://www.globalgreentag.com	Ecquate Pty Ltd PO Box 123 Thirroul NSW 2515 Australia Phone: +61 (0)7 5545 0998 http://www.ecquate.com	Weathertex Pty Ltd 470 Masonite Rd, Heatherbrae NSW 2324 Australia Phone: +61 (0)2 4980 3100 https://weathertex.com.au
Global GreenTag International green product certification trust brands	Ecquate building ecopositive	weathertex

Demonstration of Verification

☑ **Internal**	Delwyn Jones 15 Oct 2024	LCA Developed by Delwyn Jones, The Evah Institute
	S Begum 24 09 2024	EPD Developed by Dr Sharmina Begum, The Evah Institute
	David Baggs 17/10/2024	EPD Reviewed by David Baggs, Global GreenTag Pty Ltd
☑ **External Verifier Statement**	I, the undersigned, verifier, hereby confirm my examination did not find any relevant deviations by the EDP owner, LCA report or PCRs based on EN 15804 2012+A2:2019 and ECO Platform agreed interpretations by CEN TR 16970. Company-specific, upstream and downstream data in the LCA & environmental features report files held at The Evah Institute were plausible and consistent. This verification applied Global GreenTag International adopted ECO Platform checklists and this EPD states where to find programme rules and PCRs.	
	M Jones 15 Oct 2024	Verified by Murray Jones Ecquate Pty Ltd

Program Description

EPD Scope	The scope is cradle to grave A1 to C4 + D as defined by ISO14025. [1]
System boundary	The system boundary with nature includes matter & energy acquisition, processing, manufacture, transport, installation, use plus waste arising to end of life.
Stages included	All known operations in A1 to D3 are included. Modules B1 Use, B4 Replace, B5 Refurbish, B6 Water use, B7 energy use or C3 Processing waste had no flows.
Information	Figure 1 depicts A1 to C4 modules inside this cradle to grave system boundary.

Model	**Building Life Cycle Assessment**																**Beyond system**		
Information	**Actual**			**Scenarios**															
Stages	Product			Construct		Use							End-of-Life				Benefit & load		
						Fabric					Operate								
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3
Operations Cradle to Grave Fate & beyond system	Resources	Transport	Manufacture	Transport	Construct	Use	Maintain	Repair	Replace	Refurbish	Energy use	Water use	Demolish	Transport	rocess Waste	Disposal	Reuse	Recovery	Recycling
Flows	√	√	√	√	√	0	√	√	0	0	0	0	√	√	0	√	√	√	√

Figure 1 Modules A1 to C4 Cradle to Grave and D Beyond System Boundary

Data Sources

Primary Data	Data is from primary sources 2018 to 2023 including manufacturer and supplier standards, logistics, technology, market share and management system in accordance with EN ISO 14044:2006, 4.3.2. All are physically allocated not economically allocated.
A1-A3 Stage inclusions	Operations include all known raw material acquisition, refining and processing plus scrap or material reuse from prior systems; electricity generated from all sources with extraction, refining & transport plus secondary fuel energy and recovery processes. Also, transport to factory gate; manufacture of inputs, ancillary material, product, packaging, maintenance, replacement plus flows leaving at end-of-waste boundary and fate of all flows at end of life.
Variability	Significant differences of average LCIA results are declared.
Chemicals of Concern	Contains no substances in the European Chemicals Agency “Authorised or Candidate Lists of Substances of Very High Concern (SVHCs)”.

LCA Data Quality

Data quality parameters are tabled below. Data was <10 years, cut-off & quality is ISO14025compliant [1].

Background	**Data Quality**	**Parameters and Uncertainty (U)**			
Correlation	**Metric σg**	U ±0.01	U ±0.05	U ±0.10	U ±0.20
Reliability	**Reporting**	Site Audit	Expert verify	Region	Sector
	Sample	>66% trend	>25% trend	>10% batch	>5% batch
Completion	**Including**	>50%	>25%	>10%	>5%
	Cut-off	0.01%w/w	0.05%w/w	0.1%w/w	0.5%w/w
Temporal	**Data Age**	<3 years	≤5 years	<7.5 years	<10 years
	Duration	>3 years	<3 years	<2 years	1 year
Technology	**Typology**	Actual	Comparable	In Class	Convention
Geography	**Focus**	Process	Line	Plant	Corporate
	Range	Continent	Nation	Plant	Line
	Jurisdiction	Representation is Global, Australasia and Pacific Rim.			

