TEKNOFLOR®

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

Teknoflor
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Product

Teknoflor™ Medscapes HPD™ v2 Sheet Vinyl Flooring

(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-08971
EPD Valid May 10, 2023 through May 9, 2028

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. UL Environment. May 2018.

Program Operator

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SCSglobal SERVICES

Declaration Owner:	Teknoflor
Address:	1005 South 60th Street, Milwaukee, WI 53214, USA
Declaration Number:	SCS-EPD-08971
Declaration Validity Period:	EPD Valid May 10, 2023 through May 9, 2028
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:	Various
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. UL Environment. May 2018.
Part B PCR Review conducted by:	Jack Geibig (chair), Ecoform; Thomas Gloria, Industrial Ecology Consultants; Thaddeus Owen
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	1. Teknoflor ..... 2 2. Product ..... 2 3. LCA: Calculation Rules ..... 5 4. LCA: Scenarios and Additional Technical Information ..... 10 5. LCA: Results ..... 13 6. LCA: Interpretation ..... 15 7. Additional Environmental Information ..... 16 8. References 17

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. Teknoflor

Teknoflor is a major manufacturer and distributor of high-performance flooring products with a strong focus on Healthcare, Senior Care, Government, Corporate, Hospitality, Retail and Education environments. Teknoflor supplies floors that provide durability and state-of-the-art technology with a strong emphasis on no-wax, no-buff commercial resilient flooring including heterogeneous and homogeneous sheet vinyl, luxury vinyl tile (LVT), and non-vinyl flooring.

2. Product

2.1 PRODUCT DESCRIPTION

Product Line	Description	Manufacturing Location
Teknoflor™ Medscapes HPD™ v2	Teknoflor™ Medscapes HPD™ v2 homogeneous sheet vinyl brings a new sense of beauty and performance and a true through-pattern construction to the Teknoflor™ brand of commercial sheet flooring. Carrying the brand's trademark, no wax, no buff features, Medscapes HPD™ v2 is made of 100% virgin vinyl, is phthalate-free and stands tough against stains, scratches and chemicals. This second version of Teknoflor™ Medscapes HPD™ brings a cleaner, less dramatic chip design and more durable construction. Whether you're focused on infection control or color control – this vibrant, tough line is sure to suit your needs.	United Kingdom

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 sheet vinyl flooring products provide the primary function of flooring for various residential and commercial interior 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 manufacturing, 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 manufacturing facilities	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 sheet vinyl flooring products are summarized in Table 2.

Table 2. *Product specifications for Teknoflor™ Medscapes HPD™ v2.*

Characteristic			Description			
Sustainable certifications			ISO 9001; ISO 14001; Declare™; HPD; FloorScore®; JUST℠; REACH SVHC			
VOC emissions test method			CDPH/EHLB Standard Method v1.2-2017			
Characteristic			**Nominal Value**	**Unit**	**Minimum Value**	**Maximum Value**
Product thickness			2.00 (0.079)	mm (in)	1.90 (0.075)	2.15 (0.085)
Wear layer thickness (where applicable)			2.00 (0.079)	mm (in)	1.90 (0.075)	2.15 (0.085
Product weight			3250 (10.65)	g/m^2 (oz/ft^2)	2925 (9.59)	3673 (12.04)
Product Form	Rolls	Width	2000 (78.7)	mm (in)	2000 (78.7)	2010 (79.1)
Product Form		Length	20.0 (65.6)	m (ft)	20.0 (65.6)	20.6 (67.6)

2.6 MARKET PLACEMENT/APPLICATION RULES

Technical specifications of the flooring products are summarized above. Detailed product performance results can be found on the manufacturer's website www.teknoflor.com.

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The sheet vinyl flooring products are delivered for installation in the form of rolls.

2.8 MATERIAL COMPOSITION

The sheet vinyl flooring is made primarily from polyvinyl chloride (PVC), calcium carbonate (mineral reinforcement), plasticizers, stabilizers and certain other substances. The homogeneous sheet vinyl products are structured with a single through-pattern PVC wear layer and a protective surface coating.

