EPD®

BRIMSTONE®
Transforming British Woods

Environmental Product Declaration
Brimstone cladding and decking boards

Name of declared product
Brimstone cladding and decking boards

Statement of conformity to standards
Environmental Product Declaration in accordance with ISO 14025 and EN 15804. EPD of construction products may not be comparable if they do not comply with EN15804.

EPD Program Operator
The International EPD® System (www.environdec.com)
EPD International AB, Box 210 60, SE-100 31, Stockholm, Sweden.

Owner of the declaration
Vastern Timber Ltd
The Sawmills, Royal Wootton Bassett, Swindon, SN4 7PD, UK

EPD prepared by
thinkstep Ltd
Euston Tower (Level 33), 286 Euston Road, London, NW1 3DP

Verified by
Jane Anderson

UN CPC code
31102 Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness exceeding 6mm, of non-coniferous wood.

Registration number
S-P-01718

Date of issue
2019-10-09

Valid to
2024-10-09

Prepared by thinkstep

Brimstone
Cladding and decking boards

Product description
Brimstone is a range of thermally modified British hardwoods manufactured and supplied by Vastern Timber. Brimstone is created by heating the wood to 200°C+ under controlled conditions, a process known as Thermal Modification. This natural, toxin-free method removes moisture, resin and other extractives. The result is a more durable, stable and consistent material that is ideal for external cladding, decking and some joinery applications.

Brimstone is available in three versions, Brimstone ash, Brimstone poplar and Brimstone sycamore, all of which are sourced from GIB accredited woodlands in England and Wales. The wood is highly selected to produce a relatively defect free grading of Class 1 (BS1186-3) or J20 (EN942:2007), ideal for clean and contemporary designs.

The thermal modification process transforms non-durable white hardwoods into products with the highest levels of durability when used away from ground contact. Lab based testing of Brimstone by EPH Dresden has indicated Class 1 durability (EN350-2) for all three versions. Testing has also indicated a 50–60% improvement in stability after the modification process.

Company description
Vastern Timber is the largest hardwood sawmilling company in the UK. Based in Wiltshire, the Company owns and operates from two sites at Wootton Bassett and Calne, processing upwards of 9000 M3 of logs per year for timber cladding, structural beams and joinery. The company specialises in converting British grown species such as oak, ash, sweet chestnut, poplar, cedar and larch, controlling the whole process from the log to the finished product.

In 2015 Vastern Timber launched the Brimstone range of thermally modified hardwoods with the aim of creating a demand for the lesser used, but widely available, white hardwoods in British woodlands. Since the demise of the furniture industry in the UK species including ash, sycamore and poplar have become less desirable leading to falling levels of woodland management. Brimstone is designed to be part of the solution to this problem.

Product specification
This EPD relates to the range of Brimstone products made by Vastern Timber including Brimstone Ash, Brimstone Sycamore and Brimstone Poplar, which are supplied to UK customers.

In 2018 Brimstone products were produced from the different wood species in the following proportions:
• Ash (38.6%)
• Sycamore (7.3%)
• Poplar (54.1%)

Technical data
Key characteristics of Brimstone cladding and decking boards.

Technical Specification	Value/Comment
Base timber	British grown ash, poplar and sycamore
Independent certification	GIB (Grown in Britain)
Quality (EN942:2007) / (BS1186-3)	J20 / Class 1
Moisture content	4-6%
Durability (EN350-2)	Very durable. Class 1
Desired service life (BS8417)	At least 30 years when used above ground
Emission of formaldehyde (EN14915)	E1 (Not significant)
Reaction to fire (EN14915)	Euroclass F (Untested) / D-s2, dO
Other	As with all thermally modified products, Brimstone is relatively brittle

Modelling the Life Cycle

The calculation procedures described in EN ISO 14044:2006 and EN15804:2012 were followed and applied consistently throughout the study.

Declared unit

Brimstone Ash
1 m3 of profiled thermally modified timber board made from ash with apparent density 631 kg/m3 and moisture content of approximately 4% used for cladding or decking.

Brimstone Sycamore
1 m3 of profiled thermally modified timber board made from sycamore with apparent density 571 kg/m3 and moisture content of approximately 4% used for cladding.

Brimstone Poplar
1 m3 of profiled thermally modified timber board made from poplar with apparent density 409 kg/m3 and moisture content of approximately 4% used for cladding.

To convert from 1 m3 to 1 kg profiled thermally modified timber board the results in this EPD should be divided by 631 kg/m3 for ash, by 572 kg/m3 for sycamore and by 409 kg/m3 for poplar.

