**Declaration Owner**

Audacity Flooring
16c3 TML Tower 3, How Shing Road
Tsuen Wan, New Territories, Hong Kong
+1.706.434.8157| www.audacityflooring.com |
contact@audacityflooring.com

**Product**

Rigid Luxury Vinyl with IXPE backing
Rigid Luxury Vinyl with Cork backing
Rigid Luxury Vinyl with EVA backing

(UNSPSC Class Code 30161707)

**Functional Unit**

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

**EPD Number and Period of Validity**

SCS-EPD-08303
EPD Valid October 12, 2022 through October 11, 2027
Version: November 4, 2022

**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. December 2018.

PCR Guidance for Building-Related Products and Services Part B: Flooring EPD Requirements. Version 2.0. UL Environment. September 2018.

**Program Operator**

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

| | |
|---|---|
| Declaration Owner: | Audacity Flooring |
| Address: | 16c3 TML Tower 3, How Shing Road, Tsuen Wan, New Territories, Hong Kong |
| Declaration Number: | SCS-EPD-08303 |
| Declaration Validity Period: | October 12, 2022 through October 11, 2027 |
| Version Date: | November 4, 2022 |
| Program Operator: | SCS Global Services |
| 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: | OpenLCA v1.10 software and the Ecoinvent v3.8 database |
| Product RSL: | 15 years |
| Markets of Applicability: | Global |
| 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. December 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 2.0. UL Environment. September 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. Audacity Flooring ..... 2<br>2. Product ..... 2<br>3. LCA: Calculation Rules ..... 7<br>4. LCA: Scenarios and Additional Technical Information ..... 14<br>5. LCA: Results ..... 16<br>6. LCA: Interpretation ..... 23<br>7. References ..... 24 |

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

# 1. Audacity Flooring

Audacity floors are reinvented to amaze! With a wide range of Waterproof Rigid Core or Waterproof Laminate floor collections, our luxury floors come in stunning designs with superior performance and durability. Experience #FloorsFearlessToWater today!

To learn more, please visit our website www.audacityflooring.com or get in touch: contact@audacityflooring.com

# 2. Product

### 2.1 PRODUCT DESCRIPTION

Audacity Waterproof Rigid Core Flooring is a rigid high density hybrid core, which is ultra stable, 100% waterproof and has incredible wood looks!
- 100% waterproof
- Outstanding dimensional stability and resistance to heat and sunlight
- Seamless installation over large areas
- Suitable for every room of your home, including kitchen, bathroom & laundry
- Extra impact resistant and dent proof
- Easy-to-install over most hard surface subfloors
- No acclimation needed
- Wet and steam moppable for a worry-free maintenance.

### 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 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 rigid LVT flooring product are summarized in Table 2 through Table 4.

**Table 2.** *Product specifications for Rigid LVT flooring with IXPE backing.*

| Characteristic | | | Description | | | |
|---|---|---|---|---|---|---|
| Sustainable certifications | | | FloorScore (SCS), Assure (SCS), GreenGuard Gold (UL), IAC Gold (EuroFins). | | | |
| VOC emissions test method | | | CDPH, EN 16516, ISO16000-3-6-9-11, ASTM D5116-10. | | | |
| **Characteristic** | | | **Nominal Value** | **Unit** | **Minimum Value** | **Maximum Value** |
| Product thickness | | | 5.0 (0.20) | mm (in) | 4.0 (0.16) | 8.0 (0.31) |
| Wear layer thickness (where applicable) | | | 0.6 (0.02) | mm (in) | 0.2 (0.01) | 0.7 (0.03) |
| Product weight | | | 8,041 (26.35) | g/m$^2$ (oz/ft$^2$) | 6,046 (19.81) | 13,471 (44.15) |
| Product Form | Tiles | Width | 405.0 (15.94) | mm (in) | 300.0 (11.81) | 615.0 (24.21) |
| | | Length | 810.0 (31.89) | mm (in) | 600.0 (23.62) | 1,230 (48.43) |
| Product Form | Planks | Width | 192.0 (7.56) | mm (in) | 108.0 (4.25) | 234.0 (9.21) |
| | | Length | 1,235 (48.62) | mm (in) | 615.0 (24.21) | 2,260 (88.98) |

**Table 3.** *Product specifications for Rigid LVT flooring with Cork backing.*

| Characteristic | | | Description | | | |
|---|---|---|---|---|---|---|
| Sustainable certifications | | | FloorScore (SCS), Assure (SCS), GreenGuard Gold (UL), IAC Gold (EuroFins). | | | |
| VOC emissions test method | | | CDPH, EN 16516, ISO16000-3-6-9-11, ASTM D5116-10. | | | |
| **Characteristic** | | | **Nominal Value** | **Unit** | **Minimum Value** | **Maximum Value** |
| Product thickness | | | 5.0 (0.20) | mm (in) | 3.0 (0.12) | 8.0 (0.31) |
| Wear layer thickness (where applicable) | | | 0.6 (0.02) | mm (in) | 0.2 (0.01) | 0.7 (0.03) |
| Product weight | | | 8,084 (26.49) | g/m$^2$ (oz/ft$^2$) | 6,089 (19.95) | 13,514 (44.29) |
| Product Form | Tiles | Width | 405.0 (15.94) | mm (in) | 300.0 (11.81) | 615.0 (24.21) |
| | | Length | 810.0 (31.89) | mm (in) | 600.0 (23.62) | 1,230 (48.43) |
| Product Form | Planks | Width | 192.0 (7.56) | mm (in) | 108.0 (4.25) | 234.0 (9.21) |
| | | Length | 1,235 (48.62) | mm (in) | 615.0 (24.21) | 2,260 (88.98) |

**Table 4.** *Product specifications for Rigid LVT flooring with EVA backing.*

| Characteristic | | | Description | | | |
|---|---|---|---|---|---|---|
| Sustainable certifications | | | FloorScore (SCS), Assure (SCS), GreenGuard Gold (UL), IAC Gold (EuroFins), GreenRate (Global GreenTag), HealthRate PLATINUM (Global GreenTag). | | | |
| VOC emissions test method | | | CDPH, EN 16516, ISO16000-3-6-9-11, ASTM D5116-10. | | | |
| **Characteristic** | | | **Nominal Value** | **Unit** | **Minimum Value** | **Maximum Value** |
| Product thickness | | | 5.0 (0.20) | mm (in) | 4.0 (0.16) | 8.0 (0.31) |
| Wear layer thickness (where applicable) | | | 0.6 (0.02) | mm (in) | 0.2 (0.01) | 0.7 (0.03) |
| Product weight | | | 8,014 (26.26) | g/m$^2$ (oz/ft$^2$) | 6,019 (19.72) | 13,444 (44.06) |
| Product Form | Tiles | Width | 405.0 (15.94) | mm (in) | 300.0 (11.81) | 615.0 (24.21) |
| | | Length | 810.0 (31.89) | mm (in) | 600.0 (23.62) | 1,230 (48.43) |
| Product Form | Planks | Width | 192.0 (7.56) | mm (in) | 108.0 (4.25) | 234.0 (9.21) |
| | | Length | 1,235 (48.62) | mm (in) | 615.0 (24.21) | 2,260 (88.98) |

