ENVIRONMENTAL PRODUCT DECLARATION

SPHERA

FORBO FLOORING SYSTEMS
RESILIENT HOMOGENEOUS VINYL FLOOR COVERING

Sphera Element
Color 51018 “Contrast Mortar”

FLOORING SYSTEMS

The Forbo Sphera collection is setting new standards in homogeneous vinyl due to its design, technology and performance. All the latest insights and technology have been used to create ‘smart’ and innovative solutions resulting in a premium collection. Sphera heralds a new era in homogenous vinyl. SMART (Sustainable, Modern, Advanced, Robust Technology) and suitable for where a durable, bright and sustainable floor is required.

Forbo was the first flooring manufacturer to publish a complete Life Cycle Assessment (LCA) report verified by CML in 2000 to create full transparency that is independently evaluated. To offer further transparency this EPD is also including additional information to show the impacts on human health and eco-toxicity.

For more information visit;
www.forbo-flooring.com

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

FLOORING SYSTEMS

Sphera
Resilient Homogeneous Vinyl Floor Covering

According to ISO 14025 and EN 15804

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. 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, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environment 333 Pfingsten Road Northbrook, IL 60611
DECLARATION HOLDER	Forbo Flooring B.V. Industrieweg 12 P.O. Box 13 NL-1560 AA Krommenie
DECLARATION NUMBER	4791394447.102.1
DECLARED PRODUCT	Sphera Resilient Homogeneous Vinyl Floor Covering
REFERENCE PCR	EN 15804+A2: 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
DATE OF ISSUE	July 15, 2024
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	European Standards CEN/TC 134 https://www.en-standard.eu/

ENVIRONMENTAL PRODUCT DECLARATION

forbo FLOORING SYSTEMS

Sphera
Resilient Homogeneous Vinyl Floor Covering

According to ISO 14025 and EN 15804

This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Solutions
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

This EPD conforms with EN 15804

Environment

1 Product Definition

1.1 Description of Company/Organization

In 2017 Forbo Flooring has invested in a purpose-built, state of the art production facility and it signals a true change in how homogeneous vinyl is designed and manufactured. Sphera is a phthalate free homogeneous vinyl sheet product which heralds a new era in homogenous vinyl. SMART (Sustainable, Modern, Advanced, Robust Technology) and suitable for where a durable, bright and sustainable floor is required.
Making Sphera has always been done in a way to achieve the lowest carbon footprint; the starting point for innovation and development. The Forbo organization has key environmental focus areas to displaying a carbon-negative product portfolio, using renewable electricity, becoming a zero-waste company and actively contributing to the circular economy.
For its complete manufacturing of Sphera, Forbo holds all the main certifications. For environmental performance **ISO 14001**, for quality **ISO 9001** and **SA8000** for social accountability,

1.2 Product Classification and description

This declaration covers the Sphera collection, a Homogeneous Vinyl floorcovering. The Sphera core collection contains various sub-collections: Element, Energetic, Elite and Essence. Each sub-collection has its own characteristics and natural connection with a specific segment.
Sphera sheet from Forbo Flooring is a resilient floor covering complying with all the requirements of EN-ISO 10581: Resilient floor coverings – Homogeneous polyvinyl chloride floor coverings - Specification. The key raw materials include PVC, plasticizer, mineral filler and stabilizers.

Homogeneous vinyl flooring is primarily intended for use in commercial and light commercial buildings. It is frequently installed in healthcare facilities because of its superior durability and high resistance to wear, cuts and stains. Additionally the seams can be welded to seal out germs, dirt and moisture.

