six degrees
FLOORING SURFACES™

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

Six Degrees Flooring Surfaces
931 S. Springville Avenue
Fostoria, Ohio 44830
www.sixdegreesflooring.com | (844) 432-5885

Products

- Compass, Radius, DeGradus, Quick Ship (Dryback)
- Six Degrees Custom (Loose Lay)
- Six Degrees Custom (Locking Tile)

Functional Unit

The functional unit is one square meter of floor covering provided and maintained for a period of 60 years.

EPD Number and Period of Validity

SCS-EPD-05558
EPD Valid June 4, 2019 through June 3, 2024

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.

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
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SCSglobal SERVICES

Declaration Owner:	Six Degrees Flooring Surfaces
Address:	931 S. Springville Avenue, Fostoria, Ohio 44830
Declaration Validity Period:	Approved Date: June 4, 2019 – End Date: June 3, 2024
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Jeremie Hakian, SCS Global Services
LCA Software:	openLCA v1.7.4
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☑ internal ☐ external
LCA Reviewer:	Dr. Gerard Mansell, SCS Global Services
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.
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:	Tom Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	

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

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

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

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

ABOUT SIX DEGREES FLOORING SURFACES

Welcome to the exciting world of Six Degrees Flooring Surfaces. When you select a floor from Six Degrees, you can rest assured you have selected one made from the highest quality raw materials in a state of the art, family-owned factory, right here in the USA. Our products are both durable and beautiful, and we take great pride in providing our customers with the best possible service and care. Innovative production technology, superior wear and scratch resistance, and our commitment to both you, our customer, and the environment are what set us apart from the rest.

At Six Degrees, we are dedicated to the environment and work tirelessly to provide luxury vinyl tile products that are not only beautiful, but durable as well. We are proud to be a strong environmental steward and continue to work to improve upon our sourcing and production practices, offering additional satisfaction that you have selected a floor with the environment in mind.

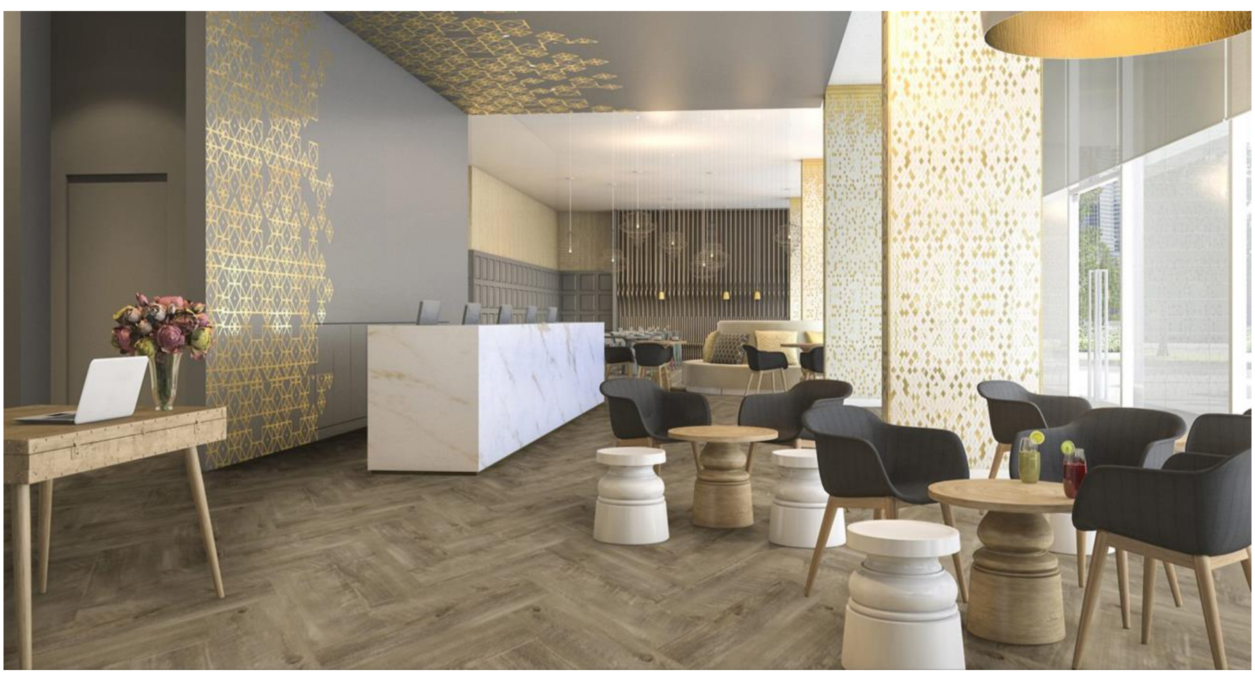
American made. American served. You’re just a few steps away from the high quality and high style of Six Degrees Flooring.

PRODUCT DESCRIPTION

Luxury vinyl flooring in this EPD are manufactured in an ISO 9001 facility in Fostoria, Ohio. A product lifetime of 30 years is asserted by the manufacturer, which is used as the reference service life in this EPD. The representative nominal thickness of 2.8 mm for Dryback is based on a weighted average, but is available in 2.0 mm, 2.5 mm, and 3 mm thicknesses. Similarly, the representative nominal thickness for Locking Tile is 4 mm, but is also available in 5 mm. Finally, the representative nominal thickness for Looselay is 5mm, but is also available in 4 mm. The Dryback product line in this EPD is sold under the brand names, *Compass*, *Radius*, *DeGradus*, and *Quick Ship*, and is referenced as *Dryback* throughout the EPD. Similarly, the Looselay product line is sold under the brand name, *Six Degrees Custom*¸ and is referenced as *Looselay* throughout the EPD. Lastly, the Locking Tile product line is sold under the brand name, *Six Degrees Custom*, and is referenced as *Locking Tile*.

PRODUCT APPLICATION

Luxury vinyl flooring in this EPD are used in various commercial and residential applications.



PRODUCT PERFORMANCE

Table 1. *Product performance test results for the luxury vinyl products in this EPD.*

Test Item	Test Method	Results
Overall thickness	ASTM F386	Nominal ± 0.005in (± 0.127mm)
Wear-layer thickness	ASTM F410	0.020 in (0.5mm) minimum For Commercial use
Dimension	ASTM F2055	± 0.016 in. per linear foot (± 0.406mm per linear meter)
Squareness	ASTM F2055	Maximum 0.010 in. (0.25mm)
Residual indentation	ASTM F1914	Average less than 8%
Flexibility	ASTM F137	1-in (25.4mm) mandrel No crack, No damage
Dimensional stability	ASTM F2199	0.020 in /ln-ft maximum
Curling after exposure to heat	EN ISO 23999	± 2mm* (+0.5mm / - 1mm)
Chemical resistance	ASTM F925	No more than a slight change in surface dulling, surface attack, or staining
Resistance to light	ASTM F1515	$\Delta E < 8$ ave MAX
Resistance to heat	ASTM F1514	$\Delta E < 8$ ave MAX
Fire resistance	ASTM E648	Class 1 (0.45 w/Cm^2 or more)
Smoke density	ASTM E662	450 or less
Static load limit	ASTM F970	0.005 in or less (0.127mm or less)
Indoor air quality	CDPH v1.1 (2017)	Low VOC, Floorscore® Certified

*+/- 1 mm for Locking Tile

MATERIAL CONTENT

The material content of each product, including the material origin and its availability, is provided below. The percent of each material component is presented as a range, which varies depending on its thickness. The range shown is therefore representative of the product line, which is available in several thicknesses. The results in this EPD are based on a representative thickness, described in the product description and product characteristics sections, and is therefore based on a specific material content corresponding to that thickness.

