

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804+A1

Owner of the declaration	Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VHI-20210199-IBG1-DE
Issue date	25/11/2021
Valid to	24/11/2026

Hardwood Veneer Plywood
Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)

Delignit[®]
naturally superior

Handed over by the member company::

Blomberger Holzindustrie GmbH
in 32825 Blomberg



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1. General Information

<p>Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)</p>	<p>Hardwood Veneer Plywood</p>
<p>Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastrasse 1 10178 Berlin Germany</p>	<p>Owner of the declaration Verband der Deutschen Holzwerkstoffindustrie e.V. Schumannstrasse 9 10117 Berlin Germany</p>
<p>Declaration number EPD-VHI-20210199-IBG1-DE</p>	<p>Declared product/declared unit 1m³ hardwood veneer plywood</p>
<p>This declaration is based on the following product category rules: Wood based panels, 12/2018 (PCR tested and approved by the independent advisory board (SVR))</p>	<p>Scope of application: The contents of this declaration are based on the specifications for manufacturing hardwood veneer plywood from the following manufacturers who are members of the Verband der Deutschen Holzwerkstoffindustrie association:</p> <ul style="list-style-type: none"> • Fritz Becker GmbH & Co. KG • Blomberger Holzindustrie GmbH
<p>Issue date 25/11/2021</p>	<p>The LCA of this declaration describes a production quantity-weighted average and covers 100 % of the named manufacturers or plants' plywood production in the reference year of 2009. This declaration can be used exclusively for plywood made of hardwood from the manufacturers listed above.</p>
<p>Valid to 24/11/2026</p>	<p>The owner of the declaration is liable for the basic information and supporting evidence; any liability of the IBU in relation to manufacturer's information, LCA data and supporting evidence is excluded. This document is a translation from German to English. This EPD was compiled in accordance with the requirements of <i>EN 15804+A1</i>. In the following the standard is referred to more simply as <i>EN 15804</i>.</p>
	<p>Verification The European <i>EN 15804</i> standard serves as the core PCR Independent verification of the declaration and statements by an independent body in accordance with <i>ISO 14025:2010</i></p>
<p>Dipl. Ing. Hans Peters (President of Institut Bauen und Umwelt e.V.)</p>	<p><input type="checkbox"/> internal <input checked="" type="checkbox"/> external</p>
 <p>Dr. Alexander Röder (Executive Director Institut Bauen und Umwelt e.V.)</p>	 <p>Therese Daxner, Independent verifier appointed by SVR</p>

2. Product

2.1. Product description/Product definition

Plywood in terms of this EPD is a panel-shaped wood-based material made from veneers of hardwood. The veneers are laid in such a manner that their fibres are arranged at a 90° angle relative to one another (blocked). They are glued together with duroplastic adhesive.

The requirements for plywood are defined according to *EN 636* for general and load-bearing applications for use in dry, damp or outdoor areas. EU Regulation no. 305/2011 of the European Parliament and Council of 9th March 2011 laying down harmonised conditions for the marketing of construction products in the EU/EFTA (except for Switzerland) and repealing

Council Directive 89/106/EEC applies for putting products on the market in the EU/EFTA. The required declarations of performance and CE labelling were produced in compliance with *DIN EN 13986:2015-6* Wood-based materials for use in construction - Characteristics, evaluation of conformity and marking.

2.2. Application

Plywood made of hardwood veneer with normal density can be used in construction, in decorative interior finishing / furniture construction, for sports equipment, as a protective and storage material, for packaging and in tool and vehicle construction. Higher density plywood can be used in construction and for technical applications.

2.3. Technical data

Requirements in accordance with *EN 636*:

Constructional data

Name	Value	Unit
raw density in accordance with EN 323	350 - 850	kg/m ³
Surface weight	-	kg/m ²
Bending tensile strength (longitudinal) in accordance with EN 310	40 - 75	N/mm ²
Bending tensile strength (transverse) in accordance with EN 310	30 - 60	N/mm ²
Elasticity module (longitudinal) in accordance with EN 310	5000 - 15000	N/mm ²
Elasticity module (transverse) in accordance with EN 310	3000 - 12000	N/mm ²
Material humidity on delivery	6 - 12	%
Right-angled tensile strength in accordance with EN 314	> 1	N/mm ²
Formaldehyde emissions in accordance with EN 717-1	≤ 124 (≤ 0.1 ppm)	µg/m ³

Please note: Specific technical data is to be found in the technical data sheets of the manufacturer products.

Technical data in accordance with *EU Regulation no. 305/2011 (CPR)*. Performance values of the product according to the declaration of performance in relation to its major features in accordance with *DIN EN 13986:2015- 6*, Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking.

