ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Verband der Deutschen Holzwerkstoffindustrie e. V.**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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Interior doors made of wood and wood-based panels

Verband der Deutschen Holzwerkstoffindustrie e. V. (VHI)

Association of the German Wood-based Panel Industry

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

1. General Information

Verband der Deutschen Holzwerkstoffindustrie e. V. (VHI)

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

Declaration number
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This Declaration is based on the Product Category Rules:
Windows and doors, 11.2014
(PCR tested and approved by the SVR)

Issue date
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Prof. Dr.-Ing. Horst J. Bossenmayer
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Interior doors made of wood and wood-based panels

Owner of the Declaration
Verband der Deutschen Holzwerkstoffindustrie e. V.
Ursulum 18
35396 Gießen

Declared product / Declared unit
One interior door, consisting of door leaf and frame, in the size 1.23 m x 2.18 m.

Scope:
This Declaration is an Association EPD, which reflects an average product of the VHI members producing interior doors.
In 2010 approx. 5.9 million interior door leaves and approx. 4.3 million wooden frames were produced in Germany. Of these, members of the VHI accounted for approx. 5.1 million interior door leaves and approx. 3.8 million wooden frames. The contents of this Declaration are based on the information from 100 % of the members, who represent a produced quantity of approx. 5.1 million interior door leaves and approx. 3.8 million wooden frames. The technology represented here is representative of all members. This document is translated from the German Environmental Product Declaration into English. It is based on the German original version EPD-VHI-20130063-CBG1-DE. The verifier has no influence on the quality of the translation.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/
☐ internally ☒ externally

Matthias Schulz
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Single-leaf interior doors generally consist of the insert, the frame which surrounds the insert on four sides as well as the cover panels and in some cases also skins, if these are not already part of the cover panels. For the inserts, wood-based panels such as particle boards, mainly extruded particle boards (boards with tubes), honeycomb boards, fibre boards, multilayer wood-based inserts and also rigid foam boards are used. As frame material, MDF boards, particle boards, softwoods and hardwoods or plywood are used. As barriers (cover panels), MDF boards, HDF boards, thin particle boards and plywood, among others, are used.

With door frames, we distinguish between two basic types, the block frame and the closed frame, which is fitted round the three sides of a wall opening as a ready-made element.

In the many different design variants, you can also find doors with glass panels in different sizes.

Fig. 1 Illustration of door structure (Sauerländer)

This EPD describes an average product of the doors produced by VHI member companies. The member companies of the VHI produce not only standard doors but also so-called special function doors. These offer additional functions such as protection from damp, smoke, fire, sound, burglary and radiation. For these purposes, the doors have a modified structure.

The entire production of doors within the VHI is divided up into the following groups:

90 % standard doors
5 % sound insulation doors
2 % fire protection doors
1.4 % burglar protection doors
0.8 % damp/wet room doors
0.8 % smoke protection doors
< 0.1 % radiation-proof doors

The composition of the average values that this EPD describes is quantity-weighted according to the production shares specified above.

2.2 Application

Interior doors are mainly used in general housing construction. In some cases, interior doors for the commercial sector have to meet high standards, which have to be complied with in accordance with statutory building regulations.

2.3 Technical Data

The characteristics listed in the following are those relevant for interior doors. The technical data to be listed according to the PCR "Windows and doors" (IBU 2012) (air permeability coefficient of joints, overall depth etc.) are only of significance for windows and exterior doors and for this reason are not mentioned here.

- Mechanical stress according to RAL-GZ 426 or DIN EN 1192:2000-06
- Climatic stress according to RAL-GZ 426 or DIN EN 1121:2000-09
- Fire protection according to DIN 4102-1:1998-05, division into classes T30, T60, T90
- Smoke protection according to DIN 18095-1:1988-10
- Sound insulation according to DIN 4109-1:2006-10, division according to guide values
- Burglar protection according to DIN 41021627:2011-09, division into classes WK1, WK2, WK3 and RC1, RC2, RC3
- Radiation protection according to DIN 6834-1:2012-12
- Suitability for wet and damp rooms according to RAL-GZ 426

2.4 Placing on the market / Application rules

Interior doors made of wood and wood-based panels are standardised in DIN 68706-1:2002-02, door frames made of wood and wood-based materials in DIN 68706-2:2002-02.

