



This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication. The declared Opus Luxury Vinyl Tile floorcovering was made by Karndean International in 2015 at Shanghai in The Peoples Republic of China for sale as with a 10 year warranty for commercial use and 35 year warranty for residential use.

Since 1973 Karndean International has developed and supplied floor covering.

With headquarters in the United Kingdom, it has offices and distribution centres in Europe, USA, Canada, Asia, Australia and New Zealand.

Karndean Design Flooring Luxury Vinyl Tile (LVT) is made for residential use including wet areas.

Commercial applications include retail shops, shopping centres, restaurants, food courts, hospitality and leisure centres as well as health and aged care facilities.

It is available in a range of styles, inspired by material such as stone, ceramic, marble, and wood.

The product comes as tile, slab and plank formats in over 150 colourways.

Karndean's K-Guard Polyurethane surface technology resists scuff marks, stains and fine scratches.

This avoids the need to apply added surface treatment after installation.

Their factories are ISO 9001 Quality and ISO 14001 Environmental Management System certified.

All such Karndean Design Flooring product is recyclable after use.

Adhesives used and specified are water based and low VOC emissions certified.

Karndean LVT uses certified best practice PVC.

The <http://www.karndean.com/> site has more information.

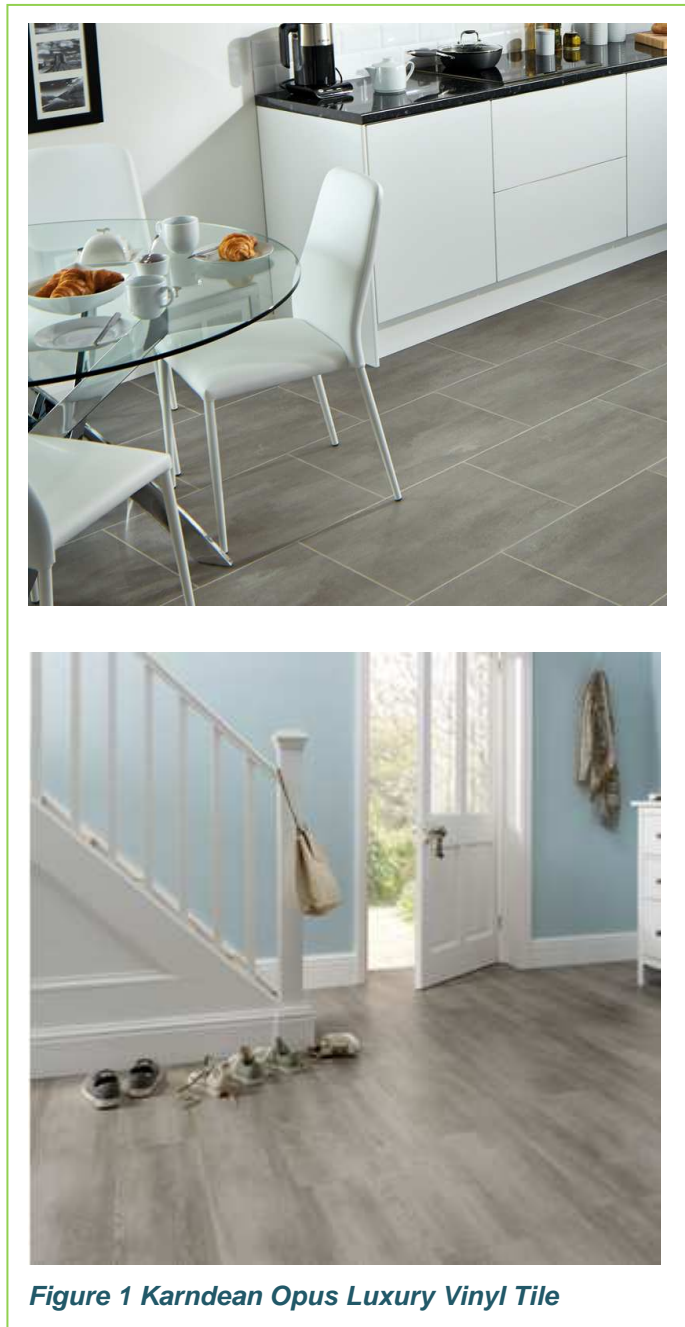


Figure 1 Karndean Opus Luxury Vinyl Tile



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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 © This EPD remains the property of Global GreenTag Pty Ltd.



