



Declaration Owner

Karndean Designflooring
Crab Apple Way, Vale Park, Evesham
Worcestershire, WR11 1GP
United Kingdom
www.karndean.com

Product

Luxury Vinyl Flooring:
Karndean Looselay, Karndean Looselay Longboard
EPD represents delivery of product to customers in North America,
the United Kingdom and Australia

Functional Unit

The functional unit is one square meter of flooring over a 75-year
period

EPD Number and Period of Validity

SCS-EPD-06708
EPD Valid February 8, 2021 through February 7, 2026
Version: March 2, 2021

Product Category Rule



PCR Guidance for Building-Related Products and Services Part A:
Life Cycle Assessment Calculation Rules and Report Requirements.
Version 3.2. UL Environment. Sept. 2018

PCR Guidance for Building-Related Products and Services Part B:
Flooring EPD Requirements. Version 2. UL Environment. May 2018.

Program Operator

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Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Gerard Mansell, Ph.D., SCS Global Services
LCA Software and LCI database:	SimaPro 8.3 software and the Ecoinvent v3.3 database
Product RSL:	35 years
Markets of Applicability:	North America; United Kingdom; Australia
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave
LCIA Method and Version:	CML-IA and TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
LCA Reviewer:	 Thomas Gloria, Ph.D., Industrial Ecology Consultants
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services Part B: Flooring EPD Requirements. Version 2. UL Environment. May 2018.
Part B PCR Review conducted by:	Jack Geibig (chair), Ecoform; Thomas Gloria, Industrial Ecology Consultants; Thaddeus Owen
Independent verification of the declaration and data, according to ISO 14025 and the PCR	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
EPD Verifier:	 Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	1. Karndean Designflooring.....2 2. Product.....2 3. LCA: Calculation Rules.....6 4.LCA: Scenarios and Additional Technical Information.....13 5.LCA: Results.....16 6. LCA: Interpretation.....23 7. Additional Environmental Information.....25 8. References.....26
<p>Disclaimers: This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.</p> <p>Scope of Results Reported: The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.</p> <p>Accuracy of Results: Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.</p> <p>Comparability: The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.</p> <p>In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.</p>	

1. Karndean Designflooring

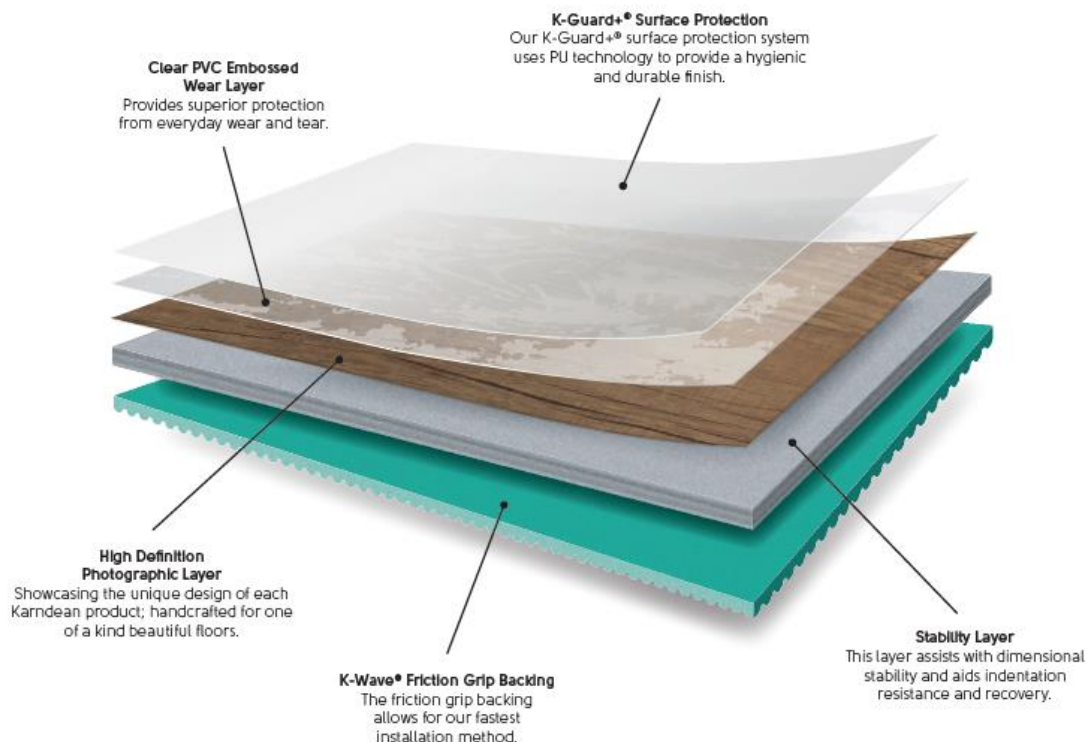
Karndean Designflooring is a global leader in flooring design with operations in the UK, USA, Australia and New Zealand. By offering a wide range of colours, textures and finishes, our products allow you to create looks that are unique to your home or business and are guaranteed to last. With a passion for creating floors which are both stylish and practical, we're here to help customers find the right floor for their space, needs and unique style.

At Karndean, we see flooring differently. From the ancient forests of Europe, to the remote Australian outback and beyond, we seek out expressive and intriguing forms in the natural world to influence our unique floor designs. By combining these original features with cutting edge design, we create simply beautiful floors that you'll love for a lifetime.

2. Product

2.1 PRODUCT DESCRIPTION

Karndean Designflooring's Luxury Vinyl Tile (LVT) ranges are suitable for both commercial and residential interiors. The products covered in this environmental product declaration are the Karndean Looselay and Karndean Looselay Longboard ranges, which are suitable for both commercial and residential interiors. These ranges offer a selection of designs in a number of sizes, including both tiles and planks. These LVT products are structured into a number of layers, with a PU protective layer, a clear embossed PVC wear layer, a high definition photographic layer, stability and backing layers, as shown below. Post-industrial recycled material is included in the stability and backing layers of the product.



2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.



2.3 APPLICATION

The LVT products provide the primary function of flooring for interior applications. The flooring products are used in various residential and commercial applications including retail, healthcare, education, and hospitality.

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the product system boundary are shown below.

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

Table 1. Life cycle phases included in the product system boundary.

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

X = included | MND = Module Not Declared

2.5 TECHNICAL DATA

Technical specifications for the LVT flooring product are summarized in Table 2 and Table 3.

Table 2. Product specifications for the Karndean Looselay LVT flooring product.

Product Characteristics			Nominal value	Unit	Minimum value	Maximum value
Product thickness			4.50 (0.177)	mm (inch)	4.40 (0.173)	4.63 (0.182)
Wear layer thickness			0.55 (0.022)	mm (inch)	0.50 (0.020)	0.62 (0.024)
Product weight			7470 (24.48)	g/m ² (oz/ft ²)	6723 (22.03)	8441 (27.66)
VOC emissions test method			FloorScore®; Indoor Air Comfort Gold			
Sustainable certifications			ISO 14001; CE			
Product form	Tiles	width	500 (19.59)	mm (inch)	499.5 (19.67)	500.5 (19.70)
		length	610 (24.02)	mm (inch)	609.5 (24)	610.5 (24.04)
Product form	Planks	width	250 (9.84)	mm (inch)	249.75 (9.83)	250.25 (9.85)
		length	1050 (41.34)	mm (inch)	1049.5 (41.32)	1050.5 (41.36)

Table 3. Product specifications for the Karndean Looselay Longboard LVT flooring product.

Product Characteristics			Nominal value	Unit	Minimum value	Maximum value
Product thickness			4.50 (0.177)	mm (inch)	4.40 (0.173)	4.63 (0.182)
Wear layer thickness			0.55 (0.022)	mm (inch)	0.50 (0.020)	0.62 (0.024)
Product weight			7470 (24.48)	g/m ² (oz/ft ²)	6723 (22.03)	8441 (27.66)
VOC emissions test method			FloorScore®; Indoor Air Comfort Gold			
Sustainable certifications			ISO 14001; CE			
Product form	Planks	width	250 (9.84)	mm (inch)	249.75 (9.83)	250.25 (9.85)
		length	1500 (59.06)	mm (inch)	1499.5 (59.04)	1500.5 (59.07)

2.6 MARKET PLACEMENT/APPLICATION RULES

Technical specifications of the flooring products are summarized below. Detailed product performance results can be found on the manufacturer's website www.karndean.com/technicaldatasheets.

