

EN 15804+A2 EPD



ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804:2012+A2:2019
Owner of the Declaration – Breedon

Declaration number: EPDIE-21-68
Issue date 3rd May 2022
Valid to 3rd May 2027

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



Breedon Cement

CEM I 42,5 R bulk cement

1. General information

PROGRAMME OPERATOR	OWNER OF DECLARATION
Irish Green Building Council 19 Mountjoy Square, Dublin D01 E8P5 info@igbc.ie	Breedon Cement Ireland Ltd Killaskillen, Kinnegad, Co. Westmeath, Ireland www.breedoncement.com
DECLARATION NUMBER	PRODUCTION SITE
EPDIE-21-68	Breedon Cement Killaskillen, Kinnegad, Co. Westmeath, Ireland
ECO PLATFORM EPD	DECLARED UNIT
Yes	1 tonne of CEM I 42,5 R bulk cement
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+A2:2019 and CEN TR 16970:2016 in Ireland, Version 2.0 3. IS EN 16908 Cement and building lime. Environmental product declarations. Product Category Rules complementary to EN 15804.	Breedon Cement CEM I 42,5 R bulk cement
DATE OF ISSUE	SCOPE OF EPD
3rd May 2022	From cradle to gate; Geographical Scope: Ireland
DATE OF EXPIRY	LCA CONSULTANT OR PERSON RESPONSIBLE FOR LCA
3rd May 2027	Ecoreview Ireland, Kilkenny, Ireland. +353 (087) 258 9783 www.ecoreview.ie
REISSUE	REISSUE DETAILS
18th July 2023	Correction in Section 8: "secondary fuels used" replaced with "waste combustion"
TYPE OF EPD: SINGLE OR MULTI PRODUCT	LCA SOFTWARE AND DEVELOPER IF APPLICABLE
Single 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 EPD owner has the sole ownership, liability and responsibility for the EPD. The intended use of this EPD is for B2B and B2C communications.	
The CEN Norm /EN 15804:2012+A2:2019 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 Email: info@marcelgomez.com Phone +34 630 6435 93

2. Scope and Type of EPD

Scope

This is a Cradle to Gate EPD. The Modules that are declared are shown in the table below. As cement is an intermediate construction product - in that it becomes physically integrated into the product of which it is a component - it is generally not possible to provide information about the environmental impacts of the product in the life stages beyond the factory gate, thus this EPD covers only the Product Stage (A1 to A3).

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	ND*	ND*	ND*	ND*	ND*
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 products on this EPD are exempt from this requirement because they fulfil the 3 following conditions: the product or material is physically integrated with other products during installation so they cannot be physically separated from them at end of life and; the product or material is no longer identifiable at end of life as a result of a physical or chemical transformation process; the product or material does not contain biogenic carbon.

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 tonne of CEM I 42,5 R bulk cement.

System Boundaries

This LCA covers the Product stage (A1 - A3).

3. Detailed product description

The cement is manufactured at the Breedon Cement Ireland factory at Kinnegad, Co. Westmeath, Ireland, in accordance with I.S. EN 197-1:2011, Compositions, specifications and conformity criterial for common cements.

The main material components of the cement are clinker, ground limestone and gypsum. A small amount of bypass dust is added as well as a chromate-reducing agent to the cement. A grinding aid is also added to assist in the grinding process.

The clinker comprises the firing of the following products in the kiln at 1,500C: limestone, shale, silica clay, silica sand, with small amounts of waste water treatment plant sludge and flue dust.

Clinker	Minor additional constituents	Gypsum	Recycled material
95 to 100%	0 to 5%	3 to 4%	< 1%

Main material contents of CEM I 42,5 R bulk cement

28-day strength	Specific density (kg/m ³)	Specific surface (m ² /kg)	setting time (min)	Soundness (mm)
56.0 - 62.5	3,050 - 3,200	325 - 425	90 - 190	0.0 - 4.0

