Laminex®

Redback™

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication.

The declared product Laminex® Redback™ was made by The Laminex Group at their Cheltenham plant in Australia in 2015 for sale with a 7 year warranty for applications in commercial residential and industrial sectors.

The Laminex Group is a leading marketer, distributor and manufacturer of decorative surfaces for over 80 years.

Laminex produces Redback, a specially formulated laminate which may be readily formed without cracking or blistering.

Through the GreenFirst corporate policy approach, Laminex employ a range of processes and latest technology to ensure carbon footprint reduction and delivery of environmentally preferable products.

Committed to sustainable building practices, The Laminex Group have undertaken initiatives on the product and manufacturing front to provide a range to assist with GBCA Green Star® rated projects.

Laminex recognises benefits from low emissions and are continually striving to reduce carbon emissions cross their supply chain.

The group also undertakes various initiatives to minimise water usage and wastage.

Their Gympie Plant has programs to improve self-sufficiency with the aim of a zero water emission site.

Laminex is committed to safer workplaces by ensuring that its sites are certified to AS/NZS 4801

The group maintains ISO 14001 certificates for most sites as well.

Laminex also sources its timber raw materials as well other wood pulp paper products from certified responsible sources certified to FSC, CoC and AFS/PEFC.

The site http://www.laminex.com.au has more information.

Figure 1 Laminex® Redback™

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Different program EPDs may not be comparable as e.g. Australian transport is more than elsewhere. **Further explanatory information is found at** http://www.globalgreentag.com/ or contact: certification1@globalgreentag.com

1. Details of This Declaration

Program Operator	GreenTag Global Pty Ltd hereafter called Global GreenTag noted at www.globalgreentag.com
EPD Number	TLG-001-2017
Date issue	24th July 2018
Validity	24th July 2021
Reference PCR	Compliant with PCR IMRP: 2017
Time	Made in and sold from 2014 or 2015 for 20 years use
Geography	Made in Australia. Uses are assumed as for Australasia
Application	Commercial, Residential and Industrial building interiors
Declared Unit	Laminex® Redback™ moisture resistant panelling 0.94kg/m^2 area
Functional unit	Laminex® Redback™ 20 year use in moisture resistant panelling 0.94kg/m^2 interior surface area cradle to fate

2. Product Characterisation

Definition	Redback™ formable laminate made by Laminex for use in residential and commercial buildings interiors.
Standard	AS/NZS 2924.1: 1998 High pressure decorative laminates AS/NZS 1859.2: 2004 Reconstituted wood-based panels

3. Green Star® Certified Credits

Products are relevant to the Green Building Council of Australia's (GBCA) Green Star® scheme. If required this EPD is evidence the declared product meets the following Green Star® credits.

It may be used as evidence in Green Star® submissions for those credits.

The product is certified by GBCA recognised Global GreenTag GreenRate to meet the following credits of Green Star®:

- Interiors V1.2: Sustainable Products, Indoor Pollutants
- Design and As Built V1.2: Sustainable Product, Indoor Pollutants
- Performance V1.1: Refurbishment Materials

GBCA Disclaimer

Green Star® is a registered mark of the Green Building Council of Australia (GBCA).

Assessments shall not be reproduced in part at any time. Rating Tools and Technical Manuals are subject to change by the GBCA.

This EPD provides Technical Opinion and as such is not endorsed by the GBCA or its agents. Green Star® Technical Manuals give technical details of credit requirements.

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4. Sustainability Assessment Scores

Table 1 lists Global GreenTag Sustainability Assessment Criteria (SAC) scores prior to weighting and then used to determine the GreenTag EcoPOINT[1].

