



**marmoleum®**

*Truth, transparency, disclosure.*

## Environmental Product Declaration (EPD) Health Product Declaration (HPD)

-- with SMaRT's ISO Compliant Universal Product Criteria Rule (PCR) covering 13 environmental impacts including toxicity



SMaRT Leadership ISO compliant EPDs, HPDs and Certification Body Market Transformation to Sustainability (MTS), clearly and transparently identify a product's life cycle environmental and health impacts. Marmoleum is a biobased product that

achieved a SMaRT Platinum Sustainable Product Certification

with 96 points in addition to the environmental and health information as part of this EPD/HPD.

Marmoleum's SMaRT Certification achieved 100% wind energy use at the manufacturing facility and

Marmoleum generates no hazardous waste over its life cycle.

## **Products Achieving SMaRT EPDs/HPDs Are Toxin Free in the Use Stage With Minimal Toxicity in other Stages**

Unlike any other EPDs/HPDs or Certifier, SMaRT ISO compliant EPDs/HPDs require SMaRT Sustainable Product Certification and adherence to its Carcinogen Policy precluding products



containing over their life cycle, the 200 plus International Agency for Research on Cancer's list of carcinogens, mutagens, and teratogens. Stepwise approach reductions are available to manufacturers. Further, SMaRT requires products also not contain any Stockholm Treaty Toxic Chemicals over the life cycle thus eliminating products that contain toxic chemicals like PVC.

The National Wildlife Federation identifies SMaRT as the toxin free independent third party sustainable product certification protecting public health & environment:

<http://mts.sustainableproducts.com/Toxin%20Free%20Piping.pdf>

Forbo's SMaRT Certification Summary is at [http://mts.sustainableproducts.com/certified\\_products/ForboSMaRTSummary.pdf](http://mts.sustainableproducts.com/certified_products/ForboSMaRTSummary.pdf)

In addition to the adherence to the Carcinogen Policy, SMaRT Certification requires 28 minimum points, adherence to the SF6 policy thus avoiding the worst climate change pollutant, social equity and legal operations requirements over the supply chain, FSC Certified Wood, operational reuse, and ISO compliant Life Cycle Assessment (LCA). This ISO Compliant EPD/HPD adheres to SMaRT's EPD/HPD Policy and unique Universal PCR covering all products and categories and sets forth LCA assumptions: [http://mts.sustainableproducts.com/SMaRT\\_product\\_standard.html](http://mts.sustainableproducts.com/SMaRT_product_standard.html)

## Product Description

Marmoleum is the most globally used brand of linoleum and has been manufactured by Forbo for more than 150 years with low environmental impacts as a result of the combination of natural renewable materials and high recycle content.

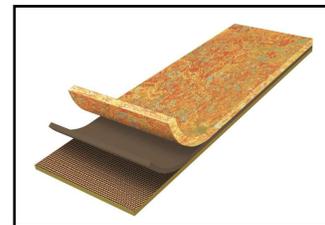
This EPD/HPD covers a broad range of designs and colors. Marmoleum is a resilient floor covering made from 70% rapid renewable raw materials and has a total recycling content of 39%. Marmoleum is a linoleum floor covering complying with all requirements for domestic / home, commercial, and industrial uses pursuant to EN-ISO 24011: *Specification for Plain and Decorative Linoleum*.

Marmoleum is made from 96% natural raw materials making it preferable ecological floor covering with a beautiful and colorful design. The key raw materials include linseed oil, which comes from the flax plant seeds, gum rosin from pine trees, recycled wood waste of wood from controlled forests, limestone and jute from the jute plant which is used for the backing.

This EPD/HPD refers to Marmoleum sheet of 2.0 and 2.5 mm nominal thickness. Marmoleum is built up in 3 layers as illustrated in the following image:

Figure 1: Illustration of Marmoleum

1. Surface layer gives Marmoleum its design and color. After finishing the product at the trimming department, a factory finish is applied to protect the surface layer.
2. Intermediate layer is calendared on the jute.
3. Backing is woven jute.



## Manufacturer

Forbo Flooring Systems is a global market player in linoleum, textile, flocked floor, and other coverings as well as entrance flooring systems, where it has a market share of over 60%. Forbo Flooring Systems is part of the Swiss Forbo Group and owns 12 manufacturing plants and branches in 32 countries worldwide.

