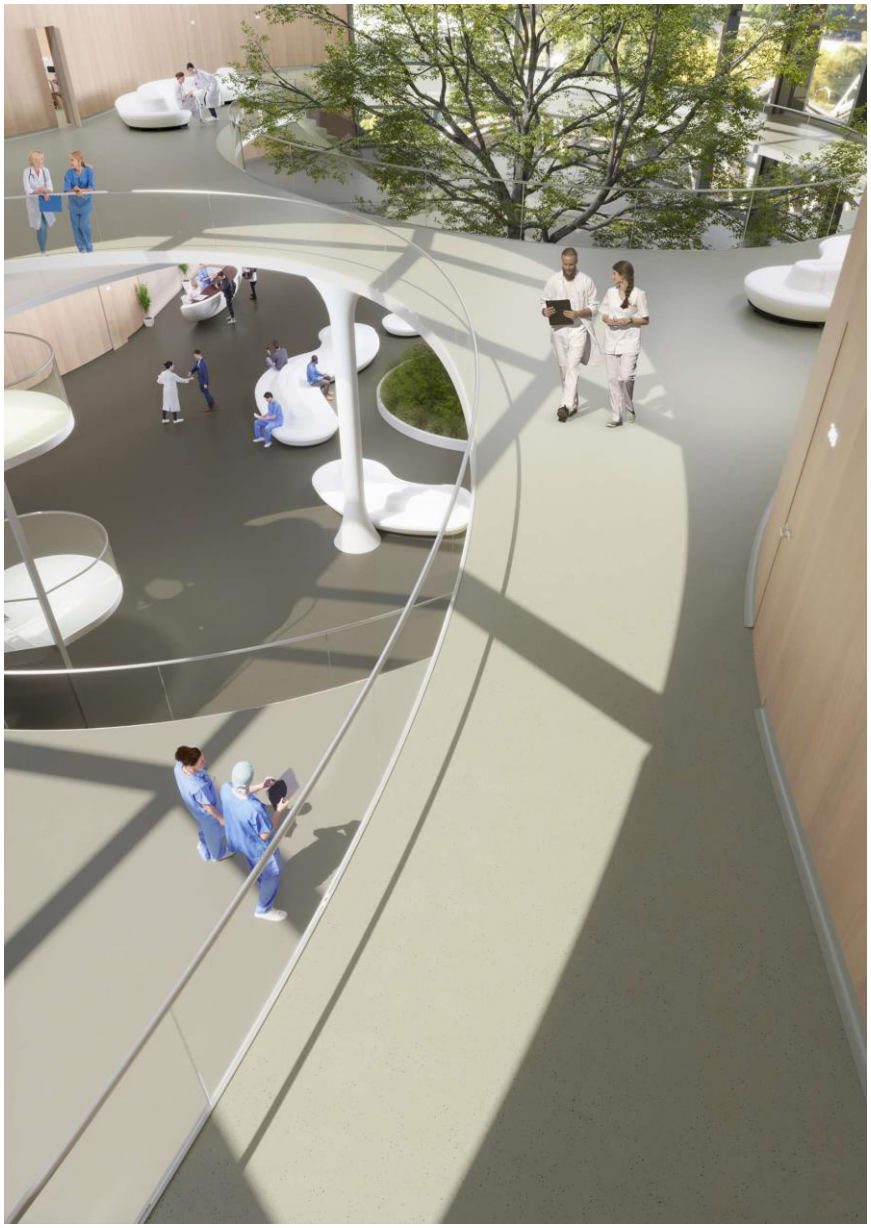
ENVIRONMENTAL PRODUCT DECLARATION

DHARMA, GRANITO, GRAIN-HARMONI, KAYAR, LAVA, NATURA, SCREED-MASSETTO, UNI, ZEUS

RUBBER FLOORING TECHNOLOGY
RESILIENT FLOOR COVERING

GAIA version



Rubber flooring with smooth or embossed surface in a variety of designs.

artigo by MONDO

Rubber is a unique raw material with great elasticity and stress resistance, making it the ideal material for producing high-performance flooring that is perfect for a wide variety of indoor public spaces, such as schools, hospitals, laboratories, offices, museums, and more. In addition to its unmatched technical characteristics and durability, rubber flooring offers endless creative and tasteful design solutions. With a passion for innovation, quality, and beauty, we pride ourselves on being a reliable partner and offering flooring solutions that represent excellence for any of your projects.

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ENVIRONMENTAL PRODUCT DECLARATION

artigo

DHARMA, GRANITO, GRAIN/HARMONI, KAYAR, LAVA, NATURA, SCREED-MASSETTO, UNI, ZEUS

RESILIENT FLOOR COVERING – VERSION **GAIA**

According to ISO 14025, EN 15804, and EN 16810

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions www.ul.com 333 Pfingsten Road, Northbrook, IL 60611 spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.4 July 2018
MANUFACTURER NAME AND ADDRESS	Artigo Spa – Loc. Carpeneto, 17014, Cairo Montenotte (Sv), Italy (part of MONDO group)
DECLARATION NUMBER	4790957837.105.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1m^2
REFERENCE PCR AND VERSION NUMBER	EN 15804+A2:2019+AC & EN 16810:2017
DESCRIPTION OF PRODUCT APPLICATION/USE	Rubber resilient flooring is classified in accordance with ISO 10874 and in reference to the FCSS to be installed in the following areas of application: Domestic 23, Commercial 34, Industrial 42
MARKETS OF APPLICABILITY	Global
DATE OF ISSUE	June 1, 2024
PERIOD OF VALIDITY	5 years
RSL	1 year
EPD TYPE	Product-Specific Type III EPD
EPD SCOPE	Cradle to grave
YEAR(S) OF REPORTED PRIMARY DATA	2022
LCA SOFTWARE & VERSION NUMBER	SimaPro v. 9.5.0.0
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v. 3.8
The PCR review was conducted by:	European Standards CSN EN 15804+A2 Info@en-standard.eu
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒EXTERNAL	Cooper McCollum, UL Solutions
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Sung Mo Yeon, H.I.P. Pathway

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. 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. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

Artigo develops and produces innovative and high-performance rubber flooring that stems from research work that began with the Pirelli Group in the 1920s, later converging with MONDO group, established in 1948 and now a world leader in rubber flooring for commercial and sport applications. The coming together of two industrial cultures has produced a vast and diverse collection, with an exceptional number of different applications.

The company is dedicated to upholding the highest standards that honour both the environment and society. This commitment is reflected in the long-lasting, high-quality flooring we offer, which respects the environment in all its facets. Artigo ensures strict oversight of production, carefully selects raw materials, and holds prestigious international certifications for their finished products, all of which serve as evidence of our environmental dedication.
Artigo's factory conforms to the following Standards:

- ISO 14001 Environmental Management Systems;
- ISO 14064 Greenhouse Gas (GHG) Quantification and Reporting;
- ISO 9001 Quality Management Systems;
- ISO 50001 Energy Management Systems.

Figure 1 Artigo Certifications

1.2. Product Description

GAIA is the result of an Eco-Design working method that consists of selecting and incorporating more sustainable ingredients into our rubber flooring products. By utilizing this approach, we can provide products with lower environmental impacts. For years, our research has been dedicated to identifying more sustainable raw materials, incorporating additional recycled content, and utilizing new bio-based options that align with our environmental goals. Same great products, new optimized sourcing.