The products are tested to the following standards:

| ASTM Standard | Description | ISO Standard | Description |
|---|---|---|---|
| ASTM F925 | Standard Test Method for Resistance to Chemicals of Resilient Flooring | ISO 4918 | Resilient, textile and laminate floor coverings — Castor chair test |
| ASTM F2199 | Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat | EN ISO 16581 | Resilient and laminate floor coverings - Determination of the effect of simulated movement of a furniture leg |
| ATSM F1514 | Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change | ISO 24334 | Laminate floor coverings — Determination of locking strength for mechanically assembled panels |
| ASTM F1515 | Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change | ISO 24337 | Laminate floor coverings — Determination of geometrical characteristics |
| ASTM 1914 | Standard Test Methods for Short-Term Indentation and Residual Indentation of Resilient Floor Covering | EN 12664 | Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. |
| ASTM F2421 | Standard Test Method for Measurement of Resilient Floor Plank by Dial Gauge | ISO 23999 | Resilient floor coverings — Determination of dimensional stability and curling after exposure to heat |
| ASTM F970 | Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading | ISO 10582 | Resilient floor coverings — Heterogeneous poly(vinyl chloride) floor covering — Specifications |
| ASTM F387 | Standard Test Method for Measuring Thickness of Resilient Floor Covering With Foam Layer | EN 438 | High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins - Part 1: Introduction and general information |
| ASTM F3261 | Standard Specification for Resilient Flooring in Modular Format with Rigid Polymeric Core | DIN 51130 | Testing of floor coverings - Determination of the anti-slip property - Workrooms and fields of activities with slip danger - Walking method - Ramp test |
| ASTM F410 | Standard Test Method for Wear Layer Thickness of Resilient Floor Coverings by Optical Measurement | EN 13893 | Resilient, laminate and textile floor coverings - Measurement of dynamic coefficient of friction on dry floor surfaces |

### 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 https://www.audacityflooring.com/

### 2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

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

### 2.8 MATERIAL COMPOSITION

The rigid luxury vinyl flooring products are 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 a IXPE, Cork or EVA backing layer, a high definition photographic layer, a PVC wear layer and a polyurethane (PU) protective layer.

**Table 5.** *Material content for the LVT flooring products in kg per square meter and percent of total mass.*

| Material | Rigid Luxury Vinyl - IXPE | Rigid Luxury Vinyl - Cork | Rigid Luxury Vinyl - EVA |
|---|---|---|---|
| PVC | 1.84 | 1.84 | 1.84 |
| | 23% | 23% | 23% |
| $CaCO_3$ | 3.22 | 3.22 | 3.22 |
| | 40% | 40% | 40% |
| Plasticizer | $8.60 \times 10^{-3}$ | $8.60 \times 10^{-3}$ | $8.60 \times 10^{-3}$ |
| | 0.11% | 0.11% | 0.11% |
| Stabilizer | $6.73 \times 10^{-2}$ | $6.73 \times 10^{-2}$ | $6.73 \times 10^{-2}$ |
| | 0.84% | 0.83% | 0.84% |
| IXPE | 0.135 | 0.00 | 0.00 |
| | 1.7% | 0% | 0% |
| Cork | 0.00 | 0.180 | 0.00 |
| | 0% | 2.2% | 0% |
| EVA | 0.00 | 0.00 | $9.00 \times 10^{-2}$ |
| | 0% | 0% | 1.1% |
| Regrind | 2.66 | 2.66 | 2.66 |
| | 33% | 33% | 33% |
| Other | 0.108 | 0.106 | 0.126 |
| | 1.3% | 1.3% | 1.6% |
| **Total Product** | **8.04** | **8.08** | **8.01** |
| | **100%** | **100%** | **100%** |

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

### 2.9 MANUFACTURING

The products are manufactured at the production facility in China. The manufacturer provided primary data for their annual production, resource use and electricity consumption and waste generation at the facility. Electricity consumption is modeled using Ecoinvent datasets for the regional electricity grid resource mix.

The production of luxury 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 paper, plastic wrap, corrugated board and wooden pallets.

**Table 6.** *Material content for the flooring product packaging in kg per square meter of flooring.*

| Material | Rigid Luxury Vinyl - IXPE | Rigid Luxury Vinyl - Cork | Rigid Luxury Vinyl - EVA |
|---|---|---|---|
| Corrugated | $1.25 \times 10^{-2}$ | $1.25 \times 10^{-2}$ | $1.25 \times 10^{-2}$ |
| | 82% | 82% | 82% |
| Paper | $3.00 \times 10^{-5}$ | $3.00 \times 10^{-5}$ | $3.00 \times 10^{-5}$ |
| | 0.2% | 0.2% | 0.2% |
| Plastic | $1.31 \times 10^{-4}$ | $1.31 \times 10^{-4}$ | $1.31 \times 10^{-4}$ |
| | 0.85% | 0.85% | 0.85% |
| Wood | $2.64 \times 10^{-3}$ | $2.64 \times 10^{-3}$ | $2.64 \times 10^{-3}$ |
| | 17% | 17% | 17% |
| **Total Packaging** | **$1.53 \times 10^{-2}$** | **$1.53 \times 10^{-2}$** | **$1.53 \times 10^{-2}$** |
| | **100%** | **100%** | **100%** |

### 2.11 PRODUCT INSTALLATION

Installation of the product is accomplished using hand tools with negligible impacts. 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 varies based on the manufacturer's warranted lifetime.

### 2.14 RE-USE PHASE

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

### 2.15 DISPOSAL

At end-of-life, the products are disposed of in a landfill.

### 2.16 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website https://www.audacityflooring.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 each product system is presented in Table 5. For the present assessment, a reference service lifetime (RSL) corresponding to the manufacturer's warranted 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 products in Table 7.

**Table 7.** *Reference flow and RSL for the LVT flooring products.*

| Product Line | Reference flow (kg/$m^2$) | Reference Service Life – RSL (years) | Total # of Products Modeled |
|---|---|---|---|
| Rigid LVT with IXPE backing | 8.04 | 15 | 5 |
| Rigid LVT with Cork backing | 8.08 | 15 | 5 |
| Rigid LVT with EVA backing | 8.01 | 15 | 5 |

### 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 8 and illustrated in Figure 1 and Figure 2.

**Table 8.** *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 facility |
| 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 landfilling which require no waste processing |
| C4 | Disposal | Disposal of flooring product in municipal landfill |
| D | Reuse-recovery-recycling potential | Module Not Declared |

