ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804 for:

Resilience Floor Tile

From

Jiangsu BBL Home Technology Co.,Ltd.

Declared product: Resilience Floor Tile Series (LVT , LVT click, PP，SPC, WPC, EPC）

Programme operator:	EPD China
Registration number:	EPD-CN-00001
Issued date:	2023-07-10
Revised date:	2023-11-24
Valid until:	2028-07-10

Programme Information

EPD Owner	Jiangsu BBL Home Technology Co., Ltd. Address: NO.10 Changhong East Rd, Henglin Town, Wujin District, Changzhou City, China. Website: https://www.bblflooring.com Email: field@bblfloor.com
Product Name	Resilience Floor Tile Series (LVT , LVT click, PP, SPC, WPC, EPC)
Production Site	Changzhou City, Jiangsu Province
Identification of product	UNCPC code: 36910 Floor coverings of plastics, in rolls or in the form of tiles; wall or ceiling coverings of plastics.
Field of Application	Vinyl flooring is widely used in living areas and working areas to protect the ground and making it more aesthetically.
Programme Operator	EPD China Address: 3rd floor, Lane 320, Tianping Road, Xuhui District, Shanghai Website: www.epdchina.cn Email: info@epdchina.cn | secretary@epdchina.cn
LCA Practitioner	Zhou Jiangling, Xu Fangyan
Responsibility	The EPD owner has the sole ownership, liability, and responsibility for the EPD
Comparability	EPDs within same category of product in different programme operator are not suggested to be compared. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible even applying the same PCR.
Validity	The EPD is published on 2023-07-10 and valid to2028-07-10
LCA Software (version)	SimaPro 9.5
LCI Dataset (version)	Ecoinvent 3.8
Year(s) of Primary Data	01/2022-12/2022
PCR	EPDEN-PCR-202204-Construction products and construction services V2.0 PCR review was conducted by EPD China Programme Technical Committee
Other Reference Document	EN 15804:2012+A2:2019/AC:2021
Verification statement according EN15804	
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐ internal ☑ external Third-party verification: Dr. Shen Zhou (Shaoxing University) Approved by: EPD China	
Procedure for follow-up of data during EPD validity involves a third-party verifier: ☑ Yes ☐ No	

1 General Information

1.1 Company information

Established in 1991, Jiangsu BBL home Technology Co., Ltd. (also known as BBL) is a professional manufacturer of Vinyl Flooring, Laminate Flooring as well as Engineered wood flooring. BBL has over 30 years of experience in construction materials and has a good reputation in this field. BBL has attained ISO9001:2008 certification for our management system and we are now using Lean Manufacturing System to improve our efficiency of internal management.

1.2 Scope and type of EPD

This study of flooring product includes life cycle information from cradle-to-grave. The product stage for product includes extraction and processing of raw materials, transportation to the factory and manufacturing processes with packaging and etc. The construction process stage includes transportation of flooring product to the building site from the factory and the installation phase. The use stage includes maintenance of flooring product. And the end of life stage includes deconstruction, waste transportation, waste processing and disposal and etc.

Over through the life cycle stages of products, all energy and material inputs have been traced back to the extraction of resources, emissions from the whole system have been quantified and waste management scenarios have also been included.

For recycling and disposal process at the end of life stage, to be conservative, the benefits of recycling and recovery is out of boundary of the product system. However, the potential benefits from recycling and energy recovery beyond the system boundary of the studied product system have been declared and reported in module D in this study.

Table 1 Process stages and EPD modules.

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITSAND LOADSBEYOND THESYSTEM BOUNDARIES
	Raw material supply	**Transport**	**Production**	**Transport from the gate to the**	**Assembly**	**Use**	**Maintenance**	**Repair**	**Replacement**	**Refurbishment**	**Operational energy use**	**Operational water use**	**Deconstruction/ demolition**	**Transport**	**Waste processing**	**Disposal**	**reuse- recovery- recycling- potential**
	A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
	x	x	x	x	x	ND	x	ND	ND	ND	ND	ND	x	x	x	x	x
	mdt	mdt	mdt	op	op	op	op	op	op	op	op	op	mdt	mdt	mdt	mdt	mdt
for EEE:	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

In this LCA study, specific data related to materials or energy flows within the production was calculated and submitted by BBL based on the reference year of 2022 (from January 2022 to January 2023), generic data for certain processes were sourced from Ecoinvent 3.8 in SimaPro 9.5.

2 Detailed Product Description

2.1 Description of the product

Resilient flooring encompasses a wide variety of hard surface flooring products from vinyl and linoleum to rubber and cork. Resilient flooring product claims to be focused on durability (so more resilient), sustainability, affordability and stylish in design, according to the Resilient Floor Covering Institute (RFCI).

Vinyl flooring is made primarily from calcium carbonate (limestone), polyvinyl chloride (PVC), plasticizers, additives (i.e. pigments and stabilizers). Vinyl flooring is classified in multiple categories dependent on the vinyl or binder content (below or above 34%, ASTM F 1066), type of surface and construction.

There are six categories of BBL resilient flooring products: LVT (Luxury Vinyl Tile), LVT click (Luxury Vinyl Tile click), PP (Polypropylene), SPC (Stone Plastic Composite), WPC (Wood Plastic Composite), EPC (Engineered Plastic Composite).

LVT and LVT click floor are very classic series in vinyl floor family, offered two installation ways: click and lock system. PP floor is manufactured with a polypropylene core free from PVC and plasticizer. SPC floor is an upgrade and improvement of LVT and WPC that is manufactured with a rigid stone plastic composite (SPC) core. WPC floor is composite vinyl floor combining the resilience of LVT and stability of composite vinyl core. EPC floor is engineered ABA structure light SPC with foaming SPC layer.

Figure 1 Picture of the declared product.

The targeted products for this project are six categories of BBL flooring products: LVT, LVT click, PP, SPC, WPC, EPC, with various combinations of thickness, length and width of the tile. Among then, LVT with a thickness of 2.5 mm, LVT click with a thickness of 4.2 mm, PP with a thickness of 4.2 mm, SPC with a thickness of 5.0 mm, EPC with a thickness of 5.0 mm and WPC with a thickness of 5.0 mm are the general specifications for each category, which can be abbreviated as LVT (2.5), LVT click (4.2), PP (4.2), SPC (5.0), WPC (5.0), EPC (5.0). A detailed flooring product specification is depicted below in Table 2.