To achieve environmental leadership Forbo Flooring places sustainability at the heart of its business. Forbo Flooring protects, invests, and cares for all environments that we touch upon and whether it is a work, indoor, or natural environment, our goal is to simply optimize our performance now, and for the benefit of our collective futures.

Creating better environments is an integral part of the way we do business and the way we promote our activities to our stakeholders.

Forbo Flooring is the first flooring manufacturer to use life cycle assessment to measure the environmental performance of all its products and the company. We have outlined an environmental strategy with a challenging target to improve all environmental impacts with focus on reducing the CO<sub>2</sub> and other related emissions that contribute to irreversible dangerous climate change caused by global warming.

### Green design principles

We conscientiously apply green design principles to all our products and processes. In order to live up to our promise to reduce our environmental footprint by 25% in 2015, all our collections are engineered and designed to commit to this goal. ***With every new product we aim at:***



Increasing efficiency in the use of materials, energy and other resources



Minimizing damage and pollution from the chosen material



Reducing to a minimum any long-term harm caused by the product

Ensuring that the planned life of the product is most appropriate in environmental terms and that the product functions efficiently for its full life



# Material Declaration

Table 1: Composition of Marmoleum

Component	Material	Availability	%	Origin
<b>Binder</b>	Linseed oil	Bio based crop	19	USA/Canada/Europe
	Gum rosin	Bio based crop	2	Indonesia/China
	Tall oil	Bio based waste product from paper Industry	11	USA
<b>Filler</b>	Wood flour	Bio based waste product from wood processing	22	Germany
	Calcium carbonate	Abundant mineral	24	Germany
	Reused Marmoleum		10	Internal
<b>Pigment</b>	Titanium dioxide	Limited mineral	2	Global
	Various other pigments	Limited mineral	1	Global
<b>Backing</b>	Jute	Biobased crop	8	India/Bangladesh
<b>Finish</b>	Lacquer		1	Netherlands

## Life Cycle Inventory Analysis

The life cycle inventory analysis covers all the life cycle stages, as shown below:

- Agriculture
- Biobased industrial waste
- Reused controlled wood and wood waste
- Ground marble & limestone
- Pigment from minerals
- Reused Marmoleum
- Manufacturing
- Transportation
- Installation, Use & Cleaning
- Reuse / End of Life

## Phase Descriptions

### Extraction

Linseed oil: Linseed oil is obtained by pressing the seeds of the flax plant. After filtering a clear golden yellow liquid remains.

Gum rosin: Rosin is obtained by wounding pine trees. The crude gum is collected and is separated into turpentine and rosin by distillation.

Tall oil: Tall oil is a post industrial waste product coming from the paper industry and consist of vegetable oil and rosin.

Wood flour: Post industrial bio based soft wood waste from the wood industry, which is milled into flour.

Calcium carbonate: An abundant mineral found in all parts of the world as the chief substance in rocks (i.e., marble and limestone). It can be ground to varying particle sizes and is widely used as filler.

Reused Marmoleum: Waste material coming from the Marmoleum production which is reused.

Titanium dioxide: A white pigment produced from the mineral rutile, a naturally occurring form of titanium dioxide.

Pigment: The production of the pigment is a large-scale chemical process. The vast majority of the used color pigments are iron oxide based.

Jute: Jute fiber is extracted from the stem of the jute plant by floating it in water. For yarn production, fiber bands are obtained by carding, stretching, spinning, warping and sizing. Finally the yarn is woven.

Lacquer: The factory applied lacquer – Topshield 2 – is a waterborne UV cured urethane – acrylate hybrid dispersion.

### Manufacturing

Marmoleum is produced in several stages starting with the oxidation of linseed oil mixed with tall oil and rosin. With the influence of oxygen from the atmosphere, a tough sticky material is obtained called linoleum cement. The linoleum cement is stored in containers for a few days for further reaction and after this it is mixed with wood flour, calcium carbonate, reused waste (if applicable), titanium dioxide and pigments.