2.4. Delivery status

Plywood from Verband der Deutschen Holzwerkstoffindustrie member companies is available in the following sizes:
 Width: 200 mm – 6250 mm
 Length: 200 mm – 8000 mm
 Thickness: 5 mm – 100 mm
 Special formats as regards length, width and thickness are available on request. Classification requirements in accordance with *EN 636*.

2.5. Base materials/ancillary materials

The main binders used are phenol-formaldehyde binder (PF), phenol-resorcinol-formaldehyde binder (PRF) urea-formaldehyde binder (UF), single-component polyurethane binder (1K-PUR), emulsion-polymer-isocyanate binder (EPI) and melamine-urea-formaldehyde binder (MUF).

The shares of UF, PF and MUF averaged for the EPD are:

- Beechwood (atro): 85.40 %
- Water: 6.80 %
- Adhesive and coating (PF/UF/MUF): 7.70 %

The product has an average raw density of 680 kg/m³ in use.

Does the product or at least one part product contain materials from the *ECHA candidate list* of materials which are especially problematic for approval: Substances of Very High Concern – SVHC) (Date: 31/05/2021) above a mass % of 0.1: no.

Does the product or at least one part product contain further CMR Category 1A or 1B substances which are not on the candidate list in doses above 0.1 mass % in at least one part product: no.

Were biocidal products added to this building product or was it treated with biocidal products (is this therefore a processed product in terms of EU Biocide Product Directive no. 528/2012): no.

2.6. Manufacturing

After storage (watering), round timber is plasticised in steaming pits and cut into peelable sections. The sections are peeled into a continuous veneer ribbon and defects are cut out. The veneer ribbon is dried and divided into veneer sheets. Veneer sections are joined to assemble larger elements. To produce the panels, veneer sheets and the joined veneer sections are coated with adhesive, laid on top of each other alternately in the direction of the grain and compacted together. The panels are formatted, sanded, possibly repaired, and packaged once the adhesive has completely hardened.

2.7. Environment and health during use

The conditions of manufacture require no special health protection measures apart from those which are provided for by the authorities for the specific work area, e.g. high-visibility jacket, safety shoes and dust protection mask.

Air

The exhaust air produced by manufacturing is cleaned in accordance with statutory regulations. Emissions are below Technical Instructions on Air Quality Control (TA Luft) values.

Water/Soil

No additional measures are prescribed by the association beyond the statutory requirements.

2.8. Product processing/installation Plywood can be sawn, milled, planed, sanded and bored with normal machines. Recommendations for processing are available in the corresponding data sheets.

Professional installation in accordance with constructional requirements must be ensured. When selecting additional products, it must be ensured that they do not have a negative effect on the environmental compatibility properties of the specified building products. Normal protective measures (dust mask, gloves, protective clothing, dust extraction) must be complied with when processing the products.

2.9. Packaging

Plywood is supplied with solid wood, wood-based materials, cardboard, metal or plastic packaging depending on the manufacturer. If the packaging cannot feasibly be reused, it is recycled, i.e. used as a material or an energy source.

2.10. Condition of use

The composition for the period of use complies with the base material composition in accordance with Section 2.5. Approximately 340 kg of carbon dioxide are bound up in the product during use. This is equivalent to approximately 1247 kg of carbon dioxide when fully oxidised.

2.11. Environment and health during use

Environmental protection

Based on current knowledge, no hazards for water, air and soil can arise with appropriate use of the products described.

Health protection

According to the current state of knowledge no hazards to health are to be feared if plywood is used normally as intended.

2.12. Reference period of use

Durability during service life depends on the application classes.

2.13. Extraordinary influences

Fire

Minimum fire class D in accordance with *EN 13501*, smoke class s2 – normally smoking, d0 – non-dripping

Change in physical condition (burning dripping/falling material): Not possible as the products described do not liquefy when heated.

Plywood can be treated with fire-retardant chemicals and thereby achieves the following fire protection in accordance to *EN 13501*.

Fire protection

Name	Value
Building material class	B
Flaming droplets	d0
Flue gas development	s1

Water

According to the current state of knowledge, no ingredients which could be hazardous to water are washed out.

Mechanical destruction

Mechanical destruction of plywood can result in sharp edges on the broken panel edges.

2.14. End-of-life phase

Plywood can be reused after the end of the primary use phase. If reuse is not possible for technical or economic reasons, material or energy recovery is conducted in accordance with the Enclosed Substance Cycle Waste Management Act (*KrWG*) and the Ordinance on Requirements for the Recovery of Waste Wood (*AltholzV*).

