

**Declaration Owner****Elegant Home-Tech Co., Ltd**

Hexing Civil Industrial Zone, Jinfeng Town
Zhangjiagang, Jiangsu 215626
China

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Product

Gluedown LVT

(UNSPSC Class Code 30161707/CSI Code 09 65 00)

Functional Unit

The functional unit is one square meter of flooring over a 60-year period.

EPD Number and Period of Validity

SCS-EPD-10180

EPD Valid June 10, 2024 through June 9, 2029

Product Category Rule

Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood. NSF International. Version 2. 2014
Extended 12 months per PCRExt 2023-112, valid through June 30, 2024

Program Operator

SCS Global Services

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Declaration Owner:	Elegant Home-Tech Co., Ltd	
Address:	Hexing Civil Industrial Zone, Jinfeng Town, Zhangjiagang, Jiangsu 215626, China	
Declaration Number:	SCS-EPD-10180	
Declaration Validity Period:	EPD Valid June 10, 2024 through June 9, 2029	
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 v2.0 software and the Ecoinvent v3.9 database	
Product RSL:	Various	
Markets of Applicability:	North America	
EPD Type:	Product-Specific	
EPD Scope:	Cradle-to-Grave	
LCIA Method and Version:	CML-IA	
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	
Product Category Rule:	Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood. NSF International. Version 2. 2014	
Part A PCR Review conducted by:	Jack Geibig, EcoForm. jgeibig@ecoform.com	
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. Elegant Home-Tech Co., Ltd 2. Product Description 3. Product Application 4. Material Content 5. Product Characteristics 6. Life Cycle Assessment 7. Functional Unit 8. Product Life Cycle Flow Diagram 9. Life Cycle Assessment Stages and Reported EPD Information 10. Life Cycle Inventory 11. Life Cycle Impact Assessment 12. Supporting Technical Information 13. References	2 2 2 2 3 4 4 4 5 7 8 11 14

Disclaimers: This EPD conforms to ISO 14025, 14040, 14044, and 21930:2007.

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. Elegant Home-Tech Co., Ltd

Over the past 20 years, we have come through trials and hardships. Founded in November 1999, ELETILE was one of China's first VINYL FLOOR manufacturers. In 2005, ELETILE invented the Grip strip floating flooring, a revolutionary product that hit the market in 2007 and gained more than CNY 500 million in sales. In November 2017, ELETILE established its joint-share system and was renamed Zhangjiagang Elegant Home Technology Co., Ltd. In the same year, it posted CNY 1 billion in revenue. On March 23, 2020, ELETILE had an IPO as the first-ever stock in the RESILIENT VINYL FLOORING industry on the A-share main board of the Shanghai Stock Exchange under the stock code of 603221, marking its advancement into the era of capital operations.

Sticking to the commitment of "give top priority to clients and quality" and the philosophy of "be green, human-centered, and innovative" since its founding, ELETILE delivers environmentally friendly, healthy, and comfortable flooring to every household and office. In recent years, we have dedicated ourselves to the innovative development of new materials and new processes, along with digital and intelligent upgrades to make ELETILE a world-famous home furnishing brand.

2. Product Description

Table 1. *Etile products included in the assessment.*

Product Name	Representative Thickness (mm)	Description
Gluedown LVT	3.2 mm	Gluedown floor is a classic product of PVC elastic flooring. It is composed of an antibacterial and scratch-resistant UV coating on the surface, a transparent wear-resistant layer, a printed layer and a substrate layer that provides elasticity, toughness and rigidity. Gluedown floor installation requires the application of glue on the ground and then the floor is pasted on top, the construction is simple and suitable for DIY construction. Gluedown flooring products are cost-effective, easy to maintain, comfortable feet and easy to install. It is widely used in all kinds of home decoration and industry scenes.

3. Product Application

The products provide the primary function of floor covering in indoor commercial areas.

