

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Rubner Holding AG - S.p.A.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-NOR-20230235-IBD2-EN
Issue date	28.06.2023
Valid to	27.06.2028

Nordpan – Solid wood panels (Update)
Nordpan GmbH - Srl

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1. General Information

Nordpan GmbH - Srl

Programme holder

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

Declaration number

EPD-NOR-20230235-IBD2-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

28.06.2023

Valid to

27.06.2028



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Nordpan – Solid wood panels (Update)

Owner of the declaration

Rubner Holding AG - S.p.A.
Handwerkerzone 2
39030 Kiens
Italy

Declared product / declared unit

1 m³ of NORDPAN solid wood panels with an average density of 493 kg/m³

Scope:

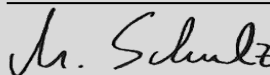
This EPD is based on a declared unit of 1 m³ of NORDPAN solid wood panels (moisture of 9 % at a raw density of 493 kg/m³). The results refer to a representative average of one- to five-layered nordpan solid wood panels. The LCA covers 100 % of nordpan's production referring to its sites located at Strassen (Austria) and Olang (Italy).

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+A2. 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



Matthias Schulz,
(Independent verifier)

2. Product

2.1 Product description/Product definition

NORDPAN solid wood panel (NORDPAN-SWP) is a homogenized wood-based plate-like material that is used in engineered structural timber constructions, façade construction, decorative interior design as well as for doors and furniture. NORDPAN-SWP consists of one to five layers made from kiln-dried coniferous wood laminations which are glued together at their wide faces orthogonally. Due to the bonded cross-sectional structure combined with the technically supported strength and stiffness classification of the raw materials, NORDPAN-SWP is characterized by a high product quality. As a result of the industrial manufacturing process, NORDPAN-SWP exhibits steady mechanical characteristics. Planar NORDPAN-SWP shows a high dimensional stability and can be characterized as a largely crack-minimized building material. For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 /CPR applies. The product needs a Declaration of Performance taking into consideration *EN 13986* and the CE-marking. For use, the respective national provisions apply.

2.2 Application

The main application of the Nordpan-SWP is the decorative interior construction of buildings. In addition, NORDPAN-SWPs are used as structural components in structural engineering constructions. NORDPAN-SWP is also used in the field of door and furniture construction.

2.3 Technical Data

The performance data of the product are in accordance with the Declaration of Performance with respect to its essential characteristics according to *EN 13353* and *EN 13986*. NORDPAN-SWP is produced in accordance with *EN 13353* the characteristic properties depending on the thickness are given in the valid DOP:

Constructional data

Name	Value	Unit
Wood types by trade names acc. to EN 1912	spruce, pine, larch, Douglas fir	-
Wood moisture acc. to EN 13183-1	< 15	%
Use of wood preservatives (the wood preservative test mark to /DIN 68800-3/ must be indicated)	Where other preservative means are insufficient	-
Bending strength (out of plane) acc. to EN 13353	12 to 35	N/mm ²
Bending strength (in plane) acc. to EN 13353	10 to 25	N/mm ²
Modulus of elasticity (in plane) acc. to EN 13353	1800 to 4700	N/mm ²
Modulus of elasticity (out of plane) acc. to EN 13353	550 to 10000	N/mm ²
Shear strength (out of plane) acc. to EN 13353	1,2 to 1,6	N/mm ²
Shear strength (in plane) acc. to EN 13353	2 to 5	N/mm ²
Compressive strength parallel acc. to EN 13353	10 to 18	N/mm ²
Compressive strength rectangular acc. to EN 13353	10-12	N/mm ²
Tensile strength parallel acc. to EN 13353	6-12	N/mm ²
Tensile strength rectangular acc. to EN 13353	3	N/mm ²
Dimensional deviation	depending on geometrical dimensions	mm
Length	< 6	m
Width	< 2.05	m
Height (min. - max.)	0.010 to 0.060	m
Gross density acc. to EN 13353	430	kg/m ³
Surface quality (Possible characteristic features must be indicated)	0, A, B, C	-
Risk class acc. to DIN 68800-3	4	-
Formaldehyde emissions acc. to EN 13986	< E1	µg/m ³
Thermal conductivity acc. to EN 12664	0.09 - 0.11	W/(mK)
Specific heat capacity acc. to EN 12664	1.6	kJ/kgK
Water vapor diffusion equivalent air layer thickness acc. to ISO 12572	n.r.	m
Water vapour diffusion resistance factor acc. to ISO 12572	20 - 50	-

NORDPAN-SWP is manufactured in accordance with *EN13353* from coniferous species, with priority being given to Spruce, Pine, Larch or Douglas fir. Other coniferous species are permissible but not typical.

