ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	VdP - Verband der Deutschen Parkettindustrie e.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VDP-20210289-IBG1-EN
Issue date	15.12.2021
Valid to	14.12.2026

Solid wood flooring

Verband der Deutschen Parkettindustrie e.V.

Institut Bauen und Umwelt e.V.

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1. General Information

Verband der Deutschen Parkettindustrie e.V.

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-VDP-20210289-IBG1-EN

This declaration is based on the product category rules:

Solid wood products, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

15.12.2021

Valid to

14.12.2026

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Solid wood flooring

Owner of the declaration

VdP - Verband der Deutschen Parkettindustrie e.V.
Flutgraben 2
53604 Bad Honnef
Germany

Declared product / declared unit

1 m² solid wood flooring

(solid wood parquet and solid wood floor boards)

Scope:

The single-layer solid wood flooring described in this EPD is produced by the members of the Verband der Deutschen Parkettindustrie (Association of the German Parquet Industry, vdp). The underlying LCA covers a share of 95.4% of the total production of solid wood flooring of the association, whereby the technology represented here is representative for all members. The LCA results determined are averaged values of an average product from several factories of several manufacturers.
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.

The EPD was created according to the specifications of EN 15804+A1. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Prof. Dr. Birgit Grahl,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Solid wood flooring entails single-layer floor coverings made of solid wood in the form of solid wood parquet (strip, lam, panel, mosaic parquet, parquet block, vertical finger, wide finger, module block) or solid wood planks. Flooring is between 8 and 32 mm thick. The products meet the requirements of the respective product standards listed in section 2.4. The averaging of the products declared here is based on the weighted production volume of the manufacturers. (EU) Regulation No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The product requires a Declaration of Performance taking consideration of the DIN EN 14342:2013-09, Wood flooring – Characteristics, evaluation of conformity and marking, and CE-marking. The respective national regulations apply for usage.

2.2 Application

Solid wood flooring is glued indoors for private and commercial use either on screed or on appropriately prepared, existing subfloors such as wood or tiles, or fixed with other fasteners. In any case, the manufacturer's instructions must be observed.

2.3 Technical Data

Technical Data - Structural Data

Name	Value	Unit
Length of elements	≥ 60	mm
Width of elements	≥ 7	mm
Thickness of elements	≥ 8	mm
Wood moisture according to DIN EN 13183-1	7 - 11	%
Wood types by trade names according to DIN EN 1912	various	-
Gross density (mean value; variation through types of wood)	645	kg/m^3
Thermal conductivity according to DIN EN 12664	0.106 - 0.2	W/(mK)
Sorting classes	in accordance with the respective product standard	-

Further technical parameters depend at least on the wood species, are stored in the relevant product standards, and can be enquired about on a manufacturer-specific basis.

The performance values of the product correspond to the Declaration of Performance with regard to its essential characteristics according to DIN EN 14342:2013+A1:09 – Wood flooring – Characteristics, evaluation of conformity and marking.

2.4 Delivery status

All products are delivered in packaging units. The accompanying delivery papers include at least the following details:

- Quantity in m^2
- Dimensions (length, width, thickness of elements) in mm
- Type of wood species
- Sorting

The product- and manufacturer-specific dimensions/quantities of the declared products as delivered are within the following ranges:

- Width: 7–320 mm
- Length: 60–8000 mm
- Thickness: 8–32 mm
- m^2/PU: 0,147–4,8 m^2

2.5 Base materials/Ancillary materials

The percentage averages of ingredients per square metre of product established for the Environmental Product Declaration:

- Hardwood (bone-dry), primarily oak approx. 91.7%
- Water approx. 8.2%
- Surface coating approx. 0.07%

The product / At least one partial product contains substances from the ECHA candidate list (30.09.2021) exceeding 0.1 percentage by mass: no .

The product / At least one partial product contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1% by mass in at least one partial product: no

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Regulation on Biocide Products No. 528/2012): no.

2.6 Manufacture

For the production of single-layer solid wood flooring, dried sawn timber or planed timber is processed in several steps into solid individual elements that can be laid. Starting with the cutting of the round timber into planks and boards, these are prepared in several work steps into dry blanks for the final production. Depending on the product, solid elements that can be laid are produced in different machining processes in the desired dimensions of the individual elements per m² of floor area.