System Scope and Boundaries

Figure 2 shows included processes in a cradle to grave system boundary to end of life fates reuse, recycling, or landfill grave.

Stages A1 to 3 model actual operations to acquire, refine, transport, fabricate, coat, use, clean, repair, reuse and dispose of metal, masonry, ceramic, timber, glass, plastic and composites.

Stage A4 to C4 are modelled on typical scenarios to forecast operations including those of:

- Mining, extracting and refining resources to make commodities and packaging;
- Acquiring, cultivating, harvesting, extracting, refining produce and biomass;
- Fuel production to supply power and process energy and freight;
- Chemicals use in processing resources, intermediates and ancillaries;
- Process energy, fuel and freight of resources, intermediates and ancillaries;
- Use, cleaning, recoating, repair, recycling, re-use and landfill, as well as
- Infrastructure process energy transformed and material wear loss e.g. tyres.

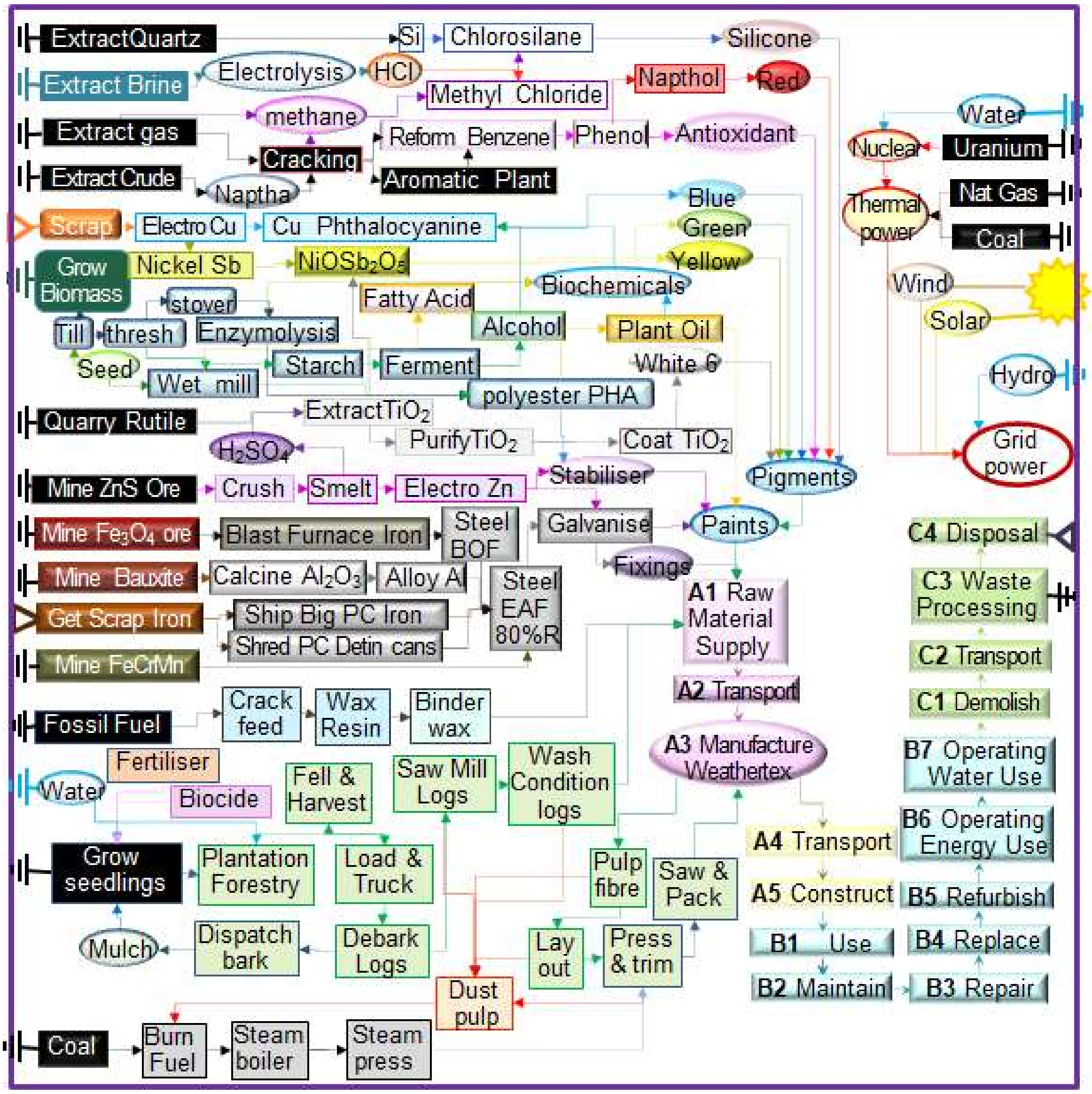

Figure 2. Product Process Flow Chart

Details of Manufacturer

The declared Weathertex natural underlay product is used on interior residential and commercial building floors to cover and physically insulate subfloors. Weathertex, the 100% Australian-owned manufacturer was founded in 1939 in Raymond Terrace, NSW. All timber is from controlled source risk assessed local state or private forests. Weathertex product is a leading industrial standard for climate security. Weathertex products contain no added silica, glues, resins or formaldehyde.

Product Information

This section provides mass and time factors for assessment calculations.

Range Names	Weathertex Trimtec Underlay
Brand Name & Code	Underlay 5.5 mm
Factory warranty	Fit for purpose use, 10 years
Manufacturer	Weathertex Pty Ltd
Factory address	470 Masonite Rd, Heatherbrae NSW 2324 Australia
Site representation	Australasia
Time	Made and sold in 2022 for single use
Application	Floor underlay to cover structural sub-floors
Function	Internal floor underlay lining for floor coverings
Lifetime	60 years Reference Service Life (RSL) [5,6] [ISO 15686]
Declared unit	Declared product of 5.904kg/m^2 coverage in built interiors
Functional unit	60 years use of declared product/kg cradle to grave and beyond

Whole of life Performance

This section provides qualitative information on whole of life performance.

Material quality	Global GreenTag International compliant sustainable lumber.
Finishes	Weathertex Underlay provides a smooth flat surface finish.
Effluent	LCI results and ESCAP raised no red-light concerns in emissions to water[1].
Waste	Cradle to grave waste to landfill from operations was non-hazardous.
Standard Reference	https://drive.google.com/file/d/1LrhPfYrAX2hhUp383F3Q6fJYbkNWxp47/view
Practices Reference	https://weathertex.com.au/construction-details/