NORDPAN-SWP is produced from kiln-dried coniferous wood with an average wood moisture content of around 7 % to 9 % at delivery. For bonding, only approved modern low-emission adhesives according to chapter 2.5 are used. The mechanical characteristics of NORDPAN-SWP are in accordance with the requirements specified in *EN 13353*. For determining the

technical specifications, the declarations of performance (DOP) in the currently valid versions apply. The dimensional tolerances are defined in accordance with *EN 13353*. The products are manufactured in qualities 0 and A to C in accordance with *EN 13017-1*. Use of preventive chemical wood preservatives in accordance with *DIN 68800-3* is unusual and permitted only if other preservative measures given in *DIN 68800-2* are not sufficient on their own.

2.4 Delivery status

NORDPAN-SWP is produced with the dimensions according to chapter 2.3 and is delivered in accordance with *EN 13017-1* in 0-, A-, B- and C-quality. The tolerances according to *EN 13353* are met.

2.5 Base materials/Ancillary materials

NORDPAN-SWP comprises one to five kiln-dried coniferous bonded single layers.

The following types of adhesive systems are used for bonding the individual components (finger jointing and surface bonding):

- Melamine-urea-formaldehyde adhesives (MUF)
- PVAC

NORDPAN-SWP contains of the following proportions of ingredients per m³ on average:

- Coniferous wood (atro), mainly spruce approx. 88-90 %
- Water approx. 7 - 9 %
- Adhesive about 3 - 5 %, The proportions of the adhesives systems used are based on about 90 % MUF and about 10 % PVAC.

The product has an average density of 493 kg/m³.

This product/article/at least one partial article contains substances listed in the *candidate list* (date: 17.01.2023) exceeding 0.1 percentage by mass: **no**.

This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass: **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) *Ordinance on Biocide Products* No. 528/2012): **no**.

2.6 Manufacture

NORDPAN-SWP is manufactured from sustainable sawn timber (PEFC) sourcing from sustainable forestry. Wet sawn timber is kiln-dried to a moisture content of about 7 % to 9 %.

To ensure the characteristic values of the NORDPAN-SWP, all individual boards are visually- or machine-graded regarding strength and stiffness.

The graded boards are subsequently assembled to single layers (butt or finger jointed) for further production. After applying the adhesive, the single layers are pressed to one to five-layer blanks.

After curing of the blanks, the final surface treatment is carried out by grinding, followed by the format cut of the blanks to obtain the final plate dimension.

To ensure the product quality, a treatment with weathering or wood preservatives may be required for transport to the construction site, storage, and during assembly.

2.7 Environment and health during manufacturing

During production, there are no negative impacts on water and soil. The resulting process wastewater is fed into the local sewage system and cleaned according to legal regulations. The

resulting exhaust air is cleaned according to the legal regulations.

Noise emissions from industrial plants are reduced by structural measures and comply with the legal requirements.

The manufacturing process applies to all production facilities covered by this EPD.

The employee protection in the manufacturing process complies with the respective country-specific requirements, employees are provided with personal protective equipment.

2.8 Product processing/Installation

NORDPAN-SWP can be processed with commercially available tools. The instructions for occupational safety/assembly are to be observed.

2.9 Packaging

To protect NORDPAN-SWP against climatic influences, polyethylene foils and wood are used in small quantities during transportation. In addition, PVC binding material, plastic edge protectors (polypropylene), underlay plates (PVC cellular boards) and underlay wood are used as packaging material.

2.10 Condition of use

The composition of NORDPAN-SWP corresponds to the composition according to Section 2.5 for the entire period of use.