2.15. Disposal

Landfilling of waste wood is impermissible in accordance with Section 9 Ordinance on Recovery of Waste Wood (*AltholzV*); material or energy recovery is conducted in accordance with the Waste Wood Ordinance. Plywood generally falls under waste wood category All according to Section 2 No. 4 Waste Wood Ordinance, i.e. glued, painted, coated, varnished or otherwise treated waste wood without halogen organic compounds in the coating and without wood preservatives. As such, it can be materially recycled according to Section 3 Waste Wood Ordinance. This also applies to plywood composites if they contain more than 50 percent wood by mass, Section 2 Waste Wood Ordinance. One recycling option is particleboard production, to name an example. If the plywood is not recycled, it must be sent to a thermal recycling plant approved for the purpose of high-quality recovery.

The European Waste Catalogue code is 17 02 if the product is used in construction.

2.16. Further information

Further information can be found on the VHI home page (<http://www.vhi.de>).

3. LCA: Calculation rules

3.1 Declared unit

The declared unit under ecological review relates to 1 m³ of coated plywood with a mass of 796.24 kg/m³, a water content of 6.83 % and an adhesive and coating content of 7.77 %. The composition complies with the weighted average by production volume of the manufacturer being assessed.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	m ³
Conversion factor to 1 kg	0.001256	-
Mass reference	796.24	kg/m ³

The balanced production volume included in the average is based on figures from two manufacturers of plywood who belong to the Verband der Deutschen Holzwerkstoffindustrie. The underlying production process does not principally differ; applications can, however, vary due to individual process steps such as moulding and surface treatments and process efficiencies. Overall, the representativeness and the robustness of the data can be regarded as average.

3.2 System boundary

The declaration type is an EPD from cradle to gate with options. It includes the production stage from the provision of raw materials through to the factory gate of the production facility (cradle-to-gate, Modules A1 to A3) and Module A5 and parts of the end-of-life stage (Modules C2 and C3). It also contains an analysis of the potential benefits and loads beyond the lifecycle of the product (Module D).

Module A1 analyses the provision of raw wood materials and the provision of adhesive and coating materials. Transports of materially used raw materials to the plant are included in Module A2. Module A3 covers the provision of fuels, operating materials, product packaging, electricity and manufacturing processes on-site. Essentially, these involve steaming and peeling, drying (including emissions), pressing and coating. Module A5 deals exclusively with the disposal of the product packaging which includes the output of the biogenic carbon and also the primary energy (PERM and PENRM) it contains.

Module C2 includes transport to the disposal company and Module C3 the preparation and sorting of the waste wood. Module C3 also records the CO₂ equivalents to the carbon inherent in wood contained in the product and the renewable and non-renewable primary energy (PERM and PENRM) in accordance with *EN 16485* as outputs.

Module D analyses the thermal recycling of the product at the end of its life and the resulting potential benefits and loads in the form of a system extension.

3.3 Estimations and assumptions

Generally, all material and energy flows for the processes required for production are determined on the basis of questionnaires. The emissions from burning wood which occur on-site are estimated based on a background data record from the *GaBi Professional Database 2020 Edition*. Emissions from drying wood and hardening adhesive are based on references to literature and are documented in detail in *Rüter, Diederichs 2012*. The transport distance to the plants for adhesives and additives is assumed to be 500 km by truck and 500 km by rail as a conservative estimate. All other data is based on average values.

3.4 Cut-off rules

Any decision on the flows to be included emanates from existing studies on analysing wood products. As a minimum, at least those material and energy flows which account for 1% of the use of renewable and non-renewable primary energy or mass, whereby the total of flows not included is not greater than 5%. Beyond this, it was ensured that no material and energy flows which exhibit special potential for significant influences in relation to environmental indicators were ignored. The loads for providing infrastructure (machines, buildings, etc.) from the entire foreground system were not included. This assumes that the above overall loads for setting up and maintaining the infrastructure do not exceed the 1% of total loads already described above. On the other hand, the energetic loads required to operate the infrastructure in the form of heat and electricity are included. Detailed information on cut-off rules is documented in *Rüter, Diederichs 2012*.

3.5 Background data

All background data was taken from the *GaBi Professional Database 2020* and the final report entitled "Basic LCA data for wood-based building products" by *Rüter, Diederichs 2012*. The latter publication forms the basis for a regularly updated internal database from which the modelling for the forest pre-chain and the processes for mapping assumptions listed in Chapter 3.3 are taken.

3.6 Data quality

The foreground data queried was validated based on the mass and in accordance with plausibility criteria.

