Designflooring

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

**Declaration Owner**

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**Product**

Korlok Rigid Core Luxury Vinyl flooring
EPD represents delivery of product to customers in Europe

**Functional Unit**

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

**EPD Number and Period of Validity**

SCS-EPD-05829
EPD Valid November 26, 2019 through November 25, 2024
Version: March 26, 2020

**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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SCSglobal SERVICES

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|---|---|
| Declaration Owner: | Designflooring International |
| Address: | Crab Apple Way, Vale Park, Evesham, Worcestershire, WR11 1GP, United Kingdom |
| Declaration Number: | SCS-EPD-05829 |
| Declaration Validity Period: | November 26, 2019 through November 25, 2024 |
| Program Operator: | SCS Global Services |
| Version: | March 26, 2020 |
| 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: | 30 years |
| Markets of Applicability: | Europe |
| 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 | ☐ internal ☒ 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 | ☐ internal ☒ external |
| EPD Verifier: | Thomas Gloria, Ph.D., Industrial Ecology Consultants |
| Declaration Contents: | 1. Designflooring....2<br>2. Product....2<br>3. LCA: Calculation Rules....6<br>4. LCA: Scenarios and Additional Technical Information....12<br>5. LCA: Results....14<br>6. LCA: Interpretation....17<br>7. Additional Environmental Information....19<br>8. References....21 |

***Disclaimers:*** *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

***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.*

***Accuracy of Results:*** *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

***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.*

*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.*

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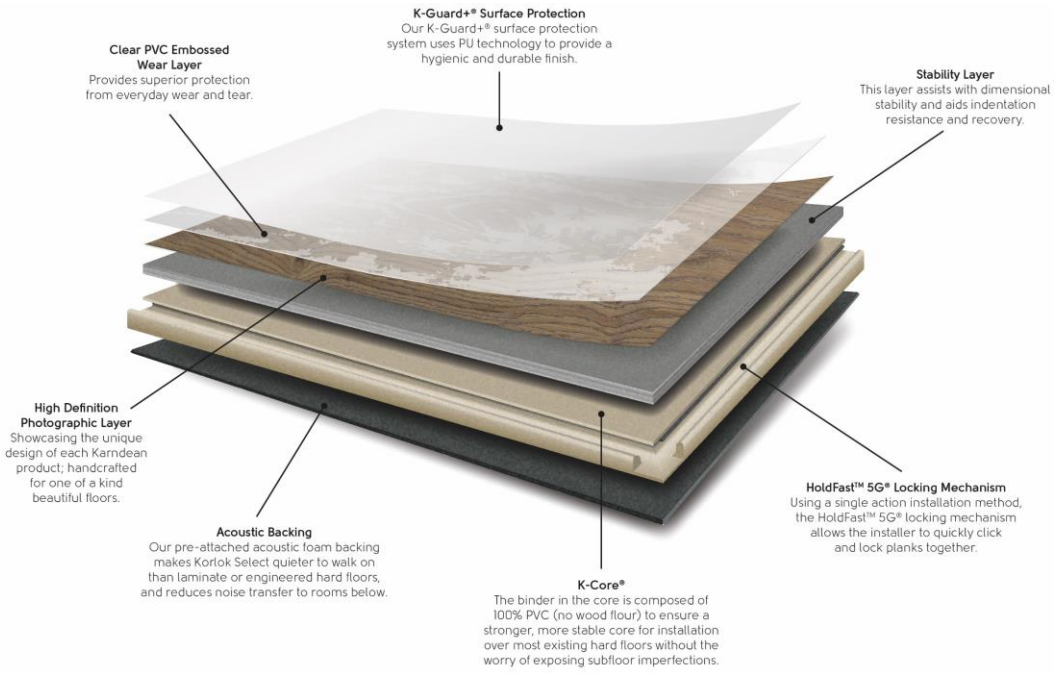
# 1. Designflooring

Designflooring is one of Europe's leading suppliers of luxury vinyl flooring. Throughout continuous growth, we remain true to our roots by offering a wide range of colours and textures to create looks that are unique to your style and needs. Just as we are inspired by nature, we also want to inspire our customers with some of the most beautiful, authentic and practical flooring ideas.

# 2. Product

### 2.1 PRODUCT DESCRIPTION

Korlok, one of Designflooring's Rigid Core ranges, is suitable for both commercial and residential interiors; achieving classifications 21, 22, 23, 31, 32, 33 according to EN ISO 10874. The product is structured into a number of layers, as shown in the diagram below, and comprises a rigid core to assist with installation over uneven subfloors, and a pre-attached acoustic backing specifically engineered to give excellent acoustic properties; reducing noise transfer to rooms below.

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### 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 Korlok products provide the primary function of flooring for interior applications. Korlok 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 | B1 | 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 Korlok product are summarized in Table 2.