2.11 Environment and health during use

Environmental protection: According to current knowledge, the intended use of NORDPAN-SWP does not present any hazards or impairments to water, air and soil.

Health protection: Under normal conditions of use, NORDPAN-SWP is not expected to cause any damage or impairments to health.

NORDPAN-SWP subsequently releases formaldehyde during life cycle.

NORDPAN-SWP bonded with PVAC based adhesives has formaldehyde emission values in the range of < 0,01 ppm (ml/m³).

Nordpan-SWP bonded with MUF-based adhesives have low emissions of formaldehyde, due to the low level of adhesive in its internal structure and due to its particular use. Measured against the limit value of 0.1 ml/m³ (0.124 mg/m³) of the Reach Regulation 1907/2006/EG, the measured values in accordance with *EN 717-1* can be classified as low.

NORDPAN-SWP with melamine-based adhesive systems (MUF) has an emission of formaldehyde in the range of 0.01 to 0.05 ppm (ml/m³).

2.12 Reference service life

NORDPAN-SWP have been used in structural timber construction for more than 30 years and is very similar to Rubner glulam with more than 100 years of experience of use. When used as designated, no end of durability must be expected due to its natural durability (protection against moisture). When used as designated, the lifetime of NORDPAN-SWP is equal to the duration of use of the building.

2.13 Extraordinary effects

Fire

NORDPAN-SWP is classified in accordance with 2007/348/EG and *EN 13986* as follows:

Fire protection

Name	Value
Building material class	D
Burning droplets	d0
Smoke gas development	s2

Floor coverings are classified with DFL-s1.

Water

No ingredients are washed out which could be hazardous to water.

Mechanical destruction

The fracture behavior of NORDPAN-SWP is appearance typical for solid wood.

2.14 Re-use phase

In the event of selective de-construction, NORDPAN-SWP can easily be re-used after the end of the structure's service life. The preferred use of NORDPAN-SWP is in the form of reuse based on the applicable country-specific requirements. If it is not re-used, it will be subject to thermal utilization for the

production of heat and electricity due to the high calorific value of approx. 16.5 MJ/kg (at a humidity of $u = 12\%$) in compliance with the applicable country-specific requirements

2.15 Disposal

If the residues are not used for any other cascading use, waste wood is disposed according to the applicable country-specific requirements. Disposal represents a possible but unusual case. NORDPAN-SWP is assigned to waste code 17 02 01 in the European list of waste 2014/955/EU. (Treated NORDPAN-SWP is assigned to waste code 17 02 04).

2.16 Further information

More detailed information is available at: www.nordpan.rubner.com

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to a declared unit of 1 m³ of solid wood panels produced by NORDPAN. The declared unit refers to an average density of 493 kg/m³ and a wood moisture at delivery of 9 %.

Declared unit

Name	Value	Unit
Declared unit	1	m ³
Gross density	493	kg/m ³
Wood moisture at delivery	9	%

The analysed products represent an average of one- to five-layered NORDPAN solid wood panels produced at the sites Strassen (AT) and Olang (IT). The declared unit refers to a weighted average of both production sites and covers 100 % of the production of NORDPAN. It is thus considered a realistic representation.

The declared unit was calculated on a volume-weighted basis. This EPD refers to an average product manufactured at several sites. All products undergo the same processing steps. A possible variability is expected due to the use of different wood species. The upstream chain for spruce is considered representative.

The composition of the boards mainly varies related to the binder content. Since the three-layer products represent the main production share, the representativity of the results is assured. For the single-layer and two-layer panels, an overestimation of the environmental impact is to be expected.

3.2 System boundary

The life cycle assessment of average solid wood panels produced by NORDPAN refers to a cradle-to-gate analysis of the environmental impacts with modules C1–C4 and module D (A1–A3 + C + D). The following life cycle phases are part of the analysis:

Module A1–A3 | Production stage

The production stage includes upstream burdens of raw materials (round wood, lumber, adhesive system, etc.) and the corresponding transports to the NORDPAN production sites in Olang (IT) and Strassen (AT). Lumber production includes direct emissions from drying processes based on a worst-case approximation. Upstream emissions from the use of binding agents rely on supplier-specific data complemented by secondary data. NORDPAN produces thermal energy in its own biomass boilers at both sites. Strassen is supplied with 100 % green electricity, Olang is supplied with electricity from the Italian grid. Additionally all sites are provided by their own photovoltaic systems.

