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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Marnar Bruk AS
Program operator:	The Norwegian EPD Foundation
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Valid to:	05.06.2025

Royal-impregnated timber

Marnar Bruk AS

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MARNAR BRUK
Royal

General information

Product:
Royal-impregnated timber

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Declaration number:
NEPD-2196-1003-EN

Place of production:
Marnadal
Norway

ECO Platform registration number:

Management system:
PEFC ST 2002:2020 - Chain of Custody of Forest Based Products

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serves as core PCR
NPCR015 version 3.0 wood and wood-based products for use in construction (04/2019).

Org. no.:
NO 963 005 431 MVA

Declaration of responsibility:
The owner of the declaration shall be responsible for the underlying information and evidence. EPD Norway shall not be responsible with regard to manufacturer information, life cycle data and evidence.

Issue date:
05.06.2020

Valid to:
05.06.2025

Declared unit with option:

Year of study:
2020

Declared unit:
Production of 1 m³ Royal-impregnated timber of pine, installed and waste treated at end-of-life.

Comparability:
EPD of construction products may not be comparable if they are not comply with NS-EN 15804 and seen in a building context.

Functional unit:

The EPD has been worked out by:

Carlos Einar Myrebøe

Treteknisk

Norwegian Institute of Wood Technology

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☑ external

Third party verifier:

Ellen Soldal, forsker
(Independent verifier approved by EPD Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
Royal impregnated timber is used outdoors as cladding on facades, terraces, roofing tables and structural timber. The oil seal means that the wood has reduced swelling, moisture absorption, shrinkage and crack formation.

Technical data:
The declared unit consist of wood with a dry density of 435 kg/m3. At 16 % timber moisture the density is 504.6 kg/m3.

Marnar Bruk AS is member of Norwegian Control Scheme for Preservative Treated Wood (Norsk Impregneringskontroll).

Product specification:
Planed pine lumber which is first pressure impregnated in copper-based impregnation liquid and then boiled in linseed oil under vacuum with or without pigment.

Materials	kg	%
Wood, pine, dry weight	435.00	81.67 %
Water content of wood	69.60	13.07 %
CU-impregnation, dry weight	7.66	1.44 %
Royal oil and pigments	20.40	3.83 %
Total, product	***532.66***	***100.00 %***
Plastic packaging	0.3	
Steel packaging	0.3	
Wooden packaging	1	
Total, with packaging	***534.26***	

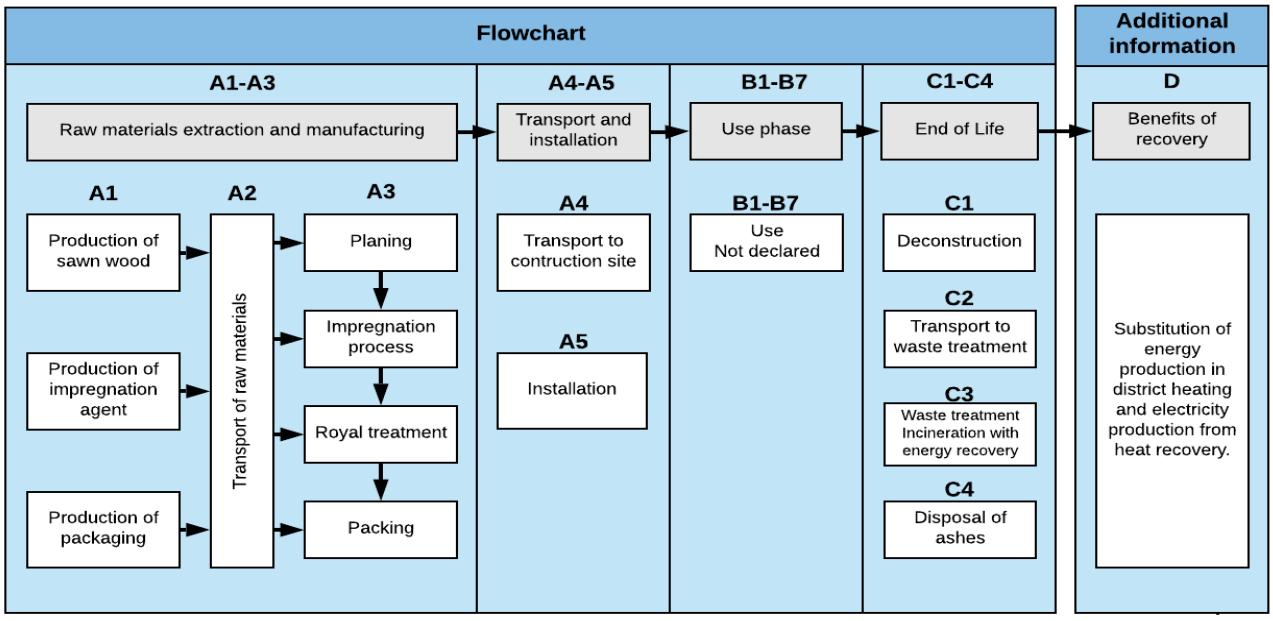
Market:
Norway and Northern Europe. The scenario is calculated for Norway.

