Statement of Verification

BREG EN EPD No.: 000627 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Forest Industries Ireland

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

$1m^3$ of Kiln Dried Timber used as a structural timber

Company Address

Forest Industries Ireland,
84/86 Lower Baggot Street,
Dublin 2,
D02 H720,
Ireland

Signed for BRE Global Ltd	Emma Baker Operator	16 September 2024 Date of this Issue
16 September 2024 Date of First Issue		15 September 2029 Expiry Date

Environmental Product Declaration

EPD Number: 000627

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2023 Product Category Rules (PN 514 Rev 3.1) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019
Commissioner of LCA study	**LCA consultant/Tool**
Forest Industries Ireland, 84/86 Lower Baggot Street, Dublin 2, D02 H720, Ireland	BRE LINA A2 Bala Subramanian
Declared/Functional Unit	**Applicability/Coverage**
1m3 of Kiln Dried Timber with the density of 480 kg/m3 (moisture content of 20%) used as a structural timber	Product Specific.
EPD Type	**Background database**
Cradle to Gate with Modules C and D	Ecoinvent 3.8

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b]) Third party verifier: Jiacheng (Francis) Yu
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☑	☑	☑		☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Data for this EPD was provided through Forest Industries Ireland from the following manufacturers:

Balcas Timber Ltd,
75 Killadeas Road,
Enniskillen,
Co. Fermanagh,
BT94 2ES,
Northern Ireland

Murray Timber Group,
Ballygar,
Co Galway,
Ireland

ECC Timber Products,
Corr na Mona,
Co. Galway,
F12 F406,
Ireland

Glennon Brothers Cork Ltd,
Farren South,
Fermoy,
Co. Cork,
P61 Y448,
Ireland

GP Wood Limited,
Main Street,
Enniskeane,
Co. Cork,
P47 HH74,
Ireland.

Construction Product:

Product Description

This Environmental Product Declaration (EPD) covers Irish and Scottish sourced and produced kiln dried timber produced by Balcas, ECC Timber Products, GP Wood, Glennon Brothers Timber and Murray Timber Group. The kiln dried timber covered by this EPD is produced from four softwood species – Spruce, Pine, Larch, and Douglas fir. Timber products produced by the sawmills are sold to the construction, fencing and the pallets and packaging markets. Timber products include construction joists, rafters, studs and truss components, windows and doors, decking, fencing, post and rail, flooring, laths, timber frame components, roof, and tile battens. For this EPD, the use phase has been modelled on the timber product being used as structural timber, in the form of a beam, joist, stud or batten. The declared unit is 1m^3 of Kiln dried timber with the density of 480kg/m^3 and it has moisture content of 20% on dry mass basis. In calculating the environmental impacts, the moisture content has been excluded, and the impacts have been assessed based on the dry mass.

Technical Information

Property	Class	C14	C16	C18	C20	C22	C24	C27	C30	C35	C40	C45	C50
Strength properties in N/mm²													
Bending strength	$f_{m,,k}$	14	16	18	20	22	24	27	30	35	40	45	50
Tension Parallel	$f_{t,0,k}$	7.2	8.5	10	11.5	13	14.5	16.5	19	22.5	26	30	33.5
Tension Perpendicular	$f_{t,90,k}$	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Compression Parallel	$f_{c,0,k}$	16	17	18	19	20	21	22	24	25	27	29	30
Compression Perpendicular	$f_{c,90,k}$	2.0	2.2	2.2	2.3	2.4	2.5	2.5	2.7	2.7	2.8	2.9	3.0
Shear	$f_{v,k}$	3.0	3.2	3.4	3.6	3.8	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Stiffness properties in kN/mm²													
Mean modulus of elasticity parallel bending	$E_{m,0,mean}$	7.0	8.0	9.0	9.5	10.0	11.0	11.5	12.0	13.0	14.0	15.0	16.0
5 percentile modulus of elasticity parallel bending	$E_{m,0,k}$	4.7	5.4	6.0	6.4	6.7	7.4	7.7	8.0	8.7	9.4	10.1	10.7
Mean modulus of elasticity perpendicular	$E_{m,90,mean}$	0.23	0.27	0.30	0.32	0.33	0.37	0.38	0.40	0.43	0.47	0.50	0.53
Mean shear modulus	G_{mean}	0.44	0.50	0.56	0.59	0.63	0.69	0.72	0.75	0.81	0.88	0.94	1.00
Density in kg/m³													
5 percentile density	ρ_k	290	310	320	330	340	350	360	380	390	400	410	430
Mean density	ρ_{mean}	350	370	380	400	410	420	430	460	470	480	490	520

