

EN 15804+A2 EPD



ENVIRONMENTAL PRODUCT DECLARATION

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

Declaration number: EPDIE-21-59
Issue date 23rd March 2022
Valid to 23rd March 2027

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



Tobermore Products

Hydropave Tegula 240
Hydropave Tegula Duo 60mm
Retro 60mm
Tegula 104x173x80mm
Tegula 140x140x50mm
Tegula 160x160x80mm
Tegula 173x173x60mm
Tegula 173x173x80mm
Tegula 175x140x50mm
Tegula 200x100x80mm
Tegula 208x173x60mm
Tegula 208x173x80mm
Tegula 240x160x80mm
Tegula Setts 50mm
Tegula Setts 60mm
Tegula Trio 50mm
Tegula Trio 60mm
Kingston 215x100x65mm
Landsdowne 215x100x65mm
Kerbstone

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-21-59 | Tobermore Concrete Products Ltd. 2 Lisnamuck Road, Tobermore, Northern Ireland BT45 5QF |
| ECO PLATFORM EPD | DECLARED UNIT |
| Yes | 1 m ³ of concrete paving/kerbs/walling with useful service life greater than 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 | Hydropave Tegula 240 Hydropave Tegula Duo 60mm Retro 60mm Tegula 104x173x80mm Tegula 140x140x50mm Tegula 160x160x80mm Tegula 173x173x60mm Tegula 173x173x80mm Tegula 175x140x50mm Tegula 200x100x80mm Tegula 208x173x60mm Tegula 208x173x80mm Tegula 240x160x80mm Tegula Setts 50mm Tegula Setts 60mm Tegula Trio 50mm Tegula Trio 60mm Kingston 215x100x65mm Landsdowne 215x100x65mm Kerbstone |
| 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 m³ of concrete paving/kerbs/walling with useful service life greater than 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 m³ of concrete paving/kerbs/walling - which is the Representative Product. This is based on the values of the CO₂-eq per m³ of the products (Cradle-to-Gate, i.e. A1-A3).

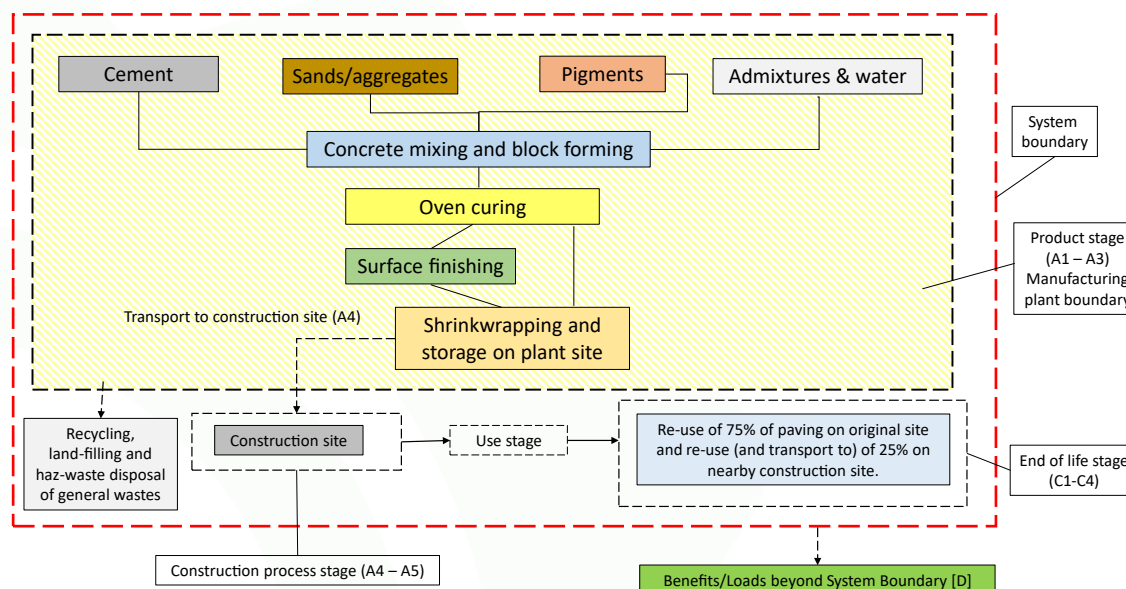
The greatest variance above the Declared Unit [Representative Product] impact values is +8.9%.

The greatest variance below the Declared Unit [Representative Product] impact values is -9.8%.