Table 2. *Origin and availability of material content for Dryback.*

Component	Materials	Percent of Total (%)	Availability			Origin of Raw Materials
			Renewable	Non-renewable	Recycled (% pre-/post-consumer)	
Filler	Calcium carbonate, magnesium carbonate, silicon dioxide	50-55%	-	Mineral, abundant	0%/0%	Global
Binder	Polyvinyl chloride	30-35%	-	Fossil, limited	0%/0%	Global
Plasticizer	1,4-Benzenedicarboxylic acid, Bis(2-ethylhexyl) ester	10-12%	-	Fossil, limited	0%/0%	Global
Stabilizer	Confidential	2.0-3.0%	-	Fossil, limited	0%/0%	Global
Print Layer Film	Polyvinyl chloride, ink	0.50-1.5%	-	Fossil, limited; Mineral, abundant	0%/0%	Global
UV Coating & Additive	Confidential	0.50-1.5%		Fossil, limited	0%/0%	Global
Pigment	Carbon black, polyvinyl chloride, bis(2-ethylhexyl) ester, calcium carbonate	0.10-0.30%		Fossil, limited; Mineral, abundant	0%/0%	Global
TOTAL	-	**100%**	-	-	**0%/0%**	-

Table 3. *Origin and availability of material content for Loose Lay.*

Component	Materials	Percent of Total (%)	Availability			Origin of Raw Materials
			Renewable	Non-renewable	Recycled (% pre-/post-consumer)	
Filler	Calcium carbonate, magnesium carbonate, silicon dioxide	40-45%	-	Mineral, abundant	0%/0%	Global
Binder	Polyvinyl chloride	32-37%	-	Fossil, limited	0%/0%	Global
Plasticizer	1,4-Benzenedicarboxylic acid, Bis(2-ethylhexyl) ester	15-18%	-	Fossil, limited	0%/0%	Global
Fiberglass	Fiberglass, continuous filament; pulp, cellulose	2.0-4.0%	Biogenic	Mineral, abundant	0%/0%	Global
Stabilizer	Confidential	2.0-4.0%	-	Fossil, limited	0%/0%	Global
Print Layer Film	Polyvinyl chloride, ink	0.50-1.5%	-	Fossil, limited; Mineral, abundant	0%/0%	Global
UV Coating & Additive	Confidential	0.50-1.5%	-	Fossil, limited	0%/0%	Global
Pigment	Carbon black, polyvinyl chloride, bis(2-ethylhexyl) ester, calcium carbonate	0.10-0.30%		Fossil, limited; Mineral, abundant	0%/0%	Global
TOTAL	-	**100%**	-	-	**0%/0%**	-

Table 4. *Origin and availability of material content for Locking Tile.*

Component	Materials	Percent of Total (%)	Availability			Origin of Raw Materials
			Renewable	Non-renewable	Recycled (% pre-/post-consumer)	
Filler	Calcium carbonate, magnesium carbonate, silicon dioxide	55-60%	-	Mineral, abundant	0%/0%	Global
Binder	Polyvinyl chloride	24-28%	-	Fossil, limited	0%/0%	Global
Plasticizer	1,4-Benzenedicarboxylic acid, Bis(2-ethylhexyl) ester	8.0-12%	-	Fossil, limited	0%/0%	Global
Fiberglass	Fiberglass, continuous filament; pulp, cellulose	2.0-4.0%	Biogenic	Mineral, abundant	0%/0%	Global
Stabilizer	Confidential	2.0-4.0%	-	Fossil, limited	0%/0%	Global
Print Layer Film	Polyvinyl chloride, ink	0.50-1.5%	-	Fossil, limited; Mineral, abundant	0%/0%	Global
UV Coating & Additive	Confidential	0.50-1.5%	-	Fossil, limited	0%/0%	Global
Pigment	Carbon black, polyvinyl chloride, bis(2-ethylhexyl) ester, calcium carbonate	0.10-0.30%		Fossil, limited; Mineral, abundant	0%/0%	Global
TOTAL	-	**100%**	**-**	**-**	**0%/0%**	**-**

In conformance with the PCR, product materials were reviewed for the presence of any hazardous chemicals. A review of Material Data Safety Sheets (MSDS) provided by the manufacturer reveals the presence of the following regulated chemicals in one or more of the products (this does not indicate that the threshold for reportable quantities is exceeded):

- Calcium carbonate (CAS# 471-34-1)
- Fiber Glass Continuous Filament (CAS# 65997-17-3)

PRODUCTION OF MAIN MATERIALS

Calcium Carbonate: An abundant mineral found worldwide and a common substance found in rocks. It can be ground into varying particle sizes.

Plasticizer: Plasticizers are used to make vinyl soft and flexible. The plasticizers used in the products declared in this EPD include 1,4-Benzenedicarboxylic acid and Bis(2-ethylhexyl) ester.

Polyvinyl Chloride (PVC): Derived from fossil fuel and salt. Petroleum or natural gas is processed to make ethylene, and salt is subjected to electrolysis to separate out the natural element chlorine. Ethylene and chlorine are combined to produce ethylene dichloride, which is further processed into vinyl chloride monomer (VCM) gas. Finally, in polymerization the VCM molecule forms chains, converting the gas into fine, white powder—vinyl resin.

Stabilizers: Stabilizers are used to prevent the decomposition which occurs as PVC is heated to soften during the extrusion or molding process. Stabilizers also provide enhanced resistance to daylight, weathering and heat aging and have an important influence on the physical properties of PVC.

Fiberglass: Fiberglass is a fiber-reinforced plastic using glass fibers.

PRODUCT CHARACTERISTICS

The representative nominal thickness of 2.8mm for Dryback is based on a weighted average, but is available in 2.0 mm, 2.5 mm, and 3 mm thicknesses. Similarly, the representative nominal thickness for Locking Tile is 4 mm, but is also available in 5 mm. Finally, the representative nominal thickness for Looselay is 5 mm, but is also available in 4 mm.