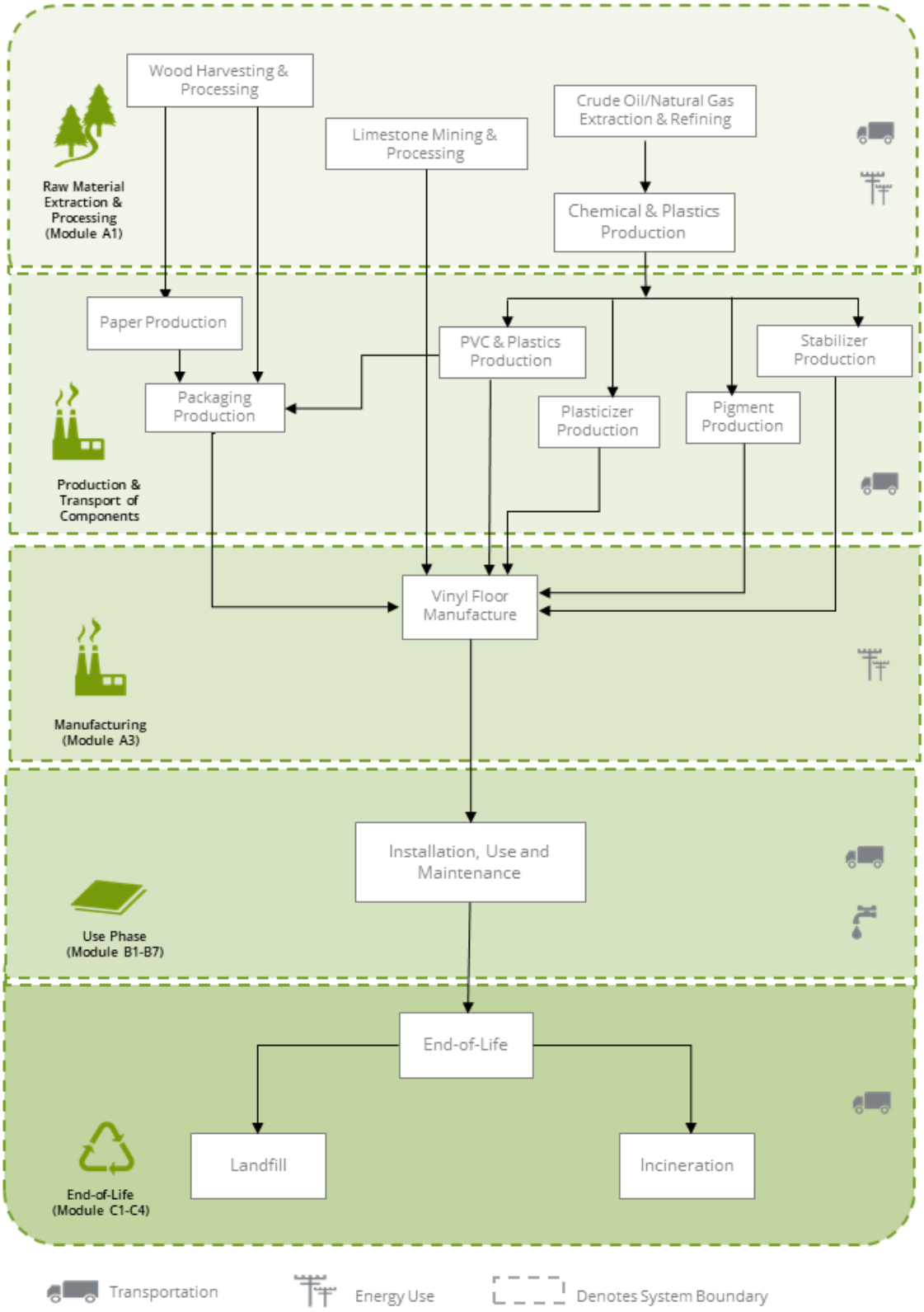


**Figure 1.** *Flow diagram for the life cycle of the LVT flooring products (IXPE and EVA backing).*

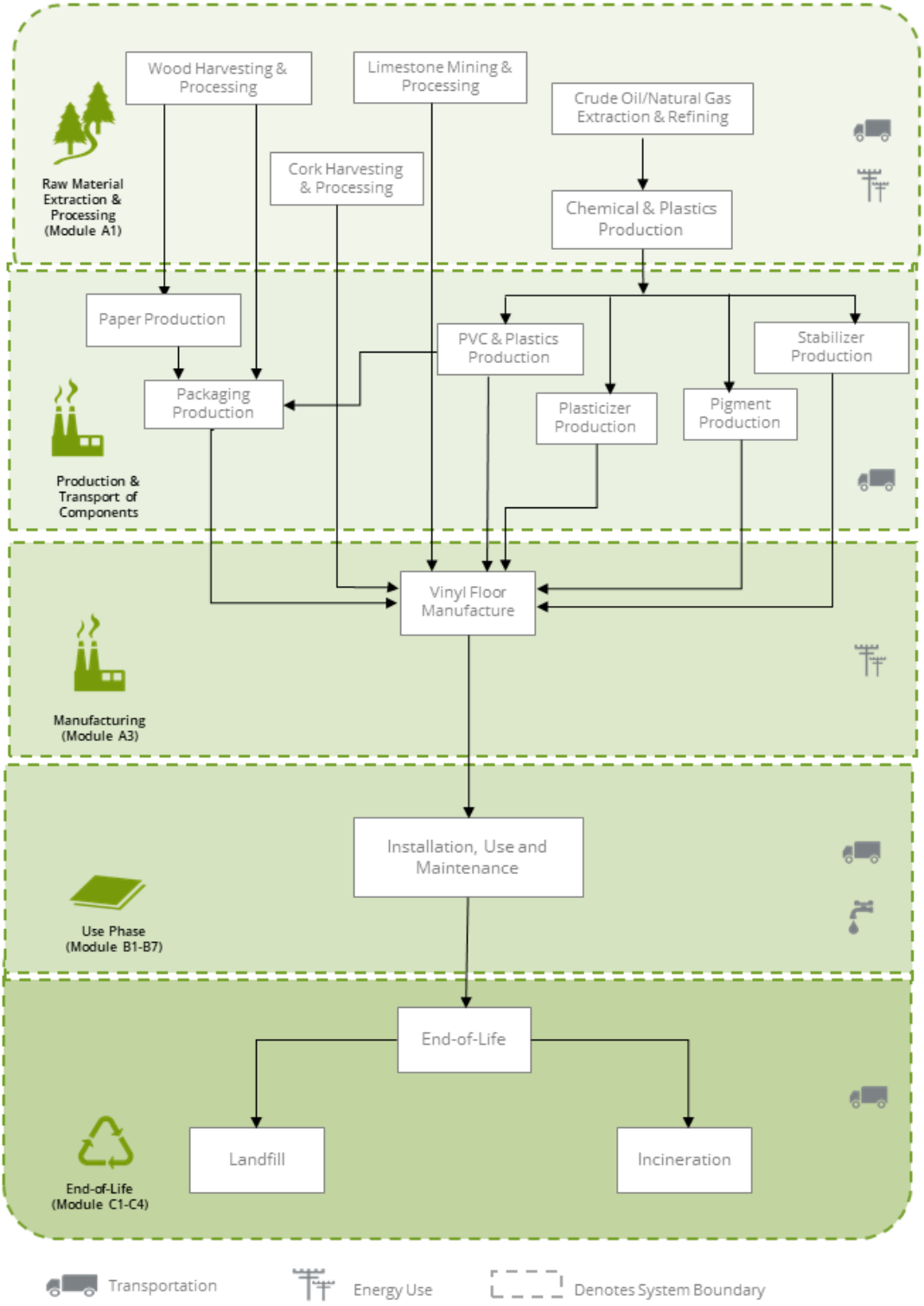


**Figure 2.** *Flow diagram for the life cycle of the LVT flooring products (Cork backing).*

### 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

- Electricity use at the manufacturing facilities was allocated to the products based on the product area as a fraction of the total production.
- The manufacturing facilities under review are located in China. Ecoinvent inventory datasets for the appropriate regional energy grid was 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. Inventory data developed for diisoheptyl phthalate (DIHP) was used as a surrogate to represent DOTP in the LCA model.
- Inventory data for some material components were unavailable and modeled using proxy datasets from the Ecoinvent LCI databases.
- The Reference Service Life (RSL) of the products was modeled based on information provided by the manufacturers 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 manufacturers representing transport for product distribution to North America.
- The maintenance phase of the product life cycle was modeled based on information provided by the manufacturers including recommended installation and cleaning methods, as well as cleaning frequency.
- For the product end-of-life, disposal of product and product packaging is modeled based on the PCR guidance regarding recycling rates of product and packaging materials.
- For final disposal of the packaging material and flooring products at end-of-life, all materials are assumed to be transported 20 miles by diesel truck to either a landfill 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.