Table 1 Normalised GreenTag EcoPOINT & SAC Scores

Category Potential	Results (-1 to +1)
Building Synergy	0.5
Health & Ecotoxicity	0.25
Biodiversity	0.30
LCA Score	0.09
Greenhouse Gas Emissions[2]	0.07
Social Responsibility	0.9
GreenTag EcoPOINT	0.32

SAC scores are normalised against business as usual (BAU) product performing comparable functions under the same category rules. Lower scores show better environmental and social benefits with fewer impacts and damages. Considering sustainability:

- worst case BAU results = 1.0,
- neutral = 0.0 and
- net positive benefit = -1.0

5. Type 1 Ecolabel

The declared product Type 1 Ecolabel achieved

Global GreenTag[CertTM]	Gold PLUS GreenRate Level A

6. Verification of this Declaration

This EPD was approved on 24th July 2018 according to requirements of ISO14025 8.1.3b.

Role	Name	Position	Signature
PCR Review Chair	Murray Jones	Ecquate Pty Ltd CEO	24-07-2018
LCI Developer	Delwyn Jones	The Evah Institute CEO	24/07 2018
LCARate, LCIA & EPD Developer	Nana Bortsie-Aryee	Global GreenTag Assessor	
3rd Party LCI Verifier	Shloka Ashar	Global GreenTag Lead Auditor LCI Verifier	24/08/2018
Internal EPD Audit	David Baggs	Global GreenTag CEO & Program Director	19/10/18

[1] http://www.ecospecifier.com.au/knowledge-green/glossary.aspx#greentagecopoint
[2] Stocker et al (eds.) Climate Change 2013: The Physical Science Basis, CH8, IPCC AR5, Cambridge U Press, UK.

5. Base Material Origin and Detail

Table 2 lists key components by function, type, key operation, source and mass % amount.

Table 2 Base Material

Function	Component	Production	Origin	%
Finishing	Decore Paper	Forest, Hew, Chip, Pulp, Paper, Finish	Global	>55<60
Binder	UF[3] Resin	Extract, Polymerise	Australia	>15<20
Binder	MUF[4] Resin	Extract, Polymerise	Australia	>10 <15
Backing	Kraft Paper	Forest, Hew, Chip, Pulp, Paper, Finish	Global	>10 <15
Biocide	Silver Chloride	Mine, Extract, Refine, Dissolve Disperse	UK	>0.01

6. Packaging, Installation, Use & Disposal

Health Safety & Environment	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential.
Cleaning & Maintenance	The recommended cleaning and maintenance raises no ecosystem or human health concerns. Care and maintenance guides are on company websites.
Packaging	Cardboard forms & cartons, plastic wrap & strapping on reused pallets.
Residual Scrap	No mill off-cuts. Installation scrap of 5% is assumed to landfill.
Service life	Residential and commercial refits vary but 20 year life is assumed typical.
Scenario	Weekly detergent spray, light mop, monthly wet machine scrub and cloth dry.
Recycling	Home mill, fabrication and installation scrap is reworked into new product.
Re-use	This study assumes 60% product is serviceable for reuse over 40 more years.
Disposal	It assumes 30% is recycled. Incineration is rare in Australia so none is modelled.

7. Whole of life Performance

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 Ecospecifier Cautionary Assessment Process (ESCAP) and no issues or red light concerns existed for product human or ecological toxicity.
Effluent	The LCI results and ESCAP raised no red light concerns in emissions to water[5].
Waste	Cradle to grave waste to landfill was 1% hazardous and 99% non-hazardous.
Environmental Protection	Continuous improvement under the maker's certified ISO14001 EMS aims to avoid toxics, waste and pollution plus reduce their material and energy use.
Environmental Health Effects	Installed products are certified as having VOC's compliant with Green Star® IEQ VOC credits for indoor environment[6] quality credits. No other potential in-use impacts on environment or health are known.

3 Urea Formaldehyde Resin
4 Melamine Formaldehyde Resin
5 According with national standards in ANZECC Guideline For Fresh & Marine Water Quality (2000)
6 in accordance with national standards and practice

8. Life Cycle Inventory Results

Table 3 lists material and energy resources use per functional unit. Figure 3 depicts the phases:

- Production including supply manufacture with transport cradle to gate then upstream;
- Construction with transport to site, installation and commissioning;
- . Use and operation including maintenance, repair, replacement, refurbishment with transport, and
- . End-of-life from deconstruction, demolition, reuse, recycling and disposal with transport.

