ArmstrongFlooring

Environmental Product Declaration
EN 15804+A2, ISO14025 ISO21930
Innova Homogeneous Flooring
EPD Registration No. ATXIA012026EP
EcoPlatform EPD No. ATXIA012026EP
Geographical Market Australia Global

Global GreenTag International EPD Program EPD Environmental Product Declaration

ECO PLATFORM EPD VERIFIED

ANZ Flooring Pty Ltd
29-39 Mills Road
Braeside Victoria 3195
EPD Type Cradle to grave
Valid to 29 May 2031
Issued 29 May 2026

Mandatory Disclosures

EPD type	Cradle to grave A1 to C4 + D
EPD Number	ATX IA 01 2026EP
Issue Date	30th May 2026
Valid Until	30th May 2031
Demonstration of Verification	
Product Category Rules	Standard EN 15804+A2 2019 serves as core Product Category Rules [1]. Sub-PCR FC:2022v1 Floor Coverings also applies [2]
Owner	This EPD is the property of the declared manufacturer.
☑ Internal	Delwyn Jones 29 05 2026 — LCA & EPD developer Delwyn Jones, Director Ecquate David Baggs 29.06.2026 — EPD Reviewed by David Baggs, Global GreenTag Pty Ltd
Communication	This EPD discloses potential environmental outcomes compliant with EN 15804 for business-to-business communication.
Comparability	Construction product EPDs may not be comparable if not EN15804 compliant. Different program EPDs may not be comparable. Comparability is further dependent on the product category rules and data sources used.
Reliability	LCIA results are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins or risks.

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	The Evah Institute 21 Roslyn Crt, Tamborine QLD 4217 Australia Phone: +61 (0)7 5545 0998 https://evah.institute/	ANZ Flooring Pty Ltd 29-39 Mills Road, Braeside Victoria 3195 Phone: +61 (0)3 9586 5500 www.armstrongflooring.au

Global GreenTag International green product certification trust brands — The Evah Institute Becoming Ecopositive — Armstrong Flooring

☑ External	I, the undersigned, 3rd party verifier, hereby confirm my examination did not find any relevant deviations by the EDP owner, LCA report or Product Category Rules based on EN 15804 2012+A2:2019 and ECO Platform agreed interpretations by CEN TR 16970. Company-specific, upstream and downstream data in 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 product category and programme rules.
	Begum 03 June 2026 — Third Party Verifier[a], Dr Sharmina Begum, Engineer, Piara Waters, Western Australia, sharmina628@gmail.com — ECO PLATFORM [a] Independent external verification of the declaration and data, mandatory for business-to-consumer communication according to ISO 14025:2010 [3].
Explanations	Further explanatory information is available at info@globalgreentag.com or by contacting certification@globalgreentag.com [3].

Program Description

EPD type	Cradle to grave scope EPD as defined by EN 15804 [1]
System boundary	The system boundary with nature includes material and energy acquisition, processing, manufacture, transport, installation, use to end of life plus waste arising.
Information Modules	Figure 1 depicts all modules assessed including some with zero results. Any module not declared (MND) does not indicate a zero result.

Information	Building Life Cycle Assessment																Supplementary		
Model	Actual			Scenarios													Potential		
Stages	Product			Construct		Building: Fabric					Building: Operation		End-of-Life				Benefit & load beyond system		
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3
Mandatory (M) & Optional (O) Unit Operations	Resources	Transport	Manufacture	Transport	Construct	Use	Maintain	Repair	Replace	Refurbish	Energy use	Water use	Demolish	Transport	Process Waste	Disposal	Reuse	Recovery	Recycling
Cradle to Gate+ Options (O)	Mandatory			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Grave				M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	O

Scope Depiction	***Figure 1 Life Cycle Modules***
Stages included	A1-3 A4-5, B1-5, C1-4 & D1.
Stages excluded	No stage was excluded, however B1, B6, B7 and C3 have zero flow with zero result.

Data Sources and Quality

Primary Data	Data was collected from primary sources, 2019 to 2022, including the manufacturer, suppliers and their publications on standards, locations, logistics, market share, technology and management system in accordance with EN ISO 14044:2006, 4.3.2, [4]. All are biochemical and physical allocated none are economically allocated.
Variability Range	Significant differences of average LCIA results are shown.
Data cut-off & quality criteria	Complies with EN 15804 [1]. The LCA used background data aged <10 years and quality parameters tabled below.

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	Experts 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
	Representation	Global. Africa, America, Europe, Pacific Rim			

Completeness

No Chemicals of Very High Concern	Contains no substances in the European Chemicals Agency "Authorised or Candidate Lists of Substances of Very High Concern (SVHCs)".
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 gates; manufacture of inputs, ancillary material, product, packaging, maintenance, replacement plus flows leaving at end-of-waste boundary as well as fates of all flows at end of life.

Product Information

Range Names in full	Homogeneous flooring sheet
Product Name & Code	Innova
Manufacturer	ANZ Flooring Pty Ltd
Factory warranty	10 years
Manufacturer address	29-39 Mills Road, Braeside Victoria 3195
Site representation	29-39 Mills Road, Braeside Victoria 3195
Application	Coated and reinforced floor covering
Function in Building	Interior dry-area resilient floor covering
Specification	Homogeneous mineral-filled polyvinyl chloride sheet
Declared unit	1 kg=0.3319 m^2 of uncoated homogeneous Armstrong flooring
Functional unit	20 years use of declared 3.01 kg/m^2 floor covering per kilogram
Design Application	Health Care, Education, Hospitality, Mercantile and Light Industrial buildings.
Practices Reference	https://www.armstrongflooring.au/pages/maintenance
Installation Procedure	https://www.armstrongflooring.com/residential/en-us/customer-service-support/installation-guides
Practicality	Protective coating reduces maintenance and increases scuff resistance.
Durability	Excellent dent and gouge resistance. Embossed surface texture and high-visual colour chip masks dirt and wear marking in high traffic areas.

Product Functional & Technical Performance

This section provides base material components, manufacturer specifications and additional information to calculate results factoring different mass and periods.

Base material content (%mass)

Function	Component	Cradle	%
Post consumer recycled (PCR) content	Homogenous	Australia	50
Home scrap	Homogenous	Australia	49
Coating	Polyurethane	Singapore	>0.6 <1.0
Packing			
Carton & core	Cardboard 90% PCR	Australia	0.09
Wrap, spacer	Card & paper 90% PCR	Australia	0.83
Tape & liner	Polymer 55% PCR	Australia	0.05
Spools	Plastic	Australia	0.04
Tape & label	Paper	Australia	0.04

Conformance to standards

Service	Standards	Parameters	Conformance to standards
Type	ISO 10581	Resilient floor covering	Homogeneous sheet vinyl
Performance		Homogeneous floor covering	√
Binder content		Type	1
Use area classification	ISO 10874	Commercial	34
		Light Industrial	43
Lifetime [5 & 6]	ISO 15686	Reference Service Life (RSL)	20 years RSL
Dimensions	ISO 24340	Wear layer thickness	2.0mm
	ISO 24341	Roll Width*Length	1.83*16m W*L
	ISO 24346	Overall thickness	2.0mm
Durability	EN 660-2	Wear resistance group	T
Slip resistance	AS 4586 Appendix	A: Wet pendulum	P3
		D: Oil-wet	R10
Emissions	ASTM D5116	Volatile Organic Compound	<0.5mg/m^2/hour
Reaction to fire	ISO 9239-1	Critical radiant flux	≥8kW/m^2
		Smoke development rate	≤750%.minutes
Fire resistance	AS 5637.1	Cone calorimeter	Group 3
	AS/NZS 3837	Average specific extinction area	<250m^2/kg

System Analysis Scope and Boundaries

Stages A1 to 3 model actual operations but stages A4 to C4 assume typical scenario operation forecasts described in the next section.

Figure 2. shows these processes in a cradle to cradle system boundary to end of life fates beyond the boundary not shown to reuse, recycling or landfill.