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### 3.7 DATA SOURCES

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

**Table 9.** *Data sources for the LVT flooring products.*

| Component | Dataset | Data Source | Publication date |
|---|---|---|---|
| **PRODUCT** | | | |
| PVC | | | |
| Polyvinyl Chloride | polyvinylchloride production, bulk polymerisation \| polyvinylchloride, bulk polymerised \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Filler | | | |
| Calcium Carbonate | limestone production, crushed, washed \| limestone, crushed, washed \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Plasticizer | | | |
| PVC Plasticizer* | diisoheptyl phthalate (DIHP)* {GLO} \| market for \| Alloc Rec U System | EI v3.8 | 2021 |
| Stabilizer | | | |
| Stabilizer | market for chemical, organic \| chemical, organic \| Cutoff, S/GLO | EI v3.8 | 2021 |
| | market for chemicals, inorganic \| chemical, inorganic \| Cutoff, S/GLO | EI v3.8 | 2021 |
| | market for limestone, crushed, washed \| limestone, crushed, washed \| Cutoff, S/RoW | EI v3.8 | 2021 |
| | market for zinc oxide \| zinc oxide \| Cutoff, S/GLO | EI v3.8 | 2021 |
| Pigments | | | |
| Carbon Black | market for carbon black \| carbon black \| Cutoff, S/GLO | EI v3.8 | 2021 |
| Backing | | | |
| IXPE | polyethylene production, low density, granulate \| polyethylene, low density, granulate \| Cutoff, S/RoW; market for fatty acid \| fatty acid \| Cutoff, S/GLO; ethylene vinyl acetate copolymer production \| ethylene vinyl acetate copolymer \| Cutoff; chemical production, inorganic \| chemical, inorganic \| Cutoff, S/GLO | EI v3.8 | 2021 |
| Cork | cork slab production \| cork slab \| Cutoff, S/RER | EI v3.8 | 2021 |
| EVA | ethylene vinyl acetate copolymer production \| ethylene vinyl acetate copolymer \| Cutoff, S/RoW | EI v3.8 | 2021 |
| **PACKAGING** | | | |
| Cardboard | containerboard production, linerboard, kraftliner \| containerboard, linerboard \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Wrapping film | packaging film production, low density polyethylene \| packaging film, low density polyethylene \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Plastics | polyethylene terephthalate production, granulate, amorphous \| polyethylene terephthalate, granulate, amorphous \| Cutoff, S/RoW; polyethylene production, low density, granulate \| polyethylene, low density, granulate \| Cutoff, S/RoW; polypropylene production, granulate \| polypropylene, granulate \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Wood | market for EUR-flat pallet \| EUR-flat pallet \| Cutoff, S/GLO | EI v3.8 | 2021 |
| **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 v3.8 | 2021 |
| Rail transport | transport, freight train, diesel \| transport, freight train \| Cutoff, S/RoW | EI v3.8 | 2021 |
| Ship transport | transport, freight, sea, container ship \| transport, freight, sea, container ship \| Cutoff, S/GLO | EI v3.8 | 2021 |
| **RESOURCES** | | | |
| Grid electricity - China | market group for electricity, medium voltage \| electricity, medium voltage \| Cutoff, S/CN | EI v3.8 | 2021 |
| Heat – natural gas | heat production, natural gas, at boiler modulating >100kW \| heat, district or industrial, natural gas \| Cutoff, S/RoW | EI v3.8 | 2021 |

### 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 10.** *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 annualized production for 2021. |
| **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 power mixes from the Ecoinvent LCI database. Surrogate data used in the assessment are representative of global or North American operations. Data representative of global operations are considered sufficiently similar to actual processes. Data representing product disposal are based on US 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 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 v3.8 data where available. Different portions of the product life cycle are equally considered. |
| **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 manufacturing facility 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 data, Ecoinvent v3.8 LCI data are used. |
| **Uncertainty of the Information:** Uncertainty related to data, models, and assumptions | Uncertainty related to materials in the products and packaging is low. Actual supplier data for all upstream operations were not available 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 calendar year 2021.

### 3.10 ALLOCATION

Manufacturing resource use was allocated to the products based on surface 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 based on information provided by the manufacturer. Transportation parameters for modeling transport to consumer markets are summarized in Table 11.

**Table 11.** *Product distribution parameters by transport mode and consumer market.*

| Parameter | Value | | | |
|---|---|---|---|---|
| Diesel truck – Fuel utilization (L/100 km) | 18.7 | | | |
| Diesel truck – Capacity utilization (%) | 76% | | | |
| Diesel rail – Fuel utilization (g/tkm) | 10 | | | |
| Diesel rail – Capacity utilization (%) | 76% | | | |
| Ocean freighter – Fuel utilization (g/tkm) | 2.5 | | | |
| Ocean freighter – Capacity utilization (%) | 65% | | | |
| Product | Transport distance (km) | | | |
| | Truck | Rail | Ship | Mass (kg) |
| Rigid LVT – IXPE backing | 203 | 178 | 13,560 | 8.06 |
| Rigid LVT – Cork backing | 203 | 178 | 13,560 | 8.10 |
| Rigid LVT – EVA backing | 203 | 178 | 13,560 | 8.03 |

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

**Table 12.** *Installation parameters for the LVT flooring products, per 1 $m^2$ (A5).*

| Parameter | Value | | | |
|---|---|---|---|---|
| Ancillary materials | neg. | | | |
| Net freshwater consumption ($m^3$) | - | | | |
| Electricity consumption (kWh) | - | | | |
| Product loss per functional unit (kg) | negligible | | | |
| Waste materials generated by product installation (kg) | negligible | | | |
| Output materials resulting from on-site waste processing (kg) | na | | | |
| Direct emissions (kg) | - | | | |
| Product | Mass of packaging waste (kg) | | | Biogenic carbon in packaging (kg $CO_2$) |
| | Plastic | Paper/Corrugate | Wood | |
| Rigid LVT – IXPE backing | $1.31 \times 10^{-4}$ | $1.26 \times 10^{-2}$ | $2.64 \times 10^{-3}$ | 0.240 |
| Rigid LVT – Cork backing | $1.31 \times 10^{-4}$ | $1.26 \times 10^{-2}$ | $2.64 \times 10^{-3}$ | 0.240 |
| Rigid LVT – EVA backing | $1.31 \times 10^{-4}$ | $1.26 \times 10^{-2}$ | $2.64 \times 10^{-3}$ | 0.240 |

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

**Table 13.** *Maintenance parameters for the flooring products, per 1 $m^2$.*

| Parameter | Unit | Value |
|---|---|---|
| Maintenance process | - | Damp mopping |
| Net freshwater consumption | $m^3/m^2/yr$ | 0.0058 |
| Cleaning agent | $kg/m^2/yr$ | 0.0119 |
| Further assumptions | - | Moderate traffic |

### *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 estimated service lifetime 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 (*C4*). For the LVT flooring products, no emissions are generated during demolition (*C1*) while no waste processing (*C3*) is required for 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 North America 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 15.