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**Table 2.** *Product specifications for the Korlok product.*

| Product Characteristics | | | Nominal value | Unit | Maximum value | Minimum value |
|---|---|---|---|---|---|---|
| Product thickness | | | 6,5 | mm | 6,63 | 6,40 |
| Wear layer thickness | | | 0,55 | mm | 0,62 | 0,50 |
| Product weight | | | 7480 | g/m$^2$ | 8452 | 6732 |
| VOC emissions test method | | | FloorScore®; Indoor Air Comfort Gold | | | |
| Sustainable certifications | | | ISO 14001; CE | | | |
| Product form | Tiles | width | 225 | mm | 225,25 | 224,75 |
| | | length | 1420 | mm | 1420,5 | 1419,5 |

### 2.6 MARKET PLACEMENT/APPLICATION RULES

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

- EN 16511:2014 - Loose-laid panels. Semi-rigid multilayer modular floor covering (MMF) panels with wear resistant top layer
- 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 Korlok products are delivered for installation in the form of planks (1420mm x 225mm).

### 2.8 MATERIAL COMPOSITION

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

**Table 3.** *Material content for the Korlok products, per square meter.*

| Component | Material | kg | Percent |
|---|---|---|---|
| Calcium carbonate | Filler - natural, ground $CaCO_3$ | 3,60 | 48,1% |
| PVC | Polyvinyl chloride | 3,02 | 40,4% |
| Plastics | Polyurethane; polyethylene | 0,399 | 5,34% |
| Plasticizer | Plasticizer – DOTP mixture | 0,289 | 3,86% |
| Additives | Various | 0,128 | 1,71% |
| Stabilizer | Ba-Zn organic liquid complex; zinc oxide | $3{,}43 \times 10^{-2}$ | 0,46% |
| Pigment | Carbon black; iron oxide; ink | $1{,}10 \times 10^{-2}$ | 0,15% |
| **Product total*** | | **7,48** | **100%** |

**totals have been rounded to 3 significant figures.*

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

### 2.9 MANUFACTURING

Designflooring's vinyl tile flooring is produced at their manufacturing facility in China. The vinyl flooring is made primarily from polyvinyl chloride (PVC), calcium carbonate (mineral reinforcement), plasticizers and additives (i.e., pigments and stabilizers). The product includes a rigid core and is structured with multiple layers including PVC backing layers, 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:

- Polyvinyl chloride resins are mixed with calcium carbonate, plasticizers, and pigments in a large industrial mixer.
- The core is extruded to a dough-like consistency. The dough-like substance is then put through calendar rollers and squeezed into sheets.
- The LVT sheets are embossed, PU coated, adhered to the core and then cut into individual planks, profiled, a foamed backing layer adhered and then packaged for shipment.

### 2.10 PACKAGING

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

**Table 4.** *Material content for the Korlok flooring product packaging, per square meter.*

| Component | Material | kg | Percent |
|---|---|---|---|
| Packaging | Corrugated board | 0,188 | 46,3% |
| Packaging | Wood pallet | 0,203 | 50,0% |
| Packaging | Plastic strapping | $9{,}53 \times 10^{-3}$ | 2,35% |
| Packaging | Stretch wrap | $5{,}64 \times 10^{-3}$ | 1,39% |
| **Packaging total*** | | **0,406** | **100%** |

**totals have been rounded to 3 significant figures.*

### 2.11 PRODUCT INSTALLATION

Installation of the product is accomplished using hand tools with negligible impacts and waste. 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 product is 30 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.

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### 2.16 FURTHER INFORMATION

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

# 3. LCA: Calculation Rules

### 3.1 FUNCTIONAL UNIT

The functional unit used in the study is defined as 1 $m^2$ of floor covering installed for use over a 75-year period. The corresponding reference flow for the product system is 7.48 $kg/m^2$. The manufacturer declares a 15-year commercial warranty and lifetime residential warranty for their products defining the lifetime as 30 years for Europe. For the present assessment, a reference service lifetime (RSL) of 30 years is assumed based on the manufacturer's recommendation and consistent with similar, industry-wide LCAs[1]. The 30-year RSL leads to a total of 2,5 product lifecycles during the 75-year period over which the product system is modeled.

**Table 5.** *Functional unit and reference flow for the Korlok product.*

| Parameter | Value | Unit |
|---|---|---|
| Functional unit | 1,00 | $m^2$ |
| Product weight per declared unit | 7,48 | $kg/m^2$ |

[1] RFCI_103.1_EPD_Rigid_Core_Flooring_Sept2018.docx

### 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 6 and illustrated in Figure 1.

**Table 6.** *The modules and unit processes included in the scope for the Korlok 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 | The product is installed using the manufacturer's recommended, or similar, adhesives with negligible impacts. 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 |