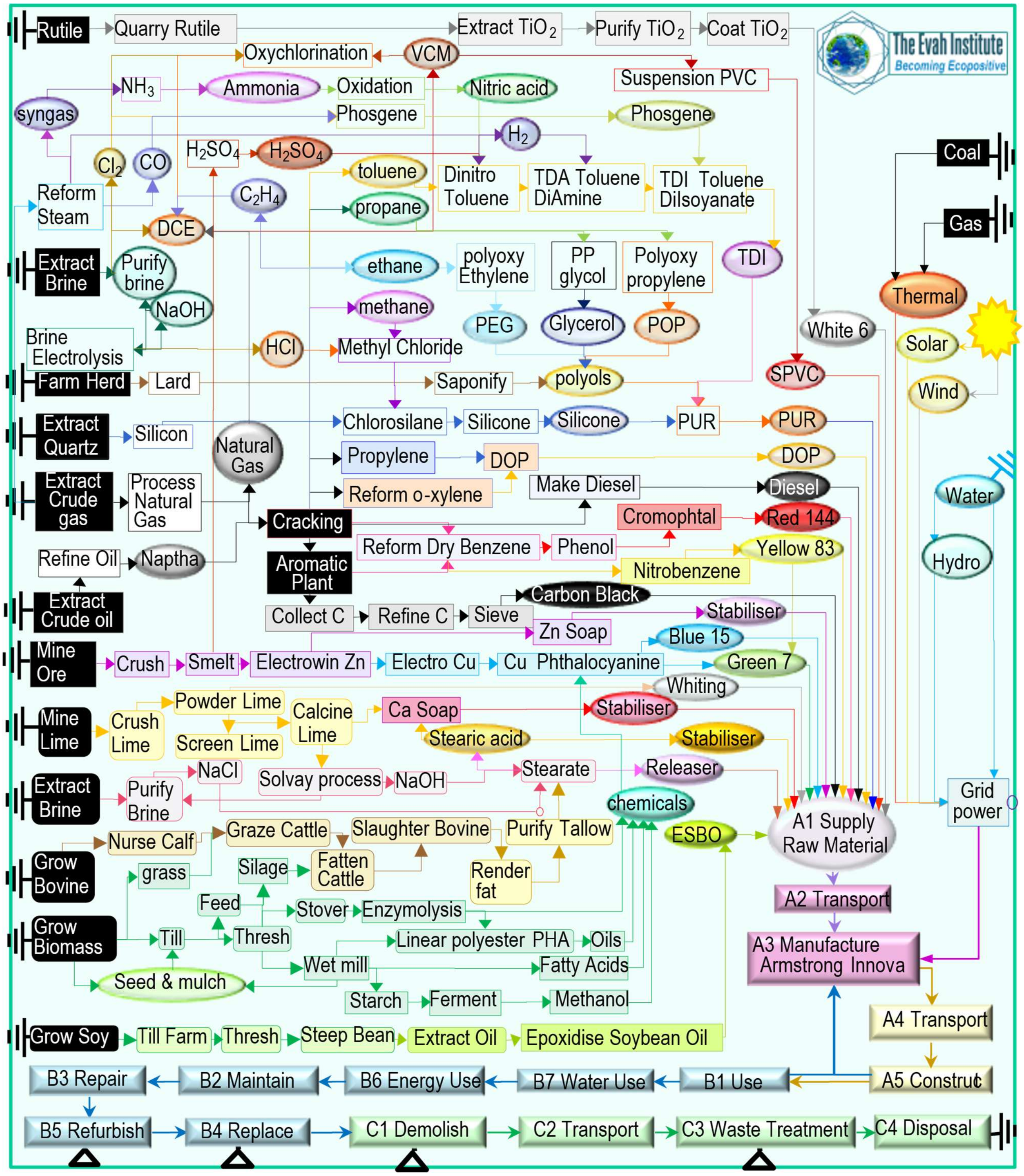

Figure 2. Product Process Flow Chart

Scenarios for Modules (Units/Functional Unit)

This section defines modelling scenarios. Stages A1 to A3 model actual operations. Stage A4 to D3 model scenarios described as listed below.

Construction

A4 Transport to Site	Type specified	Amount	Type specified	Amount
Intercity road trucking	2t to 5t vans	220 km	85% Capacity	Full back load
Long distance road trucking	25t semi-trailer	600 km	85% Capacity	Full back load
Continental freight rail	Diesel train	600 km	85% Capacity	Full back load
Global container shipping	Factory to CBD	1,200km	85% Capacity	Full back load
Volume capacity (<1 to ≥1)	Utilisation factor	1	Uncompressed	Un-nested
A5 Installation: Ancillaries	Adhesive	0.025 kg	Edge trim	0.0001 kg
Packing	Cardboard	0.005 kg	Polymer	0.00001 kg
Water & Energy	Town water	0.00 m^3	Energy type	0.0 MJ
Waste on site	Trims	0.05 kg	All packaging	As shown kg
Scrap, collection & routes	Full recycling	0.05 kg	Energy recovery	0.0 kg
Emissions	Nil to air & water	0.0 kg	All from landfill	In LCA report

Building

Stage B2 and B3 scenarios are listed below. Stages B1 Use of building fabric, B4 Replacement, B5 Refurbishment, B6 Building Operating Energy and B7 Building Operating Water each have zero flows

B2 Maintenance	Type specified	Amount	Type specified	Amount
Maker's specified process	URL shown	Specified	Clean cycle	Weekly
Ancillary material (kg)	Scrubber pads	Negligible	Detergent	0.007kgpa
Washing net water use	Town water	1.95kgpa	To drain 1.90	kg pa
Vacuum cleaning energy	Once weekly	1.62MJpa	Power mix	Local AU mean
B3 Repair	Damaged parts	0.05kg	Worn parts	Same 5%
Maker's specified process	As per website	Specified	Freight to site	As A5
Energy input & source	No excess	0.0MJpa	Packaging	As A5

End of Life

Stage C1, C2 and C4 scenarios are listed below. Stage C3 Waste Treatment has zero flows.

C1 Demolition	Type specified	Amount	Type specified	Amount
Operation	Take up worn area	0.40kg	Collection	Separate
Collection process	In site waste	0.40kg	Separate to reuse	0.0kg
C2 Transport	25t truck road	50km	85% capacity	No back load
C4 Disposal	Product specific	0.40kg	Collect separately	0.40kg
Typical Scenario	high wear to landfill	40%	All emissions	mass share
Recovery system	Recycling	0.05 kg	Not for energy	0.0 kg

Beyond System Boundary

Stage D1 scenario is listed below. Stages D2 Recovery and D3 Recycling have zero flows.

Typical Scenario	Type specified	Amount	Type specified	Amount
D1 Reuse	Retain low wear	75%	Reuse in place	0.75kg
D2 Recovery	Recover low wear	20%	Reuse as repair	0.20kg
D3 Recycle	Recycle hi wear	05%	Recycle off site	0.05kg

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 force, 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, 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 rain and snow precipitation 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.

Glossary of Terms and Units

Impact potentials, inventory inputs and outputs, acronyms, methods and units are defined below

Impact Potentials	Description of Methods	Units
Climate Change biogenic	GWP biogenic [7]	kg CO_{2eq}
Climate Change land use	GWP land use & change [7]	kg CO_{2eq}
Climate Change fossil	GWP fossil fuels [7]	kg CO_{2eq}
Climate Change total	Global Warming Potential [7]	kg CO_{2eq}.
Stratospheric Ozone Depletion	Stratospheric Ozone Loss [8]	kg CFC_{11eq}
Photochemical Ozone Creation	Summer Smog [9]	kg $NMOC_{eq}$
Acidification Potential	Accumulated Exceedance [10]	mol H^{+}_{eq}
Eutrophication Freshwater	Excess nutrients freshwater [11]	kg P_{eq}
Eutrophication Marine	Excess marine nutrients [11]	kg N_{eq}
Eutrophication Terrestrial	Excess terrestrial nutrients [11]	mol N_{eq}
Fossil Fuel Depletion	Abiotic depletion fossil fuel [13]	MJ_{ncv}
Mineral & Metal Depletion	Abiotic depletion minerals [12]	kg Sb_{eq}
Water Depletion	Water Deprivation Scarcity [14,15]	$m^3{}_{WDP\ eq}$
Fresh Water Net	Lake, river, well & town water	m^3
Secondary Material	PCR feedstock	kg
Secondary Renewable Fuel	PCR biomass burnt	MJ_{ncv}
Secondary Unrenewable Fuel	PCR fossil-fuels burnt	MJ_{ncv}
Primary Renewable Feedstock	Biomass retained material	MJ_{ncv}
Primary Renewable Energy not material	Biomass fuels burnt	MJ_{ncv}
Primary Renewable Energy Total	Biomass burnt + retained	MJ_{ncv}
Primary Unrenewable Feedstock	Fossil feedstock retained	MJ_{ncv}
Primary Unrenewable Energy not material	fossil-fuel used or burnt	MJ_{ncv}
Primary Unrenewable Energy Total	Fossil feedstock & fuel use	MJ_{ncv}
Hazardous Waste Disposed	Processed to contain hazard risks	kg
Non-hazardous Waste Disposed	Municipal landfill facility waste	kg
Radioactive Waste Disposed	Mostly nuclear power station waste	kg
Components For Reuse	Production scrap for reuse as is	kg
Material For Recycling	Factory scrap for remanufacture	kg
Material For Energy Recovery	Production scrap for use as fuel	kg
Exported Energy Electrical	Common for buildings not products	MJ_{ncv}
Exported Energy Thermal		MJ_{ncv}

Module A1 to C4 Impact & Inventory Results Cradle to Grave

Table 1.0 shows results for A1 to A3, A4 Transport and A5 Construction Modules

Table 1 Impact & Inventory Results A1 to B7 /Functional Unit

Impact Potentials	A1-3	A4	A5
Climate Change biogenic	-3.5E-02	-1.2E-06	-5.2E-03
Climate Change land use	-1.5E-03	-3.7E-06	-7.4E-05
Climate Change fossil	5.1	1.1E-02	0.38
Climate Change total	5.0	1.1E-02	0.37
Stratospheric Ozone Depletion	1.4E-08	1.6E-13	9.7E-09
Photochemical Ozone Creation	1.7E-02	8.1E-05	1.7E-03
Acidification Potential	7.9E-03	8.3E-06	7.0E-04
Eutrophication Freshwater	1.3E-06	4.9E-10	2.3E-05
Eutrophication Marine	1.4E-03	1.5E-06	1.3E-04
Eutrophication Terrestrial	1.1E-02	5.3E-06	9.7E-04
Fossil Fuel Depletion	2.1	1.3E-02	0.22
Mineral & Metal Depletion	8.1E-05	7.2E-06	1.2E-05
Water Depletion	2.6E-03	2.3E-06	1.7E-03
Fresh Water Net	1.6E-02	1.4E-05	1.1E-02
Secondary Material	1.1	9.0E-07	5.4E-02
Secondary Renewable Fuel	0.08	1.6E-06	6.4E-03
Non-Renewable Secondary Fuel	0.13	7.4E-04	3.0E-03
Primary Energy Renewable Feedstock	0.41	2.4E-03	3.4E-02
Primary Energy Renewable not Material	3.1	4.5E-04	0.24
Primary Energy Renewable Total	3.6	2.9E-03	0.28
Primary Non-Renewable Material	18	6.5E-02	1.2
Primary Energy Non-Renewable Not Material	78	0.11	3.3
Primary Energy Non-Renewable Total	95	0.18	4.5
Hazardous Waste Disposed	4.1E-03	2.1E-05	7.1E-04
Non-hazardous Waste Disposed	8.8E-02	1.7E-04	3.5E-02
Radioactive Waste Disposed	6.2E-17	8.1E-32	6.7E-18
Components For Reuse	8.5E-10	1.0E-05	4.3E-11
Material For Recycling	5.1E-02	5.5E-06	2.7E-03
Material For Energy Recovery	1.1E-03	2.3E-07	2.3E-04
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

Module B1 to B4 Impact & Inventory Results Cradle to Grave

Table 2.0 shows results for Modules B1 Building fabric Use, B2 Maintain B3 Replace B4 Replace, B5 Refurbish, B6 Operating energy and B7 Operating water.