Sphera is produced by Forbo Flooring and is sold worldwide.
This declaration refers to Sphera sheet of 2.0mm nominal thickness covering a broad range of designs and colors :

Element, Energetic, Elite and Essence

Figure 1: Typical construction

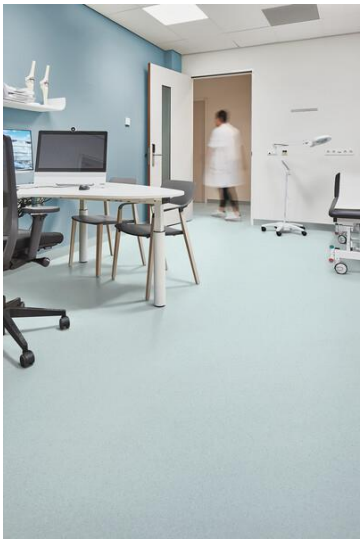
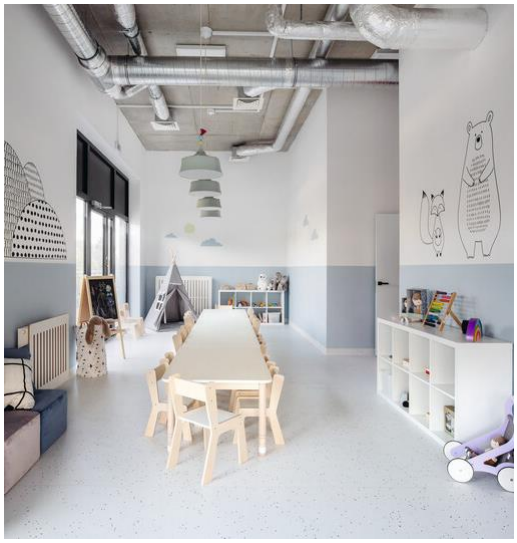
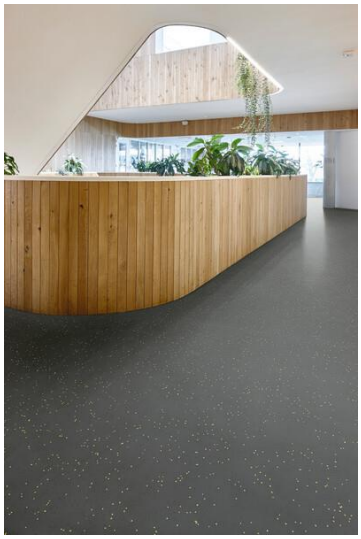
1. **SMART top finish :** The Forbo engineered process provides a film of lacquer with consistent thickness on both the peaks and in the valleys. Forbo calls this SMART-top, the PU lacquer coating for easy cleaning & maintenance with enhanced protection against scuffing, scratching, dirt retention and staining.
2. **Compact pigmented PVC layer :** A steel-belt pressed homogeneous PVC sheet with a truly non-directional visual.

This declaration refers to the declared/functional unit of 1 m^2 installed flooring product.

1.3 Range of application

Sphera is classified in accordance with EN-ISO 10581 to be installed in the following use areas defined in EN-ISO 10874:

Area of application	
Commercial	Class 34 
Industrial	Class 43 

Examples of use areas

1.4 Product Standard

The products considered in this EPD have the following technical specifications:

- Meets or exceeds all technical requirements in EN-ISO 10581 Resilient floor coverings – Homogeneous polyvinyl chloride floor coverings – Specification

Sphera meets the requirements of EN 14041 and BS EN 14041 CE UKCA		
EN 13501-1	Reaction to fire	B_{FL}-s1 L CS
EN 13893	Slip resistance	≥0,30
EN 1815	Body voltage	≤2,0 kV
EN ISO10456	Thermal conductivity	0,25 W/mK

Emission testing :

- AgBB requirements following EN ISO 16000-9 Indoor Air Emissions : TVOC at 28 days
- French act Grenelle: A+
- Compliant with CHPS 01350 requirements for VOC emissions and indoor air quality.
- M1: Finnish voluntary emission classification of building materials

1.5 Accreditation

All Forbo Flooring Systems' manufacturing operations have certified Management System in accordance with:

- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- SA 8000 Social Accountability standard

