rubisco™

Rubisco Pty Ltd

Wool Hemp Geotextile
15 Sheffield Crescent,
Burnside, Christchurch,
New Zealand

EPD Registration No.	RC01 2025EP
Issue Date	04 Aug 2025
Valid Until	04 Aug 2030
EPD Type	Cradle to grave
Geographical Scope	New Zealand

Mandatory Disclosures

EPD Verification and LCA Detail			
Range Name	Rubisco Geotextiles	**Valid Until**	04 August 2030
Product Name	Wool Hemp Geotextile	**EPD Number**	RC01 2025EP
EPD type	Cradle to Grave	**Issue Date**	04 August 2025
Objectives	To show imperatives and results towards improved environmental viability considering increasing disasters attributable to anthropogenic climate change.		
Communication	This EPD discloses potential environmental outcomes compliant with ISO14025:2010 for business-to-business communication. [a] I independent external verification of this declaration and data is underway to ensure fitness for business-to-consumer communication [1].		
Reliability	LCIA results are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins or risks.		
Comparability	Different program EPDs may not be comparable. Comparability is further dependent on the product category rules and data source used.		
Product Category Rules (PCR)	EPD compliant with ISO14025 and EN15804 standard impact assessment method, EN15804 standard PCR and sub PCR2005 GEV1 Geotextile [1, 2, 3]		

EPD Program Operator	LCA and EPD Producer	Declaration Owner
Ecquate Pty Ltd 43 Fords Road Thirroul NSW 2515 Australia Phone: +61 2 4231 1777 https://www.ecquate.com/	The Evah Institute 21 Roslyn Crt. Mt. Tamborine QLD 4272 Australia Phone: +61 (0)7 5545 0998 http://www.evah.institute	Rubisco Pty Ltd 15 Sheffield Crescent Burnside Christchurch, New Zealand Phone: +64 (3) 358 5015 http://www.rubisco.co.nz

Demonstration of Verification	
☑ Internal	Delwyn Jones 21 July 2025 LCA Developed by Delwyn Jones, The Evah Institute
☑ External	03/08/2025 Certifier review by Dr Nana Bortsie-Aryee, Global GreenTag International Pty Ltd
☑ External	I, the undersigned, 3rd party 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 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. 25 July 2025 Third Party Verifier, Dr Sharmina Begum, The Evah Institute Associate Engineer Perth Western Australia 6846.
Explanations	Further explanatory information is available at www.ecquate.com or by contacting murrayjones@ecquate.com

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 material & energy acquisition, processing, manufacture, transport, installation, use & waste arising to end of life.
Stages included	All known operations and stages in modules A1 to D3 are included but no flows occur from module B2 maintenance through repair, refurbishment, operation demolition, waste freight or processing, disposal, reuse, recovery to recycling D3
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 C_2F & beyond system to Cradle (C_2C)	Resources	Transport	Manufacture	Transport	Construct	Use	Maintain	Repair	Replace	Refurbish	Energy use	Water use	Demolish	Transport	Process Waste	Disposal	Reuse	Recovery	Recycling

Figure 1 Modules A to C Within the Cradle to Grave System Boundary and D Beyond

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
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 was <10 years and quality parameters are tabled below [1]. Cut-off & quality is ISO14025 compliant[1]. No data set with >±30% uncertainty is used.

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			

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

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.

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

Phases 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.