Module C1 | Deconstruction and demolition

After the removal of building components overlying the product, the joints can simply be loosened by screwing or sawing and lifted by cranes to the place of removal. Required energy demand can be neglected. The actual energy demand depends on the installation of the products and can therefore vary greatly in the building context.

Module C2 | Transport to disposal

Module C2 includes the transport to waste treatment. In this case, transport by truck over a transport distance of 50 km is assumed.

Module C3 | Waste processing

In Module C3, the chipping after the removal of the products is considered. The wooden products and with them the material-inherent properties leave the product system as secondary combustibles in module C3.

Module C4 | Disposal

The applied scenario declares the energetic recovery of the wooden products, therefore no environmental impacts are to be expected from waste processing of the products in C4.

Module D | Benefits and loads beyond the system boundary

Applying an European average scenario, module D describes the energetic recovery of the product at the end of life including the corresponding energy substitution potentials.

3.3 Estimates and assumptions

All assumptions are verified through detailed documentation and correspond to the best possible representation of reality based on the available data.

Background data for wood logs refer to generic data for spruce logs in bark derived from *GaBi* database. Spruce represents the majority of wood processed at NORDPAN. The used dataset represents an approximation for all other species. Regional applicability of the used background data refers to average data under European or German conditions taken from the *GaBi* database. German data was used for the Austrian and Italian market whenever European or regionalised average data were not available.

Emissions from wood drying were included in the calculations according to *Rüter & Diederichs 2012*.

3.4 Cut-off criteria

The LCA model covers all available input and output flows, which can be represented based on robust data and from which

a significant contribution can be expected. Data gaps are filled with conservative assumptions of average data or generic data if available and are documented accordingly. Only data with a contribution of less than 1 % were cut off.

Thus, no data were neglected, of which a substantial impact is to be expected. All relevant data were collected comprehensively. Cutoff material and energy flows were chosen carefully based on their expected quantitative contribution as well as potential environmental impacts. Thus, it can be assumed that the sum of all neglected input flows does not account for more than 5 % of the total material, water and energy flows. Environmental impacts of machines, plant and infrastructure were not included.

3.5 Background data

This study uses generic background data for the evaluation of upstream environmental impacts from *GaBi* database 2022.2 as well as recognised literature such as *Rüter & Diederichs 2012*.

The analysis of the major amount of adhesives used for the production of solid wood panels is based on primary data from NORDPAN's suppliers. Where necessary, this information was complemented with estimates ensuring the completeness of the component's representation in the LCA.

3.6 Data quality

Data collection is based on product-specific questionnaires. It follows an iterative process of clarifying questions via e-mail, telephone calls or in personal/web meetings. Intensive discussions between the RUBNER group and Daxner & Merl result in an accurate mapping of product-related material and energy flows. This leads to a high quality of foreground data collected. Data collection relies on a consistent process according to *ISO 14044*.

The representation of the main binding agents used for the production of NORDPAN solid wood panels is based on

supplier-specific primary data leading to a high data quality.

The technological, geographical and time-related representativeness of the database was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *GaBi* background datasets refer to the latest versions available and are carefully chosen.

The assessment of the robustness of the average can be found in Section 3.1.

3.7 Period under review

Foreground data were collected in the 2022 production year, and the data are based on the volumes produced on an annual basis.

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: Europe

3.9 Allocation

Carbon content and primary energy content of the products were assessed based on their material inherent properties according to underlying physical relationships.

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.

The *GaBi* background database was used to calculate the LCA (*GaBi* 10; 2022.2)

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

During tree growth, the wood assimilates carbon dioxide and stores biogenic carbon. The carbon stored in the product is declared in the following table.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	219	kg C
Biogenic carbon content in accompanying packaging	2.25	kg C

Installation into the building (A5)

The end of life of the product packaging is not declared in module A5.