2.5 Delivery status

Single-leaf door leaves of the companies in VHI are available in the following dimensions:

Width: 485 mm – 1360 mm
Height: 1597 mm – 2735 mm

According to DIN 68706, the door leaf thickness must be at least 39 mm. The formats of the door frames are adapted to the door leaf sizes. Special formats are available on request.

2.6 Base materials / Ancillary materials

For the production of VHI interior doors, wood-based panels (mainly particle boards and fibre boards or plywood) and/or solid wood (for the frames) are used. The inserts consist essentially of wood-based panels (extruded particle boards), the barrier of thin particle boards or fibre boards, the skin of solid wood (veneer) or synthetic materials (HPL, CPL or other synthetic resin-impregnated decor papers).
UF glue: the aminoplastic adhesive hardens fully in the pressing process through polycondensation.
PVAC glue: this thermoplastic adhesive hardens through the evaporation of water.

The average material/ingredient shares determined for the Environmental Product Declaration per door are as follows:

- wood-based panels and solid wood approx. 83 %
- HPL/CPL approx. 7 %
- fittings approx. 3 %
- glass inserts approx. 1 %
- HDF composite materials approx. 1 %
- synthetic resin-impregnated decor paper approx. 1 %
- PVAC adhesive approx. 1 %
- UF adhesive/EVA adhesive approx. 1 %
- miscellaneous (lacquers, seals, sound insulation inserts, ...) approx. 2 %

2.7 Manufacture

2.7.1 Door leaves

Pre-assembly/Basic production: The individual frame elements are assembled and the appropriate insert placed in position, and with the barriers as well as the skins are then fed to the presses. Depending on the door design, cutting is automated or manual, as is the frame construction.

Pressing: When the doors are pressed, the frames and the inserts are joined up with the barrier and the relevant skins by means of an adhesive. Bonding in the presses is effected by means of pressure and temperature. As a rule, the door blanks are pre-trimmed after pressing, that is, they are neatly cut to measure with a certain allowance, and then a label is

affixed to the lower edge of the door, the further processing stages as far as the finished product being saved on this label by means of a barcode. With this label, each door is individually identifiable.

Edging: In the next processing stage, the doors are formatted to the final dimension, and the edges of the doors are processed in accordance with the production specifications.

Intermediate processing: Doors that are given a cutout, for example to accommodate glazing or a panel, are processed after pre-trimming in an automated cutout milling machine and the cutout(s) saved in the order are then milled.

Surface finish: In doors that are to be painted, the skin is sanded in several sanding stages.

Painting: After sanding, the doors are painted in separate, automated painting plants, depending on the finish.

Milling and installation of fittings: After painting, the doors pass through a control station, where all doors are inspected from all sides for possible surface flaws, before they are forwarded to the automatic drilling and milling machine, where holes are milled for the fittings.

Packaging, order picking and shipping: The finished doors are now packaged, in part by machine, in part by hand, labelled and stored in the shipping hall.

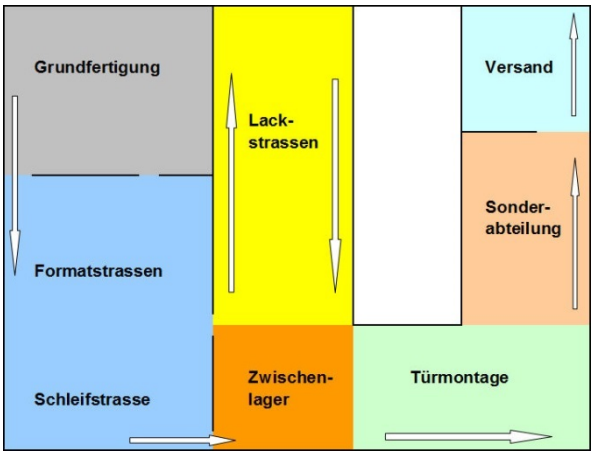

Fig. 2: Diagram of the production process (chart LEBO)

