Declaration Owner

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Product

- Stone Polymer Composite (SPC) Flooring

EPD represents delivery of product to customers globally.

Functional Unit

The functional unit is one square meter of flooring installed and maintained for over a 1-year period

EPD Number and Period of Validity

SCS-EPD-10431
EPD Valid May 19, 2025 through May 18, 2030

Product Category Rule

The International EPD System, 2024-04-30, PCR 2019:14 CONSTRUCTION PRODUCTS, version 1.3.4, VALID UNTIL: 2025-06-20.
The International EPD System, C-PCR-004 (TO PCR 2019:14), RESILIENT, TEXTILE AND LAMINATE FLOOR COVERINGS (EN 16810:2017), VERSION: 2024-04-30, VALID UNTIL: 2025-06-20

CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Program Operator

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Declaration Owner:	Jiangsu Zhengkang New Material Technology Co.,Ltd.
Address:	135 Cuixi Road, Henglin, Wujin, Changzhou, Jiangsu, China
Declaration Number:	SCS-EPD-10431
Declaration Validity Period:	EPD Valid May 19, 2025 through May 18, 2030
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 2.1 software and the Ecoinvent v3.10 database
Product RSL:	1 year
Markets of Applicability:	Global
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave and Module D
LCIA Method and Version:	EN15804 (EF3.1)
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Lindita Bushi Lindita Bushi, PhD, Athena Sustainable Materials Institute
Product Category Rule:	The International EPD System, 2024-04-30, PCR 2019:14 CONSTRUCTION PRODUCTS, version 1.3.4, VALID UNTIL: 2025-06-20.
Part A PCR Review conducted by:	The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile.
Complementary Product Category Rule:	The International EPD System, C-PCR-004 (TO PCR 2019:14), RESILIENT, TEXTILE AND LAMINATE FLOOR COVERINGS (EN 16810:2017), VERSION: 2024-04-30, VALID UNTIL: 2025-06-20
Part B PCR Review conducted by:	The Technical Committee of the International EPD® System.
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Lindita Bushi Lindita Bushi, PhD, Athena Sustainable Materials Institute
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Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and EN 15804:2012+A2:2019/AC:2021.*

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: *EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.*

The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

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1. Zhengkang Flooring

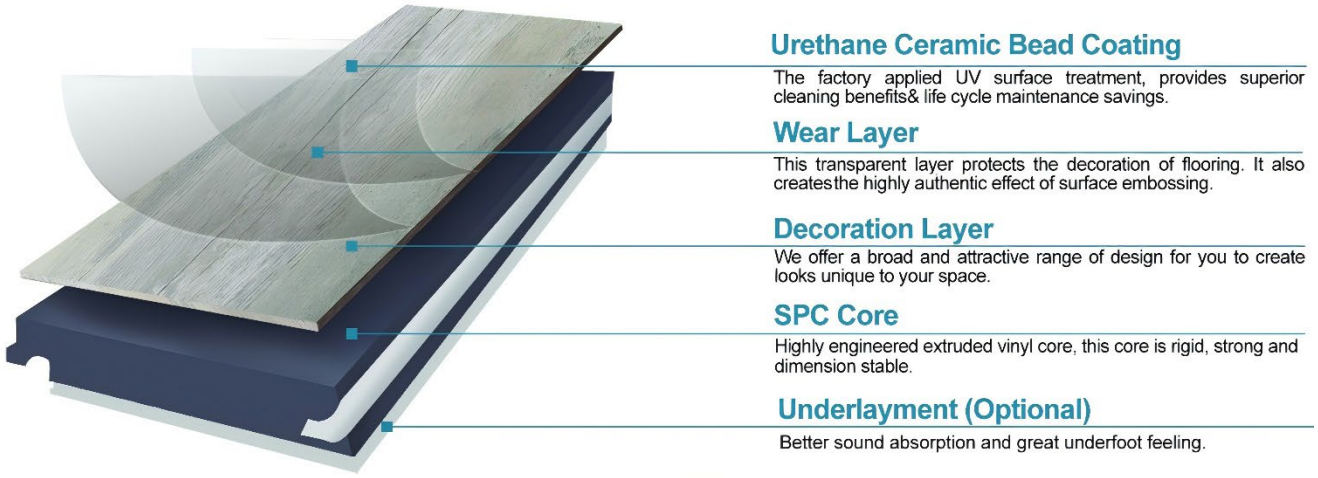
With more than 14 years of experience of vinyl flooring production, Jiangsu Zhengkang New Material Technology Co.,Ltd (Zhengkang Flooring) is continuously improving the team to make sure the customers always receive the support for successful business. Zhengkang Flooring company is equipped with the most advanced facilities in the industry and the products are produced under strict quality control. Considering the environmental impact we continuously optimize production capacity. Zhengkang Flooring aims to deliver high quality products at fair prices and exceptional customer service.