Table 2 Specification of product.

Product	Thickness	Length	Width
LVT	2.0-4.0mm	200-2000mm	100-2000mm
LVT click	3.2-5.0mm	200-2000mm	100-2000mm
PP	3.2-6.5mm	200-2000mm	100-2000mm
SPC	3.2-7.0mm	200-2000mm	100-2000mm
EPC	5.0-7.0mm	200-2000mm	100-2000mm
WPC	5.5-12mm	200-2000mm	100-2000mm

1. Description of the production processes

LVT, LVT click, PP, SPC, WPC and EPC flooring products are all manufactured in Changzhou City of Jiangsu Province in China.

The manufacturing process of BBL flooring product mainly includes banburying, open refining, material stripping, press paste, roll coating, tempering, punching slotting and packaging, which involves raw materials, energy, emissions. Since the raw materials are already considered in “raw material acquisition” step above, the model will mainly deal with energy consumption and emissions, along with the supply chain for packaging material in this stage.

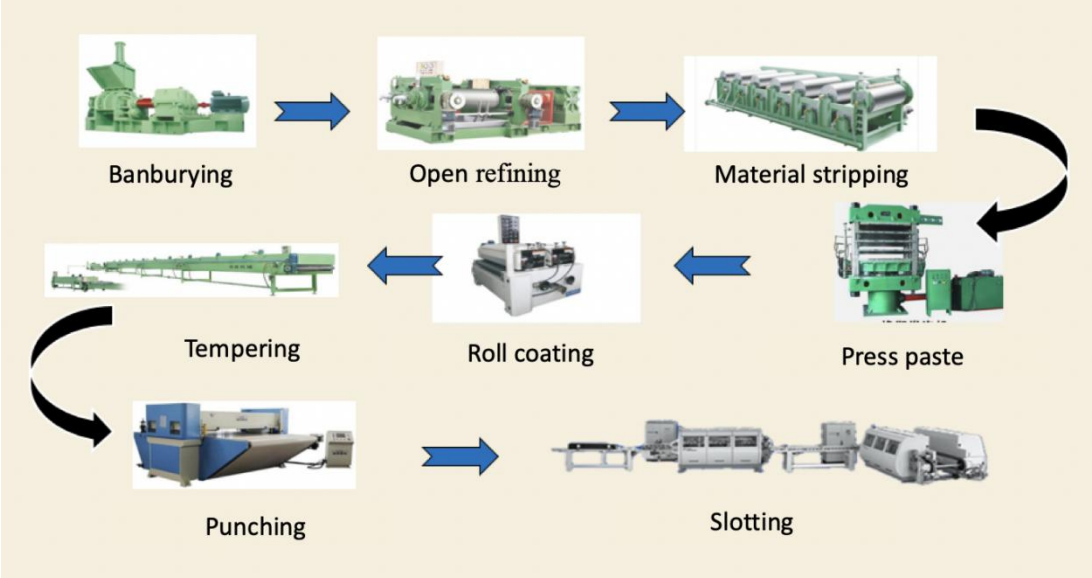

Figure 2: The production process in selected stages.

2. Product components

According to the estimate by BBL almost all of the raw materials are sourced from East China, within 500km radius from the production site in Changzhou. The type and ratio/weight of raw materials per product are listed in tables below. The information related to raw materials transportation including distance, vehicle is depicted in the section of “Transportation”.

Table 3 Main product components and packaging materials per unit.

Product components	EPC (5.0)	LVT (2.5)	LVT click (4.2)	PP (4.2)	SPC (5.0)	WPC (5.0)
Stone powder	65.60%	70.10%	70.10%	64.50%	67.40%	62.30%
PVC	23.30%	16.30%	16.30%	-	20.50%	28.50%
Other additive	0.90%	-	-	2.00%	0.60%	0.90%
Wearlayer	8.30%	7.50%	7.50%	-	10.00%	5.10%
Wearlayer-PVC free	-	-	-	9.20%	-	-
Stabilizer	1.30%	1.30%	1.30%	0.00%	1.10%	0.20%
UV coating	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
Carbon black	0.20%	0.20%	0.20%	0.10%	0.10%	0.20%
Lubricant	0.30%	-	-	0.20%	0.50%	0.80%
Film	0.10%	0.20%	0.20%	-	0.10%	0.10%
Film-PVC free	-	-	-	0.20%	-	-
DOTP	-	9.20%	9.20%	-	-	2.00%
PP	-	-	-	23.60%	-	-
ixpe	-	-	-	-	-	0.50%
Packaging materials	**Weight, kg/DU**					
Packaging box	0.146					
Tray	0.095					
Wrapping film	0.019					
Packing belt	0.01					

No substances from the candidate list of SVHC in the declared product.

Table 4 Transportation of raw material and packaging material.

Material	Transport vehicle (lorry, train, flight, ship)	Distance (km)	From
stone powder	lorry(40T)	500	Anhui
PVC	lorry(20T)	400	Shanghai
Other additive	lorry(30T)	200	Suzhou
Wearlay	lorry(40T)	200	Zhejiang
Stabilizer	lorry(20T)	300	Chizhou
UV coating	lorry(1T)	200	Zhejiang
Carbon black	lorry(10T)	400	Shanghai
Lubricant	lorry(33T)	200	Suzhou
Film	lorry(40T)	200	Zhengjiang
DOTP	lorry(30T)	100	Zhengjiang

PP	lorry(10T)	30	Changzhou
Ixpe	lorry(10T)	400	Shanghai
Carton	lorry(10T)	160	Huzhou
Wrapping film	lorry(10T)	30	Wuxi
Packing belt	lorry(5T)	10	Changzhou
Tray	lorry(10T)	20	Changzhou

Table 5 Transportation of products.

Market location	Ratio	Transport vehicle	distance(km)
EU	30%	Container via Ship	24000
		Lorry (32T)	1000
North America	50%	Container via Ship	20000
		Lorry (32T)	1000
the Asian-Pacific region	20%	Container via Ship	16000
		Lorry (32T)	1000

3. Declared unit

The declared unit is 1 m^2 of resilient flooring tile. To convert area to mass, multiply the volume by the density of the substance. The conversion factor of volume to mass can be found as fallows.