Table 5. *Product characteristics for Dryback (2.8mm).*

Characteristic			Nominal Values	Unit	Maximum Value	Minimum Value
Product thickness			2.80	mm	3.15	2.35
			(0.110)	(in)	(0.124)	(0.0925)
Wear layer thickness			0.20	mm	0.22	0.18
			(0.0079)	(in)	(0.0087)	(0.0071)
Product Weight			4.68	kg/m^2	4.68	3.70
			(15.3)	(oz/ft^2)	(15.3)	(12.1)
VOC emissions test method			FloorScore®	-		
Sustainable Certifications			FloorScore®	-		
Product form	Tiles	Width	152.40	mm	457.81	101.46
		Length	1,219.20	mm	1,506.00	1,502.00

Table 6. *Product characteristics for Loose Lay (5.0mm).*

Characteristic			Nominal Value	Unit	Maximum Value	Minimum Value
Product thickness			5.00	mm	5.15	4.85
			(0.197)	(in)	(0.203)	(0.191)
Wear layer thickness			0.20	mm	0.90	0.18
			(0.0079)	(in)	(0.035)	(0.0071)
Product Weight			8.23	kg/m^2	9.23	7.40
			(27.0)	(oz/ft^2)	(30.2)	(24.3)
VOC emissions test method			FloorScore®	-		
Sustainable Certifications			FloorScore®	-		
Product form	Tiles	Width	152.40	mm	916.22	152.20
		Length	1,219.90	mm	1,507.01	456.59

Table 7. *Product characteristics for Locking Tile (4.0mm).*

Characteristic			Nominal Values	Unit	Maximum Value	Minimum Value
Product thickness			4.00	mm	4.15	3.85
			(0.158)	(in)	(0.163)	(0.152)
Wear layer thickness			0.50	mm	0.55	0.45
			(0.0197)	(in)	(0.0217)	(0.01772)
Product Weight			6.58	kg/m^2	7.44	5.92
			(21.6)	(oz/ft^2)	(24.4)	(19.4)
VOC emissions test method			FloorScore®	-		
Sustainable Certifications			FloorScore®	-		
Product form	Tiles	Width	185.00	mm	185.25	184.75
		Length	1,212.00	mm	1,212.50	1,211.50

LIFE CYCLE ASSESSMENT

A cradle to grave life cycle assessment (LCA) was completed for this product group in accordance with ISO 14040, ISO 14044, ISO 21930, and Product Category Rule for Environmental Product Declarations for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood (Version 2).

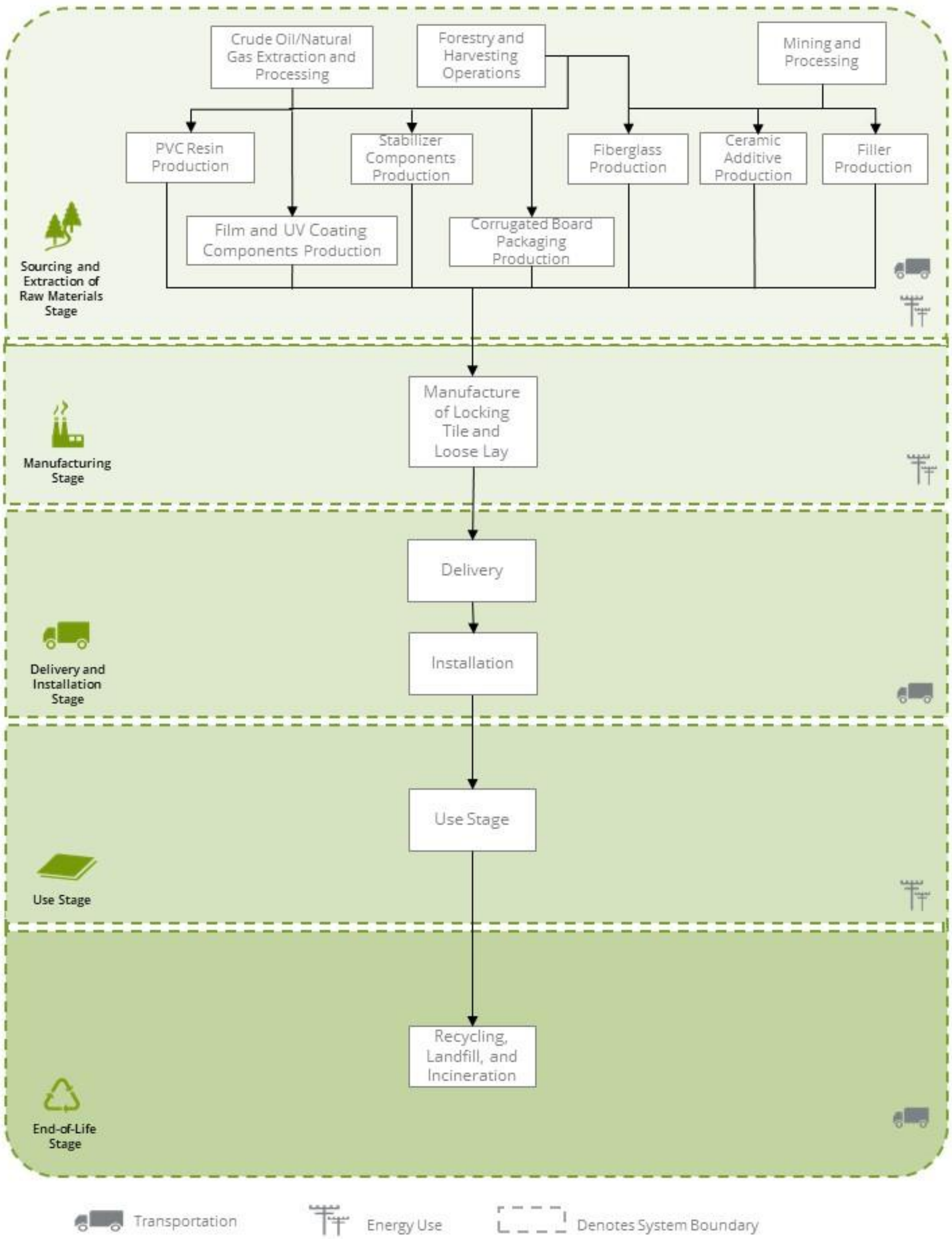
FUNCTIONAL UNIT

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, which is 30 years in this case. The PCR consequently requires separate reporting of LCA results A) for 1 m^2 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.