2. Product

2.1 PRODUCT DESCRIPTION

Stone Polymer Composite (SPC)

Flooring products are essential components in the construction and interior design industry, Zhengkang SPC flooring (UNSPSC Class Code 30161700) is made primarily from polyvinyl chloride (PVC), calcium carbonate (limestone), plasticizers, additives (i.e. Pigments, stabilizers.). It is composed of a clear surface embossed wear layer with urethane ceramic bead coating, decoration layer and highly engineered extruded vinyl core to make more strength and stability. The underlayment (such as IXPE or Cork) makes better sound absorption and great underfoot feeling. The product is waterproof and easy to maintain.



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 Zhengkang Flooring products provide the primary function of flooring for interior applications. The products are used in various residential and commercial applications.

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-grave and Module D, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The LCA is conducted using an attributional approach. The environmental loads and benefits resulting from recyclable materials leaving a product system (Module D) are negligible. Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the Zhengkang Flooring 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
Modules Declared	x	x	x	x	x	n/a	x	n/a	n/a	n/a	n/a	n/a	x	x	x	x	x
Geography	GLO	GLO	CN	GLO	GLO	n/a	GLO	n/a	n/a	n/a	n/a	n/a	GLO	GLO	GLO	GLO	GLO
Share of specific data	>90%			>90%		-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-			-		-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	-			-		-	-	-	-	-	-	-	-	-	-	-	-

X = Included in system boundary | GLO = Global; CN = China

2.5 TECHNICAL DATA

Technical specifications for the flooring products are summarized in Table 2.

Table 2. *Product specifications for the Zhengkang Flooring* ***Stone Polymer Composite*** *Flooring products.*

Characteristic		Description			
Sustainable certifications		ISO14001, ISO9001, ISO45001, CE, Floorscore, Assure			
VOC emissions test method		EN717-1:2004-Part 1 /CDPH EHLB Standard Method v1.2-2017 FloorScore®: SCS-FS-03702			
Use Classification (according to EN ISO 10874)		Domestic: 23, Commercial: 33, Industrial: 42			
Characteristic		**Average Value**	**Unit**	**Min Value**	**Max Value**
Product thickness		6.00 (0.236)	mm (in)	3.50 (0.138)	8.00 (0.315)
Wear layer thickness (where applicable)		0.55 (0.022)	mm (in)	0.30 (0.012)	0.70 (0.028)
Product weight		10,040 (32.90)	g/m^2 (oz/ft^2)	6,900 (22.61)	14,900 (48.83)
Product Form	Width	228.0 (8.98)	mm (in)	125.00 (4.92)	609.6 (24.00)
	Length	1.52 (4.99)	m (ft)	0.625 (2.05)	2.22 (7.28)

2.6 MARKET PLACEMENT/APPLICATION RULES

Technical specifications and product performance results for the flooring products can be found on the manufacturer's website: www.cnkingfisher.com.

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The products are delivered for installation in the form of tiles and planks.

2.8 MATERIAL COMPOSITION

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

Table 3. *Material content for the flooring products in kg per square meter and percent of total mass.*

Material	Renewable	Recycled Content (%)	Value
PVC	No	0%	2.26
			22%
Filler	No	0%	4.98
			50%
Regrind	No	0%	2.22
			22%
Stabilizer	No	0%	0.144
			1.4%
Plastics	No	0%	0.210
			2.1%
Other	No	0%	0.225
			2.2%
Total Product			**10.04**
			100%

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.

2.9 MANUFACTURING

Zhengkang SPC flooring products are produced at their manufacturing facility in China. The flooring are made primarily from polyvinyl chloride (PVC), calcium carbonate (mineral reinforcement), plasticizers and additives (e.g., pigments and stabilizers). The product is structured with multiple layers including SPC core, a PVC wear layer and a UV protective layer.

The Stone Polymer Composite production process begins with raw material preparation, followed by automatic batching and mixing machine and feeding into the extruding line. The materials are formed into units and undergo surface treatment, and then go through cutting and profiling. The steps of Chamfer paint and pad pasting are optional after profiling. Finally, the product undergoes a thorough inspection before packaging.

2.10 PACKAGING

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

Table 4. *Material content for the flooring products packaging, in kg per square meter and percent of total mass.*

Material	Biogenic Material	Recycled Content (%)	Value
Corrugate/Paper	Yes	0%	0.328
			70%
Plastic	No	0%	1.83×10^{-2}
			3.9%
Wood	Yes	0%	0.121
			26%
Total Packaging			**0.468**
			100%

2.11 PRODUCT INSTALLATION

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

2.12 USE CONDITIONS

No special conditions of use are noted.

