WALLCOVERINGS ON CELLULOSE FIBRE BASE

IGI - the Global Wallcoverings Association, is a world-wide not-for-profit organisation with the mission to achieve and maintain best business practices within our membership by providing a forum for discussion, disseminating information, and representing the industry before government and standards bodies in order to facilitate the establishment and the promotion of industry standards.

Members are encouraged to improve the quality of their products, services and processes throughout each company, with an emphasis on sustainable growth through sound environmental principles, and to demonstrate a high amount of responsibility for society and the environment.

IGI members are committed to cooperation in addressing common goals and issues such as ethical practices, quality standards, functionality, and innovation, with a focus on sustainability and environmental protection. We are undertaking the publication of EPD’s to demonstrate this commitment.
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.

<table>
<thead>
<tr>
<th>PROGRAM OPERATOR</th>
<th>UL Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION HOLDER</td>
<td>IGI - The Global Wallcoverings Association</td>
</tr>
<tr>
<td>ULE DECLARATION NUMBER</td>
<td>4788355787.104.1</td>
</tr>
<tr>
<td>IBU DECLARATION NUMBER</td>
<td>EPD-IGI-20170142-IBG1-EN</td>
</tr>
<tr>
<td>DECLARED PRODUCT</td>
<td>Wallcoverings on cellulose fibre base</td>
</tr>
</tbody>
</table>

DATE OF ISSUE February 5, 2015
PERIOD OF VALIDITY 5 years

The PCR review was conducted by: IBU – Institut Bauen und Umwelt e.V. PCR was approved by the Independent Expert Committee (IEC) of IBU

The CEN Norm EN 15804 serves as the core PCR. This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories

- INTERNAL
- EXTERNAL

Grant R. Martin, UL Environment

This life cycle assessment was independently verified in accordance with EN 15804 and the reference PCR by: IBU – Institut Bauen und Umwelt e.V.

This EPD conforms with EN 15804
1. General Information

Participating companies:

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-IGI-20170142-IBG1-EN

This Declaration is based on the Product Category Rules:
Wall coverings, 09.2016
(PCR tested and approved by the SVR)

Issue date
11.12.2017

Valid to
10.12.2022

Owner of the Declaration
IGI - The Global Wallcoverings Association
Chaussée de Louvain 426
1380 LASNE - Belgium

Declared product / Declared unit
The declared unit is 1m² (square metre) decorative wallcovering on cellulose fibre base including packaging.

Scope:
This EPD focusses on the production, transport and disposal of a weighted average of 1m² wallcoverings on cellulose fibre base of participating members of the IGI - The Global Wallcoverings Association.
Non-decorative wallcoverings for a later additional treatment like painting ("whites") are included in this scope as they follow a worst case approach.
12 out of 67 IGI-members are involved in this EPD. The EPD is valid only for those companies.
The technical properties are displayed in chapter 2.3.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification
The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/

Prof. Dr. Birgit Grahl
(Independent verifier appointed by SVR)

2. Product

2.1 Product description / Product definition
Wallcovering on cellulose fibre is a wallcovering according to /EN 15102/ using a cellulose fibre base. When the wallcovering is to be changed, it can be removed from the wall by wetting the surface, allow moisture to penetrate the wallcovering, and then use a scraper for removal. This property as defined in /EN 235/ is wet removable.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation /(EU) No. 305/2011/ (CPR) applies. The product needs a Declaration of Performance taking into consideration /EN 15102/ and CE-marking.
For the application and use the respective national provisions apply.

For the placing on the market in the USA the product should conform to /ASTM F 1141 – 93/ Standard Specification for Wallcovering and /ASTM F 793 – 06/ Standard Classification of Wall Covering by Use Characteristics.
2.2 Application
Wallcoverings are used for the decorative wall design of interior spaces in private or commercial use.