- ASTM F1700 - 18a: Standard Specification for Solid Vinyl Floor Tile
- EN ISO 10582:2018 - Resilient floor coverings — Heterogeneous polyvinyl chloride floor covering — Specifications
- EN ISO 10874:2012 - Resilient, Laminate and Textile Floor coverings. Classification
- European standard EN 14041:2004 - Resilient, Textile and Laminate Floor coverings; Essential Characteristics EU Construction Products Regulation 305/2011

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The luxury vinyl flooring products are delivered for installation in the form of tiles and planks of various dimensions.

2.8 MATERIAL COMPOSITION

The primary materials include polyvinyl chloride (PVC), plasticizers, fillers and various stabilizers and coatings.

Table 4. Material content for the LVT flooring products in kg per square meter and percent of total mass. All values in the table have been rounded; masses to 3 significant figures, percentages to 2 significant figures.

Component	Material	kg	Percent
Calcium carbonate	Filler - natural, ground CaCO ₃	4.23	57%
PVC	Polyvinyl chloride	2.19	29%
Plasticizer	DOTP	0.904	12%
Reinforcement	Glass fibres	5.26x10 ⁻²	0.70%
Additives	Various	4.03x10 ⁻²	0.54%
Stabilizer	Ba-Zn organic liquid complex; zinc oxide	3.81x10 ⁻²	0.51%
Pigment	Carbon black; iron oxide; ink	1.99x10 ⁻²	0.27%
Product total		7.47	100%

No substances required to be reported as hazardous are associated with the production of this product

2.9 MANUFACTURING

Karndean's luxury vinyl tile flooring is produced at their manufacturing facility in South Korea. The luxury vinyl flooring is made primarily from polyvinyl chloride (PVC), calcium carbonate (mineral reinforcement), plasticizers and additives (i.e., pigments and stabilizers). The products are structured with multiple layers including PVC backing layers containing non-woven glass reinforcement, a high definition photographic layer, a PVC wear layer and a polyurethane (PU) protective layer.

The production of vinyl tile flooring involves the following general manufacturing processes. The raw materials are first mixed and heated. The mixture is then calendared into a sheet to create the backing or the transparent wear layers. The sheets are cut and laminated with a print film. The semi-finished product is coated with a lacquer and annealed. Finally, the product is cut into tiles or planks and packaged. Quality checks are made at each step of the production process.

2.10 PACKAGING

The products are packaged for shipment using cardboard cartons, plastic wrap and wooden pallets.

Table 5. Material content for the LVT flooring product packaging in kg per square meter. All values in the table have been rounded; masses to 3 significant figures, percentages to 2 significant figures.

Pulp	Wood	Plastic	Total
0.118	0.105	3.50x10 ⁻³	0.226
52%	46%	1.5%	100%

2.11 PRODUCT INSTALLATION

Installation of the product is accomplished using hand tools with negligible impacts. Approximately 4% installation waste is assumed. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

2.12 USE CONDITIONS

No special conditions of use are noted.

2.13 REFERENCE SERVICE LIFE

The Reference Service Life (RSL) of the flooring products is 35 years.

2.14 RE-USE PHASE

The flooring products are not reused at end-of-life.

2.15 DISPOSAL

At end-of-life, the products may be disposed of in a landfill or via incineration.

2.16 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website www.karndean.com.



3. LCA: Calculation Rules

3.1 FUNCTIONAL UNIT

The functional unit used in the study is defined as 1 m² of floor covering installed for use over a 75-year period. The corresponding reference flow for each product system is presented in Table 6. For the present assessment, a reference service lifetime (RSL) corresponding to the manufacturer's estimated lifetime is assumed. The total number of required product lifecycles during the 75-year period over which the product system is modeled is also summarized for the product in Table 6.

Table 6. Reference flows and RSL for the LVT flooring products.

Product Name	Reference flow (kg/m ²)	Reference Service Life – RSL (years)	Replacement Cycle (ESL/RSL-1)
Karndean Looselay; Karndean Looselay Longboard	7.47	35	1.14

3.2 SYSTEM BOUNDARY

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the EPD scope are described in Table 7 and illustrated in Figure 1.

Table 7. The modules and unit processes included in the scope for the flooring product system.

Module	Module description from the PCR	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Extraction and processing of raw materials for the flooring components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facilities
A3	Manufacturing, including ancillary material production	Manufacturing of flooring products and packaging (incl. upstream unit processes)
A4	Transport (to the building site)	Transport of product (including packaging) to the building site
A5	Construction-installation process	Impacts from the installation of product are assumed negligible. Only impacts from packaging disposal are included in this phase.
B1	Product use	Use of the flooring in a commercial building setting. There are no associated emissions or impacts from the use of the product
B2	Product maintenance	Maintenance of products over the 75-year ESL, including periodic cleaning.
B3	Product repair	The flooring is not expected to require repair over its lifetime.
B4	Product replacement	The materials and energy required for replacement of the product over the 75-year ESL of the assessment are included in this phase
B5	Product refurbishment	The flooring is not expected to require refurbishment over its lifetime.
B6	Operational energy use by technical building systems	There is no operational energy use associated with the use of the product
B7	Operational water use by technical building systems	There is no operational water use associated with the use of the product
C1	Deconstruction, demolition	Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts
C2	Transport (to waste processing)	Transport of flooring product to waste treatment at end-of-life
C3	Waste processing for reuse, recovery and/or recycling	The product is disposed of by incineration and/or landfilling which require no waste processing
C4	Disposal	Disposal of flooring product in municipal landfill or incineration
D	Reuse-recovery-recycling potential	Module Not Declared

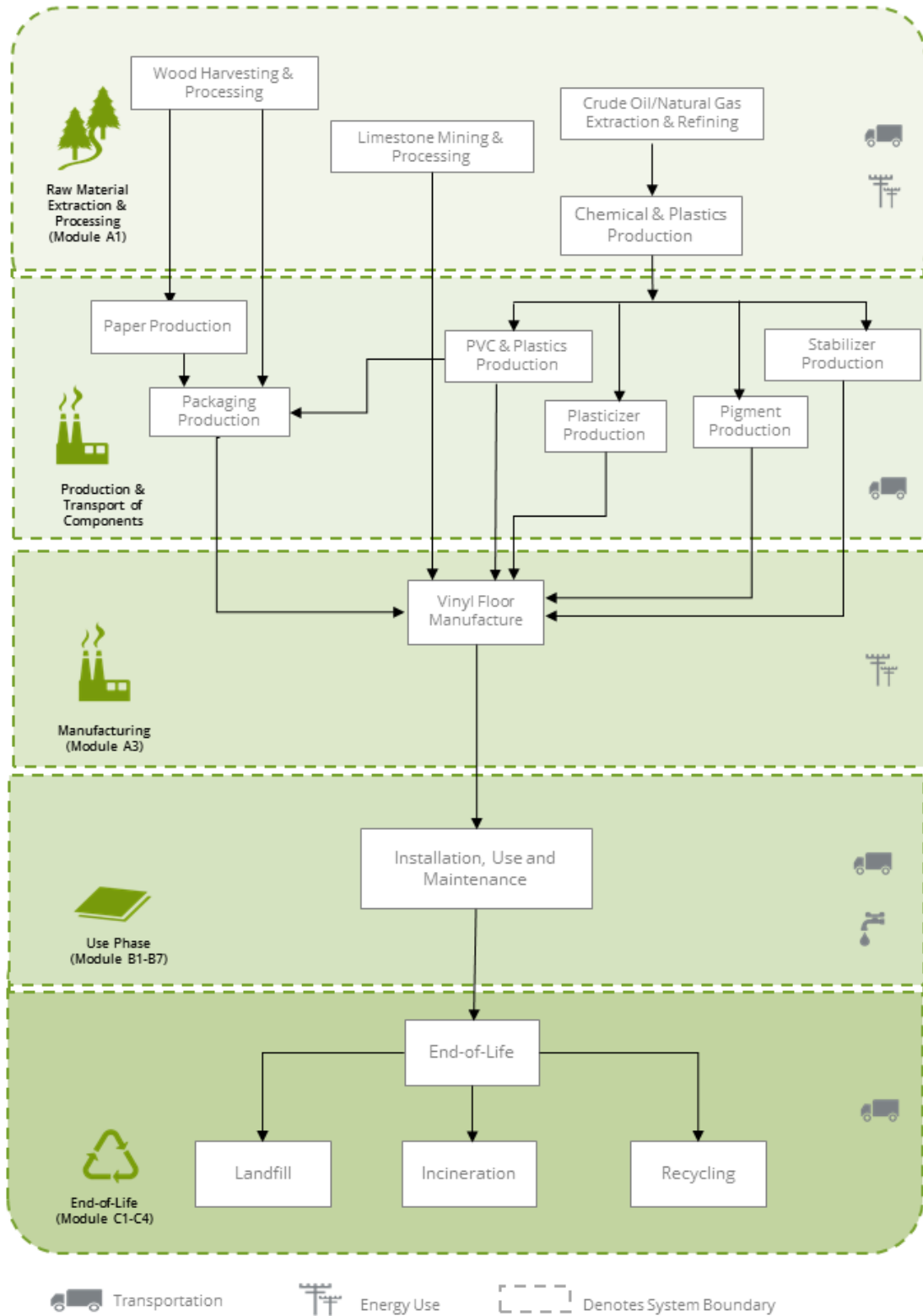


Figure 1. Flow Diagram for the life cycle of the LVT flooring products.