2.7 Environment and health during manufacturing

Due to the manufacturing conditions, no environmental and health protection measures beyond the regulations of valid EU regulations as well as national legal and other regulations are required. This also includes compliance with or falling below the occupational exposure limit values (OEL) in the manufacturing process.

2.8 Product processing/Installation

Solid wood flooring can be sawn, milled, planed and drilled with the usual stationary machines as well as (electric) hand-held tools. Carbide-tipped tools are to be given preference. Respiratory protection should be worn when using hand tools without extraction. Any tools and machines required may only be used as designated and in accordance with the respective manufacturer's operating instructions. Standard safety measures (e.g. ear protection depending on the machine, protective goggles and dust mask for sawing, gloves) should be applied. The resulting sawdust should be vacuumed off. For commercial processing, the relevant legal regulations as well as the regulations of the professional associations must be observed. Single-layer solid wood flooring is suitable for gluing over the entire surface. The products must be stored in a dry place. The specifications of the parquet manufacturer must be observed. Residual material incurred on the building site (cuttings and packaging) must be collected segregated by waste fraction. The specifications outlined by local disposal authorities and the information provided in section 2.14 'Reuse phase' must be taken into consideration when disposing of residual materials.

2.9 Packaging

Metal, paper, cardboard, wood and polyethylene are used. Packaging materials must be collected separately and recycled in accordance with local legal requirements. If Euro pallets are used, they can be reused in many cases or recycled as waste wood prior to thermal recovery.

2.10 Condition of use

Composition for the period of use complies with the base material composition in accordance with section 2.5. 'Base materials'. Approx. 5.86 kg of carbon are bound in the product during use. This complies with approx. 21.5 kg carbon dioxide at full oxidation.

2.11 Environment and health during use

According to current knowledge, no health risks are to be anticipated when used as designated. The effect relationship between solid wood flooring and health is that a positive indoor climate is achieved due to the special natural properties of wood. Hazards for water, air/atmosphere and soil cannot arise when solid wood flooring is used as intended. Solid wood flooring is a natural CO2 reservoir. Depending on its thickness, it can be sanded and renovated up to four times. It can be used, renovated and recycled several times. Thermal recycling at the end of the utilisation cascade is CO2-neutral.

2.12 Reference service life

The service life of solid wood flooring is ≥ 50 years according to the BBSR service life. In addition, cleaning and care of the products according to the manufacturer's specifications during the use phase contributes to the longevity and value retention of the solid wood flooring.

2.13 Extraordinary effects

Fire

The reaction to fire performance of solid wood flooring corresponds to the classificationsin Table 1 - Classes for the reaction to fire performance of wood flooring,according to EN 14342, in conjunction with Delegated Regulation (EU) No 1292/2014.
Solid wood flooring with or without surface coating is classified in classes Cfl-s1 (oak and beech), Dfl-s1 (all other wood species), depending on the wood species and end-use condition (gluing to the substrate, with or withoutair gap underneath). In individual cases, product-related individual tests andtheir results may deviate.

Fire protection

Name	Value
Building material class (applies for oak, beech)	Cfl
Smoke gas development	s1

Water

When exposed to water, no ingredients are washed out which could be hazardous to water. The flooring is not resistant to long-term exposure to water.

Mechanical destruction

Mechanical damage can be repaired on site. The breakage pattern of single-layer solid wood flooring depends on the respective wood species. Splintering and splinter formation may occur at the break edges (risk of injury).

2.14 Re-use phase

In the event of selective deconstruction and after the use phase has ended, the product can be easily reused. Leftover and waste solid wood flooring is recycled in accordance with AVV 17 02 01 and AVV 03 01 05.
If it is impossible to reuse the flooring several times, the wood can still be used as a material, e.g. as a raw material for manufacturing wood-based panels, which also involves the possibility of cascaded use. If the product cannot be recycled, it is directed towards thermal recycling for generating process heat and electricity on account of its high calorific value of approx. 19 MJ/kg.

2.15 Disposal

Landfilling of waste wood is not permissible according to the Waste Wood Regulation and AVV 17 02 01, nor is it necessary according to 2.14 'Reuse phase'.