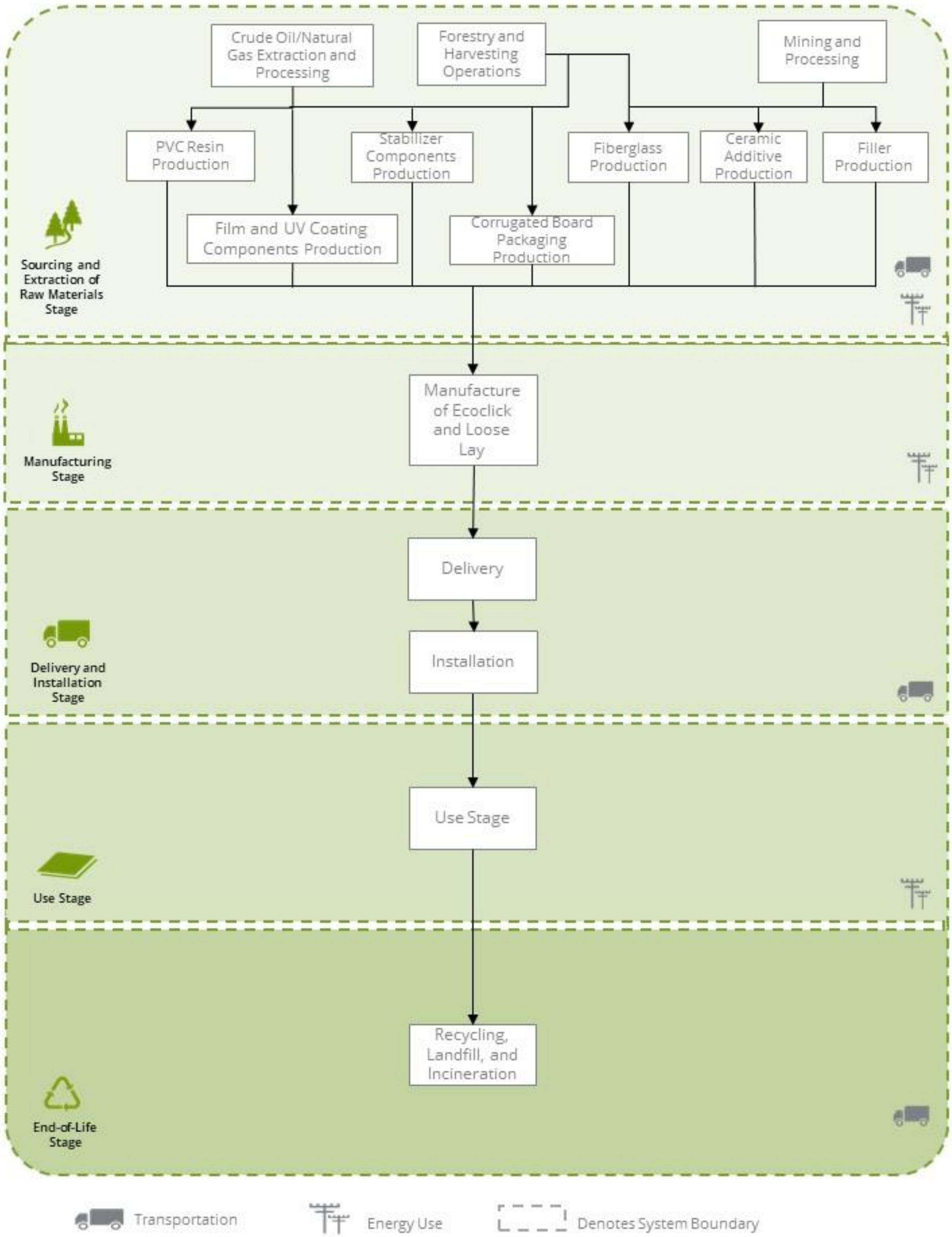
PRODUCT LIFE CYCLE FLOW DIAGRAM

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

Process Life Cycle Flow Diagram for Locking Tile and Loose Lay



Process Life Cycle Flow Diagram for Dryback



LIFE CYCLE ASSESSMENT STAGES AND REPORTED INFORMATION

Sourcing/Extraction Stage (raw material acquisition)

This stage includes extraction and processing of raw materials used for packaging and the manufacturing of luxury vinyl flooring, including delivery of these material components to the production site.

Manufacturing Stage

This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use, emissions, and wastes at the facility. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are excluded.

Delivery and Installation Stage

Delivery

This stage includes the delivery of the flooring product to the point of installation. Modeling used in the life cycle assessment assumed an estimated distribution distance to point of sale of 1,600 kilometers (994 miles) via diesel truck, representing transport from the manufacturing facility in Fostoria, Ohio to various locations across the United States.

Installation

The manufacturer provides recommended installation guidance on the web: https://sixdegreesflooring.com

Waste

Waste generated during product installation can be disposed of in a landfill, incinerated, or recycled.

Packaging

Table 8. *Origin and availability of material content for packaging of Dryback.*

Packaging Materials							
Component	Materials	Amount (kg/m^2)	Percent of Total (%)	Availability			Origin of Raw Materials
				Renewable	Non-renewable	Recycled (% pre-/post-consumer)	
Box	Corrugated board	0.154	100%	Biogenic	Fossil, limited	0%/0%	Global
TOTAL	-	**0.154**	**100%**	-	-	0%/0%	-

Table 9. *Origin and availability of material content for packaging of Loose Lay.*

Packaging Materials							
Component	Materials	Amount (kg/m^2)	Percent of Total (%)	Availability			Origin of Raw Materials
				Renewable	Non-renewable	Recycled (% pre-/post-consumer)	
Box	Corrugated board	0.270	100%	Biogenic	Fossil, limited	0%/0%	Global
TOTAL	-	**0.270**	**100%**	-	-	0%/0%	-

Table 10. *Origin and availability of material content for packaging of Locking Tile.*

Packaging Materials							
Component	Materials	Amount (kg/m^2)	Percent of Total (%)	Availability			Origin of Raw Materials
				Renewable	Non-renewable	Recycled (% pre-/post-consumer)	
Box	Corrugated board	0.216	100%	Biogenic	Fossil, limited	0%/0%	Global
TOTAL	-	**0.216**	**100%**	-	-	0%/0%	-

Use Stage

Cleaning and maintenance

Table 11. *Cleaning and maintenance for luxury vinyl flooring products in this EPD.*

Cleaning Process	Cleaning Frequency / Traffic Level			Method
	Light	Moderate	Heavy	
Daily Maintenance*	208 days/year	156 days/year	0 days/year	Sweep and mopping (3 oz neutral cleaner/gal water or 23 mL neutral cleaner/ L water)
Routine Cleaning	52 days/year	104 days/year	260 days/year	Sweep and clean with auto scrubber (3 oz neutral cleaner/gal water or 23 mL neutral cleaner/ L water)

*Based on working days per year minus the days for routine cleaning.

End-of-Life Stage

Recycling, reuse, or repurpose

Data for the estimation of recycling rates for the product and packaging are based on data prepared by the US Environmental Protection Agency's Municipal Solid Waste Report. These data provide 2014 statistics on US disposal, including recycling rates.