**Table 14.** *Recycling rates for packaging materials at end-of-life.*

| Material | North Amwerica |
|---|---|
| ***Packaging*** | |
| Paper & Pulp | 78% |
| Wood | 26% |
| Plastics | 15% |
| ***Disposal of Non-recyclables*** | |
| Landfill | 80% |
| Incineration | 20% |

**Table 15.** *End-of-life disposal scenario parameters for the flooring product.*

| Parameter | Rigid Luxury Vinyl - IXPE | Rigid Luxury Vinyl - Cork | Rigid Luxury Vinyl - EVA |
|---|---|---|---|
| Assumptions for scenario development | 100% landfill | 100% landfill | 100% landfill |
| Collection process | | | |
| Collected with mixed construction waste (kg) | 8.06 | 8.10 | 8.03 |
| Recovery | n/a | n/a | n/a |
| Landfill disposal (kg) | 8.06 | 8.10 | 8.03 |
| Removals of biogenic carbon (kg $CO_2$ eq) | n/a | n/a | 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 $C_2H_4$ 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 |
|---|---|---|---|
| **$RPR_E$:** Renewable primary resources used as energy carrier (fuel) | MJ, LHV | **HWD:** Hazardous waste disposed | kg |
| **$RPR_M$:** Renewable primary resources with energy content used as material | MJ, LHV | **NHWD:** Non-hazardous waste disposed | kg |
| **$NRPR_E$:** Non-renewable primary resources used as an energy carrier (fuel) | MJ, LHV | **HLRW:** High-level radioactive waste, conditioned, to final repository | kg |
| **$NRPR_M$:** 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 the 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 16**. *Life Cycle Impact Assessment (LCIA) results for the **Rigid LVT – IXPE** 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.*

| Impact Category | A1 | A2 | A3 | A4 | A5 | B2 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| **CML-IA** | | | | | | | | | |
| GWP (kg $CO_2$ eq) | 6.92 | 0.410 | 4.21 | 1.38 | $4.19\times10^{-3}$ | 8.37 | 62.9 | 0.328 | 2.47 |
| | 8% | 0.47% | 4.8% | 1.6% | 0.0048% | 9.6% | 72% | 0.38% | 2.8% |
| AP (kg $SO_2$ eq) | $2.79\times10^{-2}$ | $1.60\times10^{-3}$ | $1.07\times10^{-2}$ | $2.84\times10^{-2}$ | $3.65\times10^{-6}$ | $3.91\times10^{-2}$ | 0.284 | $1.53\times10^{-3}$ | $8.03\times10^{-4}$ |
| | 7.1% | 0.41% | 2.7% | 7.2% | 0.00093% | 9.9% | 72% | 0.39% | 0.2% |
| EP (kg $(PO_4)^{3-}$ eq) | $8.87\times10^{-3}$ | $3.69\times10^{-4}$ | $1.00\times10^{-2}$ | $3.38\times10^{-3}$ | $1.11\times10^{-5}$ | $1.49\times10^{-2}$ | 0.181 | $3.27\times10^{-4}$ | $2.23\times10^{-2}$ |
| | 3.7% | 0.15% | 4.2% | 1.4% | 0.0046% | 6.2% | 75% | 0.14% | 9.2% |
| POCP (kg $C_2H_4$ eq) | $1.72\times10^{-3}$ | $5.45\times10^{-5}$ | $7.85\times10^{-4}$ | $7.42\times10^{-4}$ | $8.60\times10^{-7}$ | $2.62\times10^{-3}$ | $1.55\times10^{-2}$ | $5.04\times10^{-5}$ | $5.22\times10^{-4}$ |
| | 7.8% | 0.25% | 3.6% | 3.4% | 0.0039% | 12% | 70% | 0.23% | 2.4% |
| ODP (kg CFC-11 eq) | $2.86\times10^{-6}$ | $7.13\times10^{-8}$ | $3.38\times10^{-8}$ | $2.22\times10^{-7}$ | $1.20\times10^{-10}$ | $4.13\times10^{-7}$ | $1.30\times10^{-5}$ | $5.67\times10^{-8}$ | $2.12\times10^{-8}$ |
| | 17% | 0.43% | 0.2% | 1.3% | 0.00072% | 2.5% | 78% | 0.34% | 0.13% |
| ADPE (kg Sb eq) | $1.01\times10^{-4}$ | $1.42\times10^{-6}$ | $2.43\times10^{-6}$ | $2.69\times10^{-6}$ | $8.41\times10^{-10}$ | $1.68\times10^{-4}$ | $4.33\times10^{-4}$ | $2.88\times10^{-7}$ | $4.01\times10^{-7}$ |
| | 14% | 0.2% | 0.34% | 0.38% | 0.00012% | 24% | 61% | 0.041% | 0.057% |
| ADPF (MJ eq) | 146 | 6.08 | 21.9 | 18.2 | $9.89\times10^{-3}$ | 186 | 796 | 4.49 | 2.21 |
| | 12% | 0.51% | 1.9% | 1.5% | 0.00084% | 16% | 67% | 0.38% | 0.19% |
| **TRACI 2.1** | | | | | | | | | |
| GWP (kg $CO_2$ eq) | 6.84 | 0.409 | 3.81 | 1.38 | $3.49\times10^{-3}$ | 8.29 | 59.2 | 0.328 | 2.03 |
| | 8.3% | 0.5% | 4.6% | 1.7% | 0.0042% | 10% | 72% | 0.4% | 2.5% |
| AP (kg $SO_2$ eq) | $2.86\times10^{-2}$ | $1.87\times10^{-3}$ | $1.16\times10^{-2}$ | $3.04\times10^{-2}$ | $4.57\times10^{-6}$ | $4.02\times10^{-2}$ | 0.304 | $1.89\times10^{-3}$ | $1.66\times10^{-3}$ |
| | 6.8% | 0.44% | 2.8% | 7.2% | 0.0011% | 9.6% | 72% | 0.45% | 0.39% |
| EP (kg N eq) | $1.72\times10^{-2}$ | $4.47\times10^{-4}$ | $2.41\times10^{-2}$ | $1.94\times10^{-3}$ | $2.87\times10^{-5}$ | $2.94\times10^{-2}$ | 0.419 | $2.40\times10^{-4}$ | $6.08\times10^{-2}$ |
| | 3.1% | 0.081% | 4.4% | 0.35% | 0.0052% | 5.3% | 76% | 0.043% | 11% |
| SFP (kg $O_3$ eq) | 0.364 | $4.48\times10^{-2}$ | 0.183 | 0.577 | $1.18\times10^{-4}$ | 0.467 | 4.96 | $5.35\times10^{-2}$ | $1.81\times10^{-2}$ |
| | 5.5% | 0.67% | 2.7% | 8.6% | 0.0018% | 7% | 74% | 0.8% | 0.27% |
| ODP (kg CFC-11 eq) | $2.95\times10^{-6}$ | $9.50\times10^{-8}$ | $5.87\times10^{-8}$ | $2.95\times10^{-7}$ | $1.60\times10^{-10}$ | $5.08\times10^{-7}$ | $1.40\times10^{-5}$ | $7.56\times10^{-8}$ | $2.83\times10^{-8}$ |
| | 16% | 0.53% | 0.33% | 1.6% | 0.00089% | 2.8% | 78% | 0.42% | 0.16% |
| FFD (MJ eq) | 19.4 | 0.868 | 0.710 | 2.67 | $1.46\times10^{-3}$ | 24.8 | 98.3 | 0.676 | 0.294 |
| | 13% | 0.59% | 0.48% | 1.8% | 0.00099% | 17% | 67% | 0.46% | 0.2% |