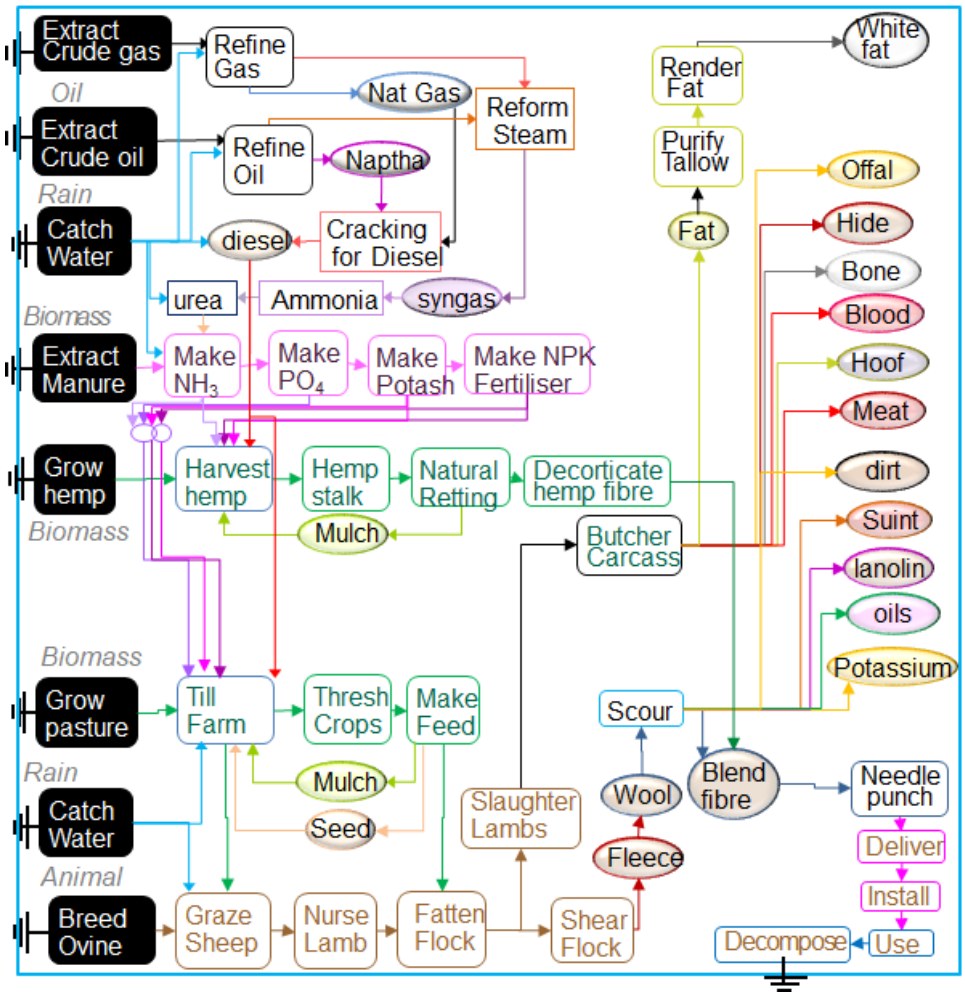

Figure 2. Product Process Flow Chart

Details of Manufacturer

Over 50 years Rubisco has transformed agricultural wisdom into textile innovation with generations of knowledge, care, innovation and excellence ensuring product performance. Today, our high-quality fibres are sold globally as our high-performance yarns and partnerships with leading designers highlights our dedication to authenticity and transparency. Together with stakeholders, we are shaping a global shift toward a more connected, beautiful future. Our hemp showcases our commitment to innovation is from dedicated farms in Canterbury via responsible sourcing programmes.

As pioneers in hemp and wool innovation, we honour nature's bio-circularity via revolutionary processes that respect natural cycles. We believe in the power of thoughtful choices. Every fibre nurtures the planet, with eco-conscious design that decomposes safely and regeneratively. Our innovative processes transform raw materials to life beyond first use. Rubisco offers a pathway toward deeper connection with the natural world. Valuing sustainability, circularity, and a more considered way of living, we inspire others in making thoughtful choices that transform industries, elevate performance, and create a regenerative tomorrow. We are leading the global shift toward high-performance, renewable materials. Our mission is to inspire the world to rethink what we wear, build, and live with, offering sustainable solutions that shape a more connected, beautiful future.

Product Information

This section provides data required to calculate assessment results factoring different mass and periods.