Reference service life:
The reference life for cladding of royal impregnated lumber is at least 60 years and depends on climatic conditions and external influences. Used as decking, the service life is 30 years. In this analysis, life expectancy is not taken into account as the use phase is not declared.

LCA: Calculation rules

Declared unit with option:
Production of 1 m³ Royal-impregnated timber of pine, installed and waste treated at end-of-life.

System boundary:
A flow chart with the system boundaries are shown below. Module D is calculated with energy substitution and is explained in more detail under the scenarios.



Data quality:
Production data was obtained from Marnar in 2019 with data for 2018. The data used for the production of sawn wood is based on a former EPD for sawn wood in Norway and with Ecoinvent v3.4 as background data. Data for the production of royal oil and copper impregnation agents are taken from Ecoinvent. Data for exported energy produced from waste incineration is based on Statistics Norway and is representative for 2017 (2018a, b, c). Remaining data is based on Ecoinvent v-3.0-v3.4 "Allocation cut-off by classification", but adjusted to improve representativeness.

Cut-off criteria:
All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. These cut-off rule does not apply for hazardous materials and substances.

Allocation:
The allocation is made in accordance with the provisions of EN 15804. Incoming energy, water and waste production are sub-divided when possible and allocated with economic allocation when the difference in revenue is high. Effects of primary production of recycled materials are allocated to the main product in which the material was used. Economic allocation between saw logs and pulp wood for transport and logging activities is used in forestry.

Calculation of biogenic carbon content:
Sequestration and emissions of biogenic carbon is calculated according to EN16485:2014. This approach is based on the modularity principle in EN15804:2012 which states that all environmental aspects and impacts are declared in the life cycle where they appear. The calculation of biogenic carbon content and conversion to carbon dioxide is done according to NS-EN 16449:2014. Net contribution to GWP from biogenic carbon by each module is shown on page 8. The timber originates from sustainable forestry and has PEFC certified traceability.

LCA: Scenarios and additional technical information

It is assumed a transport distance of 280 km from manufacturing to the building site. 250 km is assumed to be on a large size lorry and 30 km on a medium size lorry.

Transport from production place to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption pr tkm	Fuel/Energy consumption pr km
Truck	53 %	EURO5, >32 tonn	250	0.023 l/tkm	0.31 l/km
Truck	26 %	EURO5, 16-32 tonn	30	0.045 l/tkm	0.25 l/km

The assembly at building site includes 5 % product wastage, and 1 MJ of energy use in assembly and waste management of packaging materials.

Waste from copper-impregnated timber is classified as treated wood (not hazardous waste) (1142) in NS 9431: 2011, but in cases of doubt it is treated as CCA-impregnated wood (7098). Handled with combustion with energy utilization (0007) in installations with permission. Quantities are specified for one declared unit.