Disposal	No production waste is sent to river, land or ocean outfalls or council landfills.
Wildlife safety	Low VOC, no plastics, glues or formaldehydes.
Environmental Health Effects	No potential in-use impacts on environment or health are known.

Whole of life Health Safety & Environment Performance

This section provides qualitative information on Health Safety & Environment whole of life performance.

Health Safety & Environment	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential for manufacture, use or reuse.
Health Protection	The product does not contain levels of carcinogenic, toxic or hazardous substances that warrant ecological or human health concern cradle to grave. It passed the Eco specifier Cautionary Assessment Process (ESCAP) and no issues or red-light concerns existed for product human or ecological toxicity.
Environmental Protection	Continuous improvement under the maker's uncertified management system avoids toxics, waste and pollution plus reduce their material and energy use.

[1] According with national standards in ANZECC Guideline For Fresh & Marine Water Quality (2000)

Product Components

This section summarises factory components, function, source nation and % mass share.

Base Material Origin and Detail

This section lists Weathertex key components and packaging by function, type, source and % mass share.

Function	Component	Source	Amount
Fibre	Eucalyptus Hardwood	Newcastle	99.7
Water Proofing	Paraffin Melt Wax	Global	0.3
Packaging			
Spacers	PC Recycled Carboard	Australia	>8 <9
Wrapping	Linear Low density Polyethylene	Global	>3<4
Strapping	Blue steel	Australia	>1 <2
Pallet	Wood	Australia	<0.3
Strapping	Polymer	Global	<0.1
Labelling	Ink	Global	<0.0001

Product Functional & Technical Performance Information

This section provides manufacturer specifications and additional information.

Applicable standards	As tabled below plus AS/NZS1859.4, AS1530.4		
Length*Width (mm)	915 x 1220		
Thermal Properties	**Result**	**Acoustic Properties**	**System Dependant**
Thermal Conductivity	0.22 W/m-K	Weathertex can be used as part of floor systems to meet specific required performance for thermal and acoustically rated interiors.	
Thermal Resistance	0.04 m^2 K/W		
Performance Properties	**Standard**	**Result**	**BCA Required Volume**
Durability Properties			
Density	AS/NZS 4266.1	1000 kg/m^3	> 750 kg/m^3
Dimensions		Pass	±2mm/m
Bending Strength		32 MPa	> 20 MPa
Fire Properties	**Standard**	**Result**	[2]**Requirement BCA Vol 1**
Bushfire Attack Level	AS 3959	≤ BAL 19	1 -G5D32 & 2-H7D4
Ave. Specific Extinction Area	AS/NZS 3837	38.7 m2/kg	1-S7C4
Material Group Number	AS/NZS 5637.1	Group 3	1-S7C4
Early Fire Hazard Indices			
Ignitability	AS 1530.3	12	1–S7C4
Spread of Flame		5	
Heat Evolved		4	
Smoke Developed		2	
Fire Resistance Level	AS1530.4	Systems ≤120/120/120	1-Spec C1.1
Combustibility	BCA Vol 1 C1.1	Type C Compliant[2]	1-S5C24