NOTE 1 Values given above for tension strength, compression strength, shear strength, char. modulus of elasticity in bending, mean modulus of elasticity perpendicular to grain and mean shear modulus have been calculated using the equations given in EN 384.
NOTE 2 The tension strength values are conservatively estimated since grading is done for bending strength.
NOTE 3 The tabulated properties are compatible with timber at moisture content consistent with a temperature of 20 °C and a relative humidity of 65 %, which corresponds to a moisture content of 12 % for most species.
NOTE 4 Characteristic values for shear strength are given for timber without fissures, according to EN 408.
NOTE 5 These classes may also be used for hardwoods with similar strength and density profiles such as e.g. poplar or chestnut.
NOTE 6 The edgewise bending strength may also be used in the case of flatwise bending.

Note: The strength properties are taken from EN 338:2016: Structural timber — Strength classes. Please contact the Forest Industries Ireland technical team for more information on the properties and the timber grade.



Main Product Contents

Constituted entirely of Ireland and Scotland sourced timber.

Material/Chemical Input	%
Kiln dried softwood	100

Manufacturing Process

Kiln dried timber covered by this EPD is produced from four softwood species – Spruce (Sitka and Norway), Pine, Larch, and Douglas fir. The trees used to produce timber products are grown in Ireland and Scottish, sourced from sustainably managed forests which are independently certified under two forest management certification schemes, namely FSC® (Forest Stewardship Council) and PEFC ® (Programme for the Endorsement of Forest Certification) whereby the forest management practices are verified as economically, socially, and environmentally responsible.

Logs are harvested, extracted, and delivered to sawmills which produce a range of sawn timber products and a series of co-products including woodchips, bark, shavings, and sawdust. Sawn timber is sold green or dried, (kiln or air dried), and treated or untreated with a preservative. Kiln dried timber products are produced in kilns fired by residue biomass from sawmill production, natural gas or fuel oils depending on the site.

Sawn timber can be further cut, machined, or planed depending on the end product or specific client requirements. The final timber product is packaged for distribution using a mix of plastic film, paper packaging, strapping, steel banding and fixings with various timber packaging components including bearers and spacers. Each individual pack is identified by a unique I.D. tag attached at final processing stage.

- Structural timber used in buildings and bridges should be strength graded in accordance with I.S. EN 14081-1; the grading can be carried out visually by a trained operative or by machine.
- Timber graded in accordance with I.S. EN 14081-1 must be CE marked and have a Declaration of Performance (DoP). Timber for other uses (i.e., not used in buildings or bridges) should conform to the relevant product standard for example timber fencing used in farms should comply with I.S. 436.
- Timber used in battens should conform to S.R. 82.
- When timber is treated with a preservative the treater should provide information on the treatment process in accordance with I.S. EN 15228.
- The timber characteristic properties have been developed through testing and can be taken from I.S. EN 338 for the relevant strength class.
- The values from I.S. EN 338 can be used in structural design to I.S. EN 1995 (all parts).