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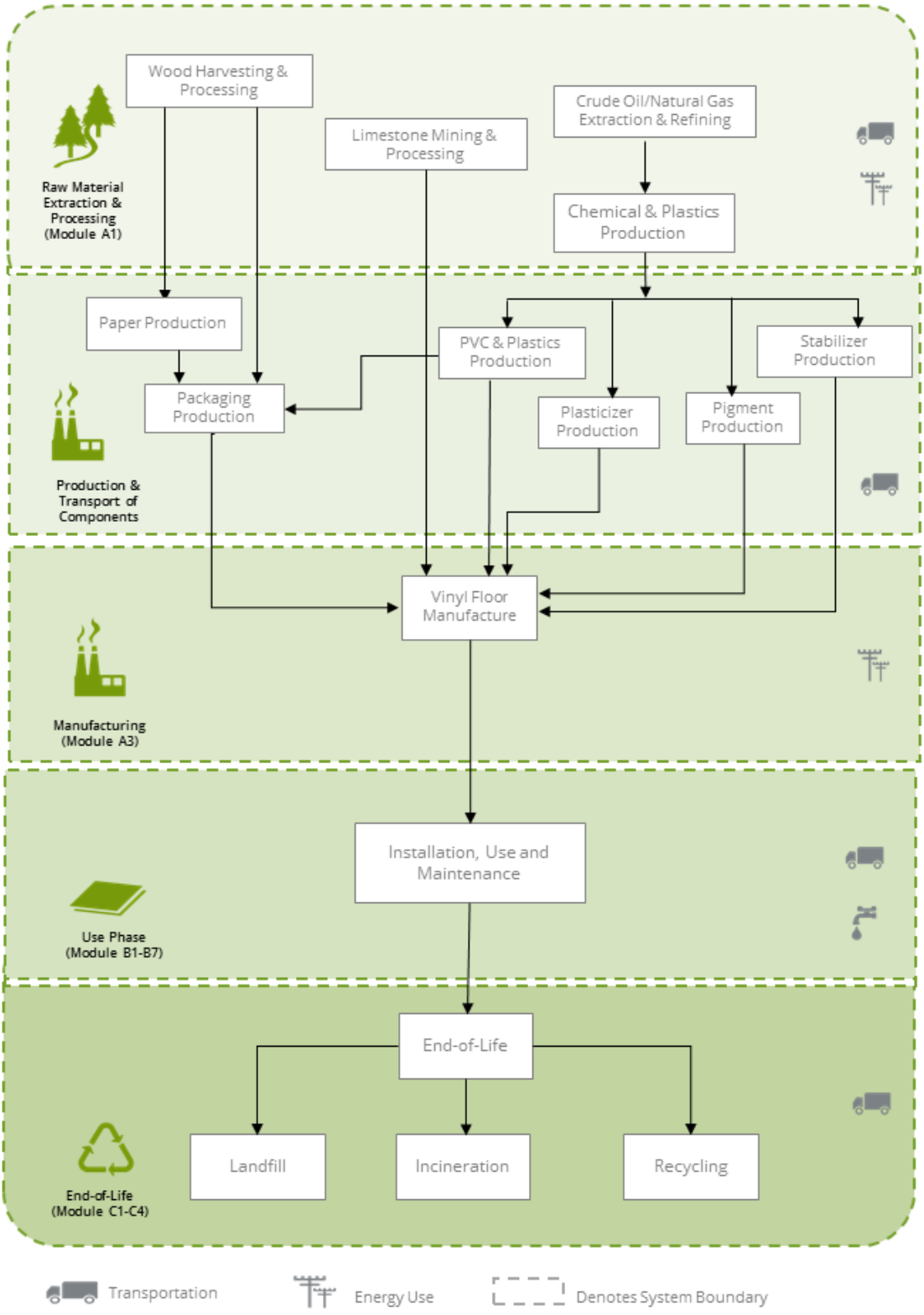


**Figure 1.** *Flow Diagram for the life cycle of the Korlok product.*

### 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 Designflooring facility is located in China. An Ecoinvent inventory dataset for the Chinese energy grid mix was used to model resource use and emissions from electricity use at the manufacturing facility.
- Life cycle inventory data for the plasticizer, a dioctyl terephthalate (DOTP) mixture, were not available. An inventory dataset for similar common plasticizers were developed using chemical process data from Overcash and Ecoinvent v3.3 unit process datasets. Inventory data developed for diisoheptyl phthalate (DIHP) was used as a surrogate to represent DOTP in the LCA model.
- 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 Europe, as specified in the PCR. The data include end-of-life recycling rates of packaging materials.
- For final disposal of the packaging material and vinyl 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 Designflooring for their manufacturing facilities. The sources of secondary LCI data are the Ecoinvent database.