Table 3 Cradle to Gate Inventory of Flows/ m^2 Declared Unit

Total Input use of	Unit	Result
Embodied Water	litre/m^2	23.95
Recycled Water	litre/m^2	2.58
Finite Material	kg/m^2	0.35
Recycled Material	kg/m^2	0.00
Renewable Material	kg/m^2	0.59
Embodied Feedstock[7]	MJ/m^2	49.52
Fossil Fuel[8]	MJ/m^2	96.23
Nuclear Energy	MJ/m^2	1.49
Hydrogen Energy	MJ/m^2	0.01
Recovered Energy	MJ/m^2	-0.12
Biomass Fuel	MJ/m^2	3.71
Hydro Power	MJ/m^2	2.02
Solar Energy	MJ/m^2	0.11
Wave/Tidal Energy	MJ/m^2	0.39
Geothermal Energy	MJ/m^2	0.01
Fuel + Feedstock	MJ/m^2	135.67

9. Life Cycle Impact Results

Table 4 shows Life Cycle Impact Assessment (LCIA) results for 20 years of product use.

Table 4 Cradle to Grave Potential Impact Results/ m^2 Functional Unit

Evaluation Category	Unit	Result
EcoIndicator 99	ecopoint	0.40
Greenhouse Gas Emissions	kg CO_{2e}	4.17
Ecosystem Quality Damages	PDF*m^2*yr	5.34E-05
Human Health Damages	DALY	5.80E-04
Ozone Depletion	kg $R11_e$	7.84E-11
Acidification	kg SO_{2e}	0.25
Fossil Fuel Depletion	$MJ_{surplus}$	5.97
Mineral Resource	$MJ_{surplus}$	0.03

[7] Available for recovery in the end of life
[8] Peat, Lignite, Coal, Gas, Oil, Sulphur, Hydrogen and Unspecified sources

10. Life Cycle Benefit Potential

Manufacturer's details on biomass and renewable energy flows confirm the product's use has the following qualitative benefits and positive outcomes cradle to grave.

Climate, water and soil security benefits arise from reliance on renewable biomass and energy.

Climate and Water Security Benefits of Renewable Content and Scrap Reuse

Climate Security	Carbon drawn down from air by biomass sequestered in biomass in product
	Brakes climate change via carbon sequestered & retained in forests and farms
	Carbon sequestered in standing pine forestry also braking global warming
Water Security	Hectares intensive pine forest flora stabilising rain catchment and water table
	Forest leaf litter mulches retains soil water and reduces water stress
Soil Carbon Security	Carbon sequestered in unburnt tree roots in forest soil also brakes climate change
	Carbon locked in standing pine forest detritus and roots in soil to brake climate change

Forestry industry security benefits arise from reliance on renewable supply.

Resource Supply Security Benefits of Renewable Content and Scrap Reuse

Forestry Security	Hectares certified pine forest and flora for foraging and grazing
	Hectares extensive certified forest flora for microbe, bird, bee and livestock forage
	Certified forest flora for microbe, bird, bee, pollinator foraging and livestock grazing
	Hectares extensive certified pine forest flora stabilising soil accumulation and erosion

Soil, biodiversity and habitat health and security benefits arise from reliance on renewable supply.

Soil, Habitat and Biodiversity Security Benefits of Renewable Content and Scrap Reuse

Soil Health and Security	Extensive forest and farm leaf & litter mulching soil reducing temperature stress
	Extensive forest soil for microbe and worm biome nutrition and soil development
Biodiversity Security	Hectares extensive forest flora for biodiverse bird, bee, pollinator and wildlife forage
	Hectares extensive standing pine forest for biodiverse wildlife and pollinator forage
Habitat Security	Hectares extensive standing forest flora for soil retention and soil biota refugia
	Hectares extensive standing pine forest flora for bird, bee, pollinator and wildlife refugia

Local and global human and ecological health security benefits flow from reliance on renewable supply.