1. Details of This Declaration

Program Operator	GreenTag Global Pty Ltd hereafter called Global GreenTag noted at www.globalgreentag.com
EPD Number	KAR-001-D-2015
Date issue	08 May 2017
Validity	08 May 2020
Reference PCR	Compliant with PCR FP: 2017 Building Floor Covering Products
Time	Made in and sold from 2015 for 20 years use
Geography	Made in China. Uses are assumed as for Australasia.
Application	Commercial and residential building interior floor covering
Functional unit	20 year use of 4.34 kg/m ² Karndean Opus LVT floorcovering cradle to fate

2. Product Characterisation

Definition	Karndean Opus LVT interior commercial and residential floorcovering ISO 9239.1-2003 Reaction to Fire Tests for Floorings
Standard	AS/NZS 4586:2004 Slip resistance classification of new pedestrian surface materials

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®:

- Design and As Built V1.1: Sustainable Product, Responsible Building Material
- Interiors V1.1 Sustainable Products, Responsible Building Materials
- Performance V1.1: Procurement and Purchasing: Refurbishment Materials
- Green Star NZ® Tools Credits: IEQ: Indoor Air Quality

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.



4. Sustainability Assessment Scores

Table 1 lists Global GreenTag Sustainability Assessment Criteria (SAC) scores prior to weighting and then used to determine the GreenTag EcoPOINT¹.

Table 1 Normalised GreenTag EcoPOINT & SAC Scores

Category Potential	Results (-1 to +1)
Building Synergy	1.00
Health & Ecotoxicity	0.25
Biodiversity	0.61
LCA Score	0.53
Greenhouse Emission	0.32
Social Responsibility	0.65
GreenTag EcoPOINT	0.52

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^{Cert™} Silver PLUS GreenRate Level A

6. Verification of this Declaration

This EPD was approved on 08 May 2017 according to requirements of ISO14025 8.1.3b.

Role	Name	Position	Signature
PCR Review Chair	Murray Jones	Ecuate Pty Ltd CEO	
LCI Developer	Delwyn Jones	The Evah Institute CEO	
LCIA, LCARate & EPD Developer	Mathilde Vlieg	Global GreenTag Researcher	
Internal LCA Audit	Shloka Ashar	Global GreenTag Lead Auditor	
Internal EPD Audit	David Baggs	Global GreenTag CEO & Program Director	

¹ <http://www.ecospecifier.com.au/knowledge-green/glossary.aspx#greentagecopoint>



7. Packaging, Installation, Use & Disposal

Packaging	Cardboard forms & cartons, plastic wrap & strapping on reused pallets.
Service life	Residential and commercial refits vary but 20 year life is assumed typical.
Health Safety & Environment	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential.
Residual Scrap	Mill off-cuts are reused. Installation scrap of 5% is assumed to landfill.
Cleaning & Maintenance Scenario	The recommended cleaning and maintenance raises no ecosystem or human health concerns. Care and maintenance guides are on company websites. 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.

8. 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 ² .
Waste	Cradle to grave waste to landfill was 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 ³ quality credits. No other potential in-use impacts on environment or health are known.

² According with national standards in ANZECC Guideline For Fresh & Marine Water Quality (2000)
³ in accordance with national standards and practice

9. Base Material Origin and Detail

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

Table 2 Base Material

Function	Component	Production	Origin	Amount %
Whiting	Limestone	Mine, Crush, Sieve & Haul	China	>50.0 <75.0
Binder	SPVC	Extract, Chlorinate, Polymerise	Taiwan	>25.0 <40.0
Plasticiser	DOTP	Drill, Distil, Extract, Polymerise	China	> 5.0 <15.0
Pigment	White Titania	Mine, Digest, Precipitate, Coat	China	>0.5 < 0.8
Plasticiser	ESBO	Farm, Press, Extract, Refine,	China	>0.2 < 0.5
Coating	PUR Acrylic	Farm, Drill, Extract, Polymerise	Taiwan	>0.2 < 0.5
Stabiliser	Ca Zn Soap	Mine, Farm, Press, Refine, Mill	Taiwan	>0.5 < 1.0
Stabiliser	Ba Zn soap	Mine, Farm, Press, Refine, Mill	China	< 0.1
Printing	Inks & Paste	Drill, Extract, Mill, Polymerise	China	< 0.1
Pattern	Carbon Black	Mine, Digest, Precipitate, Coat	China	< 0.1
Oil	Epoxy Oil	Drill, Distil, Extract, Polymerise	China	< 0.1
UV Coat	Octabenzone	Drill, Distil, Extract, Synthesise	Taiwan	< 0.1
Solvent	MEK	Drill, Distil, Extract, Synthesise	China	< 0.1