2.13 PRODUCT REFERENCE SERVICE LIFE AND BUILDING ESTIMATED SERVICE LIFE

The Reference Service Life (RSL) of the flooring product is one year based on PCR requirements.

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. Although in some instances, vinyl flooring can be recycled into other products, the practice is not typical, nor widely available as a disposal route for the products in the consumer markets considered. It is assumed that products are 100% landfilled and no components of the product are recycled at end-of-life.

2.16 FURTHER INFORMATION

Further information on the product can be found on the manufacturers' website at www.cnkingfisher.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 1-year period. The corresponding reference flow for each product system is presented in Table 5. For the present assessment, a reference service lifetime (RSL) is 1-year in conformance with the PCR.

Table 5. *Reference flows and RSL for the flooring products.*

Product Name	Reference Flow (kg/m^2)	Reference Service Life – RSL (years)
Stone Polymer Composite	10.04	1

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 following processes are excluded from the system boundary, consistent with the PCR:

- Construction activities, capital equipment, and infrastructure
- Maintenance and operation of capital equipment
- Personnel travel and resource use

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 Zhengkang Flooring products.*

Module	Module Description	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 product 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 (including upstream unit processes*)
A4	Transport (to the building site)	Transport of product (including packaging) to the building site
A5	Construction-installation process	Impacts from the installation of the product are assumed negligible. Impacts from the production, transport and disposal of waste material associated with installation are included in this phase in addition to impacts from packaging disposal
B1	Product use	Module not applicable
B2	Product maintenance	Maintenance of products over the product RSL, including periodic cleaning.
B3	Product repair	Module not applicable
B4	Product replacement	Module not applicable
B5	Product refurbishment	Module not applicable
B6	Operational energy use by technical building systems	Module not applicable
B7	Operational water uses by technical building systems	Module not applicable
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 the product to waste treatment at end-of-life
C3	Waste processing for reuse, recovery and/or recycling	The products are disposed of by landfilling, which requires no waste processing
C4	Disposal	Disposal of the product
D	Reuse-recovery-recycling potential	There are no significant impacts associated with Module D as no recycled materials are used in the products. In addition, no product components are recycled at end-of-life.

It is noted that generation of electricity used in the manufacturing process should be included in stage A1 as specified by EN 15804. However, since the separation of combustion emissions and energy resource extraction for electricity generation could not be accomplished with the LCI data used for the modeling, impacts from electricity use are modeled in the manufacturing stage A3 and impacts from stages A1 through A3 are combined and reported in aggregate in the LCA results presented in this EPD.