2.3 Technical Data
In accordance with /EN 233/, the following technical (structural) data can be declared on delivery:

### Constructional data

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures by categories /EN 233/</td>
<td>category 1 - 3</td>
<td>-</td>
</tr>
<tr>
<td>Straightness and parallelism in mm.</td>
<td>equal or less than 1</td>
<td>-</td>
</tr>
<tr>
<td>Washability according to /EN 12956/</td>
<td>spongeable to extra-washable</td>
<td>-</td>
</tr>
<tr>
<td>Colour fastness to light according to /EN ISO 105-B02/</td>
<td>3 - 6</td>
<td>-</td>
</tr>
<tr>
<td>Migration of heavy metals and other elements to /EN 12149/</td>
<td>fulfills the norm</td>
<td>-</td>
</tr>
<tr>
<td>Emissions of formaldehyde max. &lt; 120 mg/kg according to /EN 12149/</td>
<td>fulfills the norm</td>
<td>-</td>
</tr>
</tbody>
</table>

This table contains the range of all wallcoverings examined. For more precise information please contact the specific manufacturer.

For USA manufactured products should be in accordance with /ASTM F 793-0-06/ Table 1 Classification Criteria.

Depending on whether products are intended for the European or US market, the following performance data must be declared.

1a: Product according to the CPR, based on EN 15102/:
Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to /EN 15102/.

or:

1b
Performance Category I, II, III, IV, V or VI as described in Table 1 of /F 793-0-06/ should be declared.

2.4 Delivery status
The products declared are provided within the following dimensions:

<table>
<thead>
<tr>
<th>Width metres</th>
<th>Length metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>0.06</td>
<td>1.00</td>
</tr>
<tr>
<td>1.20</td>
<td>11.25</td>
</tr>
</tbody>
</table>

This table contains the range of all wallcoverings examined. For more precise information please contact the specific manufacturer.

2.5 Base materials / Ancillary materials
The weighted average of the primary product components is shown in the following table, in percentage:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>72</td>
<td>%</td>
</tr>
<tr>
<td>inks</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td>Chemicals and auxiliary materials</td>
<td>8</td>
<td>%</td>
</tr>
<tr>
<td>Packaging</td>
<td>14</td>
<td>%</td>
</tr>
<tr>
<td>Sum</td>
<td>100</td>
<td>%</td>
</tr>
</tbody>
</table>

Pallets were considered as part of the packaging.

It cannot be ruled out that individual wallcoverings may contain small amounts of substances that are included in the SVHC candidate list. This can be attributed, for example, to the contents of used waste paper. Depending on the manufacturer and wallcovering, different flame retardants, biocides and plasticizers can be used.

Further information can be obtained from the respective manufacturer.

2.6 Manufacture
The manufacturing process can be described with the help of the following graphic:

- Base web
- Coating (optional)
- Printing
- Laminating (optional)
- Embossing (optional)
- Trimming/setting
- Cut to length and winding
- Wrapping
- Packing

The order of manufacture may change and can slightly deviate for different producers.

2.7 Environment and health during manufacturing
Compliance with statutory health and safety for personnel is ensured. Further, the energy and environmental management is certified for some members according to /ISO 14001/ and /ISO 50001/.

For greater detail please contact the specific manufacturer.

2.8 Product processing/Installation
Depending on the manufacturers suggestion, the adhesive is applied to the back of the wallcovering or the substrate using a wallpaper brush or short-napped roller. The wallcovering is pressed against the wall and is cut along the top and bottom edge to fit the wall.

2.9 Packaging
Product is wrapped in polyolefin film, packed in corrugated cardboard boxes and palletised.

2.10 Condition of use
There are no special features to be noted within the limits of normal and customary usage.

2.11 Environment and health during use
No environmental problems can be expected when the product is handled and used properly.
2.12 Reference service life

Given the wallcovering is professionally installed, the reference service life is 10 years according to the German Sustainable Building Assessment System (BNB).

2.13 Extraordinary effects

2.13.1 Fire

The fire performance according to /EN 13501/ is shown in the following table:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building material class</td>
<td>B - D</td>
</tr>
<tr>
<td>Burning droplets</td>
<td>s1 - s3</td>
</tr>
<tr>
<td>Smoke gas development</td>
<td>d0 - d2</td>
</tr>
</tbody>
</table>

*This table contains the range of all wallcoverings examined. For more precise information please contact the specific manufacturer.