Manufacturing Site	15 Sheffield Crescent Burnside Christchurch, New Zealand
Site Representation and Geography	New Zealand
Range Names	Rubisco Geotextile
Brand Name & Code	Wool + Hemp Geotextile
Time	Made and sold in 2025 for single use
Functional Performance	Reduce and control soil loss and weed cover in exterior ground works.
Factory warranty	2 years
Reference Service Life	RSL 2 years with no reuse.
Declared Unit	Geotextile of given area and g/m^2 coverage[2]
Functional Unit	2 year use per kg declared product of given g/m^{2}coverage.

Primary Data Sources and Quality

This section provides primary data sources and quality parameters.

Primary Data	Data was collected in accordance with EN ISO 14044:2006, 4.3.2, from primary sources including manufacturers, suppliers and their publications on standards locations, logistics, technology, market share, management system and commitment to improved environmental performance.
Cut-off & Data quality	Criteria compliant with EN 15804:2012+A2:2019
Allocation	Physical allocation by mass and/or energy flow shares only.
Range and variability	Significant differences of mean LCIA results are declared.

Product Components Base Material Origin and Detail

This section summarises factory components, functions, source nation and % mass share. Key components by function, type, sources and % mass share are tabled below.

Function	Component	Source	Amount
Substrate	Sheep wool	New Zealand	>49<51
Substrate	Hemp	New Zealand	>49<51

[2] NRC = Noise reduction coefficient conforming to ISO11654 standard methods

Whole of life Performance

Waste	Cradle to grave waste to landfill from operations was non-hazardous.
Disposal	No production waste is sent to river, land or ocean outfalls or council landfills
Effluent	LCI results and ESCAP raised no red-light concerns in emissions to water.[3]
Wildlife safety	Low VOC, no plastics, glues or formaldehydes
Biodegradable	While different microclimates affect biodegradation rates the hemp wool 500gsm geotextile is typically fully biodegradable over 1.5 to 2 years.
Water Permeability	The hemp wool 500gsm geotextile is typically fully water permeable @111l/m^3/s which prevents water pooling and premature biodegradation.
No Chemicals of Very High Concern	Contains no substances in the "Authorised or Candidate Lists of Substances of Very High Concern (SVHCs)" with the European Chemicals Agency
Health Protection	The product does not contain levels of carcinogenic, toxic or hazardous substances that warrant ecological or human health concern cradle to grave. 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.
Environmental Health Effects	No potential in-use impacts on environment or health are known.
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.

Product Functional & Technical Performance Information

This section provides manufacturer specifications, material test data and additional information.

Material Data	**Width**	**Length**	**Coverage**
Dimensions	0.5m to 6.0 m	20m to 100m	300gsm to 900 gsm
Test data	**Result**		**Applicable standards**
Maximum Force	Warp 243N Weft 214N		Tear Test Grab Method AS2001.2.3.2-2001
	Machine 86N Lateral 85N		Tear Test Trapezoidal Method AS3706.3 2012
Bursting Pressure	708kPa (7.2kg/nm^2) SD:145.9 CV% 20.6		Burst Test Method AS2001.2.3 2012
California Bearing Ratio	Burst 0.5N, Extension: 75% Seating in Extension 1%		CBR Plunger Method AS3706.5 2000
Puncture resistance	D500: 21, h50 1980mm		Drop Cone Method AS3706.5 2000
Pore Size Distribution	0.220µm		Dry Sieving Method AS2706.7 2014
Flow Rate	111l/m^3/sec		100mm Water Head Method
Permittivity	Permittivity/s 1.11, Coefficient of Permittivity@ 104m/s 46.7		Permittivity of Geotextiles Method AS3706.9 2012