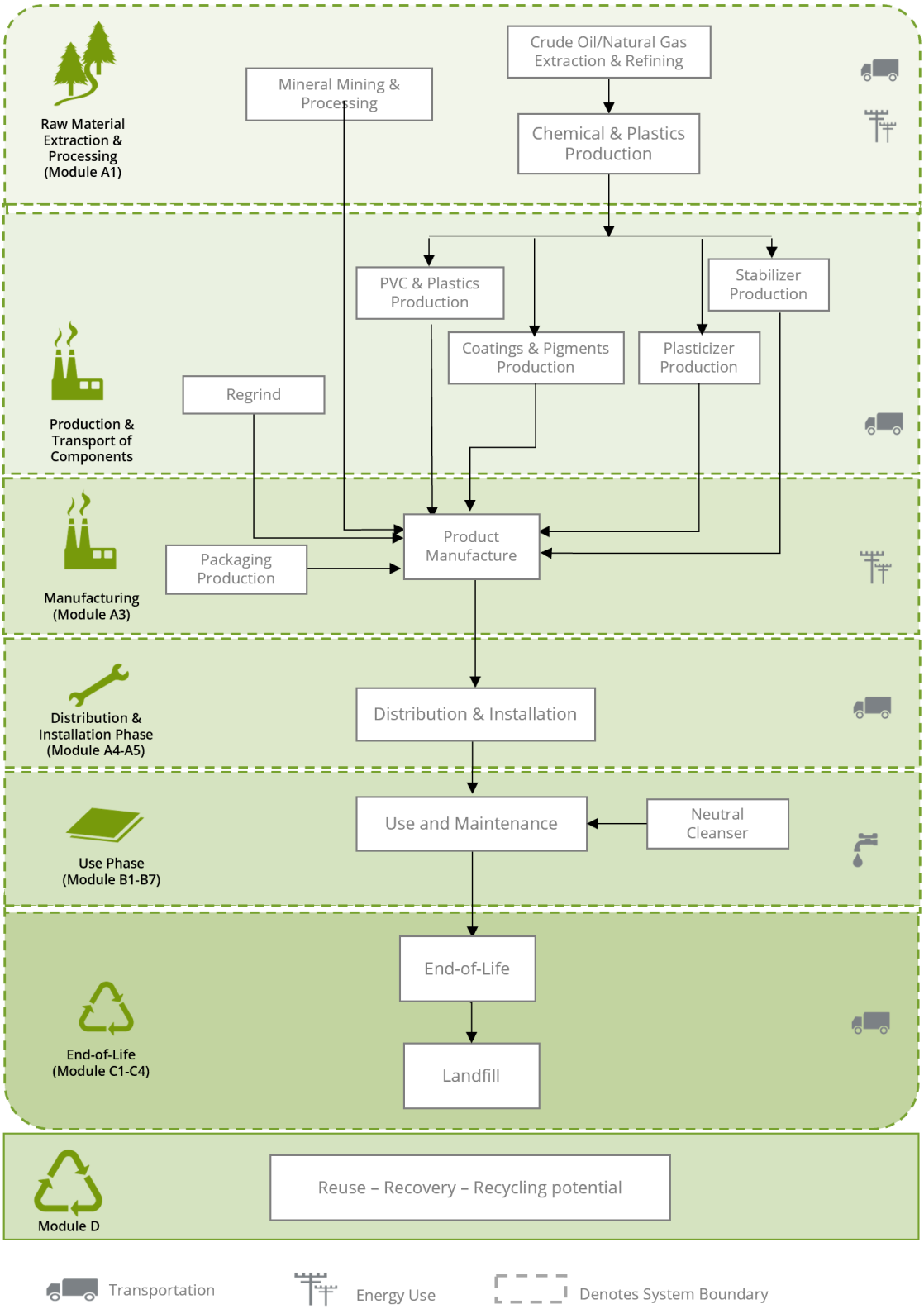


Figure 1. *Flow Diagram for the life cycle of the Zhengkang SPC flooring product system.*

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 facility was allocated to the products based on the product area as a fraction of the total production.
- The Zhengkang Flooring facility under review is located in China. An Ecoinvent inventory dataset for the country-specific energy grid was used to model resource use and emissions from electricity use at the manufacturing facility.
- The Reference Service Life (RSL) of the products was modeled based on PCR requirements.
- Downstream transport was modeled based on information provided by the manufacturer representing distribution to consumer markets globally.
- The maintenance phase of the product life cycle was modeled based on information provided by the manufacturer including recommended installation and cleaning methods, as well as cleaning frequency.
- For the product end-of-life, disposal of product is assumed landfilled while the product packaging is modeled based on regional statistics regarding recycling rates of packaging materials.
- For final disposal of the packaging material and flooring products at end-of-life, all materials are assumed to be transported 161 km 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 considering this limitation.

3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 5% 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 Zhengkang Flooring for their manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 7. *Data sources for the Zhengkang Flooring product system.*

Component	Dataset[1]	Data Source	Publication Date
PRODUCT			
Polymer Binder			
Polyvinyl Chloride	market for polyvinylchloride, bulk polymerised | polyvinylchloride, bulk polymerised | EN15804GD, S/GLO	EI v3.10	2023
Filler			
Calcium Carbonate	limestone production, crushed, washed | limestone, crushed, washed | EN15804GD, S/RoW	EI v3.10	2023
Plasticizer			
PVC Plasticizer	dioctyl terephthalate production | dioctyl terephthalate | EN15804GD, S/GLO	EI v3.10	2023
Stabilizer			
Stabilizer	chemical production, organic | chemical, organic | EN15804GD, S/GLO	EI v3.10	2023
	solvent production, organic | solvent, organic | EN15804GD, S/GLO	EI v3.10	2023
	limestone production, crushed, washed | limestone, crushed, washed | EN15804GD, S/RoW	EI v3.10	2023
	zinc oxide production | zinc oxide | EN15804GD, S/RoW	EI v3.10	2023
Pigments			
TiO_2	market for titanium dioxide | titanium dioxide | EN15804GD, S/RoW	EI v3.10	2023
Carbon Black	carbon black production | carbon black | EN15804GD, S/GLO	EI v3.10	2023
Others			
ESBO	market for soybean oil, refined | soybean oil, refined | EN15804GD, S/GLO	EI v3.10	2023
Adhesive	polyurethane adhesive production | polyurethane adhesive | Cutoff, S/GLO	EI v3.10	2023
Acrylic resin	methyl acrylate production | methyl acrylate | Cutoff, S/GLO	EI v3.10	2023
Coating	market for chemical, organic | chemical, organic | Cutoff, S/GLO	EI v3.10	2023
PACKAGING			
Cardboard/Paper	containerboard production, linerboard, kraftliner | containerboard, linerboard | EN15804GD, S/RoW kraft paper production | kraft paper | EN15804GD, S/RoW	EI v3.10	2023
Plastics	packaging film production, low density polyethylene | packaging film, low density polyethylene | EN15804GD, S/RoW; polyethylene production, low density, granulate | polyethylene, low density, granulate | EN15804GD, S/RoW	EI v3.10	2023
Adhesive	polyurethane adhesive production | polyurethane adhesive | EN15804GD, S/GLO	EI v3.10	2023
Wood	EUR-flat pallet production | EUR-flat pallet | EN15804GD, S/RoW	EI v3.10	2023
TRANSPORT			
Road transport	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | EN15804GD, S/RoW	EI v3.10	2023
Ship transport	transport, freight, sea, container ship | transport, freight, sea, container ship | EN15804GD, S/GLO	EI v3.10	2023
MAINTENANCE			
Neutral cleaner	market for ethoxylated alcohol (AE7) | ethoxylated alcohol (AE7) | EN15804GD, S/RoW fatty acid production, from palm oil | fatty acid | EN15804GD, S/RoW tap market group for tap water | tap water | EN15804GD, S/GLO	EI v3.10	2023
Electricity	market group for electricity, low voltage | electricity, low voltage | EN15804GD, S/GLO	EI v3.10	2023
Water	market group for tap water | tap water | EN15804GD, S/GLO	EI v3.10	2023
WASTE DISPOSAL			
Landfill	treatment of municipal solid waste, sanitary landfill | municipal solid waste | EN15804GD, S/RoW	EI v3.10	2023

