

EN 15804+A2 EPD



# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2.  
Owner of the Declaration – Tobermore

Declaration number: EPDIE-21-58  
Issue date 23rd March 2022  
Valid to 23rd March 2027

EPD Programme - EPD Ireland  
Programme Operator - Irish Green Building Council  
[www.epdireland.org](http://www.epdireland.org)



## Tobermore Products

Braemar 200x100x80mm Arran Stone  
Braemar 200x100x80mm Cara Slate  
Braemar 200x100x80mm Cara Slate GT  
Braemar 200x100x80mm Innis Black  
Braemar 200x100x80mm Innis Black GT  
Braemar 200x100x80mm Islay Rose GT  
Braemar 200x100x80mm Jura Grey  
Braemar 300x200x80mm Alto Silver GT  
Braemar 300x200x80mm Cara Slate GT  
Braemar 300x200x80mm Jura Grey GT  
Braemar 300x200x80mm Persa Blue GT  
Braemar 300x300x80mm Innis Black GT  
Braemar 600x300x80mm Alto Silver GT  
Braemar 600x300x80mm Arran Stone GT  
Braemar 600x300x80mm Cara Slate GT  
Braemar 600x300x80mm Innis Black GT  
Braemar 600x300x80mm Jura Grey GT

# 1. General information

PROGRAMME OPERATOR	OWNER OF DECLARATION																		
Irish Green Building Council 19 Mountjoy Square, Dublin D01 E8P5 info@igbc.ie	Tobermore Concrete Products Ltd 2 Lisnamuck Road, Tobermore, Northern Ireland, BT45 5QF GB: 0844 800 5736; NI: 028 7964 2411; ROI: 048 7964 2411 sales@tobermore.co.uk; www.tobermore.co.uk																		
DECLARATION NUMBER	PRODUCTION SITE																		
EPDIE-21-58	Tobermore Concrete Products Ltd. 2 Lisnamuck Road, Tobermore, Northern Ireland BT45 5QF																		
ECO PLATFORM EPD	DECLARED UNIT																		
Yes	1 m <sup>2</sup> of concrete paving with useful service life of 50 years																		
APPLICABLE PRODUCT CATEGORY RULES	DECLARED PRODUCT																		
1) EN 15804:2012+A2:2019 2) Product Category Rules: Part A, Implementation and use of EN 15804:2012+A1:2013, EN 15804:2012+A2:2019 and CEN TR 16970:2016 in Ireland, Version 2.0 3) IS-EN-16757 Sustainability of construction works. Environmental product declarations. Product Category Rules for concrete and concrete elements	<table border="0"> <tr> <td>Braemar 200x100x80mm Arran Stone</td> <td>Braemar 300x200x80mm Jura Grey GT</td> </tr> <tr> <td>Braemar 200x100x80mm Cara Slate</td> <td>Braemar 300x200x80mm Persa Blue GT</td> </tr> <tr> <td>Braemar 200x100x80mm Cara Slate GT</td> <td>Braemar 300x300x80mm Innis Black GT</td> </tr> <tr> <td>Braemar 200x100x80mm Innis Black</td> <td>Braemar 600x300x80mm Alto Silver GT</td> </tr> <tr> <td>Braemar 200x100x80mm Innis Black GT</td> <td>Braemar 600x300x80mm Arran Stone GT</td> </tr> <tr> <td>Braemar 200x100x80mm Islay Rose GT</td> <td>Braemar 600x300x80mm Cara Slate GT</td> </tr> <tr> <td>Braemar 200x100x80mm Jura Grey</td> <td>Braemar 600x300x80mm Innis Black GT</td> </tr> <tr> <td>Braemar 300x200x80mm Alto Silver GT</td> <td>Braemar 600x300x80mm Jura Grey GT</td> </tr> <tr> <td>Braemar 300x200x80mm Cara Slate GT</td> <td></td> </tr> </table>	Braemar 200x100x80mm Arran Stone	Braemar 300x200x80mm Jura Grey GT	Braemar 200x100x80mm Cara Slate	Braemar 300x200x80mm Persa Blue GT	Braemar 200x100x80mm Cara Slate GT	Braemar 300x300x80mm Innis Black GT	Braemar 200x100x80mm Innis Black	Braemar 600x300x80mm Alto Silver GT	Braemar 200x100x80mm Innis Black GT	Braemar 600x300x80mm Arran Stone GT	Braemar 200x100x80mm Islay Rose GT	Braemar 600x300x80mm Cara Slate GT	Braemar 200x100x80mm Jura Grey	Braemar 600x300x80mm Innis Black GT	Braemar 300x200x80mm Alto Silver GT	Braemar 600x300x80mm Jura Grey GT	Braemar 300x200x80mm Cara Slate GT	
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DATE OF ISSUE	SCOPE OF EPD																		
23rd March 2022	Cradle to gate with options, modules C1 - C4, and module D																		
DATE OF EXPIRY	LCA CONSULTANT OR PERSON RESPONSIBLE FOR LCA																		
23rd March 2027	EcoReview, Kilkenny, Co. Kilkenny, Ireland +353 87 258 9783 / +31 646 264 9327 info@ecoreview.ie / www.ecoreview.ie																		
TYPE OF EPD: SINGLE OR MULTI PRODUCT	LCA SOFTWARE AND DEVELOPER IF APPLICABLE																		
Multi product EPD	Ecochain version 3.2.12																		
PRODUCT CLASSIFICATION OR NACE CODE	NAME AND VERSION OF INVENTORY USED																		
UN CPC 375 Articles of concrete, cement and plaster	Ecoinvent version 3.6																		
COMPARABILITY																			
Environmental Product Declarations from different programmes may not be directly 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																			
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  	Marcel Gómez Ferrer - Marcel Gómez Consultoria Ambiental 