2.16 Further information

Further information is available at www.parkett.de and from the respective manufacturers.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit under ecological review is the provision of 1m² solid wood flooring with a density of 644.85 kg/m², a water content of 8.25%, and a coating content of 0.42%. The composition corresponds to the weighted average of the balanced manufacturers according to production volume.

Details on declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	644.85	kg/m^3
Grammage	12.78	kg/m^2
Thickness	19,81	mm
Wood moisture on delivery	9	%

The balanced production volume included in the average is based on information from two of the manufacturers of solid wood parquet organised in the Verband der Deutschen Parkettindustrie e.V. (Association of the German Parquet Industry). The underlying production process is similar, but pre-processed raw materials are used to varying degrees, which are represented by background data that has a correspondingly large influence on the LCA results. As this does not lead to major differences in the results of the individual manufacturers, the representativeness and robustness of the data can nevertheless be rated as good.

3.2 System boundary

This Declaration type complies with an EPD "from cradle to factory gate, with options". It includes the production stage, i.e. from provision of the raw materials through to production (cradle to gate, Modules A1 to A3), Module A5, Module B2 and parts of the end-of-life stage (Modules C2 and C3). It also contains an analysis of the potential benefits and loads over and beyond the product's entire life cycle (Module D).

In detail, Module A1 balances the provision of wood raw materials and the provision of coating materials.
Transport of the raw materials to the plant is considered in Module A2. Module A3 comprises the provision of fuels, operating materials, product packaging and electricity as well as the production processes on site. These are essentially cutting, drying and finishing, including coating of parts of the production. Module A5 exclusively depicts the disposal of product packaging which includes the disposal of biogenic carbon and primary energy contained (PERM and PENRM).

Module B2 represents a scenario for the maintenance of the product over a lifetime of 50 years and covers cleaning as well as reconditioning (grinding and oiling).

Module C2 considers transport to the disposal company and Module C3 is concerned with preparing and sorting waste wood. In accordance with EN 16485, Module C3 also includes as outflows the CO2 equivalents of the carbon inherent in the wood product as well as the renewable and non-renewable primary energy (PERM and PENRM) contained in the product.

Module D analyses the thermal utilisation of the product as a secondary fuel at its end of life as well as the ensuing potential benefits and loads in the form of a system extension.

3.3 Estimates and assumptions

As a general rule, all material and energy flows for the processes required by production are established on the basis of questionnaires. On-site emissions from wood combustion are estimated on the basis of a background data set from the GaBi Professional Database 2021.1. Emissions from wood drying are based on literature data and are documented in detail in Rüter, Diederichs, 2012. All other data is based on average values.

3.4 Cut-off criteria

A decision regarding the flows to be considered was made on the basis of studies available on the analysis of wood products. At least those material and energy flows were assessed which account for 1% of the application of renewable or non-renewable primary energy or mass, whereby the total of flows not considered does not exceed 5% of the indicators referred to. Furthermore, it ensures that no material and energy flows were ignored which represent a particular potential for significant influences with regard to the environmental indicators.

The expenses for providing the infrastructure (machines, buildings etc.) of the entire foreground system were not taken into account. This is based on the assumption that the expenses associated with building and maintaining the infrastructure do not exceed 1% of the total expenses outlined above. The requisite energy expenses for operating the infrastructure were, however, taken into consideration in the form of heat and electricity.

3.5 Background data

All background data was taken from the GaBi Professional Database and the 'Ökobilanz-Basisdaten für Bauprodukte aus Holz' (basic LCA data for construction products made of wood) final report by Rüter, Diederichs, 2012: The latter is the basis for a regularly updated internal database from which the modelling of the forest upstream chain and the processes for mapping the assumptions listed in the context of 3.3 were taken.

3.6 Data quality

The basic primary data surveyed was validated on a mass basis and in accordance with plausibility criteria.

Coverage of the primary data

The production volume balanced for this EPD covers 95.4% of the total production of solid wood flooring of the Verband der Deutschen Parkettindustrie e.V. (Association of the German Parquet Industry) in the reference year 2020.