Health Benefits of Renewable Content and Scrap Reuse

Soil Habitat Health	Forest soil microbe and worm biome nutrition enhances soils and CO_{2e} drawdown
	Forest leaf & litter forage enhancing soil conditioning and mulching
Land Use & Space	Saves landfill space by using scrap as energy instead of waste to landfill
	Saves natural land use in refugia around extensive pine resin forest
Ecological health	Health and safety benefits with climate security from braking global warming
	Environmental health benefits from avoiding dust and pollution from fossil fuel use

11. Life Cycle Benefit Results

This section shows quantitative Life Cycle Benefit Assessment (LCBA) for 60 years product use cradle to cradle (C_2C). Table 5 lists benefits from Evah 2020 LCBA results /m^2.

Table 5 Cradle to Grave Evah 2020 Gross Benefit Potential Results C_2C

Benefit Layers	Units	Process Outcome	Result
Climate Security (CLIMES)			
Climate Brake CO_{2e}	kg CO_{2e20}	Carbon embodied in product biomass	3.30
Climate Security	kg CO_{2e20}	Carbon drawn down from air by biomass	6.60
Biomass Security	kgCO_{2e100}	Carbon sequestered in product biomass	3.30
Soil Carbon Security	kgCO_{2e100}	Carbon Sequestered in tree roots in standing forest soil	3.30
Supply Energy & Resource Viability: Energy & Fuel(SERV F)			
Energy Renewal	MJ $_{surplus}$	Reliance on Renewable Energy	42.63
Energy Recovery	MJ $_{surplus}$	Reliance on recovered energy	0.14
Water Recovery	l $_{Reuse}$	Reliance on recovered water 7.46 %	39.00
Fuel Recovery	MJ $_{surplus}$	Reliance on recovered fuel	4.17
Fuel Renewal	MJ $_{surplus}$	Reliance on Biofuel	39.85
Supply Energy & Resource Viability: Renewable & Biomass Matter(SERV B)			
Material Biomass	MJ $_{surplus}$	Reliance on Renewable Feedstock	53.99
Forestry Security	MJ	Biota, biome, litter & roots retained in soil for seeds	39.85
Resource Recovery	MJ $_{surplus}$	Reliance on recovered resources	4.17
Water Catchment	Litre $_{rain}$	Local Surplus in Rainwater 15%	6.40
Quality Recovery	kg Fe_{eq}	Reliance on Retained Technical Quality	0.08
Positive Ecosystem Replenishment Fraction (PERF)			
Climate Brake $_{100year}$	kg CO_{2e100}	Potential for Retained Ecosystem	3.30
Biodiversity Security	m^2*yr	Forest leaf & litter forage for wildlife	395
Habitat Security	m^2*yr	Pine forest flora for habitat 7900	395
Water Clarification	g$PO_{4\,e}$	Avoided and captured water pollution	0.16
Hale Human Health Adjusted Life Years (HALY)			
Human Wellness	HALY	Years gained by avoided death and disability risk	1.66E-04
Dust Avoidance	kg PM_{10}	Avoided and captured dust emission pollution	1.58E+02
Ozone Layer Repair	g $R11_e$	Avoided Ozone Depleting Chemical pollution	2.25E-11
Organic Safe Air	g NM VOC	Avoided emission organic chemical compounds	2.46

12. Supply Chain Modelling

Processes to acquire, refine, transport, fabricate, coat, use, clean, repair, reuse and dispose of metal, masonry, ceramic, timber, glass, plastic and composites are modelled.

These include 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.

A flow chart in Figure 2 shows key product supply chain operations from cradle to fate.

While all known operations are included not all are shown.