Table 2 Impact & Inventory Results B1 to B7 /Functional Unit

Impact Potentials	B1	B2	B3	B4	B5	B6	B7
Climate Change biogenic	0	-8.8E-02	-2.2E-03	0	0	0	0
Climate Change land use	0	-3.4E-04	-1.5E-04	0	0	0	0
Climate Change fossil	0	0.66	0.26	0	0	0	0
Climate Change total	0	0.57	0.26	0	0	0	0
Stratospheric Ozone Depletion	0	2.6E-09	1.0E-09	0	0	0	0
Photochemical Ozone Creation	0	2.7E-03	8.6E-04	0	0	0	0
Acidification Potential	0	1.1E-03	3.9E-04	0	0	0	0
Eutrophication Freshwater	0	5.8E-07	3.9E-05	0	0	0	0
Eutrophication Marine	0	1.9E-04	7.0E-05	0	0	0	0
Eutrophication Terrestrial	0	1.4E-03	4.6E-04	0	0	0	0
Fossil Fuel Depletion	0	0.43	0.12	0	0	0	0
Mineral & Metal Depletion	0	2.8E-04	7.0E-06	0	0	0	0
Water Depletion	0	8.8E-03	2.3E-04	0	0	0	0
Fresh Water Net	0	5.5E-02	1.4E-03	0	0	0	0
Secondary Material	0	3.3E-02	4.8E-03	0	0	0	0
Secondary Renewable Fuel	0	0.19	1.5E-03	0	0	0	0
Non-Renewable Secondary Fuel	0	3.8E-02	8.2E-03	0	0	0	0
Primary Energy Renewable Feedstock	0	0.97	2.2E-02	0	0	0	0
Primary Energy Renewable not Material	0	0.71	0.13	0	0	0	0
Primary Energy Renewable Total	0	1.9	0.15	0	0	0	0
Primary Non-Renewable Material	0	1.3	0.76	0	0	0	0
Primary Energy Non-Renewable Not Material	0	6.5	2.0	0	0	0	0
Primary Energy Non-Renewable Total	0	7.8	2.7	0	0	0	0
Hazardous Waste Disposed	0	9.1E-04	4.1E-04	0	0	0	0
Non-hazardous Waste Disposed	0	9.0E-02	5.5E-02	0	0	0	0
Radioactive Waste Disposed	0	1.9E-17	5.3E-18	0	0	0	0
Components For Reuse	0	3.4E-08	2.4E-11	0	0	0	0
Material For Recycling	0	7.0E-02	1.7E-03	0	0	0	0
Material For Energy Recovery	0	3.1E-05	4.6E-05	0	0	0	0
Exported Energy Electrical	0	0	0	0	0	0	0
Exported Energy Thermal	0	0	0	0	0	0	0

Module A1 to C4 Impact & Inventory Results Cradle to Grave

Table 3.0 shows results for Modules C1 Demolish, C2 Transport C3 Waste Processing and C4 Disposal.

Table 3 Impact & Inventory Results C1 to C4 /Functional Unit

Impact Potentials	C1	C2	C3	C4
Climate Change biogenic	-2.2E-08	-9.30E-07	0	-3.5E-04
Climate Change land use	-4.0E-11	2.40E-06	0	-8.9E-07
Climate Change fossil	3.2E-06	6.20E-03	0	3.6E-03
Climate Change total	3.2E-06	6.20E-03	0	3.2E-03
Stratospheric Ozone Depletion	1.4E-19	1.1E-13	0	1.0E-11
Photochemical Ozone Creation	1.3E-08	6.0E-05	0	2.3E-05
Acidification Potential	1.8E-08	5.1E-06	0	4.7E-06
Eutrophication Freshwater	6.3E-16	3.1E-10	0	2.4E-09
Eutrophication Marine	1.0E-09	9.4E-07	0	8.0E-07
Eutrophication Terrestrial	6.8E-09	3.2E-06	0	5.2E-06
Fossil Fuel Depletion	1.4E-06	7.5E-03	0	3.2E-03
Mineral & Metal Depletion	1.7E-14	4.0E-06	0	2.1E-06
Water Depletion	1.5E-10	1.4E-06	0	6.4E-06
Fresh Water Net	9.2E-10	8.7E-06	0	4.0E-05
Secondary Material	1.5E-09	5.9E-07	0	1.3E-04
Secondary Renewable Fuel	3.2E-15	1.0E-06	0	7.5E-04
Non-Renewable Secondary Fuel	-1.5E-12	4.8E-04	0	2.4E-04
Primary Energy Renewable Feedstock	-2.7E-08	1.6E-03	0	4.2E-03
Primary Energy Renewable not Material	8.0E-04	3.3E-04	0	2.1E-03
Primary Energy Renewable Total	8.0E-04	1.9E-03	0	7.1E-03
Primary Non-Renewable Material	4.0E-07	3.7E-02	0	1.4E-02
Primary Energy Non-Renewable Not Material	2.6E-05	6.3E-02	0	3.6E-02
Primary Energy Non-Renewable Total	2.6E-05	0.10	0	5.0E-02
Hazardous Waste Disposed	1.2E-10	1.2E-05	0	6.4E-06
Non-hazardous Waste Disposed	1.2E-07	9.6E-05	0	3.8E-04
Radioactive Waste Disposed	1.6E-40	6.4E-32	0	7.6E-20
Components For Reuse	1.0E-05	1.0E-05	0	1.4E-10
Material For Recycling	3.6E-08	3.9E-06	0	5.0E-02
Material For Energy Recovery	4.7E-16	1.5E-07	0	1.5E-07
Exported Energy Electrical	0	0	0	0
Exported Energy Thermal	0	0	0	0

Module D Results Beyond System Boundaries over building life

Table 4 shows less damage from D1:75% Reuse, D2:Recover 20% and D3:Recycle 5%.

Table 4 Impact & Inventory Results D1 to D3 /Functional Unit

Flows	D1	D2	D3
Climate Change biogenic	2.7E-02	7.3E-05	1.8E-05
Climate Change land use	1.1E-03	3.0E-06	7.5E-07
Climate Change fossil	-3.8	-1.0E-02	-2.6E-03
Climate Change total	-3.8	-1.0E-02	-2.5E-03
Stratospheric Ozone Depletion	-1.1E-08	-3.1E-11	-7.7E-12
Photochemical Ozone Creation	-1.3E-02	-3.5E-05	-8.8E-06
Acidification Potential	-6.0E-03	-1.6E-05	-4.0E-06
Eutrophication Freshwater	-3.6E-06	-9.5E-09	-2.4E-09
Eutrophication Marine	-1.1E-03	-2.9E-06	-7.3E-07
Eutrophication Terrestrial	-8.6E-03	-2.3E-05	-5.7E-06
Fossil Fuel Depletion	-1.6	-4.3E-03	-1.1E-03
Mineral & Metal Depletion	-6.8E-05	-1.8E-07	-4.5E-08
Water Depletion	-2.2E-03	-5.8E-06	-1.4E-06
Fresh Water Net	-1.3E-02	-3.6E-05	-8.9E-06
Secondary Material	-0.81	-2.2E-03	-5.4E-04
Secondary Renewable Fuel	-6.2E-02	-1.6E-04	-4.1E-05
Secondary Unrenewable Fuel	-9.4E-02	-2.5E-04	-6.3E-05
Primary Renewable Feedstock	-0.31	-8.4E-04	-2.1E-04
Primary Renewable Energy not material	-2.4	-6.3E-03	-1.6E-03
Primary Renewable Energy Total	-2.7	-7.3E-03	-1.8E-03
Primary Unrenewable Feedstock	-6.7	-1.8E-02	-4.5E-03
Primary Unrenewable Energy not material	-28	-7.6E-02	-1.9E-02
Primary Unrenewable Energy Total	-35	-9.4E-02	-2.3E-02
Hazardous Waste Disposed	-3.1E-03	-8.4E-06	-2.1E-06
Non-hazardous Waste Disposed	-7.0E-02	-1.9E-04	-4.6E-05
Radioactive Waste Disposed	-4.7E-17	-1.3E-19	-3.1E-20
Components For Reuse	-7.5E-06	-2.0E-08	-5.0E-09
Material For Recycling	-3.9E-02	-1.0E-04	-2.6E-05
Material For Energy Recovery	-8.5E-04	-2.3E-06	-5.7E-07
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

Interpretation

This section interprets results. Table 5 lists component share % mass/kg cradle to gate. Half of the componentry is PCR scrap collected after flooring fitout for remanufacture. Other components are of home scrap roll ends and edge strips except for Polyurethane applied as primary product.