[2] A class 2,3 or 9c building with a rise in storeys of 2 may be of type C construction it requirements of C1.5 are satisfied.

Scenarios Descriptions

This section defines modelling stages scenarios A4 to D3 beyond actual operations in module A1 to A3.

Module	Type specified	Amount	Type specified	Amount
Construction Modules				
A4 Transport factory to depot then to site	Sea Shipping	13,000	85% Capacity	Full back load
	Interstate Rail	1,300 km	85% Capacity	Full back load
	25t semi-trailer	200 km	85% Capacity	No back load
A5 Install	VOCs indoors	0%	Packaging & Waste	0%
Building Modules				
B1 Use	VOCs	0%	No other flows	0%
B2 Maintain	fit for purpose	100%	No other flows	0%
B3 Repair	fit for purpose	95%	Repair damaged	5%
B4 Replace	fit for purpose	100%	No other flows	0%
B5 Refurbish	fit for purpose	100%	No other flows	0%
B6 Energy use	off grid	100%	No other flows	0%
B7 Water use	off grid	100%	No other flows	0%
End of Life Modules				
C1 Demolish	fit for purpose	100%	No other flows	0%
C2 Transport	fit for purpose	100%	No other flows	0%
C4 Disposal	fit for purpose	100%	No other flows	0%
Beyond System Boundary Modules				
D1 Reuse	fit for purpose	75%	No other flows	0%
D2 Recover	fit for purpose	22.5%	No other flows	0%
D3 Recycle	fit for purpose	2.5%	No other flows	0%

Environmental Impact Terminology

Environmental impacts contributing to risks of social and ecological issues and collapse are tabled below with common names and remedies given for each indicator.

Global warming forcing Climate Change	Greenhouse gases absorb infra-red radiation. This heat reduces thermal energy differentials, from equator to poles, forcing ocean current and wind circulation to blend and regulate climate. Weakly blended "lumpier" weather has more frequent, extreme heat wave, fire-storm, cyclone, rain-storm, flood and blizzard events. Accumulation of carbon dioxide, natural gas methane, nitrous oxides and volatile organic compounds from burning fossil fuels causes global warming. Forest and wilderness growth absorbing air-borne carbon in biomass can drawdown such accumulation. Urgent renewable energy reliance is vital in time to avoid imminent tipping points and the worsening "***climate emergency***".
Ozone layer depletion	Stratospheric ozone loss weakens the planet's solar shield so more shorter wavelength ultraviolet (UVB) light reaching earth damages plants and increases malignant melanoma and skin cancer in humans and animals. Chlorofluorocarbons, hydrochlorofluorocarbons (HCFC), chlorobromomethane, hydrobromofluorocarbons, carbon tetrachloride, methyl chloroform, methyl bromide and halon gas cause ozone layer loss. To repair the "***ozone hole***" reliance on ozone-safe refrigerants, aerosols and solvents is essential to avoid further its depletion and enable accumulation of naturally-formed ozone.
Acidification	Acidification reduces soil and waterway pH, impedes nitrogen fixation vital for plant growth and inhibits natural decomposition. It increases rates and incidence of fish kills, forest loss and deterioration of buildings and materials. Chief synthetic causes of "***acid rain***" are emissions of sulphur and nitrogen oxides, hydrochloric and hydrofluoric acids and ammonia from burning fossil fuels polluting precipitation of rain and snow world-wide.
Eutrophication of terrestrial, freshwater and marine life	Eutrophication from excessively high macronutrient levels added to natural waters promotes excessive plant growth that severely reduces oxygen, water and habitat security for aquatic and terrestrial organisms across related ecosystems. Chief synthetic cause of "***algal blooms***" is nitrogen (N, NOx, NH_4) and phosphorus (P, PO_4^{3-}) in rain run-off over-fertilised land catchments.
Photochemical ozone creation	Tropospheric photochemical ozone, called "***summer smog***" near ground level, is created from natural and synthetic compounds in UV sunlight. Low concentration smog damages vegetation and crops. High concentration smog is hazardous to human health. Chief synthetic causes are nitrogen oxides, carbon monoxide and volatile organic compounds (VOC) pollutants. Avoiding reliance on dirtiest coal fuel and volatile chemicals has reduced smog incidence in many areas globally.
Depletion of minerals & water	Abiotic depletion of finite mineral resources increases time, effort and money required to obtain more resources to the point of extinction of naturally viable reserves. This can limit access to available, valuable and scarce elements vital for human-life. The youth movement "***extinction rebellion***" calls on adults to secure climate, reserves and biodiversity for current and future generations.
Depletion of fossil fuel reserves	Abiotic depletion of resources by consuming finite oil, natural gas, coal and yellowcake fossil fuel reserves leaves current and future generations suffering limited available, accessible, plentiful, essential valuable as well as scarce raw material, medicinal, chemical, feedstock and fuel stock. Approaching "***peak oil***" acknowledged fossil fuel reserves are finite and the need for decision-makers to act to avoid market instability, insecurity and or oil and gas wars.