[Legend:]
Grundfertigung - Basic production
Formatstrassen - Format lines
Schleifstrasse - Sanding line
Zwischenlager - Interim storage
Lackstrassen - Painting lines
Türmontage - Door assembly
Sonderabteilung - Special department
Versand -Shipping

2.7.2 Door frames

Basic considerations: As a rule, wooden closed frames are produced using particle board or MDF as wood-based materials. Depending on requirements, plywood boards are also used. The basic production of a standard frame in accordance with DIN 68706 Part 2 is described here.

Pressing frame boards: First the wood-based material boards for the lining board as well as the facings on the visible side are covered with a layer, e.g. with veneer, synthetic laminate or priming film, and in some cases the reverse side is covered with bracing material to prevent the boards from warping.

Surface finish: The visible side of the boards, whether veneered or covered with priming film, is then sanded in several sanding passes.

Painting: After sanding, the boards are painted.

Cutting and edging:
Lining board production: The finished lining boards are cut to the width required for the wall thickness in question. A groove is then cut in the narrow surface on the door rebate side for the frame seal, and milling is carried out to accommodate the rebate facing. The narrow surface on the decorative facing side is given an edge coating, and the groove for accommodating the decorative facing.

Facing production: The finished facing boards are cut to the width required for the rebate and decorative facings and folded in a separate station to form a facing.

Final frame production and packaging: After the lining board, rebate facing and decorative facings have been completed, these three parts are further processed in a frame completion station.

Order picking and shipping: The finished frames are labelled on the front side of the cardboard packaging and stored in the shipping hall. Order picking and preparation for shipping are effected there. At this point, the production process is complete.

2.8 Environment and health during manufacturing

The production conditions do not require any special health protection measures. The usual industrial safety requirements (work gloves, ear protectors, safety shoes, dust mask for sanding and milling work, dust extraction etc.) must be complied with, as well as any measures required by the authorities for special working areas. To reduce noise, sound-proof hoods are used.

Water/Soil: No contamination of water or soil. Production-related waste water is treated internally and redirected to production.

2.9 Product processing/Installation

The interior doors are delivered ready to install. The frame is assembled and the door leaf installed. Interior doors made of wood and wood-based panels can be sawn, milled, planed, sanded and drilled using conventional machinery. The installation instructions of the manufacturer must be followed.

2.10 Packaging

Solid wood and wood-based materials (AVV 15 01 03), cardboard (AVV 15 01 01), polyethylene and polystyrene (AVV 15 01 02) as well as smaller

quantities of metals (AVV 15 01 04) are used. With the exception of the metal amounts, which undergo material recycling, the individual components of the packaging are recycled thermally as a rule.

2.11 Condition of use

Composition for the period of use complies with the base material composition in accordance with section 2.6 "Base materials".

Approx. 26 kg of carbon are bound in the product during use. This complies with approx. 95 kg of CO_2 for full oxidation.

2.12 Environment and health during use

According to the present state of knowledge, hazards for water, air and soil cannot arise if the products in question are used for the intended purpose. When interior doors are used normally and in accordance with the intended purpose, no health risks or restrictions are to be anticipated, according to the present state of knowledge. Emissions can only be established at levels which are harmless.

Comprehensive tests on door leaves and door frames in the years 2010 and 2011 showed that all of the materials examined meet the national requirements with respect to indoor air hygiene and the permissible emissions (AiF project 16210 N).

2.13 Reference service life

The service life of the interior doors is at least 100,000 opening and closing operations.