Component	Dataset[1]	Data Source	Publication Date
	treatment of waste polyethylene, sanitary landfill | waste polyethylene | EN15804GD, S/RoW	EI v3.10	2023
	treatment of waste wood, untreated, sanitary landfill | waste wood, untreated | EN15804GD, S/RoW	EI v3.10	2023
	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | EN15804GD, S/RoW	EI v3.10	2023
RESOURCES			
Grid electricity[2]	market for electricity, medium voltage | electricity, medium voltage | EN15804GD, S/CN	EI v3.10	2023
Heat – natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | EN15804GD, S/RoW	EI v3.10	2023
Heat – steam	market for heat, from steam, in chemical industry | heat, from steam, in chemical industry | EN15804GD, S/RoW	EI v3.10	2023
Water	market group for tap water | tap water | EN15804GD, S/GLO	EI v3.10	2023

[1]The impact of different materials used as proxies is estimated to be less than +/-10%

[2] The Chinese electricity resource mix consists of approximately 84% coal, 1.4% nuclear, 5.9% natural gas, 0.1% oil and 9% wind and hydropower as represented in the ecoinvent v3.10 database The GWP-GHG (AR6) impact of the Chinese grid electricity is ~0.9504 kg CO2e/kWh.

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 Zhengkang Flooring product systems.*

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 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 China. Surrogate data used in the assessment are representative of global operations. 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 5% 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 v3.10 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 v3.10 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.

The period of review is calendar year 2023.

3.10 ALLOCATION

Resource use at the manufacturing facility (e.g., water and energy) was allocated to the products based on the product area as a fraction of the total facility production volume (i.e., area-based allocation). Area-based allocation was deemed most appropriate for the flooring products as total facility production was available as total square meters of product. Electricity use at the manufacturing facility was modeled using ecoinvent inventory datasets for the country-specific electrical grid. Manufacturing scrap has no economic value and is disposed of via landfilling. No allocation of scrap is necessary.

Impacts from transportation, including product distribution to point of sale, were attributed to the products 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 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 product distribution are summarized in Table 9. Production-weighted average distances by transport mode were used to represent product distribution globally .

Table 9. *Product distribution parameters, per 1 m²*

Parameter	Unit	Value
Truck transport		
Fuel type	-	Diesel
Liters of fuel	L/100km	18.7
Vehicle type	-	Diesel truck
Capacity utilization	%	76
Ocean transport		
Fuel type	-	Fuel oil
Grams of fuel	g/tkm	2.52
Vehicle type	-	Ocean freighter
Capacity utilization	%	70

Product Name	Gross mass transported (kg)	Transport Distance (km)	
		Road	Ship
Stone Polymer Composite	10.51	602	16,010

Installation of the product and periodic cleaning are included in the life cycle Use phase. The manufacturer provided installation and maintenance guidelines detailing the recommended installation methods, as well as maintenance and cleaning guidance. For the current assessment, the impacts associated with the product installation are assumed negligible. 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.

Impacts associated with the disposal of packaging materials are also included in the installation life cycle phase. Assumed recycling rates for packaging component materials are based on the PCR requirements and are summarized in Table 10.

Table 10. *Recycling rates for packaging materials at end-of-life.*

Material	Packaging Recycling Rate (%)
Recycling Rates	
Plastics	40.3%
Paper & Pulp	82.8%
Wood	39.8%
Disposal of Non-recyclables	
Landfill	55%
Incineration	45%

Table 11 summarizes the relevant parameters for the product installation phase including biogenic carbon emissions and removals, and wastes associated with product packaging.