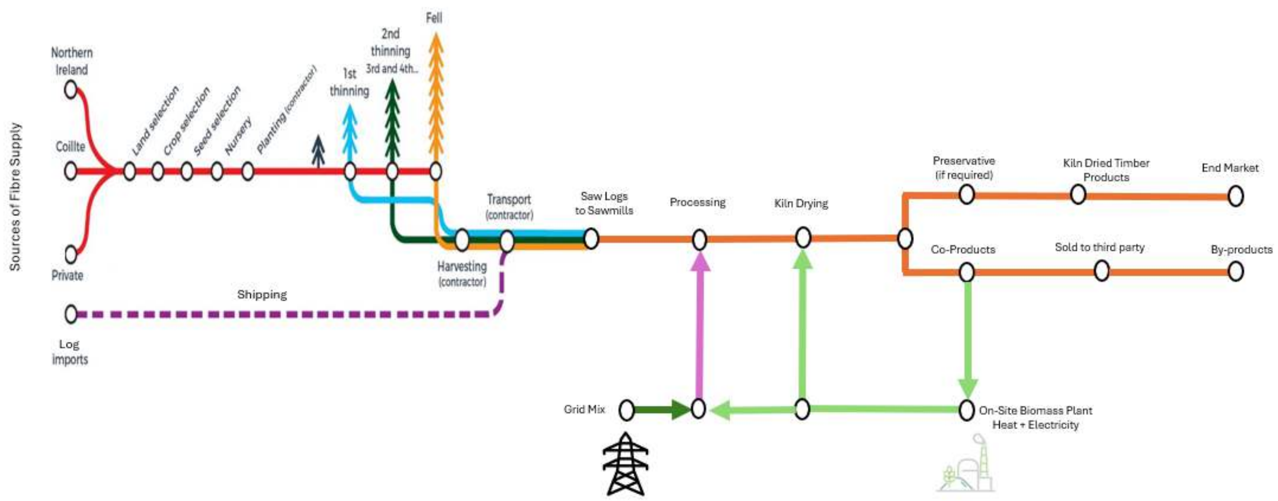
Process Flow Description

- Logs are harvested and extracted to roadside storage in forest
- Logs are collected in the forest and delivered to the sawmill
- Logs are sorted into various size categories in the sawmill storage yard
- Logs are loaded into the sawmill to be processed into wood products; some sawmill process waste residues (saw dust, chip, bark) from the production process in their on-site biomass plant.
- Butt reducer removes tapered end (chips collected for further use e.g., renewable biomass fuel of horticultural etc.)
- Debarking line removes outer bark (bark collected for further use e.g., renewable biomass fuel of horticultural etc.)
- Sawing line produces planks of various sizes (co-products produced are sawdust and wood chip which are collected for further use e.g., renewable biomass fuel, wood pellet manufacturing, horticultural, panel mills etc.)
- Product Output 1 = green timber
- Planks from output 1 are loaded into the kiln for drying
- Product Output 2 = kiln dried timber
- Planks from output 1 are loaded into the vacuum treatment vessel

- Product Output 3 = green treated timber

Process flow diagram

Kiln Dried Timber



End of life

The timber is used in structural and non-structural timber applications as part of the building fabric, taking the form of beams, joists, studs, or battens, and remain in place until the building reaches end of life. Therefore, during building demolition the timber can be removed. Timber is a natural product, making it biodegradable and suitable for recycling and reuse thereby supporting the principles of the circular economy. It can be re-manufactured for further use or broken down into wood chips or sawdust and used in various applications, such as biomass energy in the form of chip or pellet, re-processed into wood-based products, or used in horticulture applications for example. Timber used in the pallet and packaging industry already inherently follow these principles with timber components going through multiple cycles of reuse and repair.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1m^3 of Kiln Dried Timber with the density of 480 kg/m^3 (moisture content of 20%) used as a structural timber.

System boundary

This is a cradle-to-gate with module C and D LCA study that follows the modular design defined in EN 15804:2012+A2:2019, BRE 2023 Product Category Rules (PN 514 Rev 3.1), and BS EN 16485:2014. The datasets are derived from Ecoinvent v3.8 (2018), and the LCA tool used was BRE LINA A2. The LCA models and reports the production stage modules (A1 to A3), end of life stages (C1-C4) and Module D.

Data sources, quality and allocation

Specific primary data has been modelled, which was provided by five sawmills and covers the Irish and Scottish wood data. The quantity used in the data collection for this EPD is therefore an average value based on the total quantity of kiln dried timber produced during the data collection period (01/01/21-31/12/21) and one of the sawmills uses the data collection period (01/12/2020 – 30/11/2021).

Sawmills produce other products in addition to kiln-dried timber; therefore, an allocation of fuel consumption, water consumption and discharge, and waste emissions was required. So, the allocation has been made based on the total production output of Kiln-dried timber by m^3. All the consumables, such as electricity, water usage, transportation, ancillary materials, and packaging, have been reported by all the mills. The only exceptions are direct emissions to water, soil, and air, which are not measured by some of the mills. However, two of those mills have monitored and reported emissions to air. During the data review and entry process, it was noted that the production input is higher than the production output, resulting in a slight mass balance discrepancy for some of the sawmills. However, all discrepancies are within an 8% range. This is due to the kiln drying process, where it is difficult to accurately account for the final moisture content, leading to variations in the weight of the kiln-dried timber.