4. Material Content

Table 2. *Material composition for the Etile products by mass in kg/m² and as a percentage of total mass.*

Component	kg/m ²	Percent mass
PVC	1.72	31%
Filler	3.11	56%
Plasticizer	0.560	10%
Stabilizer	4.92x10 ⁻²	0.88%
Plastics	0.00	0%
Adhesives/Coatings	0.107	1.9%
Pigment	3.93x10 ⁻³	0.071%
Total Product	5.55	100%

Table 3. *Origin and availability of material content.*

Material	Availability			
	Renewable	Non-renewable	Recycled (% pre-/post-consumer)	Origin of Materials
Plastics (PVC, PE)		Fossil limited	7% - 10%/0%	Asia
Calcium Carbonate		Mineral abundant	13% - 17%/0%	Asia
Plasticizer		Fossil limited	-	Asia
Stabilizer		Fossil limited	-	Asia
Other (Adhesive, Coatings, Pigments)		Fossil limited	-	Asia
Corrugated board	Abundant		-	Asia
Packaging film (LDPE)		Fossil limited	-	Asia
Wood	Abundant		-	Asia

In conformance with the PCR, product materials were reviewed for the presence of any toxic or hazardous chemicals. Based on a review of the product components provided by the manufacturer, no regulated chemicals, i.e., Substances of Very High Concern (SVHC) or substances on the REACH Candidate List, were identified in the product or product components.

5. Product Characteristics

Table 4. *Product characteristics for the Gluedown LVT flooring products.*

Characteristic			Description			
Sustainable certifications			Global Green Tag Product Health Declaration™			
VOC emissions test method			FloorScore®			
Characteristic			Average Value	Unit	Min Value	Max Value
Product thickness			3.20 (0.13)	mm (in)	3.07 (0.12)	3.33 (0.13)
Wear layer thickness (where applicable)			0.70 (0.03)	mm (in)	0.61 (0.02)	0.79 (0.03)
Product weight			5,500 (18.0)	g/m ² (oz/ft ²)	5,225 (17.1)	5,775 (18.9)
Product Form	Planks	Width	-	mm (in)	101.6 (4)	228.6 (9)
		Length	-	m (in)	0.610 (24)	1.52 (60)
	Tiles	Width	-	mm (in)	305 (12)	457 (18)
		Length	-	m (in)	0.610 (24)	0.914 (36)

6. Life Cycle Assessment

A cradle to grave life cycle assessment (LCA) was completed for this product group in accordance with ISO 14040, ISO 14044 and the NSF International Product Category Rule for Environmental Product Declarations for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood (Version 2).



