



ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804 + A1
Owner of the Declaration – Munster Joinery Ltd

Declaration number: EPDIE-21-47
Issue date 6th August 2021
Valid to 6th August 2026

EPD Programme - EPD Ireland
Programme Operator - Irish Green Building Council
www.epdireland.org



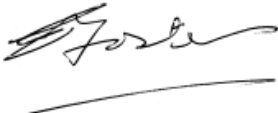
**Munster Joinery double and
triple glazed windows**

Hardwood and Softwood

1. General information

PROGRAMME OPERATOR	OWNER OF DECLARATION
Irish Green Building Council, 19 Mountjoy Square, Dublin D01 E8P5	Munster Joinery Ltd Ballydesmond, Co. Cork, Ireland T +353 (0) 64 775 1151 www.munsterjoinery.ie
DECLARATION NUMBER	PRODUCTION SITE
EPDIE-21-47	Ballydesmond, Co. Cork, Ireland
ECO PLATFORM EPD	DECLARED UNIT
Yes	1m ² of Hardwood and Softwood double and triple glazed window.
APPLICABLE PRODUCT CATEGORY RULES	DECLARED PRODUCT
EN 15804:2012+A1:2013, EPD Ireland PCR Part A. I.S. EN 17213:2020 Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets.	Hardwood and Softwood double and triple glazed window The service life of the product is taken as 50 years.
DATE OF ISSUE	SCOPE OF EPD
06.08.2021	Cradle to Gate, with options
DATE OF EXPIRY	LCA CONSULTANT OR PERSON RESPONSIBLE FOR LCA
06.08.2026	EcoReview, Kilkenny, Co. Kilkenny, Ireland, +353 87 258 9783 / +31 646 264 9327 info@ecoreview.ie / www.ecoreview.eu
TYPE OF EPD: SINGLE OR MULTI PRODUCT	LCA SOFTWARE AND DEVELOPER IF APPLICABLE
Multi product	Ecochain
PRODUCT CLASSIFICATION OR NACE CODE	NAME AND VERSION OF INVENTORY USED
NACE code: 25.12	Ecoinvent version 3.5
COMPARABILITY	
Environmental Product Declarations from different programmes may not be directly comparable if not compliant with EN 15804:2012+A1:2013. 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+A1:2013	
The CEN Norm /EN 15804 serves as the core PCR	
Independent verification of the declaration according to ISO 14025	

Internally Externally

SIGNATURE OF PROGRAMME OPERATOR	SIGNATURE VERIFIER
Pat Barry - CEO - Irish Green Building Council  	Chris Foster - EuGeos SRL 

2. Scope and Type of EPD

This is a Cradle to Gate with options EPD. The Modules that are declared are shown in the table below.

The geographical scope of this EPD is Europe.

PRODUCT STAGE			CONSTRUCTION ON 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	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	MND

X - Module declared.

MND - Module not declared.