Table 11. *Installation parameters for the flooring products, per 1 m^2.*

Parameter		Stone Polymer Composite
Ancillary materials		0.00
Net freshwater consumption (m^3)		0.00
Electricity consumption (kWh)		0.00
Product loss per functional unit (kg)		0.452
Waste materials generated by product installation (kg)		0.943
Output materials resulting from on-site waste processing (kg)		n/a
Mass of packaging waste (kg)	Plastic	4.18×10^{-3}
	Corrugate	0.343
	Wood	0.127
	Adhesive/Tape	1.78×10^{-2}
Biogenic carbon contained in packaging (kg CO_2)[1]		0.824
Direct emissions (kg)		0.00

[1] Biogenic carbon contained in packaging is calculated assuming the carbon content of corrugate and wood is 50% by weight.

Maintenance stage (B2)

According to the manufacturer, typical maintenance involves regular sweeping and damp mopping, as well as periodic machine cleaning of the vinyl flooring. The present assessment is based on a recommended weekly cleaning schedule including sweeping and mopping with a neutral cleaner and monthly machine cleaning. The parameters used to model the product maintenance are summarized in Table 12.

Table 12. *Maintenance parameters for the flooring products, per 1 m^2.*

Parameter	Unit	Stone Polymer Composite
Maintenance cycle	Cycles / ESL	52
Maintenance cycle	Cycles / RSL	52
Maintenance process	-	Damp mopping
Net freshwater consumption	$m^3/m^2/yr$	0.0058
Cleaning agent	$kg/m^2/yr$	0.119
Maintenance process	-	Vacuuming and Spray Buff
Electricity	$kWh/m^2/yr$	0.022
Finish	$m^3/m^2/yr$	1.2×10^{-4}
Further assumptions	-	Moderate traffic; weekly maintenance

Disposal stage (C1 - C4)

The disposal stage includes removal 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 flooring products, no emissions are generated during demolition (C1) while no waste processing (C3) is required for incineration or landfill disposal.

At end-of-life, the product is assumed to be disposed of in a landfill per PCR requirements. 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. The end-of-life disposal parameters are summarized in Table 13.

Table 13. *End-of-life disposal scenario parameters for the flooring products.*

Parameter		Stone Polymer Composite
Assumptions for scenario development		100% landfill
Collection process	Collected separately (kg)	-
	Collected with mixed construction waste (kg)	10.04
Recovery	na	-
Disposal	Landfill (kg)	10.04
Removals of biogenic carbon, excluding packaging (kg CO_2 eq)		0.0

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 impact indicators specified by the PCR include:

- Potential for Global Warming,
- Acidification Potential,
- Eutrophication Potential,
- Ozone Depletion Potential,
- Photochemical Ozone (smog) Creation Potential.
- Ecotoxicity,
- Human Toxicity, and
- Land Use/Land Occupation

Impact category indicators for acidification, eutrophication, ozone depletion potential and photochemical ozone creation are estimated using the characterization factors[1], as prescribed by the PCR, including from CML-IA and ReCiPe methodologies as well as those defined by EN 15804 reference package based on EF 3.0. Impact indicators for Ecotoxicity and Human Toxicity are estimated using the USEtox 2.02 characterization method, while Land Occupation impacts are estimated using the ReCiPe 2016 version 1.1 methodology. The impact category indicators included in the assessment are summarized below.

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.

Note that the use of the results of modules A1-A3 without considering the results of module C is discouraged.

[1] https://www.environdec.com/resources/indicators

Table 14. *Core Life Cycle Impact Assessment results per 1 m² of the flooring products over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* (***Stone Polymer Composite)***