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

Product	PVC	$CaCO_3$	Plasticizer	Stabilizer	Other	Total Product
Teknoflor™ Medscapes HPD™ v2	1.07 (33%)	0.887 (27%)	0.361 (11%)	$1.95x10^{-2}$ (0.6%)	0.918 (28%)*	3.25 (100%)

** Includes regrind material*

No substances required to be reported as hazardous are associated with the production of these products.

2.9 MANUFACTURING

The products are manufactured at a production facility in the United Kingdom. The manufacturer provided primary data for its annual production, resource use, 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 homogeneous sheet vinyl flooring involves the following general manufacturing process:

- The raw materials are blended per the specified recipe. The mixture is heated, calendared, and then crushed into a chip intermediate.
- The chip intermediate is blended and scattered in line, and then formed into a sheet through a figuration process.
- The sheet is then UV-coated and annealed in line before being cut, rolled, and packed into the final sheet product.
- Quality checks are made at each step of the production process.

2.10 PACKAGING

The products are packaged for shipment using paper and corrugated board.

Table 4. *Material content for the flooring product packaging in kg per square meter of flooring.*

Product	Corrugated	Paper	Total Packaging
Teknoflor™ Medscapes HPD™ v2	$3.00x10^{-2}$ (51%)	$2.94x10^{-2}$ (49%)	$5.94x10^{-2}$ (100%)

2.11 PRODUCT INSTALLATION

Installation of the products 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 products can be found on the manufacturer's website www.teknoflor.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 5.

Table 5. *Reference flow and RSL for the sheet vinyl flooring products.*

Product	Reference flow (kg/m^2)	Reference Service Life – RSL (years)	Replacement Cycle (ESL/RSL-1)
Teknoflor™ Medscapes HPD™ v2	3.25	12	6.3

3.2 SYSTEM BOUNDARY

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacturing, product delivery, installation and use, and product disposal. The life cycle phases included in the EPD scope are described in Table 6 and illustrated in Figure 1.

Table 6. *The modules and unit processes included in the scope for the 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 manufacturing facilities)	Transport of component materials to the manufacturing facilities
A3	Manufacturing, including ancillary material production	Manufacturing of flooring products and packaging (incl. upstream unit processes)
A4	Transport (to the building sites)	Transport of products (including packaging) to the building sites
A5	Construction-installation process	The products are 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 products
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 products 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 products
B7	Operational water use by technical building systems	There is no operational water use associated with the use of the products
C1	Deconstruction, demolition	Demolition of the products is accomplished using hand tools with no associated emissions and negligible impacts
C2	Transport (to waste processing)	Transport of flooring products to waste treatment at end-of-life
C3	Waste processing for reuse, recovery and/or recycling	The products are disposed of by landfilling which require no waste processing
C4	Disposal	Disposal of flooring products in municipal landfill
D	Reuse-recovery-recycling potential	Module Not Declared