Name		Value	Unit
Declared unit		1	m^2
Density	LVT (2.5)	1900	kg/m^3
	LVT click (4.2)	1950	kg/m^3
	PP (4.2)	1750	kg/m^3
	SPC (5.0)	1950	kg/m^3
	WPC (5.0)	1600	kg/m^3
	EPC (5.0)	1400	kg/m^3
Mass conversion factor of declared unit	LVT (2.5)	4.75	kg/m^2
	LVT click (4.2)	8.19	kg/m^2
	PP (4.2)	7.35	kg/m^2
	SPC (5.0)	9.75	kg/m^2
	WPC (5.0)	8	kg/m^2
	EPC (5.0)	7	kg/m^2

4. Reference service life

The LCA results are calculated based on reference service life years' usage (25 years).

5. Product installation

The six categories flooring products offer different installation ways: conventional glue down offered by LVT and lock system offered by LVT click, SPC, WPC, and installation without any adhesive or mechanical locking system offered by

the other products.

The click and lock system and floating floor installation are completely glue free, eliminating the need for using additional materials and chemicals with potential issues, and flooring products can be installed over most solid subfloor with minimal subfloor preparation. While LVT product requires glue to be applied for the installation, and the amount of glue used is 300gram per square meter.

6. Usage and maintenance

Very little effort is required in order to use BBL flooring product, hence in the usage stage the focus is put on maintaining the floor tile in terms of protecting its integrity and functionality. In normal condition, routine vacuuming, cleaning and surface conditioning is required. The energy and detergent consumption data are based on estimation from BBL and study of average product's usage data, the table below demonstrates the amount used in this report.

Table 6 Inputs in maintenance stage.

	Amount	Units	Scenario
Electricity	0.052	kWh/m^2/yr	Based on weekly vacuuming and 0.001kWh/m^2 square assumption
Detergent	0.052	kg/m^2/yr	Based on weekly mopping and 0.001kg/m^2 detergent usage assumption;

7. Disposal

According to BBL, most of flooring products are used in Europe, North America, and the Asian-Pacific region. The disposal of the used flooring product will adopt a region average disposal mode following literature review. End of life disposal treatment process (C4) from ecoinvent will be used in this LCA study. For the waste scenario, 100km of road transportation (C2) from home to waste treatment site is assumed. According to BBL, the tile can be manually removed from the floor, hence input and output is omitted in deconstruction (C1), and waste processing (C3) stage of the tile life cycle. Table below shows the disposal in the target market.

Table 7 Disposal in the target market

Nation/region		Ratio	Recycling Rate	Landfill Rate	Incineration Rate
EU[1]		30%	49.2%	19%	30.2%
North America	US[2]	50%	18.5%	65.5%	16%
	The rest market				
the Asia Pacific region	Australia[3]	20%	80%	20%	0%
	The rest market				

Source:

[1] Eurostat, Recovery and recycling rates for packaging. 2020. (Last updated March 2023)

[2] Advancing Sustainable Materials Management: 2018 Fact Sheet. (Released December 2020)

[3] National Waste Report 2022. (Released December 2022)

8. Production site: NO.10 Changhong East Rd, Henglin Town, Wujin District, Changzhou City, JS213101, China.

9. Geographical coverage: Global

3 LCA results according to EN 15804

3.1 Environmental Impacts

The results of the underlying LCA is provided in this section as environmental impacts, resource use, output flows and additional information on biogenic carbon. All pre-set parameters of EN 15804 are required.

Table 8 Environmental impacts according to EN 15804 – LVT (2.5)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	7.58E+00	1.47E+00	1.05E+00	4.19E+00	0.00E+00	6.07E-01	0.00E+00	9.70E-01	-1.29E+00
GWP-fossil	kg CO2 eq.	7.93E+00	1.47E+00	8.76E-01	3.53E+00	0.00E+00	6.07E-01	0.00E+00	6.10E-01	-1.48E+00
GWP-biogenic	kg CO2 eq.	-3.60E-01	2.85E-04	1.71E-01	-3.34E+00	0.00E+00	1.86E-04	0.00E+00	3.60E-01	1.89E-01
GWP-luluc	kg CO2 eq.	5.30E-03	9.15E-04	3.80E-04	4.00E+00	0.00E+00	6.67E-05	0.00E+00	6.94E-05	-1.54E-03
ODP	kg CFC 11 eq.	5.11E-06	3.10E-07	5.24E-08	4.34E-07	0.00E+00	1.32E-07	0.00E+00	1.09E-08	-5.79E-07
AP	mol H+ eq.	3.72E-02	3.41E-02	2.64E-03	3.64E-02	0.00E+00	3.84E-03	0.00E+00	6.81E-04	-6.91E-03
EP-freshwater	kg P eq.	1.73E-03	6.82E-05	1.17E-04	2.40E-02	0.00E+00	1.09E-05	0.00E+00	7.10E-05	-5.95E-04
EP-marine	kg N eq.	7.58E-03	8.37E-03	6.26E-04	3.38E-02	0.00E+00	1.54E-03	0.00E+00	4.11E-03	-1.39E-03
EP-terrestrial	mol N eq.	7.83E-02	9.29E-02	5.43E-03	1.20E-01	0.00E+00	1.69E-02	0.00E+00	2.36E-03	-1.36E-02
POCP	kg NMVOC eq.	2.32E-02	2.45E-02	2.05E-03	2.05E-02	0.00E+00	5.96E-03	0.00E+00	6.36E-04	-4.34E-03
ADP - minerals & metals	kg Sb eq.	5.82E-05	2.49E-06	7.80E-06	5.81E-05	0.00E+00	5.29E-07	0.00E+00	2.51E-07	-1.95E-05
ADP - fossil	MJ, net calorific value	1.23E+02	2.03E+01	1.85E+01	3.92E+01	0.00E+00	8.27E+00	0.00E+00	1.03E+00	-3.02E+01
WDP	m3 world eq. Deprived	2.47E+00	5.08E-02	2.80E-01	1.36E+01	0.00E+00	7.45E-03	0.00E+00	6.12E-02	-7.32E-01