## 2. Scope and Type of EPD

### Scope

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

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	ND	ND	ND	ND	ND	ND	ND	X	X	X	X		X
MDT	MDT	MDT	OP	OP	OP	OP	OP	OP	OP	OP	OP	MDT	MDT	MDT	MDT		MDT

*X = Module declared; ND = Module not declared; MDT = Mandatory; OP = Optional.*

The geographical areas for which this EPD is representative - and where the results can be applied - is Great Britain, Northern Ireland, the Republic of Ireland, and western Europe.

### Declared Functional Unit

The Declared Unit of this EPD is 1 m<sup>2</sup> of concrete paving with useful service life of 50 years.

For the Declared Products in this EPD (listed in General Information on page 1), the impact results of these products lie within + or - 10% of the values for the Declared Unit of 1 m<sup>2</sup> of concrete paving - which is the Representative Product. This is based on the values of the CO<sub>2</sub>-eq per m<sup>2</sup> of the products (Cradle-to-Gate, i.e. A1-A3).

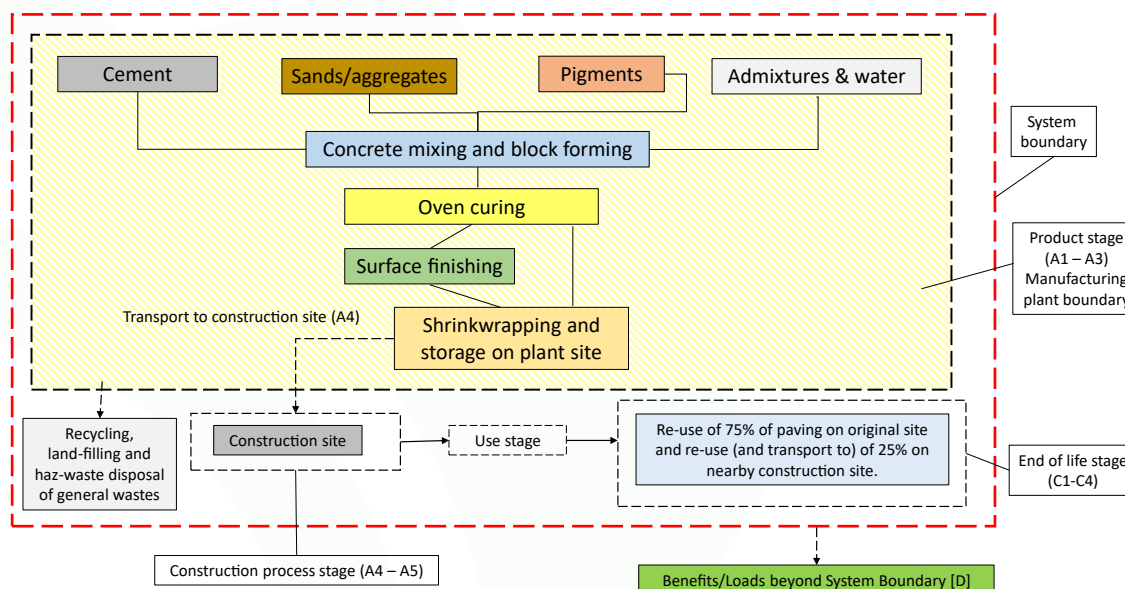
The greatest variance above the Declared Unit [Representative Product] impact values is +7.0%.