2.14 Extraordinary effects

Fire

Fire class in accordance with DIN-EN 13501-1:2010-01

Fire protection

Name	Value
Building material class	D
Burning droplets (not dripping)	d0
Smoke gas development (normal smoke)	s2

Changing the system condition (flaming dripping/falling material): not possible as the products under review do not liquefy when heated

Water

As a rule, interior doors are not exposed to the effects of weather or to the unforeseen effect of water.

Doors in damp or wet rooms are protected from the ingress of dampness or wetness by means of a special insert. Separate quality criteria for this are laid down in RAL-GZ 426.

Mechanical destruction

In the case of mechanical destruction, sharp edges can arise at points of rupture.

2.15 Re-use phase

After their use, significant parts of the interior doors can be thermally recycled in suitable incineration plants to generate heat and electricity. Waste wood from the demolition and dismantling of door leaves and frames from interior doors without harmful impurities is assigned to waste code 17 02 02, according to Appendix III German Waste Wood Ordinance (AltholzV). Construction and demolition wood with harmful impurities comes under waste code 17 02 04. The parts of the fittings consist mainly of metal and can be recycled as scrap metal.

2.16 Disposal

Waste wood may not be used for landfilling in accordance with §9 of the German Waste Wood Ordinance (AltholzV).

2.17 Further information

You can obtain further information on the Internet sites of VHI (http://www.vhi.de) or the RAL Quality Assurance Association for Interior Doors (http://www.gg-innentueren.de).

3. LCA: Calculation rules

3.1 Declared Unit

The Declared Unit is an interior door element consisting of door leaf and door frame, in the size 1.23 m x 2.18 m (reference door following DIN EN 14351-1). The total weight of this average door, calculated on the basis of the VHI members in accordance with production quantity weighting, is 74.27 kg. The share of the frame (door frame share) is 39 %.

Declared unit

Name	Value	Unit
Declared unit	1	Reference door (frame) 1.23m x 2.18m
Conversion factor to 1 kg	0.013464387	-

3.2 System boundary

The Declaration complies with an EPD "from cradle to plant gate, with options". It includes the production stage, i.e. from provision of the raw materials through to the works gate of the door factory (cradle to gate, Modules A1 to A3), and parts of the end-of-life stage (Modules C2 to C4). It also contains an analysis of the credits and debits over and beyond the product's entire life cycle (Module D).
The information module A1 comprises the provision of all semi-finished goods that can be found in the declared unit as material. Transport of these substances is considered in Module A2. Module A3 contains all work and expenditures of the manufacture of the product and its packaging from the cradle to the gate, except the aspects already considered in modules A1 and A2. Module C2 describes the transportation as far as the disposal or recycling point, Module C3 the preparation work which makes landfilling or material/thermal recycling possible. Landfilling with small quantities of the product is considered in Module C4.

In Module D, the balance of debits and credits resulting from recycling and landfilling represents a system enhancement process.

3.3 Estimates and assumptions

As a general rule, all of the material and energy flows for the processes required for production are established on site. The emissions from incineration and other processes on site could only be calculated on the basis of generic background data (see 3.5). All other data are also based on average values.

3.4 Cut-off criteria

No known material or energy flows were ignored, not even those below the 1 % limit. The total amount of ignored input flows is thus definitely below 5 % of the energy and mass applied.

3.5 Background data

All background data sets were taken from the databases ÖkoHolzBaudat (see Rüter & Diederichs 2012) GaBi-Professional (Version 4.131) and ecoinvent (Version 2.2).

3.6 Data quality

The quality of the data taken from the "ÖkoHolzbauDat" project is documented in the associated project report, which can be downloaded from "www.holzundklima.de". With the exception of forest wood, the background data used within the project "ÖkoHolzbauDat" for wood materials utilised for material and energy purposes originate from the years 2008 to 2010. The power mix originates from 2009 while the provision of forest wood was taken from a 2008 publication which is essentially based on information from 1994 to 1997.
All other information was taken from the GaBi Professional and ecoinvent databases. With the exception of five data sets which originate from the years 1995 to 2000 and which do not have any significant impact on the LCA, all background data used are less than 10 years old.
As the essential information originates from primary data surveys which are highly representative, the quality of data can be regarded as very good.