10. Life Cycle Impact Results

Table 3 shows Life Cycle Assessment (LCA) Eco-Indicator 99 results for 20 years of product use.

Table 3 Potential Impact Results

Evaluation Category	Unit	Result
Product thickness	mm	2.50
Product mass	kg/m ²	4.34
EcoIndicator 99	ecopoint	0.71
Embodied Water	kl	324
Carbon Dioxide Emissions	kg CO _{2e} ⁴	9
Gross Energy & Feedstock	MJ	215
Renewable Primary Energy	MJ	26
Ecosystem Quality Damages	PDF*m ² *yr	7.5E-05
Human Health Damages	DALY	0.001
Ozone Depletion	kg R11 _e	2E-09
Acidification	kg SO _{2e}	0.32
Eutrophication	kg PO ₄ ³⁻ _e	0.02
Fossil Fuel Depletion	MJ _{surplus}	9
Mineral Resource	MJ _{surplus}	0.004

⁴ Stocker et al (eds.) Climate Change 2013: The Physical Science Basis, CH8, IPCC AR5, Cambridge U Press, UK.
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11. 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.

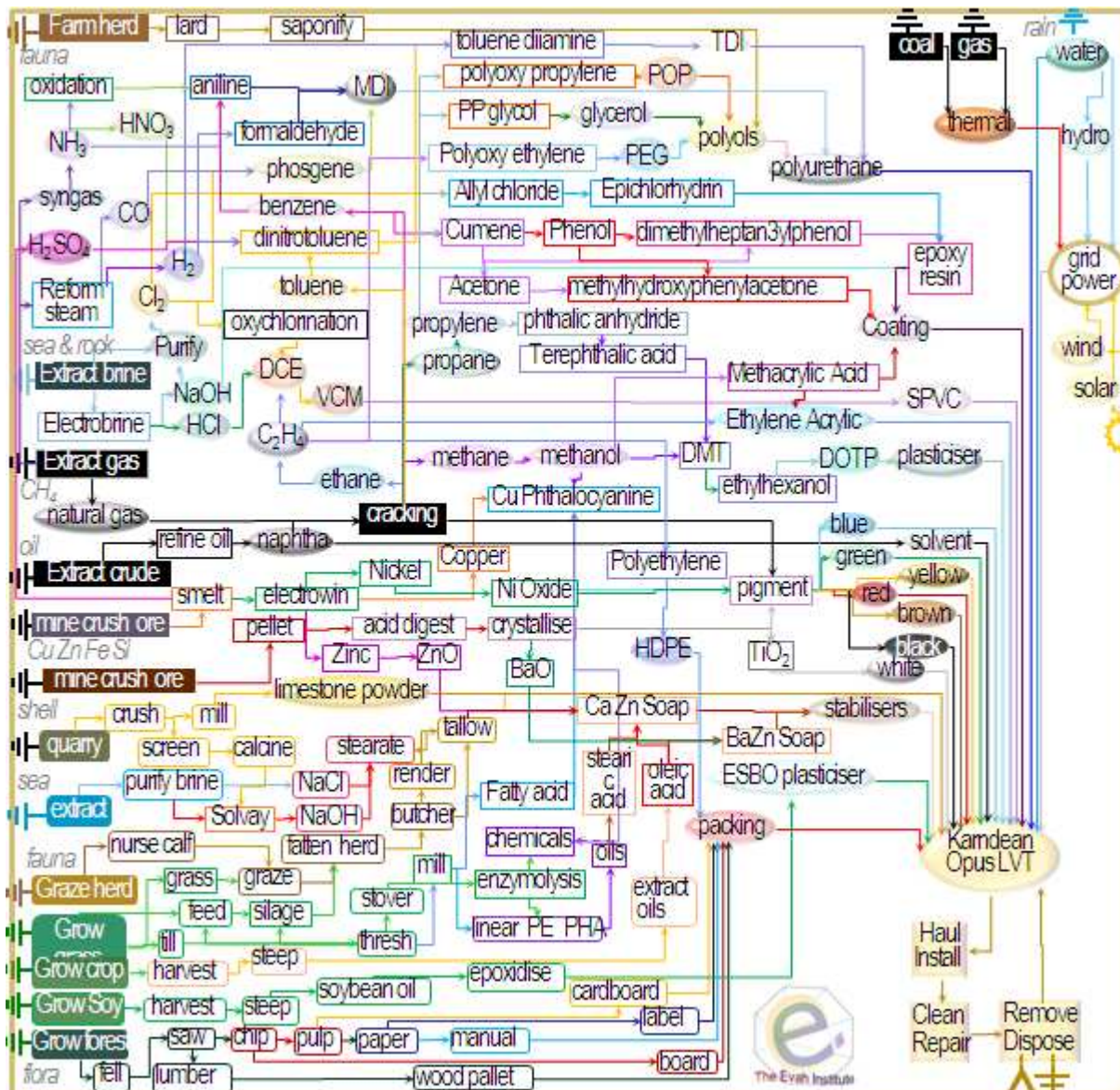


Figure 2 Major Product Operations



12. Life Cycle Assessment Method

LCA Author The Evah Institute as described at www.evah.com.au

Study Period Factory data was collected from 2012 to 2014

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 3.

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.



Phases A-D	A Produce			A Construct		B Use Built Fabric Operate						C End of life				D Fate				
Stages 1-20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Operation Modules 1-20	Acquire Resources & refine material	Dispatch, Transport, Ship & deliver	Fabricate, Finish & Pack product	Deliver, Unpack & dispatch packing	Prep, Build, Install, Scrap & Dispatch	Product Use	Clean & Maintain	Repair Product	Replace Product	Refurbish Product	Operating Energy	Operating Water	Deconstruct & Sort	Transport to Depot	Process Scrap	Disposal in Landfill	Potential Recovery	Potential Reuse	Potential Recycle	Potential Upcycled
Scope	Mandatory 1,2,3			Usual 4,5		Usual 6 to 10				Optional		Usual 13-16				Optional 17-20				
C ₂ Gate	Mandatory 1,2,3			Usual 4,5		Usual 6 to 10				Optional		Usual 13-16				Optional 17-20				
C ₂ Gate +	Mandatory 1,2,3			Usual 4,5		Usual 6 to 10				Optional		Usual 13-16				Optional 17-20				
C ₂ Grave	Mandatory 1,2,3			Mandatory 4,5		Mandatory 6 to 10				Mandatory		Mandatory 13-16				Optional 17-20				