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**Table 7.** *Data sources for the Korlok product.*

| Component | Material Description | Material Dataset | Data Source | Publication Date |
|---|---|---|---|---|
| **PRODUCT COMPONENT** | | | | |
| $CaCO_3$ | Mineral reinforcement | Limestone, crushed, washed {RoW}\| market for limestone, crushed, washed \| Alloc Rec | EI v3.3 | 2016 |
| PVC | Polyvinyl chloride | Polyvinylchloride, bulk polymerised {GLO}\| market for \| Alloc Rec | EI v3.3 | 2016 |
| Plastics | LDPE | Polyethylene, low density, granulate {RER}\| production \| Alloc Rec | EI v3.3 | 2016 |
| | PUR | Polyurethane, flexible foam {RER}\| production \| Alloc Rec | EI v3.3 | 2016 |
| Plasticizer | Plasticizer (DOTP mixture) | Diisoheptyl phthalate (DIHP) {GLO} \| market for \| Alloc Rec | EI v3.3 | 2016 |
| Organic chemicals | Organic chemicals | Chemical, organic {GLO}\| market for \| Alloc Rec | EI v3.3 | 2016 |
| Inorganic chemicals | Inorganic chemicals | Chemical, inorganic {GLO}\| market for chemicals, inorganic \| Alloc Rec | EI v3.3 | 2016 |
| Stabilizers | Zinc oxide | Zinc oxide {RER}\| production \| Alloc Rec | EI v3.3 | 2016 |
| | Ba-Zn complex | Ba-Zn stearate (stabilizer) /kg | EI v3.3; MSDS | 2016 |
| Pigments | Pigments | Carbon black {GLO}\| production \| Alloc Rec | EI v3.3 | 2016 |
| | Pigments | Chemical, inorganic {GLO}\| market for chemicals, inorganic \| Alloc Rec | EI v3.3 | 2016 |
| Other | Ethyl acetates | Ethyl acetate {RER}\| production \| Alloc Rec | EI v3.3 | 2016 |
| | Polymers | Methyl acrylate {GLO}\| production \| Alloc Rec | EI v3.3 | 2016 |
| | $NaHCO_3$ | Sodium carbonate from ammonium chloride production, at plant/GLO | EI v3.3 | 2016 |
| **PACKAGING** | | | | |
| Packaging | Corrugated board | Corrugated board box {GLO}\| market for corrugated board box \| Alloc Rec | EI v3.3 | 2016 |
| Packaging | Wood pallet | Wood pallet (22kg)/ RER | EI v2.2 | 2015 |
| Packaging | Packaging plastic | Polyethylene, low density, granulate {RER}\| production \| Alloc Rec | EI v3.3 | 2016 |
| Packaging | Stretch wrap | Packaging film, low density polyethylene {RoW}\| production \| Alloc Rec | EI v3.3 | 2016 |
| **TRANSPORTATION** | | | | |
| Road transport | Diesel Truck | Transport, freight, lorry 16-32 metric ton, EURO4 {GLO}\| market for \| Alloc Rec | EI v3.3 | 2016 |
| Rail transport | Freight train | Transport, freight train {CN}\| market for \| Alloc Rec | EI v3.3 | 2016 |
| Ship transport | Diesel Truck | Transport, freight, sea, transoceanic ship {GLO}\| market for \| Alloc Rec | EI v3.3 | 2016 |
| **RESOURCES** | | | | |
| Electricity | Grid electricity | Electricity, medium voltage {CN}\| market group for \| Alloc Rec | EI v3.3 | 2016 |
| Heat | Fuel oil | Heat, district or industrial, other than natural gas {RoW}\| heat production, light fuel oil, at industrial furnace 1MW \| Alloc Rec | EI v3.3 | 2016 |
| Heat | Coal | Heat, district or industrial, other than natural gas {RoW}\| heat production, at hard coal industrial furnace 1-10MW \| Alloc Rec | EI v3.3 | 2016 |
| Heat | Biomass | Heat, district or industrial, other than natural gas {GLO}\| heat production, straw, at furnace 300kW \| Alloc Rec | EI v3.3 | 2016 |

### 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 8.** *Data quality assessment for the Korlok 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 annualized production for 2018. |
| **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 China. 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 v3.3 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 Europe. |
| **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 facility in China 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 v2.2 and v3.3 LCI data are used, with a bias towards Ecoinvent v3.3 data. |
| **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. |

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### 3.9 PERIOD UNDER REVIEW

The period of review is calendar year 2018.

### 3.10 ALLOCATION

Manufacturing resource use was allocated to the products based on mass. 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 5. A distance of 800 km is assumed for transport by diesel truck from the distribution center to point of installation, consistent with PCR guidance.

**Table 9.** *Transport parameters (A4)*

| Parameter | Transport distance | Unit |
|---|---|---|
| Transport distance *(diesel truck)* | 217 | km |
| Transport distance *(ocean freighter)* | 17667 | km |
| Gross mass of products transported | 7,48 | kg |

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

***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 buffing of the vinyl flooring. The present assessment is based on a recommended weekly cleaning schedule including sweeping and damp mopping with a neutral cleaner and monthly buffing.

**Table 10.** *Maintenance parameters for the flooring products, per 1 $m^2$*

| Parameter | Value | Unit |
|---|---|---|
| Maintenance process | Damp mopping | - |
| Maintenance cycle | 1.560 | Cycles / RSL |
| Maintenance cycle | 3.900 | Cycles / ESL |
| Net freshwater consumption | 0,00591 | $m^3/m^2/yr$ |
| Cleaning agent | 0,0197 | $kg/m^2/yr$ |
| 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 RSL of the assessment are included in this stage.

| Parameter | Value | Unit |
|---|---|---|
| Reference Service Life (RSL) | 30 | years |
| Replacement Cycle (ESL/RSL-1) | 1,5 | - |

***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 Korlok 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 Europe 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 7.