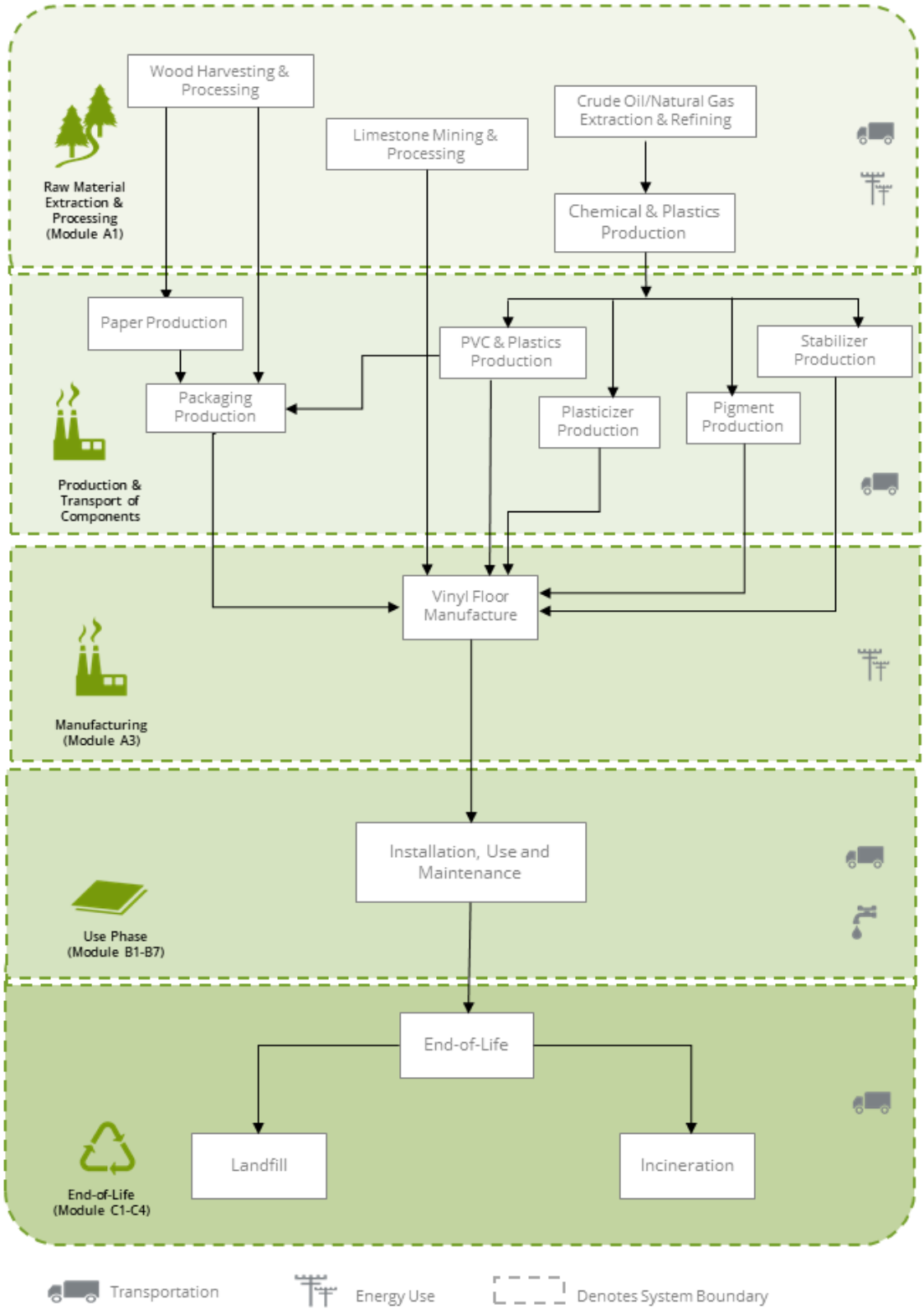

Figure 1. *Flow diagram for the life cycle of the sheet vinyl flooring products.*

3.3 PRODUCT SPECIFIC CALCULATION FOR USE PHASE

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

3.4 UNITS

All data and results are presented using SI units.

3.5 ESTIMATES AND ASSUMPTIONS

- Electricity use at the manufacturing facility was allocated to the products based on the product area as a fraction of the total production.
- The manufacturing facility under review is located in the United Kingdom. Ecoinvent inventory datasets for the appropriate regional energy grids were used to model resource use and emissions from electricity use at the manufacturing facility.
- Life cycle inventory data for the plasticizer, dioctyl terephthalate (DOTP), were not available. 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 manufacturer assuming its products are installed and maintained as recommended and used for the specific application noted.
- Downstream transport was modeled based on information provided by the manufacturer representing transport for product distribution to North America.
- 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 products and product packaging is modeled based on the PCR guidance regarding recycling rates of products and packaging materials.
- For final disposal of the packaging materials 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.