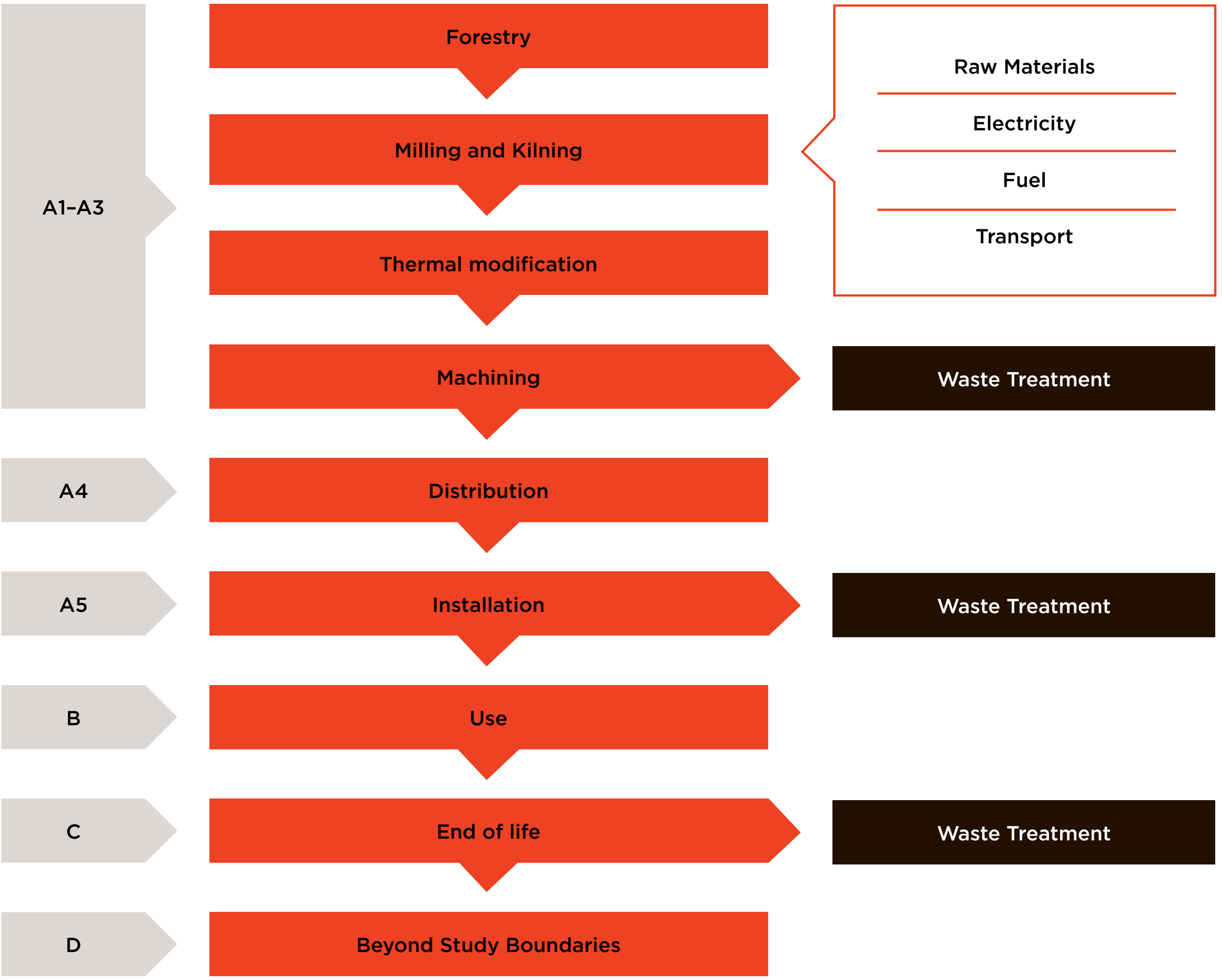
All Brimstone achieves class 1 for durability (EN350); this is according to EN335 for class 3 in use conditions of 'occasionally wet' timber, which gives a service life of 60 years. However, the reference service life (RSL) was taken to be 30 years as a more conservative choice considering the product is likely to be more than 'occasionally wet' when used in the UK.

This RSL is calculated based on the following reference conditions:
• Used above-ground in outdoor applications such as cladding or decking
• Avoiding ground contact
• Without varnish, paint, preservatives or other coatings
• Under average UK climatic conditions.

System boundary
A top-level process flow diagram for the life cycle of the Brimstone profiled thermally modified timber board is given in Figure 1, below along with the corresponding life cycle module from EN 15804.

Modelling the Life Cycle

Figure 1
Flow diagram showing the process steps included within the system boundary of the study.



Assumptions for Modelling Downstream Life Cycle Stages

It is assumed that the customer for the Brimstone boards is located in the UK and all subsequent downstream activities have been modelled to be representative of this geographical region.

Following product manufacture it is assumed that the finished Brimstone boards are transported 160km to the customer for installation.

Brimstone boards are available in a range of dimensions so if the quantities and dimensions are specified correctly there should be minimum installation waste, however a conservative estimate of 10% installation losses has been applied. This waste material is assumed to be chipped and used as biomass fuel.

It is assumed that 2.88kg stainless steel nails are required to install each cubic metre of board. Other installation materials that may be required have been excluded from this assessment as these will vary according to the specific requirements of each construction project.