The greatest variance below the Declared Unit [Representative Product] impact values is -1.7%.

The CO<sub>2</sub>-eq impact values (A1-A3) of the individual products is given in Section 8: Other Optional Additional Environmental Information.

## System Boundaries

This LCA covers the Product (A1 - A3), Construction Process (A4, A5), End of Life Stage (C1 - C4) stages, as well as as the benefits and loads beyond the system boundary (D).



## 3. Detailed product description

Tobermore concrete paving, walling and kerb products are made with sands, cements and pigments specially selected for their aesthetic and functional performance. They are manufactured in accordance with BS EN 1338 and BS EN 1339: Concrete Paving Blocks and Flags - Requirements and Test Methods. BS EN 771:3:2011 Aggregate concrete masonry units (Dense and lightweight aggregates) BS EN 1340:2003 Concrete kerb units. Requirements and test methods.

Products are manufactured in two parts - a facing mix, that is mixed separately, and is then placed on top of a base mix. The facing mix is some 8mm thick, and this is placed on top of the base mix, which is of varying thickness, (depending on loading). The facing mix comprises special sands and pigments for appearance. The base mix comprises standard sands and cement, and does not have any pigments. The declared unit of this type of product is one m<sup>2</sup>.

Specialist sands are coloured white, grey, black, red and/or other as defined. Cements are either CEM II (general use), CEM I (for high strength) or CEM I white for appearance. The mean density of the hardened products is 2350 kg/m<sup>3</sup>. Most of the sands and aggregates are sourced from Tobermore's own quarries in the locality. Cements are locally sourced from within Northern Ireland. Some specialist sands come from quarries outside of Northern Ireland, within the EU.

The finished products are then supplied to customers in bales, shrink-wrapped in polythene comprising 30% recycled plastic. Pallets are not included in the calculation.

Material	Percentage range
Cement	7 to 23%
Sands and aggregates	60 to 85%
Pigments and admixtures	~ 1%
Water	4 to 10%
Shrinkwrap packaging	0.03%

*Typical composition range of Tobermore concrete paving products*

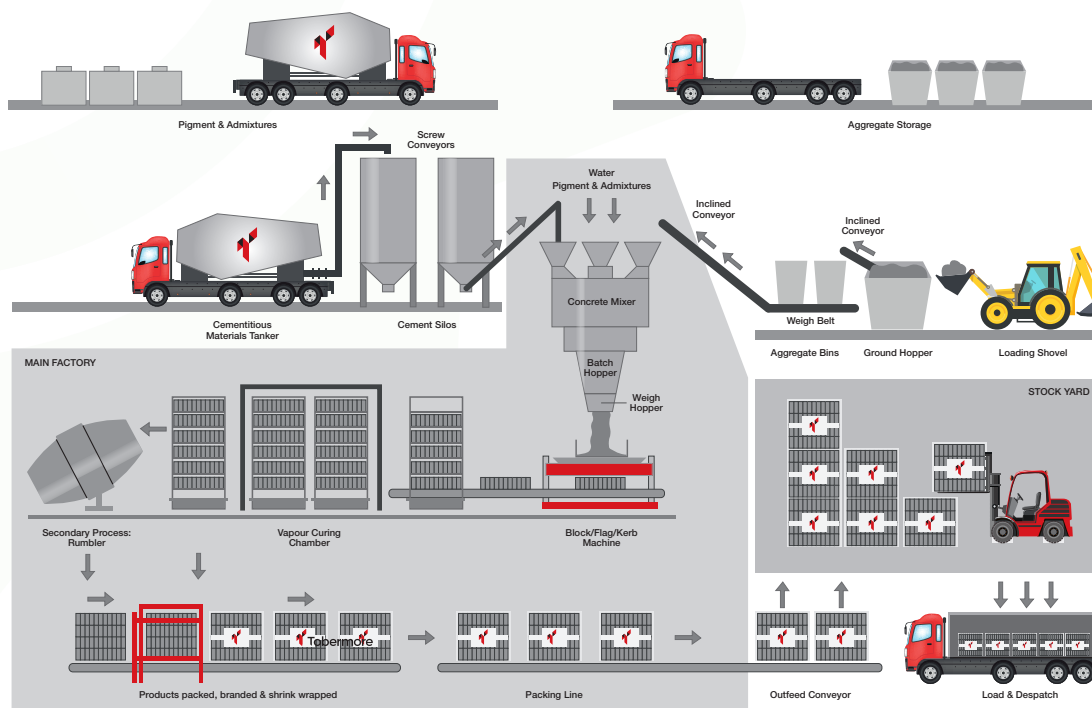
### 3.1 Manufacturing Process Description