Table 5 Components%/kg

Component Types	%
PCR homogenous flooring	50.0
Polyvinylchloride (PVC) binder	21.0
Limestone mineral filler	20.4
Dioctyl Terephthalate (DOTP)	6.1
Additives & Pigments	2.6
Polyurethane (PUR) coating	1.2

Table 6 lists gross embodied energy types in the product cradle to gate. Most energy use is fossil fuel as is most feedstock material. All stabiliser, plasticiser and coating polymers, however, contain biomass feedstock in Calcium zinc soap, epoxidised soybean oil, dioctyl adipate, diphenyl octyl Phosphite, DOTP and PUR.

Table 6 EE MJ/kg

Fuel & Feedstock Types	MJncv
Fossil Energy	78
Fossil Feedstock	18
Renewable Energy	3.1
Biomass Feedstock	0.4

Figure 3 charts greenhouse effect forcing Global Warming Potential (GWP) in $CO_{2eq\ 100yr}$ versus Abiotic Depletion of Fossil Fuel (ADP_{ff}) /kg cradle to grave. It shows most GWP emissions from Modules A1 to A3.

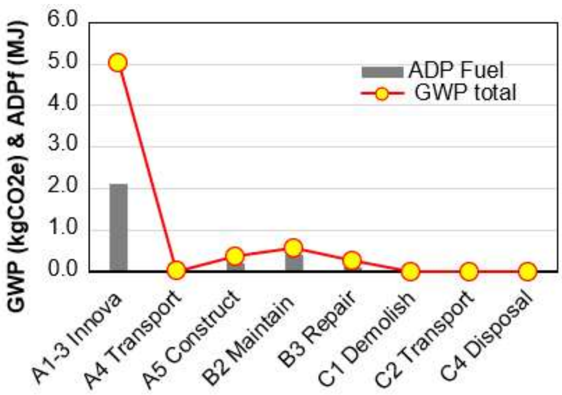

Figure 3 GWP Vs ADPff /kg A1-C4

Figure 4 charts GWP versus gross Photochemical Ozone Creation (POCP) i.e. Smog, Acidification Potential (AP H+) and secondary material/kg cradle to grave. It shows GWP associated with POCP and AP H+. All 3 emissions to air, mainly from Victorian grid brown coal power use are all highest in A1 to A3, cradle to gate.

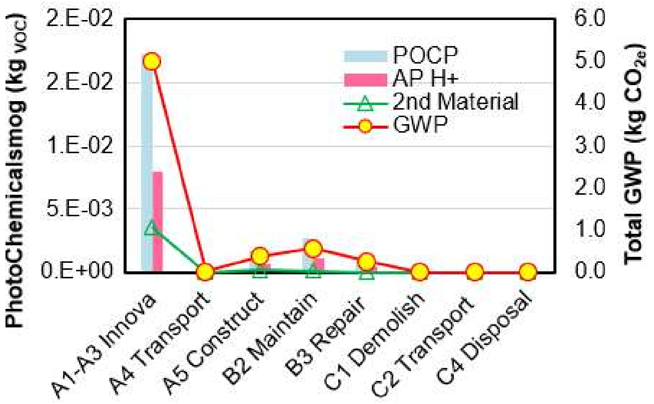

Figure 4 GWP Vs POCP, AP & 2nd Material //kg A1-C4

Life Cycle Assessment Method

LCA Author	The Evah Institute is described at https://evah.institute/
Study Period	Factory data was collected from 2022 to 2026.
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;[1]
- Consistency to Evah guidelines for all process technology, transport and energy demand; [2]
- 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

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

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.

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 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
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 used.
Other Sources	Recent IEA, GGT, SimaPro, IBIS, EcoInvent sources used and cited in the 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 GGTI.
Data Generator	All via current manufacturers, Evah, GGTI, IBIS and others is cited and in LCA reports.
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 fate.
System flows	All known flows are modelled from and to air, land, water and community sources &
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	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	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.

References

[1] EN15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

[2] GreenTag™ 2021 EPD Program, Product Category Rules https://www.globalgreentag.com/EPD.

[3] ISO14025:2010 Environmental labels and declarations, Type III environmental declarations Principles & procedures.

[4] ISO14044:2006 Environmental management – LCA – Requirements and guidelines.

[5] ISO15686-2:2012 Buildings and constructed assets - Service life planning - Part 2: Service life prediction.

[6] ISO15686-8:2008 Buildings and constructed assets - Service-life planning - Part 8: Reference service life and service-life estimation.

[7] IPCC 2013, Global Warming Potential 100-year, IPCC Fifth Assessment Report Climate Change.

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

[9] Van Zelm, R., Huijbregts, M., Hollander, H., Jaarsveld, H., Sauter, F., Struijs, J., Wijnen, H., Van de meent, D. 2008, European characterization factors for human health damage of PM10 and ozone in LCIA, Atmos Environ 42(3):441-453, LOTOS-EUROS. DOI: 10.1016/j.atmosenv.2007.09.072

[10] Seppälä, J., Posch, M., Johansson, M. & Hettelingh, J-P. 2006 Country-dependent Characterisation Factors for Acidification and Terrestrial Eutrophication Based on Accumulated Exceedance as an Impact Category Indicator, Int J of LCA 11(6):403-416 Nov 2006 DOI:10.1065/lca2005.06.215

[11] Posch, M., Seppälä, J., Hettelingh, J-P. & Johansson, M. (2008) The role of atmospheric dispersion models and ecosystem sensitivity in the determination of characterisation factors for acidifying and eutrophying emissions in LCIA, Sept 2008, I J LCA 13(6):477-486. DOI:10.1007/s11367-008-0025-9

[12] Struijs, J., Beusen, A., van Jaarsveld, H. & Huijbregts, M.A.J. (2009b). Aquatic Eutrophication. Ch 6 in: Goedkoop, M., Heijungs, R., Huijbregts, M.A.J., De Schryver, A., Struijs, J., Van Zelm, R. (2009). ReCiPe 2008 A life cycle impact assessment method comprising harmonised category indicators at the midpoint and the endpoint level. Report I: Characterisation factors, 1st Ed. EUTREND model.

[13] CML–IA V4.1 LCA methodology, 2002, October 2012, Institute of Environmental Sciences (CML), Faculty of Science, University of Leiden, Netherlands.

[14] Guinée et al., 2002, & van Oers et al., 2002 CML LCA methodology 2002a, CML, Netherlands.

[15] Boulay, A-M., Bare, J., Benini, L., Berger, M., Lathuilliere, M., Manzardo, A., Margni, M., Motoshita, M., Núñez, M., Pastor, A., Ridoutt, B. Oki, T. Worbe, S. & Pfister, S (2018). The WULCA consensus characterization model for water scarcity footprints: assessing impacts of water consumption based on available water remaining (AWARE) I J LCA. 23. 1-11. 10.1007/s11367-017-1333-8.

Bibliography

Ciroth A., Hildenbrand J., Zamagni A. & Foster C., 2015, Data Review Criteria. Annex A: LCI Dataset Review Criteria, 10.13140/RG.2.1.2383.4485 UN EP Life Cycle Initiative

EN ISO14024:2000, Environmental labels and declarations - Type I environmental labelling -Principles and procedures (ISO 14024:1999).

EN ISO14040:2006, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006).

EN15643-1:2010, Sustainability of construction works - Sustainability assessment of buildings - Part 1: General framework.

EN15643-2, Sustainability of construction works - Assessment of buildings - Part 2: Framework for the assessment of environmental performance.

EN16449, Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide.

ISO21930:2007 Sustainability in building construction - Environmental declaration of building products.

ISO21931-1:2010, Sustainability in building construction - Framework for methods of assessment of the environmental performance of construction works - Part 1: Buildings.

EPD:BA™

Environmental Product Declaration:Benefit Addendum

Nature Positive+ EPD :BA Declaration
Compliance beyond EN 15804+A2, ISO 14025 ISO 21930

Global GreenTag International

Nature Positive Assessment

The United Nations (UN) Nature Positive (N+) Program provides global impetus for EPDs to consider gain versus loss in climate and biodiversity security [27, 28, 29]. But the reach of most Life Cycle Impact Assessment (LCIA) methods such as the leading ReCiPe is modelling damage and depletion from maxima to zero as depicted on the left-hand side of in Figure 7 [29, 30, 31, 32].

Conventional LCIA models environmental damages to e.g. climate and loss of human health, ecosystem quality and resource supply [32, 33}.

The reach of N+, however extends scientific sightlines beyond zero damage to quantify benefits, gains and regeneration [33, 34], 35. Other information in N+ EPDs sight beyond damage to define additional information on net-positive benefit outcomes including many gains depicted on the right-hand side of Figure a [30 to 32].

Figure 4 depicts the ReCiPe LCIA method modelling damage, depletion and loss versus the Evah Life Cycle Benefit indicators (LCBA) method modelling benefit, repletion and gain to assess net-loss and net-gain of

- climate security,
- human wellness and
- resource supply viability [33 to 36].