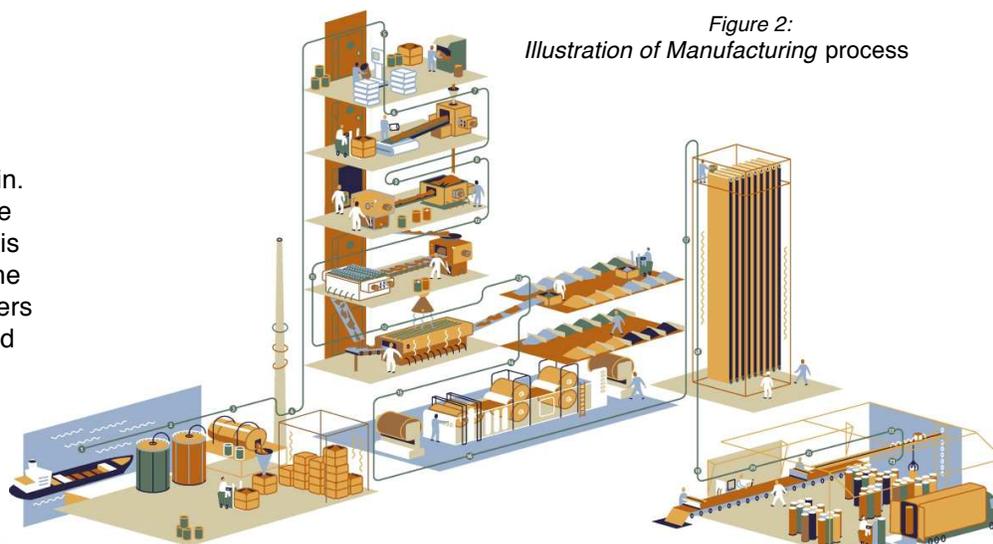


Figure 2:  
Illustration of Manufacturing process

This mixture is calendared on a jute substrate and stored in drying rooms, to cure till the required hardness is reached. After approximately 14 days, the material is taken out from the drying room to the trimming department where the factory finish is applied on the surface of the product and the end inspection is done. Finally the edges are trimmed and the sheet is cut to length into rolls of approximately 32 meters. The trimmings and the rejected product are reused.

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

### Delivery

Worldwide distribution is by truck and container ship. On average, every square meter of Marmoleum is transported as follows:

- Transport distance 40t truck 694 km
- Transport distance 7.5t truck (Fine distribution) 257 km
- Capacity utilization trucks (including empty runs) 85%
- Transport distance Ocean ship 4916 km
- Capacity utilization Ocean ship 48%

### Installation

Because of the specific techniques used during the installation of Marmoleum, 6% of the material is cut off as installation waste. For installation of Marmoleum on the floor, a worst case scenario has been modeled (assuming 0.435 kg/m<sup>2</sup> of adhesive is required). In practice this amount will almost always be lower. Waste during the installation process may be recycled as floor covering through the manufacturers' facilities or thermally recycled in a waste incineration plant. Since the major part of Marmoleum is sold in Europe, the European electricity grid mix is used in the calculations for energy recovery during incineration.

Forbo Flooring recommends use of zero emission adhesives for installing Marmoleum. Waste during the installation process may be recycled as floor covering through the manufacturers' facilities.

### Use

Cleaning regime calculations are:

- Dry cleaning with a 1.5 kW vacuum cleaner for 0.21 min/m<sup>2</sup>, twice a week. This equates to 0.55 kWh/m<sup>2</sup>\*year.
- Once a week wet cleaning with 0.062 l/m<sup>2</sup> water and 0.0008 kg/m<sup>2</sup> detergent. This results in the use of 3.224 l/m<sup>2</sup>\*year water and 0.04 kg/m<sup>2</sup>\*year detergent. The wet cleaning takes place without power machine usage. Rising wastewater is treated.

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 low traffic areas. The use of an entrance mat of at least four steps will

reduce the cleaning frequency. The cleaning regime used in the calculations is suitable for high traffic areas.

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.

### Reuse / End of Life

The deconstruction of installed Marmoleum from the floor is done mechanically and 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.

For the end of life stage no landfilling is taken into account, since the vast majority of the countries in which Marmoleum is sold have a no landfill policy. Marmoleum has been demonstrated to be compostable with no adverse environmental or health impacts.