7. Functional Unit

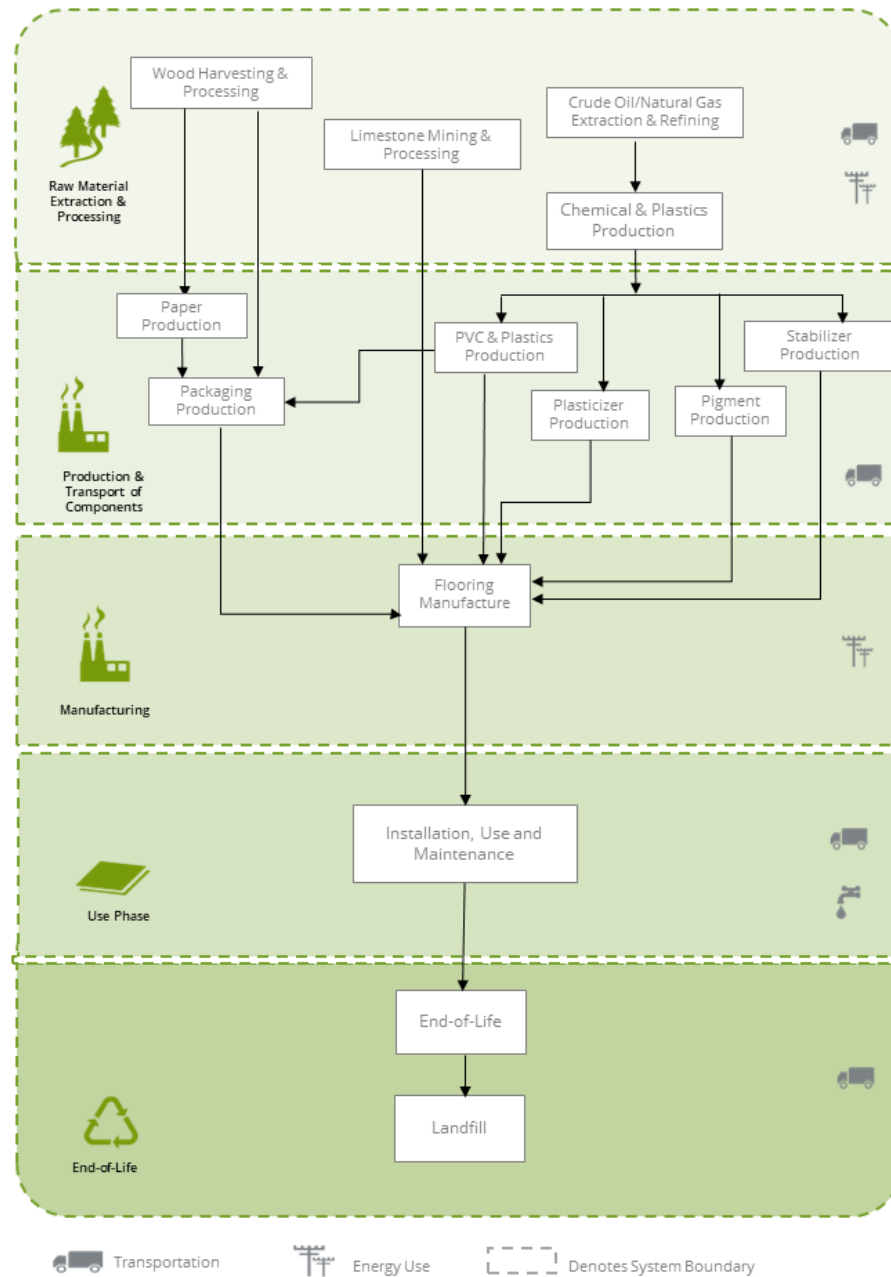
The functional unit is, according to the PCR, the total impact for the expected life of the building (60 years). But the service life is dependent on the product lifetime. The PCR consequently requires separate reporting of LCA results A) for 1 m² of floor covering - extraction/processing, manufacturing, delivery and installation and end of life, B) the average 1- year use stage, and C) for the 60 year life of the building as combined using A) and B), calculated from the reference service life (RSL) of the product.

Table 5. Reference Service Life (RSL) and reference flows for the flooring products.

Product Name	Reference Flow (kg/m ²)	Reference Service Life – RSL (years)
Gluedown LVT	5.79	7

8. Product Life Cycle Flow Diagram

The diagrams below present a representation of the most significant contributions to the life cycle of the flooring products. This includes resource extraction and processing, product manufacture, use and maintenance, and end-of-life.



9. Life Cycle Assessment Stages and Reported EPD Information

Sourcing/Extraction Stage (raw material acquisition)

This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. Resource use and emissions associated with both extraction of the raw materials and manufacture of flooring components are included.

Manufacturing Stage

This stage includes all the relevant manufacturing processes and flows, including packaging. Production of capital goods, infrastructure, production of manufacturing equipment, and personnel-related activities are not included.

Delivery and Installation Stage

Delivery

This stage includes the delivery of the flooring products to the point of installation. Modeling used in the life cycle assessment assumed an estimated average distribution distance to point of sale of distance of 12,425 km by ocean freighter and 800 km by diesel truck for all products.

Installation

For the Gluedown LVT products, 0.3 kg of adhesive per m² of flooring is required for installation. Approximately 4% of the product mass is assumed lost as waste during product installation which is landfilled. The VOC emissions associated with the installation, use and maintenance of the products are negligible.

Waste

Waste generated during product installation is disposed of in a landfill.