Foreground data coverage

The balanced production quantity covers 100% of production of those manufacturers which are covered by the scope of this EPD.

Temporal representativeness

Foreground data relates to the reference year of 2009. The continuing currentness and validity of this data is certified by confirmation from the VHI based on a member questionnaire.

The background data taken from the literature for materially and energetically used wood raw products except for forest timber originates from 2008 to 2012. The provision of forest timber was taken from a publication from 2008 which is mainly based on information from 1994 to 1997. All further background data was taken from the *GaBi Professional Database 2020* and is less than five years old.

Geographical representativeness

The entire balanced production takes place in Germany. Background data covers this via regionally specific processes (mainly DE, small part of EU-28).

Robustness of the data

The basic production process does not differ from one manufacturer to the next. The influence of individual materials or processes and the background data used is still partly quite large, whereby robustness must be described as average.

3.7 Period under review

The foreground data was collected from each manufacturer for twelve consecutive months in the period in the reference year 2009. The continuing currentness and validity of this data is certified by confirmation from the VHI based on a member questionnaire.

The production volumes for the calendar year of 2019 for the manufacturers involved were collected in a further questionnaire to calculate an updated quantity-weighted production average.

3.8 Allocation

Generally, all material-inherent property flows (biogenic carbon and primary energy contained) were allocated according to physical causalities. All further allocations for associated CO emissions were done on an economic basis.

Module A1

- Forestry: All forestry chain loads were allocated via economic allocation factors to the products of standing and industrial wood based on their prices.

Module A3

- Woodworking industry: Expenses for associated co-productions were allocated economically to the main products and residual materials based on price.
- Thermal and electrical energy produced from the disposal of waste accruing in Module A3 is treated as an output flow according to *IBU PCR Part A*.

Module D

- The system extension conducted in Module D corresponds to an energetic recycling scenario for waste wood.

3.9 Comparability

Generally, a comparison or evaluation of EPD data is only possible if all data to be compared was created in accordance with *EN 15804* and the building context and product-specific features are considered.

LCA modelling was performed using the GaBi ts 2020 software with service pack 40. All background data was taken from the *GaBi Professional Database 2020* or comes from the relevant references to literature.

4. LCA: Scenarios and further technical information

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

Installation into the building (A5)

Module A5 is declared but merely contains information on the disposal of product packaging and no information on the actual installation of the product in buildings. The quantity of packaging material which accrues as waste for thermal recycling per m³ of product in Module A5 and the resulting exported energy are shown in the following table as technical scenario information.

Name	Value	Unit
Packaging wood for thermal recycling	0.59	kg
Plastic packaging for thermal recycling	1.05	kg
Paper and cardboard for thermal recycling	6.23	kg
Total efficiency of thermal waste disposal	38– 44	%
Total exported electrical energy	19.295	MJ
Total exported thermal energy	43.669	MJ

A transport distance of 50 km is assumed for the disposal of product packaging. The total efficiency of waste incineration and the proportion of electricity and heat generation by combined heat and power correspond to the allocated waste incineration process in the *GaBi Professional Database 2020*.

End-of-life (C1-C4)

Name	Value	Unit
Product share for use as secondary fuel	796.24	kg
Redistribution transport distance of waste wood (Module C2)	50	km

A collection rate of 100 % without losses through crushing the material is assumed for the scenario of thermal recycling.

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

Name	Value	Unit
Waste wood (atro, per net flow of the declared unit)	680	kg
Adhesives and coating (per net flow of the declared unit)	61.8	kg
Electricity produced (per net flow of the declared unit)	726.8	kWh
Used waste heat (per net flow of the declared unit)	5295.4	MJ

The product is recycled in the same composition as the declared unit described at the end of its life. Energetic recycling in a biomass power station with 55 % overall efficiency and electrical efficiency of 18.19 % is assumed. Incinerating 1 t of wood (air-dried, approx. 6.16 % wood moisture, 18 MJ/kg) produces approximately 910 kWh of electricity and 6626 MJ of usable heat.

Since no secondary fuel is used in the manufacturing phase (A1-A3), the net flow included in Module D corresponds to the product composition. Considering the share of adhesives and additives, 727 kWh of electricity and 5295 MJ of thermal energy are produced per declared unit in Module D.

The exported energy replaces fuels from fossil sources, whereby it is assumed that thermal energy is produced with natural gas and the electricity replaced corresponds to the German network's electricity mix in 2016.