Table 9 Environmental impacts according to EN 15804 – LVT click (4.2)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.03E+01	2.54E+00	1.88E-01	4.19E+00	0.00E+00	1.05E+00	0.00E+00	1.41E+00	-2.28E+00
GWP-fossil	kg CO2 eq.	1.07E+01	2.54E+00	1.73E-02	3.53E+00	0.00E+00	1.05E+00	0.00E+00	1.05E+00	-2.47E+00
GWP-biogenic	kg CO2 eq.	-3.60E-01	4.91E-04	1.71E-01	-3.34E+00	0.00E+00	3.21E-04	0.00E+00	3.60E-01	1.89E-01
GWP-luluc	kg CO2 eq.	7.45E-03	1.58E-03	2.12E-06	4.00E+00	0.00E+00	1.15E-04	0.00E+00	1.20E-04	-2.41E-03
ODP	kg CFC 11 eq.	8.75E-06	5.34E-07	4.05E-10	4.34E-07	0.00E+00	2.27E-07	0.00E+00	1.88E-08	-9.93E-07
AP	mol H+ eq.	4.98E-02	5.89E-02	2.33E-05	3.64E-02	0.00E+00	6.61E-03	0.00E+00	1.17E-03	-1.14E-02
EP-freshwater	kg P eq.	2.44E-03	1.18E-04	5.35E-07	2.40E-02	0.00E+00	1.87E-05	0.00E+00	1.22E-04	-9.27E-04
EP-marine	kg N eq.	9.99E-03	1.44E-02	1.27E-04	3.38E-02	0.00E+00	2.66E-03	0.00E+00	7.09E-03	-2.24E-03
EP-terrestrial	mol N eq.	1.03E-01	1.60E-01	7.97E-05	1.20E-01	0.00E+00	2.92E-02	0.00E+00	4.06E-03	-2.19E-02
POCP	kg NMVOC eq.	3.14E-02	4.23E-02	4.24E-05	2.05E-02	0.00E+00	1.03E-02	0.00E+00	1.10E-03	-7.08E-03

ADP - minerals & metals	kg Sb eq.	9.66E-05	4.30E-06	7.40E-09	5.81E-05	0.00E+00	9.12E-07	0.00E+00	4.33E-07	-3.32E-05
ADP - fossil	MJ, net calorific value	1.82E+02	3.51E+01	3.62E-02	3.92E+01	0.00E+00	1.43E+01	0.00E+00	1.78E+00	-5.09E+01
WDP	m3 world eq. Deprived	3.87E+00	8.76E-02	1.92E-03	1.36E+01	0.00E+00	1.28E-02	0.00E+00	1.06E-01	-1.23E+00

Table 10 Environmental impacts according to EN 15804 – PP (4.2)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.08E+01	2.28E+00	1.88E-01	4.19E+00	0.00E+00	9.40E-01	0.00E+00	1.30E+00	-3.01E+00
GWP-fossil	kg CO2 eq.	1.11E+01	2.28E+00	1.73E-02	3.53E+00	0.00E+00	9.39E-01	0.00E+00	9.43E-01	-3.20E+00
GWP-biogenic	kg CO2 eq.	-3.60E-01	4.40E-04	1.71E-01	-3.34E+00	0.00E+00	2.88E-04	0.00E+00	3.60E-01	1.89E-01
GWP-luluc	kg CO2 eq.	3.74E-02	1.42E-03	2.12E-06	4.00E+00	0.00E+00	1.03E-04	0.00E+00	1.07E-04	-1.86E-03
ODP	kg CFC 11 eq.	2.57E-07	4.79E-07	4.05E-10	4.34E-07	0.00E+00	2.04E-07	0.00E+00	1.69E-08	-7.01E-08
AP	mol H+ eq.	4.82E-02	5.28E-02	2.33E-05	3.64E-02	0.00E+00	5.93E-03	0.00E+00	1.05E-03	-1.31E-02
EP-freshwater	kg P eq.	2.28E-03	1.06E-04	5.35E-07	2.40E-02	0.00E+00	1.68E-05	0.00E+00	1.10E-04	-1.08E-03
EP-marine	kg N eq.	9.63E-03	1.29E-02	1.27E-04	3.38E-02	0.00E+00	2.39E-03	0.00E+00	6.36E-03	-2.43E-03
EP-terrestrial	mol N eq.	1.00E-01	1.44E-01	7.97E-05	1.20E-01	0.00E+00	2.62E-02	0.00E+00	3.64E-03	-2.47E-02
POCP	kg NMVOC eq.	3.43E-02	3.80E-02	4.24E-05	2.05E-02	0.00E+00	9.23E-03	0.00E+00	9.84E-04	-9.47E-03
ADP - minerals & metals	kg Sb eq.	4.47E-05	3.86E-06	7.40E-09	5.81E-05	0.00E+00	8.18E-07	0.00E+00	3.89E-07	-1.50E-05
ADP - fossil	MJ, net calorific value	2.58E+02	3.15E+01	3.62E-02	3.92E+01	0.00E+00	1.28E+01	0.00E+00	1.60E+00	-9.22E+01
WDP	m3 world eq. Deprived	3.11E+00	7.86E-02	1.92E-03	1.36E+01	0.00E+00	1.15E-02	0.00E+00	9.47E-02	-1.07E+00

Table 11 Environmental impacts according to EN 15804 – SPC (5.0)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.29E+01	3.03E+00	1.88E-01	4.19E+00	0.00E+00	1.25E+00	0.00E+00	1.61E+00	-3.51E+00
GWP-fossil	kg CO2 eq.	1.31E+01	3.02E+00	1.73E-02	3.53E+00	0.00E+00	1.25E+00	0.00E+00	1.25E+00	-3.70E+00
GWP-biogenic	kg CO2 eq.	-3.60E-01	5.84E-04	1.71E-01	-3.34E+00	0.00E+00	3.83E-04	0.00E+00	3.60E-01	1.89E-01
GWP-luluc	kg CO2 eq.	1.19E-01	1.88E-03	2.12E-06	4.00E+00	0.00E+00	1.37E-04	0.00E+00	1.42E-04	-3.47E-03
ODP	kg CFC 11 eq.	3.94E-06	6.35E-07	4.05E-10	4.34E-07	0.00E+00	2.70E-07	0.00E+00	2.24E-08	-1.50E-06
AP	mol H+ eq.	6.16E-02	7.01E-02	2.33E-05	3.64E-02	0.00E+00	7.87E-03	0.00E+00	1.40E-03	-1.70E-02
EP-freshwater	kg P eq.	4.21E-03	1.40E-04	5.35E-07	2.40E-02	0.00E+00	2.23E-05	0.00E+00	1.46E-04	-1.34E-03
EP-marine	kg N eq.	1.30E-02	1.72E-02	1.27E-04	3.38E-02	0.00E+00	3.16E-03	0.00E+00	8.44E-03	-3.29E-03
EP-terrestrial	mol N eq.	1.27E-01	1.91E-01	7.97E-05	1.20E-01	0.00E+00	3.47E-02	0.00E+00	4.83E-03	-3.22E-02
POCP	kg NMVOC eq.	3.86E-02	5.03E-02	4.24E-05	2.05E-02	0.00E+00	1.22E-02	0.00E+00	1.31E-03	-1.05E-02
ADP - minerals & metals	kg Sb eq.	1.35E-04	5.11E-06	7.40E-09	5.81E-05	0.00E+00	1.09E-06	0.00E+00	4.69E-07	-5.01E-05
ADP - fossil	MJ, net calorific value	2.29E+02	4.17E+01	3.62E-02	3.92E+01	0.00E+00	1.70E+01	0.00E+00	1.92E+00	-7.65E+01