Table 12. *Recycling rates based on 2014 US EPA Municipal Solid Waste statistics.*

Material	Durable Goods	Packaging
Paper and paperboard	N/A	75.4%

Disposal

For disposal of product materials, it is assumed that 20% are incinerated and 80% go to a landfill, based on the US EPA data. Transportation of waste materials at end of life assumes a 32 kilometer (20 mile) average distance to disposal, consistent with assumptions used in the US EPA WARM model.

LIFE CYCLE INVENTORY

In accordance with ISO 21930:2007, 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
- Use of non-renewable material resources
- Consumption of freshwater
- Hazardous Waste
- Non-hazardous Waste

All results are calculated using the openLCA v1.7.4 model using primary and secondary inventory data. Classification for the use of material resources is based on a review of materials in the foreground system.

Table 13. *Aggregated inventory flows, shown in kg per 1 m² of Dryback (2.8 mm) maintained for 60 years.*

Parameter	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Total Primary Energy Consumption							
Non-renewable energy resources	MJ	280	62	53	280	3.5	680
Renewable primary energy	MJ	6.3	1.4	1.3	74	0.16	83
Material Resources Consumption							
Non-renewable material resources	kg	9.1	0.0	Neg	1.0	Neg	10
Renewable material resources	kg	0.31	0.0	Neg	Neg	Neg	0.31
Freshwater	m^3	2.1	0.32	$9.6x10^{-2}$	4.5	$1.1x10^{-2}$	7.0
Waste Generated							
Hazardous waste	kg	$7.4x10^{-5}$	$1.0x10^{-4}$	$4.1x10^{-5}$	$4.9x10^{-4}$	$1.0x10^{-5}$	$7.2x10^{-4}$
Non-hazardous waste	kg	2.3	1.1	2.0	2.4	17	25

Neg = Negligible

Table 14. *Aggregated inventory flows, shown in kg per 1 m² of Loose Lay (5.0 mm) maintained for 60 years.*

Parameter	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Total Primary Energy Consumption							
Non-renewable energy resources	MJ	580	110	65	282	6.1	1,000
Renewable primary energy	MJ	17	2.4	0.86	74	0.28	95
Material Resources Consumption							
Non-renewable material resources	kg	16	0.0	Neg	1.0	Neg	17
Renewable material resources	kg	0.56	0.0	Neg	Neg	Neg	0.56
Freshwater	m^3	4.2	0.55	$4.2x10^{-2}$	4.5	$1.9x10^{-2}$	9.3
Waste Generated							
Hazardous waste	kg	$1.8x10^{-4}$	$1.8x10^{-4}$	$4.2x10^{-5}$	$4.9x10^{-4}$	$1.8x10^{-5}$	$9.1x10^{-4}$
Non-hazardous waste	kg	3.1	1.9	3.4	2.4	30	41

Neg = Negligible

Table 15. *Aggregated inventory flows, shown in kg per 1 m^2 of Locking Tile (4.0 mm) maintained for 60 years.*

Parameter	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Total Primary Energy Consumption							
Non-renewable energy resources	MJ	330	87	52	280	4.9	750
Renewable primary energy	MJ	11	1.9	0.69	74	0.22	88
Material Resources Consumption							
Non-renewable material resources	kg	13	0.0	Neg	1.0	Neg	14
Renewable material resources	kg	0.45	0.0	Neg	Neg	Neg	0.45
Freshwater	m^3	2.5	0.44	3.4×10^{-2}	4.5	1.5×10^{-2}	7.5
Waste Generated							
Hazardous waste	kg	1.0×10^{-4}	1.4×10^{-4}	3.4×10^{-5}	4.9×10^{-4}	1.4×10^{-5}	7.8×10^{-4}
Non-hazardous waste	kg	1.8	1.5	2.7	2.4	24	32

Neg = Negligible

LIFE CYCLE IMPACT ASSESSMENT

The impact assessment for the EPD is conducted in accordance with requirements of the PCR. Impact category indicators are estimated using the CML-IA (Table 16 through Table 22) and TRACI 2.1 (Table 23 through Table 25) characterization methods. Aggregated inventory flows for energy use are also calculated. The LCIA and inventory flow results are calculated using openLCA v1.7.4 software and declared in this EPD in the following ways:

- **Table A:** The potential impacts for 1 m^2 of floor covering for each of the following life cycle stages: sourcing/extraction, manufacturing, delivery and installation, and end of life. The impacts are not normalized to the 60-year reference service life of the building.
- **Table B:** The impacts for the use stage for 1 m^2 of floor covering for an average one-year use.
- **Table C:** The total impacts of all life cycle stages based on the estimated replacement schedule for 1 m^2 of floor covering over a 60-year reference service life of a building.

Table 16. *Table A: Cradle to install and end of life LCIA results for 1 m^2 of Dryback (2.8 mm). Results are calculated using CML-IA.*

Impact Category	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	End of Life	Total
Abiotic Depletion Potential (Elements)	kg Sb eq	6.8×10^{-6} 49%	3.7×10^{-7} 2.7%	6.6×10^{-6} 47%	1.9×10^{-7} 1.4%	1.4×10^{-5} 100%
Abiotic Depletion Potential (Fossil Fuels)	MJ	160 75%	22 10%	30 14%	1.9 0.88%	220 100%
Global Warming Potential	kg CO_2 eq	7.7 52%	2.5 17%	1.8 12%	2.9 19%	15 100%
Ozone Depletion Potential	kg CFC-11 eq	4.4×10^{-7} 50%	1.5×10^{-7} 17%	2.8×10^{-7} 31%	1.9×10^{-8} 2.1%	8.9×10^{-7} 100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	1.3×10^{-3} 49%	4.0×10^{-4} 14%	4.8×10^{-4} 17%	5.2×10^{-4} 19%	2.7×10^{-3} 100%
Acidification Potential	kg SO_2 eq	2.6×10^{-2} 60%	8.8×10^{-3} 20%	7.3×10^{-3} 17%	8.8×10^{-4} 2.1%	4.3×10^{-2} 100%
Eutrophication Potential	kg PO_4^{3-} eq	5.9×10^{-3} 27%	4.3×10^{-3} 19%	2.0×10^{-3} 8.9%	1.0×10^{-2} 45%	2.2×10^{-2} 100%
Primary Energy, Non-Renewable	MJ	140 70%	31 16%	27 13%	1.7 0.88%	200 100%
Primary Energy, Renewable	MJ	3.2 69%	0.68 15%	0.64 14%	8.0×10^{-2} 1.8%	4.6 100%

Table 17. *Table C: Cradle to grave impacts over 60-year building service life for 1 m^2 of Dryback (2.8 mm). Results are calculated using CML-IA.*