3.3 PRODUCT SPECIFIC CALCULATION FOR USE PHASE

The recommended cleaning regime is highly dependent on the use of the premises where the floor covering is installed. In high traffic areas more frequent cleaning will be needed compared to areas where there is low traffic. For the purposes of this EPD, average maintenance (moderate traffic levels) is presented based on typical installations.

3.4 UNITS

All data and results are presented using SI units.

3.5 ESTIMATES AND ASSUMPTIONS

- The Karndean facility is located in South Korea. Regional Ecoinvent inventory datasets for the appropriate energy grid mix were used to model resource use and emissions from electricity use at the manufacturing facility.
- Life cycle inventory data for the plasticizer, dioctyl terephthalate (DOTP), were not available. An inventory dataset for similar common plasticizers were developed using chemical process data from Overcash and Ecoinvent v3.6 unit process datasets. Inventory data developed for diisooheptyl phthalate (DIHP) was used as a surrogate to represent DOTP in the LCA model.
- Modeling of recycled materials follows the recycled content method (also known as 100-0 method or cut-off method) whereby only the burdens of reprocessing the waste material are allocated to the system from the use of the recycled material.
- The Reference Service Life (RSL) of the products was modeled based on information provided by the manufacturer assuming their products are installed and maintained as recommended and used for the specific application noted.
- Downstream transport was modeled based on information provided by the manufacturer representing transport for global product distribution.
- The maintenance phase of the product life cycle was modeled based on information provided by the manufacturer including recommended installation and cleaning methods, as well as cleaning frequency.
- It is assumed that no components of the product are recycled at end-of-life. Disposal of the product packaging is modeled based on regional statistics regarding municipal solid waste generation and disposal in the United Kingdom, North America and Australia, as specified in the PCR. The data include end-of-life recycling rates of packaging materials.
- For final disposal of the packaging material and LVT flooring at end-of-life, all materials are assumed to be transported ~32 km (20 miles) by diesel truck to either a landfill, incineration facility, or material reclamation facility (for recycling). Datasets representing disposal in a landfill and waste incineration are from Ecoinvent.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted taking into account this limitation.

3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD

3.7 DATA SOURCES

Primary data were provided by Karndean for their manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 8. Data sources for the LVT flooring products.

Component	Dataset	Data Source	Publication data
PRODUCT			
PVC			
Polyvinyl Chloride	market for polyvinylchloride, bulk polymerised polyvinylchloride, bulk polymerised Cutoff, S/GLO ¹	EI v3.6	2019
Filler			
Calcium Carbonate	market for limestone, crushed, washed limestone, crushed, washed Cutoff, S/RoW ¹	EI v3.6	2019
Plasticizer			
PVC Plasticizer	diisoheptyl phthalate (DIHP) {GLO} market for Alloc Rec U System	EI v3.6	2019
Stabilizer			
Stabilizer	Ba-Zn stabilizer;	EI v3.6	2019
	market for chemical, organic chemical, organic Cutoff, S/GLO	EI v3.6	2019
	market for chemicals, inorganic chemical, inorganic Cutoff, S/GLO	EI v3.6	2019
	market for limestone, crushed, washed limestone, crushed, washed Cutoff, S/RoW	EI v3.6	2019
	market for zinc oxide zinc oxide Cutoff, S/GLO	EI v3.6	2019
Pigment			
Titanium dioxide	market for titanium dioxide titanium dioxide Cutoff, S/RoW	EI v3.6	2019
Carbon Black	market for carbon black carbon black Cutoff, S/GLO	EI v3.6	2019
Printing ink	market for printing ink, offset, without solvent, in 47.5% solution state printing ink, offset, without solvent, in 47.5% solution state Cutoff, S/RoW	EI v3.6	2019
Pigments	beta-Cu phthalocyanine System/GLO	EI v3.6	2019
Other			
Epoxidized Soybean oil	market for soybean oil, refined soybean oil, refined Cutoff, S/GLO	EI v3.6	2019
Organic chemicals	market for chemical, organic chemical, organic Cutoff, S/GLO	EI v3.6	2019
Amorphous Fused Silica	market for silica fume, densified silica fume, densified Cutoff, S/GLO	EI v3.6	2019
Glass Fibre	market for glass fibre glass fibre Cutoff, S/GLO	EI v3.6	2019
Urethane Acrylate	market for polyurethane, flexible foam polyurethane, flexible foam Cutoff, S/RoW	EI v3.6	2019
Polyethylene Glycol	market for ethylene glycol ethylene glycol Cutoff, S/GLO	EI v3.6	2019
Silicon Dioxide	market for activated silica activated silica Cutoff, S/GLO	EI v3.6	2019
PACKAGING			
Cardboard	market for folding boxboard/chipboard folding boxboard/chipboard Cutoff, S/GLO	EI v3.6	2019
Wrapping Film	market for packaging film, low density polyethylene packaging film, low density polyethylene Cutoff, S/GLO	EI v3.6	2019
Wood	market for EUR-flat pallet EUR-flat pallet Cutoff, S/GLO	EI v3.6	2019
TRANSPORT			
Road transport	market for transport, freight, lorry 16-32 metric ton, EURO4 transport, freight, lorry 16-32 metric ton, EURO4 Cutoff, S/RoW	EI v3.6	2019
Ship transport	transport, freight, sea, container ship transport, freight, sea, container ship Cutoff, S/GLO	EI v3.6	2019
RESOURCES			
Grid electricity	market group for electricity, medium voltage electricity, medium voltage Cutoff, S/CN	EI v3.6	2019
	market group for electricity, medium voltage electricity, medium voltage Cutoff, S/TW	EI v3.6	2019
	market group for electricity, medium voltage electricity, medium voltage Cutoff, S/KR	EI v3.6	2019
Heat – natural gas	market group for heat, district or industrial, natural gas heat, district or industrial, natural gas Cutoff, S/GLO	EI v3.6	2019

¹ adjusted for recycled content

3.8 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 9. Data quality assessment for the flooring product system.

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 5 years old (typically 2016). All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2019.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for regional grid mixes. Surrogate data used in the assessment are representative of global or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on regional statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the flooring products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.6 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in the United Kingdom, North America and Australia.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the manufacturing facilities in Asia represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI datasets, Ecoinvent v3.6 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the flooring products and packaging is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.9 PERIOD UNDER REVIEW

The period of review is calendar year 2019.

3.10 ALLOCATION

Manufacturing resource use was allocated to the products based on area. Impacts from transportation were allocated based on the mass of material and distance transported.

3.11 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.



4. LCA: Scenarios and Additional Technical Information

Delivery and Installation stage (A4 - A5)

Distribution of the flooring products to the point of installation is included in the assessment. Transportation parameters for modeling transport to product distribution centers are summarized in Table 10. A distance of 800 km is assumed for transport by diesel truck from the distribution center to point of installation, for North America and Australia, consistent with PCR guidance.

Table 10. Product distribution parameters, per 1 m² (A4).