Assembly (A5)

	Unit	Value
Auxiliary	kg	
Water consumption	m^3	
Electricity consumption	MJ	1.0
Other energy carriers	MJ	
Material loss	kg	26.6
Output materials from waste treatment	kg	1.6
Dust in the air	kg	

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	532.66
Reuse	kg	
Recycling	kg	
Energy recovery	kg	532.66
To landfill	kg	

The transport of wood waste is based on average distance for Norway in 2007 and was 85 km (Raadal et al., 2009).

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption pr tkm	Fuel/Energy consumption pr km
Truck	44 %	Unspecified	85	0.03 l/tkm	0.28 l/km

The benefits of exported energy from energy recovery is calculated with substitution of Norwegian electricity market mix on medium voltage and Norwegian district heating mix. The energy exported and the district heating mix is representative for the year 2017.

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of electricity	MJ	875
Substitution of district heating	MJ	6012
Substitution of raw materials	kg	0

LCA: Results

Global warming potential in A1-A3 includes sequestration of 827.5 kg of CO_2 through photosynthesis, which is stored as carbon in the wood, in the wood packaging and in the Royal oil. 797.5 kg CO_2 is stored in the wood in the product, 28.5 kg CO_2 is stored in the Royal oil and 1.5 kg CO_2 is stored in the wood packaging. According to the modularity principle, 1.5 kg CO_2 is released to air by combustion of the waste wood packaging in module A5. Remaining biogenic carbon stored in the product is released to air in module C3. This causes the sum of the biogenic carbon emissions to be 0 kg CO_2 for the entire life cycle. See table on page 6 for more information.

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	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	X	X	MID	MID	MID	MID	MID	MID	MID	X	X	X	X	X

Environmental impact

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2-ekv	-6.26E+02	1.46E+01	1.55E+01	8.81E-03	5.69E+00	8.77E+02	5.61E-02	-3.92E+01
ODP	kg CFC11-ekv	2.58E-05	2.79E-06	1.54E-06	8.24E-10	1.06E-06	6.11E-07	2.09E-08	-4.34E-06
POCP	kg C_2H_4-ekv	1.34E-01	2.38E-03	7.30E-03	1.82E-06	9.34E-04	2.33E-03	1.80E-05	-2.13E-02
AP	kg SO_2-ekv	1.72E+00	4.81E-02	9.64E-02	3.97E-05	1.85E-02	6.64E-02	3.86E-04	-2.16E-01
EP	kg PO_4^{3-}-ekv	7.37E-01	7.97E-03	4.04E-02	9.93E-06	3.06E-03	2.28E-02	6.77E-05	-5.76E-02
ADPM	kg Sb-ekv	2.18E-03	3.04E-05	1.17E-04	1.38E-07	1.57E-05	1.13E-05	7.52E-08	-1.53E-04
ADPE	MJ	2.99E+03	2.43E+02	1.77E+02	9.33E-02	9.30E+01	1.33E+02	2.03E+00	-5.26E+02

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

Resource use

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	3.94E+03	2.42E+00	6.70E+02	1.13E+00	9.52E-01	8.76E+03	2.91E-02	-3.39E+03
RPEM	MJ	8.74E+03	0.00E+00	-7.37E-01	0.00E+00	0.00E+00	-8.76E+03	0.00E+00	0.00E+00
TPE	MJ	1.27E+04	2.42E+00	6.69E+02	1.13E+00	9.52E-01	3.37E+00	2.91E-02	-3.39E+03
NRPE	MJ	2.97E+03	2.47E+02	1.98E+02	1.58E-01	9.44E+01	5.44E+02	2.09E+00	-6.46E+02
NRPM	MJ	4.04E+02	0.00E+00	-3.76E+00	0.00E+00	0.00E+00	-4.75E+02	0.00E+00	0.00E+00
TRPE	MJ	3.38E+03	2.47E+02	1.95E+02	1.58E-01	9.44E+01	6.87E+01	2.09E+00	-6.46E+02
SM	kg	1.19E-01	0.00E+00	6.28E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	1.28E+00	0.00E+00	1.08E-01	0.00E+00	0.00E+00	7.67E-01	0.00E+00	-2.44E+03
NRSF	MJ	8.56E-01	0.00E+00	7.20E-02	0.00E+00	0.00E+00	5.11E-01	0.00E+00	-1.63E+03
W	m^3	7.45E+00	4.19E-02	4.06E-01	8.41E-03	1.53E-02	5.04E-02	2.39E-03	-1.36E+01