1.6 Delivery Status

Table 1: Specification of delivered product

Characteristics	Nominal Value	Unit
Product thickness	2,00	mm
Product Weight	2,75 – 2,90	kg/m^2
Rolls Width Length	2,00 25	meter

2 Material Content

2.1 Material Content of the Product

Table 2: Average composition of Sphera

Component	Material	Availability			Amount [%]	Origin
		Renewable	Recycled	Non-Renewable		
Binder	PVC			X	43	Europe
	DOTP			X	19	Europe
Filler	Calcium carbonate		X		34	Europe
Pigments	Titanium Dioxide plus others			X	2	Europe
Stabilizers and process additives	Proprietary mixtures & lubricants			X	1,5	Europe
Finish	PU lacquer			X	0,5	Europe

2.2 Production of Main Materials

PVC: Polymer which is produced by the polymerization of vinyl chloride monomer.
DOTP: A non-phthalate plasticizer, being the diester of terephthalic acid and the branched-chain 2-ethylhexanol. This colorless viscous liquid used for softening PVC plastics is known for chemical similarity to general purpose phthalates such as DEHP and DINP, but without any negative regulatory pressure.
Stabilizer Ba/Zn: Mixed metal stabilizer made from barium and zinc stearate. It is used to avoid PVC degradation during processing at relative high temperature.
Calcium carbonate: The calcium carbonate used is coming from a pre-consumer recycling process.
Titanium dioxide: A white pigment produced from the mineral rutile, a naturally occurring form of titanium dioxide. The production of the pigment is a large-scale chemical process.
Finish: UV-light cross linked polyurethane based coating

3 Production of the Floor Covering

3.1 Manufacturing

Sphera is produced in in 4 steps :

1. Producing granulate : PVC granules are created by combining PVC dry blend and color pigments. Three colored PVC compositions are mixed together to create a vinyl mass, which is then pushed through a die plate which can create chips in any shape or form, depending on the design effect desired. This new chip technology is what gives Sphera its unique visual character and its bright and saturated hues.
2. Sheet making : The chips are then released by precision scatter units onto a conveyor belt. A steel-belt press forms a homogeneous sheet with a truly non-directional visual of the required thickness. Unlike conventional manufacturing, there is no need to back sand the product.
3. Lacquering & embossing : In-line, Sphera has a special UV-cured lacquer applied. After drying the lacquer, application of an embossing achieves a particularly matt finish, which diffuses light and conceals any minor sub-floor imperfections. The Forbo engineered process provides a film of lacquer with consistent thickness on both the peaks and in the valleys. Forbo calls this SMART-top, as it resist stains and matches the proven performance of Eternal sheet vinyl ranges. Resistance to betadine, commonly used in the healthcare sector, also sees Sphera outperform other homogeneous vinyls currently in the market place.
4. Relaxation : Homogeneous vinyls acquire tension during production. The tension in Sphera is removed by heating the material again and then slowly cooling to achieve the most dimensionally stable sheet product in this category.

3.2 Production Waste

Rejected material and the cuttings of the trimming stage are being reused in the manufacturing process of heterogeneous vinyl.
Packaging materials are being collected separately and externally recycled.

4 Delivery and Installation of the Floor Covering

4.1 Delivery

A worldwide distribution by truck and container ship is considered. On average every square meter of Sphera is transported as follows:

○ Transport distance 40 t truck	780 km
○ Transport distance 7.5t truck (Fine distribution)	220 km
○ Capacity utilization trucks (including empty runs)	100 %
○ Transport distance Ocean ship	2205 km
○ Capacity utilization Ocean ship	100%

4.2 Installation

Because of the specific techniques used during the installation of Sphera approximately 4,5% of the material is cut off as installation waste. For installation of Sphera on the floor a scenario has been modeled assuming 0,25 kg/m^2 of adhesive is applied to the sub-floor.
Cardboard tubes and packaging paper can be collected separately and should be used in a local recycling process. In the calculation model 100% incineration is taken into account for which there is a credit received.