Impact, Input and Output Result Categories, Units and Methods

This section summarises impact and inventory result units with descriptions and references to methods.

Impact & Input and Output Result Category Codes, Units and Methods

Result	Code	Units	Description of Methods
Climate Change Biogenic	GWP_{BIO}	kg CO_{2eq}	GWP sequestered from air [4]
Climate Change LULUC	GWP_{LULUC}	kg CO_{2eq}	GWP land use & land use change [4]
Climate Change Fossil	GWP_{FF}	kg CO_{2eq}	GWP fossil fuels [4]
Climate Change Total	GWP_{TOTAL}	kg CO_{2eq}	Global Warming Potential [4]
Stratospheric Ozone Depletion	ODP	kg CFC_{11e}	Stratospheric Ozone Loss [5]
Photochemical Ozone Creation	POCP	kg $NVOC_{e}$	Summer Smog [6]
Acidification Potential	AP	mol H^{+}_{eq}	Accumulated Exceedance [7]
Eutrophication Freshwater	EP_{FRESH}	kg P_{eq}	Excess freshwater nutrients [8]
Eutrophication Marine	EP_{MARINE}	kg N_{eq}	Excess marine nutrients [9]
Eutrophication Terrestrial	EP_{LAND}	mol N_{eq}	Excess nutrients to land [8]
Mineral Depletion	ADP_{MIN}	kg Sb_{eq}	Abiotic Depletion minerals [9]
Fossil Depletion	ADP_{FF}	MJ_{ncv}	Abiotic Depletion fossil fuel [10]
Water Scarcity Depletion	WDP	$m^3_{WDP\ eq}$	Water Deprivation Scarcity [11,12]
Input			
Net Fresh Water Use	FW	m^3	Lake, river, well & town water
Secondary Material	SM	kg	Post-consumer recycled (PCR)
Secondary Renewable Energy Fuel	RSF	MJ_{ncv}	PCR biomass burnt
Secondary Non Renewable Energy Fuel	NRSF	MJ_{ncv}	PCR fossil-fuels burnt
Primary Energy Renewable Material	PERM	MJ_{ncv}	Biomass retained material
Primary Energy Renewable Fuel	PERE	MJ_{ncv}	Biomass fuels burnt
Primary Energy Renewable Total	PERT	MJ_{ncv}	Biomass burnt + retained
Primary Energy Non Renewable Material	PENRM	MJ_{ncv}	Fossil feedstock retained
Primary Energy Non Renewable Fuel	PENRE	MJ_{ncv}	fossil-fuel used or burnt
Primary Energy Non Renewable Total	PENRT	MJ_{ncv}	Fossil feedstock & fuel use
Output			
Hazardous Waste Disposed	HWD	kg	Reprocessed to contain risks
Non-hazardous Waste Disposed	NHWD	kg	Municipal landfill facility waste
Radioactive Waste Disposed	RWD	kg	Most ex nuclear power stations
Components For Reuse	CRU	kg	Product scrap for reuse as is
Material For Recycling	MFR	kg	Factory scrap to remanufacture
Material For Energy Recovery	MER	kg	Factory scrap use as fuel
Exported Energy Electrical	EEE	MJ_{ncv}	Uncommon for building products
Exported Energy Thermal	EET	MJ_{ncv}	Uncommon for building products

Results Cradel to Grave within the System Boundary

Table 1 lists A1 Resources, A2 Transport, A3 Manufacture, A4 Delivery, A5 Construct, B2 Maintain, B3 Repair, B4 Replace, B5 Refurb, C1 Demolish, C2 Transport and C4 Disposal results. Modules B1 Use, B4 Replace, B5 Refurbish, B6 Water use, B7 energy use or C3 Processing waste had no flows or result.