## Life Cycle Impact Assessment

### *Results of the LCA – Environmental impact for Marmoleum 2.5 mm (one year)*

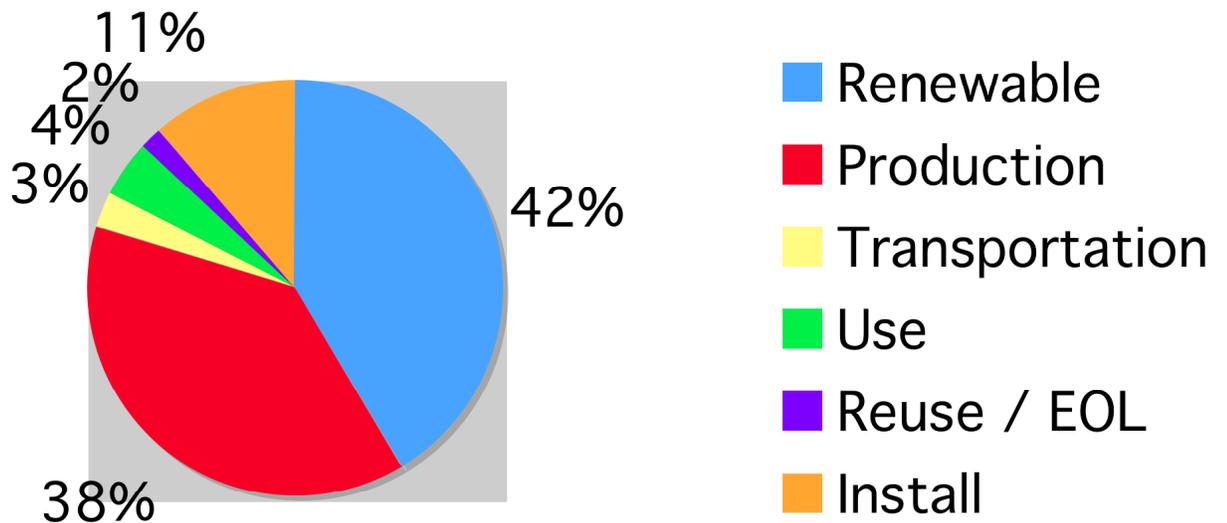
Impact Category CML 2001 – Nov. 2010	Unit	Production	Transport	Installation	Use (1 yr.)	End of Life
Global Warming Potential	kg CO2-Equiv.	0.022	0.51	1.48	0.36	3.78
Ozone Layer Depletion Potential	kg R11-Equiv.	2.75E-08	4.43E-10	-2.16E-09	1.97E-08	-1.92E-08
Acidification Potential	kg SO2-Equiv.	3.88E-02	7.54E-03	1.90E-03	1.29E-03	-1.44E-03
Eutrophication Potential	kg PSO4-Equiv.	1.02E-02	8.44E-04	2.53E-04	1.08E-04	6.65E-05
Photochem. Ozone Creation Poten.	kg Ethene-Equiv.	1.77E-03	1.87E-04	3.85E-04	9.51E-05	-3.21E-04
Abiotic Depletion Elements	kg Sb-Equiv.	2.99E-06	1.24E-08	2.66E-07	5.90E-08	6.32E-09
Abiotic Depletion Fossil	MJ	58.70	4.86	15.29	4.35	-27.46
Fresh Water Use	M3	6,30E+01	negligible	3,46E-02	9,92E-01	6,01E-03
<b>Impact Category : USEtox</b>						
Ecotoxicity	PAF m3 day	1.33E-03	8.40E-05	4.78E-04	8.69E-05	<b>-2.59E-04</b>
Human toxicity, cancer	cases	2.02E-10	6.75E-13	1.47E-11	1.36E-11	-1.14E-10
Human toxicity, non-cancer	cases	1.52E-11	2.90E-13	1.18E-10	7.45E-13	-2.15E-12