Waste during the installation process may be recycled as floor covering through the manufacturers' facility. Forbo Flooring has a Back to The Floor program in which both post-installation and end of life flooring can be recycled.

BACK TO THE FLOOR
RECYCLING PROGRAM

5 Use stage

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 lifetime (RSL) is set to one year. 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 the estimated time on the floor by the 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.

5.1 Cleaning and Maintenance

Level of use	Cleaning Process	Cleaning Frequency	Consumption of energy and resources
Commercial/Residential/Industrial	Dust mopping	Daily	-
	Damp mopping	Once a week	Hot water Neutral detergent

For the calculations the following cleaning regime is considered:

- Dry cleaning with a dust mop
- Once a week wet cleaning with 0,062 l/m^2 water and 0,0008 kg/m^2 detergent. This result in the use of 3,224 l/m^2*year water and 0,04 kg/m^2*year detergent. The wet cleaning takes place without power machine usage. Waste water treatment of the arising waste water from cleaning is considered.

The cleaning regime that is recommended in practice will be highly dependent on the use of the premises where the floor covering is installed. In high traffic areas more frequent cleaning will be needed compared to areas where there is low traffic. The use of an entrance mat of at least four steps will reduce the cleaning frequency.

5.2 Prevention of Structural Damage

All newly laid floor covering should be covered and protected with a suitable non-staining protective covering if other building activities are still in progress. Use protective feet on chairs and tables to reduce scratching. Castor wheels should be suitable for resilient floor coverings

6 End of Life

For recycling purposes both the subfloor and the floor covering need to remain as intact as possible at the End of Life stage and contamination of the material needs to be avoided. Therefore the deconstruction of installed Sphera from the floor is done mechanically with a special floor stripper.
The electrical energy needed for this is estimated to be 0,03 kWh/sqm, this amount of energy is taken into account for the calculations, although currently circularity has not yet been achieved on a large scale for floor coverings.

For the end of life stage two scenarios have been calculated assuming that the flooring is either 100% incinerated or 100% landfilled.

7 Life Cycle Assessment

A full Life Cycle Assessment has been carried out according to ISO 14040 and ISO 14044.

The following Life Cycle Stages are assessed :
A1-3 : Product Stage (Raw material acquisition, transportation to Manufacturing and Manufacturing)
A4-5 : Construction process stage (Transport Gate to User, installation flooring)
B2 : Use Stage (Maintenance of the floor). For floor coverings the modules B1, B3 to B7 are not relevant to the environmental performance of a product.
C1-4 : End of Life Stage (Deconstruction, transport, waste processing, Disposal). Two different End of Life scenarios are declared and the results are indicated separately in module C. Each scenario is calculated as a 100% scenario:
Scenario 1: 100% Municipal Waste Incineration (MWI) with $R_1 > 60\%$
Scenario 2: 100% landfill disposal
D : Benefits and loads beyond the system boundary (Reuse, recovery, recycling potential)

End of life scenario 1: 100% Municipal Waste Incineration (MWI) with $R_1 > 60\%$

- C3-1 (Waste processing): Impact from waste incineration, generated electricity and steam are listed in the result table as exported energy
- C4-1 (Disposal): The product waste leaves the system in module C3-1 and causes no additional impact
- D-1 (Recycling potential): Benefits for generated energy due to incineration of product waste at the end-of-life

End of life scenario 2: 100% landfill disposal

- C3-2 (Waste processing): Landfill disposal needs no waste processing and causes no additional impact
- C4-2(Disposal): Impact from landfill disposal
- D-2 (Recycling potential): Benefits for generated energy due to landfill disposal of product waste at the end of life

Modules C3-2 and C4-1 cause no additional impact and are therefore not displayed in the result tables