5. LCA: Results

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

Production stage			Stage of Construction of a building		Use stage							End of life stage				Credits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use/application	Maintenance	Repair	Replacement	Refurbishment	Energy use to operate the building	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse, recovery or 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	MND	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT in accordance with EN 15804+A1:

1 m³ hardwood veneer plywood

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
GWP	[kg CO ₂ eq.]	-1.14E+3	2.23E+1	2.16E+2	1.40E+1	2.31E+0	1.26E+3	-5.85E+2
ODP	[kg CFC11 eq.]	5.55E-13	2.63E-14	1.04E-10	4.53E-15	3.85E-16	5.28E-13	-1.65E-11
AP	[kg SO ₂ eq.]	2.43E-1	8.87E-2	8.55E-1	2.54E-3	9.68E-3	1.76E-2	-5.56E-1
EP	[kg (PO ₄) ₃ eq.]	6.07E-2	2.23E-2	2.47E-1	5.27E-4	2.44E-3	3.14E-3	-9.53E-2
POCP	[kg Ethene eq.]	6.78E-2	-3.77E-2	1.41E-1	1.14E-4	-4.07E-3	1.24E-3	-5.41E-2
ADPE	[kg Sb eq.]	5.53E-5	2.19E-6	1.17E-4	3.26E-7	1.95E-7	5.26E-6	-1.52E-4
ADPF	[MJ]	2.99E+3	2.99E+2	2.33E+3	3.85E+0	3.19E+1	1.27E+2	-9.56E+3

Key GWP = Global warming potential; ODP = Depletion potential for the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential for tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources (ADP – materials); ADPF = Abiotic depletion potential for fossil resources (ADP – fossil energy carriers)

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT in accordance with EN 15804+A1:

1 m³ hardwood veneer plywood

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
PERE	[MJ]	1.04E+2	2.21E+1	1.12E+4	8.37E-1	1.80E+0	9.25E+1	-2.91E+3
PERM	[MJ]	1.31E+4	0.00E+0	1.05E+2	-1.05E+2	0.00E+0	-1.31E+4	0.00E+0
PERT	[MJ]	1.32E+4	2.21E+1	1.13E+4	-1.04E+2	1.80E+0	-1.30E+4	-2.91E+3
PENRE	[MJ]	1.63E+3	3.04E+2	2.84E+3	4.17E+0	3.20E+1	1.61E+2	-1.06E+4
PENRM	[MJ]	1.40E+3	0.00E+0	3.76E+1	-3.76E+1	0.00E+0	-1.40E+3	0.00E+0
PENRT	[MJ]	3.03E+3	3.04E+2	2.88E+3	-3.34E+1	3.20E+1	-1.24E+3	-1.06E+4
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	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.31E+4
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.40E+3
FW	[m ³]	5.92E-1	2.18E-2	8.66E-1	3.62E-2	2.08E-3	5.01E-2	1.92E+0

Key PERE = Renewable primary energy as energy carrier; PERM = Renewable primary energy as material utilisation; PERT = Total use of renewable primary energy resources; PENRE = Non-renewable primary energy as energy carrier; PENRM = Non-renewable primary energy as material utilisation; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary materials; 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 TO EN 15804+A1:

1 m³ hardwood veneer plywood

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
HWD	[kg]	1.06E-5	1.13E-5	1.78E-5	2.07E-8	1.49E-6	1.08E-7	-5.31E-6
NHWD	[kg]	5.42E-1	5.87E-2	1.97E+1	2.23E-1	4.90E-3	1.24E-1	1.99E+1
RWD	[kg]	1.66E-2	2.10E-3	2.10E-1	1.29E-4	3.96E-5	1.34E-2	-4.22E-1
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	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.96E+2	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	3.55E-1	1.93E+1	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	8.24E-1	4.37E+1	0.00E+0	0.00E+0	0.00E+0

Key HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposal; RWD = Radioactive waste disposal; CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy EET = Exported thermal energy

The materially used primary energy (PERM and PENRM) is regarded as a materially inherent property in accordance with EN 16485. Consequently, it always leaves the product system with the material and is logged out of the corresponding indicator as a negative value.

6. LCA: Interpretation

The focus of the result interpretation lies on the production phase (Modules A1 to A3) as this is based on concrete information from the companies.

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

In addition, the maximum deviations of the participating companies from the average are specified.

The most significant factors for the respective categories are therefore listed below.