**Table 17.** *Resource use and waste flows for the **Rigid LVT – IXPE** 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.*

| Parameter | A1 | A2 | A3 | A4 | A5 | B2 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| **Resources** | | | | | | | | | |
| $RPR_E$ (MJ) | 5.45 | $6.94x10^{-2}$ | 2.12 | 0.162 | $8.94x10^{-5}$ | 17.8 | 31.6 | $1.71x10^{-2}$ | $7.17x10^{-2}$ |
| | 9.5% | 0.12% | 3.7% | 0.28% | 0.00016% | 31% | 55% | 0.03% | 0.13% |
| $RPR_M$ (MJ) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| $NRPR_E$ (MJ) | INA | INA | INA | INA | INA | INA | INA | INA | INA |
| $NRPR_M$ (MJ) | INA | INA | INA | INA | INA | INA | INA | INA | INA |
| SM (kg) | 2.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.6 | 0.00 | 0.00 |
| | 20% | 0% | 0% | 0% | 0% | 0% | 80% | 0% | 0% |
| RSF/NRSF (MJ) | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. |
| RE (MJ) | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. |
| FW ($m^3$) | 0.532 | $4.25x10^{-3}$ | 0.108 | $8.89x10^{-3}$ | $6.91x10^{-6}$ | 1.16 | 2.63 | $1.42x10^{-3}$ | $3.93x10^{-3}$ |
| | 12% | 0.095% | 2.4% | 0.2% | 0.00016% | 26% | 59% | 0.032% | 0.088% |
| **Wastes** | | | | | | | | | |
| HWD (kg) | $9.22x10^{-5}$ | $1.63x10^{-5}$ | $9.19x10^{-6}$ | $2.62x10^{-5}$ | $2.54x10^{-8}$ | $1.00x10^{-4}$ | $6.47x10^{-4}$ | $1.22x10^{-5}$ | $5.64x10^{-6}$ |
| | 10% | 1.8% | 1% | 2.9% | 0.0028% | 11% | 71% | 1.3% | 0.62% |
| NHWD (kg) | 0.861 | 0.313 | 3.22 | 0.258 | $3.90x10^{-3}$ | 0.782 | 50.9 | $2.29x10^{-2}$ | 8.06 |
| | 1.3% | 0.48% | 5% | 0.4% | 0.006% | 1.2% | 79% | 0.035% | 13% |
| HLRW (kg) | $2.75x10^{-5}$ | $3.12x10^{-7}$ | $2.15x10^{-6}$ | $6.45x10^{-7}$ | $4.27x10^{-10}$ | $2.19x10^{-5}$ | $1.24x10^{-4}$ | $7.10x10^{-8}$ | $3.77x10^{-7}$ |
| | 16% | 0.18% | 1.2% | 0.36% | 0.00024% | 12% | 70% | 0.04% | 0.21% |
| ILLRW (kg) | $1.60x10^{-4}$ | $3.99x10^{-5}$ | $2.06x10^{-5}$ | $1.25x10^{-4}$ | $6.71x10^{-8}$ | $1.35x10^{-4}$ | $1.56x10^{-3}$ | $3.18x10^{-5}$ | $1.24x10^{-5}$ |
| | 7.7% | 1.9% | 0.99% | 6% | 0.0032% | 6.5% | 75% | 1.5% | 0.6% |
| 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 | $1.06x10^{-2}$ | 0.00 | $4.22x10^{-2}$ | 0.00 | 0.00 |
| | 0% | 0% | 0% | 0% | 20% | 0% | 80% | 0% | 0% |
| 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 18**. *Life Cycle Impact Assessment (LCIA) results for the **Rigid LVT – Cork** 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.*

| Impact Category | A1 | A2 | A3 | A4 | A5 | B2 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| **CML-IA** | | | | | | | | | |
| GWP (kg $CO_2$ eq) | 6.65 | 0.429 | 4.21 | 1.39 | $4.19 \times 10^{-3}$ | 8.37 | 61.9 | 0.330 | 2.46 |
| | 7.8% | 0.5% | 4.9% | 1.6% | 0.0049% | 9.8% | 72% | 0.38% | 2.9% |
| AP (kg $SO_2$ eq) | $2.69 \times 10^{-2}$ | $1.67 \times 10^{-3}$ | $1.07 \times 10^{-2}$ | $2.86 \times 10^{-2}$ | $3.65 \times 10^{-6}$ | $3.91 \times 10^{-2}$ | 0.281 | $1.54 \times 10^{-3}$ | $8.05 \times 10^{-4}$ |
| | 6.9% | 0.43% | 2.7% | 7.3% | 0.00094% | 10% | 72% | 0.39% | 0.21% |
| EP (kg $(PO_4)^{3-}$ eq) | $8.66 \times 10^{-3}$ | $3.87 \times 10^{-4}$ | $1.00 \times 10^{-2}$ | $3.40 \times 10^{-3}$ | $1.11 \times 10^{-5}$ | $1.49 \times 10^{-2}$ | 0.179 | $3.29 \times 10^{-4}$ | $2.20 \times 10^{-2}$ |
| | 3.6% | 0.16% | 4.2% | 1.4% | 0.0046% | 6.2% | 75% | 0.14% | 9.2% |
| POCP (kg $C_2H_4$ eq) | $1.58 \times 10^{-3}$ | $5.70 \times 10^{-5}$ | $7.85 \times 10^{-4}$ | $7.46 \times 10^{-4}$ | $8.60 \times 10^{-7}$ | $2.62 \times 10^{-3}$ | $1.50 \times 10^{-2}$ | $5.07 \times 10^{-5}$ | $5.21 \times 10^{-4}$ |
| | 7.4% | 0.27% | 3.7% | 3.5% | 0.004% | 12% | 70% | 0.24% | 2.4% |
| ODP (kg CFC-11 eq) | $2.85 \times 10^{-6}$ | $7.47 \times 10^{-8}$ | $3.39 \times 10^{-8}$ | $2.23 \times 10^{-7}$ | $1.20 \times 10^{-10}$ | $4.13 \times 10^{-7}$ | $1.30 \times 10^{-5}$ | $5.70 \times 10^{-8}$ | $2.13 \times 10^{-8}$ |
| | 17% | 0.45% | 0.2% | 1.3% | 0.00072% | 2.5% | 78% | 0.34% | 0.13% |
| ADPE (kg Sb eq) | $9.84 \times 10^{-5}$ | $1.49 \times 10^{-6}$ | $2.43 \times 10^{-6}$ | $2.70 \times 10^{-6}$ | $8.41 \times 10^{-10}$ | $1.68 \times 10^{-4}$ | $4.23 \times 10^{-4}$ | $2.90 \times 10^{-7}$ | $4.03 \times 10^{-7}$ |
| | 14% | 0.21% | 0.35% | 0.39% | 0.00012% | 24% | 61% | 0.042% | 0.058% |
| ADPF (MJ eq) | 138 | 6.36 | 21.9 | 18.3 | $9.89 \times 10^{-3}$ | 186 | 764 | 4.51 | 2.22 |
| | 12% | 0.56% | 1.9% | 1.6% | 0.00087% | 16% | 67% | 0.4% | 0.19% |
| **TRACI 2.1** | | | | | | | | | |
| GWP (kg $CO_2$ eq) | 6.57 | 0.429 | 3.81 | 1.39 | $3.49 \times 10^{-3}$ | 8.29 | 58.2 | 0.330 | 2.03 |
| | 8.1% | 0.53% | 4.7% | 1.7% | 0.0043% | 10% | 72% | 0.41% | 2.5% |
| AP (kg $SO_2$ eq) | $2.75 \times 10^{-2}$ | $1.96 \times 10^{-3}$ | $1.17 \times 10^{-2}$ | $3.06 \times 10^{-2}$ | $4.57 \times 10^{-6}$ | $4.02 \times 10^{-2}$ | 0.301 | $1.90 \times 10^{-3}$ | $1.66 \times 10^{-3}$ |
| | 6.6% | 0.47% | 2.8% | 7.3% | 0.0011% | 9.6% | 72% | 0.46% | 0.4% |
| EP (kg N eq) | $1.68 \times 10^{-2}$ | $4.68 \times 10^{-4}$ | $2.41 \times 10^{-2}$ | $1.95 \times 10^{-3}$ | $2.87 \times 10^{-5}$ | $2.94 \times 10^{-2}$ | 0.415 | $2.42 \times 10^{-4}$ | $6.02 \times 10^{-2}$ |
| | 3.1% | 0.085% | 4.4% | 0.36% | 0.0052% | 5.4% | 76% | 0.044% | 11% |
| SFP (kg $O_3$ eq) | 0.352 | $4.69 \times 10^{-2}$ | 0.183 | 0.580 | $1.18 \times 10^{-4}$ | 0.467 | 4.94 | $5.38 \times 10^{-2}$ | $1.82 \times 10^{-2}$ |
| | 5.3% | 0.71% | 2.8% | 8.7% | 0.0018% | 7% | 74% | 0.81% | 0.27% |
| ODP (kg CFC-11 eq) | $2.94 \times 10^{-6}$ | $9.94 \times 10^{-8}$ | $5.87 \times 10^{-8}$ | $2.97 \times 10^{-7}$ | $1.60 \times 10^{-10}$ | $5.08 \times 10^{-7}$ | $1.40 \times 10^{-5}$ | $7.60 \times 10^{-8}$ | $2.85 \times 10^{-8}$ |
| | 16% | 0.55% | 0.33% | 1.6% | 0.00089% | 2.8% | 78% | 0.42% | 0.16% |
| FFD (MJ eq) | 18.2 | 0.909 | 0.710 | 2.68 | $1.46 \times 10^{-3}$ | 24.8 | 93.8 | 0.680 | 0.295 |
| | 13% | 0.64% | 0.5% | 1.9% | 0.001% | 17% | 66% | 0.48% | 0.21% |