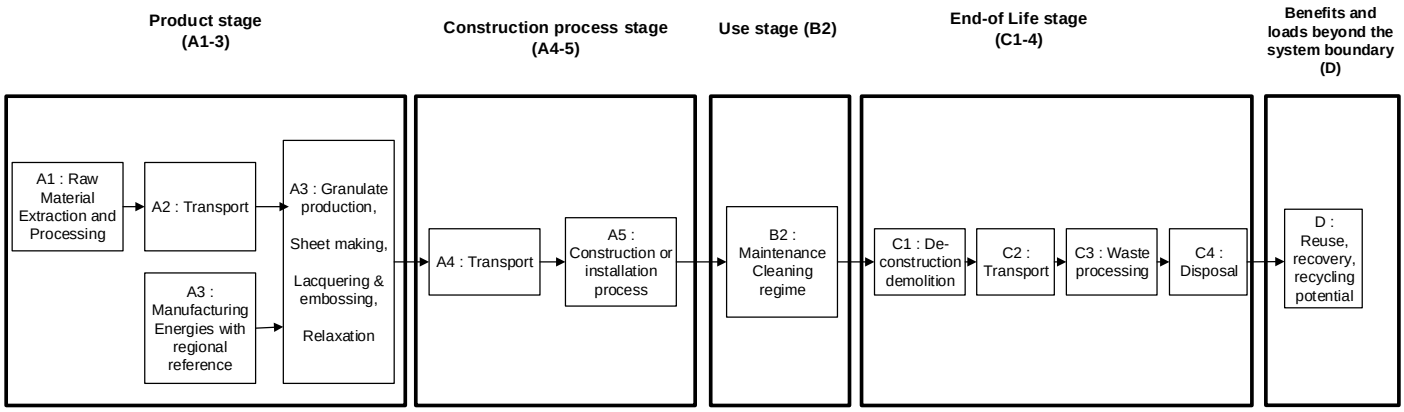


Figure 3: Flow chart of the Life Cycle Assessment

Comparisons of different floor coverings are only allowed, where EN 15804 consistent and/or preverified background data and EN 15804 consistent calculation methods and database versions are used and when the building context is taken into account, i.e. on the basis of the same use-classification (EN ISO 10874), same service life and comparable assumptions for the end of life.

7.1 Description of the Declared Functional Unit

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

7.2 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 the 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.

7.3 Allocations

In the present study some allocations have been made. Detailed explanations can be found in the chapters below.

7.4 Co-product allocation

No co-product allocation occurs in the product system.

7.5 Allocation of multi-input processes

The Production and End of Life stage include incineration plants. In these processes different products are treated together within a process. The allocation procedures followed in these cases are based on a physical classification of the mass flows or calorific values.

Credits from energy substitution are allocated to the production stage, because the gained energy from energy substitution is lower than the energy input in this stage. The same quality of energy is considered.

7.6 Allocation procedure of reuse, recycling and recovery

The installation waste and end of life waste is fed into incineration processes. Incineration processes include cogeneration processes which give thermal and power energy as outputs. It is assumed that this recovered energy offsets that produced by the European average grid mix and thermal energy generation from natural gas. The gained energy is declared in module D as avoided environmental burden. Generated electricity and steam due to the incineration of installation and end of life waste are listed in the result table as exported energy.

7.7 Description of the allocation processes in the LCA report

The description of allocation rules in of this LCA report meets the requirements of the PCR.

7.8 LCA Data

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.

For life cycle modeling of the considered products, the GaBi 10 Software System for Life Cycle Engineering, developed by Sphera has been used. All relevant LCA datasets are taken from the GaBi 10 software database. The datasets from the database GaBi are documented in the online documentation. To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

7.9 Data Quality

The requirements for data quality and LCA data correspond to the specifications of the PCR.

Foreground data are based on 1 year averaged data (year 2023). The reference ages of LCA datasets vary but are given in the table in the Appendix. The time period over which inputs to and outputs from the system is accounted for is 100 years from the year for which the data set is deemed representative. The technological LCA of the collected data reflects the physical reality of the declared product. The datasets are complete, conform to the system boundaries and the criteria for the exclusion of inputs and outputs and are geographical representative for the supply chain of Forbo flooring.