Product Identification

Product Designation: Rubber flooring Artigo GAIA version – in various designs named: Dharma, Granito, Grain-Harmoni, Kayar, Lava, Natura, Screed-Massetto, Uni, Zeus. This environmental product declaration covers the collection of resilient flooring produced by ArtigoThese products come in various designs, embossed or smooth, where the smooth surfaces have a factory-applied surface treatment.

Product Specification

Product characteristics are listed in Table 2, Table 3, Table 4, and Table 5. The product has technical specifications compliant with EN 1817 Resilient Floor Coverings (smooth) and EN 12199 Resilient Floor Coverings (relief) for the European markets, in addition to technical specifications compliant with ASTM F1344 Rubber Floor Tile and ASTM F1859 Rubber Sheet Flooring (without backing) for the North American markets.

In addition, Artigo has been awarded with several international environmental certificates such as:

- GREENGUARD Gold: UL 2818-2022
- Blue Angel – DE-UZ 120
- Cradle to Cradle - SILVER
- A+
- GECA
- Eurofins IACG (Indoor Air Comfort Gold)
- Emission Class for building material M1

Figure 2 Artigo Certifications

The following United Nations Standard Products and Services Code (UNSPSC) and Construction Specifications Institute (CSI) classification apply to the product:

- UNSPSC: 30161700 Flooring
- CSI/CSC: 09 65 00 Resilient Flooring

This declaration covers products in GAIA version with the commercial references: Dharma, Granito, Grain-Harmoni, Kayar, Lava, Natura, Screed-Massetto, Uni, Zeus, in the thicknesses 2, 3, 3.5, 5 mm. An analysis has been performed on all products. The environmental impacts have a variation of ±5% compared to the median.

1.3. Application

The products covered by this declaration are designed for use in schools, offices, laboratories, hospitals, museums, indoor public spaces and other commercial environments. Artigo rubber flooring is classified in accordance with ISO 10874 (previously EN 685) and in reference to the FCSS (Floor Covering Standard Symbol) to be installed in the following areas of application :

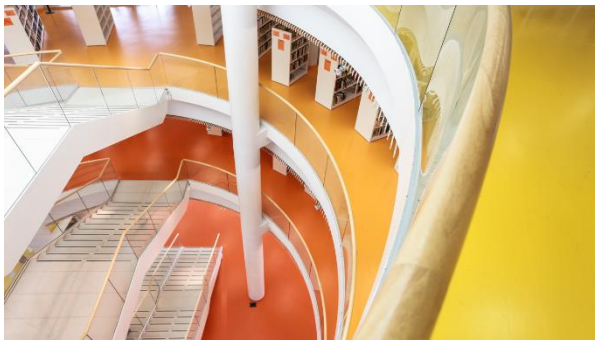


Figure 3 Example of application.

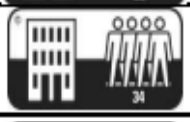
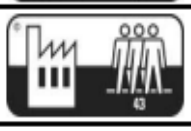
Domestic	
Commercial	
Industrial	

Table 1 Area of application

1.4. Declaration of Methodological Framework

For this project, a Cradle-to-Grave LCA approach has been applied, using a functional unit as reference.
Specific data and background system have been modelled with generic data from the Ecoinvent 3.8 database. No known flows have been deliberately omitted from the calculation.

The Reference Service Life (RSL) and technical and functional performances described in this EPD are applicable as long as the product use complies with that defined by ISO 10874 (previously EN 685) and EN 1817 in accordance with the product's classification.
Information concerning the LCA rules including cut-off and allocation rules to this study may be found in Chapter 2.

1.5. Technical Requirements

Characteristics	Nominal Value	Unit	Standard
Product Thickness	2.0	mm	-
Product Weight	3.1	kg/m²	-
Abrasion Resistance	150	mm^3	ISO 4649 (Met. A-5N)
Roll Width **Length**	1.90 14	m	- -
Tile Size	0.61 x 0.61	m	-
Hardness	88	Shore A	ISO 48-4 (ISO 7619)
Residual indentation	≤ 0.15	mm	EN/ISO 24343-1 (EN 433)
Fire behaviour	Bfl – s1	class	EN 13501-1
Slip resistance	≥0.30(DS)	class	EN 13893

Table 2 Average product characteristics for 2 mm.

Characteristics	Nominal Value	Unit	Standard
Product Thickness	3.0	mm	-
Product Weight	4.75	kg/m²	-
Abrasion Resistance	150	mm^3	ISO 4649 (Met. A-5N)
Roll Width **Length**	1.90 10	m	- -
Tile Size	0.61 x 0.61 1 x 1	m	-
Hardness	88	Shore A	ISO 48-4 (ISO 7619)
Residual indentation	≤ 0.20	mm	EN/ISO 24343-1 (EN 433)
Fire behaviour	Bfl – s1	class	EN 13501-1
Slip resistance	≥0.30(DS)	class	EN 13893

Table 3 Average product characteristics for 3 mm.

Characteristics	Nominal Value	Unit	Standard
Product Thickness	3.5	mm	-
Product Weight	5.45	kg/m²	-
Abrasion Resistance	140	mm^3	ISO 4649 (Met. A-5N)
Tile Size	1 x 1	m	-
Hardness	90	Shore A	ISO 48-4 (ISO 7619)
Residual indentation	≤ 0.25	mm	EN/ISO 24343-1 (EN 433)
Fire behaviour	Bfl – s1	class	EN 13501-1
Slip resistance	≥0.30(DS)	class	EN 13893

Table 4 Average product characteristics for 3.5 mm.

Characteristics	Nominal Value	Unit	Standard
Product Thickness	5.0	mm	-
Product Weight	8.1	kg/m²	-
Abrasion Resistance	150	mm^3	ISO 4649 (Met. A-5N)
Roll Width **Length**	1.90 10	m	- -
Tile Size	0.61 x 0.61 1 x 1	m	-
Hardness	86	Shore A	ISO 48-4 (ISO 7619)
Residual indentation	≤ 0.20	mm	EN/ISO 24343-1 (EN 433)
Fire behaviour	Bfl – s1	class	EN 13501-1
Slip resistance	≥0.30(DS)	class	EN 13893

Table 5 Average product characteristics for 5 mm.

1.6. Material Composition

Component	Material	Mass %	Availability		
			Renewable	Recycled	Non-Renewable
Binder	Synthetic rubber	22			*Non-Renewable -- Limited*
	Synthetic rubber BA		*bio attributed*		
Filler	Calcium Carbonate	8		*Post industrial waste*	
	Reused & Recycled rubber	21,5			
	Silica	36	*bio-based from rice husk*		
	Kaolin				*Abundant Mineral*
Additives	Various	8			*Limited*
Pigments	Titanium Dioxide	3			*Limited*
	Other Pigments	0,5			*Limited*
Surface treatment	UV cured	1			

NB: The total renewable content, from bio-attribute and bio-based, is 18% in average

Table 6 Average product composition for 2 mm.

Component	Material	Mass %	Availability		
			Renewable	Recycled	Non-Renewable
Binder	Synthetic rubber	22			*Non-Renewable -- Limited*
	Synthetic rubber BA		*bio attributed*		
Filler	Calcium Carbonate	15		*Post industrial waste*	
	Reused & Recycled rubber	20			
	Silica	33	*bio-based from rice husk*		
	Kaolin				*Abundant Mineral*
Additives	Various	7			*Limited*
Pigments	Titanium Dioxide	2			*Limited*
	Other Pigments	0,4			*Limited*
Surface treatment	UV cured	0,6			

NB: The total renewable content, from bio-attribute and bio-based, is 14,5% in average

Table 7 Average product composition for 3 mm.