Two of those mills have their own biomass CHP plant, which is fuelled by residue from the saw logs and supplies electricity to the sawmill site and exports electricity to the grid. Two of those mills have their own biomass CHP plant, which is fuelled by residue from the saw logs and supplies electricity to the sawmill site and exports electricity to the grid. There is no waste; all production waste is consumed on site to produce heat and electricity, and some residues, such as bark, chips, sawdust, shavings, etc., have been sold to external customers. Therefore, according to BS EN 16485:2014, the sequestered carbon in the timber entering the sawmill will be allocated to the co-products based on their physical content of sequestered carbon using mass allocation. However, the impacts of forestry and the sawmilling process and the processing wastages are generally allocated to the co-products based on the economic value of the co-products sold. The amount of impact for each co-product is determined by calculating the total revenue stream from all co-products and then allocating it to each co-product based on its proportion of the revenue stream i.e., using the economic allocation. The LCA analysis has been conducted for the individual sawmills, as a result the impact of five sawmills has around a 5 to 10% variance from the average result, so the average result table is represented in the EPD.

Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e., raw material production) from the ecoinvent 3.8 database. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804 A2.

ISO14044 guidance. **Quality Level**	**Geographical representativeness**	**Technical representativeness**	**Time representativeness**
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e., identical technology).	n/a
Very Good	n/a	n/a	There is approximately 1-2 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific European and Ireland datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore very good. The quality level of time representativeness is good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken. The GWP carbon footprint for using 1 kWh of electricity in Ireland is 0.405 kgCO2e/kWh. Some sawmills produce electricity and heat on-site using biomass boilers, resulting in a GWP carbon footprint of 0.058 kgCO2e/kg for 1 kWh of heat and power from cogeneration. Additionally, one sawmill has confirmed that it only produces heat for drying purposes, with a GWP carbon footprint of 0.07 kgCO2e/kg for 1 kWh of on-site heat.

Moisture content calculation: The moisture content, as well as both the green and dry density of log products, can vary significantly between different products when harvested. The density and moisture content of the harvested forest products significantly influence several factors in the study. Additionally, the moisture content of the logs impacts the drying operations required during processing. Finally, the dry density of the logs directly determines the mass of carbon stored per unit volume of the product. In this EPD, the LCA is typically calculated on a dry mass basis, by using the formula ($m_{dry} = m_{wet} /(mc+1)$) the dry content has been calculated at 400 kg/m^3.

Cut-off criteria

All raw materials and energy input to the manufacturing process have been included. The inventory process in this LCA includes all data related to raw material, packaging material and consumable items, and the associated transport to the manufacturing site. Process energy, water use, and general waste are included. The only exceptions are direct emissions to water, soil, and air, which are not measured by some of the mills. However, two of those mills have monitored and reported emissions to air.

LCA Results – Average result

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	-8.90E+02	6.24E+01	-9.53E+02	1.06E+00	9.68E-06	4.99E-01	3.05E-02
	Transport	A2	1.78E+01	1.78E+01	1.45E-02	7.26E-03	4.11E-06	9.64E-02	1.12E-03
	Manufacturing	A3	2.42E+01	2.23E+01	1.49E+00	7.97E-02	4.43E-06	3.61E-01	4.23E-03
	Total	A1-3	-8.48E+02	1.02E+02	-9.52E+02	1.15E+00	1.82E-05	9.57E-01	3.58E-02
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	7.34E+00	7.30E+00	6.24E-03	2.87E-03	1.70E-06	2.97E-02	4.70E-04
	Waste processing	C3	2.63E+02	2.74E+00	9.52E+02	8.95E-04	1.90E-07	2.92E-02	1.20E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.61E+02	-1.58E+02	-2.70E+00	-1.90E-01	-8.92E-06	-5.03E-01	-2.09E-02
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.46E+00	1.46E+00	1.25E-03	5.76E-04	3.39E-07	5.94E-03	9.43E-05
	Waste processing	C3	2.87E+02	2.97E+00	9.52E+02	9.72E-04	2.06E-07	3.18E-02	1.31E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.19E+02	-1.19E+02	-1.68E-01	-1.76E-01	-8.33E-06	-3.82E-01	-1.92E-02