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 information⁵ for each dataset noted, checked and updated;
- Consistency to Evah guidelines⁶ for all process technology, transport and energy demand;
- Completeness of modelling 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.

⁵ Jones D G (2004) LCI Database for Commercial Building Report 2001-006-B-15 Icon.net, Australia
⁶ Evah Tools, Databases and Methodology Queensland, Australia at <http://www.evah.com.au/tools.html>



13. 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 Deviation² (σ_g) is used to define quality as in Table 4⁷.

Table 4 Data Quality Uncertainty (U) for 2014

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.

⁷ Evah Institute data quality control system accords with UNEP SETAC Global LCI Database Quality 2010 Guidelines



14. Supply Chain Modelling Assumptions

Australian building sector rules and Evah assumptions applied are defined in Table 5.

Table 5 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 2014 to 2016
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 2014 to 2016
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 2016, GGT 2016, Boustead 2013, Simapro 2016, IBIS 2016, EcolInvent 2016
Data mix	Power grid and renewable shares updated to latest IEA 2016 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 2016; Global Green Tag Researchers 2016
Data Generator	Manufacturers, Evah Institute 2016; GGT 2016; Meta: IBIS 2016, Other pre 2016
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 stocks Δ , industry stockpiles Δ , 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 \pm 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 & EcolInvent 3.2
Validity Checks	Are made versus Plastics Europe, Ecobilan, GaBi & or Industry LCA Literature

15. 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>
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- 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
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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:

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**Global GreenTagCert™ EPD Program
Environmental Product Declaration
Compliant to ISO 14025**

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