**Table 11.** *Recycling rates for materials at end-of-life.*

| Material | Product | Packaging |
|---|---|---|
| ***Recycling Rates*** | | |
| Paper and pulp | N/A | 83% |
| Plastics | N/A | 40% |
| Wood | N/A | 40% |
| ***Disposal of Non-recyclables*** | | |
| Incineration | 26% | 45% |
| Landfill | 74% | 55% |

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# 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 the CML-IA characterization factors:

| Impact Category | Unit |
|---|---|
| Global Warming Potential (GWP 100) | kg $CO_2$ eq |
| Acidification Potential (AP) | kg $SO_2$ eq |
| Eutrophication Potential (EP) | kg $(PO_4)^{3-}$ eq |
| Ozone Depletion Potential (ODP) | kg CFC 11 eq |
| Photochemical Oxidant Creation Potential (POCP) | kg $C_2H_4$ eq |
| Abiotic depletion potential (ADP-elements) for non-fossil resources | kg Sb eq |
| Abiotic depletion potential (ADP-fossil fuels) for fossil resources | MJ, LHV |

The following optional environmental impact category indicators are also reported based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1:

| Impact Category | Unit |
|---|---|
| Global Warming Potential (GWP 100) | kg $CO_2$ eq |
| Acidification Potential (AP) | kg $SO_2$ eq |
| Eutrophication Potential (EP) | kg N eq |
| Ozone Depletion Potential (ODP) | kg CFC 11 eq |
| Smog Formation Potential (SFP) | kg $O_3$ eq |
| Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources ($ADP_{fossil}$) | MJ Surplus, LHV |

**Table 12.** *CML Life Cycle Impact Assessment (LCIA) results for the Korlok product over a 75-yr time horizon. All values are rounded to three significant digits. Results reported in MJ are calculated using lower heating values.*

| Module | GWP | ODP | AP | EP | POCP | ADPE | ADPF |
|---|---|---|---|---|---|---|---|
| | kg $CO_2$ eq | kg CFC-11 eq | kg $SO_2$ eq | kg $PO_4^{3-}$ eq | kg $C_2H_4$ eq | kg Sb eq | MJ eq |
| Total | 59.3 | $2.82x10^{-6}$ | 0.250 | 0.108 | $1.46x10^{-2}$ | $4.50x10^{-5}$ | 792 |
| | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| A1 | 8.91 | $1.74x10^{-7}$ | $2.83x10^{-2}$ | $5.71x10^{-3}$ | $1.62x10^{-3}$ | $6.11x10^{-6}$ | 211 |
| | 15% | 6.2% | 11% | 5.3% | 11% | 14% | 27% |
| A2 | 0.777 | $1.13x10^{-7}$ | $4.31x10^{-3}$ | $9.61x10^{-4}$ | $1.76x10^{-4}$ | $1.84x10^{-6}$ | 11.0 |
| | 1.3% | 4.0% | 1.7% | 0.89% | 1.2% | 4.1% | 1.4% |
| A3 | 2.65 | $3.24x10^{-8}$ | $1.50x10^{-2}$ | $2.82x10^{-3}$ | $6.86x10^{-4}$ | $7.27x10^{-7}$ | 23.9 |
| | 4.5% | 1.1% | 6.0% | 2.6% | 4.7% | 1.6% | 3.0% |
| A4 | 2.94 | $5.01x10^{-7}$ | $3.92x10^{-2}$ | $4.69x10^{-3}$ | $1.33x10^{-3}$ | $4.25x10^{-6}$ | 44.5 |
| | 5.0% | 18% | 16% | 4.3% | 9.1% | 9.5% | 5.6% |
| A5 | 0.134 | $5.35x10^{-9}$ | $1.67x10^{-4}$ | $5.12x10^{-4}$ | $2.83x10^{-5}$ | $2.33x10^{-8}$ | 0.463 |
| | 0.23% | 0.19% | 0.07% | 0.47% | 0.19% | 0.05% | 0.06% |
| B1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| B2 | 6.80 | $3.36x10^{-7}$ | $1.99x10^{-2}$ | $1.81x10^{-2}$ | $3.49x10^{-3}$ | $1.08x10^{-5}$ | 28.6 |
| | 11% | 12% | 8.0% | 17% | 24% | 24% | 3.6% |
| B3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B4 | 31.5 | $1.49x10^{-6}$ | 0.138 | $5.38x10^{-2}$ | $6.68x10^{-3}$ | $2.05x10^{-5}$ | 458 |
| | 53% | 53% | 55% | 50% | 46% | 46% | 58% |
| B5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | 0.781 | $1.42x10^{-7}$ | $3.72x10^{-3}$ | $7.85x10^{-4}$ | $1.47x10^{-4}$ | $5.19x10^{-7}$ | 11.8 |
| | 1.3% | 5.0% | 1.5% | 0.73% | 1.0% | 1.2% | 1.5% |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | 4.80 | $2.41x10^{-8}$ | $1.31x10^{-3}$ | $2.04x10^{-2}$ | $4.73x10^{-4}$ | $1.97x10^{-7}$ | 2.46 |
| | 8.1% | 0.86% | 0.53% | 19% | 3.2% | 0.44% | 0.31% |
| D | MND | MND | MND | MND | MND | MND | MND |