### *Results of the LCA – Environmental impact for Marmoleum 2.0 mm (one year)*

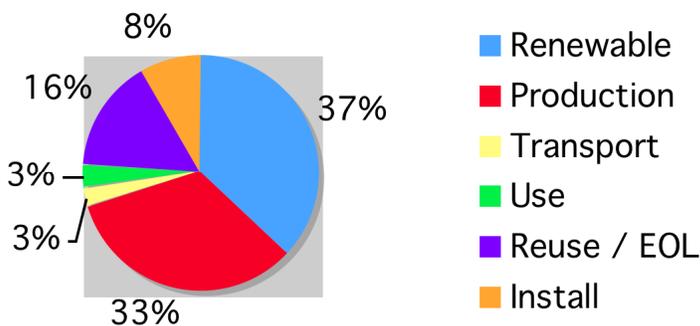
Impact Category CML 2001 – Nov. 2010	Unit	Production	Transport	Installation	Use (1 yr.)	End of Life
Global Warming Potential	kg CO2-Equiv.	0.20	0.41	1.44	0.36	3.03
Ozone Layer Depletion Potential	kg R11-Equiv.	2.30E-08	3.56E-10	-1.91E-09	1.97E-08	-1.52E-08
Acidification Potential	kg SO2-Equiv.	3.12E-02	6.06E-03	1.92E-03	1.29E-03	-1.14E-03
Eutrophication Potential	kg PSO4-Equiv.	8.20E-02	6.78E-04	2.52E-04	1.08E-04	5.41E-05
Photochem. Ozone Creation Poten.	kg Ethene-Equiv.	1.44E-03	1.50E-04	3.89E-04	9.51E-05	-2.56E-04
Abiotic Depletion Elements	kg Sb-Equiv.	2.58E-06	9.99E-09	2.66E-07	5.90E-08	5.30E-09
Abiotic Depletion Fossil	MJ	50.26	3.91	15.64	4.35	-21.96
Fresh Water Use	M3	6.20E+01	negligible	6.46E-01	9.92E-01	4.49E-03
<b>Impact Category : USEtox</b>						
Ecotoxicity	PAF m3 day	1.12E-03	6.75E-05	4.82E-04	8.69E-05	-2.07E-04
Human toxicity, cancer	cases	1.82E-10	5.36E-13	1.61E-11	1.36E-11	-9.08E-11
Human toxicity, non-cancer	cases	1.39E-11	2.31E-13	1.18E-10	7.45E-13	-1.72E-12

## Life Cycle Carbon Footprint of Marmoleum 2.0mm

Production, Transportation, Use, and install are all carbon based. Production is extraction and manufacturing. Renewable is renewable non-carbon energy. The Reuse percent is a negative percent actually reducing carbon energy. These conditions also apply for 2.5mm below.



## Life Cycle Carbon Footprint of Marmoleum 2.5mm



## Maintenance, Quality, Durability

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

- Meets or exceeds all technical requirements in ASTM F 2034 Standard Specification for Linoleum Sheet Flooring.
- Meets or exceeds all technical requirements in EN-ISO 24011 Specification for plain and decorative Linoleum.

Marmoleum meets the requirements of EN 14041:

- EN 13501-1 Reaction to fire Cfl - s1
- EN 13893 Slip resistance DS:  $\geq 0.30$
- EN 1815 Body voltage  $< 2$  kV
- EN 12524 Thermal conductivity  $0.17$  W/mK

Fire Testing:

- Class 1 when tested in accordance with ASTM E 648/NFPA 253, Standard Test Method for Critical Radiant Flux.
- Meets 450 or less when tested in accordance with ASTM E 662/NFPA 258, Standard Test Method for Smoke Density.
- Class c when tested in accordance to ASTM E 84/NFPA 255, Standard Test Method for Surface Burning Characteristics.
- FSC1-150; SD-160 when tested in accordance to CAN/ULC S102.2, Standard Test Method for Flame Spread Rating and Smoke Development.

Compliant with CHPS 01350 / SMaRT PHE 3-2 & 3-3 requirements for VOC emissions and indoor air quality documenting no carcinogens.

## Marmoleum and SMaRT

Marmoleum achieved Sustainable Platinum by the SMaRT<sup>®</sup> Sustainable Product Standard. SMaRT is a comprehensive, transparent, consensus sustainable product standard and label measuring a product's environmental, economic and social benefits over its life cycle and throughout its global supply chain, from raw materials extraction through reclamation or re-use.

SMaRT is a type 1 consensus, performance-based and quantified Ecolabel, an independently third-party verified, multi-criteria license to use the SMaRT Label indicating the overall environmental and sustainable preferability of a product on a life cycle basis. Type 2 labels are manufacturer self-claims on the environment without third-party verification. A type 3 label is an independent, qualified third-party verified environmental product declaration based on a quantified LCA with set parameters. To increase accuracy, SMaRT EPDs/HPDs combine the



requirements of a type 1 Ecolabel with a transparent type 3 label. LCAs are best used to obtain supplier environmental impact data and improve product design.