The CO₂-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 a single mix. The mix comprises special sands and pigments for appearances, as well as standard sands and aggregates for the main structure. The declared unit of this type of product is one m³.

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/m³. 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 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

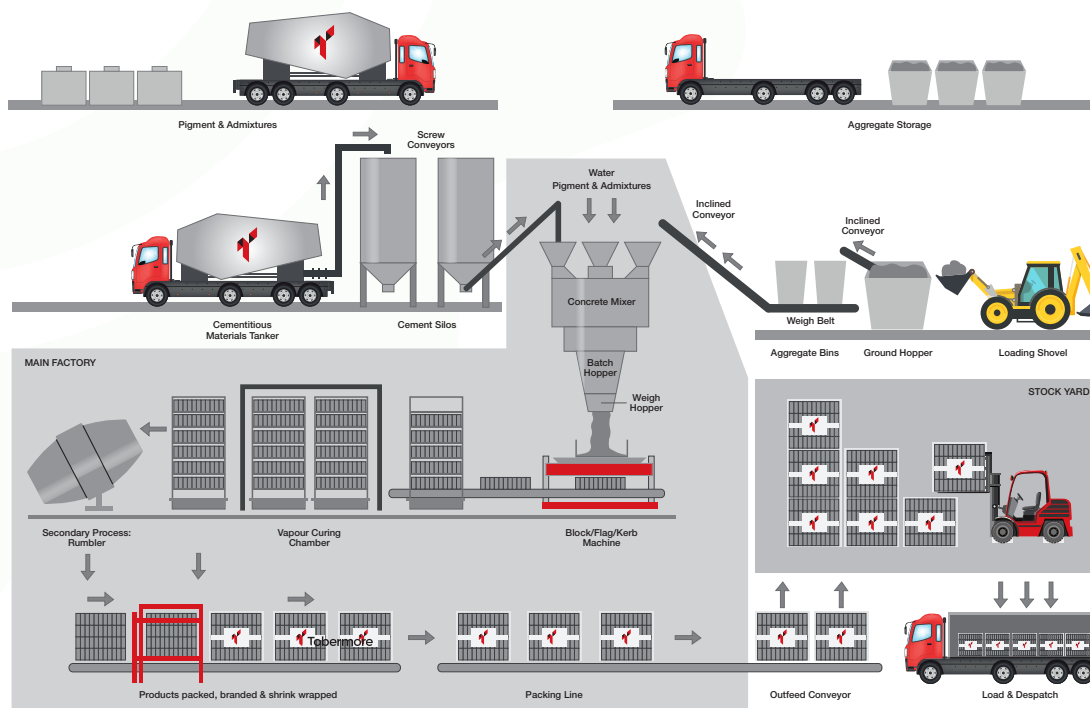
3.1 Manufacturing Process Description

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 - 1m³ of representative paving/kerbs/walling