Parameter	Consumer Market		
	North America	United Kingdom	Australia
Diesel truck – Fuel utilization (L/100 km)	18.7	18.7	18.7
Diesel truck – Capacity utilization (%)	76%	76%	76%
Diesel truck – Distance (km)	1,200	400	830
Ocean freighter – Fuel utilization kg/kg m ⁻¹	0.0025	0.0025	0.0025
Ocean freighter – Capacity utilization (%)	65%	65%	65%
Ocean freighter – Distance (km)	14,140	16,580	8,360
Gross mass of products transported ¹ (kg) – Karndean Looselay; Karndean Looselay Longboard	7.70	7.70	7.70

¹The mass transported is calculated from the declared mass per square metre of the product and packaging.

Installation of the product is accomplished using hand tools with no associated emissions and negligible impacts. Approximately 4% installation waste is assumed landfilled. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

Table 11. Installation parameters for the LVT flooring products, per 1 m² (A5).

Parameter	Value	
Ancillary materials (kg)	negligible	
Net freshwater consumption (m ³)	-	
Electricity consumption (kWh)	-	
Product loss per functional unit (kg)	0.299	
Waste materials generated by product installation (kg)	0.299	
Output materials resulting from on-site waste processing (kg)	N/A	
Mass of packaging waste (kg)	Paper/Corrugated	0.118
	Plastic	3.50x10 ⁻³
	Wood	0.105
Biogenic carbon contained in packaging (kg CO ₂)	0.392	
Direct emissions (kg)	-	

Use stage (B1)

No impacts are associated with the use of the product over the Reference Service Lifetime.

Maintenance stage (B2)

According to the manufacturer, typical maintenance involves regular sweeping and damp mopping, as well as periodic machine cleaning of the vinyl flooring. The present assessment is based on a recommended weekly cleaning schedule including sweeping and mopping with a neutral cleaner and monthly machine cleaning.

Table 12. Maintenance parameters for the flooring products, per 1 m².

Parameter	Unit	Value
Maintenance cycle	Cycles / RSL	1820
Maintenance cycle	Cycles / ESL	3,900
Maintenance process	-	Mopping
Net freshwater consumption	m ³ /m ² /yr	0.0058
Cleaning agent	kg/m ² /yr	0.0119
Maintenance process	-	Machine cleaning
Electricity	kWh/m ² /yr	0.022
Further assumptions	-	Moderate traffic; weekly maintenance

Repair/Refurbishment stage (B3; B5)

Product repair and refurbishment are not relevant during the lifetime of the product.

Replacement stage (B4)

The materials and energy required for replacement of the product over the 75-year ESL of the assessment are included in this stage.

Building operation stage (B6 – B7)

There is no operational energy or water use associated with the use of the product.

Disposal stage (C1 - C4)

The disposal stage includes demolition of the products (C1); transport of the flooring products to waste treatment facilities (C2); waste processing (C3); and associated emissions as the product degrades in a landfill or is burned in an incinerator (C4). For the luxury vinyl flooring products, no emissions are generated during demolition (C1) while no waste processing (C3) is required for incineration or landfill disposal.

Transportation of waste materials at end-of-life (C2) assumes a 20 mile (~32 km) average distance to disposal, consistent with assumptions used in the US EPA WARM model. The recycling rates used for the product packaging are based on national waste disposal statistics regarding recycling rates for the United Kingdom, North America and Australia, as specified in the PCR. No recycling of the product materials is assumed at end-of-life. The relevant disposal statistics used for the packaging are summarized in Table 13.

Table 13. Recycling rates for packaging materials at end-of-life.

Material	North America	United Kingdom	Australia
Packaging			
Paper & Pulp	78.2%	79.0%	60.0%
Plastics	14.5%	46.2%	12.0%
Wood	26.1%	31.4%	39.8%
Disposal of Non-recyclables			
Landfill	80.0%	55.0%	80.0%
Incineration	20.0%	45.0%	20.0%

Table 14. End-of-life disposal scenario parameters for the flooring products.

Parameter	Value
Assumptions for scenario development	100% landfill
Collection process	-
Collected with mixed construction waste (kg)	7.47
Recovery	n/a
Landfill disposal (kg)	7.47
Removals of biogenic carbon (kg CO ₂ eq)	n/a



5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All LCA results are stated to three significant figures in agreement with the PCR for this flooring product and therefore the sum of the total values may not exactly equal 100%.

The following environmental impact category indicators are reported using characterization factors based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1 and CML-IA.

CMLI-A Impact Category	Unit	TRACI 2.1 Impact Category	Unit
Global Warming Potential (GWP)	kg CO ₂ eq	Global Warming Potential (GWP)	kg CO ₂ eq
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq	Ozone Depletion Potential (ODP)	kg CFC 11 eq
Acidification Potential of soil and water (AP)	kg SO ₂ eq	Acidification Potential (AP)	kg SO ₂ eq
Eutrophication Potential (EP)	kg PO ₄ ³⁻ eq	Eutrophication Potential (EP)	kg N eq
Photochemical Oxidant Creation Potential (POCP)	kg C ₂ H ₄ eq	Smog Formation Potential (SFP)	kg O ₃ eq
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq	Fossil Fuel Depletion Potential (ADP _{fossil})	MJ Surplus, LHV
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ, LHV		

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

The following inventory parameters, specified by the PCR, are also reported.

Resources	Unit	Waste and Outflows	Unit
RPRE: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	HWD: Hazardous waste disposed	kg
RPRM: Renewable primary resources with energy content used as material	MJ, LHV	NHWD: Non-hazardous waste disposed	kg
NRPRE: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	HLRW: High-level radioactive waste, conditioned, to final repository	kg
NRPRM: Non-renewable primary resources with energy content used as material	MJ, LHV	ILLRW: Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
SM: Secondary materials	MJ, LHV	CRU: Components for re-use	kg
RSF: Renewable secondary fuels	MJ, LHV	MR: Materials for recycling	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	MER: Materials for energy recovery	kg
RE: Recovered energy	MJ, LHV	EE: Recovered energy exported from the product system	MJ, LHV
FW: Use of net freshwater resources	m ³		

Modules B1, B3, B5, B6, and B7 are not associated with any impact and are therefore declared as zero. In addition, module C1 is likewise not associated with any impact as the floor is manually deconstructed. Additionally, as LVT flooring products do not typically contain significant amounts of bio-based materials, biogenic carbon emissions and removals are not declared. Module D is not declared. In the interest of space and table readability, these modules are not included in the results presented below.

Table 15. Life Cycle Impact Assessment (LCIA) results for the Karndean **Looselay/Looselay Longboard** vinyl flooring products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. Product distribution to the United Kingdom.