Temporal representativeness

The basic primary data used refers to the reference year 2020. With the exception of forest wood, the background data used for wood materials for material and energy purposes originates from literature in 2008 to 2012. The provision of forest wood was taken from a 2008 publication which is essentially based on information from 1994 to 1997. This is data on forest management processes that has been subjected to an update check for use in this EPD. All other information was taken from the GaBi Professional Database 2021.1 and is not older than five years.

Geographical representativity

The entire balanced production takes place in Germany, although some preliminary products are imported. The background data covers this via regionally specific processes.

Data robustness

Some of the primary production data received differs significantly with regard to the degree of pre-processing of the wood resource, which makes it difficult to directly compare the influence of the individual processes taking place in the plants. The LCA results in the sum of Modules A1-A3 of the individual manufacturers are generally comparable, but there are major differences in the POCP and ADPE (see 6.11), which can be attributed to individual background processes. Overall, the robustness of the data can nevertheless be rated as good.

3.7 Period under review

The data collation was carried out for the period from 2019 to 2020. All information is based on averaged data for 12 consecutive months.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Germany

3.9 Allocation

Flows of properties inherent to the material (biogenic carbon and primary energy contained therein) were allocated in accordance with physical causalities. All other allocations of associated co-products were carried out on an economic basis.

Module A1

Forestry: All expenses in the upstream forest chain were allocated using economical allocation methods to logs and industrial wood on the basis of their prices.

Module A3

Wood-processing industry: For associated co-products, expenses were allocated economically to primary products and residual materials on the basis of their prices.
Produced thermal and electrical energy from the disposal of waste generated in Module A3 is treated as an output flow according to IBU PCR, Part A.

Module D

The system expansion process performed in Module D complies with an energetic recycling scenario for waste wood

3.10 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. As a general rule, EPD data can only be

compared or evaluated when all of the data records to be compared have been drawn up in accordance with EN 15804 and the building context and/or product-specific characteristics are taken into consideration.

The LCA modelling was done using version 10.0.1.92 of the GaBi ts 2021 software.
All background data was taken from the GaBi Professional Database 2021.1 or literary sources.

4. LCA: Scenarios and additional technical information

The scenarios on which the LCA is based are described in more detail below.

Construction installation process (A5)

Module A5 is declared but only contains details on disposal of the product packaging and no details on actual installation of the product in the building. The volume of packaging material incurred as waste material for thermal utilisation per square metre product in Module A5 and the ensuing exported energy are indicated in the following chart as technical scenario information.

Name	Value	Unit
Packaging wood for thermal waste processing	0,029	kg
Plastic packaging for thermal waste processing	0,016	kg
Paper and cardboard for thermal waste processing	0,0062	kg
Overall efficiency of thermal waste processing	38–44	%
Total exported electrical energy	0,21	MJ
Total exported thermal energy	0,42	MJ

A transport distance of 50 km is assumed for disposal of the product packaging. Total efficiency of waste incineration as well as the percentages of electricity and heat generation by means of heat and power combinations correspond with the allocated waste incineration process in the GaBi Professional Database 2021.1.

Maintenance (B2)

For maintenance, a scenario with maintenance and renovation of the product over the reference service life (RSL) of 50 years is assumed. Maintenance includes cleaning (vacuuming twice a week and damp-cleaning twice a month) and oiling the product. Renovation includes sanding and re-oiling the product.

Name	Value	Unit
Maintenance cycle -Cleaning (vacuuming)	5200	Number/RSL
Maintenance cycle – Reinigung (feucht)	1200	Number/RSL
Maintenance cycle – Oiling	6	Number/RSL
Maintenance cycle – Sanding and oiling	2	Number/RSL
Electricity consumption (cleaning)	15.6	kWh
Electricity consumption (renovation)	4,53	kWh
Water consumption	0.24	m^3
Cleaning agents	24	l
Parquet oil	0,19	kg
Parquet varnish	0,45	kg
Abrasive agents	0,04	kg
Material loss (renovation)	0.902	kg

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies to the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list of service life by *BNB* is declared.