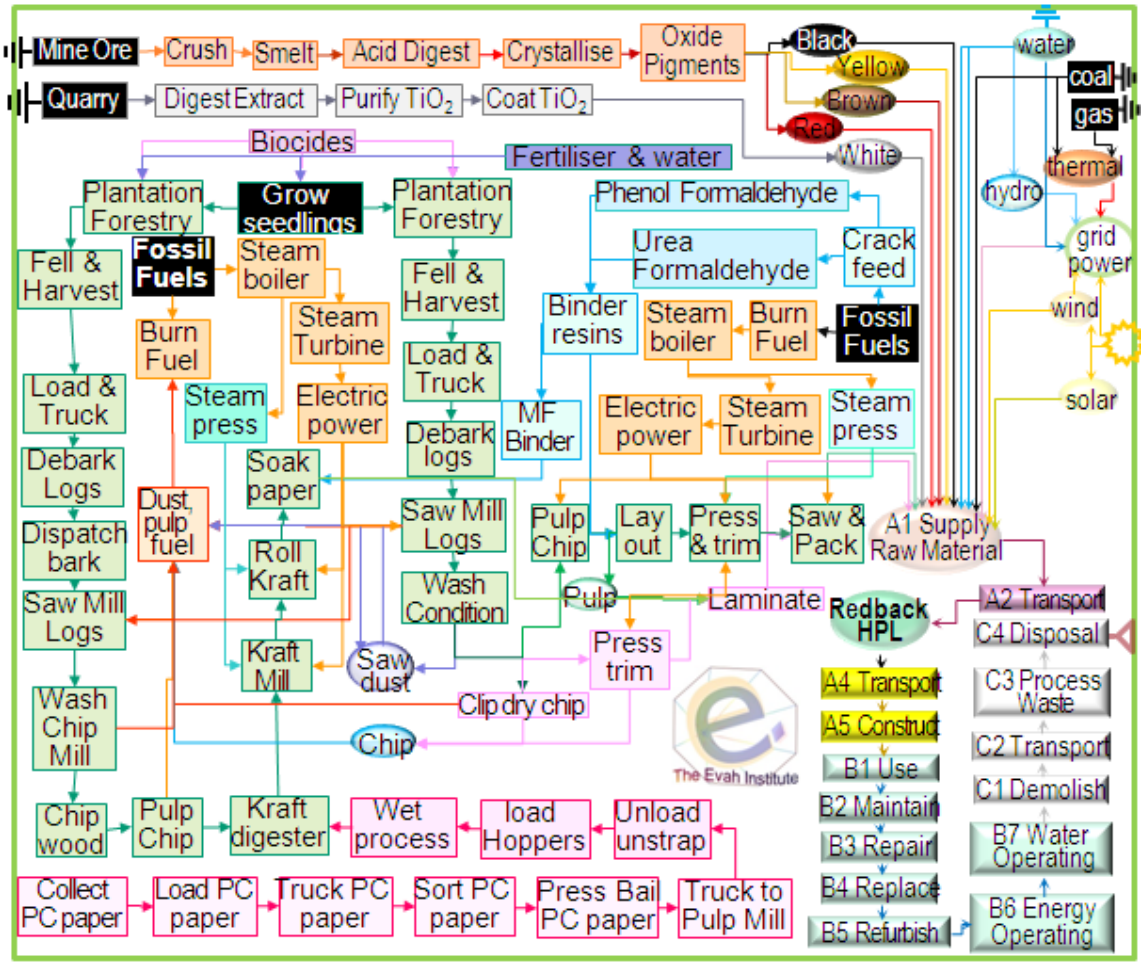

Figure 2 Major Product Operations

13. Life Cycle Assessment Method

LCA Author	The Evah Institute as described at www.evah.com.au
Study Period	Factory data was collected from 2015 to 2018
LCA Method	Compliant with ISO 14040 and ISO 14044 Standards
LCIA method	EcoIndicator 99 Life Cycle Impact (LCIA) Assessment
Scope	Cradle to Fate including all supply chain phases and stages depicted in Figure 2.
Phases	The LCA covered all known flows in all known stages cradle to end of life fate.
Assumptions	Use is to typical Australian Facility Management professional practice.
Scenarios	Use, cleaning, maintenance plus disposal and re-use were scenario-based using Facility Management Association denoted and published typical operations.
System Boundaries	The LCA covers all operations in the system boundary depicted in Figure 3.
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 involved to make, pack and install the product are included.