Impact Category	A1	A2	A3	A4	A5	B2	B4	C2	C4
CML-IA									
GWP (kg CO ₂ eq)	9.28	0.287	5.00	1.72	0.233	0.562	23.8	0.305	3.45
	21%	0.64%	11%	3.9%	0.52%	1.3%	53%	0.68%	7.7%
ODP (kg CFC-11 eq)	2.80x10 ⁻⁶	5.04x10 ⁻⁸	5.28x10 ⁻⁷	2.84x10 ⁻⁷	4.80x10 ⁻⁹	5.37x10 ⁻⁸	4.34x10 ⁻⁶	5.31x10 ⁻⁸	2.13x10 ⁻⁸
	34%	0.62%	6.5%	3.5%	0.06%	0.66%	53%	0.65%	0.26%
AP (kg SO ₂ eq)	3.59x10 ⁻²	1.13x10 ⁻³	1.21x10 ⁻²	3.33x10 ⁻²	1.53x10 ⁻⁴	2.18x10 ⁻³	9.96x10 ⁻²	1.43x10 ⁻³	9.05x10 ⁻⁴
	19%	0.60%	6.5%	18%	0.08%	1.2%	53%	0.76%	0.48%
EP (kg (PO ₄) ³⁻ eq)	1.29x10 ⁻²	2.68x10 ⁻⁴	8.01x10 ⁻³	3.99x10 ⁻³	9.19x10 ⁻⁴	7.93x10 ⁻⁴	5.36x10 ⁻²	3.07x10 ⁻⁴	1.97x10 ⁻²
	13%	0.27%	8.0%	4.0%	0.91%	0.79%	53%	0.31%	20%
POCP (kg C ₂ H ₄ eq)	2.15x10 ⁻³	3.92x10 ⁻⁵	5.82x10 ⁻⁴	8.86x10 ⁻⁴	4.81x10 ⁻⁵	1.26x10 ⁻⁴	5.27x10 ⁻³	4.72x10 ⁻⁵	7.34x10 ⁻⁴
	22%	0.40%	5.9%	9.0%	0.49%	1.3%	53%	0.48%	7.4%
ADPE (kg Sb eq)	4.91x10 ⁻⁷	2.95x10 ⁻¹⁰	4.43x10 ⁻⁸	9.72x10 ⁻¹⁰	2.66x10 ⁻¹¹	9.17x10 ⁻⁹	6.24x10 ⁻⁷	8.33x10 ⁻¹¹	3.75x10 ⁻¹⁰
	42%	0.03%	3.8%	0.08%	0.00%	0.78%	53%	0.01%	0.03%
ADPF (MJ eq)	203	4.24	58.2	23.0	0.407	9.99	349	4.17	2.21
	31%	0.65%	8.9%	3.5%	0.06%	1.5%	53%	0.64%	0.34%
TRACI 2.1									
GWP (kg CO ₂ eq)	9.09	0.286	4.98	1.72	0.211	0.556	23.1	0.305	3.09
	21%	0.66%	11%	4.0%	0.49%	1.3%	53%	0.70%	7.1%
ODP (kg CFC-11 eq)	2.94x10 ⁻⁶	6.71x10 ⁻⁸	6.80x10 ⁻⁷	3.77x10 ⁻⁷	6.38x10 ⁻⁹	6.13x10 ⁻⁸	4.84x10 ⁻⁶	7.07x10 ⁻⁸	2.83x10 ⁻⁸
	32%	0.74%	7.5%	4.2%	0.07%	0.68%	53%	0.78%	0.31%
AP (kg SO ₂ eq)	3.71x10 ⁻²	1.32x10 ⁻³	1.34x10 ⁻²	3.56x10 ⁻²	2.35x10 ⁻⁴	2.27x10 ⁻³	0.108	1.76x10 ⁻³	2.50x10 ⁻³
	18%	0.65%	6.6%	18%	0.12%	1.1%	53%	0.87%	1.2%
EP (kg N eq)	2.56x10 ⁻²	3.35x10 ⁻⁴	1.68x10 ⁻²	2.44x10 ⁻³	2.41x10 ⁻³	1.53x10 ⁻³	0.117	2.31x10 ⁻⁴	5.30x10 ⁻²
	12%	0.15%	7.7%	1.1%	1.1%	0.70%	53%	0.11%	24%
SFP (kg O ₃ eq)	0.477	3.14x10 ⁻²	0.227	0.669	4.72x10 ⁻³	2.79x10 ⁻²	1.72	4.98x10 ⁻²	2.02x10 ⁻²
	15%	0.97%	7.0%	21%	0.15%	0.86%	53%	1.5%	0.62%
FFD (MJ eq)	25.8	0.570	5.81	3.17	5.49x10 ⁻²	1.20	42.8	0.591	0.266
	32%	0.71%	7.2%	3.9%	0.07%	1.5%	53%	0.74%	0.33%

Table 16. Resource use and waste flows for the Karndean **Looselay/Looselay Longboard** vinyl flooring products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. Product distribution to the United Kingdom.

Parameter	A1	A2	A3	A4	A5	B2	B4	C2	C4
Resources									
RPR _E (MJ)	7.41	4.71x10 ⁻²	3.70	0.187	5.96x10 ⁻³	1.86	15.2	1.54x10 ⁻²	8.54x10 ⁻²
	26%	0.16%	13%	0.65%	0.02%	6.5%	53%	0.05%	0.30%
RPR _M (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRPR _E (MJ)	INA	INA	INA	INA	INA	INA	INA	INA	INA
NRPR _M (MJ)	INA	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m ³)	0.574	3.08x10 ⁻³	0.320	1.15x10 ⁻²	4.01x10 ⁻⁴	8.64x10 ⁻²	1.14	1.37x10 ⁻³	4.85x10 ⁻³
	27%	0.14%	15%	0.54%	0.02%	4.0%	53%	0.06%	0.23%
Wastes									
HWD (kg)	1.69x10 ⁻⁴	1.13x10 ⁻⁵	6.70x10 ⁻⁵	3.48x10 ⁻⁵	1.17x10 ⁻⁶	8.61x10 ⁻⁶	3.55x10 ⁻⁴	1.13x10 ⁻⁵	6.75x10 ⁻⁶
	25%	1.7%	10%	5.2%	0.18%	1.3%	53%	1.7%	1.0%
NHWD (kg)	0.972	0.203	0.268	0.407	0.349	4.46x10 ⁻²	11.1	1.97x10 ⁻²	7.49
	4.7%	0.97%	1.3%	1.9%	1.7%	0.21%	53%	0.09%	36%
HLRW (kg)	3.28x10 ⁻⁵	2.31x10 ⁻⁷	1.00x10 ⁻⁴	8.10x10 ⁻⁷	3.27x10 ⁻⁸	9.49x10 ⁻⁶	1.65x10 ⁻⁴	7.03x10 ⁻⁸	4.88x10 ⁻⁷
	11%	0.07%	32%	0.26%	0.01%	3.1%	53%	0.02%	0.16%
ILLRW (kg)	2.18x10 ⁻⁴	2.80x10 ⁻⁵	3.62x10 ⁻⁴	1.58x10 ⁻⁴	2.67x10 ⁻⁶	5.48x10 ⁻⁵	9.88x10 ⁻⁴	2.96x10 ⁻⁵	1.21x10 ⁻⁵
	12%	1.5%	20%	8.5%	0.14%	3.0%	53%	1.6%	0.65%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	0.141	0.00	0.161	0.00	0.00
	0.00%	0.00%	0.00%	0.00%	47%	0.00%	53%	0.00%	0.00%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

Table 17. Life Cycle Impact Assessment (LCIA) results for the Karndean **Looselay/Looselay Longboard** vinyl flooring products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. Product distribution to North America.

Impact Category	A1	A2	A3	A4	A5	B2	B4	C2	C4
CML-IA									
GWP (kg CO ₂ eq)	9.28	0.287	5.00	2.59	0.248	0.726	25.0	0.305	3.45
	20%	0.61%	11%	5.5%	0.53%	1.5%	53%	0.65%	7.4%
ODP (kg CFC-11 eq)	2.80x10 ⁻⁶	5.04x10 ⁻⁸	5.28x10 ⁻⁷	4.40x10 ⁻⁷	4.88x10 ⁻⁹	5.02x10 ⁻⁸	4.51x10 ⁻⁶	5.31x10 ⁻⁸	2.13x10 ⁻⁸
	33%	0.60%	6.2%	5.2%	0.06%	0.59%	53%	0.63%	0.25%
AP (kg SO ₂ eq)	3.59x10 ⁻²	1.13x10 ⁻³	1.21x10 ⁻²	3.29x10 ⁻²	1.55x10 ⁻⁴	4.18x10 ⁻³	0.101	1.43x10 ⁻³	9.05x10 ⁻⁴
	19%	0.59%	6.4%	17%	0.08%	2.2%	53%	0.75%	0.48%
EP (kg (PO ₄) ³⁻ eq)	1.29x10 ⁻²	2.68x10 ⁻⁴	8.01x10 ⁻³	4.46x10 ⁻³	1.02x10 ⁻³	1.59x10 ⁻³	5.51x10 ⁻²	3.07x10 ⁻⁴	1.97x10 ⁻²
	12%	0.26%	7.7%	4.3%	0.99%	1.5%	53%	0.30%	19%
POCP (kg C ₂ H ₄ eq)	2.15x10 ⁻³	3.92x10 ⁻⁵	5.82x10 ⁻⁴	9.10x10 ⁻⁴	5.17x10 ⁻⁵	1.94x10 ⁻⁴	5.38x10 ⁻³	4.72x10 ⁻⁵	7.34x10 ⁻⁴
	21%	0.39%	5.8%	9.0%	0.51%	1.9%	53%	0.47%	7.3%
ADPE (kg Sb eq)	4.91x10 ⁻⁷	2.95x10 ⁻¹⁰	4.43x10 ⁻⁸	1.99x10 ⁻⁹	2.77x10 ⁻¹¹	1.23x10 ⁻⁶	2.02x10 ⁻⁶	8.33x10 ⁻¹¹	3.75x10 ⁻¹⁰
	13%	0.01%	1.2%	0.05%	0.00%	32%	53%	0.00%	0.01%
ADPF (MJ eq)	203	4.24	58.2	36.3	0.414	11.8	366	4.17	2.21
	30%	0.62%	8.5%	5.3%	0.06%	1.7%	53%	0.61%	0.32%
TRACI 2.1									
GWP (kg CO ₂ eq)	9.09	0.286	4.98	2.59	0.224	0.719	24.3	0.305	3.09
	20%	0.63%	11%	5.7%	0.49%	1.6%	53%	0.67%	6.8%
ODP (kg CFC-11 eq)	2.94x10 ⁻⁶	6.71x10 ⁻⁸	6.80x10 ⁻⁷	5.85x10 ⁻⁷	6.49x10 ⁻⁹	5.92x10 ⁻⁸	5.07x10 ⁻⁶	7.07x10 ⁻⁸	2.83x10 ⁻⁸
	31%	0.71%	7.1%	6.2%	0.07%	0.62%	53%	0.74%	0.30%
AP (kg SO ₂ eq)	3.71x10 ⁻²	1.32x10 ⁻³	1.34x10 ⁻²	3.55x10 ⁻²	2.40x10 ⁻⁴	4.29x10 ⁻³	0.110	1.76x10 ⁻³	2.50x10 ⁻³
	18%	0.64%	6.5%	17%	0.12%	2.1%	53%	0.85%	1.2%
EP (kg N eq)	2.56x10 ⁻²	3.35x10 ⁻⁴	1.68x10 ⁻²	3.39x10 ⁻³	2.68x10 ⁻³	3.05x10 ⁻³	0.120	2.31x10 ⁻⁴	5.30x10 ⁻²
	11%	0.15%	7.5%	1.5%	1.2%	1.4%	53%	0.10%	24%
SFP (kg O ₃ eq)	0.477	3.14x10 ⁻²	0.227	0.694	4.72x10 ⁻³	5.21x10 ⁻²	1.78	4.98x10 ⁻²	2.02x10 ⁻²
	14%	0.94%	6.8%	21%	0.14%	1.6%	53%	1.5%	0.60%
FFD (MJ eq)	25.8	0.570	5.81	4.94	5.59x10 ⁻²	1.28	45.0	0.591	0.266
	31%	0.68%	6.9%	5.9%	0.07%	1.5%	53%	0.70%	0.32%