3.7 DATA SOURCES

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

Table 7. *Data sources for the sheet vinyl 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
Titanium dioxide	market for titanium dioxide | titanium dioxide | Cutoff, S/RoW	EI v3.8	2021
Other			
Organic chemicals	market for chemical, organic | chemical, organic | Cutoff, S/GLO	EI v3.8	2021
Glass fibre	glass fibre production | glass fibre | Cutoff, S/RoW	EI v3.8	2021
Urethane acrylate	market for polyurethane, flexible foam | polyurethane, flexible foam | Cutoff, S/RoW	EI v3.8	2021
Methyl acrylate	methyl acrylate production | methyl acrylate | Cutoff, S/GLO		
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 - UK	market for electricity, medium voltage | electricity, medium voltage | Cutoff, S/GB	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
Heat – fuel oil	heat production, light fuel oil, at industrial furnace 1MW | heat, district or industrial, other than natural gas | Cutoff, S/RoW	EI v3.8	2021
Heat – diesel	diesel, burned in building machine | diesel, burned in building machine | Cutoff, S/GLO	EI v3.8	2021
Heat – steam	market for heat, from steam, in chemical industry | heat, from steam, in chemical industry | 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 8. *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 manufacturing 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 facilities 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 products 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 9.

Table 9. *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)			Mass
	Truck	Rail	Ship	(kg)
Teknoflor™ Medscapes HPD™ v2	1,618	80	6,438	3.32

Installation of the products 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 10. *Installation parameters for the sheet vinyl 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)
	Paper/Corrugate	
Teknoflor™ Medscapes HPD™ v2	$5.94x10^{-2}$	0.105

Use stage (B1)

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

Maintenance stage (B2)

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

Table 11. *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
Maintenance process	-	Spray buffing
Electricity	$kWh/m^2/yr$	0.022
Further assumptions	-	Moderate traffic

Repair/Refurbishment stage (B3; B5)

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

Replacement stage (B4)

The materials and energy required for replacement of the products 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 products.

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 products degrade in a landfill (*C4*). For the sheet vinyl 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 product packaging are summarized in Table 12.

Table 12. *Recycling rates for packaging materials at end-of-life.*

Material	Recycling rate (%)
Packaging	
Paper & Pulp	78%
Wood	26%
Plastics	15%
Disposal of Non-recyclables	
Landfill	80%
Incineration	20%

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

Parameter	Medscapes HPD™ v2
Assumptions for scenario development	100% landfill
Collection process	
Collected with mixed construction waste (kg)	3.32
Recovery	n/a
Landfill disposal (kg)	3.32
Removals of biogenic carbon (kg CO_2 eq)	n/a