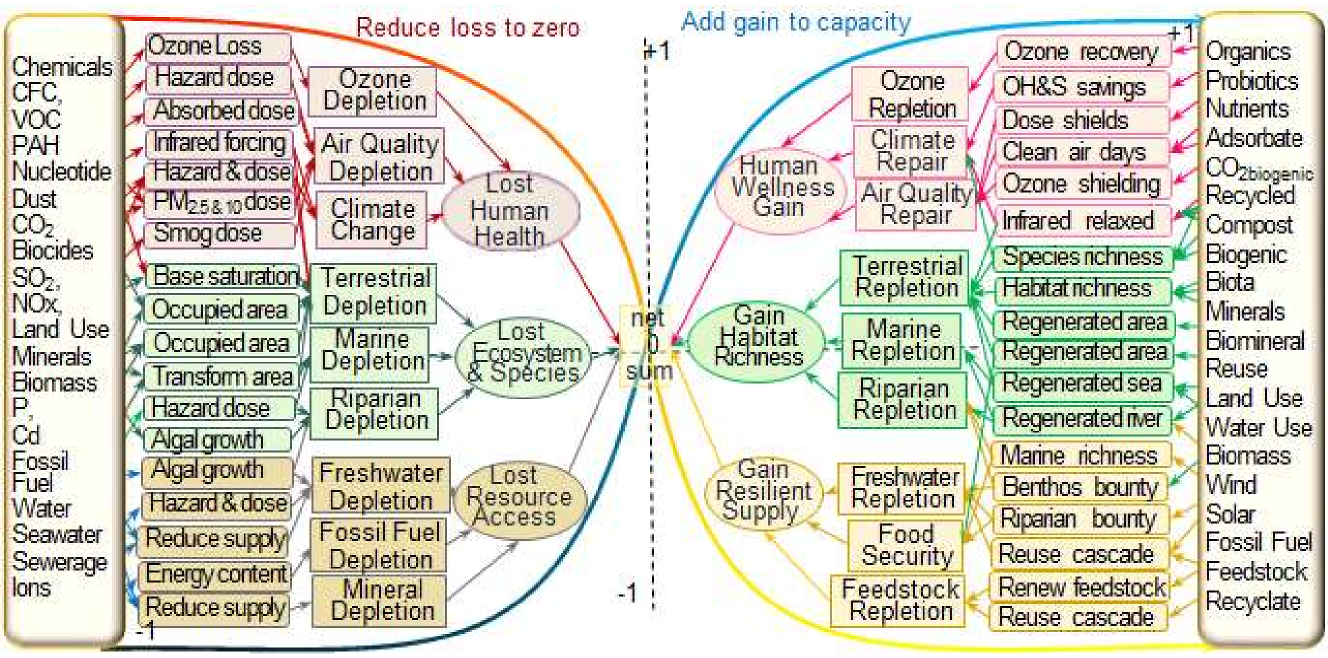

Figure 5 ReCiPe LCIA of damaging loss versus Evah LCBA of beneficial gain

Such extended assessment is applicable to empower communication and reduce barriers for regenerative and nature-positive initiatives. LCA of benefits offers community, government and business a new environmental science tool with examples of methods to measure gains in accelerating climate security and restoration.

Using LCBA in conjunction with conventional LCIA modelling of damages allows LCA modelling of damages to and beyond zero climate, health, ecosystems and supply losses to beneficial gains in e.g. climate, wellness, biodiversity and supply security.

Reaching to quantify and show positive gains well beyond the negative and zero loss outcomes, LCBA enables a truer market assessment. The capacity to report positive metrics can also reduce prevalent greenwashing and reliance on bad news that has disempowered scientifically valid communications and efforts to engage community action.

Environmental Benefit Terminology

Key environmental benefits contributing to ecological regeneration of climate and biodiversity security are tabled below with common names and responses for each indicator.

Climate Security	Reliance on renewable energy is vital to restore thermal energy differentials, from equator to poles. Differential forcing of ocean current and wind circulation blends and regulates climate to reduce extreme weather events. Forest, wilderness and algal growth can drawdown such gasses. Carbon banked in standing forests, detritus, roots and soils brakes climate change. Greenhouse gas *d*rawdown and sequestration in product biomass is vital for "***Climate security***".
Water Security	***"Water security*** arises from conservation and recycling as well as reliance on renewable and reclaimed biomass to avoid climate-change-induced drought. Hectares of intensive forest and plantings stabilise rain catchment and ground water table levels. Ground mulches retain soil hydration and reduce water stress.
Ozone Repletion	Repairing the planet's stratospheric ozone solar shield protects plants, humans and animals allowing them to be ***sun-safe"*** for longer in the outdoors. Ground level oxygenation via growing plants and algae is a vital way to enable accumulation at higher levels of naturally-formed Ozone***.*** Restoring the ozone layer also depends on use of ozone-safe refrigerants, aerosols and solvents
Buffered air, land and waters	Acid rain-free air-sheds are safer for natural terrestrial, aquatic and urban communities. Buffered air-pH supports healthy soil and waterways, nitrogen fixation vital for plant growth and natural decomposition. Safe pH supports health of fisheries, forests, buildings and materials. The chief way to enhance "***natural-rain"*** is reliance on renewable fuels and power supply.
Oxygenated terrestrial and aquatic life	In natural waterways balanced nutrient and oxygen availability for aquatic and terrestrial organisms promotes healthy growth as well as water and habitat security across related ecosystems. A vital way to enhance healthy waterways is tight control of slow-release fertilisers avoiding synthetic nutrients in run-off over land catchments.
Sweet-air	Smog-free air in summer near ground level when most people live and breathe outside is generated by plants and avoiding or filtering pollutants. **Sweet-air** enables healthy vegetation, crops and humans to thrive. Chief ways to enhance sweet-air are reliance on low-emission renewable energy and non-volatile chemicals.
Resource Repletion	The extinction rebellion youth movement calls on governance to secure climate, material reserves and biodiversity for current and future generations. Chief ways to ensure resource repletion include investing in sustainably managed **"circularity",** recycling, renewables and reclaimed biomass. This retains accessible, plentiful, essential valuable raw material, medicinal, chemical, feedstock and fuel stock.
Biodiversity Security	Extensive bushland, biodynamic and organic agriculture plus standing forests offer natural land use ranges and corridors for wildlife, herds and flora **"biodiversity"**: • habitat bird, bee, pollinator, avian, worm biome, shelter, forage and grazing • leaf & litter forage enhance soil condition, mulch, nutrition and retention, • soil microbiota, detritus-feeders and biotic refuges reduce temperature stress • sequestered CO_{2e} in natural habitat, biomass & soil braking climate change.
Ecological Wellness	Human ecological health benefits flow from reliance on renewable and reclaimed biomass instead of fossil fuel. Chief ways to enhance **"wellness"** include avoiding particulates and pollution, smog, volatile organics and carcinogens. Climate and ozone security and safer air-sheds ensue for natural, terrestrial, aquatic and urban communities.

Life Cycle Benefit Assessment (LCBA) Reference Framework

This section summarises the LCBA framework of indicators measures and metrics. Local and global human wellness, habitat regeneration and supply resilience are framed across United Nations Sustainable development goals (UN SDG)s [16 to 32]. LCBA reaches beyond zero loss to show gains in climate, wellness, biodiversity and supply security. Most apply comparable LCIA measures and metrics for example as in common use for avoided impacts. All are also shown versus % circularity outcomes.

LCA framework of LCBA indicators

Benefit Layer	Exposure & Jurisdiction	Unit pa	Local	Global	UN	Circularity
Healthy Able Life Years		HALY/capita		metric	SDG	% Capacity
Local Shelter	Household shelter	m^2 GFA	Housed	UN eq		Housing
Fresh Food	Affordably nourished	kJ UN eq	Nourished	UN eq		Nutrition
Fresh Air	Oxygen indoors	kg O_2	Oxygenate	O_2 C1750		Oxygenation
Clean Air	$PM_{2.5}$ dust-free	µg PM2.5	Clean Air	PM C1750		Decongestion
Sweet Air	VOC free indoors	µg VOC	Safe Air	VOC C1750		Inhalation
Sun Safety	Ozone layer repair	kg O_2 outdoors	Sun Safe	O_3 C1750		Ozonating
Time in Nature	Recreation 100 days/ppa	R&R Ha	Relaxed	Ha C1750		Free-time
Medical Access	Paramedic Care	hours aid	Paramedic	hours to aid		Medic-access
Work Dignity	>30hrs paid work/week	$ eq/hour	Employed	km UN eq		Secure-work
Fresh Water	Potable rain hydrated	m^3	Catchment	rain C1750		Potability
Supply Energy & Resource Viability		SERV/capita				
Viable Water	Refill local reservoirs	m^3 freshwater	Watered	Rain C1750		Freshwater
Viable Air	Photosynthetic Cities	kg O_{2e100}	Breathable	O_2 C1750		Oxygenation
Viable C-bank	Resink Carbon in product	kg CO_{2e100}	Embody C	CO_{2e100}		Bank-carbon
Viable Energy	Reliance on renewable	kg renewed	Renewal	oil eq		Renewability
Viable Food	Reliance on local food	kJ km	Autonomy	UN eq		Food autonomy
Viable Supply	Refuel local reserves	kg feedstock	Fuelstock	oil eq		Autonomy
Viable Mineral	Recycle scarce material	MJ elemental	Security	oil eq		Mineral security
Viable Feedstock	Recycle material & scrap	MJ recycle	Feedstock	oil eq		Recyclability
Viable Disaster	Reserved sustenance	t back-up	Sustenance	UN eq		Recoverability
Viable Shelter	Refuges in disasters	bed pc	Refugia	GFA		Safe havens
Positive Ecosystem ReFormation		PERF/Ha				
Natural Access	Nature parks & tracks	m^2 R&R	Innature	Reach C1750		Natural Access
Urban Bounty	Pre-urban carrying capacity	t flora/GFA	Urbundant	Bounty C1750		Greenspace
Soil Carbon	Carbon banking	kg CO_{2e20}	C Soilbank	Soil C C1750		Soil-Carbon
Climate Brakes	Carbon drawdown	t CO_{2e20}	C Biomass	Worms C1750		Climate safety
Plants & Algae	Carbon drawdown	t CO_{2e100}	Drawdown	Algae C1750		Climate security
Aquatic Stock	Species rich range	t Frog-rich	Species	Frogs C1750		Aquatic bounty
Marine Stock	Species richness & range	t Fish-rich	Species	Whales C1750		Marine bounty
Wildlife Habitat	Corridor & refuge range	Ha Biomes	Apex species	Range C1750		Linked Ranges
Terrestrial Stock	Rich flora & fauna range	t Wildlife	Species	Bears C1750		Wildlife rich
Avian Stock	Species rich refugia	t Bird-rich	Richness	Birds C1750		Abundance
Pollinator stock	Species richness & range	t Pollinated	Species	Bees C1750		Biodiversity
Nature Reserve	Scarce reserves restocked	t Abundant	Reserves	Stock C1750		Reserves

Contemporary Natural and Social Disasters

In the data period that this LCA covers, many worst-ever-recorded and widespread natural and social disasters also disrupted supply chains locally nationally and globally. After recent widespread worst-ever recorded environmental and social disasters, few benefits were expected for the geographical area where most product components were sourced. In the last decade many reports describe historic social and natural disasters and their impacts on natural land, bush, urban, air and aquatic and marine environments [32].