Reference service life

Name	Value	Unit
Reference service life	50	a
Life Span (acc. to BBSR)	50	a

End of Life (C1–C4)

Name	Value	Unit
Share of product for use as secondary fuel	11,87	kg
Redistribution transport distance for waste wood (Module C2)	50	km

A collection rate of 100% without losses incurred by crushing the material is assumed for the scenario of thermal utilisation.

Reuse, recovery and recycling potential (D), relevant scenario information

Name	Value	Unit
Waste wood (bone-dry, per net flow of declared unit)	10,89	kg
Coating (per net flow of declared unit)	0,0083	kg
Electricity generated (per net flow of declared unit)	10,5	kWh
Waste heat used (per net flow of declared unit)	37,7	MJ

The product is recycled in the same composition as the declared unit, minus the mass losses in wood from Module B2, at the end-of-life stage. Energetic recovery in a biomass power station with an overall degree of efficiency of 55% and electrical efficiency of 18.19% is assumed, whereby incineration of 1 kg wood (bone-dry, approx. 9% wood moisture content and 17.5 MJ/kg) generates approx. 88.2 kWh electricity and 642.8 MJ useful heat. Since no secondary fuel is used in the manufacturing phase (A1-A3), the net flow that enters Module D corresponds to the product composition after deduction of the mass losses of wood from Module B2. Taking into account the share of additives in the product coating, 10.5 kWh of electricity and 37.7 MJ of thermal energy are produced in Module D per declared unit. The exported energy substitutes fossil fuels, whereby it is alleged that the thermal energy is generated from natural gas and the substituted electricity complies with the German power mix for 2016.

5. LCA: Results

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

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	X	MND	X	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² Massivholzboden

Parameter	Unit	A1	A2	A3	A5	B2	C2	C3	D
GWP	kg CO_2 eq	-1.89E+01	5.86E-01	1.84E+00	9.64E-02	3.24E+01	1.38E-02	2.02E+01	-1.1E+01
ODP	kg CFC11 eq	2.51E-14	2.62E-16	1.39E-13	2.88E-17	5.77E-13	2.44E-18	1.02E-14	-2.64E-13
AP	kg SO_2 eq	1.54E-02	2.94E-03	1.19E-02	1.5E-05	8.93E-02	5.68E-05	2.89E-04	-7.61E-03
EP	kg PO_4^{3} eq	3.46E-03	6.59E-04	2.64E-03	3.11E-06	1.35E-02	1.45E-05	5.38E-05	-1.45E-03
POCP	kg Ethen eq	1.79E-02	-9.51E-04	5.49E-03	7.77E-07	4.9E-02	-2.43E-05	2.06E-05	-7.48E-04
ADPE	kg Sb eq	6.88E-07	5.39E-08	8.54E-07	2.25E-09	7.68E-05	1.22E-09	9.92E-08	-2.82E-06
ADPF	MJ	4.12E+01	8.06E+00	2.49E+01	2.78E-02	6.45E+02	1.91E-01	2.26E+00	-1.52E+02

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 - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m² Massivholzboden

Parameter	Unit	A1	A2	A3	A5	B2	C2	C3	D
PERE	MJ	1.72E+02	4.74E-01	1.52E+02	6.17E-03	1.21E+02	1.07E-02	1.85E+00	-4.81E+01
PERM	MJ	2.26E+02	0	4.98E-01	-4.98E-01	-1.6E+01	0	-2.1E+02	0
PERT	MJ	3.98E+02	4.74E-01	1.52E+02	-4.92E-01	1.05E+02	1.07E-02	-2.08E+02	-4.81E+01
PENRE	MJ	4.57E+01	8.12E+00	2.82E+01	3.1E-02	6.92E+02	1.91E-01	2.84E+00	-1.67E+02
PENRM	MJ	5.25E-02	0	5.71E-01	-5.71E-01	0	0	-5.25E-02	0
PENRT	MJ	4.58E+01	8.12E+00	2.88E+01	-5.4E-01	6.92E+02	1.91E-01	2.78E+00	-1.67E+02
SM	kg	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	2.1E+02
NRSF	MJ	0	0	0	0	0	0	0	5.25E-02
FW	m^3	2.77E-02	4.99E-04	1.22E-02	3.11E-04	1.01E+01	1.18E-05	7.7E-04	3E-02