Packaging

Table 6. Packaging materials and amounts for the flooring products. Results are shown in kg per 1 m² flooring.

Component	kg/m ²	Percent mass
Corrugated	0.104	44%
Plastic	1.36x10 ⁻³	0.57%
Wood	0.131	56%
Total Packaging	0.237	100%

Use Stage

Cleaning and maintenance

For the purposes of this assessment, average maintenance (moderate traffic levels) is presented based on typical installations as summarized in Table 7.

Table 7. Cleaning and maintenance for flooring products.

Cleaning Process	Traffic Level			Energy & Resource Use
	Light - 500 traffics or less daily	Moderate - 500-1,000 traffics daily	Heavy - 1,000-2,500 traffics daily	
Dust mop	Twice or more each week	At least once daily	Daily	None
Damp mop	Monthly	Weekly	Daily	Water; neutral cleaning agent
Machine cleaning	Monthly	Weekly	Daily	Electricity

The parameters used to model the product maintenance are summarized in Table 8.

Table 8. Maintenance parameters for the flooring products, per 1 m².

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
Maintenance process	-	Machine cleaning
Electricity	kWh/m ² /yr	0.022
Further assumptions	-	Moderate traffic; weekly maintenance

End-of-Life Stage

At end-of-life, the product is assumed to be disposed in a landfill. Additionally, 10% of the packaging materials are recycled at end-of-life while materials not recycled are landfilled.

Transportation for end-of-life scenarios was modeled assuming a distance of 161 km from the point of product use to a landfill, material recovery center, or waste incinerator. Ecoinvent datasets are used to model the impacts associated with incineration and landfilling, which does not include energy recovery from landfill gas.

10. Life Cycle Inventory

The following aggregated inventory flows are included in the LCA, in addition to the LCIA and inventory flow requirements specified by the PCR:

- Use of renewable material resources
- Consumption of freshwater
- Hazardous Waste
- Non-hazardous Waste

All results are calculated using the OpenLCA v2.0 model using primary and secondary inventory data. Classification for Use of Renewable Material Resources is based on review of elementary flows and resources considered renewable on a human time scale. Elementary flows related to use of wood, minerals, and land occupation were not included. Water consumption is also not included as this is reported separately. Based on this classification process, no renewable material resources are estimated for the product system under consideration.

Table 9. Results for aggregated inventory flows, shown in kg per 1 m² of flooring maintained for 60 years.

Parameter	Gluedown LVT
Resources	
PED, non-renewable (MJ eq)	2,870
PED, renewable (MJ eq)	174
Water Use (m ³)	8.93
Use of renewable materials (kg)	0.00
Wastes	
Landfill Avoidance (Recycling) (kg)	49.8
Hazardous Waste (kg)	6.81x10 ⁻³
Non-hazardous Waste (kg)	80.0

11. Life Cycle Impact Assessment

Life cycle impact assessment is the process of converting the life cycle inventory results into a representation of environmental and human health impacts. For example, emissions such as carbon dioxide, methane, and nitrous oxide (inventory) together contribute to climate change (impact assessment). The impact assessment for the EPD is conducted in accordance with requirements of the PCR. Impact category indicators are estimated using the CM-IA characterization method. Aggregated inventory flows for energy use and wastes are also calculated. The LCIA and inventory flow results are calculated using OpenLCA software.

Table 10. Table A: Cradle-to-install and end-of-life. Results reported in MJ are calculated using lower heating values. **(Gluedown LVT)**