3.7 Period under review

Data was surveyed from 2011 to 2012, whereby data was always provided for the full calendar year.
All information is based on averaged data from 12 consecutive months. The specific manufacturer data therefore cover either the period 01. - 12.2010 or 01. - 12.2011.

3.8 Allocation

No co-product allocations occur in the entire modelling process.
Credits from the recycling and thermal utilisation of production waste are taken into account in Module A3.
Credits from the recycling, thermal utilisation and landfilling of the product are taken into account in Module D, which represents a system enhancement process.

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

End of Life (C2-C4)
While 100 % thermal/material recycling can be assumed for packaging materials, the end of life scenario for the product provides for a collective rate of 95 %. This means that the product shares reach their intended material/thermal recycling figure less 5 % of their initial mass. The reason for this material loss is presumed to be landfilling.

Name	Value	Unit
Collected separately	76.3	kg
Collected as mixed construction waste	3.7	kg
Recycling	1.9	kg
Energy recovery	74.4	kg
Landfilling	3.7	kg

Re-use, recovery and recycling potential (D), relevant scenario information
Module D contains the work and expenditures caused by the incineration of significant product shares in a biomass-fired power plant as well as potential credits caused by the resulting production of thermal energy and electricity. In accordance with the statements on the state of technology of energetical waste wood incineration, a total utilisation rate of 35 % and a combined heat and power system efficiency rate of 23 % is assumed, whereby incineration of 1 tonne of wood (atro) generates approx. 1231 kWh electricity and 2313 MJ useful heat.

In the thermal recycling of the remaining - not materially recycled - components, disposal as household waste-like commercial waste in a waste incineration plant was assumed.

During the disposal of the 5 % collective losses occurring in Module C3, landfill gases occur. The utilisation of these results in an electricity credit in Module D.
A material credit of 90 % is calculated for the recycling of the fittings and of the metal share of the packaging. It is assumed that the secondary materials obtained in this way are substitutes for galvanised sheet steel.

5. LCA: Results

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

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
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	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: One interior door size 1.23 m x 2.18 m

Parameter	Unit	A1	A2	A3	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	-4.38E+1	1.19E+0	2.80E+1	7.92E-2	1.01E+2	2.60E+0	-4.01E+1
ODP	[kg CFC11-Eq.]	5.30E-6	2.10E-9	6.20E-6	1.40E-10	5.14E-7	4.44E-9	-1.12E-5
AP	[kg SO_2-Eq.]	1.75E-1	5.24E-3	1.10E-1	3.49E-4	3.03E-3	9.71E-4	-4.98E-2
EP	[kg $(PO_4)^{3-}$-Eq.]	3.25E-2	1.20E-3	2.24E-2	7.98E-5	2.55E-4	4.54E-3	7.77E-4
POCP	[kg ethene-Eq.]	3.87E-2	5.26E-4	1.76E-2	3.50E-5	2.04E-4	6.13E-4	-4.44E-3
ADPE	[kg Sb-Eq.]	3.06E-3	4.01E-8	8.61E-6	2.67E-9	5.31E-8	3.41E-9	-1.42E-4
ADPF	[MJ]	1.11E+3	1.67E+1	6.23E+2	1.11E+0	3.81E+1	1.86E+0	-1.05E+3

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: One interior door size 1.23 m x 2.18 m