**A1 Raw materials supply:** The raw materials, sands, pigments, admixtures and cements are sourced from within the representative geographic area. This module takes into account extraction and processing (including energies) of raw materials before delivery to Tobermore.

**A2 Transport:** This module covers the impacts of the transport of the raw materials to the production site.

**A3 Manufacturing:** The paving products are manufactured from specially selected sands, cement, water and a variety of admixtures. The ingredients are batch-weighed and mixed in a concrete pan mixer and dropped through a weigh hopper into moulds for setting. The wet mixes are placed in a curing chamber where the paving products harden and set. After leaving the curing oven, the paving products are finished according to intended market. The finishing processes are: (a) tumbling in a rotating drum, (b) texturing by shot-blasting the facing surface, and (c) grinding of the facing surface with a carbide tipped grinding head. A proportion of the products do not go through any of the finishing processes. Some products are both textured and ground. After finishing, the paving products are shrink-wrapped and then stored onsite for onward delivery to the customers.

The manufacturing processes are illustrated below.



## 4.1.A. LCA results - 1m<sup>2</sup> of representative paving

### Core Environmental impact per 1m<sup>2</sup> of paving

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> eq.]	1.77E+01	1.49E+00	3.16E+01	5.07E+01	9.63E+00	1.08E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	3.84E-01	0.00E+00	0.00E+00	-2.26E+00
GWP-fossil	[kg CO <sub>2</sub> eq.]	1.77E+01	1.49E+00	3.15E+01	5.07E+01	9.62E+00	1.05E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	3.84E-01	0.00E+00	0.00E+00	-2.26E+00
GWP-biogenic	[kg CO <sub>2</sub> eq.]	3.93E-03	7.66E-04	2.17E-02	2.64E-02	3.40E-03	-3.74E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	2.06E-04	0.00E+00	0.00E+00	-2.83E-03
GWP-luluc	[kg CO <sub>2</sub> eq.]	1.67E-03	5.46E-04	2.56E-03	4.78E-03	3.03E-03	6.39E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	1.37E-04	0.00E+00	0.00E+00	-5.43E-04
ODP	[kg CFC-11 eq.]	3.33E-07	3.37E-07	6.78E-06	7.45E-06	2.19E-06	4.62E-08	ND	ND	ND	ND	ND	ND	ND	0.00E+00	8.73E-08	0.00E+00	0.00E+00	-2.38E-07
AP	[mol H+ eq.]	5.29E-02	5.13E-03	3.23E-01	3.82E-01	4.45E-02	3.75E-03	ND	ND	ND	ND	ND	ND	ND	0.00E+00	1.10E-03	0.00E+00	0.00E+00	-1.78E-02
EP-freshwater	[kg P eq.]	7.20E-05	1.18E-05	1.19E-04	2.03E-04	1.46E-04	1.34E-05	ND	ND	ND	ND	ND	ND	ND	0.00E+00	3.07E-06	0.00E+00	0.00E+00	-1.98E-05
EP-marine	[kg N eq.]	1.52E-02	1.04E-03	1.42E-01	1.58E-01	8.49E-03	1.18E-03	ND	ND	ND	ND	ND	ND	ND	0.00E+00	2.18E-04	0.00E+00	0.00E+00	-5.87E-03
EP-terrestrial	[mol N eq.]	1.76E-01	1.16E-02	1.56E+00	1.75E+00	9.63E-02	1.19E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	2.44E-03	0.00E+00	0.00E+00	-7.64E-02
POCP	[kg NMVOC eq.]	6.23E-02	4.17E-03	4.29E-01	4.96E-01	3.17E-02	4.00E-03	ND	ND	ND	ND	ND	ND	ND	0.00E+00	9.35E-04	0.00E+00	0.00E+00	-1.89E-02
ADP-minerals&metals <sup>[2]</sup>	[kg Sb eq.]	8.77E-05	4.05E-05	5.67E-05	1.85E-04	2.71E-05	5.73E-06	ND	ND	ND	ND	ND	ND	ND	0.00E+00	1.06E-05	0.00E+00	0.00E+00	-2.35E-05
ADP-fossils <sup>[2]</sup>	[MJ] ncv	9.52E+01	2.24E+01	4.33E+02	5.51E+02	1.46E+02	7.43E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	5.80E+00	0.00E+00	0.00E+00	-2.15E+01
WDP <sup>[2]</sup>	m <sup>3</sup> world eq. deprived	7.58E+00	6.30E-02	6.10E-01	8.26E+00	1.12E+00	3.98E-01	ND	ND	ND	ND	ND	ND	ND	0.00E+00	1.64E-02	0.00E+00	0.00E+00	-1.04E+00