Regenerative imperitives

Positive results also illustrate nature positive imperatives for regeneration to combat recent natural disasters attributable to anthropogenic climate change [15]. So after a decade of increasingly widespread worst-ever recorded local, national and global, environmental and social disasters disrupted security no benefits were expected from flora and fauna livestock in natural landscapes and urban greenspace, aquatic livestock in rivers, lakes and dams or marine livestock in estuaries, bays and oceans. The ultimate source of metabolic energy for all biological systems, photosynthesis in plant and algal biomass generates oxygen while drawing down carbon dioxide and water from air increases wellness. Such biological systems enact:

- supply of feedstock and food to grow living communities of biomes, wildlife, livestock and people
- energy delivery for ecosystem growth of viable genetic, habitat and species biodiversity ranges
- braking of greenhouse gas force accelerating anthropogenic climate change as well as
- oxygen release that is a buffer against anthropogenic depletion of stratospheric ozone layer.

Comparative Primary Components Content range (%w/w)

In the comparative primary product content listed below the % mass ±5% range has a 90% certain confidence interval to contain true population means at any time. Listing such 90±5% certainty allows for intellectual property protection whilst ensuring fullest possible transparency. It also reflects normal resource acquisition, supply chain, sedimentation, seasonality and manufacturing variation over this EPD's 5-year validity period.

Original Primary Components content range (%w/w)

Recycled Content component	Home scrap	**Cradle**	**%**
Binder	Polyvinyl Chloride	Taiwan	>20 <21
Filler	Limestone	Australia	>20 <21
Plasticiser	Dioctyl Terephthalate	Mainland	>5.0 <6.0
Stabiliser	Calcium Zinc Soap	Taiwan	>0.7 <1.0
Stabiliser & plasticiser	Epoxidised Soybean Oil	Taiwan	>0.4 <0.5
Stabiliser & plasticiser	Di Octyl Adipate	Korea	>0.4 <0.5
Binder	Post Industrial Scrap PVC	Australia	>0.3 <0.4
Stabiliser	Diphenyl Octyl Phosphite	India	>0.2 <0.3
Total additives for adhesion, PP, cross-linking, defoaming, levelling & matting	All additives safety & hazard checked.	EU, USA & CN	>0.05 <0.1

Differentiating Negative and Positive outcomes

Some materials and practices inherently promote wellness and like medicine others inherently destroy illness. Positive and net-positive gains and benefits can offset damages and loss. Benefits from less and avoided impacts and gains arising from properties inherent within a component or utility can also be additive. Positive benefit, gain and circularity results for each damage outcome range from levels being:

- improved where it avoids 1 to 99% loss; and net-zero gain when it avoids 100% loss;
- net-benefit when it regains ≥100% loss; and regenerative where it regains ≥200% loss.

In the next sections, results illustrate if, how and why nature positive wellness, ecosystem and supply benefits arise from reliance on circularity of all types of fossil and biomass feedstock resources and renewable energy. It describes cradle to cradle outcome results including of:

- Worse more unsustainable losses;
- Net-zero outcomes avoiding loss
- Improved outcomes avoiding all loss
- Nature Positive net-benefit compensating for more than the loss.
- Regenerative outcomes compensating for all loss plus replacing it.

EN15805 LCIA & LCI Method Results Cradle to Cradle

In this section the product functional unit is a square metre of the product used over 20 years and reused beyond cradle to grave (C_2C). It discusses the GGTI LCARate EN15804 ReCiPe LCIA and LCI method. Table 7 compares Innova recycled versus primary product of the same mill and components. Compared to the primary version Innova shows a 501% increase in material reuse that was a regenerative outcome. There were 4 worse and 24 less damaging but no net-zero outcomes or net-benefit gains.

Because of Innova recycled components there was 1% less material for reuse and 1% less for recycling, 3% less PCR biofuel and 4% less total renewable energy needed.

Table 7 Innova Vs Primary Homogeneous Flooring EN15805/m² 20yr C_2G

Outcome	LCIA & LCI Results	Primary	Innova	∆%
Worse	Acidification Potential	3.16E-02	3.18E-02	-0.52
	Photochemical Smog	6.82E-02	6.97E-02	-2.2
	Eutrophication Marine	5.45E-03	5.58E-03	-2.4
	Eutrophication Terrestrial	0.038	0.043	-12
Slightly less damage	Material For Recycling	0.469	0.474	1.0
	Components For Reuse	1.07E-07	1.08E-07	1.1
	Eutrophication Freshwater	2.95E-04	2.92E-04	1.2
	Climate Change total	19.0	18.6	2.4
	Climate Change fossil	19.6	19.1	2.7
	PCR Renewable Fuel	1.31	1.27	3.3
	Fossil Fuel	155	149	3.9
	Renewable Total	19	20	4.0
Significantly less damage	Depletion Water	4.48E-02	4.16E-02	7.1
	Fresh Water Net	0.28	0.26	7.1
	Depletion Fossil Fuel	9.76	8.87	9.2
	Renewable Feedstock	6.3	5.7	10
	General Waste	1.3	1.2	11
	Energy Recovery Material	9.9E-03	8.7E-03	12
	Climate Change biogenic	-0.55	-0.49	12
	Renewable Energy	11	13	13
	Fossil Total	218	190	13
	Stratospheric Ozone Loss	1.47E-07	1.27E-07	13
	Depletion Mineral & Metal	1.38E-03	1.19E-03	14
Most Significantly less damage	PCR Fossil Fuel	0.97	0.68	30
	Fossil Feedstock	63	41	35
	Hazardous Waste	0.03	0.02	39
	Radioactive Waste	4.6E-16	2.7E-16	42
	Climate Change land use	-1.0E-02	-5.7E-03	45
Regenerative	Recycled Material	0.60	3.62	501

Worse outcomes, all from factory use of state power grid reliant on brown coal included 0.52% worse acidification, 2.2% worse smog, 2.4% worse marine and 12% worse terrestrial eutrophication.

Slightly lower damage was from 1.2% less freshwater eutrophication, 3% less fossil fuel GWP 2% less total GWP 4% less fossil fuel.

Significantly lower damage included less depletion 7.1% of freshwater and 9.2% of fossil fuel with 11% less general waste and 13% less ozone loss. Also PRC components meant 10% less biomass, 12% less material for energy recovery, 12% less biogenic GWP, 13% less renewable energy,13% less total fossil energy as well as 14% less mineral & metal depletion. Most significantly lower damage included 30% less fossil PCR and primary feedstock use generating 39% less hazardous waste, 42% less radioactive waste, 45% less natural land use change GWP.

EcoIndicator 99 (EI99) LCIA & LCI Method Results Cradle to Grave

In this section the product functional unit is a kilogram used over 20 years and reused beyond Cradle to Grave (C_2G). It discusses the GGTI LCARate method that employs the EcoIndicator 99 (EI99) LCIA to model:

- Ecosystem Quality measured in Potentially Disappeared Fraction (PDF) of species*m^2*yr from damage and loss due to acidification, eutrophication, land use change and ecotoxicity.
- Resource Access measured in MJ surplus energy for future mineral and fossil fuel extraction.
- Human Health measured in Disability Adjusted Life Years (DALY) loss from damage due to climate change, ozone layer depletion, radiation, respiratory distress and toxicity.

One hundred EI99 ecopoints represented one European citizen's environmental load per year in 1999. Table 8 compares primary flooring from the same components and production process versus Innova PCR and post industry recycled (PR) homogeneous flooring. Compared to primary Homogenous 2 tonnes of Innova used over 20 years avoids one person's 20 years of damage to health, ecosystems, and resource extraction.

Overall Innova LCIA is 0.01 EcoIndicator points lower than primary Homogenous/kilogram. Reducing overall damage by 0.01 points over 20 years avoids 3.65 days of damage to health, ecosystems, and resource extraction by one person. Compared to primary Homogenous 100kg of Innova used over 20 years avoids one person's annual damage to health, ecosystems, and resource extraction.