MND = Module not declared

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**Table 13.** *TRACI Life Cycle Impact Assessment (LCIA) results for the Korlok product over a 75-yr time horizon. All values are rounded to three significant digits. Results reported in MJ are calculated using lower heating values.*

| Module | GWP | ODP | AP | EP | POCP | FFD |
|---|---|---|---|---|---|---|
| | kg $CO_2$ eq | kg CFC-11 eq | kg $SO_2$ eq | kg N eq | kg $O_3$ eq | MJ eq |
| Total | 57.6 | $2.81x10^{-6}$ | 0.260 | 0.227 | 4.13 | 99.0 |
| | 100% | 100% | 100% | 100% | 100% | 100% |
| A1 | 8.78 | $1.74x10^{-7}$ | $2.94x10^{-2}$ | $8.51x10^{-3}$ | 0.493 | 28.4 |
| | 15% | 6.2% | 11% | 3.7% | 12% | 29% |
| A2 | 0.770 | $1.13x10^{-7}$ | $4.88x10^{-3}$ | $1.21x10^{-3}$ | 0.108 | 1.35 |
| | 1.3% | 4.0% | 1.9% | 0.53% | 2.6% | 1.4% |
| A3 | 2.58 | $3.15x10^{-8}$ | $1.48x10^{-2}$ | $5.18x10^{-3}$ | 0.142 | 0.953 |
| | 4.5% | 1.1% | 5.7% | 2.3% | 3.4% | 0.96% |
| A4 | 2.93 | $5.01x10^{-7}$ | $4.03x10^{-2}$ | $4.42x10^{-3}$ | 0.652 | 5.91 |
| | 5.1% | 18% | 15% | 1.9% | 16% | 6.0% |
| A5 | 0.113 | $5.35x10^{-9}$ | $2.05x10^{-4}$ | $1.34x10^{-3}$ | $5.24x10^{-3}$ | $6.39x10^{-2}$ |
| | 0.20% | 0.19% | 0.08% | 0.59% | 0.13% | 0.06% |
| B1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| B2 | 6.76 | $3.36x10^{-7}$ | $2.11x10^{-2}$ | $3.78x10^{-2}$ | 0.228 | 2.33 |
| | 12% | 12% | 8.1% | 17% | 5.5% | 2.4% |
| B3 | 0 | 0 | 0 | 0 | 0 | 0 |
| B4 | 30.5 | $1.49x10^{-6}$ | 0.144 | 0.114 | 2.34 | 58.0 |
| | 53% | 53% | 55% | 50% | 57% | 59% |
| B5 | 0 | 0 | 0 | 0 | 0 | 0 |
| B6 | 0 | 0 | 0 | 0 | 0 | 0 |
| B7 | 0 | 0 | 0 | 0 | 0 | 0 |
| C1 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | 0.779 | $1.42x10^{-7}$ | $4.53x10^{-3}$ | $6.35x10^{-4}$ | 0.124 | 1.67 |
| | 1.4% | 5.0% | 1.7% | 0.28% | 3.0% | 1.7% |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | 4.40 | $2.41x10^{-8}$ | $1.61x10^{-3}$ | $5.45x10^{-2}$ | $3.47x10^{-2}$ | 0.303 |
| | 7.6% | 0.86% | 0.62% | 24% | 0.84% | 0.31% |
| D | MND | MND | MND | MND | MND | MND |

MND = Module not declared

**Table 14.** *Resource use for the Korlok product over a 75-yr time horizon. All values are rounded to three significant digits. Results reported in MJ are calculated using lower heating values.*