3. Detailed product description

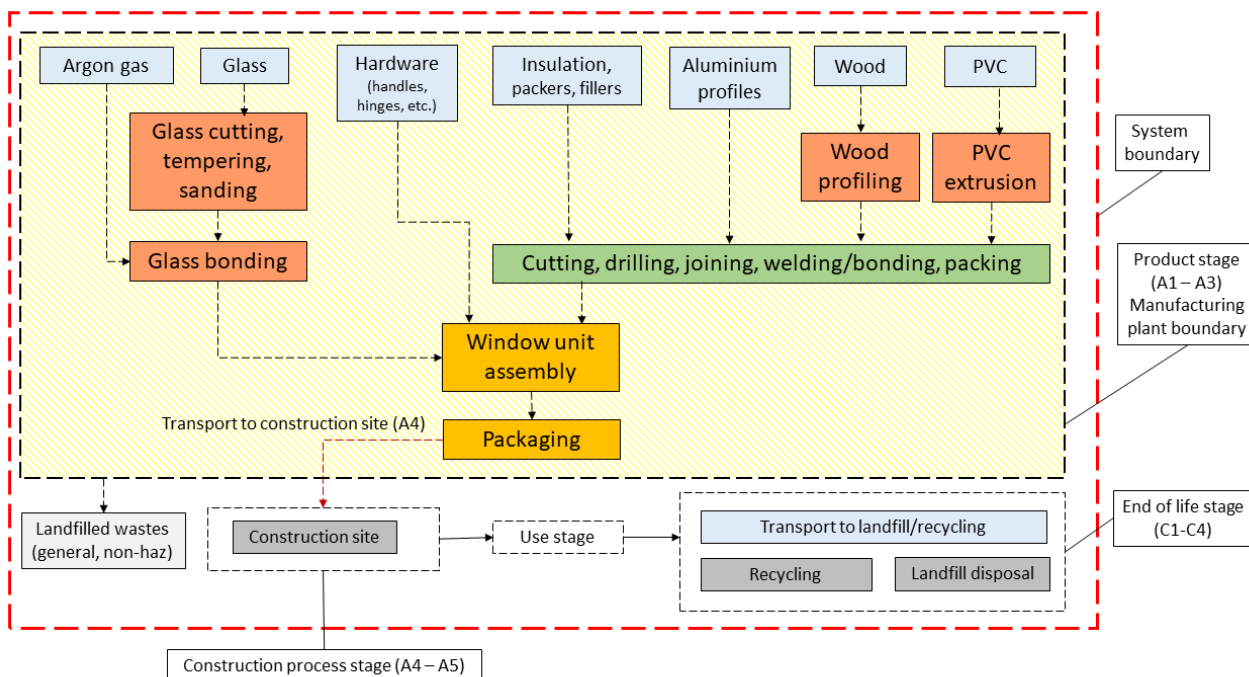
This EPD is carried out for the Munster Joinery Hardwood and Softwood double and triple glazed windows. The raw materials for the Hardwood and Softwood windows comprise: glass, argon, hardwood/softwood profiles, warm edge spacer and associated hardware (hinges, handles, receivers and gears). The windows are manufactured in accordance with I.S. EN 14351-1:2006 +A1:2010 Windows and doors - Product standard, performance characteristics.

Further technical information can be obtained at: <https://www.munsterjoinery.ie/windows.html>

3.1 Manufacturing Process Description

The three main production processes at Munster Joinery are (a) the cutting and assembly in the factory of the double and triple glazing sheets (b) cutting and forming of wood profiles and (c) the assembly of these, with insulation, spacers, and fixings in the final window assembly. The glazing starts with the cutting of the glass to the required specifications. The glass sheets are bonded into double or triple glass sheets by sealing the layers to a warm edge spacer and filling the space between the layers with argon gas. Relevant profiles are filled with an insulating foam. Profiles are then cut to the desired specific length. For the aluminium and wood profiles, these profile sections are cut to size/shape and jointed together. Profiles are welded or jointed together, creating the window frames. In the final window assembly the glazing is placed in the window and the hinges, locks, receivers and gears are attached.

The manufacturing process flowchart is shown below:



4.1 LCA results - 1 m² of Hardwood double glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	7.33E+01	2.63E+00	3.56E+00	7.95E+01	1.79E+00	1.60E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.45E-01	2.01E-01	1.76E-01	MND
ODP	[kg CFC11-Eq.]	1.03E-06	4.85E-07	1.90E-07	1.71E-06	3.21E-07	6.73E-08	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.34E-07	2.26E-08	5.31E-08	MND
AP	[kg SO ₂ -Eq.]	3.13E-01	7.30E-03	1.71E-02	3.38E-01	4.28E-03	9.47E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.78E-03	9.52E-04	1.25E-03	MND
EP	[kg (PO ₄)-Eq.]	3.33E-02	1.14E-03	6.45E-03	4.09E-02	6.79E-04	1.21E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.83E-04	2.19E-04	2.38E-04	MND
POCP	[kg ethene-Eq.]	3.57E-02	1.33E-03	2.43E-03	3.95E-02	8.48E-04	1.33E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.53E-04	1.40E-04	1.76E-04	MND
ADPE	[kg Sb-Eq.]	3.41E-01	7.91E-06	3.73E-05	3.41E-01	7.15E-06	8.94E-07	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.98E-06	3.27E-07	2.39E-07	MND
ADPF	[MJ]	1.07E+03	4.02E+01	1.85E+01	1.13E+03	2.70E+01	7.04E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.12E+01	1.96E+00	4.74E+00	MND