Brimstone boards should require no treatment (e.g. painting/varnishing) or maintenance (e.g. repair or refurbishment) during use, nor do they require water or energy, so all use stage impacts are assessed as zero.

Due to the nature of Brimstone boards and their expected location in a building, it is probable that deconstruction would predominantly be achieved using manual labour, so no energy has been modelled for the deconstruction process. As with installation waste, it is assumed that at end of life the boards are transported 50km to a waste treatment plan where they are chipped and used for biomass fuel.

Data quality

Data collection followed the guidance provided in EN 15804, clause 4.3.2. All data received were cross-checked for completeness and plausibility using mass balances and stoichiometry, as well as internal and external benchmarking.

All producer-specific data are from 2018 and are based on one-year averaged data, representative of the scenario currently in use.

Background data for LCA modelling were sourced from the GaBi 2018 databases, for which full documentation is available online (thinkstep, 2018).

Cut-off criteria

Cut-off criteria follows EN 15804, whereby all emissions and their environmental impact contributing greater than 1% to the total must be recorded.

In this assessment, all information gathered from data collection for the production of Brimstone timber have been modelled, i.e. all raw materials used, the electrical energy and other fuels used, use of ancillary materials and all direct production waste. Transport data on input and output flows have also considered. Scenarios have been developed to account for downstream processes such as installation, demolition and waste treatment. No data on inputs or outputs have knowingly been omitted from the assessment. The only exception is the packaging used for transporting the finished product to the installation site. This comprises two thin plastic straps per pack of boards to secure them together for transport. These fall far below the cut off thresholds for energy and mass and so have been omitted from the assessment.

Modelling the Life Cycle

Allocation

Co-product allocation

During production of profiled Brimstone boards, a significant quantity of woodchip co-product is generated. Most of this is used within the process (e.g. the drying kiln) but the excess is sold, and so forms a co-product from the Brimstone production process. Economic data were gathered from Vastern Timber relating to the cost of the Brimstone boards and the woodchip co-product and allocation was applied based on economic value.

Multi-input allocation

The module C4 includes end of life datasets (e.g. for landfill of stainless steel nails) in which different products are treated together within a single process. The allocation procedures followed in these cases are based on a physical allocation of the mass flows and are documented in the GaBi online documentation (thinkstep, 2018).

Allocation procedure of reuse, recycling and recovery

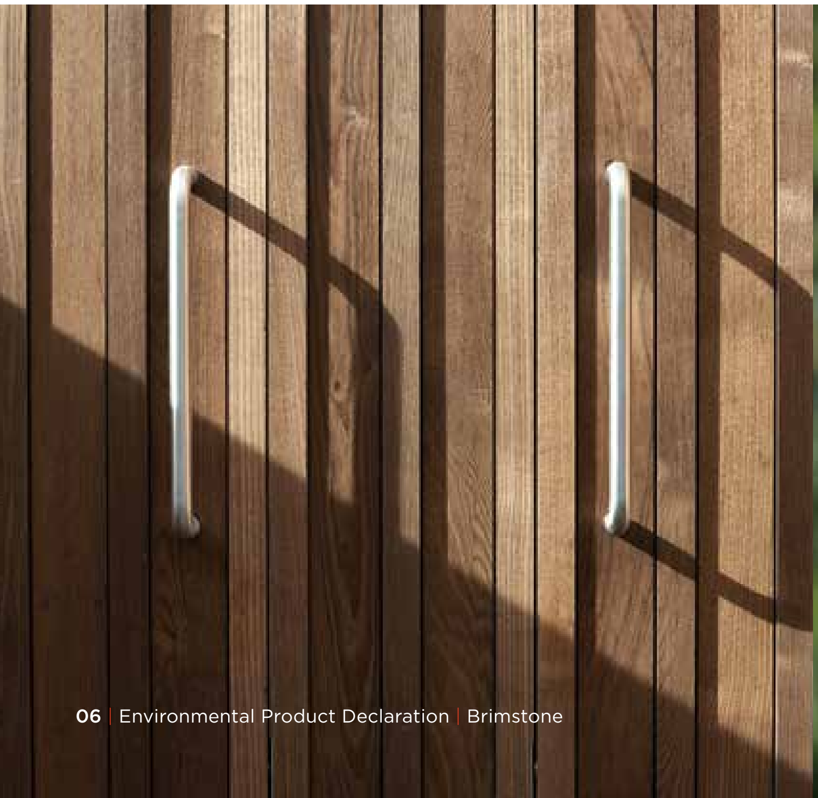
Brimstone boards are modelled as being chipped at end of life, ready for use as biomass fuel.

Energy recovered from waste arising in downstream processes (A5 and C3) is grouped with the potential benefits reported in module D. The thermal energy recovered in D is modelled as substituting for thermal energy from natural gas, as a conservative choice (based on guidance from EN 16485, Table 1 and section 6.4.3.3).