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

Inventory and Damage Impact Categories, Units and References to Methods

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

Impact & Inventory Results/Functional Unit

Result	Units	Description of Methods
Climate Change biogenic	kg CO_{2eq}	GWP sequestered from air [4]
Climate Change luluc	kg CO_{2eq}	GWP land use & change [4]
Climate Change fossil	kg CO_{2eq}	GWP fossil fuels [4]
Climate Change total	kg CO_{2eq}	Global Warming Potential [4]
Stratospheric Ozone Depletion	kg CFC_{11e}	Stratospheric Ozone Loss [5]
Photochemical Ozone Creation	kg NVOC $_{e}$	Summer Smog [6]
Acidification Potential	mol H^{+} $_{eq}$	Accumulated Exceedance [7]
Eutrophication Freshwater	kg P $_{eq}$	Excess freshwater nutrients [8]
Eutrophication Marine	kg N $_{eq}$	Excess marine nutrients [9]
Eutrophication Terrestrial	mol N $_{eq}$	Excess nutrients to land [8]
Fossil Depletion	MJ $_{ncv}$	Abiotic Depletion fossil fuel [10]
Mineral and Metal Depletion	kg Sb $_{eq}$	Abiotic Depletion minerals [9]
Water Scarcity Depletion	m^3 $_{WDP\ eq}$	Water Deprivation Scarcity [11,12]
Net Fresh Water Use	m^3	Lake, river, well & town water
Secondary Material	kg	Post-consumer recycled (PCR)
Secondary Renewable Energy Use	MJ $_{ncv}$	PCR biomass burnt
Primary Renewable Feedstock Material	MJ $_{ncv}$	Biomass retained material
Primary Renewable Energy Used	MJ $_{ncv}$	Biomass fuels burnt
Total Primary Renewable Energy	MJ $_{ncv}$	Biomass burnt + retained
Secondary Fossil Energy Use	MJ $_{ncv}$	PCR fossil-fuels burnt
Primary Fossil Feedstock Material	MJ $_{ncv}$	Fossil feedstock retained
Primary Fossil Energy Use	MJ $_{ncv}$	fossil-fuel used or burnt
Total Primary Fossil Energy Use	MJ $_{ncv}$	Fossil feedstock & fuel use
Hazardous Waste Disposed	kg	Reprocessed to contain risks
Non-hazardous Waste Disposed	kg	Municipal landfill facility waste
Radioactive Waste Disposed	kg	Most ex nuclear power stations
Components For Reuse	kg	Product scrap for reuse as is
Material For Recycling	kg	Factory scrap to remanufacture
Material For Energy Recovery	kg	Factory scrap used as fuel
Exported Energy Electrical	MJ $_{ncv}$	Uncommon for building products
Exported Energy Thermal	MJ $_{ncv}$	Uncommon for building products

Results Module A and B

Table 1 lists Module A and B environmental impact, resource use and waste results per functional unit. Modules B2 Maintain, B3 Repair, B4 Replace, B5 Refurbish, B6 Energy use, B7 Water use , C1 Demolish, C2 Transport, C4 Disposal, D1 Reuse, D2 Recover and D3 Recycle had no flows so all results are zero.

Table 1 Impact & Inventory Results Modules A and B / functional unit

Parameter	Produce	Deliver	Construct	Use
/Module	A1-3	A4	A5	B1
Environmental Impact				
Climate Change biogenic	-2.8	-1.0E-06	-6.8E-02	0.87
Climate Change luluc	-3.2E-03	1.1E-04	-8E-05	1.9E-03
Climate Change fossil	1.4	1.1E-02	3.4E-02	0
Climate Change total	-1.4	1.1E-02	-3.5E-02	0.87
Stratospheric Ozone Depletion	2.4E-08	1.7E-13	4.7E-10	0
Photochemical Ozone	0	8.1E-05	0	1.5
Acidification Potential	0	8.3E-06	0	1.2
Eutrophication Freshwater	3.0E-04	4.9E-10	7.5E-06	0
Eutrophication Marine	0	1.5E-06	0	0.13
Eutrophication Terrestrial	0	5.3E-06	0	0.43
Fossil Depletion	11.2	7.2E-06	0.26	0
Mineral and Metal Depletion	3.8E-03	1.3E-02	9.6E-05	0
Water Scarcity Depletion	0.11	2.3E-06	2.5E-03	0
Resource Use				
Net Fresh Water	0.66	1.4E-04	1.6E-02	0
Secondary Material	0	9.0E-06	0	0
Renewable Secondary Fuel	1.2	6.8E-06	2.9E-02	0
Non-renewable Secondary Fuel	-4.0E-02	7.4E-04	-2.6E-04	0
Primary Renewable Material Energy	65	2.4E-03	1.6	0
Primary Renewable Energy	7.8	3.0E-04	0.19	0
Total Primary Renewable Energy	74	2.7E-03	1.8	0
Primary Non-renewable Material Energy	4.3	0.19	9.4E-02	0
Primary Non-renewable Energy	134	0.11	0.32	0
Total Primary Non-renewable Energy	18	0.30	0.42	0
Waste Output				
Hazardous Waste	1.2E-02	2.1E-04	3.0E-04	0
Non-hazardous Waste	0.98	1.7E-03	2.4E-02	0
Radioactive Waste	1.1E-16	8.1E-31	2.8E-18	0
Components For Reuse	0.85	1.0E-04	2.1E-02	0
Material For Recycling	0.57	5.5E-05	1.3E-02	0
Material For Energy Recovery	1.0E-04	2.3E-06	1.1E-06	0
Exported Energy Electrical	0	0	0	0
Exported Energy Thermal	0	0	0	0