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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 m² Massivholzboden

Parameter	Unit	A1	A2	A3	A5	B2	C2	C3	D
HWD	kg	2.29E-06	4.18E-10	6.52E-07	5.72E-12	1.66E-03	9.64E-12	1.03E-09	-5.36E-08
NHWD	kg	9.37E-02	1.23E-03	1.16E-01	1.56E-03	6.77E-01	2.84E-05	2.21E-03	5.89E-02
RWD	kg	1.8E-03	2.27E-05	1.41E-03	1.26E-06	1.86E-02	2.31E-07	2.27E-04	-5.9E-03
CRU	kg	0	0	0	0	1E+00	0	0	0
MFR	kg	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	1.19E+01	0
EEE	MJ	0	0	6.92E-03	2.06E-01	2E+00	0	0	0
EET	MJ	0	0	1.61E-02	4.2E-01	4.68E+00	0	0	0

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

The primary energy used as material (PERM and PENRM) is understood as a material-inherent property according to EN 16485. Consequently, it always leaves the product system with the material and is booked out of the corresponding indicator as a negative value.

For the range of product thickness from 8 to 32 mm covered by the balance, the LCA results can be scaled on the basis of mass or volume. To do this, the results are first multiplied by a factor of 0.0505 and then by the product thickness in millimetres.

6. LCA: Interpretation

The interpretation of results focuses on the production phase (Modules A1 to A3), as it is based on specific data provided by the companies. The interpretation takes the form of a dominance analysis of the environmental impacts (GWP, ODP, AP, EP, POCP, ADPE, ADPF) and the use of renewable/non-renewable primary energy (PERE, PENRE). In addition, the maximum deviations of the balanced plants from the average are given.

Accordingly, the most significant factors for the respective categories are listed below.

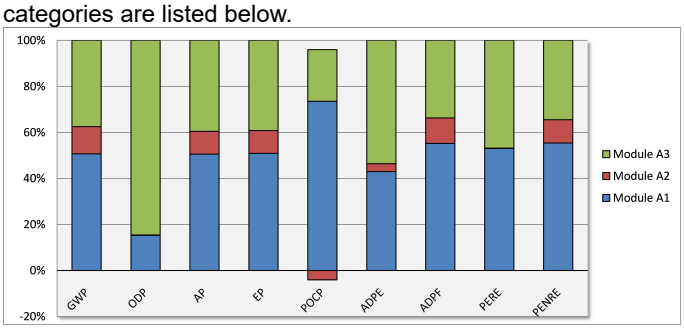

Fig. 1: Relative shares of Modules A1-A3 in the influence on environmental impact indicators and primary energy use (cradle-to-gate)

6.1 Global warming potential (GWP)

The CO2 product system inputs and outputs inherent in wood deserve separate attention in terms of GWP

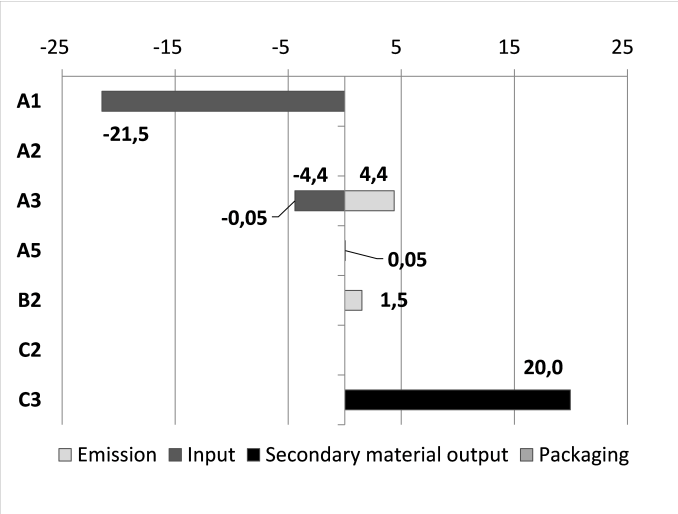

Fig. 2: CO2 product system inputs and outputs inherent in wood [kg CO2 equiv.]. The inverse indications suggested by inputs and outputs is in line with the LCO CO2 flow analysis in terms of the atmosphere.