Woodchips are produced from Brimstone waste in modules A5 and C3. As these woodchips cross the boundary of the product system their renewable energy and biogenic carbon content is subtracted from modules A5 and C3 and added to module D. These are inherent properties of the woodchips and so are carried with them as they enter the next product system.

Carbon Sequestration

The carbon sequestered has been taken into account for the finished product, calculated according to EN 16485 for round and sawn timber. The densities of ash, sycamore and poplar at 4% moisture content are 631 kg/m3, 571 kg/m3 and 409 kg/m3, respectively. Accordingly, each m3 of Brimstone board sequesters 1,110 kg CO2/m3 for ash, 1,010 kg CO2/m3 for sycamore and 719 kg CO2/m3 for poplar.



Life Cycle Analysis
System Boundaries

The scope of this EPD is ‘cradle to gate with options’; it follows the modular system boundary of EN 15804, as illustrated in the following table. All modules from A1 to D were declared.

Product stage	A1	Raw material supply (extraction, processing, recycled material)
	A2	Transport to manufacturer
	A3	Manufacturing
Construction process stage	A4	Transport to building site
	A5	Installation into building
Use stage	B1	Use / application
	B2	Maintenance
	B3	Repair
	B4	Replacement
	B5	Refurbishment
	B6	Operational energy use
	B7	Operational water use
End-of-life stage	C1	Deconstruction / demolition
	C2	Transport to EoL
	C3	Waste processing for reuse, recovery or recycling
	C4	Disposal
BTSB*	D	Reuse, recovery or recycling potential

*Benefits and loads beyond the system boundary

Results Indicators

Environmental Impacts	Abbreviation	Unit
Global warming potential	GWP	kg CO2 equivalent
Depletion potential of the stratospheric ozone layer	ODP	kg CFC 11 equivalent
Acidification potential of soil and water	AP	kg SO2 equivalent
Eutrophication potential	EP	kg (PO4)3- equivalent
Formation potential of tropospheric ozone	POCP	kg C2H4 equivalent
Abiotic depletion potential for non-fossil resources	ADPE	kg Sb equivalent
Abiotic depletion potential for fossil resources	ADPF	MJ, net calorific value

Resource Use and Primary Energy	Abbreviation	Unit
Use of renewable primary energy as energy carrier	PERE	MJ, net calorific value
Use of renewable primary energy as raw materials	PERM	MJ, net calorific value
Total use of renewable primary energy	PERT	MJ, net calorific value
Use of non-renewable primary energy as energy carrier	PENRE	MJ, net calorific value
Use of non-renewable primary energy as raw materials	PENRM	MJ, net calorific value
Total use of non-renewable primary energy	PENRT	MJ, net calorific value
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ, net calorific value
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value
Net use of fresh water	FW	kg

Waste Categories	Abbreviation	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg

Output Flows	Abbreviation	Unit
Components for reuse	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ

Life Cycle Results
Brimstone Ash

Environmental Impact for Brimstone Ash

Parameters describing environmental impacts*

Parameter	Unit	A1-3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP	[kg CO2-eq.]	-704	6.03	51.8	0	0	1.88	1110	0.0458	-792
ODP	[kg CFC11-eq.]	4.00E-10	2.50E-13	4.60E-11	0	0	7.82E-14	3.84E-13	1.04E-14	-3.95E-14
AP	[kg SO2-eq.]	3.21	5.23E-03	0.387	0	0	1.63E-03	9.87E-03	2.71E-04	1.84
EP	[kg PO43-eq.]	0.225	1.21E-03	0.0264	0	0	3.78E-04	8.84E-04	3.74E-05	0.0613
POCP	[kg ethene-eq.]	0.826	-4.10E-05	0.0859	0	0	-1.28E-05	1.71E-03	2.14E-05	0.210
ADPE	[kg Sb-eq.]	3.59E-05	5.34E-07	5.66E-04	0	0	1.67E-07	3.38E-07	1.76E-08	-1.12E-05
ADPF	[MJ]	6090	81.9	771	0	0	25.6	298	0.592	-13500

GWP Global warming potential
ODP Ozone depletion potential
AP Acidification potential
EP Eutrophication potential
POCP Photochemical ozone creation potential
ADPE Abiotic depletion potential for non-fossil resources
ADPF Abiotic depletion potential for fossil resources

Life Cycle Results
Brimstone Ash

Resource Use and Primary Energy for Brimstone Ash
Parameters describing resource use, secondary materials and fuels, use of water*

Parameter	Unit	A1-3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	[MJ]	22200	4.30	2020	0	0	1.34	-11500	0.0760	12600
PERM	[MJ]	9250	0	0	0	0	0	0	0	0
PERT	[MJ]	31500	4.30	2020	0	0	1.34	-11500	0.0760	12600
PENRE	[MJ]	6480	82.4	822	0	0	25.7	299	0.614	-13500
PENRM	[MJ]	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	6480	82.4	822	0	0	25.7	299	0.614	-13500
SM	[kg]	0	0	0	0	0	0	0	0	0
RSF	[MJ]	7.99E-11	4.05E-28	7.99E-12	0	0	1.27E-28	1.48E-28	9.31E-24	13900
NRSF	[MJ]	1.73E-03	6.16E-27	1.73E-04	0	0	1.92E-27	2.25E-27	1.09E-22	0
FW	[m3]	0.714	7.92E-03	0.146	0	0	2.47E-03	2.88E-03	1.17E-04	0.0697