The SMaRT Scorecard results of different products can be accurately compared and include LCA results. Marmoleum's SMaRT Certification Summary is at: [http://mts.sustainableproducts.com/SMaRT\\_Certified.html](http://mts.sustainableproducts.com/SMaRT_Certified.html)

**Marmoleum Certification: SMART® Platinum.** Auditing conducted by Ernst & Young Global Sustainable Auditing. **Total Points Earned – 96** out of a possible 173. Marmoleum achieved the following SMaRT Credits:

**Safe for Public Health & Environment – Points Earned: 16**

- Feedstock Inventory Documentation
- No Input or Output Stockholm Chemicals
- Minimized Indoor Air VOCs
- Minimized Indoor Air Carcinogenic VOCs
- Minimized Indoor Formaldehyde Emissions
- Green Cleaning Procedures
- Green Primary Installation Materials
- Inventoried Human & Ecological Health Chemical Emissions
- No Supply Chain Stockholm Chemicals

**Renewable Energy and Energy Efficiency – Points Earned: 21**

- Electrical & Thermal Energy Inventory
- 100% Renewable Energy Use at the Manufacturing Facility

**Biobased or Recycled Materials – Points Earned: 22**

- Inventoried Biobased & Recycled Materials
- 88% Biobased Materials
- 40% Environmentally Preferable Product Materials

**Facility or Company Based Manufacturing – Points Earned: 13**

- EMS Environmental Policy & Targets
- Social Indicator Reporting for Manufacturer
- Conduct ISO Compliant Life Cycle Assessment
- Transparent Secondary Materials Recycling System
- Adopted Design for Environment Process
- Environmental Management System Certification
- Disclosed Sustainable/EPP Product Transactions

**Reclamation, Sustainable Reuse or End of Life Management – Points Earned: 4**

- Operational Reclamation and/or Sustainable Reuse System
- Performance Durability Standard Compliance
- Extended Product Life

**Innovation in Manufacturing – Points Earned: 20**

- Extra Points Dematerialization (less material by % weight)
- Extra Points for Sustainable Pollution Reduction from TopShield Finish

**DISCLOSURE:** All statements are accurate and not misleading based on Forbo's SMART® Platinum legally binding Certification to the Federal Trade Commission Environmental Marketing Guides.



## Marmoleum and LEED

Marmoleum contributes to a number of LEED credits:

- Materials and Resources Credit 4: Recycled Content, 2 points possible
- Pilot LCA and EPD Credits 4 points possible
- Innovation in Design Credit: SmARt Certified Materials, 1 point possible
- Materials Credit 6: Rapidly Renewable Material, 1 credit
- IEQ Credit 4: Low Emitting Materials, 1 credit

## Interpretation

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

The manufacturing / production stage has the main contribution to the overall impact for Acidification Potential (AP), Eutrophication Potential (EP), Photochemical Ozone Creation Potential (POCP), Abiotic Depletion Elements (ADPE), and Abiotic Depletion Fossil (ADPF). For these categories the main contributor in the production stage is the Raw material supply with a share of 65-92% of total impacts from the production stage.

The abiotic (not living or non organic) depletion potential covers all natural resources such as metal containing ores, crude oil and mineral raw materials. Abiotic resources include all raw materials from non-living resources that are non-renewable. This impact category describes the reduction of the global amount of non-renewable raw materials. Non-renewable means a time frame of at least 500 years. This impact category covers an evaluation of the availability of natural elements in general, as well as the availability of fossil energy carriers.

ADPE elements describe the quantity of non-energetic resources directly withdrawn from the geosphere. It reflects the scarcity of the materials in the geosphere and is expressed in Antimony equivalents.

For Global Warming Potential (GWP), POCP, and ADPF, the adhesive for the flooring installation has a significant impact. The LCA for the installation is based on a conservative assumption of 435g/m<sup>2</sup> adhesive. In practice this amount will almost always be lower.

Forbo declares in this EPD/HPD a worldwide distribution by truck (951km) and container ship (4916 km). For this scenario, the transport has a relevance of 7%-16% in the impact categories GWP, AP, EP, POCP and ADPF.

The LCA profile for the results of Stratospheric Ozone Depletion Potential (ODP) is different. After the production stage (89-105%), the use stage accounts for the main contribution to ODP (76%). For the production stage, the raw materials are responsible for most of the impact (78-

82%) while for the use stage the contribution is mainly due to the consumption of electricity (EU power grid mix) for cleaning. The third main impact on ODP comes from the End Of Life stage.

The LCA for GWP reflects the use of renewable raw materials for the production of Marmoleum (linseed oil and jute).

Carbon dioxide, a greenhouse gas, is locked in from the atmosphere in the course of plant growth via photosynthesis and stored during the use stage. This carbon dioxide is not released until the end of life when it is incinerated with energy recovery – this process accounts for the greatest emission of greenhouse gases in the life cycle of the product.