The growth of the wood required for production binds 21.5 kg of CO2 in Module A1. The growth of the wood used for energy in production also binds 4.4 kg of CO2, which enters Module A3 and is also re-emitted in this module through combustion at the site. The provision of wood and paper for product packaging binds about 0.05 kg of CO2, which enters the product system in Module A3 and is re-emitted into the atmosphere during thermal waste treatment of the packaging in Module A5. In the course of renovation of the product in Module B2, 1.5 kg of CO2 is produced in the form of wood dust, which leaves the product system during thermal waste treatment. The remaining 20 kg of CO2 leave the product system in Module C3 in the form of recyclable waste wood.

The main sources of fossil greenhouse gases are the provision of semi-finished wood products (Module A1) with 50%, electricity consumption in the plant (Module A3) with 16% and heat generation in the plant with 19%.

6.2 Ozone depletion potential (ODP)

OPD is mainly generated by the provision of paper as product packaging (Module A3), accounting for 56%. In addition, electricity consumption in the plant (Module A3) accounts for around 22% and the provision of semi-finished wood products for 15% of the ODP.

6.3 Acidification potential (AP)

Emissions with acidification potential are 50% attributable to the provision of semi-finished wood products (Module A1). In Module A3, heat generation is the main contributor to the AP with 33% and a further 10% is due to the transport of semi-finished wood products.

6.4 Eutrification potential (EP)

The eutrification potential is distributed almost identically to the AP across Modules A1-A3 with the processes there.

6.5 Photochemical ozone creation potential (POCP)

At 76%, the positive POCP contributions are largely caused by the provision of semi-finished wood products (Module A1). Another 21% is attributable to the provision of heat in the plant (Module A3). The negative values recorded for the POCP in Module A2 are attributable to the negative characterisation factor for nitrogen monoxide emissions in accordance with EN 15804 in combination with the GaBi Professional Database 2021.1 truck transport process used for modelling the transport processes. They influence overall emissions by -4%.

6.6 Abiotic depletion potential non-fossil resources (ADPE)

The essential contributions to ADPE are incurred by the provision of semi-finished wood products (41%, Module A1) and electricity consumption in the plant (22%, Module A3). A further 19% is caused by the provision of operating materials (especially cutting materials).

6.7 Abiotic depletion potential fossil fuels (ADPF)

55% of the total ADPF is due to the provision of semi-finished wood products (Module A1) and 11% to transport thereof (Module A2). In Module A3, electricity consumption in the plant with 11% and heat generation with 19% are further influences on the total ADPF.

6.8 Renewable primary energy as energy carrier (PERE)

Wood combustion for heat generation (Module A3) accounts for 45% of PERE use and the provision of semi-finished wood products (Module A1) for 53%.

6.9 Non-renewable primary energy as energy carrier (PENRE)

The provision of semi-finished wood products (Module A1) accounts for 55% of PENRE use. Electricity consumption in the plant accounts for another 12% of total PENRE use and heat generation for 19% (both Module A3).

6.10 Waste

78% of hazardous waste is generated by the provision of semi-finished wood products (Module A1). Heat generation at the site (Module A3) contributes 21% to the generation of hazardous waste.

6.11 Range of results

The individual results for the modelled plants differ from the average results in the Environmental Product Declaration. Maximum deviations of +15%/-3% (GWP), +25%/-6% (ODP), +2%/-9% (AP), +1%/-9% (EP), +16%/-87% (POCP), +134%/-26% (ADPE) and +1%/-15% (ADPF) were calculated for the environmental impacts in relation to the results outlined in section 5.

7. Requisite evidence

This EPD describes an average product produced by several manufacturers. The evidence required within the scope of the Declaration of Performance according to the Construction Products Regulation (Regulation (EU) No. 305/2011) is provided by the respective manufacturer and must be requested there, along with the testing body(ies), test reports and the test methods used.

Requisite evidence:
System of assessment and verification of constancy of performance

Performance properties

- Breaking strength
- Reaction to fire
- Formaldehyde emissions
- Pentachlorophenol content
- Sliding resistance
- Thermal conductivity
- Biological durability

Evidence of VOC emissions is provided in accordance with the rules applicable in the respective country of use and is also deposited with the manufacturer. Below are exemplary VOC emission data from a test report of an accredited laboratory for a solid wood parquet product of a manufacturer in the described specification (wood species: oak; oiled).