Impact Category	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Abiotic Depletion Potential (Elements)	kg Sb eq	1.4×10^{-5} 10%	7.5×10^{-7} 0.53%	1.3×10^{-5} 9.4%	1.1×10^{-4} 80%	3.9×10^{-7} 0.28%	1.4×10^{-4} 100%
Abiotic Depletion Potential (Fossil Fuels)	MJ	320 42%	44 5.9%	59 7.8%	330 43%	3.8 0.50%	760 100%
Global Warming Potential	kg CO_2 eq	15 28%	5.0 9.2%	3.6 6.7%	25 45%	5.8 11%	54 100%
Ozone Depletion Potential	kg CFC-11 eq	8.9×10^{-7} 16%	3.0×10^{-7} 5.4%	5.6×10^{-7} 10%	3.8×10^{-6} 68%	3.8×10^{-8} 0.69%	5.5×10^{-6} 100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	2.7×10^{-3} 22%	7.9×10^{-4} 6.4%	9.5×10^{-4} 7.8%	6.8×10^{-3} 55%	1.0×10^{-3} 8.5%	1.2×10^{-2} 100%
Acidification Potential	kg SO_2 eq	5.2×10^{-2} 24%	1.8×10^{-2} 8.0%	1.5×10^{-2} 6.7%	0.13 61%	1.8×10^{-3} 0.81%	0.22 100%
Eutrophication Potential	kg PO_4^{3-} eq	1.2×10^{-2} 13%	8.6×10^{-3} 9.1%	3.9×10^{-3} 4.2%	5.0×10^{-2} 53%	2.0×10^{-2} 21%	9.4×10^{-2} 100%
Primary Energy, Non-Renewable	MJ	280 41%	62 9.1%	53 7.8%	280 41%	3.5 0.51%	680 100%
Primary Energy, Renewable	MJ	6.3 7.6%	1.4 1.6%	1.3 1.5%	74 89%	0.16 0.19%	83 100%

Table 18. *Table A: Cradle to install and end of life LCIA results for 1 m^2 of Loose Lay (5.0 mm). Results are calculated using CML-IA.*

Impact Category	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	End of Life	Total
Abiotic Depletion Potential (Elements)	kg Sb eq	$1.5x10^{-5}$ 65%	$6.5x10^{-7}$ 2.9%	$6.8x10^{-6}$ 30%	$3.4x10^{-7}$ 1.5%	$2.2x10^{-5}$ 100%
Abiotic Depletion Potential (Fossil Fuels)	MJ	340 82%	39 9.3%	34 8.1%	3.3 0.79%	420 100%
Global Warming Potential	kg CO_2 eq	16 58%	4.4 16%	2.3 8.3%	5.1 18%	28 100%
Ozone Depletion Potential	kg CFC-11 eq	$8.3x10^{-7}$ 54%	$2.6x10^{-7}$ 17%	$4.1x10^{-7}$ 27%	$3.3x10^{-8}$ 2.2%	$1.5x10^{-6}$ 100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	$4.5x10^{-3}$ 69%	$6.9x10^{-4}$ 11%	$3.8x10^{-4}$ 5.9%	$9.1x10^{-4}$ 14%	$6.5x10^{-3}$ 100%
Acidification Potential	kg SO_2 eq	$5.6x10^{-2}$ 68%	$1.5x10^{-2}$ 19%	$8.9x10^{-3}$ 11%	$1.5x10^{-3}$ 1.9%	$8.2x10^{-2}$ 100%
Eutrophication Potential	kg PO_4^{3-} eq	$1.3x10^{-2}$ 33%	$7.5x10^{-3}$ 19%	$2.2x10^{-3}$ 5.4%	$1.7x10^{-2}$ 43%	$4.0x10^{-2}$ 100%
Primary Energy, Non-Renewable	MJ	290 76%	54 14%	32 8.5%	3.1 0.80%	380 100%
Primary Energy, Renewable	MJ	8.7 83%	1.2 11%	0.43 4.1%	0.14 1.3%	10 100%

Table 19. *Table C: Cradle to grave impacts over 60-year building service life for 1 m^2 of Loose Lay (5.0 mm). Results are calculated using CML-IA.*

Impact Category	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Abiotic Depletion Potential (Elements)	kg Sb eq	$2.9x10^{-5}$ 19%	$1.3x10^{-6}$ 0.83%	$1.4x10^{-5}$ 8.6%	$1.1x10^{-4}$ 72%	$6.8x10^{-7}$ 0.43%	$1.6x10^{-4}$ 100%
Abiotic Depletion Potential (Fossil Fuels)	MJ	680 59%	78 6.7%	68 0.57%	330 28%	6.6 0.57%	1,200 100%
Global Warming Potential	kg CO_2 eq	32 40%	8.7 11%	4.6 5.7%	25 31%	10 13%	80 100%
Ozone Depletion Potential	kg CFC-11 eq	$1.7x10^{-6}$ 24%	$5.2x10^{-7}$ 7.7%	$8.2x10^{-7}$ 12%	$3.8x10^{-6}$ 55%	$6.7x10^{-8}$ 0.98%	$6.8x10^{-6}$ 100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	$9.0x10^{-3}$ 45%	$1.4x10^{-3}$ 7.0%	$7.6x10^{-4}$ 3.9%	$6.8x10^{-3}$ 34%	$1.8x10^{-3}$ 9.2%	$2.0x10^{-2}$ 100%
Acidification Potential	kg SO_2 eq	0.11 38%	$3.1x10^{-2}$ 10%	$1.8x10^{-2}$ 6.0%	0.13 45%	$3.1x10^{-3}$ 1.1%	0.30 100%
Eutrophication Potential	kg PO_4^{3-} eq	$2.7x10^{-2}$ 20%	$1.5x10^{-2}$ 11%	$4.3x10^{-3}$ 3.3%	$5.0x10^{-2}$ 38%	$3.5x10^{-2}$ 27%	0.13 100%
Primary Energy, Non-Renewable	MJ	580 56%	110 10%	65 6.2%	280 27%	6.1 0.59%	1,000 100%
Primary Energy, Renewable	MJ	17 18%	2.4 2.5%	0.86 0.90%	74 78%	0.28 0.30%	95 100%

Table 20. *Table A: Cradle to install and end of life LCIA results for 1 m² of Locking Tile (4.0 mm). Results are calculated using CML-IA.*