PERE Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM Use of renewable primary energy resources used as raw materials
PERT Total use of renewable primary energy resources

PENRE Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM Use of non-renewable primary energy resources used as raw materials
PENRT Total use of non-renewable primary energy resources

SM Use of secondary material
RSF Use of renewable secondary fuels
NRSF Use of non-renewable secondary fuels
FW Use of net fresh water

Ouput flows at end of life and waste categories for Brimstone Ash
Parameters describing environmental impacts*

Parameter	Unit	A1-3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	[kg]	5.00E-04	4.34E-06	5.12E-05	0	0	1.36E-06	1.60E-06	1.06E-08	-2.85E-06
NHWD	[kg]	12.5	6.61E-03	2.60	0	0	2.06E-03	3.74E-03	2.88	8.07
RWD	[kg]	0.159	1.72E-04	0.0206	0	0	5.37E-05	3.26E-04	8.88E-06	-7.96E-03
CRU	[kg]	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0	0	0	0	0	0	0
MER	[kg]	0	0	63.1	0	0	0	631	0	0
EEE	[MJ]	0	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	0	0	0	0	0

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

Life Cycle Results
Brimstone Sycamore

Environmental Impact for Brimstone Sycamore
Parameters describing environmental impacts*

Parameter	Unit	A1-3	A4	A5 B7	B1-	C1	C2	C3	C4	D
GWP	[kg CO2-eq.]	-639	5.46	47.6	0	0	1.70	1010	0.0458	-717
ODP	[kg CFC11-eq.]	3.63E-10	2.27E-13	4.22E-11	0	0	7.07E-14	3.48E-13	1.04E-14	-3.57E-14
AP	[kg SO2-eq.]	2.93	4.73E-03	0.358	0	0	1.48E-03	8.93E-03	2.71E-04	1.66
EP	[kg PO43--eq.]	0.206	1.09E-03	0.0245	0	0	3.42E-04	8.00E-04	3.74E-05	0.0555
POCP	[kg ethene-eq.]	0.798	-3.71E-05	0.0832	0	0	-1.16E-05	1.54E-03	2.14E-05	0.190
ADPE	[kg Sb-eq.]	3.38E-05	4.83E-07	5.66E-04	0	0	1.51E-07	3.05E-07	1.76E-08	-1.01E-05
ADPF	[MJ]	5420	74.1	701	0	0	23.1	270	0.591	-12200

GWP Global warming potential
ODP Ozone depletion potential
AP Acidification potential
EP Eutrophication potential
POCP Photochemical ozone creation potential
ADPE Abiotic depletion potential for non-fossil resources
ADPF Abiotic depletion potential for fossil resources

Resource Use and Primary Energy for Brimstone Sycamore
Parameters describing resource use, secondary materials and fuels, use of water*

Parameter	Unit	A1-3	A4	A5	B1- B7	C1	C2	C3	C4	D
PERE	[MJ]	18100	3.89	1830	0	0	1.21	-10400	0.0760	11400
PERM	[MJ]	10400	0	0	0	0	0	0	0	0
PERT	[MJ]	28500	3.89	1830	0	0	1.21	-10400	0.0760	11400
PENRE	[MJ]	5810	74.5	751	0	0	23.3	270	0.614	-12200
PENRM	[MJ]	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	5810	74.5	751	0	0	23.3	270	0.614	-12200
SM	[kg]	0	0	0	0	0	0	0	0	0
RSF	[MJ]	6.61E-11	3.67E-28	6.61E-12	0	0	1.14E-28	1.34E-28	9.30E-24	12600
NRSF	[MJ]	1.43E-03	5.58E-27	1.43E-04	0	0	1.74E-27	2.03E-27	1.09E-22	0
FW	[m3]	0.682	7.16E-03	0.143	0	0	2.24E-03	2.61E-03	1.17E-04	0.0631

PERE Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM Use of renewable primary energy resources used as raw materials
PERT Total use of renewable primary energy resources

PENRE Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM Use of non-renewable primary energy resources used as raw materials
PENRT Total use of non-renewable primary energy resources

SM Use of secondary material
RSF Use of renewable secondary fuels
NRSF Use of non-renewable secondary fuels
FW Use of net fresh water

Life Cycle Results
Brimstone Sycamore

Ouput flows at end of life and waste categories for Brimstone Sycamore
Parameters describing environmental impacts*