Impact Category	Sourcing/ Extraction	Manufacturing	Delivery and Installation	End of Life	Total
CML					
Global Warming Potential (kg CO ₂ eq)	8.23	6.75	4.22	3.77	23.0
	36%	29%	18%	16%	100%
Acidification Potential (kg SO ₂ eq)	3.10x10 ⁻²	2.54x10 ⁻²	3.11x10 ⁻²	5.50x10 ⁻³	9.31x10 ⁻²
	33%	27%	33%	5.9%	100%
Eutrophication Potential (kg (PO ₄) ³⁻ eq)	1.05x10 ⁻²	7.22x10 ⁻³	7.40x10 ⁻³	1.58x10 ⁻²	4.09x10 ⁻²
	26%	18%	18%	39%	100%
Photochemical Oxidant Creation Potential (kg C ₂ H ₄ eq)	3.46x10 ⁻³	1.12x10 ⁻³	1.87x10 ⁻³	7.54x10 ⁻⁴	7.21x10 ⁻³
	48%	16%	26%	10%	100%
Ozone Depletion Potential (kg CFC-11 eq)	5.37x10 ⁻⁶	2.76x10 ⁻⁸	3.32x10 ⁻⁷	1.71x10 ⁻⁸	5.75x10 ⁻⁶
	93%	0.48%	5.8%	0.3%	100%
Abiotic Depletion Potential, fossil (MJ eq)	164	62.7	59.6	17.7	304
	54%	21%	20%	5.8%	100%
Abiotic Depletion Potential, elements (kg Sb eq)	7.49x10 ⁻⁵	3.48x10 ⁻⁶	2.32x10 ⁻⁵	1.08x10 ⁻⁶	1.03x10 ⁻⁴
	73%	3.4%	23%	1.1%	100%
Resources					
PED, non-renewable (MJ eq)	175	66.5	63.2	17.8	323
	54%	21%	20%	5.5%	100%
PED, renewable (MJ eq)	11.8	5.01	2.43	0.133	19.4
	61%	26%	13%	0.69%	100%
Water Use (m ³)	0.537	0.250	0.160	9.13x10 ⁻³	0.956
	56%	26%	17%	0.96%	100%
Use of renewable materials (kg)	0.00	0.00	0.00	0.00	0.00
	0%	0%	0%	0%	0%
Wastes					
Landfill Avoidance (Recycling) (kg)	0.00	0.00	0.237	5.55	5.79
	0%	0%	4.1%	96%	100%
Hazardous Waste (kg)	3.39x10 ⁻⁴	1.20x10 ⁻⁴	1.98x10 ⁻⁴	1.19x10 ⁻⁴	7.76x10 ⁻⁴
	44%	15%	26%	15%	100%
Non-hazardous Waste (kg)	1.23	1.03	1.35	5.65	9.27
	13%	11%	15%	61%	100%

Table 11. Table B: Use phase (1-year average). Results reported in MJ are calculated using lower heating values. **(Gluedown LVT)**

Impact Category	Use
CML	
Global Warming Potential (kg CO ₂ eq)	7.84x10 ⁻²
Acidification Potential (kg SO ₂ eq)	2.63x10 ⁻⁴
Eutrophication Potential (kg (PO ₄) ³⁻ eq)	1.37x10 ⁻⁴
Photochemical Oxidant Creation Potential (kg C ₂ H ₄ eq)	1.38x10 ⁻⁵
Ozone Depletion Potential (kg CFC-11 eq)	3.62x10 ⁻¹⁰
Abiotic Depletion Potential, fossil (MJ eq)	1.36
Abiotic Depletion Potential, elements (kg Sb eq)	6.31x10 ⁻⁷
Resources	
PED, non-renewable (MJ eq)	1.66
PED, renewable (MJ eq)	0.123
Water Use (m ³)	1.19x10 ⁻²
Use of renewable materials (kg)	0.00
Wastes	
Landfill Avoidance (Recycling) (kg)	0.00
Hazardous Waste (kg)	2.31x10 ⁻⁶
Non-hazardous Waste (kg)	5.11x10 ⁻³

Table 12. Table C: Cradle-to-grave. Results reported in MJ are calculated using lower heating values. **(Gluedown LVT)**