Table 18. Resource use and waste flows for the Karndean **Looselay/Looselay Longboard** vinyl flooring products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. Product distribution to North America.

Parameter	A1	A2	A3	A4	A5	B2	B4	C2	C4
Resources									
RPR _E (MJ)	7.41	4.71x10 ⁻²	3.70	0.344	6.19x10 ⁻³	6.19	20.3	1.54x10 ⁻²	8.54x10 ⁻²
	19%	0.12%	9.7%	0.90%	0.02%	16%	53%	0.04%	0.22%
RPR _M (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRPR _E (MJ)	INA	INA	INA	INA	INA	INA	INA	INA	INA
NRPR _M (MJ)	INA	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m ³)	0.574	3.08x10 ⁻³	0.320	2.19x10 ⁻²	4.01x10 ⁻⁴	8.71x10 ⁻²	1.16	1.37x10 ⁻³	4.85x10 ⁻³
	26%	0.14%	15%	1.0%	0.02%	4.0%	53%	0.06%	0.22%
Wastes									
HWD (kg)	1.69x10 ⁻⁴	1.13x10 ⁻⁵	6.70x10 ⁻⁵	7.42x10 ⁻⁵	1.18x10 ⁻⁶	2.36x10 ⁻⁵	4.17x10 ⁻⁴	1.13x10 ⁻⁵	6.75x10 ⁻⁶
	22%	1.5%	8.6%	9.5%	0.15%	3.0%	53%	1.5%	0.86%
NHWD (kg)	0.972	0.203	0.268	1.15	0.387	4.61x10 ⁻²	12.0	1.97x10 ⁻²	7.49
	4.3%	0.90%	1.2%	5.1%	1.7%	0.20%	53%	0.09%	33%
HLRW (kg)	3.28x10 ⁻⁵	2.31x10 ⁻⁷	1.00x10 ⁻⁴	1.60x10 ⁻⁶	3.41x10 ⁻⁸	7.59x10 ⁻⁵	2.41x10 ⁻⁴	7.03x10 ⁻⁸	4.88x10 ⁻⁷
	7.3%	0.05%	22%	0.35%	0.01%	17%	53%	0.02%	0.11%
ILLRW (kg)	2.18x10 ⁻⁴	2.80x10 ⁻⁵	3.62x10 ⁻⁴	2.45x10 ⁻⁴	2.72x10 ⁻⁶	4.07x10 ⁻⁵	1.07x10 ⁻³	2.96x10 ⁻⁵	1.21x10 ⁻⁵
	11%	1.4%	18%	12%	0.14%	2.0%	53%	1.5%	0.60%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	0.120	0.00	0.137	0.00	0.00
	0.00%	0.00%	0.00%	0.00%	47%	0.00%	53%	0.00%	0.00%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

Table 19. Life Cycle Impact Assessment (LCIA) results for the Karndean **Looselay/Looselay Longboard** vinyl flooring products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. Product distribution to Australia.

Impact Category	A1	A2	A3	A4	A5	B2	B4	C2	C4
CML-IA									
GWP (kg CO ₂ eq)	9.28	0.287	5.00	1.69	0.363	1.03	24.5	0.305	3.45
	20%	0.63%	11%	3.7%	0.79%	2.2%	53%	0.66%	7.5%
ODP (kg CFC-11 eq)	2.80x10 ⁻⁶	5.04x10 ⁻⁸	5.28x10 ⁻⁷	2.88x10 ⁻⁷	5.21x10 ⁻⁹	2.40x10 ⁻⁸	4.31x10 ⁻⁶	5.31x10 ⁻⁸	2.13x10 ⁻⁸
	35%	0.62%	6.5%	3.6%	0.06%	0.30%	53%	0.66%	0.26%
AP (kg SO ₂ eq)	3.59x10 ⁻²	1.13x10 ⁻³	1.21x10 ⁻²	2.00x10 ⁻²	1.76x10 ⁻⁴	4.25x10 ⁻³	8.68x10 ⁻²	1.43x10 ⁻³	9.05x10 ⁻⁴
	22%	0.69%	7.4%	12%	0.11%	2.6%	53%	0.88%	0.56%
EP (kg (PO ₄) ³⁻ eq)	1.29x10 ⁻²	2.68x10 ⁻⁴	8.01x10 ⁻³	2.78x10 ⁻³	1.27x10 ⁻³	4.69x10 ⁻³	5.71x10 ⁻²	3.07x10 ⁻⁴	1.97x10 ⁻²
	12%	0.25%	7.5%	2.6%	1.2%	4.4%	53%	0.29%	18%
POCP (kg C ₂ H ₄ eq)	2.15x10 ⁻³	3.92x10 ⁻⁵	5.82x10 ⁻⁴	5.59x10 ⁻⁴	7.67x10 ⁻⁵	1.87x10 ⁻⁴	5.00x10 ⁻³	4.72x10 ⁻⁵	7.34x10 ⁻⁴
	23%	0.42%	6.2%	6.0%	0.82%	2.0%	53%	0.50%	7.8%
ADPE (kg Sb eq)	4.91x10 ⁻⁷	2.95x10 ⁻¹⁰	4.43x10 ⁻⁸	1.34x10 ⁻⁹	3.45x10 ⁻¹¹	1.61x10 ⁻⁹	6.16x10 ⁻⁷	8.33x10 ⁻¹¹	3.75x10 ⁻¹⁰
	43%	0.03%	3.8%	0.12%	0.00%	0.14%	53%	0.01%	0.03%
ADPF (MJ eq)	203	4.24	58.2	23.8	0.449	13.6	354	4.17	2.21
	31%	0.64%	8.8%	3.6%	0.07%	2.0%	53%	0.63%	0.33%
TRACI 2.1									
GWP (kg CO ₂ eq)	9.09	0.286	4.98	1.69	0.327	1.03	23.8	0.305	3.09
	20%	0.64%	11%	3.8%	0.73%	2.3%	53%	0.68%	6.9%
ODP (kg CFC-11 eq)	2.94x10 ⁻⁶	6.71x10 ⁻⁸	6.80x10 ⁻⁷	3.83x10 ⁻⁷	6.92x10 ⁻⁹	3.17x10 ⁻⁸	4.81x10 ⁻⁶	7.07x10 ⁻⁸	2.83x10 ⁻⁸
	33%	0.74%	7.5%	4.2%	0.08%	0.35%	53%	0.78%	0.31%
AP (kg SO ₂ eq)	3.71x10 ⁻²	1.32x10 ⁻³	1.34x10 ⁻²	2.17x10 ⁻²	2.84x10 ⁻⁴	4.33x10 ⁻³	9.42x10 ⁻²	1.76x10 ⁻³	2.50x10 ⁻³
	21%	0.75%	7.6%	12%	0.16%	2.5%	53%	1.00%	1.4%
EP (kg N eq)	2.56x10 ⁻²	3.35x10 ⁻⁴	1.68x10 ⁻²	2.19x10 ⁻³	3.36x10 ⁻³	1.05x10 ⁻²	0.128	2.31x10 ⁻⁴	5.30x10 ⁻²
	11%	0.14%	7.0%	0.91%	1.4%	4.4%	53%	0.10%	22%
SFP (kg O ₃ eq)	0.477	3.14x10 ⁻²	0.227	0.427	5.19x10 ⁻³	5.08x10 ⁻²	1.47	4.98x10 ⁻²	2.02x10 ⁻²
	17%	1.1%	8.2%	15%	0.19%	1.8%	53%	1.8%	0.73%
FFD (MJ eq)	25.8	0.570	5.81	3.24	5.99x10 ⁻²	0.985	42.7	0.591	0.266
	32%	0.71%	7.3%	4.0%	0.07%	1.2%	53%	0.74%	0.33%