Component	Material	Mass %	Availability		
			Renewable	Recycled	Non-Renewable
Binder	Synthetic rubber	22			*Non-Renewable - - Limited*
	Synthetic rubber BA		*bio attributed*		
Filler	Calcium Carbonate	10		*Post industrial waste*	
	Reused & Recycled rubber	25,5			
	Silica	34	*bio-based from rice husk*		
	Kaolin				*Abundant Mineral*
Additives	Various	6			*Limited*
Pigments	Titanium Dioxide	2			*Limited*
	Other Pigments	0,4			*Limited*

NB: The total renewable content, from bio-attribute and bio-based, is 14% in average

Table 8 Average product composition for 3.5 mm.

Component	Material	Mass %	Availability		
			Renewable	Recycled	Non-Renewable
Binder	Synthetic rubber	22			*Non-Renewable - - Limited*
	Synthetic rubber BA		*bio attributed*		
Filler	Calcium Carbonate	30		*Post industrial waste*	
	Reused & Recycled rubber	16,5			
	Silica	25	*bio-based from rice husk*		
	Kaolin				*Abundant Mineral*
Additives	Various	5			*Limited*
Pigments	Titanium Dioxide	1			*Limited*
	Other Pigments	0,1			*Limited*
Surface treatment	UV cured	0,4			

NB: The total renewable content, from bio-attribute and bio-based, is 8% in average

Table 9 Average product composition for 5 mm.

Synthetic rubber: mainly SBR high-quality elastomeric material, making it suitable for various applications, including flooring. The origin of the polymer can be fossil or bio-attributed. Bio-attributed SBR is produced from bio-attributed monomer, a renewable biomass-derived raw material that does not compete with the food chain. It replaces fossil raw materials, saving greenhouse gases compared to conventionally produced SBR.

Calcium Carbonate: an abundant mineral found in all parts of the world. A recycled alternative material is available by sourcing post-industrial waste from marble processing.

Kaolin: obtained by quarrying the abundant mineral kaolinite.

Amorphous silica from rice husk: an inorganic material characterized by its particulate structure, derived from rice husks, which is the part of the rice left over after threshing, contains a good amount of silica, which can be extracted through appropriate processes, and is considered a more sustainable alternative to silica obtained from traditional sources, such as quartz, as it exploits an agricultural by-product and reduces dependence on non-renewable natural resources . It is used for its positive contribution to mechanical properties.

Titanium Dioxide & pigment: a white pigment produced by an industrial chemical processing of rutile, a natural form of titanium dioxide. Other colour pigments are mainly iron oxide based.

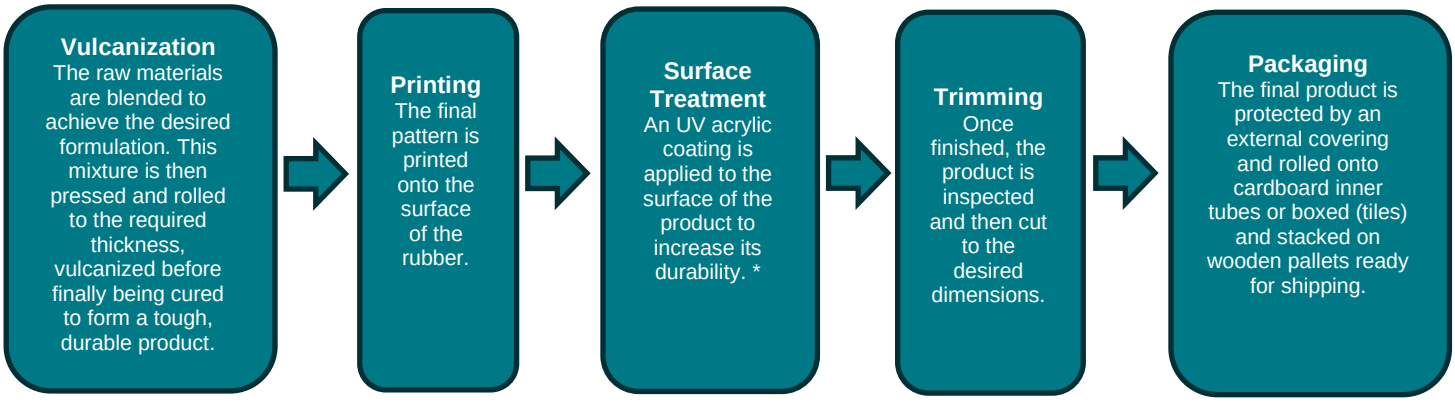
Reused & Recycled rubber – post-industrial scrap material from Artigo production or from other factories. The material is grinded, processed and used as a raw material into new flooring.

Various other additives: auxiliary materials and sulfur needed for vulcanization.

Surface treatment: factory applied, uv-cured, surface treatment based on an acrylate dispersion.

1.7. Manufacturing

The production of the resilient flooring is divided into the following stages:



- Production scraps are re-used into the new production process, with the rest being collected and recycled externally. Packaging materials are likewise collected and disposed or recycled externally.
- Artigo has solar panels installed on its factory to provide electricity. The remaining electricity is supplied by a certified renewable energy supplier.

** Surface treatment applied only to smooth products where provided.*

1.8. Packaging

All packaging materials are recyclable, however due to the variability of waste treatment on construction sites the hypothesis are divided into landfill, incineration and recycling, excluding wooden pallets for which reuse has been considered, has been retained for this EPD.

1.9. Transportation

Sales take place in Europe, Far East (China) and North America. For sales in Europe the product is delivered by truck, while for sales abroad it is shipped by sea from the port of Genoa, 50 km from the factory. On average every square meter of floor is transported as per the following table, divided into the various floor thicknesses:

Type of vehicle	Average value (km)			
	2 mm	3 mm	3,5 mm	5 mm
7.5-16T Truck	403	364	527	506
16-32T Truck	402	365	529	506
Transoceanic Freight	1191	1280	1653	279

Table 10 Average distance (in km) of destinations.

1.10. Product Installation

The product is installed by hand using steel or carbide trowels. Approximately 300g/m² of an acrylic water-based low emission adhesive is used to glue the flooring in place. Following installation, a first cleaning is performed with a neutral detergent (0.0149 kg/m²) diluted in water (0.1999 kg/m²), either by mop or floor scrubber (electricity consumption: 0.0404 kWh/ m²). For this LCA the following scenario has been used as 50% using the Mop and 50 % using machine. During the installation approximately 5% of the material is lost as off-cuts. In the modelling, in module A5, a contribution of 5% of modules A1- A3 + A4 was considered. The waste was assumed to be 50% landfilled and 50% recycled (for cement production). A distance of 50 km was assumed from the installation site to the disposal/recovery plant. The waste generated during the installation phase is the packaging of the finished product. For the simulation of the end-of-life of the packaging, the treatment/disposal site was assumed to be 50 km from the installation site. For the Pallet, it was considered a reuse.

1.11. Use

The service lifetime of a floor covering for a certain application on a floor is too widespread to give one common number. For this EPD model the reference service life (RSL) is set to one year, according with EN 16810:2017. This means that all impacts for the use phase are based on the cleaning and maintenance model for one year. Depending on the area of use, the technical lifetime advised by the manufacturer and estimated time on the floor by customer, the service lifetime can be determined. The use phase impacts should be calculated with the foreseen service life to arrive at the total environmental impact. The service lifetime recommended by Artigo is 35 years.