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

Note - MND - Module not declared INA - Indicator not assessed

4.1 LCA results - 1 m² of Hardwood double glazed window

Resource use per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	9.18E+02	4.41E-01	2.39E+02	1.16E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	6.21E-02	5.08E-02	MND
PERM	[MJ]	5.21E+02	0.00E+00	0.00E+00	5.21E+02	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PERT	[MJ]	1.44E+03	4.41E-01	2.39E+02	1.68E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	6.21E-02	5.08E-02	MND
PENRE	[MJ]	1.04E+03	4.30E+01	1.82E+01	1.10E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.17E+00	5.08E+00	MND
PENRM	[MJ]	3.40E+01	0.00E+00	0.00E+00	3.40E+01	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PENRT	[MJ]	1.07E+03	4.30E+01	1.82E+01	1.14E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.17E+00	5.08E+00	MND
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW	[m ³]	2.01E+00	6.64E-03	1.08E-02	2.02E+00	4.40E-03	1.02E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.83E-03	1.36E-03	4.99E-03	MND

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. INA = Indicator not assessed. MND = Module not declared.

SM, RSF and NRSF are not calculated by the EcoChain software.

4.1 LCA results - 1 m² of Hardwood double glazed window

Output flows and waste categories per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	3.30E-01	2.58E-05	2.61E-04	3.31E-01	1.94E-05	2.77E-06	MND	MND	MND	MND	MND	MND	MND	0.00E+00	8.09E-06	1.45E-06	3.41E-06	MND
NHWD	[kg]	3.14E+00	1.91E+00	4.79E+00	9.84E+00	1.05E+00	1.39E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	4.39E-01	1.21E-01	-1.88E+01	MND
RWD	[kg]	4.59E-03	2.74E-04	7.60E-05	4.94E-03	1.81E-04	3.87E-05	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.53E-05	1.39E-05	2.99E-05	MND
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

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.

CRU, MFR, MER, EEE, EET are not calculated by the EcoChain software.

4.2 LCA results - 1 m² of Hardwood triple glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	1.06E+02	3.86E+00	4.03E+00	1.14E+02	1.79E+00	1.60E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.45E-01	2.52E-01	2.64E-01	MND
ODP	[kg CFC11-Eq.]	1.11E-06	7.10E-07	2.42E-07	2.06E-06	3.21E-07	6.73E-08	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.34E-07	2.49E-08	7.95E-08	MND
AP	[kg SO ₂ -Eq.]	4.49E-01	1.07E-02	2.27E-02	4.82E-01	4.28E-03	9.47E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.78E-03	1.05E-03	1.88E-03	MND
EP	[kg (PO ₄)-Eq.]	4.67E-02	1.68E-03	8.07E-03	5.64E-02	6.79E-04	1.21E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.83E-04	2.44E-04	3.57E-04	MND
POCP	[kg ethene-Eq.]	4.77E-02	1.94E-03	3.12E-03	5.28E-02	8.48E-04	1.33E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.53E-04	1.59E-04	2.64E-04	MND
ADPE	[kg Sb-Eq.]	5.22E-01	1.16E-05	5.15E-05	5.22E-01	7.15E-06	8.94E-07	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.98E-06	4.74E-07	3.59E-07	MND
ADPF	[MJ]	1.55E+03	5.89E+01	2.37E+01	1.64E+03	2.70E+01	7.04E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.12E+01	2.22E+00	7.10E+00	MND

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

Note - MND - Module not declared INA - Indicator not assessed

4.2 LCA results - 1 m² of Hardwood triple glazed window

Resource use per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	9.81E+02	6.46E-01	3.32E+02	1.31E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	8.89E-02	7.61E-02	MND
PERM	[MJ]	5.46E+02	0.00E+00	0.00E+00	5.46E+02	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PERT	[MJ]	1.53E+03	6.46E-01	3.32E+02	1.86E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	8.89E-02	7.61E-02	MND
PENRE	[MJ]	1.51E+03	6.30E+01	2.31E+01	1.60E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.48E+00	7.61E+00	MND
PENRM	[MJ]	4.22E+01	0.00E+00	0.00E+00	4.22E+01	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PENRT	[MJ]	1.55E+03	6.30E+01	2.31E+01	1.64E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.48E+00	7.61E+00	MND
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW	[m ³]	2.30E+00	9.73E-03	1.43E-02	2.32E+00	4.40E-03	1.02E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.83E-03	1.95E-03	7.48E-03	MND

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. INA = Indicator not assessed. MND = Module not declared.