Table 1 Impact & Input and Output Results/kg Functional Unit

Burdens	A1-3	A4	A5	B2	B3	C1	C2	C4
GWP BIO	-2.4	-1.9E-04	-1.9E-04	-0.10	-0.23	-1.3E-19	-5.4E-07	6.9
GWP	-0.31	1.0E-09	1.0E-02	6.2E-06	-2.9E-03	1.0E-08	7.9E-10	0
GWP FF	2.3	1.9E-02	2.0E-04	0.71	0.12	1.9E-03	6.1E-03	2.0E-05
GWP	-0.16	1.9E-02	1.0E-02	0.61	-0.35	1.9E-03	6.1E-03	6.9
ODP	2.3E-09	1.7E-13	2.4E-08	3.1E-09	1.2E-10	7.0E-17	1.1E-13	0
POCP	8.0E-03	1.2E-04	9.6E-02	2.9E-03	4.3E-04	7.6E-06	6.0E-05	6.0E-07
AP	2.5E-03	1.2E-05	3.0E-02	1.2E-03	1.6E-04	3.5E-06	5.0E-06	4.9E-04
EPFRESH	2.2E-06	5.6E-10	9.4E-05	6.4E-07	1.1E-07	3.9E-13	3.1E-10	0
EP MARINE	4.4E-04	2.3E-06	5.3E-03	2.0E-04	2.3E-05	6.4E-07	9.4E-07	8.4E-10
EPLAND	1.6E-02	7.7E-06	0.17	1.4E-03	8.2E-04	4.1E-06	3.2E-06	1.8E-08
ADP MIN	1.64	7.2E-06	3.5E-04	3.1E-04	2.1E-06	6.2E-12	4.0E-06	0
ADP FF	2.9E-05	2.2E-02	19.2	0.52	8.8E-02	9.2E-04	7.5E-03	0
WDP	3.1E-03	2.9E-06	3.2E-02	9.7E-03	1.6E-04	8.5E-08	1.4E-06	0
Input								
FW	1.9E-02	1.8E-05	0.20	6.0E-02	1.0E-03	5.2E-07	8.7E-06	0
SM	0.18	2.3E-06	0.07	0	9.5E-03	1.6E-05	1.7E-06	0
RSF	4.0	6.8E-06	8.7E-04	0	0.21	2.9E-04	9.2E-05	0
NRSF	-0.12	7.4E-04	5.9E-03	4.2E-02	-6.1E-03	3.9E-10	4.8E-04	0
PERM	22	3.0E-04	2.3E-03	1.1	1.2	1.3E-09	1.6E-03	0
PERE	0.13	2.4E-03	5.2E-03	0.56	7.1E-03	2.0E-03	2.0E-04	0
PERT	22	2.7E-03	7.4E-03	1.7	1.2	2.0E-03	1.9E-03	0
PENRM	3.2	0.11	0.1	1.7	0.17	2.5E-04	3.7E-02	0
PENRE	23	0.19	0.12	7.4	1.2	1.6E-02	6.3E-02	0
PENRT	26	0.30	0.22	9.1	1.4	1.7E-02	0.10	0
Output								
HWD	4.8E-04	3.7E-05	8.5E-03	9.9E-04	2.8E-05	7.2E-08	1.2E-05	0
NHWD	0.13	3.1E-04	0	9.9E-02	1.2E-02	4.3E-06	9.6E-05	5.0E-02
RWD	3.9E-18	1.0E-31	4.1E-17	2.5E-17	2.1E-19	5.5E-38	8.0E-32	0
CRU	0.42	5.0E-06	4.4E+00	0	2.2E-02	5.0E-06	5.0E-06	0
MFR	0.13	5.7E-06	1.37	7.6E-02	6.9E-03	2.2E-05	4.0E-06	0
MER	2.6E-05	2.3E-07	2.8E-04	3.4E-05	1.4E-06	1.3E-13	1.5E-07	0
EEE	0	0	0	0	0	0	0	0
EET	0	0	0	0	0	0	0	0

Results for Module D: Beyond System Boundaries

Table 2 lists D1 reuse, D2 recovery and D3 recycling benefit and load results beyond the system boundary.