Cleaning and maintenance

For the calculations the following cleaning routine is considered:

- Daily cleaning (if necessary): simply clean with a soft brush.
- Routine cleaning (once a week or when necessary): clean with 0.7441 kg/ m² *year neutral detergent diluted in water or 0.0339 kg/ m² *year of alkaline detergent using a mop for small zone. For larger areas the cleaning is combined with an electric machine with an electricity consumption of 0.1444 kWh/ m² *year. The wet cleaning includes a water consumption of 10.374 kg/ m² *year. For LCA calculations, 50 routine cleanings per year and 2 extraordinary cleanings per year are assumed.

Prevention of structural damage

To avoid excessive wear, usage should be restricted to the stated areas of application as outlined by the norm ISO 10874 (previously EN 685).

Health aspects during usage

The products are compliant with BlueAngel, GREENGUARD Gold and Eurofins IACG specifications.

1.12. End of life

It is assumed that no specific impacts should be attributed to the deconstruction phase, as this process is either carried out by hard or in the case of a building demolition, the product adds no impact to the overall impact of the demolition.

For the end-of-life phase, two different scenarios have been assumed and the results are indicated separately in module C:

1. 100% landfill disposal
2. 100% it was assumed that the material is recycled in a cement factory for use as CSS "End of Waste"

For Scenario 1 and 2, it has been assumed that 100% of the product is respectively sent to landfill or to cement factory at the end of its useful life. The transport between installation site and landfill/cement factory is by truck, with an estimated distance of 50 km.

Reuse, Recycling, and Energy Recovery

Module D includes the avoided impacts of all net end-of-life flows. This encompasses the avoided impacts related to the percentages of material sent for recycling/recovery in modules A5 and C3. Specifically, the benefit typically derived from the production of thermal energy following the use of the pavement as CSS 'waste end of life' in cement production has been considered (with a fossil fuel substitution rate of 52.2%.). As a precaution, the benefits arising from the energy recovery and material recovery of packaging in module A5 have not been taken into account.

2. Life Cycle Assessment Background Information

A full Life Cycle Assessment has been performed according to ISO 14040, ISO 14044 and in compliance with EN15804 and EN 16810.

2.1. Functional or Declared Unit

The functional unit is one square meter of installed product and the use stage is considered for one year of service life.

	Value	Unit
Functional Unit	1	m²
Conversion factor to 1kg	0.322	-

Table 11 Functional Unit for 2 mm

	Value	Unit
Functional Unit	1	m²
Conversion factor to 1kg	0.211	-

Table 12 Functional Unit for 3 mm

	Value	Unit
Functional Unit	1	m²
Conversion factor to 1kg	0.183	-

Table 13 Functional Unit for 3.5 mm

	Value	Unit
Functional Unit	1	m²
Conversion factor to 1kg	0.123	-

Table 14 Functional Unit for 5 mm

2.2. System Boundary

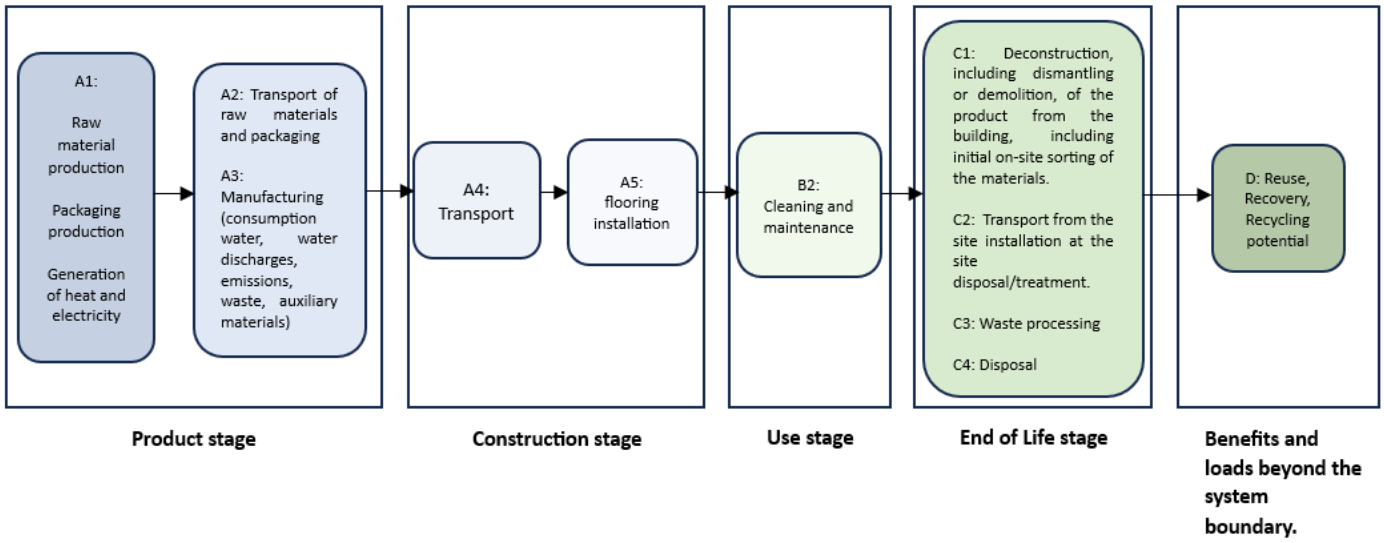


Figure 4 Flow diagram of the Life Cycle Assessment

This EPD is a cradle-to-grave analysis, consisting of the following steps:

A1 – A3: Product stage - includes the provision of all raw materials and their packaging, transport to the production site and energy consumption during the manufacturing of the product, as well as processing of waste generated by the factory.

A4 – A5: Construction stage - includes the transport from the factory to the final customer, packaging of the final product and the installation of the product, as well as all consumables and energy required, and processing of waste generated during the installation.

B2: Use Stage (Maintenance of the floor) – includes provision and transport of all materials, product and services related to the use phase of the product, as well as their related energy and water consumption, and the processing of any resulting waste. For floor coverings the modules B1, B3 to B7 are not relevant to the environmental performance of a product.

C1 – C4: End of Life Stage (Deconstruction, Transport, Waste processing, Disposal). Two different End of Life scenarios are declared:

- Scenario 1: 100% landfill disposal
- Scenario 2: it was assumed that the material would be sent to the cement factory for use as CSS "End of Waste".

D: Benefits and loads beyond the system boundary (Reuse, Recovery, Recycling potential).

2.3. Cut-off Criteria

The cut - off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows per module shall be a maximum of 5% of energy usage and mass.

In practice, in this assessment, all data from the production data acquisition are considered, i.e. all raw materials used as per formulation, use of water, electricity and other fuels, the required packaging materials, and all direct production waste. Transport data on all considered inputs and output material are also considered.

2.4. Data Sources

As a general rule, specific data derived from specific production processes or average data derived from specific production processes have been used as the first choice as a basis for calculating an EPD.

To model the life cycle of the product in question, the software SimaPro 9.5, developed by PRé, has been used in conjunction with the LCA database Ecoinvent v3.8.

There were no instances of missing data.

2.5. Data Quality

The requirements for data quality and LCA data are in accordance with the specifications of the PCR. All generic data has been checked for plausibility both internally and by the manufacturer.

Temporal Coverage – producer specific data is averaged over 1 year of production and from within the last 5 years or data from specific project. Generic data is taken from the Ecoinvent 3.8 database. Inputs to and outputs from the system are accounted for over a period of 100 years from the year for which the data set is deemed relevant.