SM, RSF and NRSF are not calculated by the EcoChain software.

4.2 LCA results - 1 m² of Hardwood triple glazed window

Output flows and waste categories per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	5.12E-01	3.78E-05	3.60E-04	5.12E-01	1.94E-05	2.77E-06	MND	MND	MND	MND	MND	MND	MND	0.00E+00	8.09E-06	1.84E-06	5.12E-06	MND
NHWD	[kg]	3.68E+00	2.79E+00	5.28E+00	1.18E+01	1.05E+00	1.39E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	4.39E-01	1.80E-01	-2.83E+01	MND
RWD	[kg]	6.74E-03	4.01E-04	9.29E-05	7.23E-03	1.81E-04	3.87E-05	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.53E-05	1.57E-05	4.48E-05	MND
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

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.

CRU, MFR, MER, EEE, EET are not calculated by the EcoChain software.

4.3 LCA results - 1 m² of Softwood double glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	7.32E+01	2.63E+00	3.56E+00	7.94E+01	1.79E+00	1.60E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.45E-01	2.01E-01	1.76E-01	MND
ODP	[kg CFC11-Eq.]	9.75E-07	4.85E-07	1.90E-07	1.65E-06	3.21E-07	6.73E-08	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.34E-07	2.26E-08	5.31E-08	MND
AP	[kg SO ₂ -Eq.]	3.13E-01	7.30E-03	1.71E-02	3.38E-01	4.28E-03	9.47E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.78E-03	9.52E-04	1.25E-03	MND
EP	[kg (PO ₄)-Eq.]	3.32E-02	1.14E-03	6.45E-03	4.08E-02	6.79E-04	1.21E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.83E-04	2.19E-04	2.38E-04	MND
POCP	[kg ethene-Eq.]	3.07E-02	1.33E-03	2.43E-03	3.44E-02	8.48E-04	1.33E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.53E-04	1.40E-04	1.76E-04	MND
ADPE	[kg Sb-Eq.]	3.41E-01	7.91E-06	3.73E-05	3.41E-01	7.15E-06	8.94E-07	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.98E-06	3.27E-07	2.39E-07	MND
ADPF	[MJ]	1.07E+03	4.02E+01	1.85E+01	1.13E+03	2.70E+01	7.04E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.12E+01	1.96E+00	4.74E+00	MND

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

Note - MND - Module not declared INA - Indicator not assessed

4.3 LCA results - 1 m² of Softwood double glazed window

Resource use per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	8.90E+02	4.41E-01	2.39E+02	1.13E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	6.21E-02	5.08E-02	MND
PERM	[MJ]	3.75E+02	0.00E+00	0.00E+00	3.75E+02	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PERT	[MJ]	1.27E+03	4.41E-01	2.39E+02	1.50E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	6.21E-02	5.08E-02	MND
PENRE	[MJ]	1.04E+03	4.30E+01	1.82E+01	1.10E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.17E+00	5.08E+00	MND
PENRM	[MJ]	3.40E+01	0.00E+00	0.00E+00	3.40E+01	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PENRT	[MJ]	1.07E+03	4.30E+01	1.82E+01	1.13E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.17E+00	5.08E+00	MND
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW	[m ³]	2.01E+00	6.64E-03	1.08E-02	2.02E+00	4.40E-03	1.02E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.83E-03	1.36E-03	4.99E-03	MND

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. INA = Indicator not assessed. MND = Module not declared.

SM, RSF and NRSF are not calculated by the EcoChain software.

4.3 LCA results - 1 m² of Softwood double glazed window

Output flows and waste categories per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	3.30E-01	2.58E-05	2.61E-04	3.31E-01	1.94E-05	2.77E-06	MND	MND	MND	MND	MND	MND	MND	0.00E+00	8.09E-06	1.45E-06	3.41E-06	MND
NHWD	[kg]	2.61E+00	1.91E+00	4.79E+00	9.31E+00	1.05E+00	1.39E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	4.39E-01	1.21E-01	-1.88E+01	MND
RWD	[kg]	4.56E-03	2.74E-04	7.60E-05	4.91E-03	1.81E-04	3.87E-05	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.53E-05	1.39E-05	2.99E-05	MND
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

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.