**Table 19.** *Resource use and waste flows for the **Rigid LVT – Cork** 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.*

| Parameter | A1 | A2 | A3 | A4 | A5 | B2 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| **Resources** | | | | | | | | | |
| $RPR_E$ (MJ) | 15.2 | $7.27x10^{-2}$ | 2.12 | 0.163 | $8.94x10^{-5}$ | 17.8 | 70.7 | $1.72x10^{-2}$ | $7.19x10^{-2}$ |
| | 14% | 0.068% | 2% | 0.15% | 0.000084% | 17% | 67% | 0.016% | 0.068% |
| $RPR_M$ (MJ) | 3.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.7 | 0.00 | 0.00 |
| | 20% | 0% | 0% | 0% | 0% | 0% | 80% | 0% | 0% |
| $NRPR_E$ (MJ) | INA | INA | INA | INA | INA | INA | INA | INA | INA |
| $NRPR_M$ (MJ) | INA | INA | INA | INA | INA | INA | INA | INA | INA |
| SM (kg) | 2.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.1 | 0.00 | 0.00 |
| | 20% | 0% | 0% | 0% | 0% | 0% | 80% | 0% | 0% |
| RSF/NRSF (MJ) | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. |
| RE (MJ) | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. |
| FW ($m^3$) | 0.523 | $4.45x10^{-3}$ | 0.108 | $8.94x10^{-3}$ | $6.91x10^{-6}$ | 1.16 | 2.60 | $1.43x10^{-3}$ | $3.94x10^{-3}$ |
| | 12% | 0.1% | 2.5% | 0.2% | 0.00016% | 26% | 59% | 0.032% | 0.089% |
| **Wastes** | | | | | | | | | |
| HWD (kg) | $9.10x10^{-5}$ | $1.70x10^{-5}$ | $9.20x10^{-6}$ | $2.64x10^{-5}$ | $2.54x10^{-8}$ | $1.00x10^{-4}$ | $6.46x10^{-4}$ | $1.23x10^{-5}$ | $5.66x10^{-6}$ |
| | 10% | 1.9% | 1% | 2.9% | 0.0028% | 11% | 71% | 1.4% | 0.62% |
| NHWD (kg) | 0.843 | 0.327 | 3.22 | 0.259 | $3.90x10^{-3}$ | 0.782 | 51.1 | $2.30x10^{-2}$ | 8.11 |
| | 1.3% | 0.51% | 5% | 0.4% | 0.006% | 1.2% | 79% | 0.036% | 13% |
| HLRW (kg) | $2.77x10^{-5}$ | $3.26x10^{-7}$ | $2.15x10^{-6}$ | $6.48x10^{-7}$ | $4.27x10^{-10}$ | $2.19x10^{-5}$ | $1.25x10^{-4}$ | $7.14x10^{-8}$ | $3.78x10^{-7}$ |
| | 16% | 0.18% | 1.2% | 0.36% | 0.00024% | 12% | 70% | 0.04% | 0.21% |
| ILLRW (kg) | $1.62x10^{-4}$ | $4.18x10^{-5}$ | $2.06x10^{-5}$ | $1.25x10^{-4}$ | $6.71x10^{-8}$ | $1.35x10^{-4}$ | $1.58x10^{-3}$ | $3.19x10^{-5}$ | $1.25x10^{-5}$ |
| | 7.7% | 2% | 0.98% | 5.9% | 0.0032% | 6.4% | 75% | 1.5% | 0.59% |
| 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 | $1.06x10^{-2}$ | 0.00 | $4.22x10^{-2}$ | 0.00 | 0.00 |
| | 0% | 0% | 0% | 0% | 20% | 0% | 80% | 0% | 0% |
| 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 20**. *Life Cycle Impact Assessment (LCIA) results for the **Rigid LVT – EVA** 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.*