WDP	m3 world eq. Deprived	5.42E+00	1.04E-01	1.92E-03	1.36E+01	0.00E+00	1.53E-02	0.00E+00	1.14E-01	-1.84E+00

Table 12 Environmental impacts according to EN 15804 – WPC (5.0)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.24E+01	2.48E+00	1.88E-01	4.19E+00	0.00E+00	1.02E+00	0.00E+00	1.39E+00	-3.17E+00
GWP-fossil	kg CO2 eq.	1.26E+01	2.48E+00	1.73E-02	3.53E+00	0.00E+00	1.02E+00	0.00E+00	1.03E+00	-3.36E+00
GWP-biogenic	kg CO2 eq.	-3.60E-01	4.79E-04	1.71E-01	-3.34E+00	0.00E+00	3.14E-04	0.00E+00	3.60E-01	1.89E-01
GWP-luluc	kg CO2 eq.	1.52E-01	1.54E-03	2.12E-06	4.00E+00	0.00E+00	1.12E-04	0.00E+00	1.17E-04	-3.17E-03
ODP	kg CFC 11 eq.	4.88E-06	5.21E-07	4.05E-10	4.34E-07	0.00E+00	2.22E-07	0.00E+00	1.84E-08	-1.36E-06
AP	mol H+ eq.	5.90E-02	5.75E-02	2.33E-05	3.64E-02	0.00E+00	6.46E-03	0.00E+00	1.15E-03	-1.54E-02
EP-freshwater	kg P eq.	4.34E-03	1.15E-04	5.35E-07	2.40E-02	0.00E+00	1.83E-05	0.00E+00	1.20E-04	-1.22E-03
EP-marine	kg N eq.	1.28E-02	1.41E-02	1.27E-04	3.38E-02	0.00E+00	2.60E-03	0.00E+00	6.93E-03	-2.99E-03
EP-terrestrial	mol N eq.	1.22E-01	1.56E-01	7.97E-05	1.20E-01	0.00E+00	2.85E-02	0.00E+00	3.97E-03	-2.93E-02
POCP	kg NMVOC eq.	3.70E-02	4.13E-02	4.24E-05	2.05E-02	0.00E+00	1.00E-02	0.00E+00	1.07E-03	-9.50E-03
ADP - minerals & metals	kg Sb eq.	1.25E-04	4.20E-06	7.40E-09	5.81E-05	0.00E+00	8.91E-07	0.00E+00	4.23E-07	-4.53E-05
ADP - fossil	MJ, net calorific value	2.20E+02	3.42E+01	3.62E-02	3.92E+01	0.00E+00	1.39E+01	0.00E+00	1.74E+00	-6.93E+01
WDP	m3 world eq. Deprived	5.26E+00	8.56E-02	1.92E-03	1.36E+01	0.00E+00	1.25E-02	0.00E+00	1.03E-01	-1.66E+00

Table 13 Environmental impacts according to EN 15804 – EPC (5.0)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.06E+01	2.17E+00	1.88E-01	4.19E+00	0.00E+00	8.95E-01	0.00E+00	1.26E+00	-2.59E+00
GWP-fossil	kg CO2 eq.	1.09E+01	2.17E+00	1.73E-02	3.53E+00	0.00E+00	8.95E-01	0.00E+00	8.98E-01	-2.78E+00
GWP-biogenic	kg CO2 eq.	-3.60E-01	4.20E-04	1.71E-01	-3.34E+00	0.00E+00	2.75E-04	0.00E+00	3.60E-01	1.89E-01
GWP-luluc	kg CO2 eq.	5.78E-02	1.35E-03	2.12E-06	4.00E+00	0.00E+00	9.82E-05	0.00E+00	1.02E-04	-2.67E-03
ODP	kg CFC 11 eq.	2.96E-06	4.56E-07	4.05E-10	4.34E-07	0.00E+00	1.94E-07	0.00E+00	1.61E-08	-1.12E-06
AP	mol H+ eq.	5.10E-02	5.03E-02	2.33E-05	3.64E-02	0.00E+00	5.65E-03	0.00E+00	1.00E-03	-1.28E-02
EP-freshwater	kg P eq.	3.04E-03	1.01E-04	5.35E-07	2.40E-02	0.00E+00	1.60E-05	0.00E+00	1.05E-04	-1.03E-03
EP-marine	kg N eq.	1.05E-02	1.23E-02	1.27E-04	3.38E-02	0.00E+00	2.27E-03	0.00E+00	6.06E-03	-2.50E-03
EP-terrestrial	mol N eq.	1.05E-01	1.37E-01	7.97E-05	1.20E-01	0.00E+00	2.49E-02	0.00E+00	3.47E-03	-2.45E-02
POCP	kg NMVOC eq.	3.18E-02	3.61E-02	4.24E-05	2.05E-02	0.00E+00	8.79E-03	0.00E+00	9.37E-04	-7.92E-03
ADP - minerals & metals	kg Sb eq.	1.02E-04	3.67E-06	7.40E-09	5.81E-05	0.00E+00	7.79E-07	0.00E+00	3.70E-07	-3.74E-05
ADP - fossil	MJ, net calorific value	1.83E+02	3.00E+01	3.62E-02	3.92E+01	0.00E+00	1.22E+01	0.00E+00	1.52E+00	-5.73E+01
WDP	m3 world eq. Deprived	4.07E+00	7.49E-02	1.92E-03	1.36E+01	0.00E+00	1.10E-02	0.00E+00	9.02E-02	-1.38E+00