Impact Category	Sourcing/Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
CML						
Global Warming Potential (kg CO ₂ eq)	70.8	58.1	36.3	4.70	32.4	202
	35%	29%	18%	2.3%	16%	100%
Acidification Potential (kg SO ₂ eq)	0.267	0.219	0.268	1.58x10 ⁻²	4.73x10 ⁻²	0.816
	33%	27%	33%	1.9%	5.8%	100%
Eutrophication Potential (kg (PO ₄) ³⁻ eq)	9.02x10 ⁻²	6.21x10 ⁻²	6.36x10 ⁻²	8.21x10 ⁻³	0.136	0.360
	25%	17%	18%	2.3%	38%	100%
Photochemical Oxidant Creation Potential (kg C ₂ H ₄ eq)	2.98x10 ⁻²	9.66x10 ⁻³	1.61x10 ⁻²	8.30x10 ⁻⁴	6.49x10 ⁻³	6.29x10 ⁻²
	47%	15%	26%	1.3%	10%	100%
Ozone Depletion Potential (kg CFC-11 eq)	4.62x10 ⁻⁵	2.38x10 ⁻⁷	2.86x10 ⁻⁶	2.17x10 ⁻⁸	1.47x10 ⁻⁷	4.95x10 ⁻⁵
	93%	0.48%	5.8%	0.044%	0.3%	100%
Abiotic Depletion Potential, fossil (MJ eq)	1,410	539	512	81.5	152	2,700
	52%	20%	19%	3%	5.6%	100%
Abiotic Depletion Potential, elements (kg Sb eq)	6.44x10 ⁻⁴	2.99x10 ⁻⁵	2.00x10 ⁻⁴	3.78x10 ⁻⁵	9.28x10 ⁻⁶	9.21x10 ⁻⁴
	70%	3.2%	22%	4.1%	1%	100%
Resources						
PED, non-renewable (MJ eq)	1,510	572	543	99.9	153	2,870
	52%	20%	19%	3.5%	5.3%	100%
PED, renewable (MJ eq)	101	43.1	20.9	7.36	1.15	174
	58%	25%	12%	4.2%	0.66%	100%
Water Use (m ³)	4.62	2.15	1.38	0.715	7.86x10 ⁻²	8.93
	52%	24%	15%	8%	0.88%	100%
Use of renewable materials (kg)	0.00	0.00	0.00	0.00	0.00	0.00
	0%	0%	0%	0%	0%	0%
Wastes						
Landfill Avoidance (Recycling) (kg)	0.00	0.00	2.03	0.00	47.8	49.8
	0%	0%	4.1%	0%	96%	100%
Hazardous Waste (kg)	2.91x10 ⁻³	1.03x10 ⁻³	1.71x10 ⁻³	1.39x10 ⁻⁴	1.03x10 ⁻³	6.81x10 ⁻³
	43%	15%	25%	2%	15%	100%
Non-hazardous Waste (kg)	10.6	8.88	11.6	0.307	48.6	80.0
	13%	11%	15%	0.38%	61%	100%

12. Supporting Technical Information

Data Sources

Unit processes are developed with OpenLCA software, drawing upon data from multiple sources. Primary data were provided by Etile for their manufacturing processes. The primary sources of secondary LCI data are from Ecoinvent Database.