| Module | PERE | PERM | PENRE | PENRM | SM | RSF | NRSF | RE | FW |
|---|---|---|---|---|---|---|---|---|---|
| | MJ | MJ | MJ | MJ | kg | MJ | MJ | MJ | $m^3$ |
| Total | 78.8 | 0.00 | 0.00 | 0.00 | 2.81 | 0.00 | 0.00 | Neg. | 5.56 |
| | 100% | 0.00 | 0.00 | 0.00 | 100% | 0.00 | 0.00 | Neg. | 100% |
| A1 | 5.03 | 0.00 | INA | INA | 1.12 | 0.00 | 0.00 | Neg. | 1.61 |
| | 6.4% | 0.00 | 0.00 | 0.00 | 40% | 0.00 | 0.00 | Neg. | 29% |
| A2 | 0.282 | 0.00 | INA | INA | 0.00 | 0.00 | 0.00 | Neg. | $1.41x10^{-2}$ |
| | 0.36% | 0.00 | 0.00 | 0.00 | 0.00% | 0.00 | 0.00 | Neg. | 0.25% |
| A3 | 7.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Neg. | $6.95x10^{-2}$ |
| | 9.1% | 0.00 | 0.00 | 0.00 | 0.00% | 0.00 | 0.00 | Neg. | 1.2% |
| A4 | 0.817 | 0.00 | INA | INA | 0.00 | 0.00 | 0.00 | Neg. | $4.62x10^{-2}$ |
| | 1.0% | 0.00 | 0.00 | 0.00 | 0.00% | 0.00 | 0.00 | Neg. | 0.83% |
| A5 | $4.79x10^{-3}$ | 0.00 | INA | INA | 0.00 | 0.00 | 0.00 | Neg. | $4.65x10^{-4}$ |
| | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | Neg. | 0.01% |
| B1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0.00 |
| B2 | 45.2 | 0.00 | INA | INA | 0.00 | 0.00 | 0.00 | Neg. | 1.17 |
| | 57% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | Neg. | 21% |
| B3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B4 | 20.2 | 0.00 | INA | INA | 1.68 | 0.00 | 0.00 | Neg. | 2.64 |
| | 26% | 0.00% | 0.00% | 0.00% | 60% | 0.00% | 0.00% | Neg. | 47% |
| B5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | $5.08x10^{-2}$ | 0.00 | INA | INA | 0.00 | 0.00 | 0.00 | Neg. | $4.08x10^{-3}$ |
| | 0.06% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | Neg. | 0.07% |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | 0.106 | 0.00 | INA | INA | 0.00 | 0.00 | 0.00 | Neg. | $1.22x10^{-2}$ |
| | 0.14% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | Neg. | 0.22% |
| D | MND | MND | MND | MND | MND | MND | MND | MND | MND |

MND = Module not declared | INA = Indicator not assessed | Neg. = Negligible

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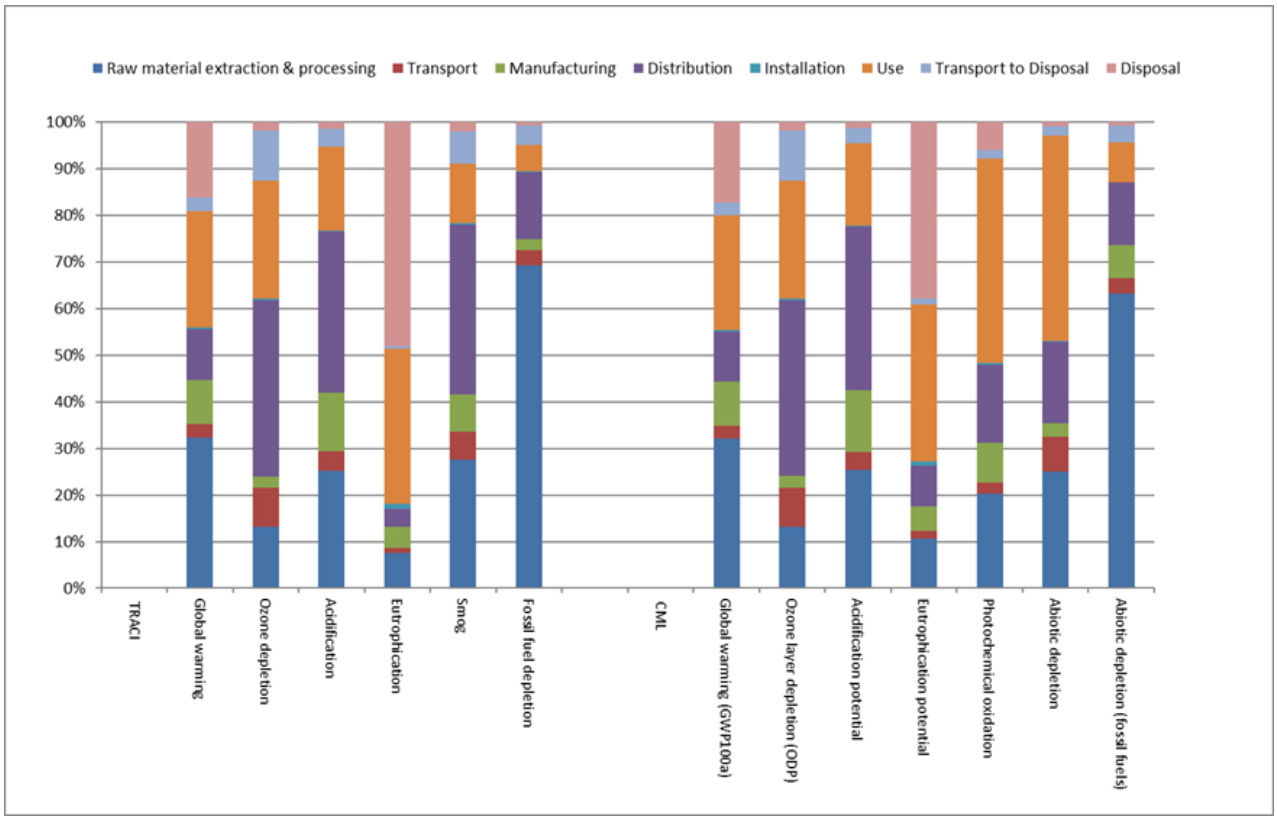
**Table 15.** *Waste and outflows for the Korlok product in over a 75-yr time horizon. All values are rounded to three significant digits. Results reported in MJ are calculated using lower heating values.*