Core Environmental impact per 1m³ of paving/kerbs/walling

| 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 ₂ eq.] | 2.29E+02 | 5.76E+00 | 1.79E+01 | 2.52E+02 | 1.20E+02 | 1.35E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 4.80E+00 | 0.00E+00 | 0.00E+00 | -2.64E+01 |
| GWP-fossil | [kg CO ₂ eq.] | 2.29E+02 | 5.76E+00 | 1.77E+01 | 2.52E+02 | 1.20E+02 | 1.35E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 4.80E+00 | 0.00E+00 | 0.00E+00 | -2.64E+01 |
| GWP-biogenic | [kg CO ₂ eq.] | 8.59E-02 | 3.10E-03 | 1.64E-01 | 2.53E-01 | 4.25E-02 | 1.09E-02 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 2.58E-03 | 0.00E+00 | 0.00E+00 | -3.41E-02 |
| GWP-luluc | [kg CO ₂ eq.] | 3.65E-02 | 2.05E-03 | 2.57E-03 | 4.11E-02 | 3.79E-02 | 1.38E-03 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.71E-03 | 0.00E+00 | 0.00E+00 | -6.41E-03 |
| ODP | [kg CFC-11 eq.] | 6.11E-06 | 1.31E-06 | 3.43E-06 | 1.09E-05 | 2.73E-05 | 4.51E-07 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.09E-06 | 0.00E+00 | 0.00E+00 | -2.85E-06 |
| AP | [mol H+ eq.] | 7.75E-01 | 1.65E-02 | 9.92E-02 | 8.90E-01 | 5.57E-01 | 4.23E-02 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.38E-02 | 0.00E+00 | 0.00E+00 | -2.15E-01 |
| EP-freshwater | [kg P eq.] | 1.60E-03 | 4.60E-05 | 1.35E-04 | 1.78E-03 | 1.83E-03 | 7.28E-05 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 3.83E-05 | 0.00E+00 | 0.00E+00 | -2.40E-04 |
| EP-marine | [kg N eq.] | 1.99E-01 | 3.27E-03 | 3.41E-02 | 2.37E-01 | 1.06E-01 | 1.21E-02 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 2.73E-03 | 0.00E+00 | 0.00E+00 | -7.15E-02 |
| EP-terrestrial | [mol N eq.] | 2.36E+00 | 3.66E-02 | 3.73E-01 | 2.77E+00 | 1.20E+00 | 1.40E-01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 3.05E-02 | 0.00E+00 | 0.00E+00 | -9.34E-01 |
| POCP | [kg NMVOC eq.] | 7.93E-01 | 1.40E-02 | 1.10E-01 | 9.17E-01 | 3.97E-01 | 4.82E-02 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.17E-02 | 0.00E+00 | 0.00E+00 | -2.29E-01 |
| ADP-minerals&metals ^[2] | [kg Sb eq.] | 3.30E-03 | 1.59E-04 | 1.59E-04 | 3.62E-03 | 3.38E-04 | 5.73E-05 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.32E-04 | 0.00E+00 | 0.00E+00 | -2.61E-04 |
| ADP-fossils ^[2] | [MJ] ncv | 1.33E+03 | 8.71E+01 | 2.29E+02 | 1.65E+03 | 1.83E+03 | 8.11E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 7.26E+01 | 0.00E+00 | 0.00E+00 | -2.55E+02 |
| WDP ^[2] | m ³ world eq. deprived | 1.13E+02 | 2.46E-01 | 7.65E-01 | 1.14E+02 | 1.40E+01 | 5.06E+00 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 2.05E-01 | 0.00E+00 | 0.00E+00 | -1.32E+01 |

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.

^[2]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 - 1m³ of representative paving/kerbs/walling

Resource use per 1m³ of paving/kerbs/walling

| PARAMETER | UNIT | A1 | A2 | A3 | TOTAL A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|-----------|-------------------|----------|----------|----------|----------------|----------|----------|----|----|----|----|----|----|----|----------|----------|----------|----------|-----------|
| PERE | [MJ] | 1.93E+02 | 1.25E+00 | 1.58E+02 | 3.53E+02 | 2.11E+01 | 1.64E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.04E+00 | 0.00E+00 | 0.00E+00 | -2.27E+01 |
| 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] | 1.93E+02 | 1.25E+00 | 1.58E+02 | 3.53E+02 | 2.11E+01 | 1.64E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.04E+00 | 0.00E+00 | 0.00E+00 | -2.27E+01 |
| PENRE | [MJ] | 1.44E+03 | 9.24E+01 | 2.44E+02 | 1.77E+03 | 1.94E+03 | 8.68E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 7.70E+01 | 0.00E+00 | 0.00E+00 | -2.71E+02 |
| 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] | 1.44E+03 | 9.24E+01 | 2.44E+02 | 1.77E+03 | 1.94E+03 | 8.68E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 7.70E+01 | 0.00E+00 | 0.00E+00 | -2.71E+02 |
| SM | [kg] | 1.63E+03 | 9.37E+01 | 4.02E+02 | 2.13E+03 | 1.96E+03 | 1.03E+02 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 7.81E+01 | 0.00E+00 | 0.00E+00 | -2.94E+02 |
| RSF | [MJ] | 9.33E+00 | 0.00E+00 | 0.00E+00 | 9.33E+00 | 0.00E+00 | 5.52E-01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -5.52E-01 |
| NRSF | [MJ] | 1.33E+02 | 0.00E+00 | 0.00E+00 | 1.33E+02 | 0.00E+00 | 7.87E+00 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -7.87E+00 |
| FW | [m ³] | 6.02E+00 | 9.31E-03 | 2.46E-02 | 6.05E+00 | 3.02E-01 | 2.99E-01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 7.76E-03 | 0.00E+00 | 0.00E+00 | -4.97E-01 |

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 - 1m³ of representative paving/kerbs/walling