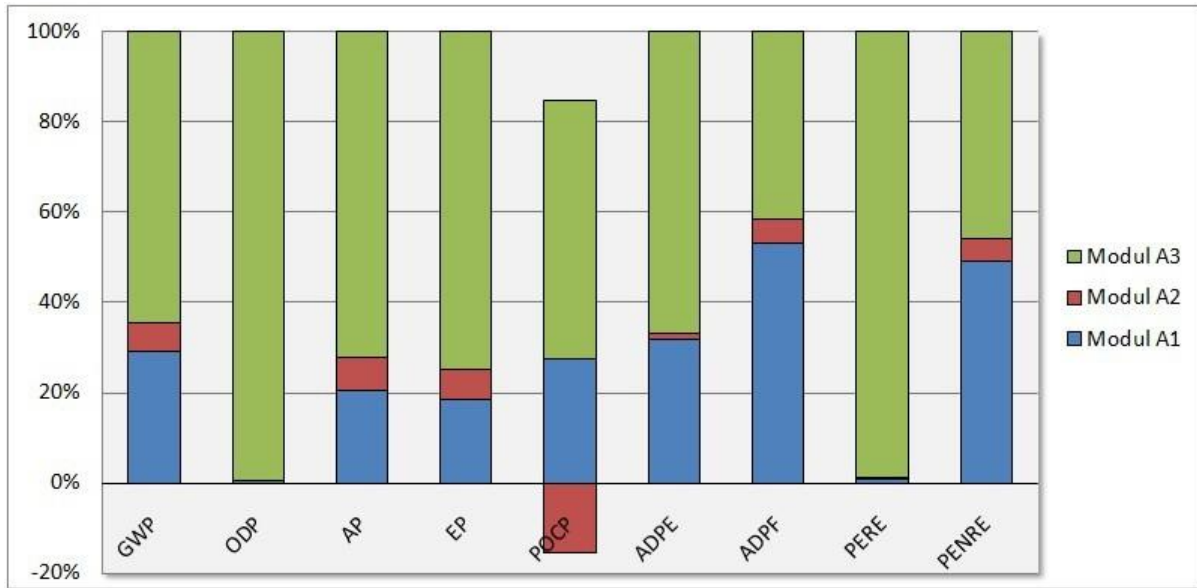


Fig.1: Relative shares of Modules A1-A3 on the influence of environmental impact categories and primary energy use (cradle-to-gate)

The remaining 1247 kg of CO₂ leaves the product system in Module C3 in the form of recyclable waste wood.

6.1 Global warming potential (GWP)

Wood-inherent CO₂ product system inputs and outputs require special examination with regard to global warming potential.

The main causes of fossil-based greenhouse gases are the adhesive and coating materials at 26 % (Module A1) and the use of electricity in the plants at 50 % (module A3). Provision of the raw wood material (Module A1) contributes 3 % and heat production in the plants (Module A3) 11 % to fossil GWP.

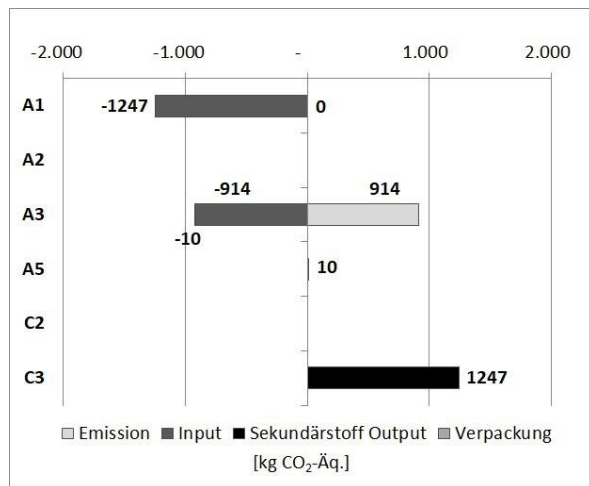


Fig.2: Wood-inherent CO₂ product system inputs and outputs [kg CO₂ eq.]. The inverse signing of the inputs and outputs allows for the LCA CO₂ flow from the point of view of the atmosphere to be examined.

1247 kg of CO₂ are bound up in Module A1 through the growth of wood needed for plywood production. The growth of the wood used for energy in the production process additionally binds up 914 kg of CO₂ which goes into Module A3 and is also emitted again in this module by incineration in situ. Some 10 kg of CO₂ which enters the product system in Module A3 and is emitted into the atmosphere again by the thermal recycling of the packaging in Module A5 is bound up by the provision of wood and paper for product packaging.

6.2 Ozone depletion potential (ODP)

92 % of ODP occurs mainly through the provision of paper as product packaging (Module A3). Beyond this, electricity consumption in the plants (Module A3) also contributes around 7 % to ODP.

6.3 Acidification potential (AP)

Emissions with acidification potential are relatively evenly distributed across Module A1 on the provision of wood as raw material with 5 % and adhesive and coating materials with 15 %. In Module A3, electricity consumption (20 %) and heat production (49 %) contribute mainly to acidification potential.