Technological Coverage – the technological coverage of the data reflects the physical reality of the declared product.

Geographical Coverage – whenever possible, country specific data reflecting the reality of the Artigo supply chain has been used. If country specific data is unavailable, European regional data is used in preference to global data sources.

2.6. Period under Review

This study is based on primary collected for the year 2022.

2.7. Allocation

The overall values for the factory's material and energy consumptions during a period of one year have been divided by the annual production of each product to supply a value per square meter of flooring produced. All factory data is measured in square meters, and it is assumed that the process consumptions are governed by area of flooring processed rather than mass.

2.8. Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

3. Life Cycle Assessment Results

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				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 supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	X	X	MNR	X	MNR	MNR	MNR	MNR	MNR	X	X	X	X	X
Description of the system boundary (**X**= included in LCA; **MNR**=MODULE NOT RELEVANT for EN 16810)																	

3.1. LCA results for 2 mm.

3.1.1. Life Cycle Impact Assessment Analysis

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
GWP - total	kg CO2 eq	3,26E+00	5,28E-01	7,06E-01	2,93E-01	0	2,78E-02	0	2,97E-01	-2,20E-02	-9,03E-01
GWP - Fossil	kg CO2 eq	5,99E+00	1,42E-04	8,17E-03	-9,37E-03	0	7,59E-06	0	2,49E-04	-7,15E-06	-2,93E-04
GWP - Biogenic	kg CO2 eq	-3,06E+00	5,28E-01	6,97E-01	2,89E-01	0	2,78E-02	0	1,17E+00	-2,20E-02	-9,03E-01
GWP - luluc	kg CO2 eq	3,30E-01	6,82E-06	8,63E-04	1,35E-02	0	4,60E-07	0	8,52E-06	-6,09E-07	-2,50E-05
ODP	kg CFC11 eq	3,72E-06	1,17E-07	2,21E-07	1,37E-08	0	6,34E-09	0	2,98E-09	-2,86E-09	-1,17E-07
AP	mol H+ eq	5,92E-02	1,19E-02	4,67E-03	1,68E-03	0	1,25E-04	0	1,71E-04	-2,83E-05	-1,16E-03
EP - freshwater	kg P eq	2,53E-04	2,88E-07	2,07E-05	2,28E-05	0	5,57E-08	0	2,51E-07	-1,50E-08	-6,14E-07
EP - marine	kg N eq	1,62E-02	3,04E-03	8,33E-04	6,52E-04	0	4,50E-05	0	4,39E-04	-6,86E-06	-2,81E-04
EP - terrestrial	mol N eq	1,57E-01	3,38E-02	9,21E-03	3,41E-03	0	4,96E-04	0	7,34E-04	-7,47E-05	-3,06E-03
POCP	kg NMVOC eq	3,38E-02	8,62E-03	2,86E-03	1,45E-03	0	1,29E-04	0	2,78E-04	-2,77E-05	-1,14E-03
ADPF	kg Sb eq	1,15E-05	1,28E-08	9,35E-07	4,42E-07	0	2,12E-09	0	8,00E-10	-2,59E-11	-1,06E-09
ADPE	MJ	1,04E+02	7,12E+00	1,61E+01	4,72E+00	0	3,93E-01	0	2,38E-01	-3,60E-01	-1,47E+01
WDP	m3 eq	2,26E+01	-1,25E-03	5,39E-01	2,07E-01	0	1,15E-04	0	7,52E-04	-5,42E-04	-2,22E-02

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP - terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element); ADPF = abiotic depletion potential (fossil); WDP = water scarcity

Table 15 Results of the LCA – Environmental Impacts for 2 mm.

3.1.2. Resource use

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PERE	MJ	3,51E+01	7,56E-03	5,29E-01	3,33E-01	0	3,88E-04	0	9,52E-03	-5,26E-04	-2,15E-02
PERM	MJ	6,94E+01	2,54E-03	2,42E+00	4,79E-01	0	1,39E-04	0	1,51E-03	-5,86E-05	-2,40E-03
PERT	MJ	1,04E+02	1,01E-02	2,95E+00	8,12E-01	0	5,27E-04	0	1,10E-02	-5,84E-04	-2,39E-02
PENRE	MJ	6,96E+01	7,12E+00	7,65E+00	3,44E+00	0	3,93E-01	0	2,37E-01	-3,60E-01	-1,47E+01
PENRM	MJ	3,40E+01	7,39E-04	8,45E+00	1,29E+00	0	5,84E-05	0	6,57E-04	-1,98E-05	-8,10E-04
PENRT	MJ	1,04E+02	7,12E+00	1,61E+01	4,73E+00	0	3,93E-01	0	2,38E-01	-3,60E-01	-1,47E+01
SM	Kg	9,15E-01	0	0	0	0	0	0	0	0	0
RSF	MJ	9,56E-01	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	5,69E-01	2,42E-05	1,27E-02	6,29E-03	0	8,06E-06	0	4,71E-05	-2,12E-05	-8,69E-04

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Table 16 Results of the LCA – Resource Use for 2 mm.

3.1.3. Output Flows and Waste Categories

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
HWD	kg	1,68E-03	1,04E-05	8,76E-05	3,06E-06	0	1,06E-06	0	4,77E-07	-4,62E-07	-1,89E-05
NHWD	kg	1,08E+00	3,18E-04	1,61E-01	2,97E-02	0	8,89E-05	0	3,13E+00	-4,17E-05	-1,71E-03
RWD	kg	4,09E-04	5,12E-05	2,97E-05	1,23E-05	0	2,78E-06	0	1,48E-06	-8,42E-08	-3,45E-06
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	1,50E-01	0	1,17E-01	0	0	0	3,10E+00	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

Table 17 Results of the LCA – Output Flows and Waste for 2 mm.

3.1.4. Biogenic Carbon Content

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	0.347	kg C
Biogenic carbon content in accompanying packaging	0.052	kg C
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2		

Table 18 Results of the LCA – Information describing the biogenic carbon content at the factory gate for 2 mm.

3.2. LCA results for 3 mm.

3.2.1. Life Cycle Impact Assessment Analysis

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
GWP - total	kg CO2 eq	4,65E+00	5,92E-01	7,09E-01	2,93E-01	0	4,16E-02	0	4,45E-01	-3,37E-02	-1,38E+00
GWP - Fossil	kg CO2 eq	7,72E+00	5,92E-01	7,00E-01	2,89E-01	0	4,16E-02	0	4,44E-01	-3,37E-02	-1,38E+00
GWP - Biogenic	kg CO2 eq	-3,45E+00	1,56E-04	8,18E-03	-9,37E-03	0	1,14E-05	0	1,33E+00	-1,10E-05	-4,49E-04
GWP - luluc	kg CO2 eq	3,74E-01	8,00E-06	8,63E-04	1,35E-02	0	6,89E-07	0	1,28E-05	-9,33E-07	-3,82E-05
ODP	kg CFC11 eq	6,10E-06	1,30E-07	2,21E-07	1,37E-08	0	9,48E-09	0	4,47E-09	-4,38E-09	-1,79E-07
AP	mol H+ eq	7,25E-02	1,47E-02	4,67E-03	1,68E-03	0	1,87E-04	0	2,57E-04	-4,33E-05	-1,77E-03
EP - freshwater	kg P eq	3,08E-04	3,25E-07	2,07E-05	2,28E-05	0	8,35E-08	0	3,77E-07	-2,30E-08	-9,41E-07
EP - marine	kg N eq	1,93E-02	3,72E-03	8,38E-04	6,52E-04	0	6,74E-05	0	6,58E-04	-1,05E-05	-4,31E-04
EP - terrestrial	mol N eq	1,91E-01	4,13E-02	9,22E-03	3,41E-03	0	7,42E-04	0	1,10E-03	-1,15E-04	-4,70E-03
POCP	kg NMVOC eq	4,22E-02	1,05E-02	2,86E-03	1,45E-03	0	1,93E-04	0	4,17E-04	-4,25E-05	-1,74E-03
ADPF	kg Sb eq	1,27E-05	1,29E-08	9,35E-07	4,42E-07	0	3,17E-09	0	1,20E-09	-3,96E-11	-1,63E-09
ADPE	MJ	1,47E+02	7,93E+00	1,61E+01	4,72E+00	0	5,88E-01	0	3,56E-01	-5,51E-01	-2,26E+01
WDP	m3 eq	2,61E+01	-1,39E-03	5,39E-01	2,07E-01	0	1,73E-04	0	1,13E-03	-8,30E-04	-3,40E-02