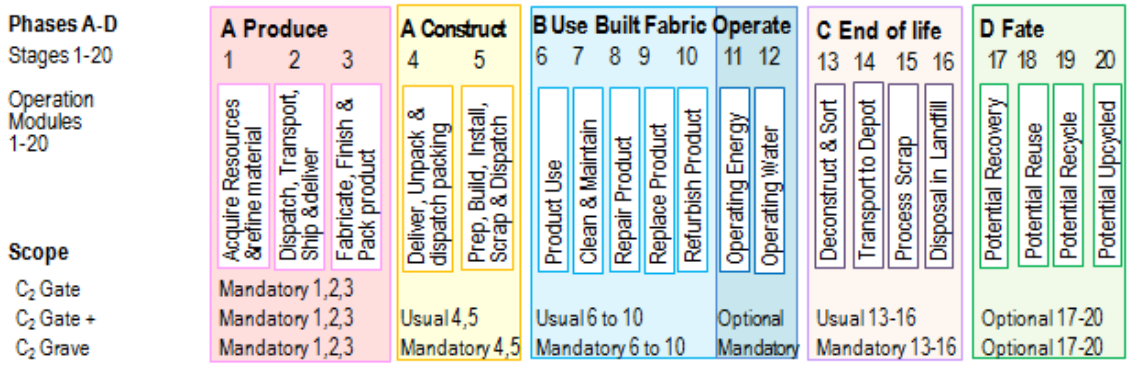

Figure 3 Phases and Stages Cradle to Grave

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.

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[9] for each dataset noted, checked and updated;
- Consistency to Evah guidelines[10] 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.

Electricity supply models in active databases are updated annually. As each project is modelled and new data is available the databases are updated and audited by external Type 1 ecolabel certifiers.

[9] Jones D G (2004) LCI Database for Commercial Building Report 2001-006-B-15 Icon.net, Australia
[10] Evah Tools, Databases and Methodology Queensland, Australia at http://www.evah.com.au/tools.html

14. 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 clients, Annual Reports and their 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, Boustead 6, Plastics Europe, CML2, Simapro 8, EcoInvent 3 and NREL USLCI model databases. Information on operations is also sourced from:

- 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 in Table 6[11].

Table 6 Data Quality Uncertainty (U) for 2017-18

Metric σ_g	U ±0.01	U ±0.05	U ±0.10	U ±0.20	U ±0.30
Temporal	Post 2015	Post 2010	Post 2005	Post 2000	Pre 2000
Duration	>3yr	3yr	2yr	1yr	<1yr
Data Source	Process	Line	Plant	Corporate	Sector
Technology	Actual	Comparable	Within Class	Conventional	Within Sector
Reliability on	Site Audit	Expert verify	Region Report	Sector Report	Academic
Precision to	Process	Line	Plant	Company	Industry
Geography	Process	Line	Plant	Nation	Continent
True of the	Process	Mill	Company	Group	Industry
Sites cover of	>50%	>25%	>10%	>5%	<5%
Sample size	>66% trend	>25% trend	>10% batch	>5% batch	Academic
Cut-off mass	0.01%	0.05%	0.1%	0.5%	1%
Consistent to	±0.01	<±0.05	<±0.10	<±0.20	<±0.30
Reproducible	>98%	>95%	>90%	>80%	<70%
Certainty	Very High	High	Typical	Poor	>±0.30

No data set with >±30% uncertainty is used without notation in the LCA as well as the EPD.

[11] Evah Institute data quality control system accords with UNEP SETAC Global LCI Database Quality 2010 Guidelines

15. Supply Chain Modelling Assumptions

Australian building sector rules and Evah assumptions applied are defined in Table 7.