Parameter	Unit	A1	A2	A3	C2	C3	C4	D
PERE	[MJ]	3.81E+2	1.81E-2	5.32E+2	1.20E-3	2.04E+0	8.82E-2	-4.50E+1
PERM	[MJ]	1.05E+3	0.00E+0	9.51E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.43E+3	1.81E-2	6.27E+2	1.20E-3	2.04E+0	8.82E-2	-4.50E+1
PENRE	[MJ]	1.10E+3	1.67E+1	6.23E+2	1.11E+0	3.81E+1	1.86E+0	-1.05E+3
PENRM	[MJ]	1.41E+2	0.00E+0	8.78E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	1.25E+3	1.67E+1	6.32E+2	1.11E+0	3.81E+1	1.86E+0	-1.05E+3
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	9.41E+0	0.00E+0	0.00E+0	0.00E+0	1.05E+3
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	-	-	-	-	-	-	-

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: One interior door size 1.23 m x 2.18 m

Parameter	Unit	A1	A2	A3	C2	C3	C4	D
HWD	[kg]	-	-	-	-	-	-	-
NHWD	[kg]	-	-	-	-	-	-	-
RWD	[kg]	-	-	-	-	-	-	-
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.75E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.89E+1	0.00E+0	-8.89E+1
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

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

The values listed apply for the average door in question in accordance with Section 2.1. In particular, they apply for the typical distribution of the various doors in one building. If the door in question is explicitly only a special function door or for example a building that has a high proportion of special function doors, then the worst case environmental values indexed through the ranges (see 06.10) are to be shown for the door in question or for the building in question.

Note on the indicators governing Net use of fresh water, Hazardous waste for disposal, Disposed of, non-hazardous waste and Disposed of, radioactive waste: Not all background data sets support the methodical approach of the waste indicators as per DIN 15804. The indicator values therefore include a higher degree of uncertainty and are not shown in accordance with the Expert Committee decision of 07.01.2013.

6. LCA: Interpretation

The interpretation of the results is effected by means of a dominance analysis of the environmental impacts (GWP, ODP, AP, EP, POCP, ADPE, ADPF) and the renewable/non-renewable primary energy requirements (PERE, PENRE).

The most important factors in the categories in question are listed in the following.

6.1 Global Warming Potential GWP
With respect to the consideration of the GWP, the CO2 product system inputs and outputs inherent in wood deserve particular consideration. Through the growth of the wood required for sawn timber wood-based material production, 121 kg CO2 is bound in Module A1. Of this, 26 kg CO2 is emitted during the production of semi-finished goods in Module A1. In Module A3, 47 kg CO2 is bound through the growth of industrial waste wood occurring later in the door factory, through the growth of the waste wood purchased for energy production in the door factory and through the growth of the wood required for the packaging of the door. Within Module A3, 42 kg CO2 is emitted in the production of the industrial waste wood and of the packaging wood as well as through the incineration of the industrial waste wood and of the waste wood purchased for energy production in the door factory. Finally, 99.5 kg CO2 leaves the product system as recyclable waste wood in the product and in the packaging wood in Module C3.
If we consider the entire life cycle, the balance of the CO2 flows inherent in the wood is 0.

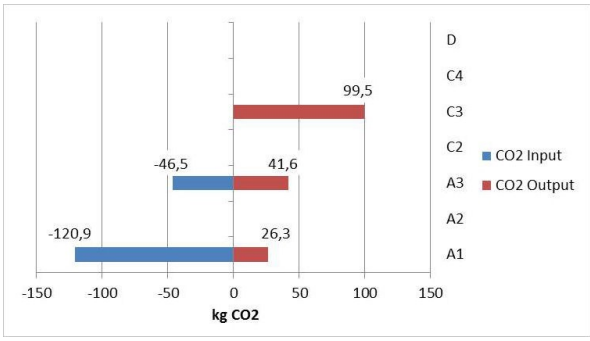

Fig. 3: CO2 product system inputs and outputs inherent in wood. The inverse signs before the inputs and outputs take account of the LCA CO2 flow analysis from the point of view of the atmosphere.

Not counting the CO2 flows caused directly by the wood, the main GWP contributions can be attributed to the production of wood and wood-based materials for the product (27 % [Module A1]), the production of the door fittings (15 % [A1]), the provision of electricity in the door factory (20 % [A3]) and the production of wood and wood-based materials occurring in the door factory as industrial waste wood (9 % [A3]).