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral& metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	1.83E-01	1.95E+00	7.49E-01	2.03E-04	1.01E+03	2.25E+01	2.65E-05
	Transport	A2	2.75E-02	3.03E-01	8.92E-02	5.94E-05	2.68E+02	1.19E+00	1.52E-06
	Manufacturing	A3	1.19E-01	1.63E+00	3.20E-01	6.76E-05	3.83E+02	6.79E+00	5.40E-06
	Total	A1-3	3.30E-01	3.88E+00	1.16E+00	3.30E-04	1.66E+03	3.05E+01	3.34E-05
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	8.95E-03	9.76E-02	2.99E-02	2.54E-05	1.11E+02	4.99E-01	6.31E-07
	Waste processing	C3	1.53E-02	1.47E-01	3.63E-02	6.75E-06	2.35E+01	-1.60E+00	3.12E-07
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-9.61E-02	-1.04E+00	-2.83E-01	-3.74E-04	-2.46E+03	-1.18E+01	-2.26E-06
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.79E-03	1.96E-02	5.98E-03	5.10E-06	2.21E+01	9.94E-02	1.26E-07
	Waste processing	C3	1.67E-02	1.60E-01	3.93E-02	7.34E-06	2.56E+01	-1.74E+00	3.39E-07
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-9.17E-02	-1.01E+00	-2.50E-01	-3.36E-04	-3.12E+03	-2.23E+01	-2.09E-06

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	1.42E+01	1.91E+03	8.05E-08	1.95E-06	1.01E+05
	Transport	A2	1.37E+00	2.07E+02	6.97E-09	2.15E-07	1.83E+02
	Manufacturing	A3	2.29E+00	2.97E+03	4.26E-08	1.23E-06	5.47E+03
	Total	A1-3	1.78E+01	5.09E+03	1.30E-07	3.40E-06	1.06E+05
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse							
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	5.69E-01	8.62E+01	2.80E-09	9.06E-08	7.60E+01
	Waste processing	C3	5.10E-02	4.22E+01	7.82E-09	3.74E-07	7.56E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.46E+01	-1.07E+03	-3.45E-08	-9.69E-07	-3.09E+03
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling							
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.14E-01	1.73E+01	5.58E-10	1.81E-08	1.52E+01
	Waste processing	C3	5.54E-02	4.59E+01	8.48E-09	4.07E-07	8.22E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.08E+02	-1.48E+03	-3.13E-08	-8.70E-07	-1.18E+03

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.10E+04	7.66E+03	1.87E+04	1.00E+03	0.00E+00	1.00E+03
	Transport	A2	3.68E+00	0.00E+00	3.68E+00	2.63E+02	0.00E+00	2.63E+02
	Manufacturing	A3	1.30E+03	2.02E+00	1.30E+03	3.02E+02	7.15E+01	3.74E+02
	Total	A1-3	1.23E+04	7.66E+03	2.00E+04	1.57E+03	7.15E+01	1.64E+03
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.56E+00	0.00E+00	1.56E+00	1.09E+02	0.00E+00	1.09E+02
	Waste processing	C3	-2.27E+03	2.27E+03	5.17E-01	2.12E+01	0.00E+00	2.12E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.05E+02	-8.70E+02	-1.08E+03	-2.46E+03	0.00E+00	-2.46E+03
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	3.12E-01	0.00E+00	3.12E-01	2.17E+01	0.00E+00	2.17E+01
	Waste processing	C3	-2.46E+03	2.47E+03	5.65E-01	2.31E+01	0.00E+00	2.31E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	2.25E+02	-7.85E+02	-5.61E+02	-3.12E+03	0.00E+00	-3.12E+03

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	5.59E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	2.94E-02
	Manufacturing	A3	7.47E-02	6.95E-02	0.00E+00	1.66E-01
	Total (Consumption grid)	A1-3	7.47E-02	6.95E-02	0.00E+00	7.55E-01
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	1.23E-02
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	-3.71E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-3.38E-01
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.47E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	-4.04E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-5.69E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	3.49E+00	1.12E+02	6.85E-03
	Transport	A2	3.54E-01	6.09E+00	7.96E+01
	Manufacturing	A3	1.18E+00	1.61E+01	2.17E-03
	Total (Consumption grid)	A1-3	5.02E+00	1.35E+02	7.96E+01
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.22E-01	2.16E+00	7.49E-04
	Waste processing	C3	9.32E-01	1.65E+02	3.89E-05
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.89E+00	-1.07E+02	-1.36E-02
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.44E-02	4.33E-01	1.50E-04
	Waste processing	C3	1.01E+00	1.80E+02	4.26E-05
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-6.53E+00	-9.17E+01	-2.73E-02