Table 20. Resource use and waste flows for the Karndeian **Looselay/Looselay Longboard** vinyl flooring products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. Product distribution to Australia.

Parameter	A1	A2	A3	A4	A5	B2	B4	C2	C4
Resources									
RPR _E (MJ)	7.41	4.71x10 ⁻²	3.70	0.229	7.85x10 ⁻³	1.12	14.4	1.54x10 ⁻²	8.54x10 ⁻²
	27%	0.17%	14%	0.85%	0.03%	4.2%	53%	0.06%	0.32%
RPR _M (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRPR _E (MJ)	INA	INA	INA	INA	INA	INA	INA	INA	INA
NRPR _M (MJ)	INA	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m ³)	0.574	3.08x10 ⁻³	0.320	1.46x10 ⁻²	5.29x10 ⁻⁴	9.13x10 ⁻²	1.15	1.37x10 ⁻³	4.85x10 ⁻³
	27%	0.14%	15%	0.68%	0.02%	4.2%	53%	0.06%	0.22%
Wastes									
HWD (kg)	1.69x10 ⁻⁴	1.13x10 ⁻⁵	6.70x10 ⁻⁵	5.01x10 ⁻⁵	1.23x10 ⁻⁶	6.34x10 ⁻⁶	3.70x10 ⁻⁴	1.13x10 ⁻⁵	6.75x10 ⁻⁶
	24%	1.6%	9.7%	7.2%	0.18%	0.91%	53%	1.6%	0.97%
NHWD (kg)	0.972	0.203	0.268	0.789	0.482	5.40x10 ⁻²	11.7	1.97x10 ⁻²	7.49
	4.4%	0.92%	1.2%	3.6%	2.2%	0.25%	53%	0.09%	34%
HLRW (kg)	3.28x10 ⁻⁵	2.31x10 ⁻⁷	1.00x10 ⁻⁴	1.07x10 ⁻⁶	4.33x10 ⁻⁸	8.54x10 ⁻⁷	1.55x10 ⁻⁴	7.03x10 ⁻⁸	4.88x10 ⁻⁷
	11%	0.08%	34%	0.37%	0.01%	0.29%	53%	0.02%	0.17%
ILLRW (kg)	2.18x10 ⁻⁴	2.80x10 ⁻⁵	3.62x10 ⁻⁴	1.60x10 ⁻⁴	2.90x10 ⁻⁶	6.00x10 ⁻⁶	9.36x10 ⁻⁴	2.96x10 ⁻⁵	1.21x10 ⁻⁵
	12%	1.6%	21%	9.1%	0.17%	0.34%	53%	1.7%	0.69%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	2.10x10 ⁻³	0.00	2.40x10 ⁻³	0.00	0.00
	0.00%	0.00%	0.00%	0.00%	47%	0.00%	53%	0.00%	0.00%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

6. LCA: Interpretation

The contributions to total impact indicator results are dominated by the product replacement phase (B4) of the assessment. Of the remaining life cycle phases, the raw material extraction and processing (A1) and product manufacturing (A3) phases are generally the largest contributors to indicator impact results followed by product distribution (A4) and disposal (C4). Other life cycle phase contributions are minimal.

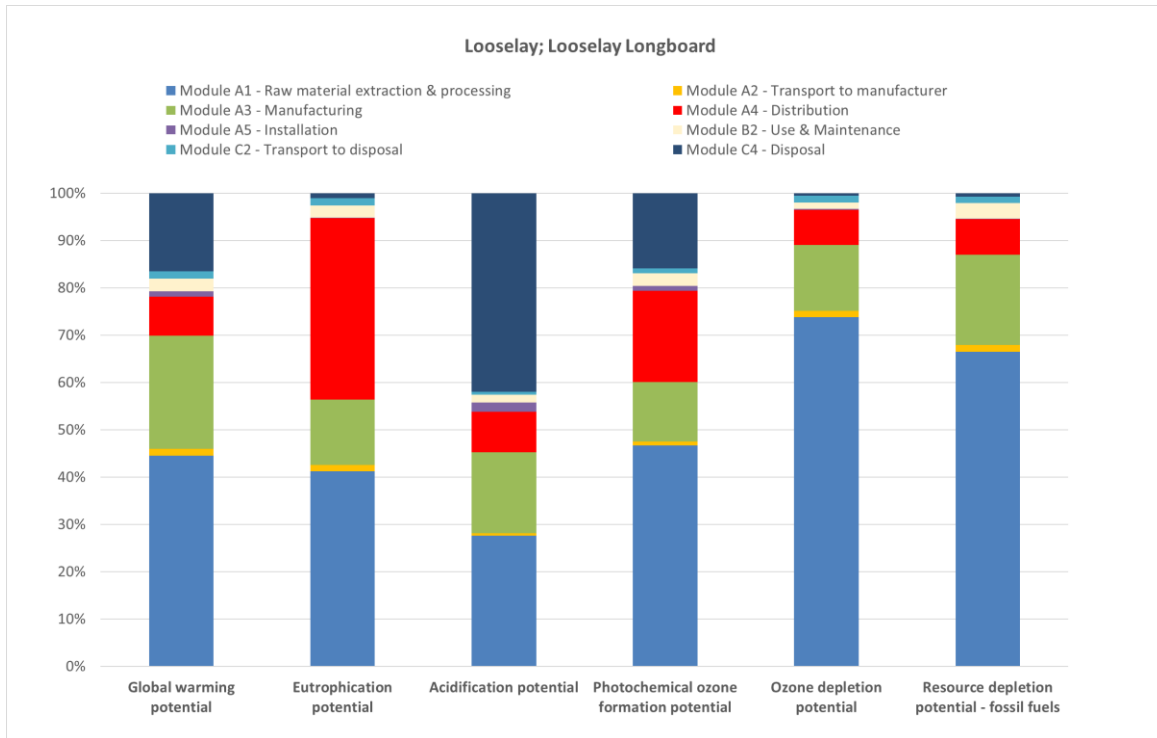


Figure 2. Contribution analysis for the Karndean Designflooring LVT flooring products (excluding product replacements) over the product's RSL – CML-IA. Product distribution to the United Kingdom.