6.4 Eutrophication potential (EP)

14 % of the total eutrophication potential is attributable to processes for providing adhesives and additives and a further 4 % to the provision of raw wood material (both Module A1). Electricity consumption for the production process contributes 13 % and heat production in the plants 39 % to the eutrophication potential (both Module A3). In addition, infrastructure expenditures are included in the EP to an amount of 23 % (Module A3).

6.5 Formation potential for tropospheric ozone photochemical oxidants (POCP)

Positive POCP contributions of 60 % are caused mainly by veneer drying and adhesive hardening in the plants (Module A3). 33 % is attributable to the provision of adhesives (Module A1).

The negative values for POCP in Module A2 are attributable to the negative characterisation factor for carbon monoxide emissions of EN 15804+A1-compliant CML-IA Version (2001-Apr. 2013) in combination with the currently used truck transport process in the *GaBi Professional Database 2020* for modelling the transport processes. They influence total emissions by -19 %.

6.6 Abiotic depletion potential for non-fossil resources (ADPE)

The main contributions to ADPE are attributable to electricity consumption in the plants (Module A3) at 41 % and the provision of adhesive and coating materials (Module A1) at 31 %, while 22 % can be traced back to the provision of operating materials (Module A3).

6.7 Abiotic depletion potential for fossil resources (ADPF)

51 % of the total ADPF is attributable to the provision of the adhesive and coating materials (Module A1). In Module A3, electricity consumption in the plants at 31 % and heat production at 7 % further influence the overall ADPF.

6.8 Renewable primary energy as energy carrier (PERE)

86 % of PERE use is attributable to heat production and 11 % to electricity consumption in the plants (both Module A3).

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

47 % of PENRE use is attributable to the provision of adhesive and coating materials (Module A1). As the largest influence in Module A3, electricity consumption in the plants causes a further 35 % of total PENRE, whilst heat production, also in Module A3, is responsible for some 7 %.

6.10 Waste

24 % of special waste is incurred from the provision of the raw wood material (Module A1), whereby diesel consumption in the forest pre-chain is the main cause. Approximately 24 % is attributable to the transport of raw materials to the plants (Module A2) and heat production on site (Module A3) contributes 34 % to the generation of special waste.

6.11 Range of results

The individual results of the participating companies differ from the average results in the environmental product declaration. Maximum deviations in environmental effects of +54 %/-12 % (GWP), +101 %/-20 % (ODP), +96 %/-19 % (AP), +95 %/-19 % (EP), +147 %/-29 % (POCP), +32 %/-7 % (ADPE) and +30 %/-8 % (ADPF) were calculated in relation to the results described in Chapter 5. The main reasons for these deviations are differences in heat production at the plants and the adhesive systems used.

7. Requisite evidence

7.1. Formaldehyde

Measuring point: EPH Entwicklungs- und Prüflabor Holztechnologie GmbH, Zellescher Weg 24, 01217 Dresden

Test reports and date:

Test report 2117047/2020/4/HWPW/E1-2020 from 03/03/2020

Aim of the test: Determination of formaldehyde emissions in accordance with *EN 717-1*

Measuring method: Test chamber method in accordance with *EN 717-1*

Results: The plywood panels inspected in accordance with *EN 717-1* (x-factor 2.0, so-called standard E05) fulfils the requirements of the Chemicals Prohibition ordinance *ChemVerbotsV* Appendix 1 (in 3) column 2 (1) of 19th June 2020. The threshold value of < 124 µg/m³ (0.1 ppm) is adhered to.

7.2 Volatile organic compounds (VOC)

Measuring point: Entwicklungs- und Prüflabor Holztechnologie GmbH Zellescher Weg 24 01217 Dresden

Test reports and date: Test report 25161155 from 22/12/2016

Aim of the test: Determination of VOC emission in accordance with *RAL-UZ 76*

Measuring method: *ISO 16000* and *DIN CEN/TS 16516* in accordance with requirements according to *RAL-UZ 76*

Results: Plywoods inspected according to ISO 16000 and *DIN CEN/TS 16516* adhere to the requirements according to *RAL-UZ 76* from 2016, based on the *AgBB schema*, for VOC of <10 mg/m³ after three days and of < 1 mg/m³ after 28 days and their corresponding total values, and also the limit values for carcinogenic substances < 0.001 mg/m³.

7.3 Toxicity of flue gases

The toxicity of flue gases arising from burning plywood corresponds to the toxicity of flue gases which occur when natural wood burns.