For life cycle modeling of the considered products the GaBi 10 Software System for Life Cycle Engineering, developed by Sphera, is used. All relevant LCA datasets are taken from the GaBi 10 software database. The last revision of the used data sets took place within the last 10 years.

7.10 System Boundaries

Production Stage includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage.

Transport and Installation Stage includes provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction stage. These information modules also include all impacts and aspects related to any losses during this construction stage (i.e. production, transport, and waste processing and disposal of the lost products and materials). For the transportation a worldwide distribution is considered.
Use Stage includes provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage. These information modules also include all impacts and aspects related to the losses during this part of the use stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).
End of Life Stage includes provision and all transports, provision of all materials, products and related energy and water use. It also includes any declared benefits and loads from net flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state in the form of reuse, recovery and/or recycling potentials.

7.11 Power mix

The selection of LCA data for the electricity generation is in line with the PCR.

The products are manufactured in Coevorden, the Netherlands. The GaBi 10 Windpower dataset has therefore been used (reference year 2024). The energy supplier is providing Forbo with a certificate every year.

7.12 CO_2-Certificates

No CO_2-certificates are considered in this study as the Sphera manufacturing is realized without offsetting.

7.13 Life Cycle Inventory Analysis

In table 3 the environmental impacts are presented for all the lifecycle stages with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal.

Table 3: Results of the LCA – Environmental impact for Sphera (one year)

Parameter	A1-A3	A4	A5	B2	C1	C2	C3/1	C4/2	D/1	D/2
GWP - total [kg CO2 eq.]	5,75E+00	5,36E-01	3,01E-01	6,34E-02	4,78E-03	2,40E-02	5,70E+00	2,03E-01	-1,62E+00	0,00E+00
GWP - fossil [kg CO2 eq.]	6,09E+00	5,26E-01	2,96E-01	6,08E-02	4,73E-03	2,41E-02	5,70E+00	2,06E-01	-1,61E+00	0,00E+00
GWP - biogenic [kg CO2 eq.]	-3,41E-01	7,68E-03	4,67E-03	2,57E-03	5,13E-05	-3,35E-04	9,72E-04	-2,35E-03	-9,13E-03	0,00E+00
GWP - luluc [kg CO2 eq.]	2,53E-03	2,31E-03	2,58E-05	6,37E-07	5,08E-07	2,20E-04	4,35E-04	1,64E-04	-1,04E-04	0,00E+00
ODP [kg CFC-11 eq.]	4,10E-09	2,58E-14	9,79E-13	1,58E-09	8,63E-14	2,08E-15	4,06E-12	3,35E-13	-1,25E-11	0,00E+00
AP [Mole of H+ eq.]	1,43E-02	3,49E-03	6,14E-04	1,16E-04	9,99E-06	8,24E-05	1,27E-03	5,98E-04	-1,99E-03	0,00E+00
EP - freshwater [kg P eq.]	2,12E-05	9,21E-07	4,88E-07	2,09E-06	1,75E-08	8,65E-08	1,19E-06	3,84E-05	-2,58E-06	0,00E+00
EP - marine [kg N eq.]	3,44E-03	1,17E-03	1,78E-04	4,01E-05	2,39E-06	3,79E-05	4,12E-04	1,37E-04	-5,83E-04	0,00E+00
EP - terrestrial [Mole of N eq.]	4,35E-02	1,30E-02	1,96E-03	2,30E-04	2,50E-05	4,27E-04	5,45E-03	1,50E-03	-6,25E-03	0,00E+00
POCP [kg NMVOC eq.]	1,66E-02	2,69E-03	4,84E-04	9,12E-05	6,38E-06	7,51E-05	1,17E-03	4,35E-04	-1,63E-03	0,00E+00
ADPF [MJ]	1,74E+02	4,10E+00	7,46E+00	1,23E+00	9,84E-02	3,23E-01	9,05E+00	2,98E+00	-2,95E+01	0,00E+00
ADPE [kg Sb eq.]	1,70E-05	1,66E-08	1,22E-08	1,35E-10	7,25E-10	1,53E-09	3,57E-08	5,27E-09	-1,15E-07	0,00E+00
WDP [m³ world equiv.]	9,76E-01	2,97E-03	1,30E-02	1,38E-01	1,04E-03	2,74E-04	5,62E-01	-2,82E-03	-1,52E-01	0,00E+00

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

7.14 Interpretation

The interpretation of the results has been carried out considering the assumptions and limitations declared in the EPD, both methodology- and data-related for a one year usage.