Table 2 D1 to D3 Impact & Inventory Results/Functional Unit

Result	D1	D2	D3
Climate Change biogenic	1.8	-9.9E-02	6.0E-02
Climate Change luluc	0.23	-1.4E-06	7.8E-03
Climate Change fossil	-1.7	-0.16	-5.6E-02
Climate Change total	0.12	-0.14	3.9E-03
Stratospheric Ozone Depletion	-1.7E-09	-7.0E-10	-5.7E-11
Photochemical Ozone Creation	-6.0E-03	-6.5E-04	-2.0E-04
Acidification Potential	-1.9E-03	-2.8E-04	-6.3E-05
Eutrophication Freshwater	-1.6E-06	-1.5E-07	-5.4E-08
Eutrophication Marine	-3.3E-04	-4.5E-05	-1.1E-05
Eutrophication Terrestrial	-1.2E-02	-3.2E-04	-3.9E-04
Mineral and Metal Depletion	-2.1E-05	-7.1E-05	-7.2E-07
Fossil Depletion	-1.2	-0.12	-4.1E-02
Water Scarcity Depletion	-2.3E-03	-2.2E-03	-7.7E-05
Input			
Net Fresh Water Use	-1.4E-02	-1.3E-02	-4.7E-04
Secondary Material	-0.14	-4.1E-02	-4.5E-03
Secondary Renewable Fuel	-3.0	-0.90	-0.10
Secondary Non-renewable Fuel	8.9E-02	-0.25	3.0E-03
Primary Renewable Material	-17	-0.13	-0.55
Primary Energy Renewable Not Feedstock	-0.10	-0.37	-3.3E-03
Primary Energy Renewable Total	-17	-9.5E-03	-0.56
Primary Energy Non-renewable Material	-2.4	-0.38	-8.0E-02
Primary Non-renewable Energy Not Feedstock	-17	-1.7	-0.58
Primary Energy Non-renewable Total	-20	-2.1	-0.66
Output			
Hazardous Waste Disposed	-3.6E-04	-2.2E-04	-1.2E-05
Non-hazardous Waste Disposed	-0.10	-2.2E-02	-3.2E-03
Radioactive Waste Disposed	-2.9E-18	-5.7E-18	-9.8E-20
Components For Reuse	-0.32	-9.5E-02	-1.1E-02
Material For Recycling	-0.10	-1.7E-02	-3.3E-03
Material For Energy Recovery	-2.0E-05	-7.6E-06	-6.5E-07
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

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Life Cycle Assessment Method

LCA Author	The Evah Institute is described at www.evah.com.au.
Study Period	Factory data was collected from 2021 to 2023
LCA Method	Compliant with ISO 14040 and ISO 14044 Standards
LCIA method	ReCiPe 2016 Life Cycle Impact Assessment (LCIA)
Scope	Cradle to fate including all supply chain phases and stages depicted in Figure a.
Phases	The LCA covered all known flows in all known stages cradle to end of life fate.
Assumptions	Use is to typical Australian wildlife conservation professional practice.
Scenarios	Use, cleaning, maintenance plus disposal and re-use were scenario-based using Facility Management Association denoted and published typical operations.
Processes	All known processes are included from resource acquisition, water, fuel & energy use, power generation & distribution, freight, refining, intermediates, manufacture, scrap re-use, packing and dispatch, installation, use, maintenance and landfill. All significant waste and emission flows from all supply chain operations used to make, pack and install the product are included.

Evah industry databases cover all known domestic and global scope 1 and 2 operations. They exclude scope 3 burdens from capital facilities, equipment churn, noise and dehydration as well as incidental activities and employee commuting. Electricity supply models in active databases are updated annually. As each project is modelled and new data is available the databases are updated. They are then audited by external Type 1 ecolabel certifiers. The databases exist in top zones of commercial global modelling and calculating engines. Quality control methods are applied to ensure:

- Coverage of place in time with all information for each dataset noted, checked and updated;
- Consistency to Evah guidelines for all process technology, transport and energy demand;
- Completeness of modeling based on in-house reports, literature and industry reviews;
- Plausibility in 2 way checks of LCI input and output flows of data checked for validity, plus
- Mathematical correctness of all calculations in mass and energy balance cross checks.