Parameter	Unit	A1-3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	[kg]	4.94E-04	3.93E-06	5.05E-05	0	0	1.23E-06	1.45E-06	1.06E-08	-2.58E-06
NHWD	[kg]	11.5	5.98E-03	2.50	0	0	1.87E-03	3.38E-03	2.88	7.30
RWD	[kg]	0.157	1.56E-04	0.0203	0	0	4.86E-05	2.95E-04	8.88E-06	-7.20E-03
CRU	[kg]	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0	0	0	0	0	0	0
MER	[kg]	0	0	57.1	0	0	0	571	0	0
EEE	[MJ]	0	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	0	0	0	0	0

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

Life Cycle Results
Brimstone Poplar

Environmental Impact for Brimstone Poplar
Parameters describing environmental impacts*

Parameter	Unit	A1-3	A4	A5 B7	B1-	C1	C2	C3	C4	D
GWP	[kg CO2-eq.]	-453	3.91	37.4	0	0	1.22	720	0.0457	-513
ODP	[kg CFC11-eq.]	2.73E-10	1.62E-13	3.31E-11	0	0	5.07E-14	2.49E-13	1.04E-14	-2.56E-14
AP	[kg SO2-eq.]	2.18	3.39E-03	0.283	0	0	1.06E-03	6.39E-03	2.71E-04	1.19
EP	[kg PO43--eq.]	0.156	7.83E-04	0.0194	0	0	2.45E-04	5.72E-04	3.74E-05	0.0397
POCP	[kg ethene-eq.]	0.724	-2.66E-05	0.0757	0	0	-8.31E-06	1.10E-03	2.14E-05	0.136
ADPE	[kg Sb-eq.]	2.86E-05	3.45E-07	5.65E-04	0	0	1.08E-07	2.19E-07	1.76E-08	-7.26E-06
ADPF	[MJ]	3810	53.0	529	0	0	16.6	193	0.591	-8710

GWP Global warming potential
ODP Ozone depletion potential
AP Acidification potential
EP Eutrophication potential
POCP Photochemical ozone creation potential
ADPE Abiotic depletion potential for non-fossil resources
ADPF Abiotic depletion potential for fossil resources
WSP Water scarcity potential

Life Cycle Results
Brimstone Poplar

Resource Use and Primary Energy for Brimstone Poplar
Parameters describing resource use, secondary materials and fuels, use of water*

Parameter	Unit	A1-3	A4	A5 B7	B1-	C1	C2	C3	C4	D
PERE	[MJ]	13000	2.79	1330	0	0	0.87	-7450	0.0760	8200
PERM	[MJ]	7460	0	0	0	0	0	0	0	0
PERT	[MJ]	20500	2.79	1330	0	0	0.87	-7450	0.0760	8200
PENRE	[MJ]	4180	53.4	578	0	0	16.7	194	0.614	-8730
PENRM	[MJ]	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	4180	53.4	578	0	0	16.7	194	0.614	-8730
SM	[kg]	0	0	0	0	0	0	0	0	0
RSF	[MJ]	3.35E-11	2.63E-28	3.35E-12	0	0	8.22E-29	9.59E-29	9.30E-24	9000
NRSF	[MJ]	7.26E-04	3.99E-27	7.26E-05	0	0	1.25E-27	1.46E-27	1.09E-22	0
FW	[m3]	0.600	5.13E-03	0.134	0	0	1.61E-03	1.87E-03	1.17E-04	0.0452

PERE Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM Use of renewable primary energy resources used as raw materials
PERT Total use of renewable primary energy resources

PENRE Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM Use of non-renewable primary energy resources used as raw materials
PENRT Total use of non-renewable primary energy resources

SM Use of secondary material
RSF Use of renewable secondary fuels
NRSF Use of non-renewable secondary fuels
FW Use of net fresh water

Ouput flows at end of life and waste categories for Brimstone Poplar
Parameters describing environmental impacts*

Parameter	Unit	A1-3	A4	A5 B7	B1-	C1	C2	C3	C4	D
HWD	[kg]	4.77E-04	2.81E-06	4.86E-05	0	0	8.80E-07	1.04E-06	1.06E-08	-1.85E-06
NHWD	[kg]	8.77	4.29E-03	2.23	0	0	1.34E-03	2.42E-03	2.88	5.23
RWD	[kg]	0.150	1.12E-04	0.0196	0	0	3.49E-05	2.11E-04	8.88E-06	-5.16E-03
CRU	[kg]	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0	0	0	0	0	0	0
MER	[kg]	0	0	40.9	0	0	0	409	0	0
EEE	[MJ]	0	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	0	0	0	0	0

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

Interpretation

Figure 2 (opposite), shows a detailed breakdown of the Green House Gas (GHG) removals and emissions over the life cycle of the Brimstone boards.

During forest growth a large amount of carbon is sequestered in the wood of the trees used to make the Brimstone products. Ash, sycamore and poplar differ in density so the amount of carbon sequestered per m3 varies depending on the species, with ash, the densest, storing the most and poplar, the lightest, storing the least. This difference in density also explains the variation in the carbon footprint results for other stages in the product life cycle seen for the different wood species.