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP - terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element); ADPF = abiotic depletion potential (fossil); WDP = water scarcity

Table 19 Results of the LCA – Environmental Impacts for 3 mm.

3.2.2. Resource use

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PERE	MJ	4,06E+01	8,31E-03	5,29E-01	3,33E-01	0	5,80E-04	0	1,43E-02	-8,05E-04	-3,30E-02
PERM	MJ	8,46E+01	2,80E-03	2,42E+00	4,79E-01	0	2,08E-04	0	2,27E-03	-8,97E-05	-3,68E-03
PERT	MJ	1,25E+02	1,11E-02	2,95E+00	8,12E-01	0	7,88E-04	0	1,65E-02	-8,95E-04	-3,67E-02
PENRE	MJ	8,76E+01	7,93E+00	7,65E+00	3,44E+00	0	5,88E-01	0	3,55E-01	-5,51E-01	-2,26E+01
PENRM	MJ	5,89E+01	7,98E-04	8,45E+00	1,29E+00	0	8,85E-05	0	9,86E-04	-3,03E-05	-1,24E-03
PENRT	MJ	1,47E+02	7,93E+00	1,61E+01	4,73E+00	0	5,88E-01	0	3,56E-01	-5,51E-01	-2,26E+01
SM	Kg	1,66E+00	0	0	0	0	0	0	0	0	0
RSF	MJ	1,22E+00	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m3	6,54E-01	2,76E-05	1,27E-02	6,29E-03	0	1,21E-05	0	7,06E-05	-3,25E-05	-1,33E-03

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Table 20 Results of the LCA – Resource Use for 3 mm

3.2.3. Output Flows and Waste Categories

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
HWD	kg	1,71E-03	1,04E-05	8,76E-05	3,06E-06	0	1,58E-06	0	7,15E-07	-7,07E-07	-2,90E-05
NHWD	kg	1,14E+00	3,58E-04	1,95E-01	2,97E-02	0	1,33E-04	0	4,70E+00	-6,39E-05	-2,62E-03
RWD	kg	4,96E-04	5,70E-05	2,97E-05	1,23E-05	0	4,16E-06	0	2,22E-06	-1,29E-07	-5,29E-06
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	1,50E-01	0	1,59E-01	0	0	0	4,75E+00	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

Table 21 Results of the LCA – Output Flows and Waste for 3 mm.

3.2.4. Biogenic Carbon Content

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	0.398	kg C
Biogenic carbon content in accompanying packaging	0.052	kg C
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2		

Table 22 Results of the LCA – Information describing the biogenic carbon content at the factory gate for 3 mm.

3.3. LCA results for 3.5 mm.

3.3.1. Life Cycle Impact Assessment Analysis

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
GWP - total	kg CO2 eq	6,27E+00	1,23E+00	7,11E-01	2,93E-01	0	4,86E-02	0	5,19E-01	-3,87E-02	-1,59E+00
GWP - Fossil	kg CO2 eq	1,00E+01	1,23E+00	7,02E-01	2,89E-01	0	4,86E-02	0	5,18E-01	-3,87E-02	-1,59E+00
GWP - Biogenic	kg CO2 eq	-4,16E+00	3,74E-04	8,18E-03	-9,37E-03	0	1,33E-05	0	1,53E+00	-1,26E-05	-5,15E-04
GWP - luluc	kg CO2 eq	4,31E-01	1,13E-05	8,63E-04	1,35E-02	0	8,05E-07	0	1,49E-05	-1,07E-06	-4,39E-05
ODP	kg CFC11 eq	3,88E-06	2,90E-07	2,21E-07	1,37E-08	0	1,11E-08	0	5,21E-09	-5,02E-09	-2,06E-07
AP	mol H+ eq	8,99E-02	1,03E-02	4,67E-03	1,68E-03	0	2,18E-04	0	3,00E-04	-4,97E-05	-2,04E-03
EP - freshwater	kg P eq	3,78E-04	6,43E-07	2,07E-05	2,28E-05	0	9,76E-08	0	4,40E-07	-2,63E-08	-1,08E-06
EP - marine	kg N eq	2,39E-02	3,14E-03	8,41E-04	6,52E-04	0	7,89E-05	0	7,67E-04	-1,21E-05	-4,94E-04
EP - terrestrial	mol N eq	2,34E-01	3,47E-02	9,22E-03	3,41E-03	0	8,68E-04	0	1,28E-03	-1,31E-04	-5,39E-03
POCP	kg NMVOC eq	5,18E-02	8,93E-03	2,87E-03	1,45E-03	0	2,26E-04	0	4,86E-04	-4,88E-05	-2,00E-03
ADPF	kg Sb eq	1,61E-05	4,87E-08	9,35E-07	4,42E-07	0	3,71E-09	0	1,40E-09	-4,55E-11	-1,87E-09
ADPE	MJ	2,00E+02	1,74E+01	1,61E+01	4,72E+00	0	6,88E-01	0	4,16E-01	-6,32E-01	-2,59E+01
WDP	m3 eq	3,31E+01	-2,93E-03	5,39E-01	2,07E-01	0	2,02E-04	0	1,32E-03	-9,52E-04	-3,90E-02

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP - terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element); ADPF = abiotic depletion potential (fossil); WDP = water scarcity

Table 23 Results of the LCA – Environmental Impacts for 3,5 mm.

3.3.2. Resource use

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PERE	MJ	5,49E+01	1,97E-02	5,29E-01	3,33E-01	0	6,79E-04	0	1,67E-02	-9,24E-04	-3,79E-02
PERM	MJ	9,34E+01	6,54E-03	2,42E+00	4,79E-01	0	2,43E-04	0	2,65E-03	-1,03E-04	-4,22E-03
PERT	MJ	1,48E+02	2,62E-02	2,95E+00	8,12E-01	0	9,23E-04	0	1,93E-02	-1,03E-03	-4,21E-02
PENRE	MJ	1,14E+02	1,74E+01	7,65E+00	3,44E+00	0	6,88E-01	0	4,15E-01	-6,32E-01	-2,59E+01
PENRM	MJ	8,07E+01	2,23E-03	8,45E+00	1,29E+00	0	1,03E-04	0	1,15E-03	-3,47E-05	-1,42E-03
PENRT	MJ	1,95E+02	1,74E+01	1,61E+01	4,73E+00	0	6,88E-01	0	4,16E-01	-6,32E-01	-2,59E+01
SM	Kg	1,93E+00	0	0	0	0	0	0	0	0	0
RSF	MJ	1,25E+00	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	8,29E-01	5,00E-05	1,27E-02	6,29E-03	0	1,41E-05	0	8,24E-05	-3,73E-05	-1,53E-03

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Table 24 Results of the LCA – Resource Use for 3,5 mm.