Data Sources Representativeness and Quality

Primary data used for modelling the state of art of each operation includes all known process for:

- Technology sequences;
- Energy and water use;
- Landfill and effluent, plus
- Reliance on raw and recycled material;
- High and reduced process emissions;
- Freight and distribution systems.

Primary data is sourced from client annual reports and publications on corporate locations, logistics, technology use, market share, management systems, standards and commitment to improved environmental performance. Information on operations is also sourced from client:

- Supply chain mills, their technical manuals, corporate annual reports and sector experts, and
- Manufacturing specifications websites and factory site development license applications.

Background data is sourced from the International Energy Agency, IBISWorld, USGS Minerals, Franklin Associates, Plastics Europe, CML2, Simapro 9.5, EcoInvent 3.9 and NREL USLCI databases plus:

- Library, document, NPI and web searches, review papers, building manuals and
- Global industry association and Government reports on best available technology (BAT).

For benchmarking, comparison and integrity checks inventory data is developed to represent BAT, business as usual and worst practice options with operations covering industry sector supply and infrastructure in Australia and overseas. Such technology, performance and license conditions were modelled and evaluated across mining, farming, forestry, freight, infrastructure and manufacturing and building industry sectors since 1995.As most sources do not provide estimates of accuracy, a pedigree matrix of uncertainty estimates to 95% confidence levels of Geometric Standard Deviation[2] (σ_g) is used to define quality as on page 3. No data set with >±30% uncertainty is used.

Supply Chain Modelling Assumptions

Australian building sector rules and Evah assumptions applied are defined in Table b.

Table b Scope Boundaries Assumptions and Metadata

Quality/Domain	National including Import and Export
Process Model	It is typical industry practice with currently most common or best (BAT) technology.
Resource flows	LCI uses regional data for resource mapping, fuels, energy, electricity and logistics.
Temporal	Project data collated over the previous 4 years represents averages over the last
Geography	Jurisdiction is of the declared client, site, regional, national, Pacific Rim then Europe.
Representation	It represents the declared client, their suppliers and energy providers to each cradle.
Consistency	All known operations are modelled according to operations with closest proximity.
Technology	The industry supply chain modelled is typical recent Pacific Rim technology and
Functional Unit	A 20 or 60 year period of typical service life, use, cleaning and disposal/kg or m^2
System Control	
Primary Sources	Client and supplier mills, publications, websites, specifications and manuals are
Other Sources	Recent IEA, GGT, Simapro, IBIS, EcoInvent sources used and cited in the LCA
Data mix	Power grid and renewable shares are updated according to the latest IEA reports.
Operational	Company data is used for process performance, product share, waste and
Logistics	Local data is used for power, fuel mix, water supply, logistics share & capacity.
New Data Entry	New data is entered by current researchers at Malaika LCT, Evah and GGTI.
Data Generator	All via current manufacturers, Evah, GGTI, IBIS and others is cited and in LCA
Data Publisher	Publishers include the Evah Institute, GGTI and designated clients only.
Contributors	All professional and personal contributors are cited in Evah & GGTI records.
Data Flow & Mix	
System Boundary	All known resources and emissions are modelled from Earth cradles to end of life
System flows	All known flows are modelled from & to air, land, water & community sources & sinks.
Capital inclusions	Natural stocksΔ, industry stockpilesΔ, capital wear Δ, system losses and usage.
Arid Practice	Dry technology adopted; Water use is factored by 0.1 as for e.g. mining.
Transportation	Distance >20% than EU; >20% fuel efficient larger vehicles, load & distance.
Industrial	Company or industry sector data for manufacturing and minerals involved.
Mining	All raw material extraction is based on Australian or Pacific Rim technology.
Imported fuel	The fuel mix is from nearest sources such as UAE, SE Asia, Canada or New Zealand.
Finishes	Processing inputs with finishing burdens are factored in otherwise that is denoted.
Validation	
Accuracy	10th generation study is ± 5 to 15% uncertain due to some background data.
Completeness	All significant operations are tracked and documented from the cradle to grave.
Precision	Tracking of >90% flows apply a 90:10 rule sequentially to 99.9% and beyond.
Allocation	All is allocated to co products on reaction stoichiometry by energetic or mass fraction.
Burdens	All known resource use from & emissions to community air land, water are included.
Plausibility	Results are checked and benchmarked against BAT, BAU & worst practice.
Sensitivity	Calculated U is reported & compared to Bath U RICE & EcoInvent libraries.
Validity Checks	Checks are versus Plastics Europe, Bath U RICE & or Industry LCA Literature.

Further and explanatory information is found at

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