Much of the carbon sequestered during tree growth remains contained within the Brimstone product, but offcuts and wood chips generated during the manufacturing process are used as fuel for the kiln, where the sequestered carbon is released as carbon dioxide back to the atmosphere[1]. Overall, the use of biomass fuel is carbon neutral as the emissions are balanced by the uptake. Electricity is used in the milling and kilning process, which does contribute some fossil GHG emissions.

The thermal modification process uses less energy than is needed for wood drying and so has smaller GHG emissions. However, this is all fuelled by natural gas, a fossil resource and so these emissions are not offset by carbon uptake from forestry.

Transport associated with bringing cut lumber to the mill is noticeable but other transport steps are relatively insignificant in the context of the full life cycle. Likewise, GHG emissions associated with other wood processing activities, such as preparation for thermal modification and profiling, are also small.

The other major GHG emissions occur at the end of life stage, and are related to the use of the Brimstone boards as renewable secondary fuel. As with the wood chips used in the kiln, these emissions are off-setting the carbon uptake that occurred during forestry at the start of the life cycle, and so do not result in a net increase in GHG emissions.

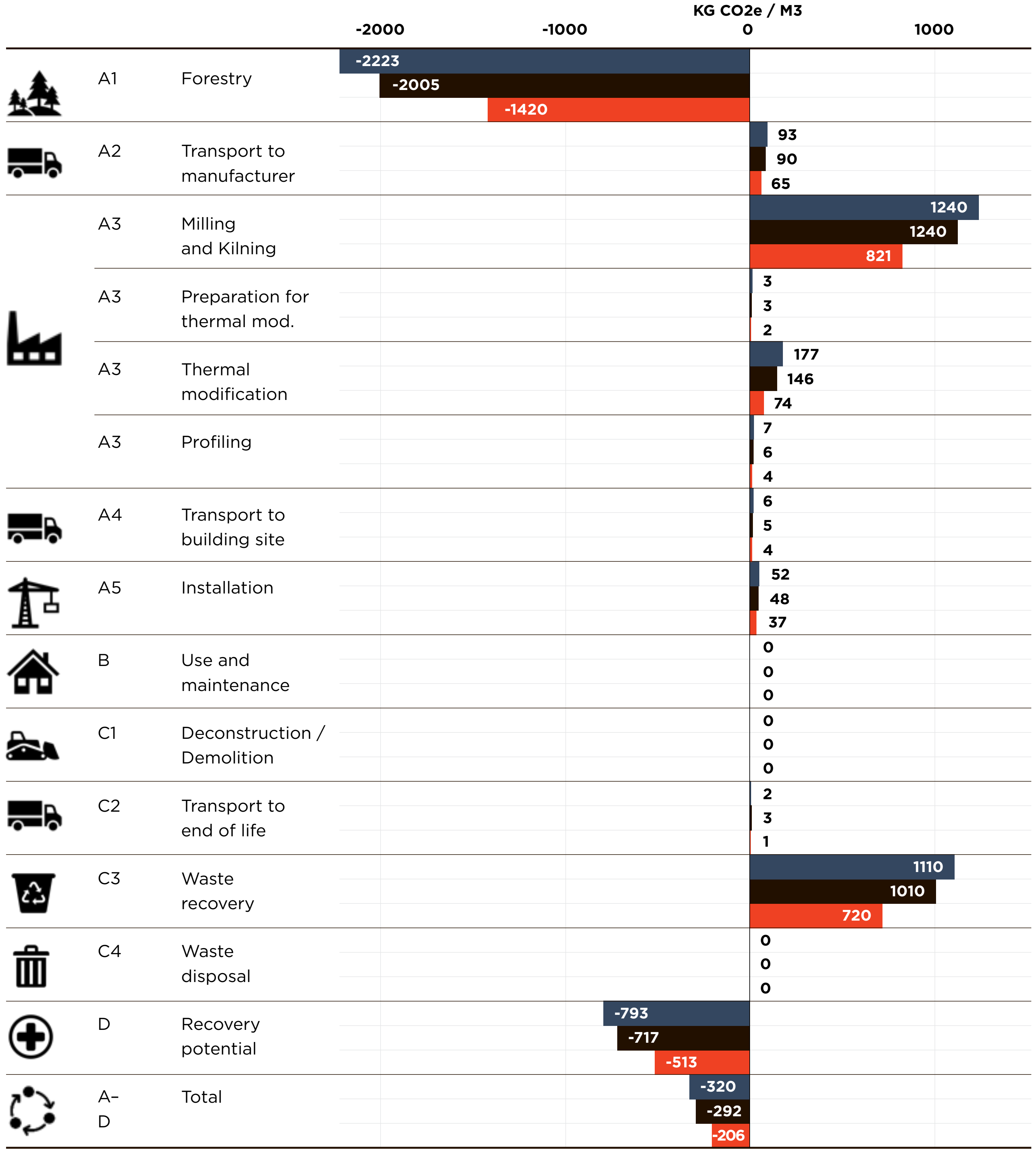
By generating this renewable secondary fuel at end of life additional potential benefits can be achieved by substituting for fossil fuels that would otherwise be used. These potential benefits are reported in module D and assume that they replace energy from natural gas. If dirtier fuels, such as coal, were substituted, the potential benefits would be even greater.