3.3.3. Output Flows and Waste Categories

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
HWD	kg	1,78E-03	4,15E-05	8,76E-05	3,06E-06	0	1,85E-06	0	8,35E-07	-8,11E-07	-3,33E-05
NHWD	kg	1,22E+00	7,29E-04	2,16E-01	2,97E-02	0	1,56E-04	0	5,48E+00	-7,33E-05	-3,01E-03
RWD	kg	6,72E-04	1,24E-04	2,97E-05	1,23E-05	0	4,87E-06	0	2,58E-06	-1,48E-07	-6,07E-06
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	1,50E-01	0	1,76E-01	0	0	0	5,45E+00	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

Table 25 Results of the LCA – Output Flows and Waste for 3,5 mm.

3.3.4. Biogenic Carbon Content

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	0.463	kg C
Biogenic carbon content in accompanying packaging	0.052	kg C
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2		

Table 26 Results of the LCA – Information describing the biogenic carbon content at the factory gate for 3,5 mm.

3.4. LCA results for 5 mm.

3.4.1. Life Cycle Impact Assessment Analysis

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
GWP - total	kg CO2 eq	8,72E+00	1,37E+00	7,16E-01	2,93E-01	0	6,93E-02	0	7,41E-01	-5,75E-02	-2,36E+00
GWP - Fossil	kg CO2 eq	1,17E+01	1,37E+00	7,07E-01	2,89E-01	0	6,93E-02	0	7,41E-01	-5,75E-02	-2,36E+00
GWP - Biogenic	kg CO2 eq	-3,40E+00	3,95E-04	8,18E-03	-9,37E-03	0	1,89E-05	0	1,63E+00	-1,87E-05	-7,66E-04
GWP - luluc	kg CO2 eq	4,61E-01	1,49E-05	8,63E-04	1,35E-02	0	1,15E-06	0	2,13E-05	-1,59E-06	-6,52E-05
ODP	kg CFC11 eq	6,81E-06	3,14E-07	2,21E-07	1,37E-08	0	1,58E-08	0	7,45E-09	-7,46E-09	-3,06E-07
AP	mol H+ eq	9,26E-02	2,02E-02	4,67E-03	1,68E-03	0	3,11E-04	0	4,28E-04	-7,38E-05	-3,03E-03
EP - freshwater	kg P eq	4,11E-04	7,31E-07	2,07E-05	2,28E-05	0	1,39E-07	0	6,28E-07	-3,92E-08	-1,61E-06
EP - marine	kg N eq	2,15E-02	5,48E-03	8,49E-04	6,52E-04	0	1,12E-04	0	1,10E-03	-1,79E-05	-7,35E-04
EP - terrestrial	mol N eq	2,32E-01	6,08E-02	9,24E-03	3,41E-03	0	1,24E-03	0	1,83E-03	-1,95E-04	-8,01E-03
POCP	kg NMVOC eq	5,91E-02	1,55E-02	2,87E-03	1,45E-03	0	3,22E-04	0	6,94E-04	-7,25E-05	-2,97E-03
ADPF	kg Sb eq	1,50E-05	4,48E-08	9,35E-07	4,42E-07	0	5,29E-09	0	2,00E-09	-6,76E-11	-2,77E-09
ADPE	MJ	2,67E+02	1,90E+01	1,61E+01	4,72E+00	0	9,81E-01	0	5,94E-01	-9,40E-01	-3,85E+01
WDP	m3 eq	2,43E+01	-3,25E-03	5,39E-01	2,07E-01	0	2,88E-04	0	1,88E-03	-1,42E-03	-5,80E-02

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP - terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element); ADPF = abiotic depletion potential (fossil); WDP = water scarcity

Table 27 Results of the LCA – Environmental Impacts for 5 mm.

3.4.2. Resource use

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PERE	MJ	5,17E+01	2,09E-02	5,29E-01	3,33E-01	0	9,68E-04	0	2,38E-02	-1,37E-03	-5,63E-02
PERM	MJ	1,03E+02	6,97E-03	2,42E+00	4,79E-01	0	3,47E-04	0	3,78E-03	-1,53E-04	-6,27E-03
PERT	MJ	1,55E+02	2,79E-02	2,95E+00	8,12E-01	0	1,32E-03	0	2,76E-02	-1,53E-03	-6,26E-02
PENRE	MJ	1,27E+02	1,90E+01	7,66E+00	3,44E+00	0	9,81E-01	0	5,93E-01	-9,40E-01	-3,85E+01
PENRM	MJ	1,39E+02	2,23E-03	8,45E+00	1,29E+00	0	1,47E-04	0	1,64E-03	-5,16E-05	-2,12E-03
PENRT	MJ	2,67E+02	1,90E+01	1,61E+01	4,73E+00	0	9,81E-01	0	5,94E-01	-9,40E-01	-3,85E+01
SM	Kg	3,77E+00	0	0	0	0	0	0	0	0	0
RSF	MJ	1,72E+00	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	6,05E-01	5,89E-05	1,27E-02	6,29E-03	0	2,01E-05	0	1,18E-04	-5,54E-05	-2,27E-03

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Table 28 Results of the LCA – Resource Use for 5 mm.

3.4.3. Output Flows and Waste Categories

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
HWD	kg	1,74E-03	3,77E-05	8,76E-05	3,06E-06	0	2,64E-06	0	1,19E-06	-1,21E-06	-4,94E-05
NHWD	kg	1,23E+00	8,19E-04	2,75E-01	2,97E-02	0	2,22E-04	0	7,83E+00	-1,09E-04	-4,47E-03
RWD	kg	6,89E-04	1,36E-04	2,97E-05	1,23E-05	0	6,94E-06	0	3,69E-06	-2,20E-07	-9,02E-06
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	1,50E-01	0	2,42E-01	0	0	0	8,10E+00	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	0	0	0
Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy											

Table 29 Results of the LCA – Output Flows and Waste for 5 mm.

3.4.4. Biogenic Carbon Content

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	0.502	kg C
Biogenic carbon content in accompanying packaging	0.052	kg C
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2		

Table 30 Results of the LCA – Information describing the biogenic carbon content at the factory gate for 5 mm.

4. Additional Environmental Impact Indicators

The following tables contains the additional environmental impact indicators according to the European Standard EN15804+A2.

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PM	Disease incidences	4,90E-07	2,34E-08	3,68E-08	1,57E-08	0	1,81E-09	0	3,92E-09	-5,93E-11	-2,43E-09
IR	kBq U-235 eq	1,49E-01	3,11E-02	2,62E-02	1,62E-02	0	1,69E-03	0	1,11E-03	-6,26E-05	-2,57E-03
ETF-fw	CTUe	4,55E+01	1,67E+00	3,13E+00	3,08E+00	0	9,65E-02	0	1,08E+00	-4,88E-02	-2,00E+00
HTP-c	CTUh	3,23E-09	1,30E-11	1,69E-10	5,47E-11	0	1,06E-12	0	9,61E-13	-6,05E-13	-2,48E-11
HTP-nc	CTUh	3,77E-08	1,20E-10	9,33E-10	2,19E-10	0	1,21E-11	0	3,64E-10	-3,50E-12	-1,44E-10
SQP	dimensionless	5,06E+02	1,88E-02	9,10E+00	1,02E+00	0	1,88E-03	0	5,51E-01	-3,29E-04	-1,35E-02

Caption: PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects; SQP = Soil quality potential/ Land use related impacts

Table 31 Results of the LCA – Additional environmental impacts for 2 mm.