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

Other environmental information describing output flows – at end of life			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.33E+02	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	1.66E-01	4.28E-08	5.98E-03	3.34E-02	4.09E-06
	Total (Consumption grid)	A1-3	0.00E+00	1.66E-01	4.28E-08	5.98E-03	-7.33+02	4.09E-06
Ireland Scenario - 54% to Incineration, 38% to Recycling and 8% to Reuse								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+01	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
The UK scenario - 55% to Incineration for energy recovery, 45% to Recycling								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E+01	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C1 - Deconstruction	The timber is used in structural and non-structural timber applications as part of the building fabric, taking the form of beams, joists, studs, or battens, and remain in place until the building reaches end of life. Therefore, during building demolition the timber can be removed by heavy machines and the energy associated with the building demolition is not included in the LCA analysis. Since the product is sold across the UK and Ireland, therefore two End of life scenario has been modelled. During the deconstruction of the timber, it is assumed that 100% of the wood will be recovered from the demolition site and it be sent to the waste processing facility.		
C2 – Transportation for Ireland EoL scenario	250km by road has been modelled for module C2 as a typical distance from the demolition site to the disposal unit. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required (IGBC, 2022).		
	Road transportation- Lorry 16-32 tonne	km	250
	Litres per km	l/km	0.267
C2 – Transportation – the UK scenario	50km by road has been modelled for module C2 as a typical distance from the demolition site to the waste processing site. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.		
	Road transportation- Lorry 16-32 tonne	km	50
	Litres per km	l/km	0.267
C3 – Waste processing – Ireland scenario	Waste timber in a waste processing facility can be managed and processed in several ways to minimise environmental impact and potentially create useful byproducts. According to IGBC, 54% of the waste timber will be incinerated for energy recovery, 38% will be recycled to create byproducts, and the remaining 8% will be reused. Generally, kiln-dried timber has a density of 480 kg/m³ and a moisture content of 20%, therefore in calculating the recycling and incineration impacts the moisture content has been removed in the backend dataset and only dry has been accounted.		
	Wood waste to incineration	Kg/m³	259.2
	Wood waste to recycling	Kg/m³	182.4
	Wood waste to reuse	Kg/m³	38.4
C3 – Waste processing – the UK scenario	According to the UK End of life scenario for the timber products, 55% will be recycled and 45% will be incinerated for energy recovery (BRE PCR 3.1).		
	Wood waste to incineration – 55%	kg/m³	264
	Wood waste to recycling – 45%	kg/m³	216
C4- Disposal	100% of the waste timber will be recycled, incinerated, and reused at waste processing facility therefore no timber waste left to landfill		

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
Module D – Ireland scenario	In the assumed end-of-life scenario, 54% of waste wood will be incinerated in Ireland, so the Ireland electricity dataset has been selected. The dataset used to calculate the avoided impacts of electricity consumption in a future system was ‘Electricity, medium voltage {IE} | market for | Alloc Def, U’. This process is energy-efficient, with 85% of the combustion heat recovered after incineration from the CHP boilers in Ireland. The efficiency rate has been calculated using reports from SEAI, 2020. Therefore, by using the boiler efficiency and the calorific value of wood, a bespoke dataset has been created in the backend, and the incineration benefits have been calculated. Calorific value of wood = 16 MJ/kg Wood dry mass = 92% per kg. Benefits due to recycling = 38%, it is assumed as 100% yield during the recycling process.		
	Benefits due to incineration of waste wood	Kg/m^3	259.2
	Benefits due to recycling of waste wood	Kg/m^3	182.4
	Benefits due to reusing the waste wood	Kg/m^3	38.4
Module D – the UK scenario	In the assumed end-of-life scenario, 55% of waste wood will be incinerated in the UK, so the UK national grid electricity dataset has been selected. The dataset used to calculate the avoided impacts of electricity consumption in a future system was ‘Electricity, medium voltage {UK} | market for | Alloc Def, U’. This process is energy-efficient, with 80% of the combustion heat recovered after incineration from the CHP boilers in the UK (Combined heat and power - GOV.UK (www.gov.uk)). The efficiency rate has been calculated using reports from Ecoinvent 3.8. Therefore, by using the boiler efficiency and the calorific value of wood, a bespoke dataset has been created and the incineration benefits have been calculated. It is assumed as 100% yield during the recycling process		
	Benefits due to incineration of waste wood	kg/m^3	264
	Benefits due to recycling of waste wood	kg/m^3	216

Interpretation of results:

The results presented in this EPD are an average of individual results from five sawmills which produce Kiln-dry timber.

The bulk of the environmental impacts are attributed to the extraction and processing of Kiln-dry timber, covered by information modules A1-A3 of EN15804:2012+A2:2019. The most significant contributions to production phase impacts are the upstream production of raw materials used in the wood processing process, generation/supply of electricity and the production/use of fuels on site.

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