AgBB Overview of results (28 days)

Name	Value	Unit
TVOC (C6 - C16)	<1000	µg/m ³
Total SVOC (C16 - C22)	<100	µg/m ³
R (dimensionless)	<1	-
VOC without NIK	<100	µg/m ³
Carcinogenic	<1	µg/m ³

AgBB Overview of results (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<10000	µg/m ³
Total SVOC (C16 - C22)	-	µg/m ³
R (dimensionless)	-	-
VOC without NIK	-	µg/m ³
Carcinogenic	<10	µg/m ³

References

AgBB schema

The AgBB schema (AgBB = Committee to Assess the Health Implications of Building Product Emissions) describes the procedure when assessing the health implications of building product emissions.

Waste Wood Ordinance

Waste Wood Ordinance (AltholzV): Ordinance on requirements for the recycling and disposal of waste wood, 2020.

European Waste Catalogue

European Waste Catalogue (EWC) of 10th December 2001 (Federal Legal Gazette I p. 3379) which was last amended by Article 1 of the Ordinance of 30th June 2020 (Status: 30/06/2020).

German Chemicals Prohibition Ordinance

German Chemicals Prohibition Ordinance: Ordinance on the prohibition of and limitations on the putting on the market and supply of certain substances, mixtures and products in accordance with the Chemicals Act.

DIN EN 16516

Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air;

ECHA List

Candidate list of substances of exceedingly high concern for authorisation (date: 31/05/2021) in accordance with Article 59 Paragraph 10 of the REACH regulations. European Chemicals Agency.

EN 310

Wood-based panels; determination of modulus of elasticity in bending and of bending strength;

EN 314

Plywood - Bonding quality - Part 1: Test methods;

EN 323

Wood-based panels; determination of density;

EN 636

Plywood - Specifications;

EN 717-1

Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method

EN 13501

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

EN 13986

Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking.

EN 15804

Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

EN 16485

Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction.

GaBi Professional Database 2020

GaBi Professional Database 2020. Service pack 40. Sphera Solutions GmbH, 2020.

GaBi ts 2020

Software database for integrated lifecycle assessment. Service pack 40. Sphera Solutions GmbH, 2020.

IBU 2021

Institut für Bauen und Umwelt e.V.: general EPD programme instruction from Institut Bauen und Umwelt e.V. (IBU) Version 2.0. Institut Bauen und Umwelt e.V. 2021

IBU PCR Part A

Product category rules for building-related products and services, Part A: Calculation rules for the LCA and requirements of the background report. Berlin: Institut Bauen und Umwelt e.V.; status 2021- 01; Version 2.0.

ISO 14025

Environmental labels and declarations - Type III Environmental declarations - Principles and procedures.

ISO 16000

Series of standards for Indoor air contamination.

Enclosed Substance Cycle Waste Management Act (KrWG)

The purpose of the law is to promote cycle waste management and ensure protection for people and the environment when producing and managing waste.

PCR wooden materials

PCR Product category rule guidance for building-related products and services, Part B: Requirements of the EPD for wood materials. Berlin: Institut Bauen und Umwelt e.V.;

RAL-UZ 76

Award criteria for the Blauer Engel environmental label (Version 9, 2016): Low-emission wood-based materials (building and furniture panels) for interior construction. RAL gGmbH.

Rüter, Diederichs 2012

LCA basic data for wooden building products. Final report, Hamburg: Johann Heinrich von Thünen Institut, Institut für Holztechnologie und Holzbiologie.

Technical Instructions on Air Quality Control (TA Luft)

Technical Instructions on Air Quality Control. Version dated 24th July 2002 and all VDI guidelines, DIN standards and statutory provisions contained therein.

EU Regulation no. 305/2011

Ordinance of the European Parliament and Council of 9th March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

**Publisher**

Institut Bauen und Umwelt e.V.
Panoramastrasse 1
10178 Berlin
Germany

Tel. +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Email info@ibu-epd.com
Web www.ibu-epd.com

**Programme holder**

Institut Bauen und Umwelt e.V.
Panoramastrasse 1
10178 Berlin
Germany

Tel. +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Email info@ibu-epd.com
Web www.ibu-epd.com

**Author of the lifecycle assessment**

Thünen Institute for Wood Research
Leuschnerstrasse 91
21031 Hamburg
Germany

Tel +49(0)40 73962 - 619
Fax +49(0)40 73962 - 699
Mail holzundklima@thuenen.de
Web www.thuenen.de

**Owner of the declaration**

Verband der Deutschen
Holzwerkstoffindustrie e.V.
Schumannstraße 9
10117 Berlin
Germany

Tel +49 (0)30 28 09 12 50
Fax +49 (0)30 28 30 12 56
Mail info@vhi.de
Web www.vhi.de