3.2 Resource use and waste categories

Table 14 Resource use and waste categories according to EN 15804 – LVT (2.5)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	9.11E+00	1.95E-01	3.08E-01	1.20E+02	0.00E+00	3.37E-02	0.00E+00	4.66E-02	-
PERM	MJ	1.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PERT	MJ	1.10E+01	1.95E-01	3.08E-01	1.20E+02	0.00E+00	3.37E-02	0.00E+00	4.66E-02	-
PENRE	MJ	1.22E+02	2.13E+01	1.84E+01	3.75E+01	0.00E+00	8.53E+00	0.00E+00	1.04E+00	-
PENRM	MJ	4.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PENRT	MJ	1.23E+02	2.13E+01	1.84E+01	3.75E+01	0.00E+00	8.53E+00	0.00E+00	1.04E+00	-
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
FW	m3	4.37E+00	2.69E-01	3.18E-01	4.55E+00	0.00E+00	3.69E-02	0.00E+00	6.31E-02	-
HWD	kg	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NHWD	kg	4.50E-01	0.00E+00	7.45E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MR	kg	0.00E+00	0.00E+00	3.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E+00	-
MER	kg	0.00E+00	0.00E+00	1.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.30E-01	-
EE	MJ	0.00E+00	0.00E+00	9.06E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.48E+00	-

Table 15 Resource use and waste categories according to EN 15804 – LVT click (4.2)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	1.11E+01	3.37E-01	1.31E-03	1.20E+02	0.00E+00	5.82E-02	0.00E+00	8.04E-02	-
PERM	MJ	1.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PERT	MJ	1.31E+01	3.37E-01	1.31E-03	1.20E+02	0.00E+00	5.82E-02	0.00E+00	8.04E-02	-
PENRE	MJ	1.82E+02	3.67E+01	3.68E-02	3.75E+01	0.00E+00	1.47E+01	0.00E+00	1.80E+00	-
PENRM	MJ	4.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PENRT	MJ	1.82E+02	3.67E+01	3.68E-02	3.75E+01	0.00E+00	1.47E+01	0.00E+00	1.80E+00	-
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
FW	m3	7.04E+00	4.63E-01	1.94E-03	4.55E+00	0.00E+00	6.37E-02	0.00E+00	1.09E-01	-
HWD	kg	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NHWD	kg	4.50E-01	0.00E+00	1.09E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-

CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MR	kg	0.00E+00	0.00E+00	4.67E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+00	-
MER	kg	0.00E+00	0.00E+00	1.74E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E+00	-
EE	MJ	0.00E+00	0.00E+00	1.23E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E+00	-

Table 16 Resource use and waste categories according to EN 15804 – PP (4.2)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	9.98E+00	3.02E-01	1.31E-03	1.20E+02	0.00E+00	5.22E-02	0.00E+00	7.21E-02	-
PERM	MJ	1.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PERT	MJ	1.19E+01	3.02E-01	1.31E-03	1.20E+02	0.00E+00	5.22E-02	0.00E+00	7.21E-02	-
PENRE	MJ	2.58E+02	3.29E+01	3.68E-02	3.75E+01	0.00E+00	1.32E+01	0.00E+00	1.61E+00	-
PENRM	MJ	4.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PENRT	MJ	2.58E+02	3.29E+01	3.68E-02	3.75E+01	0.00E+00	1.32E+01	0.00E+00	1.61E+00	-
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NRSF	MJ	3.44E+00	4.16E-01	1.94E-03	4.55E+00	0.00E+00	5.72E-02	0.00E+00	9.77E-02	-
FW	m3	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
HWD	kg	4.50E-01	0.00E+00	1.01E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NHWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
CRU	kg	0.00E+00	0.00E+00	4.33E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E+00	-
MR	kg	0.00E+00	0.00E+00	1.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E+00	-
MER	kg	0.00E+00	0.00E+00	2.29E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+01	-
EE	MJ	1.22E+01	2.64E-01	1.26E-03	1.25E+02	0.00E+00	5.00E-02	0.00E+00	6.70E-02	-

Table 17 Resource use and waste categories according to EN 15804 – SPC (5.0)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	1.67E+01	4.01E-01	1.31E-03	1.20E+02	0.00E+00	6.93E-02	0.00E+00	9.57E-02	-
PERM	MJ	1.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PERT	MJ	1.87E+01	4.01E-01	1.31E-03	1.20E+02	0.00E+00	6.93E-02	0.00E+00	9.57E-02	-
PENRE	MJ	2.29E+02	4.37E+01	3.68E-02	3.75E+01	0.00E+00	1.75E+01	0.00E+00	2.14E+00	-
PENRM	MJ	4.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PENRT	MJ	2.29E+02	4.37E+01	3.68E-02	3.75E+01	0.00E+00	1.75E+01	0.00E+00	2.14E+00	-
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
FW	m3	9.79E+00	5.52E-01	1.94E-03	4.55E+00	0.00E+00	7.58E-02	0.00E+00	1.30E-01	-
HWD	kg	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-

NHWD	kg	4.50E-01	0.00E+00	1.25E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MR	kg	0.00E+00	0.00E+00	5.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.90E+00	-
MER	kg	0.00E+00	0.00E+00	2.01E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+00	-
EE	MJ	0.00E+00	0.00E+00	1.46E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+01	-

Table 18 Resource use and waste categories according to EN 15804 – WPC (5.0)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	1.74E+01	3.29E-01	1.31E-03	1.20E+02	0.00E+00	5.68E-02	0.00E+00	7.85E-02	-
PERM	MJ	1.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PERT	MJ	1.93E+01	3.29E-01	1.31E-03	1.20E+02	0.00E+00	5.68E-02	0.00E+00	7.85E-02	-
PENRE	MJ	2.20E+02	3.58E+01	3.68E-02	3.75E+01	0.00E+00	1.44E+01	0.00E+00	1.75E+00	-
PENRM	MJ	4.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PENRT	MJ	2.20E+02	3.58E+01	3.68E-02	3.75E+01	0.00E+00	1.44E+01	0.00E+00	1.75E+00	-
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
FW	m3	9.05E+00	4.53E-01	1.94E-03	4.55E+00	0.00E+00	6.22E-02	0.00E+00	1.06E-01	-
HWD	kg	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NHWD	kg	4.50E-01	0.00E+00	1.07E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MR	kg	0.00E+00	0.00E+00	4.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E+00	-
MER	kg	0.00E+00	0.00E+00	1.70E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.40E+00	-
EE	MJ	0.00E+00	0.00E+00	1.41E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.52E+00	-