CRU, MFR, MER, EEE, EET are not calculated by the EcoChain software.

4.4 LCA results - 1 m² of Softwood triple glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	1.06E+02	3.86E+00	4.03E+00	1.14E+02	1.79E+00	1.60E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.45E-01	2.52E-01	2.64E-01	MND
ODP	[kg CFC11-Eq.]	1.06E-06	7.10E-07	2.42E-07	2.01E-06	3.21E-07	6.73E-08	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.34E-07	2.49E-08	7.95E-08	MND
AP	[kg SO ₂ -Eq.]	4.49E-01	1.07E-02	2.27E-02	4.83E-01	4.28E-03	9.47E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.78E-03	1.05E-03	1.88E-03	MND
EP	[kg (PO ₄)-Eq.]	4.67E-02	1.68E-03	8.07E-03	5.64E-02	6.79E-04	1.21E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.83E-04	2.44E-04	3.57E-04	MND
POCP	[kg ethene-Eq.]	4.25E-02	1.94E-03	3.12E-03	4.75E-02	8.48E-04	1.33E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.53E-04	1.59E-04	2.64E-04	MND
ADPE	[kg Sb-Eq.]	5.22E-01	1.16E-05	5.15E-05	5.22E-01	7.15E-06	8.94E-07	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.98E-06	4.74E-07	3.59E-07	MND
ADPF	[MJ]	1.55E+03	5.89E+01	2.37E+01	1.63E+03	2.70E+01	7.04E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.12E+01	2.22E+00	7.10E+00	MND

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

Note - MND - Module not declared INA - Indicator not assessed

4.4 LCA results - 1 m² of Softwood triple glazed window

Resource use per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	9.61E+02	6.46E-01	3.32E+02	1.29E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	8.89E-02	7.61E-02	MND
PERM	[MJ]	3.97E+02	0.00E+00	0.00E+00	3.97E+02	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PERT	[MJ]	1.36E+03	6.46E-01	3.32E+02	1.69E+03	3.18E-01	2.53E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.32E-01	8.89E-02	7.61E-02	MND
PENRE	[MJ]	1.51E+03	6.30E+01	2.31E+01	1.59E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.48E+00	7.61E+00	MND
PENRM	[MJ]	4.22E+01	0.00E+00	0.00E+00	4.22E+01	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
PENRT	[MJ]	1.55E+03	6.30E+01	2.31E+01	1.64E+03	2.88E+01	7.38E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.20E+01	2.48E+00	7.61E+00	MND
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW	[m ³]	2.30E+00	9.73E-03	1.43E-02	2.32E+00	4.40E-03	1.02E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.83E-03	1.95E-03	7.48E-03	MND

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. INA = Indicator not assessed. MND = Module not declared.

SM, RSF and NRSF are not calculated by the EcoChain software.

4.4 LCA results - 1 m² of Softwood triple glazed window

Output flows and waste categories per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	5.12E-01	3.78E-05	3.60E-04	5.12E-01	1.94E-05	2.77E-06	MND	MND	MND	MND	MND	MND	MND	0.00E+00	8.09E-06	1.84E-06	5.12E-06	MND
NHWD	[kg]	3.14E+00	2.79E+00	5.28E+00	1.12E+01	1.05E+00	1.39E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	4.39E-01	1.80E-01	-2.83E+01	MND
RWD	[kg]	6.71E-03	4.01E-04	9.29E-05	7.20E-03	1.81E-04	3.87E-05	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.53E-05	1.57E-05	4.48E-05	MND
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

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.

CRU, MFR, MER, EEE, EET are not calculated by the EcoChain software.

5.1 LCA results - Additional Impact Indicators - 1 m² of Hardwood double glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Human toxicity potential	kg 1,4-DB-eq	1.23E+01	1.03E+00	2.94E+00	1.63E+01	6.27E-01	9.09E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.61E-01	5.36E-01	1.01E-01	MND
Freshwater aquatic ecotoxicity potential	kg 1,4-DB-eq	3.52E-01	2.75E-02	5.38E-02	4.34E-01	1.70E-02	2.80E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.09E-03	1.72E-03	1.69E-03	MND
Marine aquatic ecotoxicity potential	kg 1,4-DB-eq	3.04E+03	1.06E+02	1.29E+02	3.28E+03	6.39E+01	3.35E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.66E+01	5.15E+00	5.82E+00	MND
Terrestrial ecotoxicity potential	kg 1,4-DB-eq	9.83E-02	3.54E-03	1.31E-01	2.33E-01	2.43E-03	4.31E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.01E-03	2.56E-04	2.37E-04	MND

Note - MND - Module not declared INA - Indicator not assessed.