VOC emissions

Name	Value	Unit
Overview of Results (28 days), oak, oiled	-	µg/m^3
TVOC (C6 - C16)	116	µg/m^3
Sum SVOC (C16 - C22)	-	µg/m^3
R (dimensionless)	0.095	-
VOC without NIK	-	µg/m^3
Carcinogenic Substances	-	µg/m^3

8. References

Standards

EN 13183
DIN EN 13183-1: Moisture content of a piece of sawn timber – Part 1: Determination by oven dry method

EN 13226
DIN EN 13226:2009-09, Wood flooring – Solid parquet elements with grooves and/or tongues

EN 13227
DIN EN 13227:2017-12, Wood flooring – Solid lamparquet products

EN 13228
DIN EN 13228:2011-08, Wood flooring – Solid wood overlay flooring elements including blocks with an interlocking system

EN 13488
DIN EN 13488:2003-05, Wood flooring – Mosaic parquet elements

EN 13501
DIN EN 13501-1:2019-05, Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

EN 13629
DIN EN 13629:2020-05, Wood flooring – Solid individual and pre-assembled hardwood boards

EN 13990
DIN EN 13990:2004-04, Wood flooring – Solid softwood floor boards.

EN 14342
DIN EN 14342:2013-09, Wood flooring – Characteristics, evaluation of conformity and marking

EN 14761
DIN EN 14761:2008-09, Wood flooring – Solid wood parquet – Vertical finger, wide finger and module brick

EN 15804
DIN EN 15804:2012+A1:2014, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

EN 16485
DIN EN 16485:2014-07, Round and sawn timber – Environmental product declarations – Product category rules for wood and wood-based products for use in construction

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

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AgBB evaluation scheme 2021 Health-related evaluation of emissions by volatile organic compounds (VVOC, VOC and SVOC) from construction products Committee for health-related evaluation of construction products, 2021.

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AVV
Regulation on the List of Wastes (AVV) dated 10 December 2001 (Federal Law Gazette No. I, p. 3379), last amended by Article 1 of the Directive dated 30 June 2020 (Federal Law Gazette No. I S. 1533) (last revised: 30 June 2020)

BBSR service life

Service lives of components for Life Cycle Analyses in accordance with the evaluation system for sustainable building (BNB), Federal Institute for Building, Urban Affairs and Regional Planning (BBSR), 201

Delegated Regulation (EU) No 1292/2014
of the Commission dated 17 July 2014 on the conditions for the classification, without testing, of certain uncoated wood floorings covered by standard EN 14342 with respect to their reaction to fire

GaBi Professional Database 2021.1
GaBi Professional Database 2020; content version 2021.1; Sphera Solutions GmbH, 2021

GaBi ts 2021
GaBi ts 2020, version 10.0.1.92: Software and database for comprehensive analysis; content version 2021.1; Sphera Solutions GmbH, 2021

IBU PCR Part A
Product Category Rules for building-related products and services, Part A: Calculation rules for the Life Cycle Assessment and requirements on the project report; Berlin; Institut Bauen und Umwelt e.V.; last revised January 2021; version 2.0

IBU programme instructions
General instructions on the IBU range of EPDs. Creation of Environmental Product Declarations; Berlin; Institut Bauen und Umwelt e.V.; last revised January 2021; version 2.0

PCR: Solid wood products
PCR guidelines for building-related products and services, Part B: Requirements on the EPD for solid wood products; Berlin; Institut Bauen und Umwelt e.V.; last revised December 2018; version 1.1

Rüter, Diederichs, 2012
Sebastian Rüter, Stefan Diederichs (2012): Basic LCA data for construction products made of wood; Final report, Hamburg: Johann Heinrich von Thünen Institute, Institute for Wood Technology and Wood Biology

(EU) Directive No. 305/2011
Directive (EU) No. 305/2011 of the European Parliament and Council dated 9 March 2011 establishing harmonised conditions for marketing construction products and replacing Council Guideline 89/106/EEC

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