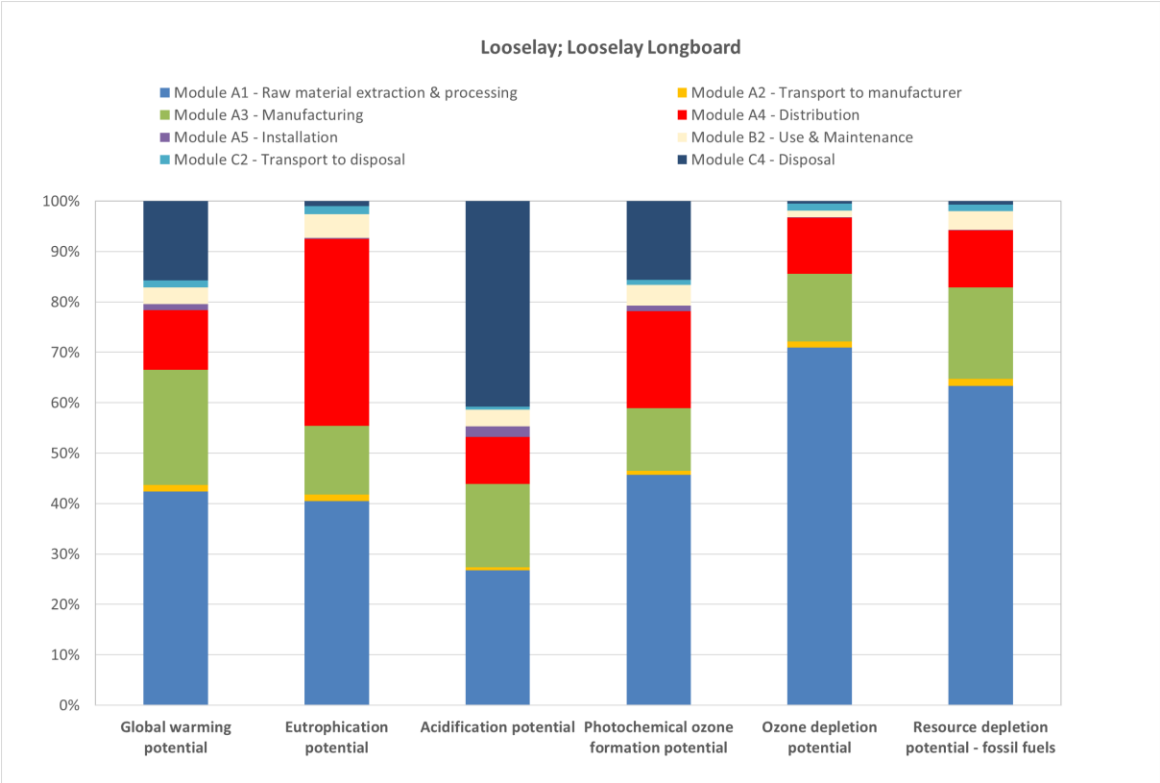


Figure 3. Contribution analysis for the Karndean Designflooring LVT flooring products (excluding product replacements) over the product's RSL – CML-IA. Product distribution to North America.

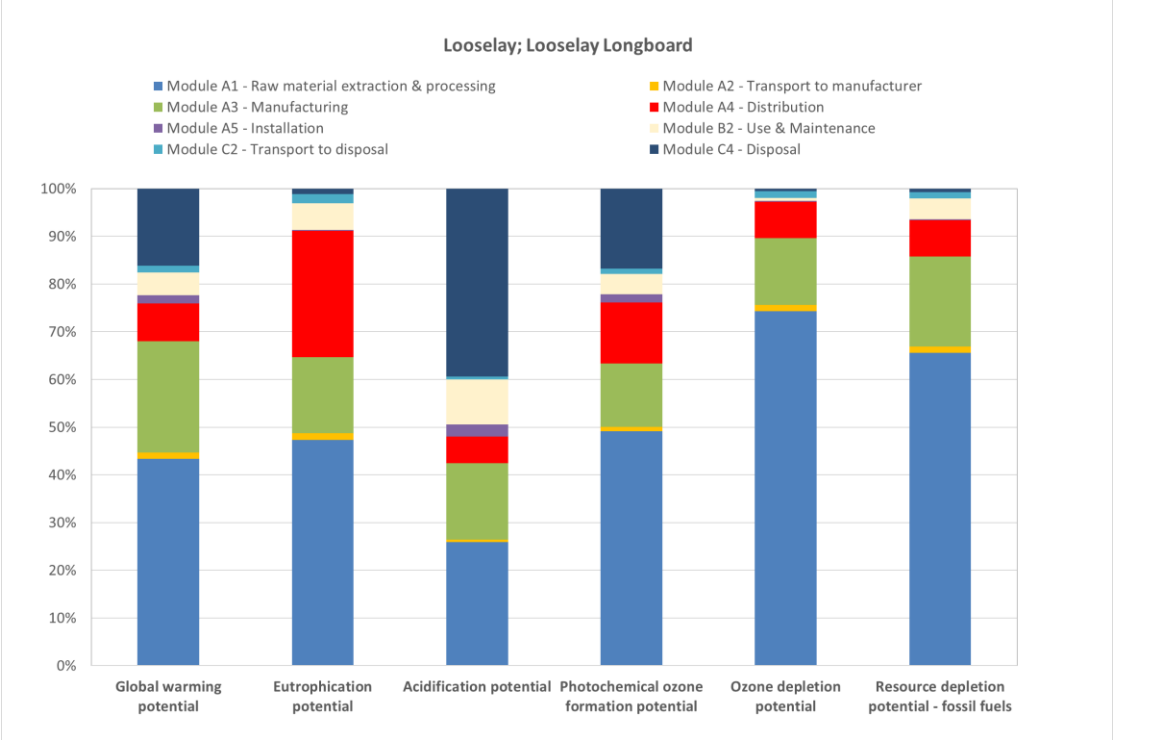


Figure 4. Contribution analysis for the Karndean Designflooring LVT flooring products (excluding product replacements) over the product's RSL – CML-IA. Product distribution to Australia.

7. Additional Environmental Information

7.1 ENVIRONMENT AND HEALTH DURING MANUFACTURING

The Karndean manufacturing facility is certified to ISO 14001 – Environmental management systems.

7.2 ENVIRONMENT AND HEALTH DURING INSTALLATION

The Karndean LVT flooring products meet the requirements of the following:

1. Indoor Air Comfort Gold (VOC certification)
2. CDPH/EHLB Standard Method v1.2-2017 (California Section 01350)

7.3 EXTRAORDINARY EFFECTS

Fire

The Karndean flooring products meet the following fire classification and performance standards:

- EN 13501-1:2002: Fire classification of construction products and building elements. Classification using test data from reaction to fire tests. The Karndean Looselay and Karndean Looselay Longboard ranges achieve a reaction to fire classification of B_{fl}-s1.
- ASTM E648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems using a Radiant Heat Energy Source (also referenced as NFPA 253 and FTM Standard 372). The Karndean Looselay and Karndean Looselay Longboard ranges achieve Class 1.
- AS ISO 9239.1:2003: Reaction to fire tests for floor-coverings. Determination of the burning behavior using a radiant heat source.
- ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials, also referenced as NFPA 258. The Karndean Looselay and Karndean Looselay Longboard ranges meet <450 requirement for smoke density.

7.4 ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

The Karndean Designflooring products are REACH compliant. Our accreditations and certifications include; FloorScore, Indoor Air Comfort Gold, NSF 332.

For more information on Karndean Designflooring's certifications and environmental initiatives please view our Global Environmental Statement www.karndean.com/eco

8. References

1. Life Cycle Assessment of Luxury Vinyl Flooring. SCS Global Services Report. Prepared for Karndean Designflooring. February 2021.
2. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
3. ISO 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018
6. PCR Guidance for Building-Related Products and Services Part B: Flooring EPD Requirements. Version 2. UL Environment. May 2018.
7. SCS Type III Environmental Declaration Program: Program Operator Manual. V10.0 April 2019. SCS Global Services.
8. Overcash, M. LCI gate-to-gate database, Department of Chemical and Biomolecular Engineering, NCSU, Raleigh, NC, 1998-2004.
9. Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). Dr. Bare, J., <https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci>
10. CML-IA Characterization Factors. Leiden University, Institute of Environmental Sciences. April 2013. <https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors>
11. Ecoinvent Centre (2019) ecoinvent data from v3.6. Swiss Center for Life Cycle Inventories, Dübendorf, 2019, <http://www.ecoinvent.org>
12. European Joint Research Commission. International Reference Life Cycle Data System handbook. *General guide for Life Cycle Assessment – Detailed Guidance*. © European Union, 2010.

“WARM Model Transportation Research – Draft.” Memorandum from ICF Consulting to United States Environmental Protection Agency. September 7, 2004.
https://19january2017snapshot.epa.gov/www3/epawaste/conserves/tools/warm/pdfs/retail_transport-memo.pdf.



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