In most of the impact categories the production stage is the main contributor to the overall impact. The raw material supply is the key contributor for all of these impact categories with a share of 80 – 99% of the total impact of the production stage.

The worldwide distribution by truck and container ship shows a significant contribution for GWP-Luluc, AP, EP-marine, EP terrestrial and POCP.

The installation of Sphera has a minor impact for all categories, main contributor is the adhesive used to install the floor.

In the Use stage only ODP shows a significant impact of 28% of the total. This impact comes mainly from the detergent used to spot clean the floor.

Energy recovery from incineration and the respective energy substitution at the end of life results in a small credit for all of the impact categories in the End of Life stage.

7.15 Resource use

In table 4 the parameters describing resource use are presented for all the lifecycle stages for a one year usage with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal

Table 4: Results of the LCA – Resource use for Sphera (one year)

	A1-A3	A4	A5	B2	C1	C2	C3/1	C4/2	D/1	D/2
PERE [MJ]	2,74E+01	2,43E-01	4,96E-01	1,84E-02	5,88E-02	2,28E-02	2,12E+00	2,69E-01	-8,55E+00	0,00E+00
PERM [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	0,00E+00	0,00E+00
PERT [MJ]	2,74E+01	2,43E-01	4,96E-01	1,84E-02	5,88E-02	2,28E-02	2,12E+00	2,69E-01	-8,55E+00	0,00E+00
PENRE [MJ]	1,29E+02	4,11E+00	7,46E+00	1,23E+00	9,85E-02	3,24E-01	9,06E+00	2,98E+00	-2,95E+01	0,00E+00
PENRM [MJ]	4,49E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT [MJ]	1,74E+02	4,11E+00	7,46E+00	1,23E+00	9,85E-02	3,24E-01	9,06E+00	2,98E+00	-2,95E+01	0,00E+00
SM [kg]	1,46E+00	0,00E+00	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	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	0,00E+00	0,00E+00
FW [m3]	3,27E-02	2,68E-04	1,05E-03	4,85E-05	4,75E-05	2,52E-05	1,41E-02	2,94E-05	-6,93E-03	0,00E+00

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

7.16 Waste categories and output flows

In table 5 other environmental information describing different waste categories and output flows are presented for all the lifecycle stages with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal

Table 5: Results of the LCA – Output flows and Waste categories for Sphera (one year)

	A1-A3	A4	A5	B2	C1	C2	C3/1	C4/2	D/1	D/2
HWD [kg]	8,00E-04	1,48E-11	7,98E-10	-7,62E-13	-7,70E-12	1,20E-12	3,09E-11	2,51E-10	-1,58E-09	0,00E+00
NHWD [kg]	1,46E-01	5,54E-04	3,00E-03	3,53E-03	7,21E-05	4,66E-05	2,42E+00	2,89E+00	-1,45E-02	0,00E+00
RWD [kg]	4,89E-03	5,23E-06	5,17E-05	2,58E-05	1,57E-05	4,18E-07	2,51E-04	3,53E-05	-2,27E-03	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	0,00E+00	0,00E+00
MFR [kg]	0,00E+00	0,00E+00	2,90E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER [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	0,00E+00	0,00E+00
EEE [MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,55E+00	0,00E+00	0,00E+00	0,00E+00
EET [MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,37E+01	0,00E+00	0,00E+00	0,00E+00