For USA information on fire performance according to /ASTM E 84/ Test method for Surface Burning Characteristics of Building Materials.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 m² of wallcovering including packaging. The model shows a weighted average based on data (including produced square metres) from the participating manufacturers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declared unit</td>
<td>1</td>
<td>m²</td>
</tr>
<tr>
<td>Grammage</td>
<td>0.170</td>
<td>kg/m²</td>
</tr>
<tr>
<td>Conversion factor</td>
<td>5.882</td>
<td></td>
</tr>
</tbody>
</table>

3.2 System boundary

Type of the EPD: cradle to gate - with options. The EPD is considered as a declaration of an average product as calculated from the output of several manufacturers (2b).

Module A1-3, A4 and A5

The product stage begins with the consideration of the production of the necessary raw materials and energies including all corresponding upstream processes as well as transport. Furthermore, the entire production phase was investigated, including the treatment of production waste until reaching the end-of-waste status (EoW). In addition, distribution transport and installation in the building were taken into account.

Module C2-4

The modules include the environmental impacts of the waste treatment until reaching the end-of-waste status (EoW) including the associated transport at the end of the product life cycle.

Module D

Calculation of potential benefits through the generated energy (electric & thermic) by the incineration processes in the life cycle stages in A5 C3 and C4.

2.14 Re-use phase

Product is not re-usable.

2.15 Disposal

Wallcoverings are subject to the waste code 170904 (mixed construction and demolition waste other than those mentioned in 170901, 170902 and 170903) in accordance with the /European Waste Catalogue/ (EWC).

Wallcoverings can therefore be disposed of as normal household waste, that is in the dustbin or in additional refuse sacks. Used wallcoverings should not be placed in the waste paper bank. Most household waste is incinerated or landfilled depending on regional legal regulations in the EU or in the US.

2.16 Further information

For further information please visit www.igiwallcoverings.org.

3.2.1 Conversion

Grammage

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declared unit</td>
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</tr>
<tr>
<td>Conversion factor</td>
<td>5.882</td>
<td></td>
</tr>
</tbody>
</table>

The burdens resulting from the waste-to-energy plants are assigned in module C3 or C4 in case of landfill gas combustion.

3.3 Estimates and assumptions

Most solvents were modelled as a generic mix of solvents.

Even though this EPD is also valid for ‘whites’, they are not part of the average which is responsible for the results in chapter 5. ‘Whites’ are not decorative wallcoverings yet, because there is a final production step (e.g. painting) missing. As a result, ‘whites’ have less environmental impact than comparable decorative wallcoverings with similar weights.

3.4 Cut-off criteria

Some materials that contribute less than 0.2% to the total weight of the average wallcovering were cut off. This is about 3% of the total input mass. No energy consumption was neglected.

3.5 Background data

For modeling the lifecycle, the software system for holistic balancing /GaBi/ was used. All background data records relevant for production and disposal were almost exclusively taken from various GaBi supplementary databases or rarely also from /ecoinvent/ (v.2.2). The data records included in the databases are documented online.

3.6 Data quality

Data collection for the investigated products was carried out on the basis of evaluations of the internal production and environmental data, the collection of LCA-relevant data within the supply chain as well as through the measurement of relevant energy supply data. The collected data was checked for plausibility...
and consistency. A good representation is to be assumed.
The data were collected in 2016 and refer to the calendar year 2015.

3.7 Period under review
The LCA data were collected for the calendar year 2015.

3.8 Allocation
Potential benefits resulting from the thermal utilization of the packaging waste (module A5) as well as from the energetic utilization of the wallcoverings at the end of life (module C3 and C4) are allocated to module D.

3.9 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.

4. LCA: Scenarios and additional technical information

<table>
<thead>
<tr>
<th>Transport to the building site (A4)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck transport</td>
<td>27</td>
<td>t payload</td>
<td></td>
</tr>
<tr>
<td>Transport distance</td>
<td>445</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Train transport</td>
<td>726</td>
<td>t payload</td>
<td></td>
</tr>
<tr>
<td>Transport distance</td>
<td>7</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Ship transport</td>
<td>27500</td>
<td>dwt payload</td>
<td></td>
</tr>
<tr>
<td>Transport distance</td>
<td>261</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Cargo plane transport</td>
<td>65</td>
<td>t payload</td>
<td></td>
</tr>
<tr>
<td>Transport distance</td>
<td>47</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Capacity utilisation (including empty runs)</td>
<td>80 - 90</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

Because many different countries are involved, there were always global data sets used to model the transport distances.