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

The Eco-toxicity is predominated by the production stage in which the raw materials are having a big impact with a share of around 78-84%. The other main contributor is the adhesive used for installing the floor.

In the Human toxicity (cancer) a huge benefit is coming from the incineration of the Marmoleum as energy recovery (EU27 Thermal energy from natural gas). The largest contribution in this impact category is coming from the production stage in which the raw materials and the Manufacturing (Thermal energy) equally share the impact.

The adhesive used for the installation of Marmoleum has by far the biggest impact on the Human toxicity (non-canc.). This is calculated as a worst case and will in practice probably be lower.

## Methodology and Certification

The Life Cycle Assessment (LCA) was performed using Gabi 5.0 software, following the SMaRT Product Criteria Rule (PCR). The functional unit is one square meter of installed product and the use stage is considered for one year of service life.

Regarding data quality, foreground data are based on 1 year averaged data (year 2011). The reference ages of LCA datasets vary but are given in the Forbo LCA document that this EPD/HPD is based on. 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 5 Software System for Life Cycle Engineering, developed by PE INTERNATIONAL AG, is used. All relevant LCA datasets are taken from the GaBi 5 software database. The last revision of the used data sets took place within the last 10 years.



This SMaRT Environmental and Health Product Declaration (EPD/HPD) was certified by Market Transformation to Sustainability (MTS) January 2013, and expires January 2016.

Forbo asserts that the SMaRT EPD/HPD Policy and PCR were adhered to in preparation of this Declaration with accurate information that is not misleading, and qualified professionals were used, consistent with the FTC Environmental Marketing Guides.

SMaRT PCR review consistent with ISO 21930 §§6.2 & 9.1 & ISO 14025 §8.1.2 was conducted by MTS. The SMaRT© National Consensus Committee overseeing this EPD/HPD Policy and requirements can be contacted through [MTS@sustainableproducts.com](mailto:MTS@sustainableproducts.com).

Independent verification of the declaration and data, according to ISO 14025:2006 was performed by an external expert reviewer, Mike Italiano, Founder USGBC. (ISO 14025 §8.1.1).

SMaRT EPD/HPD third-party verification was conducted by MTS, independent of first parties (suppliers/manufacturers) and second parties (purchasers). The verification is appropriate for business-to-business and business-to-consumer communications, and consumer and environmental representatives, per the SMaRT EPD/HPD Policy, which is consistent with ISO 14025 §9.3.

MTS was not involved in the development of the ISO-compliant LCA or the EPD/HPD, has no conflicts of interests, and is a nonprofit IRC §501(c)(3) (ISO 14025 §§8.1.1 & 9.4).

MTS is competent to conduct the third-party SMaRT© EPD/HPD verification pursuant to ISO 14025 §8.2 as documented in section 12 of the SMaRT© EPD/HPD Policy.

## References

GABI 5 2012 PE INTERNATIONAL AG; GaBi 5: Software-System and Database for Life Cycle Engineering, 1992-2012.

GABI 5 2012D GaBi 5: Documentation of GaBi 5: Software-System and Database for Life Cycle Engineering, 1992-2012. <http://documentation.gabi-software.com/>

Life Cycle Assessment, Marmoleum 2.0 and 2.5 mm, Forbo (2012)

Market Transformation to Sustainability, EPD/HPD Policy & Universal Product Criteria Rule (2011-13)

ERFMI 2008 Final report: LCA, Environmental Information Sheet and Ecodesign Model of Resilient Flooring by order of ERFMI, PE International, 2008

IBU 2011 PCR - Part A: Calculation rules for the Life Cycle Assessment and Requirements on the Background Report, Institut Bauen und Umwelt e.V. PE 2012

ILCD Handbook: General guide for Life Cycle Assessment -

Detailed guidance Description of Selected Impact Categories, PE International AG, 2012

European Commission - Joint Research Centre - Institute for Environment and Sustainability: International Reference Life Cycle Data System (ILCD) Handbook - General guide for Life Cycle Assessment - Detailed guidance. First edition March 2010. EUR 24708 EN. Luxembourg. Publications Office of the European Union; 2010

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);

CEN/TR 15941 Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; German version CEN/TR 1594EN 15804 EN 15804: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

ISO 24011 Resilient floor coverings - Specification for plain and decorative linoleum

CPR REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

EN-ISO 10874 Resilient, textile and laminate floor coverings – Classification

## Contact

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