Name	Value	Unit
Packaging (polyethylene)	0.460	kg
Packaging (polypropylene)	0.006	kg
Packaging (polyvinyl chloride)	0.299	kg
Packaging (wood)	5.031	kg

The end-of-life scenario used in this LCA study is based on the following assumptions:

End of life (C1-C4)

Name	Value	Unit
Energy recovery	493	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Processing rate	100	%
Efficiency of power plant	68	%

The product reaches the end-of-waste status after removal from the building, transport to processing and chipping of the product. For the end of life of the solid wood panels, energy recovery as secondary fuel in a biomass power plant is assumed. As the main sales market for the solid wood products is concentrated in the European region, plant-specific characteristic values correspond to a European average scenario (EU). The scenario considers a reprocessing rate of 100 % for the solid wood products after removal from the building. This assumption has to be adjusted accordingly when applying the results in the building context. At the end of life of the product, the equilibrium moisture is comparable to the moisture content at delivery. This value can vary depending on the storage of the product before energy recovery.

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 m³ of solid wood panels produced by NORDPAN (493 kg/m³).

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR 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	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ solid wood panel (493 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO ₂ eq	-6.65E+02	0	1.56E+00	8.13E+02	0	-4.36E+02
Global Warming Potential fossil fuels (GWP-fossil)	kg CO ₂ eq	1.4E+02	0	1.48E+00	3.64E+00	0	-4.09E+02
Global Warming Potential biogenic (GWP-biogenic)	kg CO ₂ eq	-8.06E+02	0	6.47E-02	8.09E+02	0	-2.66E+01
Global Warming Potential luluc (GWP-luluc)	kg CO ₂ eq	2.51E-01	0	9.97E-03	7.69E-04	0	-4.89E-02
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	2.69E-09	0	1.45E-13	5.32E-11	0	-3.17E-09
Acidification potential of land and water (AP)	mol H ⁺ eq	4.98E-01	0	4.95E-03	7.98E-03	0	3.39E-01
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	4.08E-04	0	5.29E-06	1.06E-05	0	-6.39E-04
Eutrophication potential aquatic marine (EP-marine)	kg N eq	2.45E-01	0	2.26E-03	1.79E-03	0	7.35E-02
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	2.47E+00	0	2.53E-02	1.88E-02	0	8.71E-01
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	8.89E-01	0	4.44E-03	4.84E-03	0	3.12E-01
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2.99E-05	0	1.49E-07	9.91E-07	0	-6.8E-05
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.2E+03	0	1.94E+01	6.6E+01	0	-7.08E+03
Water use (WDP)	m ³ world eq deprived	1.33E+01	0	1.66E-02	8.29E-01	0	-2.33E+01

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ solid wood panel (493 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	1.07E+03	0	1.35E+00	8.12E+03	0	-2.18E+03
Renewable primary energy resources as material utilization (PERM)	MJ	8.08E+03	0	0	-8.08E+03	0	0
Total use of renewable primary energy resources (PERT)	MJ	9.15E+03	0	1.35E+00	3.66E+01	0	-2.18E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	1.86E+03	0	1.95E+01	3.81E+02	0	-7.08E+03
Non renewable primary energy as material utilization (PENRM)	MJ	3.4E+02	0	0	-3.15E+02	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.2E+03	0	1.95E+01	6.6E+01	0	-7.08E+03
Use of secondary material (SM)	kg	0	0	0	0	0	0
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0	8.08E+03
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	3.15E+02
Use of net fresh water (FW)	m ³	7.29E-01	0	1.56E-03	3.49E-02	0	-1.49E+00

RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ solid wood panel (493 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	6.69E-07	0	1.03E-10	5.71E-09	0	-8.77E-07
Non hazardous waste disposed (NHWD)	kg	1.35E+00	0	3.18E-03	4.97E-02	0	2.45E-01
Radioactive waste disposed (RWD)	kg	6.38E-02	0	3.62E-05	1.05E-02	0	-6.27E-01
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	0	0	0	0	0	0
Materials for energy recovery (MER)	kg	0	0	0	4.93E+02	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0	0
Exported thermal energy (EET)	MJ	0	0	0	0	0	0