Table 19 Resource use and waste categories according to EN 15804 – EPC (5.0)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit										
Core indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	1.30E+01	2.88E-01	1.31E-03	1.20E+02	0.00E+00	4.97E-02	0.00E+00	6.87E-02	-
PERM	MJ	1.93E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PERT	MJ	1.50E+01	2.88E-01	1.31E-03	1.20E+02	0.00E+00	4.97E-02	0.00E+00	6.87E-02	-
PENRE	MJ	1.83E+02	3.14E+01	3.68E-02	3.75E+01	0.00E+00	1.26E+01	0.00E+00	1.53E+00	-
PENRM	MJ	4.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
PENRT	MJ	1.83E+02	3.14E+01	3.68E-02	3.75E+01	0.00E+00	1.26E+01	0.00E+00	1.53E+00	-
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-

FW	m3	7.46E+00	3.96E-01	1.94E-03	4.55E+00	0.00E+00	5.44E-02	0.00E+00	9.30E-02	-
HWD	kg	3.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
NHWD	kg	4.50E-01	0.00E+00	9.70E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MR	kg	0.00E+00	0.00E+00	4.19E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+00	-
MER	kg	0.00E+00	0.00E+00	1.53E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E+00	-
EE	MJ	0.00E+00	0.00E+00	1.22E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.60E+00	-

3.3 Information on biogenic carbon content

Information on biogenic carbon content which shall be included in the EPD as table below.

Table 20 Biogenic carbon content

Biogenic carbon content	Unit (expressed per functional unit or per declared unit)
Biogenic carbon content in product	0 kg C
Biogenic carbon content in accompanying packaging	0.098 kg C
NOTE：1 kg biogenic carbon is equivalent to 44/12 kg of CO2.	

4 Supplementary information

4.1 Calculation rules

4.1.1 Assumptions

The key assumptions of this LCA study are as follows：

- The raw material Calcium stearate and Zinc stearate can't be found in background database, they were substituted by stearic acid from Ecoinvent database;
- Distribution of natural gas consumption and electricity among the production processes were calculated by the site engineer using historical data and knowledge of operation, because there is no specific metering or monitoring system in place to track the consumption rate of material flows in the factory;
- Transport assumptions were made where it was not possible to obtain the specific data, e.g. distance of oceanic transportation and in land transportation in North America, EU and other market. When this occurred, it was clearly stated in the report and a sensitivity analysis is conducted;
- Electricity and material consumption data were not obtained for certain processes so assumptions were made for these, e.g. maintenance stage. When this or similar situation occurred, it was clearly stated in the report;
- Deconstruction of flooring tile from the floor during the disposal stage is considered through manual operation for LVT Click and other products, but some mechanical operation is considered for removal of LVT product (as it is glued onto the floor). However due to the small ratio (likely below 1% of overall energy consumption), the removal of LVT tile from floor are omitted from modelling.

4.1.2 Cut off rules

The following procedure was followed for the exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process will be included in the calculation for which data is available. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices will be documented;
- In case of insufficient input data or data gaps for a unit process, according to the PCR requirement, the cut-off criteria chosen is 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows of the cradle to grave stage, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5% of energy usage and mass, in this study, the neglected flow is demonstrated in table below.

Table 22: Cut off flows

Flow name	Process stage	Mass %	Total Mass %
Waste filter cotton	Production process waste gas treatment	8.5 E-05, <<1%	8.5 E-05, <<1%
Waste residue	Production process	7 E-05, <<1%	1.55 E-04, <<1%
Waste rag	Production process	1 E-04, <<1%	2.55 E-04, <<1%
Waste heat conducting oil	Production process	2.8 E-04, <<1%	5.35 E-04, <<1%

It is estimated that the largest omitted mass flow in the product life cycle is associated with production stage, but it does not exceed 1% of total mass flow in the worst-case scenario. It is estimated that environmental relevance over impact categories during whole product life cycle does not exceed 1% in the worst-case scenario.

Cut-off criteria were applied to capital equipment production and maintenance. It was assumed that the impacts associated with these aspects were sufficiently small enough to fall below cut-off when it is scaled down to the declared unit.

Material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this study will be included in the assessment. So far according to review of the Material Safety Data Sheet (MSDS) and relevant physical, no significant negative emission to the environment is identified.

4.1.3 Data quality

Steps were taken to ensure that the life cycle inventory data were reliable and representative. The type of data that was used is clearly stated in the Inventory Analysis, be it measured or calculated from primary sources or whether data are from the life cycle inventory databases. In this study, generic data for certain processes were sourced from databases in SimaPro 9.5.

SimaPro is the world's most widely used LCA software and the data in it comes predominantly from Ecoinvent 3.8, the world's most complete and widely used set of data on industrial processes, material production, packaging production, transport and so on.

The data quality requirements for this study were as follows:

- Existing LCI data were, at most, 10 years old. Newly collected LCI data were current or up to 3 years old.
- The LCI data related to the geographical locations in which the processes occurred, e.g. electricity and transportation data from China, disposal in USA and Europe and etc.
- The technology represented the average technologies at the time of data collection.

In the study the key parameters for producer-specific foreground data are based on 1 year (2022) of averaged data. In case of gap of data from Ecoinvent 3.8 database, to avoid using dummy (empty) processes in the study, and also to use as much regional data as possible in some cases, alternative database is also referred to.

4.1.4 Allocations

Allocation refers to partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems. In this report, in plant recycling for substrate production is considered and assumed as a close loop, meaning all of the environment impact from recycling of substrate scraps, and flooring scraps from cutting and edging treatment and benefit of using recycled material to avoid waste treatment for substrate production are allocated to the process of flooring production.

For recycling and disposal process at the end of life stage, as described above, the benefits of recycling and recovery is out of boundary of the product system, and will not be allocated to flooring product.

For process-related allocations, a distinction is made between multi-input and multi-output processes.