5.2 LCA results - Additional Impact Indicators - 1 m² of Hardwood triple glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Human toxicity potential	kg 1,4-DB-eq	1.63E+01	1.51E+00	4.00E+00	2.18E+01	6.27E-01	9.09E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.61E-01	7.85E-01	1.51E-01	MND
Freshwater aquatic ecotoxicity potential	kg 1,4-DB-eq	4.74E-01	4.03E-02	7.06E-02	5.84E-01	1.70E-02	2.80E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.09E-03	2.33E-03	2.53E-03	MND
Marine aquatic ecotoxicity potential	kg 1,4-DB-eq	4.44E+03	1.55E+02	1.67E+02	4.76E+03	6.39E+01	3.35E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.66E+01	6.87E+00	8.72E+00	MND
Terrestrial ecotoxicity potential	kg 1,4-DB-eq	1.31E-01	5.18E-03	1.81E-01	3.18E-01	2.43E-03	4.31E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.01E-03	3.54E-04	3.55E-04	MND

Note - MND - Module not declared INA - Indicator not assessed.

5.3 LCA results - Additional Impact Indicators - 1 m² of Softwood double glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Human toxicity potential	kg 1,4-DB-eq	1.20E+01	1.03E+00	2.94E+00	1.60E+01	6.27E-01	9.09E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.61E-01	5.36E-01	1.01E-01	MND
Freshwater aquatic ecotoxicity potential	kg 1,4-DB-eq	3.09E-01	2.75E-02	5.38E-02	3.90E-01	1.70E-02	2.80E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.09E-03	1.72E-03	1.69E-03	MND
Marine aquatic ecotoxicity potential	kg 1,4-DB-eq	3.02E+03	1.06E+02	1.29E+02	3.26E+03	6.39E+01	3.35E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.66E+01	5.15E+00	5.82E+00	MND
Terrestrial ecotoxicity potential	kg 1,4-DB-eq	8.77E-02	3.54E-03	1.31E-01	2.22E-01	2.43E-03	4.31E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.01E-03	2.56E-04	2.37E-04	MND

Note - MND - Module not declared INA - Indicator not assessed.

5.4 LCA results - Additional Impact Indicators - 1 m² of Softwood triple glazed window

Environmental impact per m²

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Human toxicity potential	kg 1,4-DB-eq	1.60E+01	1.51E+00	4.00E+00	2.15E+01	6.27E-01	9.09E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.61E-01	7.85E-01	1.51E-01	MND
Freshwater aquatic ecotoxicity potential	kg 1,4-DB-eq	4.28E-01	4.03E-02	7.06E-02	5.39E-01	1.70E-02	2.80E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.09E-03	2.33E-03	2.53E-03	MND
Marine aquatic ecotoxicity potential	kg 1,4-DB-eq	4.42E+03	1.55E+02	1.67E+02	4.74E+03	6.39E+01	3.35E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.66E+01	6.87E+00	8.72E+00	MND
Terrestrial ecotoxicity potential	kg 1,4-DB-eq	1.21E-01	5.18E-03	1.81E-01	3.07E-01	2.43E-03	4.31E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.01E-03	3.54E-04	3.55E-04	MND

Note - MND - Module not declared INA - Indicator not assessed.

6. LCA Results - Additional LCI Indicators

N/A

7. Calculation rules

Methodology and reproducibility

The process descriptions and quantities in this study are reproducible in accordance to the reference standards that have been used. The references of all sources, both primary and public sources and literature, have been documented in the LCA report. The 'polluter pays' and 'modularity' principles have been followed. The cut-off criteria of section 6.3.5 of EN 15804 have been followed. Allocation of electricity types and amounts to the various manufacturing processes has been provided by Munster Joinery; allocation of impacts to the products is based on the product composition mass. The measurement of environmental impacts uses the CML 2 baseline method. In addition, to facilitate the reproducibility of this LCA, a full set of data records has been generated which can be accessed via the EcoChain tool. This data portfolio contains a summary of all the data used in this LCA, and correspondingly, in the Munster Joinery Ecochain account. Indicator values for the glass are from the glass manufacturer's EPDs [10], which were developed using the GaBi database. As this EPD is based on Ecoinvent database, there can be a lack of consistency between GaBi and Ecoinvent indicators such as toxicities, ozone depletion and hazardous waste disposal, although there is good agreement on global warming potential.