Output flows and waste categories per 1m³ of paving/kerbs/walling

| PARAMETER | UNIT | A1 | A2 | A3 | TOTAL A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|-----------|------|----------|----------|----------|----------------|----------|----------|----|----|----|----|----|----|----|----------|----------|----------|----------|-----------|
| HWD | [kg] | 6.23E+00 | 2.28E-04 | 4.93E-04 | 6.23E+00 | 1.16E-03 | 3.04E-01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.90E-04 | 0.00E+00 | 0.00E+00 | -3.05E-01 |
| NHWD | [kg] | 2.25E+01 | 4.23E+00 | 6.61E-01 | 2.74E+01 | 8.13E+01 | 1.23E+00 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 3.53E+00 | 0.00E+00 | 0.00E+00 | -7.46E+00 |
| RWD | [kg] | 2.39E-02 | 5.93E-04 | 1.48E-03 | 2.60E-02 | 1.23E-02 | 1.47E-03 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 4.94E-04 | 0.00E+00 | 0.00E+00 | -2.55E-03 |
| 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 - 1m³ of representative paving/kerbs/walling

Additional Environmental impact per 1m³ of paving/kerbs/walling

| 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 | 6.48E-06 | 3.66E-07 | 1.92E-06 | 8.76E-06 | 7.37E-06 | 4.12E-07 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 3.05E-07 | 0.00E+00 | 0.00E+00 | -2.91E-06 |
| IRP ^[1] | kBq U235 eq | 4.94E+00 | 3.81E-01 | 9.22E-01 | 6.25E+00 | 7.84E+00 | 3.15E-01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 3.17E-01 | 0.00E+00 | 0.00E+00 | -1.02E+00 |
| ETP-fw ^[2] | CTUe | 1.82E+03 | 7.01E+01 | 2.27E+02 | 2.12E+03 | 1.29E+03 | 8.91E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 5.84E+01 | 0.00E+00 | 0.00E+00 | -5.49E+03 |
| HTP-c ^[2] | CTUe | 8.86E-07 | 1.95E-09 | 9.50E-09 | 8.97E-07 | 3.82E-08 | 5.19E-08 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 1.63E-09 | 0.00E+00 | 0.00E+00 | -5.77E-08 |
| HTP-nc ^[2] | CTUe | 8.65E-07 | 7.39E-08 | 2.61E-07 | 1.20E-06 | 1.41E-06 | 4.19E-08 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 6.16E-08 | 0.00E+00 | 0.00E+00 | -2.51E-07 |
| SQP ^[2] | dimensionless | 1.66E+03 | 6.09E+01 | 4.60E+01 | 1.77E+03 | 1.18E+03 | 8.34E+01 | ND | ND | ND | ND | ND | ND | ND | 0.00E+00 | 5.08E+01 | 0.00E+00 | 0.00E+00 | -4.20E+02 |

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.

^[1] 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.

^[2] 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 ³ |

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 CO₂ 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 CO₂-eq per m³ 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 CO₂-eq values and the that of the Representative Product (Tegula 140x140x50mm) are given in column C in the table below:

| A | B | C |
|----------------------------|---|--|
| Product | kg CO ₂ -eq per m ³ | Difference from Representative Product (%) |
| Hydropave Tegula 240 | 270.71 | 7.3 |
| Hydropave Tegula Duo 60mm | 256.90 | 1.8 |
| Retro 60mm | 274.84 | 8.9 |
| Tegula 104x173x80mm | 256.90 | 1.8 |
| Tegula 140x140x50mm | 252.34 | 0.0 |
| Tegula 160x160x80mm | 256.99 | 1.8 |
| Tegula 173x173x60mm | 247.84 | -1.8 |
| Tegula 173x173x80mm | 247.84 | -1.8 |
| Tegula 175x140x50mm | 252.34 | 0.0 |
| Tegula 200x100x80mm | 245.53 | -2.7 |
| Tegula 208x173x60mm | 247.75 | -1.8 |
| Tegula 208x173x80mm | 256.99 | 1.8 |
| Tegula 240x160x80mm | 247.84 | -1.8 |
| Tegula Setts 50mm | 247.00 | -2.1 |
| Tegula Setts 60mm | 247.75 | -1.8 |
| Tegula Trio 50mm | 256.90 | 1.8 |
| Tegula Trio 60mm | 252.34 | 0.0 |
| Kingston 215x100x65mm | 230.71 | -8.6 |
| Landsdowne 215x100x65mm | 227.71 | -9.8 |
| Kerbstone | 266.02 | 5.4 |

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.