Evidence for tests or certificates
Tests of thermally modified timber durability against wood decay fungi and selected physical and mechanical properties: for Brimstone Ash and Brimstone Poplar (EPH Dresden, 2018) and for Brimstone Sycamore (EPH Dresden, 2019).

1. Some of these woodchips are sold externally but only the sequestered carbon associated with the Brimstone product and fuel used in the kiln is represented in the figure.

Key
Brimstone Ash
Brimstone Sycamore
Brimstone Poplar

Figure 2
Diagram showing the GHG removals and emissions associated with each step in the life cycle of Brimstone Ash, Sycamore and Poplar.



Additional data

Figure 3
Diagram showing average Fossil GHG removals and emissions. Average figures calculated on the basis of annual sales split by specie.

Figure 4
Diagram showing average Biogenic GHG removals and emissions. Average figures calculated on the basis of annual sales split by specie.

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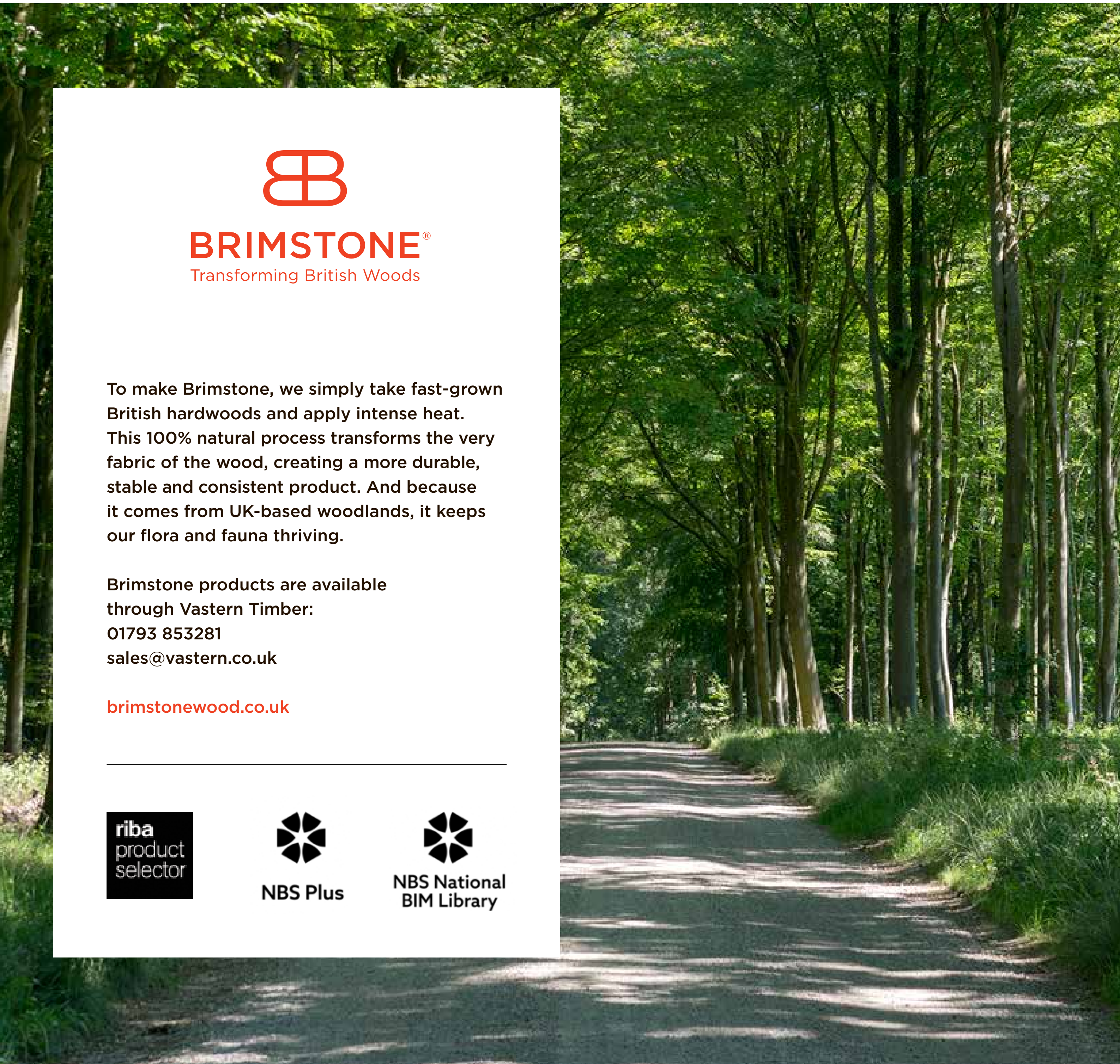

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