Table 8 PCR PI Innova Vs Primary Homogeneous Flooring Use 20yr EI99 & TRACI[3] results/kg C_2G

Tier	Outcome Category	Unit	LCIA & LCI Results		∆ EI99	∆%	∆%
			Primary	Innova	points	P-I/P	Sum
Ecosystem Quality Loss	Ecosystem Quality	PDF*m^2*yr	3.4E-05	3.1E-05		8.8	53
	Climate Change	kg $CO_{2eq\ 100yr}$	6.6	6.5		2.6	
	Ecotoxicity Freshwater	CTUe	0.047	0.033		30	
	CML Acidification	mol $H^+_{eq.}$	2.05E-06	2.06E-06		-0.52	
	Stratospheric Ozone	kg $CFC_{11eq.}$	8.7E-10	7.5E-10		13	
	CML Eutrophication	kg $PO4_{eq.}$	4.19E-07	4.25E-07		-1.4	
Resource Access Loss	Resource Depletion	$MJ_{surplus}$	5.6E-04	5.1E-04		9.0	30
	Freshwater Use	m^3 water	109.6	95.6		13	
	Fossil Energy	MJ	3.2	2.9		9.2	
	Mineral & Metal	kg $Sb_{eq.}$	0.062	0.063		-0.93	
Human Health Loss	Human Health	DALY	4.17E-04	4.21E-04		-1.0	5
	Respirable Inorganics	kg $PM_{2.5eq}$	5.24E-06	5.32E-06		-1.5	
	Respirable Organics	CTU_h	1.44E-08	1.38E-08		4.5	
	Carcinogens	CTU_h	5.75E-08	5.63E-08		2.1	
	Climate Change	kg $CO_{2eq\ 100yr}$	1.15E-06	1.14E-06		1.3	
EI99	EcoIndicator 99	Ecopoints	0.253	0.243	0.01		88%

Ignoring EI99 system weightings the 0.01 Ecopoints saving relates to the gross 88% difference between primary and recycled Innova influenced mostly by Ecosystem Quality 53% then Resource Access 30% and least Human Health Quality 5%.

[3] Tool for Reduction & Assessment of Chemicals & Other Impacts https://www.epa.gov/chemical-research/tool-reduction-and-assessment-etc

Evah LCBA Method Results C_2C

In the next sections the functional unit is a kilogram of the product used over 20 years and reused beyond C_2C. Evah's LCBA method classes EI99, TRACI and ReCiPe and Product Environment Footprint (PEF) LCIA system metrics to reflect ecosystem, supply and wellness security variables. Table 9 and Figures 6a, 6b and 6c array Δ% results including summation of results across 3 classes.

Table 9 Life Cycle Benefit /kg Functional Unit

Tier	Outcome Category	Unit	Δ% Gain	Δ% Loss
Eco system Security	Balanced pH in air land & water	mol H^+ eq..		-0.50
	Marine Oxygen-Nutrient Balance	kg N eq..		-2.4
	Terrestrial Oxygen-Nutrient Balance	mol N eq.		-12
	Freshwater Oxygen-Nutrient Balance	kg P eq.	1.2	
	Potable Freshwater	CTUe	7.1	
	Climate Braking Far Term	kg CO_2 eq. 100 yr.	12	
	Stratospheric Ozone Refill	kg $CFC^{-}{}_{11}$ eq.	13	
	Eco system Security Δ% Benefit + Δ% Damage		**18**	
Resource Supply Security	Biogenic Drawdown & Biodiversity	kg CO_2 eq. 20 yr.	4.8	
	Freshwater Cascades	m^3 water eq.	7.1	
	Circularity of Matter & Energy (E&M)	MJ share	9.0	
	Feedstock Renewal	MJ	10	
	Reused Mineral and Metal	kg Sb eq.	14	
	Reused Energy	MJ	33	
	Less Natural Land Use Change	kg CO_2 eq. 20 yr.	45	
	Resource Security Δ% Benefit + Δ% Damage		**123**	
Wellness Security	Free of Volatile Organic Chemical	kg NMVOC eq.		-2.2
	Free of ultrafine particulates	PPM2.5		-12
	Free of Ecotoxicity	HALY	1.9	
	Free from Cancer Toxicity	CTUh	2.1	
	Free of Photochemical Smog	kg C_2H_2	2.7	
	Free from Non-cancer Toxicity	CTUh	4.5	
	Free of Ionizing Radiation	kBq U_{235} eq.	42	
	Wellness Security Δ% Benefit + Δ% Damage		**39**	

Ecosystem security damage was less 18% overall, despite 0.50% worse acidity and worse oxygen-nutrient balance 12% on land and 2.4% to seas as there was 1.2% more freshwater oxygen-nutrient balance, 7% more freshwater, 12% more braking force on climate change and 13% more ozone layer refill.

Overall supply security showed a 123% net-benefit as it regains ≥100% loss altogether from 7% more freshwater reuse cascades, 5% more biogenic drawdown & biodiversity, 9% more energy & matter circularity, 10% more biomass feedstock, 14% more reused mineral and metal, 33% more reused energy and 45% better natural land use change. Despite 12% worse dust and 2% worse volatile chemicals, human wellness was 39% less damaged without 2% ecotoxicity, 42% ionizing radiation 3% summer smog, 2% cancer toxicity, 5% non-cancer toxicity.

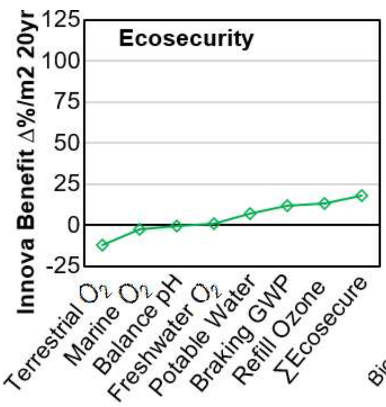

Figure 6a Innova Ecosecurity

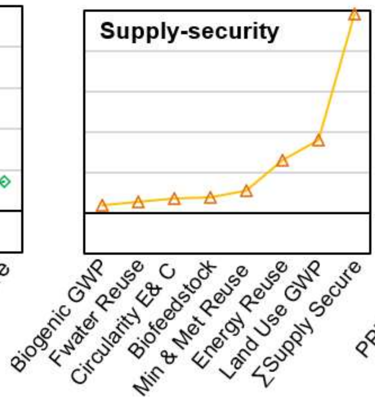

Fig. 6b Innova Supply Security

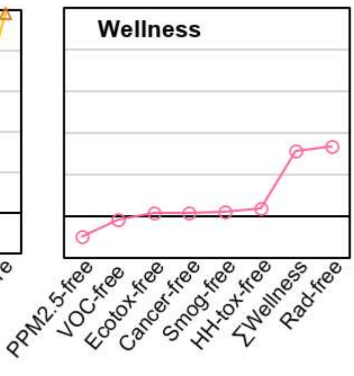

Fig. 6c Innova Supply Security

Innova Recycled Vs Primary LCBA Results (C2C)

Table 10 lists and Figures 7a, 7b and 7c charts primary versus Innova (recycled) LCBA wellness, supply and ecosystem outcome results across the Nature Positive framework, % circularity and 17 UN SDG goals. Figure 7a shows net-positive wellness 170% sum ∆ HALY. Figure 7b shows regeneratively nature positive supply 588% sum ∆ SERV. The ecosystem results showed less damaging 74% sum ∆ PERF.

Table 10 Summary of LCBA results /kg Functional Unit

Tier	Outcome Category		Unit/ kg	Primary	Innova	∆% Circularity	SDG
Human Added Life Years (HALY)	Safe Shelter	Ecotox-free	HALY	2.30E-06	2.26E-06	2% Sheltered	
	Vital Air	Cancer-free	CTUh	5.75E-08	5.63E-08	2% Benignant	
	Clean Air	Smog-free	C_2H_2	2.12E-02	2.06E-02	3% Clearer	
	Sweet Air orgs	Chemical-free	HALY	1.44E-08	1.38E-08	5% Decongest	
	Fresh Air	Oxygen outdoors	kg O_2	1.15E-06	1.14E-06	1% Aerating	
	Safe in Nature	Toxic-waste-free	kg	3.0E-02	1.8E-02	64% Safer	
	Fresh Water	Potable rain	l rain	0.28	0.26	8% Potable	
	Sun Safety	Ozone layer refill	kg CFC_{11e}	8.7E-10	7.5E-10	13% Oxygenising	
	Rad-safe	radioactive-free	kBq $U_{235\ eq.}$	4.6E-16	2.7E-16	73% Rad-free	
Supply Energy & Resource Viability (SERV)	Viable Water	Refill Cascade	m^3 freshwater	26	17	37% Watered	
	Viable Air	Photosynthetic	kg O_{2e100}	6.6	6.5	3% Oxygenated	
	Viable Biomass	Renewable	MJ_{ncv}	6.3	5.7	10% Bank-carbon	
	Viable Supply	M & C Circularity	kJ_{ncv}	5.6E-04	5.1E-04	9% Autonomy	
	Viable Fuel	Refuel Reserves	MJ_{ncv}	9.8	8.9	10% Replete	
	Viable Material	Recycle PC &PI	MJ_{ncv}	0.60	3.62	501% Regenerated	
	Viable Mineral	Recycle Mineral	kg $Sb_{eq.}$	1.4E-03	1.2E-03	17% Recyclable	
	Viable Reserve	Reserve Scarcity	MJ_{ncv}	0.47	0.47	1% Minerality	
	Viable Reuse	Reuse Component	MJ_{ncv}	1.07E-07	1.08E-07	1% Reusable	
Positive Ecosystem ReForm (PERF)	Ecosystem Quality	Wildlife range	Ecopoints	3.4E-05	3.1E-05	9% Sheltered	
	EcoIndicator	Wildlife range	Ecopoints	0.253	0.243	4% Preserved	
	Viable Water	Refill cascades	l water	4.5E-02	4.2E-02	7% Freshwater	
	C Biodiversity	Biogenic GWP	kg CO_{2e20}	-0.52	-0.47	-10% Biodiverse	
	C land bank	GWP LULUC	kg CO_{2e100}	-1.0E-02	-5.7E-03	45% Carbon bank	
	Climate Brake	Carbon drawdown	kg CO_{2e100}	-0.55	-0.49	-12% Clime brake	
	Plant & Algae	Marine H^+ & O_2	kg $N_{eq.}$	0.128	0.126	1% Marine rich	
	Aquatic Stock	Species O2 rich	kg P_{eq}	2.95E-04	2.92E-04	1% Aquatic rich	
	Land Habitat	Ecotox-free	kg stock	0.05	0.03	30% Land Health	

The >100% overall gross human wellness security sum ∆ change 170%(∆ HALY) so it was nature positive. Contributions were from 73% radiation-safer in overseas supply chains mostly from 64% safer nature from less hazardous solid waste and also 13% sun safer from less Ozone layer loss, 8% saved rainwater, 5% less inhalable decongestion from avoided organic chemicals, 3% cleaner air avoiding smog, 2% safer air avoiding carcinogens, 2% safer haven avoiding ecotoxicity to human health

The >200% overall gross supply viability sum ∆ SERV of 588% was regeneratively nature positive mainly from 501% PCR and PI material usage. There was also 37% more water recycling, 17% less primary mineral used, 10% less fuel depletion, 10% less biomass wasted, 9% fossil feedstock circularity.