RESULTS OF THE LCA - additional impact categories according to EN 15804+A2-optional: 1 m³ solid wood panel (493 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	ND	ND	ND	ND	ND	ND

Human exposure efficiency relative to U235 (IR)	kBq U235 eq	ND	ND	ND	ND	ND	ND
Comparative toxic unit for ecosystems (ETP-fw)	CTUe	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	ND	ND	ND	ND	ND	ND
Soil quality index (SQP)	SQP	ND	ND	ND	ND	ND	ND

The additional and optional impact categories according to *EN 15804+A2* are not declared, as the uncertainty of these indicators is to be classified as high.

Disclaimer 1 – for the indicator 'Potential Human exposure efficiency relative to U235'.

This impact category deals mainly with the eventual impact of lowdose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'.

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

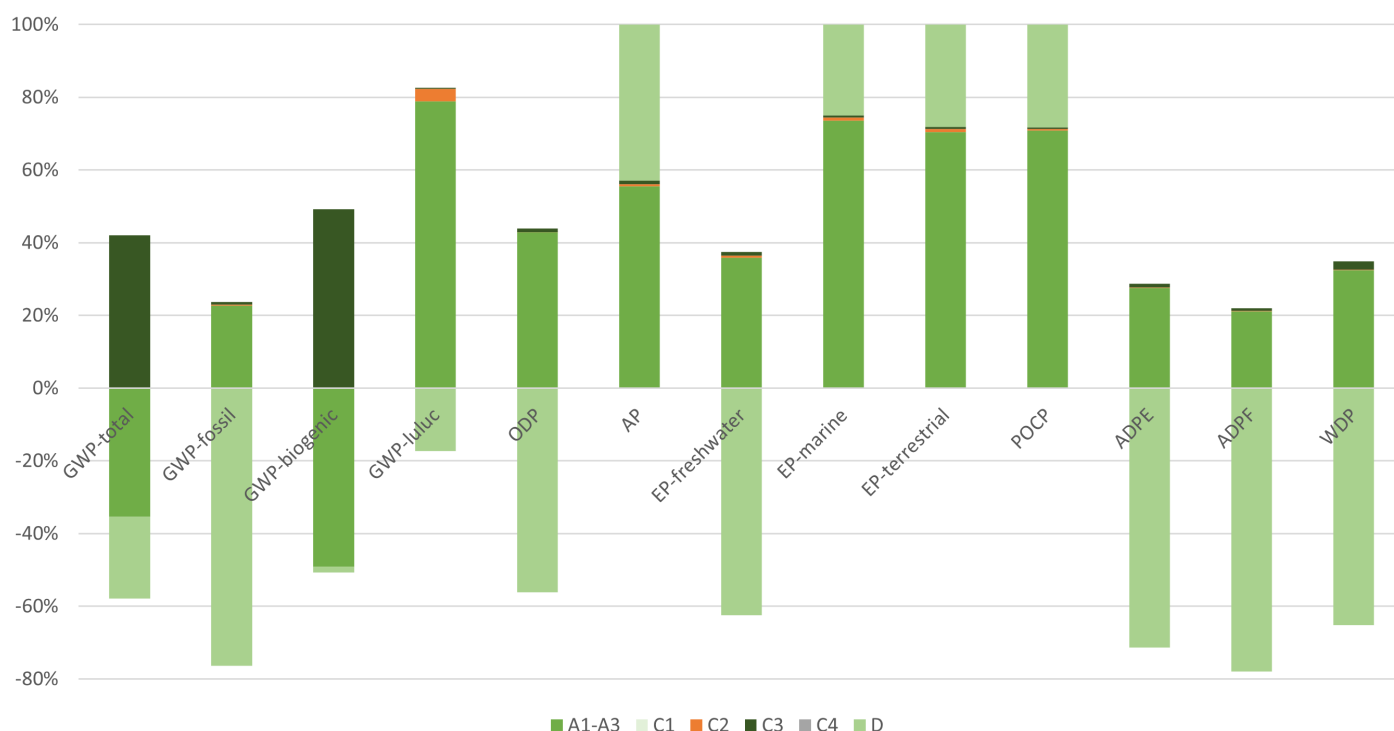
The following interpretation contains a summary of the LCA results referenced to a declared unit of 1 m³ of NORDPAN solid wood panel.