Data quality

Data flows have been modeled as realistically as possible. Data quality assessment is based on the principle that the primary data used for processes occurring at the production site is selected in the first instance. Where this is not available, other reference data is selected from appropriate sources.

Data collection period

The dataset is representative for the production processes used in 2020.

8. Scenarios and additional technical information

A1. Raw materials supply

This module considers the extraction and processing of all raw materials and energy which occur upstream to the Munster Joinery window manufacturing process, as well as waste processing up to the end-of waste state.

A2. Transport of raw materials to manufacturer

This includes the transport distance of the raw materials to the manufacturing facility via road and sea.

A3. Manufacturing

This module covers the manufacturing of Munster Joinery windows and includes all processes linked to production such as: production of double and triple glazed sheets, cutting of wood profiles, and assembly of window units. Use of electricity (renewables) and fuels (biomass) used for production is taken into account, as well as treatment of wastes generated from production.

A4 and A5. Transport and installation

This module covers road transport of the Munster Joinery windows from production plant to construction site in Ireland and installation in the building.

References transport:

Road transport: Transport, freight, lorry 7.5-16 metric ton, EURO6 | Europe

Distance by road: 126 km

Capacity utilisation: 64%

Installation of the window in the building uses 80ml of oil-based bedding mastic

Reference: market for bitumen seal, polymer EP4 flame retardant | Global

C2, C3, and C4. End of Life

C1 In the deconstruction/demolition phase it is assumed that the windows are removed manually from building, thus no energy or materials are required for module C1, and the impacts assumed to be zero.

C2 In the transport phase it is assumed that these materials travel 50km to their destinations (waste processing or disposal).

C3, C4 In the Waste Processing phase, the following assumptions are made for recycling, landfilling and incineration, based on the default end-of-life scenarios in the windows PCR I.S. EN 17213:2020 (Annex B). The scenario for the Hardwood and Softwood windows are highlighted in the table.

Default end-of-life scenarios (percentage of material type)												
General window type	Metal				uPVC				Wood			
Munster Joinery window name	Ecotherm				HP PVC; Passiv AluClad:				Hardwood, Softwood			
					Passiv AluP; Passiv uPVC							
	Glass	Metals	Wood	Plastics	Glass	Metals	Wood	Plastics	Glass	Metals	Wood	Plastics
Landfill	70	5	5	5	70	25		25	70	5	5	5
Recycling	30	95			30	75		34	30	95		
Incineration			95	95				41			95	95

9. Mandatory additional information on release of dangerous substances to indoor air, soil and water

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation”, or they do not exceed the limit for registration with the European Chemicals Agency.

10. Other optional additional environmental information

N/A

11. References

1. ISO 14040: Environmental management - Life cycle assessment – Principles and Framework', International Organization for Standardization, ISO 14040:2006.
2. ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines', International Organization for Standardization, ISO 14044:2006.
3. ISO 14025: Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures', International Organization for Standardization, ISO 14025:2006.
4. I.S. EN 15804: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products', I.S. EN 15804:2012+A1:2013.
5. Ecochain, 2020, web: <http://app.ecochain.com>.
6. CML - Department of Industrial Ecology, CML-IA Characterisation Factors, Dated August 2016, Leiden University, Leiden, Netherlands Available at: <https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors>
7. Ministerie van Verkeer en Waterstaat, 8 maart 2004, Toxiciteit heeft z'n prijs, Schaduwprijzen voor (eco-) toxiciteit en uitputting van abiotische grondstoffen binnen DuboCalc.
8. I.S. EN 17213:2020 Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets.
9. Product Category Rules : Part A. Implementation and use of I.S. EN 15804:2012 and CEN TR 16970:2016 in Ireland. EPD Ireland, Irish Green Building Council, July 2018.
10. St. Gobain Planitherm and Planiclear EPDs (https://www.greenbuilding.saint-gobain.com/node/17?doc_id=1256).