The<100% less damaging ecosystem reformation sum ∆ PERF of 74% overall included 9% less Ecosystem Quality damage was contributed to by 4% gross sum ∆ EI99 less damage. To avoid double counting the sum ∆ PERF change was reduced 4% to 70% overall. It was mostly from avoiding 30% ecotoxicity to land, 7% freshwater and 1% aquatic and marine eutrophication disrupting plant & algae nutrients and oxygenation.

The 45% more natural land use retained with GWP drawdown to brake Climate Change over 100 years via carbon banks in soil and extensive natural foliage, was reduced by 10% less biogenic GWP drawdown to brake Climate Change insider 20 years 12% less GWP drawdown to brake Climate Change over 100 years.

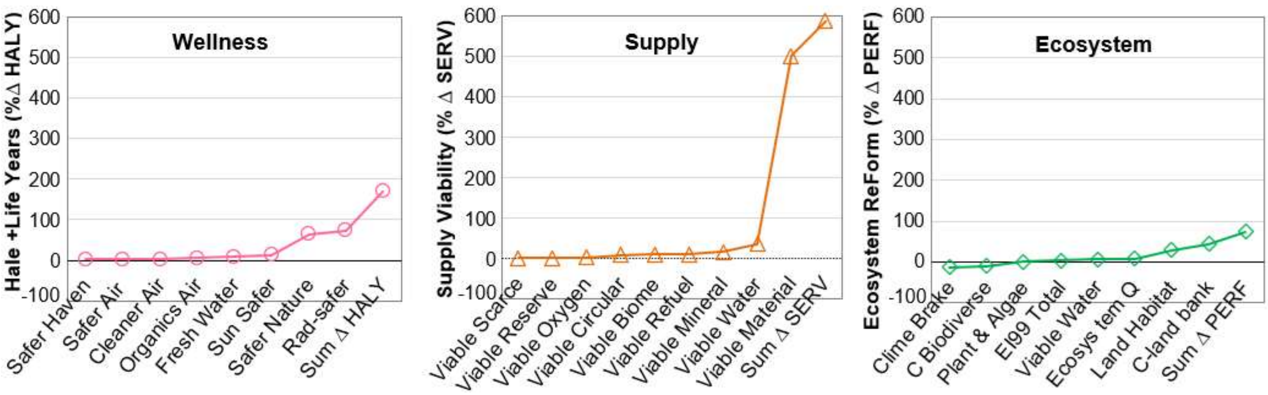

Figure 7a Innova Wellness HALY Fig. 7b Innova Supply SERV Fig. 7c Innova Ecosystem PERF

References Addendum

[16] A Global Goal for Nature, Nature Positive by 2030, About Nature+ Positive 2021 https://www.naturepositive.org/

[17] The Partnerships for SDGs online platform. Net Positive in Water & Carbon by 2040. 2022: https://sustainabledevelopment.un.org/partnership/?p=32625

[18] Locke, H., Rockström, J., Bakker, P., Bapna, M., Gough, M., Lambertini, M., Morris, J., Polman, P., & Carlos, M. Nature Positive 2021 The Global Goal for Nature. 2021; pp. 1–21. https://www.nature.org/content/dam/tnc/nature/en/documents/NaturePositiveGlobalGoal.pdf 2022.

[19] Stockholm resilience centre., Planetary boundaries 2022, https://www.stockholmresilience.org/research/planetary-boundaries.html

[20] Cole, R. J. 2015 Net-zero & net-positive design. Build. Res. Inf., 431, pp. 1–6. DOI: 10.1080/09613218.2015.961046

[21] Croes, P.R. & W.J. Vermeulen 2021 The assessment of positive impacts in LCA of products. Int J Life Cycle Assess 261: p. 143-156. DOI 10.1007/s11367-020-01820-x

[22] Vlieg, M., Moazzem, S., Naiker, D., Jones, D. G., 2022. "Quantifying Nature Positive." DOI: 10.20944/preprints 202201.0012.v3

[23] Jones, D, Vlieg, M., Ashar S., Friend, L. & Costa, Gomez C., 2022. "Learning to Quantify Positive Futures." International Journal of Environmental Impacts: 1-18. DOI 10.2495/EI-V5-N2-128-145 WIT Trans. Ecol. Environ 2022, https://www.witpress.com/journals/ei

[24] Vlieg M, Jones D. G. Benefit assessment in LCA, Procs FSLCI LCIC 2020 Conf, Berlin, Session 16. https://www.researchgate.net/publication/359865895

[25] Jones, D. G., Ashar, S., Vlieg, M. A. M., & Baggs, D. M. 2020. Counting Gains to Beyond Zero Impact Futures, WIT Trans. Ecol. Environ 2020; 245, pp. 97-108. DOI 10.2495/EID200101

[26] Vlieg M, Jones D. G. Benefit assessment in LCA, Procs FSLCI LCIC 2020 Conf, Berlin, Session 16. https://www.researchgate.net/publication/359865895

[27] Jones, D. G., Vlieg, A. M., Ashar, S. & Baggs, D. Positive LCA Factoring Planetary Boundaries. Procs 27th SETAC Conf, Brussels, Belgium, pp. 23–32, 2017: https://www.researchgate.net/publication/339815429

[28] Baggs D. M, Jones D., Vlieg M. Ashar S. Driving Beyond LCA Metrics for Net Positive Cities. Procs SETAC Conf Brussels, Belgium, pp. 167–168. 2017

[29] Jones. D., Vlieg, M., Baggs. D.M., Biaz. O. & Bortsie-Aryee. N., Novel Wood LCA & EPDs Procs Conf, pp. 255–256. Helsinki, Finland, 2019. https://www.researchgate.net/publication/339815300

[30] Vlieg M. A. M., Jones D. G. & Ashar S. Forest Product LCA: Carbon Form, Fire, Fuel & Fate Rules. Procs SETAC 2017, pp52, Brussels, Belgium, https://www.researchgate.net/publication/339815272

Normative References for this LCA & EPD

EN ISO 14040:2006, Environmental management - LCA - Principles and framework (ISO14040:2006)

EN 15643-1:2010, Sustainability of construction works - Sustainability assessment of buildings - Part 1: General framework

EN 15643-2, Sustainability of construction works - Assessment of buildings - Part 2: Framework for the assessment of environmental performance

EN 16449, Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide

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 14025:2010 Environmental labels and declarations Type III environmental declarations - Principles and procedures

ISO 14031:1999 EM: Environmental performance evaluation: Guidelines

ISO14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines

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 and constructed assets - Service life planning - Part 2: Service life prediction

ISO 15686-8:2008 Buildings and constructed assets - Service-life planning - Part 8: Reference service life and service-life 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 methods of assessment of the environmental performance of construction works - Part 1: Buildings

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

Bibliography

Australian & New Zealand 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

International Energy Agency (2024) Energy Statistics http://www.iea.org/countries/membercountries/

Ciroth A., Hildenbrand J., Zamagni A. & Foster C., 2015, Data Review Criteria. Annex A: LCI Dataset Review Criteria, 10.13140/RG.2.1.2383.4485 UN EP Life Cycle Initiative

EcoInvent (2024) LCI Model 3.9.1 database http://www.ecoinvent.ch/ EcoInvent, Switzerland

Evah (2024) LCA Tools, Databases & Methodology at http://www.evah.institute/

Franklin Associates (2024) US LCI http://www.fal.com/index.html Eastern Research Group USA

GreenTag™ Certification (2024) https://www.globalgreentag.com/about.html

IBISWorld (2024) Market Research, http://www.ibisworld.com.au/ IBISWorld Australia

Plastics Europe (2024) Portal http://www.plasticseurope.org/plastics-sustainability/eco-profiles.aspx

Pre (2024) SimaPro 8 Software, The Netherlands http://www.pre-sustainability.com/simapro-manuals

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

USLCI (2024) Life-Cycle Inventory Database https://www.lcacommons.gov/nrel/search, USA

U. S. Geological Survey National Minerals (2024) http://minerals.usgs.gov/minerals/pubs/country/ USA

U. S. 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.

Further and explanatory information is found at

http://www.globalgreentag.com/

or contact:

certification@globalgreentag.com

GLOBAL GREEN TAG INTERNATIONAL PTY LTD
green product certification
trust brands

Global GreenTag^{CertTM} EPD Program

Environmental Product Declaration

Compliant to ISO 14025