Impact Category	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	End of Life	Total
Abiotic Depletion Potential (Elements)	kg Sb eq	8.8×10^{-6} 59%	5.2×10^{-7} 3.5%	5.4×10^{-6} 36%	2.7×10^{-7} 1.8%	1.5×10^{-5} 100%
Abiotic Depletion Potential (Fossil Fuels)	MJ	190 76%	31 12%	27 11%	2.6 1.1%	250 100%
Global Warming Potential	kg CO_2 eq	9.1 49%	3.5 19%	1.8 10%	4.0 22%	18 100%
Ozone Depletion Potential	kg CFC-11 eq	4.6×10^{-7} 45%	2.1×10^{-7} 20%	3.3×10^{-7} 32%	2.7×10^{-8} 2.6%	1.0×10^{-6} 100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	2.9×10^{-3} 65%	5.5×10^{-4} 12%	3.1×10^{-4} 6.7%	7.3×10^{-4} 16%	4.5×10^{-3} 100%
Acidification Potential	kg SO_2 eq	3.2×10^{-2} 61%	1.2×10^{-2} 23%	7.1×10^{-3} 13%	1.2×10^{-3} 2.3%	5.3×10^{-2} 100%
Eutrophication Potential	kg PO_4^{3-} eq	7.6×10^{-3} 26%	6.0×10^{-3} 21%	1.7×10^{-3} 5.9%	1.4×10^{-2} 48%	2.9×10^{-2} 100%
Primary Energy, Non-Renewable	MJ	160 69%	43 18%	26 11%	2.4 1.0%	240 100%
Primary Energy, Renewable	MJ	5.3 79%	1.0 14%	0.34 5.1%	0.11 1.7%	6.8 100%

Table 21. *Table C: Cradle to grave impacts over 60-year building service life for 1 m² of Locking Tile (4.0 mm). Results are calculated using CML-IA.*

Impact Category	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Abiotic Depletion Potential (Elements)	kg Sb eq	1.8×10^{-5} 12%	1.0×10^{-6} 0.74%	1.1×10^{-5} 7.6%	1.1×10^{-4} 79%	5.4×10^{-7} 0.38%	1.4×10^{-4} 100%
Abiotic Depletion Potential (Fossil Fuels)	MJ	380 46%	62 7.5%	54 6.5%	330 40%	5.3 0.64%	830 100%
Global Warming Potential	kg CO_2 eq	18 30%	7.0 11%	3.7 6.0%	25 40%	8.1 13%	62 100%
Ozone Depletion Potential	kg CFC-11 eq	9.3×10^{-7} 16%	4.2×10^{-7} 7.2%	6.6×10^{-7} 11%	3.8×10^{-6} 65%	5.3×10^{-8} 0.92%	5.8×10^{-6} 100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	5.9×10^{-3} 37%	1.1×10^{-3} 7.0%	6.1×10^{-4} 3.9%	6.8×10^{-3} 43%	1.5×10^{-3} 9.2%	1.6×10^{-2} 100%
Acidification Potential	kg SO_2 eq	6.5×10^{-2} 27%	2.5×10^{-2} 10%	1.4×10^{-2} 6.0%	0.13 56%	2.5×10^{-3} 1.0%	0.24 100%
Eutrophication Potential	kg PO_4^{3-} eq	1.5×10^{-2} 14%	1.2×10^{-2} 11%	3.5×10^{-3} 3.2%	5.0×10^{-2} 46%	2.8×10^{-2} 26%	0.11 100%
Primary Energy, Non-Renewable	MJ	330 43%	87 12%	52 6.9%	280 38%	4.9 0.65%	750 100%
Primary Energy, Renewable	MJ	11 12%	1.9 2.2%	0.69 0.78%	74 85%	0.22 0.26%	88 100%

Table 22. *Table B: Average 1-year use stage impacts for 1 m^2 for luxury vinyl flooring products in this EPD. Results are calculated using CML-IA.*

Impact Category	Units	Average 1-year Use and Maintenance Impacts
Abiotic Depletion Potential (Elements)	kg Sb eq	2.6×10^{-6}
Abiotic Depletion Potential (Fossil Fuels)	MJ	5.6
Global Warming Potential	kg CO_2 eq	0.32
Ozone Depletion Potential	kg CFC-11 eq	6.3×10^{-8}
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	1.2×10^{-4}
Acidification Potential	kg SO_2 eq	2.2×10^{-3}
Eutrophication Potential	kg PO_4^{3-} eq	1.1×10^{-3}
Primary Energy, Non-Renewable	MJ	4.7
Primary Energy, Renewable	MJ	1.2

Table 23. *Cradle to install and end of life LCIA results for 1 m^2 for luxury vinyl flooring products in this EPD. Results are calculated using TRACI 2.1.*

Impact Category	Units	Dryback (2.8 mm)	Loose Lay (5.0 mm)	Locking Tile (4.0 mm)
Ozone depletion	kg CFC-11 eq	1.2×10^{-6}	2.0×10^{-6}	1.4×10^{-6}
Global warming	kg CO_2 eq	14	27	18
Smog	kg O_3 eq	0.68	1.2	0.81
Acidification	kg SO_2 eq	4.5×10^{-2}	8.5×10^{-2}	5.5×10^{-2}
Eutrophication	kg N eq	4.8×10^{-2}	8.8×10^{-2}	6.5×10^{-2}
Fossil fuel depletion	MJ surplus	28	54	32

Table 24. *Cradle to grave impacts over 60-year building service life for 1 m^2 luxury vinyl flooring products in this EPD. Results are calculated using TRACI 2.1.*

Impact Category	Units	Dryback (2.8 mm)	Loose Lay (5.0 mm)	Locking Tile (4.0 mm)
Ozone depletion	kg CFC-11 eq	6.5×10^{-6}	8.2×10^{-6}	6.9×10^{-6}
Global warming	kg CO_2 eq	53	77	60
Smog	kg O_3 eq	2.6	3.7	2.9
Acidification	kg SO_2 eq	0.22	0.30	0.24
Eutrophication	kg N eq	0.20	0.28	0.23
Fossil fuel depletion	MJ surplus	89	140	98

Table 25. *Average 1-year use stage impacts for 1 m^2 for luxury vinyl flooring products in this EPD. Results are calculated using TRACI 2.1.*

Impact Category	Units	Average 1-year Use and Maintenance Impacts
Ozone depletion	kg CFC-11 eq	6.9×10^{-8}
Global warming	kg CO_2 eq	0.40
Smog	kg O_3 eq	2.1×10^{-2}
Acidification	kg SO_2 eq	2.2×10^{-3}
Eutrophication	kg N eq	1.7×10^{-3}
Fossil fuel depletion	MJ surplus	0.56

SUPPORTING TECHNICAL INFORMATION

Unit processes are developed with openLCA v1.7.4 software, drawing upon data from multiple sources. Primary data were provided by NOX US, LLC for their manufacturing processes. The primary sources of secondary LCI data are from Ecoinvent, Overcash, and PlasticsEurope Eco-profiles.