GWP-total = Global Warming Potential total; GWP-fossil= Global Warming Potential fossil fuels (GWP-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; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&fossils = Abiotic depletion potential for non-fossil resources; ADP-fossils= Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.

<sup>[2]</sup>The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

ND = Module not declared; INA = Indicator not assessed.

## 4.1.B. LCA results - 1m<sup>2</sup> of representative paving

### Resource use per 1m<sup>2</sup> of paving

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	1.16E+01	3.18E-01	1.21E+01	2.40E+01	1.69E+00	2.07E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	8.31E-02	0.00E+00	0.00E+00	-1.98E+00
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	[MJ]	1.16E+01	3.18E-01	1.21E+01	2.40E+01	1.69E+00	2.07E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	8.31E-02	0.00E+00	0.00E+00	-1.98E+00
PENRE	[MJ]	9.74E+01	2.38E+01	4.60E+02	5.81E+02	1.55E+02	8.21E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	6.16E+00	0.00E+00	0.00E+00	-2.26E+01
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	[MJ]	9.74E+01	2.38E+01	4.60E+02	5.81E+02	1.55E+02	8.21E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	6.16E+00	0.00E+00	0.00E+00	-2.26E+01
SM	[kg]	1.09E+02	2.41E+01	4.72E+02	6.05E+02	1.57E+02	1.03E+01	ND	ND	ND	ND	ND	ND	ND	0.00E+00	6.24E+00	0.00E+00	0.00E+00	-2.46E+01
RSF	[MJ]	7.97E-01	0.00E+00	0.00E+00	7.97E-01	0.00E+00	3.79E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.97E-02
NRSF	[MJ]	1.14E+01	0.00E+00	0.00E+00	1.14E+01	0.00E+00	5.40E-01	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.10E-01
FW	[m <sup>3</sup> ]	3.08E-01	2.38E-03	2.31E-02	3.34E-01	2.41E-02	2.20E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	6.21E-04	0.00E+00	0.00E+00	-3.32E-02

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.

ND = Module not declared; INA = Indicator not assessed.