<table>
<thead>
<tr>
<th>Reference service life</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference service life</td>
<td>10</td>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End of life (C1-C4)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration</td>
<td>83</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Landfilling</td>
<td>17</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

For the calculation of this LCA landfilling is chosen for the US and incineration for the EU. Different disposal routes are available but not taken into account for this industry average LCA.

Reuse, recovery and/or recycling potentials (D), relevant scenario information
In module D the potential benefits of the thermal combustion of the wallcoverings (C3) and their packaging (A5) as well as the incineration of landfill gases (C4) are displayed.
5. LCA: Results

In this section, the LCA results for 1 m² wallcoverings are presented. It should be borne in mind that the LCA results only indicate possible effects.

Indicators used for evaluation:
The CML (Centrum voor Milieukunde) methodology with the characterization factors in version 2001 - April 2013 is used to evaluate the possible environmental effects of the wallcoverings. The following impact categories are evaluated:
- Global warming potential (GWP), Degradation potential of the stratospheric ozone layer (ODP), Acidification potential of soil and water (AP), Eutrophication potential (EP), Photochemical ozone creation potential (POCP), Potential for abiotic degradation of non-fossil resources (ADPE), Potential for abiotic degradation of fossil fuels (ADPF)

The fresh water consumption corresponds to the "Blue Water" consumption according to "The Water Footprint Assessment Manual, 2011".

### DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

| Raw material supply | Transport | Manufacturing | Transport from the gate to the site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction | Demolition | Transport | Waste processing | Disposal | Reuse/Recovery | Recycling potential |
|---------------------|-----------|--------------|-----------------------------------|---------|-----|-------------|--------|-------------|--------------|------------------------|---------------------|----------------|------------|-----------|----------------|----------------|-----------|-----------------|------------------|
| A1                  | X         | X            | X                                 | X       | X   | MND         | MND    | MND         | MND          | MND                    | MND                 | X             | X          | X         | X              |             | X         | X               |                  |

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1m² wallcoverings on cellulose fibre base

#### CML 2001 – April 2013

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>[kg CO₂ eq.]</td>
<td>1.16E-1</td>
<td>3.33E-2</td>
<td>2.69E-2</td>
<td>1.01E-3</td>
<td>2.04E-1</td>
<td>2.14E-2</td>
<td>-6.98E-2</td>
</tr>
<tr>
<td>ODP</td>
<td>[kg CFC11 eq.]</td>
<td>8.92E-10</td>
<td>1.08E-14</td>
<td>5.47E-15</td>
<td>8.20E-16</td>
<td>2.35E-12</td>
<td>3.51E-15</td>
<td>-1.43E-12</td>
</tr>
<tr>
<td>AP</td>
<td>[kg SO₂ eq.]</td>
<td>9.33E-4</td>
<td>1.17E-4</td>
<td>6.83E-6</td>
<td>6.18E-6</td>
<td>3.98E-5</td>
<td>5.98E-6</td>
<td>-1.14E-4</td>
</tr>
<tr>
<td>EP</td>
<td>[kg NOx eq.]</td>
<td>2.11E-4</td>
<td>2.42E-5</td>
<td>5.39E-5</td>
<td>1.57E-6</td>
<td>7.42E-6</td>
<td>1.01E-5</td>
<td>-1.15E-5</td>
</tr>
<tr>
<td>POCP</td>
<td>[kg H₂S eq.]</td>
<td>5.70E-5</td>
<td>1.95E-6</td>
<td>3.15E-6</td>
<td>2.73E-6</td>
<td>2.59E-6</td>
<td>5.34E-6</td>
<td>-1.55E-5</td>
</tr>
<tr>
<td>ADPE</td>
<td>[kg Sb eq.]</td>
<td>4.25E-7</td>
<td>1.31E-9</td>
<td>4.09E-10</td>
<td>9.11E-11</td>
<td>3.57E-9</td>
<td>2.95E-10</td>
<td>-1.43E-8</td>
</tr>
<tr>
<td>ADPF</td>
<td>[MJ]</td>
<td>4.41E-0</td>
<td>4.60E-1</td>
<td>1.74E-2</td>
<td>1.39E-2</td>
<td>4.90E-2</td>
<td>2.05E-2</td>
<td>-9.52E-1</td>
</tr>
</tbody>
</table>