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All LCA results are stated to three significant figures in agreement with the PCR for flooring products 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 sheet vinyl 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 14. *Life Cycle Impact Assessment (LCIA) results for the* ***Teknoflor™ Medscapes HPD™ v2*** *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)	4.20	0.339	0.837	1.13	$2.37x10^{-2}$	9.21	43.0	0.133	1.44
	7%	0.56%	1.4%	1.9%	0.039%	15%	71%	0.22%	2.4%
AP (kg SO_2 eq)	$1.63x10^{-2}$	$1.44x10^{-3}$	$1.59x10^{-3}$	$8.92x10^{-3}$	$1.74x10^{-5}$	$4.33x10^{-2}$	0.155	$6.18x10^{-4}$	$3.81x10^{-4}$
	7.2%	0.63%	0.7%	3.9%	0.0076%	19%	68%	0.27%	0.17%
EP (kg $(PO_4)^{3-}$ eq)	$1.02x10^{-2}$	$3.16x10^{-4}$	$6.60x10^{-4}$	$1.44x10^{-3}$	$6.66x10^{-5}$	$1.61x10^{-2}$	0.114	$1.32x10^{-4}$	$8.75x10^{-3}$
	6.7%	0.21%	0.43%	0.95%	0.044%	11%	75%	0.087%	5.8%
POCP (kg C_2H_4 eq)	$1.08x10^{-3}$	$4.79x10^{-5}$	$1.02x10^{-4}$	$2.60x10^{-4}$	$4.05x10^{-6}$	$2.80x10^{-3}$	$9.65x10^{-3}$	$2.04x10^{-5}$	$3.08x10^{-4}$
	7.6%	0.34%	0.71%	1.8%	0.028%	20%	68%	0.14%	2.2%
ODP (kg CFC-11 eq)	$1.35x10^{-6}$	$5.88x10^{-8}$	$1.85x10^{-7}$	$1.93x10^{-7}$	$5.62x10^{-10}$	$4.41x10^{-7}$	$9.63x10^{-6}$	$2.29x10^{-8}$	$8.77x10^{-9}$
	11%	0.49%	1.6%	1.6%	0.0047%	3.7%	81%	0.19%	0.074%
ADPE (kg Sb eq)	$4.88x10^{-5}$	$1.16x10^{-6}$	$1.28x10^{-6}$	$3.51x10^{-6}$	$4.03x10^{-9}$	$1.84x10^{-4}$	$2.92x10^{-4}$	$1.17x10^{-7}$	$1.90x10^{-7}$
	9.2%	0.22%	0.24%	0.66%	0.00076%	35%	55%	0.022%	0.036%
ADPF (MJ eq)	89.3	5.01	12.3	16.3	$4.64x10^{-2}$	197	666	1.82	0.953
	9%	0.51%	1.2%	1.6%	0.0047%	20%	67%	0.18%	0.096%
TRACI 2.1									
GWP (kg CO_2 eq)	4.15	0.338	0.826	1.13	$2.04x10^{-2}$	9.12	41.2	0.133	1.17
	7.1%	0.58%	1.4%	1.9%	0.035%	16%	71%	0.23%	2%
AP (kg SO_2 eq)	$1.66x10^{-2}$	$1.67x10^{-3}$	$1.76x10^{-3}$	$9.87x10^{-3}$	$2.18x10^{-5}$	$4.43x10^{-2}$	0.166	$7.64x10^{-4}$	$6.33x10^{-4}$
	6.9%	0.69%	0.73%	4.1%	0.009%	18%	69%	0.32%	0.26%
EP (kg N eq)	$2.19x10^{-2}$	$3.72x10^{-4}$	$1.24x10^{-3}$	$1.32x10^{-3}$	$1.73x10^{-4}$	$3.18x10^{-2}$	0.258	$9.72x10^{-5}$	$2.36x10^{-2}$
	6.5%	0.11%	0.36%	0.39%	0.051%	9.4%	76%	0.029%	7%
SFP (kg O_3 eq)	0.208	$3.92x10^{-2}$	$3.35x10^{-2}$	0.207	$5.63x10^{-4}$	0.510	2.74	$2.16x10^{-2}$	$7.90x10^{-3}$
	5.5%	1%	0.89%	5.5%	0.015%	14%	73%	0.57%	0.21%
ODP (kg CFC-11 eq)	$1.41x10^{-6}$	$7.83x10^{-8}$	$2.44x10^{-7}$	$2.57x10^{-7}$	$7.48x10^{-10}$	$5.45x10^{-7}$	$1.08x10^{-5}$	$3.06x10^{-8}$	$1.17x10^{-8}$
	11%	0.59%	1.8%	1.9%	0.0056%	4.1%	81%	0.23%	0.088%
FFD (MJ eq)	12.1	0.716	1.90	2.34	$6.84x10^{-3}$	26.2	92.7	0.274	0.123
	8.9%	0.52%	1.4%	1.7%	0.005%	19%	68%	0.2%	0.09%