Table 7 Scope Boundaries Assumptions and Metadata

Quality/Domain	National including Import and Export
Process Model	Typical industry practice with currently most common or best (BAT) technology
Resource flows	Regional data for resource mapping, fuels, energy, electricity and logistics
Temporal	Project data was collated from 2015 to 2017
Geography	Designated client, site, regional, national, Pacific Rim then European jurisdiction
Representation	Designated client, their suppliers and energy supply chains back to the cradle
Consistency	Model all operations by known given operations with closest proximity
Technology	Pacific Rim Industry Supply Chain Technology typical of 2015 to 2018
Functional Unit	Typical product usage with cleaning& disposal/m^2 over the set year service life
System Control	
Primary Sources	Clients and suppliers mills, publications, websites, specifications & manuals
Other Sources	IEA 2018, GGT 2018, Boustead 2013, Simapro 2016, IBIS 2018, EcoInvent 2018
Data mix	Power grid and renewable shares updated to latest IEA 2018 reports
Operational	Company data for process performance, product share, waste and emissions
Logistics	Local data is used for power, fuel mix, water supply, logistics share & capacity
New Data Entry	VliegLCA, Evah Institute 2018; Global Green Tag Researchers 2018
Data Generator	Manufacturers, Evah Institute 2018; GGT 2018; Meta: IBIS 2018, Other pre 2018
Data Publisher	The Evah Institute Pty Ltd to Global GreenTag and designated client only
Persons input	All contributors cited in Evah & Global GreenTag records or websites
Data Flow & Mix	
System Boundary	Earth's cradle of all resource & emission flows to end of use, fitout or build life
System flows	All known from and to air, land, water and community sources & sinks
Capital inclusions	Natural stocksΔ, industry stockpilesΔ, capital wear Δ, system losses and use
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	Mix is from nearest sources is e.g. UAE, SE Asia, Canada or New Zealand
Finishes	Processing inputs with finishing burdens are factored in. If not that is denoted
Validation	
Accuracy	10^{th} 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 applies a 90:10 rule sequentially to 99.9% and beyond
Allocation	%100 to co products on reaction stoichiometry by energetic or mass fraction
Burdens	All 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 libraries of Bath U RICE & EcoInvent 3.2
Validity Checks	Are made versus Plastics Europe, Ecobilan, GaBi & or Industry LCA Literature

16. References for this LCA & EPD

Australian & New Zealand (ANZECC) Guidelines For Fresh & Marine Water Quality (2000) http://www.environment.gov.au/water/quality/national-water-quality-management-strategy

Basel Convention (2011) Control of Transboundary Movement of Hazardous Waste & Disposal http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf

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Evah (2016) LCA Tools, Databases & Methodology at http://www.evah.com.au/tools.html

Franklin Associates (2016) US LCI Database http://www.fal.com/index.html Eastern Research Group US

GreenTag™ Certification (2016) http://www2.ecospecifier.org/services_offered/greentag_certification

GreenTag™ (2016) Product Category Rules http://www.globalgreentag.com/greentag-epd-program

Jones D., Mitchell. P. & Watson P. (2004) LCI Database for Australian Commercial Building Material: Report 2001-006-B-15, Sustainable Built Assets, CRC for Construction Innovation

Jones D.G et al. (2009) Chapter 3: Material Environmental LCA in Newton P et al., (eds) Technology, Design & Process Innovation in the Built Environment, Taylor & Francis, UK

IBISWorld (2014) Market Research, http://www.ibisworld.com.au/ IBISWorld Australia

International Energy Agency (2016) Energy Statistics http://www.iea.org/countries/membercountries/

ISO 9001:2008 Quality Management Systems Requirements

ISO 14001:2004 Environmental management systems: Requirements with guidance for use

ISO 14004:2004 EMS: General guidelines on principles, systems & support techniques

ISO 14015:2001 EMS: Environmental assessment of sites & organizations (EASO)

ISO 14020:2000 Environmental labels & declarations — General principles

ISO 14024:2009 Environmental labels & declarations -- Type I Principles & procedures

ISO 14025:2006 Environmental labelling & declarations Type III EPDs Principles & procedures

ISO 14031:1999 EM: Environmental performance evaluation: Guidelines

ISO 14040:2006 EM: Life cycle assessment (LCA): Principles & framework

ISO 14044:2006 EM: LCA: Requirement & guideline for data review: LCI; LCIA, Interpretation results