#### TRACI 2.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>[kg CO₂ eq.]</td>
<td>1.16E-1</td>
<td>3.33E-2</td>
<td>2.69E-2</td>
<td>1.01E-3</td>
<td>2.04E-1</td>
<td>2.14E-2</td>
<td>-6.98E-2</td>
</tr>
<tr>
<td>ODP</td>
<td>[kg CFC11 eq.]</td>
<td>1.05E-09</td>
<td>1.15E-14</td>
<td>5.47E-15</td>
<td>8.69E-16</td>
<td>2.56E-12</td>
<td>3.70E-15</td>
<td>-1.51E-12</td>
</tr>
<tr>
<td>AP</td>
<td>[kg H⁺ ions eq.]</td>
<td>1.03E-03</td>
<td>1.48E-04</td>
<td>1.10E-05</td>
<td>8.42E-06</td>
<td>4.91E-05</td>
<td>1.21E-05</td>
<td>-1.19E-04</td>
</tr>
<tr>
<td>EP</td>
<td>[kg N eq.]</td>
<td>2.53E-04</td>
<td>8.75E-06</td>
<td>2.28E-06</td>
<td>6.37E-07</td>
<td>2.98E-06</td>
<td>4.03E-06</td>
<td>-7.77E-06</td>
</tr>
<tr>
<td>Smog Air</td>
<td>[kg CO₂ eq.]</td>
<td>1.67E-02</td>
<td>4.16E-03</td>
<td>1.99E-04</td>
<td>1.89E-04</td>
<td>1.21E-03</td>
<td>1.70E-04</td>
<td>-1.80E-03</td>
</tr>
</tbody>
</table>

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources.

### RESULTS OF THE LCA - RESOURCE USE: 1m² wallcoverings on cellulose fibre base

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERE</td>
<td>[MJ]</td>
<td>4.44E-0</td>
<td>4.33E-3</td>
<td>3.59E-1</td>
<td>7.17E-4</td>
<td>1.69E+0</td>
<td>2.38E-1</td>
<td>-1.82E-1</td>
</tr>
<tr>
<td>PERM</td>
<td>[MJ]</td>
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<td>-3.49E-1</td>
<td>0.00E+0</td>
<td>-1.68E-0</td>
<td>-2.36E-1</td>
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<td>[MJ]</td>
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<td>PENRE</td>
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<td>4.62E-1</td>
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<tr>
<td>SM</td>
<td>[kg]</td>
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<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
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<tr>
<td>RSF</td>
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<td>0.00E+0</td>
<td>0.00E+0</td>
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<td>0.00E+0</td>
<td>0.00E+0</td>
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<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
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<td>0.00E+0</td>
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<tr>
<td>FW</td>
<td>[m³]</td>
<td>4.27E-2</td>
<td>8.58E-6</td>
<td>3.81E-5</td>
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<td>5.09E-6</td>
<td>2.97E-6</td>
<td>-2.75E-4</td>
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</table>

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.
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:
1m² wallcoverings on cellulose fibre base

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
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<td>HWD</td>
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<td>1.82E-7</td>
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<td>9.26E-3</td>
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<tr>
<td>MER</td>
<td>[kg]</td>
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<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
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<td>EEE</td>
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<td>5.24E-1</td>
<td>0.00E+0</td>
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</tbody>
</table>

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

6. LCA: Interpretation

The production stage (module A1-A3) clearly dominates the LCA results. The loads caused by the disposal stage (modules C3 and C4) become noticeable especially in creating a major impact in the global warming potential (GWP). Transports play a subordinate, yet not insignificant role.

The main environmental impacts are in all categories located in module A1-A3 and there mostly in the generation of thermal and electric energy for general production and heating/drying processes in A3. Besides the GWP, this affects mainly the acidification potential (AP) as well as the resource depletion of fossil fuels (ADPF).