Table 15. *Resource use and waste flows for the **Teknoflor™ Medscapes HPD™ v2** 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)	5.69	$5.80x10^{-2}$	2.43	0.181	$4.37x10^{-4}$	20.6	44.5	$7.08x10^{-3}$	$3.81x10^{-2}$
	7.7%	0.079%	3.3%	0.25%	0.00059%	28%	61%	0.0096%	0.052%
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)	0.836	0.00	0.00	0.00	0.00	0.00	4.39	0.00	0.00
	16%	0%	0%	0%	0%	0%	84%	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)	0.280	$3.47x10^{-3}$	$2.85x10^{-2}$	$1.06x10^{-2}$	$3.41x10^{-5}$	1.16	1.72	$5.74x10^{-4}$	$2.01x10^{-3}$
	8.7%	0.11%	0.89%	0.33%	0.0011%	36%	54%	0.018%	0.062%
Wastes									
HWD (kg)	$2.24x10^{-4}$	$1.33x10^{-5}$	$1.45x10^{-5}$	$3.93x10^{-5}$	$1.21x10^{-7}$	$1.12x10^{-4}$	$1.58x10^{-3}$	$4.94x10^{-6}$	$2.88x10^{-6}$
	11%	0.67%	0.73%	2%	0.0061%	5.6%	79%	0.25%	0.14%
NHWD (kg)	0.461	0.254	$8.33x10^{-2}$	0.707	$1.88x10^{-2}$	0.824	25.4	$9.25x10^{-3}$	3.26
	1.5%	0.82%	0.27%	2.3%	0.06%	2.7%	82%	0.03%	11%
HLRW (kg)	$1.40x10^{-5}$	$2.55x10^{-7}$	$5.35x10^{-6}$	$7.80x10^{-7}$	$2.06x10^{-9}$	$3.63x10^{-5}$	$1.09x10^{-4}$	$2.87x10^{-8}$	$2.00x10^{-7}$
	8.4%	0.15%	3.2%	0.47%	0.0012%	22%	66%	0.017%	0.12%
ILLRW (kg)	$1.01x10^{-4}$	$3.29x10^{-5}$	$3.68x10^{-5}$	$1.08x10^{-4}$	$3.13x10^{-7}$	$2.12x10^{-4}$	$1.58x10^{-3}$	$1.28x10^{-5}$	$5.20x10^{-6}$
	4.9%	1.6%	1.8%	5.2%	0.015%	10%	76%	0.62%	0.25%
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	$4.82x10^{-2}$	0.00	0.253	0.00	0.00
	0%	0%	0%	0%	16%	0%	84%	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.

7. Additional Environmental Information

The Teknoflor™ Medscapes HPD v2 flooring is certified to various environmental standards, as summarized below (certified standards vary with product).

ISO 9001 establishes the criteria for a quality management system. The standard is based on several quality management principles, including a strong customer focus, the motivation and implication of top management, the process approach, and continual improvement. For more information, visit: https://www.iso.org/iso-9001-quality-management.html

ISO 14001 establishes the criteria for an environmental management system. Designed for any type of organization, regardless of its activity or sector, it can provide assurance to company management and employees as well as external stakeholders that environmental impact is being measured and improved. For more information, visit: https://www.iso.org/iso-14001-environmental-management.html

JUST℠ is a voluntary disclosure program that allows companies and organizations to (further) develop and optimize the policies and practices they have in-place related to social justice and equity. Just scores companies and organizations across twenty-two metrics that fall within six categories: diversity & inclusion, equity, employee health, employee benefits, stewardship, purchasing & supply chain. For more information, visit: https://living-future.org/just/

Declare™ labels are commonly referred to as nutrition labels for building products. Declare labels allow manufacturers to answer three questions: 1) Where are the products made? 2) What chemicals/substances make-up the products? 3) What end-of-life options are available for the products? Chemicals/substances are screened against the International Living Future Institute's Red List. For more information, visit: https://living-future.org/declare/declare-about/

The Health Product Declaration (HPD) Open Standard provides manufacturers with a standardized way of reporting material contents of building products. The contents of such products are scored per GreenScreen for Safer Chemicals and screened against over 70 priority hazard lists, including California Proposition 65 and REACH SVHC. For more information, visit: https://www.hpd-collaborative.org/hpd-open-standard/

FloorScore® is the most recognized indoor air quality (IAQ) certification standard for hard surface flooring materials, adhesives, and underlayments. Administered by SCS Global Services, FloorScore ensures that such products meet strict requirements for VOC emissions and are made at factories that have implemented quality management procedures. For more information, visit: https://www.scsglobalservices.com/services/floorscore

The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (EC 1907/2006) aims to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. REACH also aims to enhance innovation and competitiveness of the EU chemicals industry. For more information, visit: https://ec.europa.eu/environment/chemicals/reach/reach_en.htm

8. References

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