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

7.17 Biogenic Carbon content

Table 6: Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	**Unit (kg CO_2/m^2)**
Biogenic carbon content in product	0,30
Biogenic carbon content in accompanying packaging	0,07
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2	

8 Additional Environmental Impact Indicators

To be fully transparant Forbo Flooring does not only want to declare the environmental impacts required in the PCR, but also the additional environmental impact indicators according to the European Standard EN15804+A2 with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal

Table 7: Results of the LCA – Environmental impact for Sphera (one year)

	A1-A3	A4	A5	B2	C1	C2	C3/1	C4/2	D/1	D/2
PM [Disease incidences]	1,14E-07	4,47E-08	4,76E-09	7,75E-10	8,41E-11	5,33E-10	2,84E-08	5,80E-09	-1,69E-08	0,00E+00
IR [kBq U235 eq.]	1,05E+00	7,53E-04	5,57E-03	2,54E-03	2,60E-03	6,04E-05	3,05E-02	5,21E-03	-3,77E-01	0,00E+00
ETF-fw [CTUe]	2,27E+03	2,86E+00	2,58E+00	2,93E-01	4,34E-02	2,25E-01	5,93E+00	2,83E+00	-6,43E+00	0,00E+00
HTP-c [CTUh]	2,85E-09	5,72E-11	1,23E-10	7,13E-12	1,45E-12	4,58E-12	2,48E-10	1,30E-10	-3,26E-10	0,00E+00
HTP-nc [CTUh]	1,67E-07	4,18E-09	9,15E-09	2,20E-10	3,56E-11	3,12E-10	2,36E-08	1,08E-08	-1,01E-08	0,00E+00
SQP [Pt]	2,99E+01	1,41E+00	4,18E-01	6,79E-03	3,86E-02	1,35E-01	1,93E+00	2,58E-01	-5,62E+00	0,00E+00

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

8.1 **Interpretation**

The interpretation of the results has been carried out considering the assumptions and limitations declared in the EPD, both methodology- and data-related for a one year usage.

In all of the environmental impact categories the production stage is the main contributor to the total overall impact. The raw material supply has a share of 81-100% of the production stage, mainly caused by the manufacturing of PVC, stabilizer and plasticizer.

Energy recovery from incineration and the respective energy substitution at the end of life results in a small credit for all of the impact categories

8.2 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" the 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 in need of some improvements)
- Type 3 (recommended, but to be applied with caution).

Table 8: Classification of disclaimers to the declaration of core and additional environmental impact indicators

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 emissions (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 2	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.		

9 References

GABI 10 2012	Sphera; GaBi 10: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2017.
GABI 10 2012D	GaBi 10: Documentation of GaBi 10: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2017. http://documentation.gabi-software.com/
UL ENVIRONMENT	UL Environment's Program Operator Rules V2.7 2022
PE 2012 ILCD Handbook: General guide for Life Cycle Assessment - Detailed guidance	Description of Selected Impact Categories, Sphera, 2012 European Commission-Joint Research Centre - Institute for Environment and Sustainability: International Reference Life Cycle Data System (ILCD) Handbook- Recommendations for Life Cycle Impact Assessment in the European context. First edition November 2011. EUR 24571 EN. Luxemburg. Publications Office of the European Union; 2011
STANDARDS AND LAWS	
DIN EN ISO 14044	Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006); German and English version EN ISO 14044
ISO 14025 2006	DIN EN ISO 14025: Environmental labels and declarations — Type III environmental declarations — Principles and procedures
ISO 14040 2006	Environmental management - Life cycle assessment - Principles and framework (ISO 14040); German and English version EN ISO 14040
CEN/TR 15941	Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; German version CEN/TR 15941
EN15804:2012+A2:2019+AC:2021	EN 15804: 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
CPR	REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
EN-ISO 10874 EN-ISO 10581	Resilient, textile and laminate floor coverings – Classification Resilient floor coverings – Homogeneous poly(vinyl chloride) floor coverings - Specification