Life Cycle Assessment Method

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	Intercity Truck	300 km	85% Capacity	Full back load
	25t semi-trailer	200 km	85% Capacity	No back load
A5 Install	outdoors	0%	Packaging & Waste	0%
Building Modules				
B1 Use	Full decomposition modelled	0%	No other flows	0%
B2 Maintain	no	0%	fit for purpose	0%
B3 Repair	no	0%	Repair damaged	0%
B4 Replace	no	0%	No other flows	0%
B5 Refurbish	no	0%	fit for purpose	0%
B6 Energy use	off grid	0%	Solar and wind energy	100%
B7 Water use	off grid	0%	Rain and dew	100%
End of Life Modules				
C1 Demolish	no	0%	No other flows	0%
C2 Transport	no	0%	No other flows	0%
C4 Disposal	no	0%	No other flows	0%
Beyond System Boundary Modules				
D1 Reuse	no	0%	No other flows	0%
D2 Recover	no	0%	No other flows	0%
D3 Recycle	no	0%	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, metals & 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.

LCA Author	The Evah Institute is described at www.evah.institute
Study Period	Factory data was collected from 2022 to 2024
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;[4]
- Consistency to Evah guidelines for all process technology, transport and energy demand; [5]
- 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, Boustead 6, Plastics Europe, CML2, Simapro 9.5, EcoInvent 3.9 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.

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

Supply Chain Modelling Assumptions

Australian building sector rules and Evah assumptions applied are tabled below

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 year.
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 practice.
Functional Unit	A 2 year period of typical service life, use/kg applies.
System Control	
Primary Sources	Client and supplier mills, publications, websites, specifications and manuals are used.
Other Sources	Recent IEA, Ecquate, Simapro, IBIS, EcoInvent sources used & cited in LCA reports.
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 emissions.
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 Ecquate.
Data Generator	All via current manufacturers, Evah, Ecquate, IBIS & others is cited and in LCA reports.
Data Publisher	Publishers include the Evah Institute, Ecquate and designated clients only.
Contributors	All professional and personal contributors are cited in Evah & Ecquate records.
Data Flow & Mix	
System Boundary	All known resources and emissions are modelled from Earth cradles to end of life fate.
System flows	All known flows are modelled from/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	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.

LCIA Methodology References

[1] ISO 14025:2010 Environmental labels and declarations – Type III – environmental declarations - Principles and procedures

[2] EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

[3] Ecquate EPD Program Product Category Rules https://www.ecquate.com

[4] Intergovernmental Panel on Climate Change (IPCC) 2013, Assessment Report 5 Climate Change, Ch 8 Anthropogenic and Natural Radiative Forcing, Global Warming Potential 100-year, http://www.ipcc.ch

[5] WMO 2014, Ozone Depletion Potentials for Steady-state, Scientific Assessment of Ozone Depletion: 2014, Global Ozone Research and Monitoring Project Report No. 55, 2014

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