### 4.1.C. LCA results - 1m<sup>2</sup> of representative paving

#### Output flows and waste categories per 1m<sup>2</sup> of paving

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	1.36E-04	5.80E-05	1.17E-03	1.36E-03	9.27E-05	2.27E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	1.52E-05	0.00E+00	0.00E+00	-4.71E-05
NHWD	[kg]	1.32E+00	1.07E+00	5.43E-01	2.93E+00	6.51E+00	1.13E-01	ND	ND	ND	ND	ND	ND	ND	0.00E+00	2.82E-01	0.00E+00	0.00E+00	-6.90E-01
RWD	[kg]	1.88E-03	1.53E-04	3.00E-03	5.03E-03	9.86E-04	1.07E-04	ND	ND	ND	ND	ND	ND	ND	0.00E+00	3.95E-05	0.00E+00	0.00E+00	-2.14E-04
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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.

ND = Module not declared; INA = Indicator not assessed.



## 4.1.D. LCA results - 1m<sup>2</sup> of representative paving

### Additional Environmental impact per 1m<sup>2</sup> of paving

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	4.45E-07	9.35E-08	8.51E-06	9.05E-06	5.90E-07	3.92E-08	ND	ND	ND	ND	ND	ND	ND	0.00E+00	2.44E-08	0.00E+00	0.00E+00	-2.38E-07
IRP <sup>[1]</sup>	kBq U235 eq	3.75E-01	9.79E-02	1.85E+00	2.32E+00	6.28E-01	2.60E-02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	2.54E-02	0.00E+00	0.00E+00	-8.66E-02
ETP-fw <sup>[2]</sup>	CTUe	9.57E+01	1.80E+01	2.67E+02	3.80E+02	1.03E+02	8.82E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	4.67E+00	0.00E+00	0.00E+00	-4.41E+02
HTP-c <sup>[2]</sup>	CTUe	6.24E-08	5.15E-10	9.42E-09	7.24E-08	3.06E-09	3.67E-09	ND	ND	ND	ND	ND	ND	ND	0.00E+00	1.30E-10	0.00E+00	0.00E+00	-4.64E-09
HTP-nc <sup>[2]</sup>	CTUe	3.60E-08	1.89E-08	2.34E-07	2.88E-07	1.13E-07	5.20E-09	ND	ND	ND	ND	ND	ND	ND	0.00E+00	4.93E-09	0.00E+00	0.00E+00	-2.74E-08
SQP <sup>[2]</sup>	dimensionless	1.30E+02	1.55E+01	5.65E+01	2.02E+02	9.43E+01	1.24E+01	ND	ND	ND	ND	ND	ND	ND	0.00E+00	4.06E+00	0.00E+00	0.00E+00	-3.42E+01

PM = Potential incidence of disease due to PM emissions, 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, SQP = Potential soil quality index.

<sup>[1]</sup> This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuelcycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

<sup>[2]</sup> The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

ND = Module not declared; INA = Indicator not assessed.

## 5. Calculation rules

The measurement of environmental impacts in this EPD uses the LCIA methodologies recommended for PEF3.0.

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.

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 LCA tool. This data portfolio contains a summary of all the data used in this LCA, and correspondingly, in the Tobermore Ecochain account.

### Cut-off criteria

The cut-off criteria of section 6.3.6 of EN15804 +A2 have been followed, where 99% of the total energy and materials are included, and the total neglected input flows for the modules reported on in the LCA are less than 5% of the energy usage and mass.

### Data Quality

The dataset is representative for the production processes used in 2020. The data Quality Level, according to Table E.1 of EN 15804 +A2, Annex E, is 'very good'.

### Allocations

Allocation of electricity types and amounts to the various manufacturing processes has been provided by Tobermore along with production waste and direct emissions. Allocation of impacts to the products is based on the product composition mass.

The electricity used by Tobermore is 100% renewable. All primary data has been supplied directly by Tobermore Ltd.

## 6. Scenarios and additional technical information

### A4. Transport to market

The transport to market is based on the paving slabs being manufactured in Tobermore, Northern Ireland, and transported to a location in central England (assumed Birmingham) by road (290 km) and ship (350 km).

Parameter	Value / Description
Road transport	Transport, freight, lorry 16-32 metric ton, EURO6 engine
Sea transport	Transport, freight, sea, bulk carrier for dry goods
Distance, road	290 km
Distance, sea	350 km
Capacity utilisation road freight	46% (% assumed in the Ecoinvent V 3.6 database)
Bulk density transported goods	2350 kg/m <sup>3</sup>

## A5. Construction installation

In the construction installation process, the following assumptions apply:

- No ancillary materials are used (i.e. zero)
- No energy or other resources are used (i.e. zero)
- Losses of 5% of the product occur on-site during the installation processes.
- The lost material is re-used on site as incidental construction infill, and not transported off site.