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE 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; W Use of net fresh water

End of life - Waste									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
HW	kg	8.68E-01	1.53E-02	4.47E-01	5.62E-05	6.55E-03	5.24E-02	7.56E+00	-2.59E-01
NHW	kg	9.45E+01	1.82E+01	6.10E+00	6.73E-03	5.60E+00	1.93E+00	1.07E+00	-1.32E+01
RW	kg	1.49E-02	1.58E-03	8.80E-04	1.11E-06	6.01E-04	1.68E-04	1.20E-05	-2.89E-03

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life - Output flow									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	7.18E-01	0.00E+00	6.71E-01	0.00E+00	0.00E+00	4.00E-02	0.00E+00	0.00E+00
MER	kg	8.07E-01	0.00E+00	1.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	2.15E+01	0.00E+00	4.17E+01	0.00E+00	0.00E+00	7.70E+02	0.00E+00	-8.75E+02
ETE	MJ	1.48E+02	0.00E+00	2.86E+02	0.00E+00	0.00E+00	5.29E+03	0.00E+00	-6.01E+03

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Reading example: 9,0 E-03 = $9{,}0*10^{-3}$ = 0,009

Additional Norwegian requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase
National production mix with import, on low voltage (production of transmission lines, in addition to direct emissions and losses in grid) is applied for electricity in the manufacturing process (A3).

Data source	Amount	Unit
Ecoinvent v3.4 (August 2017)	31.0	gram CO_2-eqv/kWh

Hazardous substances

- ☑ The product contains no substances from REACH Candidate List or the Norwegian Priority List
- ☐ The product contains substances below 0.1% by weight on the REACH Candidate List
- ☐ The product contains substances from REACH Candidate List or the Norwegian Priority List, see table under Specific Norwegian requirements.
- ☐ The product does not contain any substances on the REACH Candidate List or the Norwegian Priority List. The product can be characterized as hazardous waste (according to the Waste Shift, Appendix III), see table under Specific Norwegian requirements.

Transport
Transport from production site to a construction site according to scenario A4: 280 km

Indoor environment
There has not been performed tests for emission to indoor environment since the products is intended for outdoor use.

Carbon footprint
To increase the transparency of the climate impacts, the GWP indicator has been divided into sub-indicators:
GWP-IOBC Climate impacts calculated according to instant oxidation principle
GWP-BC Climate impacts calculated from the net impacts of sequestration and emission of biogenic carbon

Climate impact									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-IOBC	kg CO_2-eqv	2.01E+02	1.46E+01	1.40E+01	8.81E-03	5.69E+00	5.07E+01	5.61E-02	-3.92E+01
GWP-BC	kg CO_2-eqv	-8.28E+02	0.00E+00	1.47E+00	0.00E+00	0.00E+00	8.26E+02	0.00E+00	0.00E+00
GWP	kg CO_2-eqv	-6.26E+02	1.46E+01	1.55E+01	8.81E-03	5.69E+00	8.77E+02	5.61E-02	-3.92E+01

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NEPD-307-179-NO	*EPD for skurlast av gran eller furu. Treindustrien.*
NS 9431:2011	*Classification of waste*
DNV GL	*Chain of Custody certificate - PEFC CoC 2018-SKM-PEFC-265*

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