Multi-input processes

For data sets in this study, the allocation of the inputs from coupled processes is generally carried out via the mass. For literature data, the source is generally referred to. In this study one allocation occurs on BBL flooring production, in allocating the input and output, i.e. energy within the production site such as electricity, natural gas and etc. and some other raw material such as diesel, emission such as off gas among the various series of flooring products, allocation is done via both mass and size of the specific series of product produced on a yearly average. The principle for choosing the mass and size is based on the linear relationship of the product output to the environmental impacts.

Multi-output processes

In this study, there is no other by products produced from the production line, hence there is quite little occasion that required allocation for multi-output processes. One allocation occurs on the environmental emissions allocation, especially in the area of waste treatment. In the end of life stage, the allocation within the disposal scenario follows mass allocation, which applies to waste treatment process inventory adopted from Ecoinvent data.

4.2 Scenarios and additional technical information

Table 23 Scenario and additional technical information of installation.

Name			Value	Unit
Ancillary materials			0.3 (glue, only for LVT product)	kg
Water use			-	m^3
Other resources			-	kg
Electricity consumption			-	kWh
Other energy carriers			-	MJ
Product loss per functional unit			0.1	m^2/m^2
Waste materials at the construction site before waste processing, generated by product installation	Waste product		0.1	m^2
	Packaging waste	Paper	0.146	kg
		Wood	0.095	
		Plastic	0.029	
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	Waste product	recycling	0.400	m^2
		energy recovery	0.175	m^2
		disposal	0.425	m^2
	Packaging waste	recycling	Paper:0.101 Wood:0.032 Plastic:0.005	kg
		energy recovery	Paper:0.008 Wood:0.016 Plastic:0.006	kg
		disposal	Paper:0.036 Wood:0.048 Plastic:0.018	kg
Direct emissions to ambient air, soil and water			-	kg

Note:

1. Output materials (specified by type) as result of waste processing at the building site use weighted value, namely,

Output materials=ΣMass of material*market ratio*route ratio

2. The energy recovery of waste packaging materials in the table mainly refers to energy recovery from waste incineration.

Table 24 Scenario and additional technical information of RSL.

Name	Value	Unit
RSL	25	years
Declared product properties (at the gate) and finishes, etc.	Resilient flooring tile	m^2
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)	-	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	-	-
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	-	-
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)	Temperature: 23±2°C; Humidity: 30% - 50%	-
Use conditions, e.g. frequency of use, mechanical exposure.	Residential use	-
Maintenance, e.g. required frequency, type and quality of replacement components	Vacuuming and mopping once a week	-

Table 25 Scenario and additional technical information of maintenance.

Name	Value	Unit
B2 Maintenance		
Maintenance process information (cite source in report)	Vacuuming and mopping	-
Maintenance cycle	Vacuuming: 52 Mopping: 52	Cycles/yr
Ancillary materials specified by type (e.g. cleaning agent)	Detergent: 0.052	$g/m^2/yr$
Other resources	-	kg
Energy input, specified by activity, type and amount	Electricity: 0.052	$kWh/m^2/yr$
Net fresh water consumption during maintenance	-	m^3
Waste materials from maintenance (specify materials)	-	kg
Direct emissions to ambient air, soil and water	-	kg

Table 26 Scenario and additional technical information of end of life.

Name		Value		Unit
Collection process	Collected separately	-		kg
	Collected with mixed construction waste	LVT (2.5)	4.75	kg
		LVT click (4.2)	8.19	
		PP (4.2)	7.35	
		SPC (5.0)	9.75	
		WPC (5.0)	8	
		EPC (5.0)	7	
Recovery	Reuse	-		kg
	Recycling	LVT (2.5)	1.90	kg
		LVT click (4.2)	3.28	
		PP (4.2)	2.94	
		SPC (5.0)	3.90	
		WPC (5.0)	3.20	
		EPC (5.0)	2.80	
	Energy recovery	LVT (2.5)	0.83	kg
		LVT click (4.2)	1.44	
		PP (4.2)	1.29	
		SPC (5.0)	1.71	
		WPC (5.0)	1.40	
		EPC (5.0)	1.23	
Disposal	Product or material for final deposition	LVT (2.5)	2.02	kg
		LVT click (4.2)	3.48	
		PP (4.2)	3.12	
		SPC (5.0)	4.14	
		WPC (5.0)	3.40	
		EPC (5.0)	2.97	
Assumptions for scenario development, e.g. transportation	Waste transportation (from building site to MSW treatment site)	100 (lorry)	km	Assumptions for scenario development, e.g. transportation

Note: Mass of Recovery/Disposal of product or material use weighted value, namely, Mass of Recovery/Disposal =Σ Mass of product or material*market ratio*route ratio.

The raw materials of BBL flooring products are non-degradable, and the energy recovery of the waste products is mainly from waste incineration. According to the conclusion of the Best Available Technology (BAT) for waste incineration released by the European Union in December 2019, the electricity generation efficiency of waste incineration is 20%-35%.

Table 27 Scenario and additional technical information of transport to the building site.

Name		Value		Unit
		Road	Ocean	
Fuel type		Diesel	Heavy Oil	
Liters of fuel		31.11 l/100km	12.483 t/100km	L /100km or T/100km
Vehicle type		Lorry (32t)	Transoceanic Ship (50000 dwt)	
Transport distance		1000	20400	km
Bulk density of transported products	LVT (2.5)	1900	1900	kg/m^3
	LVT click (4.2)	1950	1950	
	PP (4.2)	1750	1750	
	SPC (5.0)	1950	1950	
	WPC (5.0)	1600	1600	
	EPC (5.0)	1400	1400	
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)		0.4	0.4	-

Note: Transport distance (Ocean)uses weighted value, namely, Transport distance (Ocean) = Σ market ratio*market distance.

References

EPD CHINA GENERAL PROGRAMME INSTRUCTIONS VERSION 3.0

EN 15804: 2012+A2:2019/AC:2021, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14040: Environmental management – Life cycle assessment – Principles and framework

ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines

EPDEN-PCR-202204-Construction products and construction services V2.0

LCA Report - LCA Report for BBL Resilience Floor Tile21 LVT, LVT click, PP, SPC, WPC, EPC. by Xu Fangyan,

https://www.bblflooring.com

Revision history

First revision: this EPD has been updated on 24th November, 2023. This revision includes applying the EPD China template, updating PENRT results, and deleting unverifiable information relating to company information and product description.

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