## C1. De-construction demolition

It is assumed in this module that the impacts of de-construction of the paving blocks are negligible.

## C2. Transport

In the transport phase C2, it is assumed that where paving is removed from site, the material travels 50km to the location it will be re-used. It is assumed that 25% of the paving is removed from the site where it was installed, and 75% is re-used on the same site. The transport vehicle type used is: Freight lorry 16-32 metric ton, EURO6.

## C3. Waste processing

No waste processing is carried out. It is assumed that 100% of the product is re-used at the end of life, in accordance with Table 3 (Default Values for construction & demolition waste) of the Irish PCR Version 2.0 for EN 15804, reference [\[6\]](#).

## C4. Disposal

No products are disposed. All paving products are re-used.

## D. Reuse – Recovery – Recycling potential

Beyond the system, after the paving has passed beyond the end-of-waste stage, 95% of the paving replaces the use of virgin aggregates as infill, and 5% replaces the use of new paving from virgin materials, as replacement (or salvaged) paving. In this analysis, it has been assumed that there is no additional crushing in the next life-cycle of the paving for further use as infill.

## Declaration of biogenic carbon content at the production gate

The mass of biogenic carbon containing materials in the product and the packaging is less than 5% of the mass of the product, thus the declaration of biogenic carbon content is not included. For reference, the biogenic CO<sub>2</sub> content of the products, for the A1–A3 modules, is 0.04% of the overall A1–A3 GWP impacts.

## 7. 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.

## 8. Other optional additional environmental information

The kg CO<sub>2</sub>-eq per m<sup>2</sup> of the individual paving products listed in column A are given in column B (Cradle-to-Gate, i.e. A1-A3), and the percentage difference between these CO<sub>2</sub>-eq values and the that of the Representative Product (Braemar 200x100x80mm Arran Stone) are given in column C in the table below:

A	B	C
Product	kg CO <sub>2</sub> -eq per m <sup>2</sup>	Difference from Representative Product (%)
Braemar 200x100x80mm Arran Stone	50.74	0.0
Braemar 200x100x80mm Cara Slate	50.23	-1.0
Braemar 200x100x80mm Cara Slate GT	50.55	-0.4
Braemar 200x100x80mm Innis Black	50.78	0.1
Braemar 200x100x80mm Innis Black GT	51.10	0.7
Braemar 200x100x80mm Islay Rose GT	50.59	-0.3
Braemar 200x100x80mm Jura Grey	50.12	-1.2
Braemar 300x200x80mm Alto Silver GT	53.79	6.0
Braemar 300x200x80mm Cara Slate GT	50.73	0.0
Braemar 300x200x80mm Jura Grey GT	50.44	-0.6
Braemar 300x200x80mm Persa Blue GT	50.83	0.2
Braemar 300x300x80mm Innis Black GT	54.30	7.0
Braemar 600x300x80mm Alto Silver GT	50.59	-0.3
Braemar 600x300x80mm Arran Stone GT	51.06	0.6
Braemar 600x300x80mm Cara Slate GT	50.55	-0.4
Braemar 600x300x80mm Innis Black GT	51.10	0.7
Braemar 600x300x80mm Jura Grey GT	50.44	-0.6

## 9. 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] EN 15804+A2: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products EN 15804:2012+A2:2019.
- [5] Ecochain 3.2.12, 2021, web: <http://app.Ecochain.com>.
- [6] Product Category Rules: Part A, Implementation and use of EN 15804:2012+A1:2013, EN 15804:2012+A2:2019 and CEN TR 16970:2016 in Ireland for the development of Environmental Product Declarations; Version 2.0, issue date: 17.08.2021, published by the EPD Ireland Programme operator (Irish Green Building Council).
- [7] IS-EN-16757 Sustainability of construction works. Environmental product declarations. Product Category Rules for concrete and concrete elements.
- [8] PEF methodology final draft.pdf (europa.eu)

## 10. Annex

N/A.