Table 26. *Data sources used for the LCA study.*

Flow	Dataset	Data Source(s)	Publication Date
Product Materials			
PVC resin	Polyvinylchloride, emulsion polymerised {RoW}| polyvinylchloride production, emulsion polymerisation | Alloc Rec, U	Ecoinvent	2017
Plasticizer	2-ethylhexyl phthalate (DEHP) {GLO} | market for | Alloc Rec U	Ecoinvent; Overcash	2017; 2004
Stabilizer	chemical production, organic | chemical, organic | Cutoff, U - GLO	Ecoinvent	2017
Pigment	Carbon black {GLO}| production | Alloc Rec, U	Ecoinvent	2017
Filler	Limestone, crushed, for mill {GLO}| market for | Alloc Rec, U	Ecoinvent	2017
Print Layer Film	polyvinylchloride production, emulsion polymerisation | polyvinylchloride, emulsion polymerised | Cutoff, U - RoW	Ecoinvent	2017
Binder	polyvinylchloride production, emulsion polymerisation | polyvinylchloride, emulsion polymerised | Cutoff, U - RoW	MSDS; Ecoinvent	2017
UV Coating	Polyurethane {RoW} | production | Alloc Rec U	SCS; Ecoinvent	2017
Additive	silica sand production | silica sand | Cutoff, U - RoW	Ecoinvent	2017
Fiberglass	market for glass fibre reinforced plastic, polyester resin, hand lay-up | glass fibre reinforced plastic, polyester resin, hand lay-up | Cutoff, U – GLO; market for kraft paper, unbleached | kraft paper, unbleached | Cutoff, U - GLO	Ecoinvent	2017
Installation			
Adhesive	Acrylic binder, without water, in 34% solution state {GLO}| market for | Alloc Rec, U	Ecoinvent	2017
Maintenance			
Cleaner	Chemical, organic {GLO}| market for | Alloc Rec, U; Citric acid {GLO}| market for | Alloc Rec, U; Sodium hydroxide, without water, in 50% solution state {GLO}| market for | Alloc Rec, U; Sodium sulfite {GLO}| market for | Alloc Rec, U; Water, deionised, from tap water, at user {GLO}| market for | Alloc Rec, U	MSDS; Ecoinvent	2017
Electricity	market group for electricity, low voltage | electricity, low voltage | Cutoff, U - US	Ecoinvent	2017
Water	Tap water {RoW}| market for | Alloc Rec, U	Ecoinvent	2017
Manufacturing			
Electricity	Electricity, medium voltage, at grid/RFCW 2016 U	eGRID; Ecoinvent	2018; 2017
Propane	market for propane, burned in building machine | propane, burned in building machine | Cutoff, U - GLO	Ecoinvent	2017
Packaging			
Cardboard box	Corrugated board box {RoW}| production | Alloc Rec, U	Ecoinvent	2017
Transportation			
Truck	Transport, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Rec, U	Ecoinvent	2017
Truck (disposal)	Transport, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Rec, U	Ecoinvent	2017
Ship	Transport, freight, sea, transoceanic ship {GLO}| market for | Alloc Rec, U	Ecoinvent	2017

Data Quality

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 10 years old. All the primary data used represented an average of one year's worth of data collection. Manufacturer-supplied data are based on calendar year 2017.
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. Actual processes for upstream operations are primarily in the Republic of Korea and the United States, while downstream processes are primarily in the United States. Representative data used in the assessment are representative of US, Global, or "Rest-of-World" (average for all countries in the world with uncertainty adjusted). Datasets chosen are considered sufficiently similar to actual processes.
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 or as a proxy, are used to represent the actual processes where primary data were not available.
Precision Measure of the variability of the data values for each data expressed (e.g. variance)	Precision of results are not quantified due to a lack of data. Manufacturer data, and representative data used for upstream processes 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 luxury vinyl flooring. In some instances, surrogate datasets used to represent upstream processes may be missing some data which is propagated in the model. Missing data represent less than 5% of the mass or energy flows.
Representativeness Qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period and technology coverage)	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 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 represent an annual average and are considered of good 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. A mass and energy balance check were completed during the data collection period. For secondary LCI datasets, Ecoinvent, Overcash, and PlasticsEurope Eco-profiles databases are used, with a bias towards Ecoinvent data.
Uncertainty of the Information Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the luxury vinyl flooring is low, while uncertainty related to the type of packaging materials used is relatively high. Primary data for upstream processes were not available; as such, the study relied upon use of existing representative datasets for these cases. These representative datasets contained relatively recent data (~10 years, or more recent), but in some instances lacked perfect geographical and technological representativeness. Uncertainty related to the impact assessment methods used in the study are relatively high since they lack characterization of thresholds or tipping points.

Allocation

For the raw material supply and all secondary datasets used for this LCA study, processes were modelled using the cut-off system model of Ecoinvent v3.4 database.

For the transport stage, impacts were allocated based on the mass of the material and distance transported to each facility.

This study follows the allocation guidelines of ISO-14044 and allocation rules specified in the PCR and sought to minimize the use of allocation wherever possible. For the manufacturing stage, mass allocation was deemed the most accurate and reproducible way of calculating resource use, emissions, and wastes. Primary data for resource use (e.g., electricity, natural gas, water, etc.), waste, and emissions released at the facility were allocated to the product on a mass-basis as a fraction of total annual production.

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.

ADDITIONAL ENVIRONMENTAL INFORMATION

Additional Information About Raw Materials: In 2015, RHC Family Companies (of which Six Degrees is a part) joined the Sustainable Purchasing Leadership Council (SPLC) and uses SPLC guidance in purchasing decisions Six Degrees vinyl products are made using virgin raw materials. Layered vinyl products, such as the luxury vinyl tiles described in this EPD, are made with non-phthalate plasticizers.

SUSTAINABLE PURCHASING LEADERSHIP COUNCIL

Recycled materials are not used in formulations for Six Degrees products, so that plasticizers, heavy metals from pigments, and other contaminants are not introduced to the Six Degrees products.

Additional Information About Chemicals of Concern: RHC follows the Lowell Center Framework to remove chemicals of concern from all products. For 30 years, RHC has been a leader in removing hazardous components from building materials including switching to a green pigment without heavy metals (traces of Lead, Hexavalent Chromium, Mercury, and Cadmium) in 2011. In 2015, RHC joined the Health Product Declaration Collaborative, and is using HPD 2.1 to prioritize work on chemicals of concern and actively participating in HPDC work groups.

A balance between product quality, chemical risk, and cost is pursued in evaluating raw materials and the production process. Product quality includes durability, aesthetics, ease of maintenance and cleaning—all the aspects of the product that customers rely upon. Chemical risk includes hazard, exposure, and concentration of chemicals of concern. Members of the engineering, chemistry, technical & installation services, and sustainability groups are continuously searching out and evaluating new possible materials and processes.

Corporate Environmental Sustainability Goals: Corporate environmental sustainability goals for four key metrics have been set for the period 2016-2025. These metrics and their goals are provided below.

Metric	Goal	Measured as:
Energy Intensity	20% reduction	kWh/pound of product
Greenhouse Gases	20% reduction	kg CO_2-equivalents/pound of product
Waste to Landfill	25% reduction	Pounds waste/pound of product
Water Used/Consumed	20% reduction	Gallons water/pound of product

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