| Module | HWD | NHWD | RWD-HL | RWD-LL | CRU | MR | MER | EE |
|---|---|---|---|---|---|---|---|---|
| | kg | kg | kg | kg | kg | kg | kg | MJ |
| Total | $2.66x10^{-4}$ | 21.9 | $6.78x10^{-5}$ | $1.48x10^{-3}$ | 0.00 | $8.73x10^{-2}$ | Neg. | Neg. |
| | 100% | 100% | 100% | 100% | 0.00 | 100% | Neg. | Neg. |
| A1 | $1.89x10^{-5}$ | 0.592 | $5.25x10^{-6}$ | $7.91x10^{-5}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 7.1% | 2.7% | 7.7% | 5.3% | 0.00 | 0.00% | Neg. | Neg. |
| A2 | $9.09x10^{-6}$ | 0.368 | $1.06x10^{-6}$ | $6.34x10^{-5}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 3.4% | 1.7% | 1.6% | 4.3% | 0.00 | 0.00% | Neg. | Neg. |
| A3 | $2.12x10^{-5}$ | 0.780 | $3.39x10^{-6}$ | $1.46x10^{-5}$ | 0.00 | $8.73x10^{-2}$ | Neg. | Neg. |
| | 8.0% | 3.6% | 5.0% | 0.99% | 0.00 | 100% | Neg. | Neg. |
| A4 | $2.51x10^{-5}$ | 0.961 | $5.09x10^{-6}$ | $2.84x10^{-4}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 9.4% | 4.4% | 7.5% | 19% | 0.00 | 0.00% | Neg. | Neg. |
| A5 | $2.20x10^{-7}$ | 0.179 | $2.09x10^{-8}$ | $2.94x10^{-6}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 0.08% | 0.82% | 0.03% | 0.20% | 0.00 | 0.00% | Neg. | Neg. |
| B1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 |
| B2 | $5.57x10^{-5}$ | 0.507 | $2.90x10^{-5}$ | $1.44x10^{-4}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 21% | 2.3% | 43% | 9.7% | 0.00 | 0.00% | Neg. | Neg. |
| B3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B4 | $1.26x10^{-4}$ | 12.9 | $2.33x10^{-5}$ | $8.03x10^{-4}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 47% | 59% | 34% | 54% | 0.00 | 0.00% | Neg. | Neg. |
| B5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | $3.84x10^{-6}$ | $4.82x10^{-2}$ | $2.73x10^{-7}$ | $7.98x10^{-5}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 1.4% | 0.22% | 0.40% | 5.4% | 0.00% | 0.00% | Neg. | Neg. |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | $5.79x10^{-6}$ | 5.64 | $4.41x10^{-7}$ | $1.14x10^{-5}$ | 0.00 | 0.00 | Neg. | Neg. |
| | 2.2% | 26% | 0.65% | 0.77% | 0.00% | 0.00% | Neg. | Neg. |
| D | MND | MND | MND | MND | MND | MND | MND | MND |

MND = Module not declared | Neg. = Negligible

# 6. LCA: Interpretation

Depending on the impact category, the contributions to indicator results for the product system over the 75-yr RSL are dominated by the product maintenance (*B2*) and raw material and extraction phases (*A1*) followed by product distribution (*A4*), product disposal (*C1-C4*) and product manufacturing (*A3*).




# 7. Additional Environmental Information

### 7.1 ENVIRONMENT AND HEALTH DURING MANUFACTURING

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

### 7.2 ENVIRONMENT AND HEALTH DURING INSTALLATION

The Korlok 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)

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### 7.3 EXTRAORDINARY EFFECTS

Fire

The Korlok products achieve a reaction to fire classification of $B_{fl}$-s1 according to EN 13501-1:2002: Fire classification of construction products and building elements. Classification using test data from reaction to fire tests.

### 7.4 ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

The Korlok products are REACH compliant. Our accreditations and certifications include FloorScore, Indoor Air Comfort Gold (VOC certification)

The Korlok products fully comply with the National emission requirements of European countries and VOC requirements of low emitting products, including; Belgium regulation, France VOC Class A+ (ISO 16000), Germany AgBB/AGB/DGNB; BREEAM NOR, BREEAM NL, LEED outside North America, WELL Building, SKA Rating, French HQE certification, Italian Regulation on Green Public Procurement, BVB Sweden, Blue Angel DE-UZ-120, Austrian Ecolabel criteria UZ 56, M1, Danish Indoor Climate Label, Singapore Green Label, GreenTag Australia

For more information on Designflooring's certifications and environmental initiatives please view our Environmental Statement www.designflooring.com/environmentalpolicy

# 8. References


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