However, also the production of (recycled) paper has a noticeable effect. It has a relatively high share of the greenhouse potential due to energy demands. In the GWP category, the biogenic carbon dioxide contained in the paper is treated first as a credit; after incineration in a waste-to-energy facility, it is treated as a load (C3). Moreover, the paper production has a relatively large influence on the acidification potential (AP), the eutrophication potential (EP), and the ozone depletion (ODP). A small proportion is attributable to the production of paints, consisting of solvents, auxiliaries and fillers.

Transport processes do also affect GWP, AP, EP, POCP and ADPF. The main reason is the combustion of fuels.

Range of the results

The individual results of the participating companies differ from the average results in the present environmental product declaration. In terms of GWP, the results may be 40% higher or 50% lower than the average for this EPD. The main reason for the deviations are differences in the grammage of the individual wallcoverings. In addition, there are different materials used as well as varying heat and electricity consumptions depending on the manufacturer.
7. Requisite evidence

Members of the The Global Wallcoverings Association have the following certificates:

- The declared products comply with /EN 15102/.
- According to the (emission) test chamber assessment, which follows the French measurement method /Arrêté du 19/04/11/ the wallcoverings meet the requirements of the test standard /ISO 16000/.
- Optional according to the chamber test which follows the german AgBB (Committee for health-related evaluation of building products) regulations the wallcoverings meet the requirements of test standard /ISO 16000/.
- Optional compliance with German /RAL-GZ 479/.

The certificates and classifications for the various wallcoverings can be obtained from the respective manufacturers.

8. References

ASTM E 84

ASTM F 793

ASTM F1141 - 93

BNB
Lifetimes of components for life cycle analyses according to the Bewertungssystem Nachhaltiges Bauen, 2011.

CDPH/EHLB
Standard method for measuring and evaluating chemical emissions from indoor sources using environmental chambers, Version 1.1

CPR
Construction Product Regulation EU

EN 12149:1997
Wallcoverings in roll form - Determination of migration of heavy metals and certain other elements, of vinyl chloride monomer and of formaldehyde release.

EN 12956:1999
Wallcoverings in roll form - Determination of dimensions, straightness, spongeability and washability.

Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire Tests.

Decorative wall coverings - Roll and panel form.

EN 233:2016
Wallcoverings in roll form - Specification for finished wallpapers, wall vinyls and plastics wallcoverings.

EN 234:1997
Wallcoverings in roll form – Specification for wallcoverings for subsequent decoration

EN 235:2001
Wall coverings - Vocabulary and Symbols.

EN 259-1:2001
Wall coverings in roll form - Heavy duty wallcoverings - Part 1: Specifications.

EN ISO 105-B02

EN ISO 14025:2006
Environmental labels and declarations — Type III environmental declarations — Principles and procedures; 2009-11.

EN ISO 14044:2006

EN ISO 16000:2006
Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air - Active sampling method.

Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.

Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method.

Indoor air - Part 11: Determination of the emission of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens.
Environmental Product Declaration

IGI - The Global Wallcoverings Association

Wallcoverings on cellulose fibre base

Ecoinvent
Database for Life Cycle Assessment, version 2.2.
Swiss Center for Life Cycle Inventories, St. Gallen, 2010.

European Waste Catalogue (EWC)
European Waste Catalogue / Ordinance on European List of Wastes

GaBi

Institut Bauen und Umwelt e. V.

Institut Bauen und Umwelt e. V.
PCR Guidance-Texts for Building-Related Products and Services - Part B (v 1.5): Requirements on the EPD for Wallcoverings. 2016-09

ISO 14001:2015
Environmental management systems - Requirements with guidance for use.

ISO 50001:2011
Energy management systems - Requirements with guidance for use.

RAL-GZ 479
Wallpapers - Quality assurance

WA-101
WA Quality Standard for Polymer Coated Fabric Wallcovering

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.):
Generation of Environmental Product Declarations (EPDs);

General Principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2015/10
www.ibu-epd.de

/ISO 14025/
DIN EN /ISO 14025:2011-10/, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products