| Impact Category | A1 | A2 | A3 | A4 | A5 | B2 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| **CML-IA** | | | | | | | | | |
| GWP (kg $CO_2$ eq) | 6.87 | 0.410 | 4.21 | 1.38 | $4.19 \times 10^{-3}$ | 8.37 | 62.8 | 0.327 | 2.52 |
| | 7.9% | 0.47% | 4.8% | 1.6% | 0.0048% | 9.6% | 72% | 0.38% | 2.9% |
| AP (kg $SO_2$ eq) | $2.77 \times 10^{-2}$ | $1.60 \times 10^{-3}$ | $1.07 \times 10^{-2}$ | $2.83 \times 10^{-2}$ | $3.65 \times 10^{-6}$ | $3.91 \times 10^{-2}$ | 0.283 | $1.52 \times 10^{-3}$ | $8.08 \times 10^{-4}$ |
| | 7.1% | 0.41% | 2.7% | 7.2% | 0.00093% | 10% | 72% | 0.39% | 0.21% |
| EP (kg $(PO_4)^{3-}$ eq) | $8.83 \times 10^{-3}$ | $3.69 \times 10^{-4}$ | $1.00 \times 10^{-2}$ | $3.37 \times 10^{-3}$ | $1.11 \times 10^{-5}$ | $1.49 \times 10^{-2}$ | 0.179 | $3.26 \times 10^{-4}$ | $2.19 \times 10^{-2}$ |
| | 3.7% | 0.15% | 4.2% | 1.4% | 0.0046% | 6.2% | 75% | 0.14% | 9.2% |
| POCP (kg $C_2H_4$ eq) | $1.65 \times 10^{-3}$ | $5.45 \times 10^{-5}$ | $7.84 \times 10^{-4}$ | $7.40 \times 10^{-4}$ | $8.60 \times 10^{-7}$ | $2.62 \times 10^{-3}$ | $1.52 \times 10^{-2}$ | $5.02 \times 10^{-5}$ | $5.33 \times 10^{-4}$ |
| | 7.6% | 0.25% | 3.6% | 3.4% | 0.004% | 12% | 70% | 0.23% | 2.5% |
| ODP (kg CFC-11 eq) | $2.86 \times 10^{-6}$ | $7.13 \times 10^{-8}$ | $3.38 \times 10^{-8}$ | $2.21 \times 10^{-7}$ | $1.20 \times 10^{-10}$ | $4.13 \times 10^{-7}$ | $1.31 \times 10^{-5}$ | $5.65 \times 10^{-8}$ | $2.12 \times 10^{-8}$ |
| | 17% | 0.43% | 0.2% | 1.3% | 0.00072% | 2.5% | 78% | 0.34% | 0.13% |
| ADPE (kg Sb eq) | $1.01 \times 10^{-4}$ | $1.42 \times 10^{-6}$ | $2.43 \times 10^{-6}$ | $2.68 \times 10^{-6}$ | $8.41 \times 10^{-10}$ | $1.68 \times 10^{-4}$ | $4.33 \times 10^{-4}$ | $2.87 \times 10^{-7}$ | $4.04 \times 10^{-7}$ |
| | 14% | 0.2% | 0.34% | 0.38% | 0.00012% | 24% | 61% | 0.041% | 0.057% |
| ADPF (MJ eq) | 144 | 6.07 | 21.9 | 18.2 | $9.89 \times 10^{-3}$ | 186 | 788 | 4.47 | 2.21 |
| | 12% | 0.52% | 1.9% | 1.6% | 0.00084% | 16% | 67% | 0.38% | 0.19% |
| **TRACI 2.1** | | | | | | | | | |
| GWP (kg $CO_2$ eq) | 6.78 | 0.409 | 3.81 | 1.38 | $3.49 \times 10^{-3}$ | 8.29 | 59.1 | 0.327 | 2.07 |
| | 8.3% | 0.5% | 4.6% | 1.7% | 0.0042% | 10% | 72% | 0.4% | 2.5% |
| AP (kg $SO_2$ eq) | $2.84 \times 10^{-2}$ | $1.87 \times 10^{-3}$ | $1.16 \times 10^{-2}$ | $3.03 \times 10^{-2}$ | $4.57 \times 10^{-6}$ | $4.02 \times 10^{-2}$ | 0.303 | $1.88 \times 10^{-3}$ | $1.67 \times 10^{-3}$ |
| | 6.8% | 0.45% | 2.8% | 7.2% | 0.0011% | 9.6% | 72% | 0.45% | 0.4% |
| EP (kg N eq) | $1.72 \times 10^{-2}$ | $4.47 \times 10^{-4}$ | $2.40 \times 10^{-2}$ | $1.94 \times 10^{-3}$ | $2.87 \times 10^{-5}$ | $2.94 \times 10^{-2}$ | 0.414 | $2.40 \times 10^{-4}$ | $5.96 \times 10^{-2}$ |
| | 3.1% | 0.082% | 4.4% | 0.35% | 0.0053% | 5.4% | 76% | 0.044% | 11% |
| SFP (kg $O_3$ eq) | 0.361 | $4.48 \times 10^{-2}$ | 0.183 | 0.575 | $1.18 \times 10^{-4}$ | 0.467 | 4.94 | $5.33 \times 10^{-2}$ | $1.81 \times 10^{-2}$ |
| | 5.4% | 0.67% | 2.8% | 8.6% | 0.0018% | 7% | 74% | 0.8% | 0.27% |
| ODP (kg CFC-11 eq) | $2.95 \times 10^{-6}$ | $9.50 \times 10^{-8}$ | $5.87 \times 10^{-8}$ | $2.94 \times 10^{-7}$ | $1.60 \times 10^{-10}$ | $5.08 \times 10^{-7}$ | $1.40 \times 10^{-5}$ | $7.53 \times 10^{-8}$ | $2.82 \times 10^{-8}$ |
| | 16% | 0.53% | 0.33% | 1.6% | 0.00089% | 2.8% | 78% | 0.42% | 0.16% |
| FFD (MJ eq) | 19.1 | 0.868 | 0.710 | 2.66 | $1.46 \times 10^{-3}$ | 24.8 | 97.3 | 0.674 | 0.293 |
| | 13% | 0.59% | 0.48% | 1.8% | 0.001% | 17% | 66% | 0.46% | 0.2% |

**Table 21.** *Resource use and waste flows for the **Rigid LVT – EVA** 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.*

| Parameter | A1 | A2 | A3 | A4 | A5 | B2 | B4 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| **Resources** | | | | | | | | | |
| $RPR_E$ (MJ) | 5.42 | $6.94x10^{-2}$ | 2.12 | 0.161 | $8.94x10^{-5}$ | 17.8 | 31.5 | $1.71x10^{-2}$ | $7.27x10^{-2}$ |
| | 9.5% | 0.12% | 3.7% | 0.28% | 0.00016% | 31% | 55% | 0.03% | 0.13% |
| $RPR_M$ (MJ) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| $NRPR_E$ (MJ) | INA | INA | INA | INA | INA | INA | INA | INA | INA |
| $NRPR_M$ (MJ) | INA | INA | INA | INA | INA | INA | INA | INA | INA |
| SM (kg) | 2.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.9 | 0.00 | 0.00 |
| | 20% | 0% | 0% | 0% | 0% | 0% | 80% | 0% | 0% |
| RSF/NRSF (MJ) | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. |
| RE (MJ) | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. | Neg. |
| FW ($m^3$) | 0.529 | $4.24x10^{-3}$ | 0.108 | $8.86x10^{-3}$ | $6.91x10^{-6}$ | 1.16 | 2.62 | $1.41x10^{-3}$ | $3.98x10^{-3}$ |
| | 12% | 0.096% | 2.4% | 0.2% | 0.00016% | 26% | 59% | 0.032% | 0.09% |
| **Wastes** | | | | | | | | | |
| HWD (kg) | $9.21x10^{-5}$ | $1.63x10^{-5}$ | $9.19x10^{-6}$ | $2.62x10^{-5}$ | $2.54x10^{-8}$ | $1.00x10^{-4}$ | $6.46x10^{-4}$ | $1.22x10^{-5}$ | $5.71x10^{-6}$ |
| | 10% | 1.8% | 1% | 2.9% | 0.0028% | 11% | 71% | 1.3% | 0.63% |
| NHWD (kg) | 0.869 | 0.313 | 3.21 | 0.257 | $3.90x10^{-3}$ | 0.782 | 50.9 | $2.28x10^{-2}$ | 8.04 |
| | 1.4% | 0.49% | 5% | 0.4% | 0.0061% | 1.2% | 79% | 0.035% | 12% |
| HLRW (kg) | $2.73x10^{-5}$ | $3.11x10^{-7}$ | $2.15x10^{-6}$ | $6.43x10^{-7}$ | $4.27x10^{-10}$ | $2.19x10^{-5}$ | $1.23x10^{-4}$ | $7.08x10^{-8}$ | $3.83x10^{-7}$ |
| | 15% | 0.18% | 1.2% | 0.37% | 0.00024% | 12% | 70% | 0.04% | 0.22% |
| ILLRW (kg) | $1.62x10^{-4}$ | $3.99x10^{-5}$ | $2.06x10^{-5}$ | $1.24x10^{-4}$ | $6.71x10^{-8}$ | $1.35x10^{-4}$ | $1.56x10^{-3}$ | $3.16x10^{-5}$ | $1.24x10^{-5}$ |
| | 7.8% | 1.9% | 0.98% | 5.9% | 0.0032% | 6.5% | 75% | 1.5% | 0.59% |
| 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 | $1.06x10^{-2}$ | 0.00 | $4.22x10^{-2}$ | 0.00 | 0.00 |
| | 0% | 0% | 0% | 0% | 20% | 0% | 80% | 0% | 0% |
| 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 of the assessment. Of the remaining life cycle phases, the raw material extraction and processing and product maintenance phases are the generally largest contributors to the overall impacts, depending on the specific indicator. followed by the product manufacturing and distribution phases.

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