The global warming potential (**GWP**) of solid wood panels shows negative values in the production phase (modules A1–A3). These negative impacts result from the use of wood as raw material. Wood sequesters biogenic carbon during tree growth. The sequestered carbon does not contribute to global warming as long as it is stored in the biomass.

After its use in the building, the product is assumed to be incinerated in a biomass power plant. As a result, the incorporated carbon is emitted again to the atmosphere representing biogenic carbon dioxide emissions (module C3).

The negative values in the end-of-life (module D) result from the energetic treatment of the product. As the energy produced at the biomass power plant can substitute (mainly fossil) fuels, an environmental net benefit is generated.

Hot-spot analysis of nordpan solid wood panels



Potential global warming (**GWP**) due to the production of NORDPAN solid wood panels mainly stems from electricity use for production at the Olang site (Italian residual-mix), lumber production and the upstream supply chain of the binding agents. The processing of the products includes the use of all

wooden residues for heat production. Its thermal treatment is taken into account as carbon neutral, as the wood is derived from sustainably managed forests.

The presented results are considered to be representative for

both NORDPAN production sites. It refers to an average product based on the weighted production volumes of each site.

Due to the different binder contents of specific multi-layer products, there is a certain variance in the results to be expected. Three-layer boards account for the majority of the total production. For single-layer and two-layer boards, tending to contain a lower proportion of adhesive, a potential overestimation of the environmental impacts can be assumed.

7. Requisite evidence

The following evidence of environmental and health relevance was provided.

7.1 Formaldehyde

The emissions (melamine-based adhesive systems) listed in section 2.11 are based on test results of emission measurements in accordance with *EN 717-1* at a temperature of 23 °C, a relative humidity of 45 % and an air change rate of 1.0 per hour. The test results all meet the requirements of emission class E1 according to *EN 13986* of 0.124 mg/m³. Test report No CT-08-12-17-01, (2008) defines a formaldehyde emission of <0.01 ppm for one layered NORDPAN-SWP with PVAC adhesive.

Test report No 2518056, (2018) defines a formaldehyde emission of 0.01 ppm for three layered NORDPAN-SWP with MUF adhesive after 240 h.

Test report No PB_2117078_QDF_2021_2, (2021) defines a formaldehyde emission of 0.02 ppm for three layered NORDPAN-SWP with MUF adhesive after 384 h.

Test report No CT-14-04-04-02, (2014) defines a formaldehyde emission of 0.05 ppm for five layered NORDPAN-SWP with MUF adhesive.

According to the test report for proof of occupational exposure (according to *EN 689*) (date 23.02.2022), the maximum allowed workplace concentration of 0.246 mg/m³ is significantly higher than the measured concentration of 0.071 mg/m³.

7.2 MDI

In the context of production, no such substances are added to the wood. Thus, a MDI emission from the finished NORDPAN-SWP is not to be expected.

7.3 Fire gas toxicity

Due to the heterogeneous structure of NORDPAN-SWP, combined with the non-applicability of the test standard *DIN*

Since the wood species processed is dominated by spruce, the variation associated with the forestry of different wood species is considered to be small.

The results of the previous EPD (EPD-RUB-20180061-IBB2-EN) are not directly comparable with the present updated version due to the update of the underlying methodology according to *EN 15804+A2*.

53436, no relevant measurement results are available, the test specimen geometry is not able to represent the real gas composition for a representative cross-section.

7.4 VOC emissions

For the verification of VOC emissions, two test reports (3-layer: 2519107/4, 2019; 5-layer: 252391/2, 2013) of emission analysis according to *AgBB-Scheme 2015* are available. Analysis was performed in accordance with *ISO 16000-9*.