6.2 Ozone Depletion Potential (ODP)
24 % of the total ODP is due to the production of wood and wood-based materials for the product, and a further 10 % for the production of the door fittings (both Module A1). 41 % can be attributed to the provision of the electricity for the door factory (A3). The production of wood and wood-based materials occurring as industrial waste wood in the door factory contributes 8 % to the total ODP (A3).

6.3 Acidification Potential (AP)
The production of wood and wood-based materials for the product accounts for 22 % and the production of the door fittings 21 % of the total AP (both Module A1). The incineration of industrial waste wood and purchased waste wood in the door factory contributes 12 % and the provision of electricity 10 % to the AP (both A1). At 7 % the production of wood and wood-based materials occurring in the door factory as industrial waste wood (A3) also make an appreciable contribution.

6.4 Eutrification Potential (EP)
29 % of the total EP is due to the production of wood and wood-based materials for the product, and a further 11 % for the production of the door fittings (both Module A1). The incineration of industrial waste wood and purchased waste wood contributes 13 % to the EP (A3). The production of wood and wood-based materials occurring as industrial waste wood in the door factory accounts for 10 %.

6.5 Photochemical Ozone Creation Potential (POCP)
The main POCP contributions can be attributed to the production of wood and wood-based materials for the product (41 % [Module A1), the production of the door fittings (10 % [A1]), the production of wood and wood-based materials occurring in the door factory as industrial waste wood (24 % [A3]) and the incineration of industrial waste wood and purchased waste wood (8 % [A3]).

6.6 Abiotic Depletion Potential of non-Fossil Resources (ADPE)
99 % of the ADPE is due to the production of the door fittings (Module A1).

6.7 Abiotic Depletion Potential of Fossil Fuels (ADPF)
The production of wood and wood-based materials for the product accounts for 28 %, the provision of electricity in the door factory accounts for 21 % and the production of the door fittings 12 % of the total ADPF (both Module A1). The production of the HPL/CPL boards contributes 7 % (A1). The ADPF share in the production of wood and wood-based materials occurring as industrial waste wood in the door factory is 9 % (A3).

6.8 Renewable primary energy as energy carrier (PERE)
31 % of the use of PERE can be attributed to the production of wood and wood-based materials for the product (Module A1). Another 52 % is required for the production of wood and wood-based materials that occur in the door factory as industrial waste wood and for the incineration in the door factory (A3).

6.9 Non-renewable primary energy as energy carrier (PENRE)
A large proportion of the use of PENRE is consumed in the production of the wood and wood-based materials for the product (28 % [Module A1]). Another 11 % is required for the production of the door fittings (A1). The

provision of the electricity in the door factory accounts for 20 % and the production of the wood and wood-based materials occurring in the door factory as industrial waste wood account for 9 % of the use of PENRE (both Module A3).

6.10 Range of results

The individual results for the participating companies differ from the average results in the Environmental Product Declaration. In the environmental impact, maximum discrepancies of +943 %/-183 % (GWP), +390 %/-39 % (ODP), +256 %/-27 % (AP), +194 %/-27 % (EP), +173 %/-21 % (POCP), +394 %/-50 % (ADPE) and +294 %/-18 % (ADPF) were calculated in relation to the results described in Chapter 5. The reason for these discrepancies is the inclusion of the production of special function doors in the calculation of the averages.

7. Requisite evidence

In a research project (see final report of the AiF project 16210 N), indoor emissions caused by interior doors through VOC emissions was examined on a broad basis. All examined door leaves and door frames complied with the national requirements concerning permissible formaldehyde emissions. Furthermore, all examined variants of interior doors (door leaves, door frames) met the requirements of the AgBB scheme. Without exception, all values were very significantly lower than the relevant limit values (also as a combination of door leaf and door frame).

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