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PM	Disease incidences	6,10E-07	2,43E-08	3,68E-08	1,57E-08	0	2,72E-09	0	5,89E-09	-9,08E-11	-3,72E-09
IR	kBq U-235 eq	1,98E-01	3,46E-02	2,62E-02	1,62E-02	0	2,52E-03	0	1,67E-03	-9,59E-05	-3,93E-03
ETF-fw	CTUe	5,94E+01	1,85E+00	3,14E+00	3,08E+00	0	1,44E-01	0	1,62E+00	-7,48E-02	-3,07E+00
HTP-c	CTUh	4,30E-09	1,34E-11	1,69E-10	5,47E-11	0	1,59E-12	0	1,44E-12	-9,26E-13	-3,80E-11
HTP-nc	CTUh	4,36E-08	1,18E-10	9,37E-10	2,19E-10	0	1,81E-11	0	5,46E-10	-5,37E-12	-2,20E-10
SQP	dimensionless	5,94E+02	2,09E-02	9,11E+00	1,02E+00	0	2,82E-03	0	8,26E-01	-5,05E-04	-2,07E-02

Caption: PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects; SQP = Soil quality potential/ Land use related impacts

Table 32 Results of the LCA – Additional environmental impacts for 3 mm.

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PM	Disease incidences	7,72E-07	8,10E-08	3,68E-08	1,57E-08	0	3,18E-09	0	6,87E-09	-1,04E-10	-4,27E-09
IR	kBq U-235 eq	2,55E-01	7,55E-02	2,62E-02	1,62E-02	0	2,95E-03	0	1,95E-03	-1,10E-04	-4,51E-03
ETF-fw	CTUe	7,19E+01	4,12E+00	3,15E+00	3,08E+00	0	1,69E-01	0	1,89E+00	-8,58E-02	-3,52E+00
HTP-c	CTUh	5,77E-09	4,53E-11	1,69E-10	5,47E-11	0	1,86E-12	0	1,68E-12	-1,06E-12	-4,36E-11
HTP-nc	CTUh	5,83E-08	4,97E-10	9,39E-10	2,19E-10	0	2,12E-11	0	6,36E-10	-6,16E-12	-2,53E-10
SQP	dimensionless	7,43E+02	4,66E-02	9,11E+00	1,02E+00	0	3,30E-03	0	9,64E-01	-5,79E-04	-2,37E-02

Caption: PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects; SQP = Soil quality potential/ Land use related impacts

Table 33 Results of the LCA – Additional environmental impacts for 3.5 mm.

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3/s1-s2	C4/s1	D/s1	D/s2
PM	Disease incidences	8,25E-07	7,71E-08	3,69E-08	1,57E-08	0	4,53E-09	0	9,81E-09	-1,55E-10	-6,35E-09
IR	kBq U-235 eq	3,15E-01	8,26E-02	2,63E-02	1,62E-02	0	4,21E-03	0	2,78E-03	-1,63E-04	-6,70E-03
ETF-fw	CTUe	7,55E+01	4,48E+00	3,17E+00	3,08E+00	0	2,41E-01	0	2,70E+00	-1,28E-01	-5,23E+00
HTP-c	CTUh	6,80E-09	4,29E-11	1,69E-10	5,47E-11	0	2,65E-12	0	2,40E-12	-1,58E-12	-6,48E-11
HTP-nc	CTUh	4,95E-08	4,45E-10	9,46E-10	2,19E-10	0	3,02E-11	0	9,09E-10	-9,16E-12	-3,75E-10
SQP	dimensionless	7,25E+02	5,05E-02	9,12E+00	1,02E+00	0	4,70E-03	0	1,38E+00	-8,61E-04	-3,53E-02

Caption: PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects; SQP = Soil quality potential/ Land use related impacts

Table 34 Results of the LCA – Additional environmental impacts for 5 mm.

5. LCA Interpretation

The analysis of the results has been conducted with due consideration to the assumptions and limitations outlined in the Environmental Product Declaration (EPD), encompassing both methodological and data-related constraints. The use phase results are based on a one-year use scenario.

By analyzing the entire life cycle of the product, the LCA study highlighted that the production phase (A1-A3) overwhelmingly influences all mandatory and additional environmental impact indicators. This predominant contribution is primarily attributed to the production of raw materials. Conversely, a considerably lesser impact stems from the utilization of thermal and electrical energy during the manufacturing process.

6. Additional Environmental Information

6.1. Environment and Health During Manufacturing

Artigo's factory conforms to the ISO 14001 Environmental Management Systems and ISO 50001 Energy Management Systems.

6.2. Environment and Health During Installation

The manufacturer's guidelines should be adhered to during the installation of this product. The product also conforms to the GREENGUARD Gold certification standard as described in §6.4.

6.3. Extraordinary Effects

Fire

- ASTM E 648 Critical radiant flux ≥ 0.45 W/cm^2
- ASTM E 662 Smoke Density < 450
- EN 13501-1 Fire Behavior B_{fl} – s1

Water

The product is impermeable to water.

Mechanical Destruction

Mechanical damage does not chemically alter the product.

6.4. Environmental Activities and Certifications

- GREENGUARD Gold: UL 2818-2022
- Blue Angel – DE-UZ 120
- Cradle to Cradle - SILVER
- A+
- GECA
- Eurofins IACG (Indoor Air Comfort Gold)
- Emission Class for building material M1

6.5. Further Information

Further information concerning the product may be found at the company website: www.artigo.com and www.mondocontractflooring.com

7. Supporting Documentation

All documentation necessary to confirm the data provided in this EPD has been submitted to the critical reviewer.

8. Disclaimers to the declaration of core and additional environmental impact indicators

According to the "ILCD Handbook: Recommendations for Life Cycle Impact Assessment in the European context" recommended characterization models and associated characterization factors are classified according to their quality into three levels:

- Type 1 (recommended and satisfactory);
- Type 2 (recommended but it need of some improvements);
- Type 3 (recommended, but to applied with caution).

ILCD classification	Indicator	Disclaimer
ILCD Type 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emission (PM)	None
ILCD Type 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 - This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.		
Disclaimer 2 - The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.		

Table 35 Classification of disclaimers to the declaration of core and additional environmental impact indicators.

9. References

REPORTING STANDARDS

Database Ecoinvent v3.8 (www.ecoinvent.org)

EN 15804:2012+A2:2019+AC: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

EN 16810:2017 Resilient, textile and laminate floor coverings - Environmental product declarations - Product category rules

ISO 14025:2011-10: Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO 14040:2021 – Environmental management – Life cycle assessment - Principles and framework

ISO 14044:2021 – Environmental management – Life cycle assessment – Requirements and guidelines

Life Cycle Assessment – code: LCA002, rev.01 of 16th April 2024 released by Artigo S.p.a

EN 1817 – Resilient Floor Coverings: Specification for homogeneous and heterogeneous smooth rubber floor coverings.

EN 12199 – Resilient floor coverings: Specifications for homogeneous and heterogeneous relief rubber floor coverings.

10. Contact Information

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