VOC emissions: 3 layered element: larch

Name	Value	Unit
Overview of Results (28 days)	-	µg/m ³
TVOC (C6 - C16) acc. to AgBB 2015	8	µg/m ³
Sum SVOC (C16 - C22) acc. to AgBB 2015	27	µg/m ³
R (dimensionless) acc. to AgBB 2015	0,148	-

The tested specimens fulfil the requirements according to *AgBB Scheme 2015* and French "Arrêté étiquetage".

VOC emissions: 5 layered element: spruce

Name	Value	Unit
TVOC (C6 - C16)	-	µg/m ³
Overview of Results (28 days)		µg/m ³
Sum SVOC (C16 - C22)	-	µg/m ³
TVOC (C6 - C16) acc. to /AgBB 2015/	22	µg/m ³
R (dimensionless)	-	-
VOC without NIK	-	µg/m ³
Carcinogenic Substances	-	µg/m ³

The tested specimens fulfil the requirements according to *AgBB Scheme 2015* and French "Arrêté étiquetage".

8. References

Standards

DIN 53436

DIN 53436:2015, Generation of thermal decomposition products from materials for their analytic-toxicological testing.

DIN 68800-2

DIN 68800-2:2012-02, Wood preservation – Part 2: Preventive constructional measures in buildings.

DIN 68800-3

DIN 68800-3:2012-02, Wood preservation – Part 3: Preventive protection of wood with wood preservatives.

EN 689

EN 689:1995, Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy.

EN 717-1

DIN EN 717-1:2005-01, Wood-based panels – Determination of Formaldehyde release – Part 1: Formaldehyde emission by the chamber method.

EN 1912

EN 1912:2013-10-15, Structural timber - Strength classes - Assignment of visual grades and species.

EN 12369-3

DIN EN 12369-3:2009-02, Wood-based panels - Characteristic values for structural design - Part 3: Solid-wood panels.

EN 12664

EN 12664:2001, Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products with medium and low thermal resistance.

EN 13183-1

EN 13183-1:2002, Moisture content of a piece of sawn timber - Part 1: Determination by oven dry method.

EN 13353

DIN EN 13353:2011-07, Solid wood panels (SWP) - Requirements.

EN 13986

DIN EN 13986:2015-06, Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking.

EN 13017-1

DIN EN 13017-1:2001-03, Solid wood panels - Classification by surface appearance - Part 1: Softwood.

EN 15804

DIN EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works Environmental product declarations Core rules for the product category of construction products.

hEN 14081

hEN 14081-1:2016-06-01, Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements.

ISO 12572

EN ISO 12572:2016, Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method.

ISO 14025

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

ISO 14044

DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines.

ISO 16000-9

EN ISO 16000-9:2006, Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method.

Further references

AgBB-Scheme 2015

German Committee for HealthRelated Evaluation of Building Products (AgBB): Approach to health assessment of emissions of volatile organic compounds (VOCs and SVOCs) from building products.

Candidate List

List of substances of very high concern considered for approval (status 17.01.2023) according to Article 59 para. 10 of the REACH Regulation. European Chemicals Agency.

GaBi

GaBi 10, Software-System and Database for Life Cycle Engineering. 2022.2. Stuttgart, Echterdingen: Sphera, 1992-2022. Available at: <https://sphera.com/product-sustainability-gabi-data-search/>

IBU 2021

Institut Bauen und Umwelt e.V.: General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V. (IBU). Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibuepd.com

Ordinance on Biocide Products

Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.

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 according to EN 15804+A2:2019. Version 1.3. Berlin: Institut Bauen und Umwelt e.V., 2022.

PCR: Solid wood products

Product category rules for building-related products and services. Part B: EPD requirements for solid wood products. Version v2, Berlin: Institut Bauen und Umwelt e.V., 31.05.2023.

PCR 305/2011 (EU)

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

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Ökobilanz-Basisdaten für Bauprodukte aus Holz. Work report from the Institut für Holztechnologie und Holzbiologie Nr. 2012/1. Hamburg: Johann Heinrich von Thünen-Institut.

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2007/348/EG

2007/348/EC: Commission Decision of 15 May 2007 amending Decision 2003/43/EC establishing the classes of reaction-to-fire performance for certain construction products as regards wood-based panels.

2014/955/EU

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