Table 13. *Data sources used for the LCA.*

Component	Dataset	Data Source	Publication Date
PRODUCT			
PVC			
Polyvinyl Chloride	polyvinylchloride production, bulk polymerisation polyvinylchloride, bulk polymerised Cutoff, S/RoW	EI v3.9	2023
Filler			
Calcium Carbonate	limestone production, crushed, washed limestone, crushed, washed Cutoff, S/RoW	EI v3.9	2023
Plasticizer			
PVC Plasticizer	diethyl terephthalate production diethyl terephthalate Cutoff, S/GLO	EI v3.9	2023
Stabilizer			
Stabilizer	Ca-Zn stabilizer: chemical production, organic chemical, organic Cutoff, S/GLO	EI v3.9	2023
	chemical production, inorganic chemical, inorganic Cutoff, S/GLO	EI v3.9	2023
	limestone production, crushed, washed limestone, crushed, washed Cutoff, S/RoW	EI v3.9	2023
	zinc oxide production zinc oxide Cutoff, S/RoW	EI v3.9	2023
Pigment			
Carbon Black	carbon black production carbon black Cutoff, S/GLO	EI v3.9	2023
Plastics			
PE	polyethylene production, low density, granulate steam, in chemical industry Cutoff, S/RoW	EI v3.9	2023
PUR	market for polyurethane, flexible foam polyurethane, flexible foam Cutoff, S/RoW	EI v3.9	2023
Other			
Organic chemicals	chemical production, organic chemical, organic Cutoff, S/GLO	EI v3.9	2023
Adhesive	polyurethane adhesive production polyurethane adhesive Cutoff, S/GLO	EI v3.9	2023
Methyl methacrylate	methyl methacrylate production methyl methacrylate Cutoff, S/RoW	EI v3.9	2023
PACKAGING			
Cardboard	corrugated board box production corrugated board box Cutoff, S/RoW	EI v3.9	2023
Wood	EUR-flat pallet production EUR-flat pallet Cutoff, S/RoW	EI v3.9	2023
Plastic	packaging film production, low density polyethylene packaging film, low density polyethylene Cutoff, S/RoW;	EI v3.9	2023
TRANSPORT			
Road transport	transport, freight, lorry 16-32 metric ton, EURO4 transport, freight, lorry 16-32 metric ton, EURO4 Cutoff, S/RoW	EI v3.9	2023
Ship transport	transport, freight, sea, container ship transport, freight, sea, container ship Cutoff, S/GLO	EI v3.9	2023
RESOURCES			
Grid electricity	market group for electricity, medium voltage electricity, medium voltage Cutoff, S/CN	EI v3.9	2023
Heat - natural gas	market for heat, central or small-scale, natural gas heat, central or small-scale, natural gas Cutoff, S/RoW	EI v3.9	2023
Heat - Heavy fuel oil	heat production, heavy fuel oil, at industrial furnace 1MW heat, district or industrial, other than natural gas Cutoff, S/RoW	EI v3.9	2023
Heat - Steam	market for heat, from steam, in chemical industry heat, from steam, in chemical industry Cutoff, S/RoW	EI v3.9	2023

Table 14. *Data quality assessment of Life Cycle Inventory.*

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. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2023.
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 Asia. Surrogate data used in the assessment are representative of global or European operations. Data representative of European operations is 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 v3.9 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 the manufacturing facility represents 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 v3.9 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 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.

Allocation

This study follows the allocation guidelines of ISO 14044 and sought to minimize the use of allocation wherever possible. The PCR requires primary data for allocation based on physical relationships (e.g., volume, energy content, or mass-based relationships). Alternatively, economic allocation may be applied. The secondary databases used for the product system (discussed below) apply allocation based primarily on physical relationships.

Resource use (e.g., water and energy) at the Etile facility in China was allocated to the product based on the product area as a fraction of the total facility production volume (i.e., area-based allocation). Electricity use at the manufacturing facility was modeled using ecoinvent inventory datasets for the country-specific electrical grid.

Impacts from transportation were attributed to the product based on the mass of material and distance transported.

System boundaries

The system boundaries of the life cycle assessment are cradle to grave. A description of the system boundaries for this study are as follows:

- **Sourcing/extraction stage** – This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. Resource use and emissions associated with both extraction of the raw material component manufacturing are included. Upstream transportation is also included.
- **Manufacturing stage** – This stage includes all the relevant manufacturing processes and flows, including packaging. Production of capital goods, infrastructure, production of manufacturing equipment, and personnel-related activities are not included.
- **Delivery and installation stage** – This stage includes the delivery of the flooring products to the point of installation and installation of the products.
- **Use stage** – The use stage includes the cleaning and maintenance of the flooring during its lifetime, as well as extraction, manufacturing and transport of all sundry material for maintenance and cleaning.
- **End of life stage** – The end of life stage includes the transport of the floor covering to end of life processes including landfill, incineration, and recycling.

Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact must be included in the inventory. In the present study, except as noted, all known materials and processes were included in the life cycle inventory.

13. References

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