ISO 14064:2006 EM: Greenhouse Gases: Organisation & Project reporting, Validation & verification

ISO 15392:2008 Sustainability in building construction General principles

ISO 15686-1:2011 Buildings & constructed assets Service life planning Part 1: General principles

ISO 15686-2:2012 Buildings & constructed assets Service life (SL) planning Part 2: prediction

ISO 15686-8:2008 Buildings & constructed assets SL planning Part 8: Reference & estimation

ISO 21929-1:2011 Sustainability in building construction Sustainability indicators Part 1: Framework

ISO 21930:2007 Building construction: Sustainability, Environmental declaration of building products

ISO/TS 21931-1:2010 Sustainability in building construction: Framework for assessment, Part 1:

ISO 21932:2013 Sustainability in buildings and civil engineering works -- A review of terminology

Plastics Europe (2016) Portal http://www.plasticseurope.org/plastics-sustainability/eco-profiles.aspx

Pre (2016) SimaPro 8 Software, The Netherlands http://www.pre-sustainability.com/simapro-manuals

Myhre et al, 2013, Anthropogenic and Natural Radiative Forcing Chapter 8 in Stocker et al (eds.) Climate Change 2013, AR5 of the IPCC, Cambridge U Press UK. http://www.ipcc.ch/report/ar5/wg1/

Roache S. K. (2012) IMF Report WP/12/115 China's Impact on World Commodity Markets http://www.imf.org/external/pubs/ft/wp/2012/wp12115.pdf International Monetary Fund

UNEP (2016) Persistent Organic Pollutants http://www.chem.unep.ch/pops/ The UN

USLCI (2016) Life-Cycle Inventory Database https://www.lcacommons.gov/nrel/search, USA

U.S. Geological Survey National Minerals (2016) http://minerals.usgs.gov/minerals/pubs/country/ USA

US EPA (2016) Database of Sources of Environmental Releases of Dioxin like Compounds in U.S http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=20797 p 1-38, 6-9, USA

17. Reviewers Report Conclusions

The independent LCA reviewer's report confirmed that the LCA project report and addition information addressed the EPD. The verifier, Shloka Ashar, was not involved in developing the LCA or EPD and has no conflict of interests from their organisational position. While the report is confidential its conclusions confirmed that documentation according to set ISO Standard requirements was provided including evidence from the:

The Evah Institute, the LCA developer:

a) Recipes of input and output data of unit processes used for LCA calculations √

b) Datasheets of measures, calculations, estimates and emails with sources as in Table 6 √

e) References to literature and databases from which data was extracted as noted in Table 6 √

g) Notes on supply chain processes and scenarios satisfying requirements of this Standard √

i) Embodied Energy shares as used for sensitivity analyses re ISO 14044:2006, 4.5.3.3 √

j) Proof percentages or figures in calculations in the end of life scenario √

k) Notes on proof of % and allocation calculations √

o) All operations covered Vs criteria and substantiation used to determine system boundaries √

Product Manufacturer in:

c) Specifications used to create the manufacturer's product √

d) Citations, references, specifications or regulations & data showing completeness √

f) Specification demonstrating that the building product can fulfil the intended use √

The Certifier Global GreenTag on:

l) Notes and calculation of averages of different locations yielding generic data √

m) Substantiating additional environmental information ISO 14025:2006, 7.2.4 √

n) Procedures for data collection, questionnaires, instructions, confidentiality deeds √

Requiring No Evidence:

As the EPD is cradle to grave as well as PCR compliant the independent reviewer did not need to:

h) Substantiate a few stages as all stages were substantiated √

p) Substantiate alternatives when no other choices and assumptions were applied √

q) Demonstrate consistency for few stages as the same rules in Tables 5 and 6 applied to all. √

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication.

Further and explanatory information is found at

http://www.globalgreentag.com/

or contact:

certification1@globalgreentag.com

Global GreenTagCertTM EPD Program

Environmental Product Declaration

Compliant to ISO 14025