Impact Category	Units	A1-A3	A4	A5	B2	C2	C4
Core Indicators							
Global Warming Potential - total (GWP-total)	kg CO_2 eq	20.1	2.95	1.75	$6.28x10^{-2}$	0.314	4.30
	%	68%	10%	5.9%	0.21%	1.1%	15%
Global Warming Potential - fossil fuels (GWP-fossil)	kg CO_2 eq	18.8	2.95	1.14	$6.33x10^{-2}$	0.313	0.600
	%	79%	12%	4.8%	0.26%	1.3%	2.5%
Global Warming Potential - biogenic (GWP-biogenic)	kg CO_2 eq	1.27	$-5.09x10^{-4}$	0.609	$-1.34x10^{-3}$	$9.25x10^{-6}$	3.70
	%	23%	-0.0091%	11%	-0.024%	0.00017%	66%
Global Warming Potential - land use and land use change (GWP-luluc)	kg CO_2 eq	$1.57x10^{-2}$	$1.40x10^{-3}$	$7.96x10^{-4}$	$8.43x10^{-4}$	$1.26x10^{-4}$	$1.06x10^{-4}$
	%	83%	7.4%	4.2%	4.4%	0.66%	0.56%
Global warming potential (GWP-GHG)	kg CO_2 eq	20.3	2.95	1.58	$6.42x10^{-2}$	0.314	3.52
	%	71%	10%	5.5%	0.22%	1.1%	12%
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	$5.01x10^{-6}$	$4.30x10^{-8}$	$2.29x10^{-7}$	$1.68x10^{-9}$	$4.66x10^{-9}$	$3.20x10^{-9}$
	%	95%	0.81%	4.3%	0.032%	0.088%	0.06%
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	$8.22x10^{-2}$	$5.58x10^{-2}$	$6.97x10^{-3}$	$2.91x10^{-4}$	$1.31x10^{-3}$	$1.30x10^{-3}$
	%	56%	38%	4.7%	0.2%	0.89%	0.88%
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	$5.09x10^{-3}$	$1.51x10^{-4}$	$2.76x10^{-4}$	$1.92x10^{-5}$	$2.46x10^{-5}$	$4.12x10^{-4}$
	%	85%	2.5%	4.6%	0.32%	0.41%	6.9%
Eutrophication potential - marine (EP-marine)	kg N eq.	$2.10x10^{-2}$	$1.45x10^{-2}$	$2.70x10^{-3}$	$6.26x10^{-5}$	$4.77x10^{-4}$	$9.64x10^{-3}$
	%	43%	30%	5.6%	0.13%	0.99%	20%
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	0.183	0.160	$1.88x10^{-2}$	$5.90x10^{-4}$	$5.20x10^{-3}$	$4.38x10^{-3}$
	%	49%	43%	5.1%	0.16%	1.4%	1.2%
Photochemical Ozone Creation Potential (POCP)	kg NMVOC eq.	$7.56x10^{-2}$	$4.50x10^{-2}$	$6.85x10^{-3}$	$2.88x10^{-4}$	$1.81x10^{-3}$	$2.43x10^{-3}$
	%	57%	34%	5.2%	0.22%	1.4%	1.8%
Depletion of abiotic resources - minerals and metals (kg Sb eq)[1]	kg Sb eq	$1.69x10^{-4}$	$5.75x10^{-6}$	$8.02x10^{-6}$	$4.70x10^{-7}$	$1.04x10^{-6}$	$3.20x10^{-7}$
	%	92%	3.1%	4.3%	0.25%	0.56%	0.17%
Depletion of abiotic resources - fossil fuels (MJ)[1]	MJ	334	38.4	18.6	1.15	4.43	2.90
	%	84%	9.6%	4.7%	0.29%	1.1%	0.73%
Water use (m^3 depriv.)[1]	m^3 depriv	4.64	0.135	0.223	$2.45x10^{-2}$	$1.99x10^{-2}$	$2.40x10^{-2}$
	%	92%	2.7%	4.4%	0.48%	0.39%	0.47%

1) The results of this environmental impact indicator shall be used with case as uncertainties on these results are high or as there is limited experience with the indicator.

Table 15. *Additional Life Cycle Impact Assessment results per 1 m² of the flooring products over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* (***Stone Polymer Composite)***

Impact Category	Units	A1-A3	A4	A5	B2	C2	C4
Additional Indicators							
Potential incidence of disease due to PM emissions (PM)	Disease Incidence	9.54×10^{-7}	1.51×10^{-7}	6.68×10^{-8}	3.10×10^{-9}	2.56×10^{-8}	2.08×10^{-8}
	%	78%	12%	5.5%	0.25%	2.1%	1.7%
Potential Human exposure efficiency relative to U235 (IRP)[2]	kBq U235 eq.	0.997	2.38×10^{-2}	4.71×10^{-2}	4.52×10^{-3}	3.63×10^{-3}	5.46×10^{-3}
	%	92%	2.2%	4.4%	0.42%	0.34%	0.5%
Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe	211	8.20	18.4	0.366	1.17	445
	%	31%	1.2%	2.7%	0.053%	0.17%	65%
Potential Comparative Toxic Unit for humans - cancer effects (HTP-c)[1]	CTUh	8.06×10^{-8}	1.36×10^{-8}	4.56×10^{-9}	2.38×10^{-10}	1.63×10^{-9}	8.63×10^{-10}
	%	79%	13%	4.5%	0.23%	1.6%	0.85%
Potential Comparative Toxic Unit for humans - non-cancer effects (HTP-nc)[1]	CTUh	4.26×10^{-7}	1.65×10^{-8}	2.31×10^{-8}	7.09×10^{-10}	2.84×10^{-9}	2.77×10^{-8}
	%	86%	3.3%	4.7%	0.14%	0.57%	5.6%
Potential Soil quality index (SQP)[1]	Dimensionless	114	12.0	6.33	0.253	2.64	5.92
	%	81%	8.5%	4.5%	0.18%	1.9%	4.2%

1) The results of this environmental impact indicator shall be used with case as uncertainties on these results are high or as there is limited experience with the indicator.

2) This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Table 16. *Resource use per 1 m² of the flooring products over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* ***(Stone Polymer Composite)***

Parameter	Units	A1-A3	A4	A5	B2	C2	C4
Resources							
Use of renewable primary energy resources used as energy carrier (PERE)	MJ	16.6	0.384	0.780	0.102	5.81×10^{-2}	7.11×10^{-2}
	%	92%	2.1%	4.3%	0.57%	0.32%	0.39%
Use of renewable primary energy resources used as raw materials (PERM)	MJ	7.88	0.00	0.355	0.00	0.00	0.00
	%	96%	0%	4.3%	0%	0%	0%
Total use of renewable primary energy resources (PERT)	MJ	24.5	0.384	1.13	0.102	5.81×10^{-2}	7.10×10^{-2}
	%	93%	1.5%	4.3%	0.39%	0.22%	0.27%
Use of non renewable primary energy resources used as energy carrier (PENRE)	MJ	279	38.1	18.4	1.14	4.40	2.88
	%	81%	11%	5.3%	0.33%	1.3%	0.84%
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ	50.7	0.00	2.16×10^{-3}	0.00	0.00	0.00
	%	100%	0%	0.0043%	0%	0%	0%
Total use of non renewable primary energy resources (PENRT)	MJ	334	38.4	18.6	1.15	4.43	2.90
	%	84%	9.6%	4.7%	0.29%	1.1%	0.73%
Use of secondary materials (SM)	kg	0.660	2.67×10^{-2}	3.14×10^{-2}	3.83×10^{-4}	3.29×10^{-3}	0.00
	%	91%	3.7%	4.4%	0.053%	0.46%	0%
Use of renewable secondary fuels (RSF)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of non renewable secondary fuels (NRSF)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of net fresh water (FW)	m^3	0.105	3.69×10^{-3}	2.56×10^{-3}	6.48×10^{-3}	5.85×10^{-4}	-3.75×10^{-2}
	%	130%	4.6%	3.2%	8.1%	0.73%	-47%

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Table 17. *Waste and outflows per 1 m² of the flooring products over a 1-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.* (***Stone Polymer Composite)***

Parameter	Units	A1-A3	A4	A5	B2	C2	C4
Wastes							
Hazardous waste disposed (HWD)	kg	5.47×10^{-3}	2.28×10^{-4}	2.69×10^{-4}	1.32×10^{-5}	3.06×10^{-5}	1.90×10^{-5}
	%	91%	3.8%	4.5%	0.22%	0.51%	0.32%
Non hazardous waste disposed (NHWD)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Radioactive waste disposed (RWD)	kg	2.50×10^{-4}	5.81×10^{-6}	1.18×10^{-5}	1.11×10^{-6}	8.89×10^{-7}	1.33×10^{-6}
	%	92%	2.1%	4.3%	0.41%	0.33%	0.49%
Components for re-use (CRU)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Materials for recycling (MFR)	kg	0.00	0.00	0.234	0.00	0.00	0.00
	%	0%	0%	100%	0%	0%	0%
Materials for energy recovery (MER)	kg	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Exported electrical energy (EEE)	MJ	0.105	2.19×10^{-3}	4.86×10^{-3}	6.90×10^{-5}	3.15×10^{-4}	0.00
	%	93%	2%	4.3%	0.062%	0.28%	0%
Exported thermal energy (EET)	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%

6. LCA: Interpretation

Results were summarized by life cycle phase for a cradle-to-grave assessment of the Zhengkang Flooring product system. With few exceptions, the potential impacts over a single product life cycle are dominated by the raw material extraction and processing (A1), the product manufacturing (A3) and product distribution (A4) stages. Construction and installation stage is generally the next highest contributor to the cradle-to-grave impacts over a single product life cycle.

7. Additional Environmental Information

7.1 ENVIRONMENT AND HEALTH DURING MANUFACTURING

The Zhengkang Flooring manufacturing facility is certified to ISO 9001 and ISO 14001 – Environmental management systems.

7.2 ENVIRONMENT AND HEALTH DURING INSTALLATION

The Zhengkang Flooring products meet the requirements of the following:

- SCS EC 10.3 – 2014 Indoor Air Quality Performance Standard
- CDPH/EHLB Standard Method v1.2-2017 (California Section 01350)

7.3 ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

For more information on Zhengkang Flooring's certifications and environmental initiatives please view the website at www.cnkingfisher.com.

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