Main technical characteristics of CEM I 42,5 R bulk cement

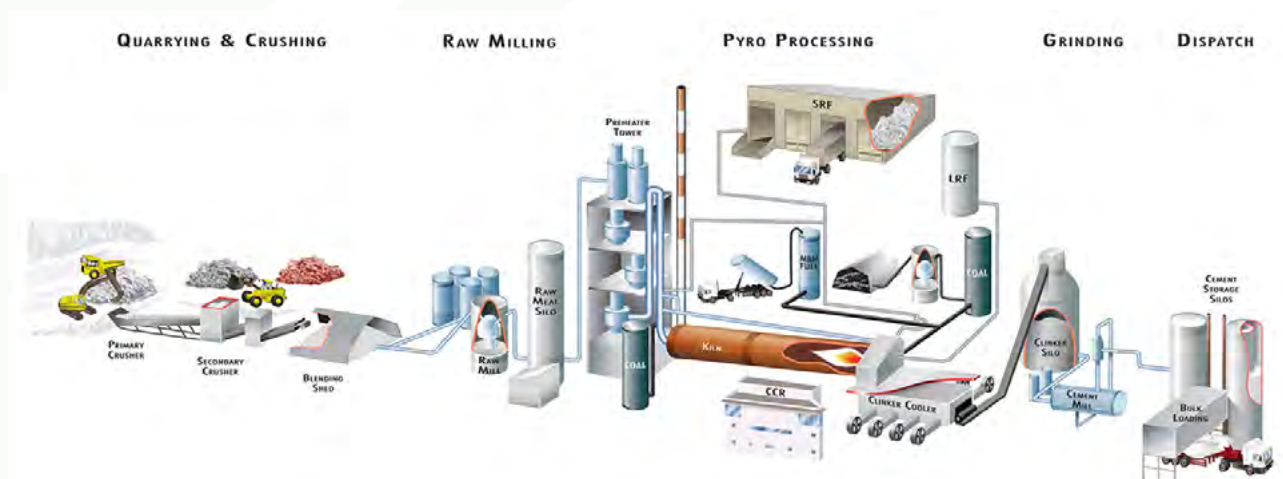
3.1 Manufacturing Process Description

A1 Raw materials supply: The raw materials are limestone, shale, clay, sand for the clinker, and then gypsum, and minor additional constituents (inorganic, comprising no more than 5% of the cement), are added to the clinker to make the final cement product.

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

A3 Manufacturing: The main raw materials for clinker, limestone, shale clay and sand, are quarried on site, crushed to smaller sizes and mixed to create a homogenous mix. To this is added crushed shale (clay) and sand. These are then pre-heated before being fed into the cement kiln., where they are burned with a mixture of coal, fuel oil, and alternate fuels: solvents, meat & bonemeal and solid recovered fuel (SRF). The material that emerges from the kiln is clinker. The clinker is then cooled and transported by conveyor belt to the clinker store, and from there to the cement mill, as and when needed. The cement mill grind the clinker and additions as the mill rotates on its horizontal axis. The clinker is inter-ground with additions of limestone and gypsum, and minor additional constituents of by-pass dust, chromate-reducing agents, and a grinding aid (to increase grinding efficiency).

The manufacturing processes are illustrated below.



4.A. LCA results - 1 tonne of cement

Core Environmental impact per 1 tonne of CEM I 42,5 R bulk cement

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.]	6.28E+02	2.47E+00	2.23E+00	6.33E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP-fossil	[kg CO ₂ eq.]	6.28E+02	2.46E+00	1.84E+00	6.32E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP-biogenic	[kg CO ₂ eq.]	-1.37E-02	1.68E-03	3.85E-01	3.73E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP-luluc	[kg CO ₂ eq.]	9.40E-03	1.04E-03	1.31E-03	1.17E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ODP	[kg CFC-11 eq.]	3.09E-06	5.21E-07	1.04E-07	3.72E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AP	[mol H ⁺ eq.]	9.58E-01	3.70E-02	1.31E-02	1.01E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP-freshwater ^[1]	[kg P eq.]	1.12E-03	3.94E-05	8.34E-05	1.24E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP-marine	[kg N eq.]	2.80E-01	7.22E-03	1.95E-03	2.89E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP-terrestrial	[mol N eq.]	3.24E+00	8.14E-02	1.70E-02	3.34E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
POCP	[kg NMVOC eq.]	7.58E-01	2.22E-02	6.16E-03	7.86E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADP-minerals&metals ^[2]	[kg Sb eq.]	3.33E-04	3.72E-06	1.57E-04	4.94E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADP-fossils ^[2]	[MJ] ncv	2.33E+02	3.63E+01	1.30E+01	2.82E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WDP ^[2]	m ³ world eq. deprived	4.08E+00	2.88E-01	4.87E-01	4.86E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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.

The measurement of environmental impacts uses the recommended default LCIA methods for the PEF 3.0 method [\[8\]](#). These methods include amongst others: USEtox® 2.0, ReCiPe (2016), CML-2001, EDIP 2003, IPCC.

^[1]To express EP freshwater as kg of PO₄³⁻ eq, multiply the value for kg P eq. by 3.067

^[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.B. LCA results - 1 tonne of cement

Resource use per 1 tonne of CEM I 42,5 R bulk cement

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	2.74E+02	6.20E-01	1.90E+02	4.65E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	[MJ]	2.74E+02	6.20E-01	1.90E+02	4.65E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	[MJ]	2.47E+02	3.85E+01	1.38E+01	3.00E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	[MJ]	2.47E+02	3.85E+01	1.38E+01	3.00E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SM	[kg]	5.21E+02	3.92E+01	2.04E+02	7.64E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	[m ³]	1.01E-01	6.37E-03	1.35E-02	1.20E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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.

The measurement of environmental impacts uses the recommended default LCIA methods for the PEF 3.0 method [8]. These methods include amongst others: USEtox® 2.0, ReCiPe (2016), CML -2001.

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

4.C. LCA results - 1 tonne of cement

Output flows and waste categories per 1 tonne of CEM I 42,5 R bulk cement

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	4.79E-04	2.22E-05	5.65E-06	5.07E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NHWD	[kg]	8.05E+00	8.58E-01	5.34E-01	9.45E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RWD	[kg]	1.42E-03	2.41E-04	5.69E-06	1.67E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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.

The measurement of environmental impacts uses the recommended default LCIA methods for the PEF 3.0 method [\[8\]](#). These methods include amongst others: USEtox® 2.0, ReCiPe (2016), CML -2001.

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

4.D. LCA results - 1 tonne of cement

Additional Environmental impact per 1 tonne of CEM I 42,5 R bulk cement

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	5.08E-06	1.12E-07	9.00E-08	5.28E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IRP ^[1]	kBq U235 eq	9.81E-01	1.59E-01	1.34E-02	1.15E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw ^[2]	CTUe	3.53E+03	2.51E+01	1.12E+02	3.66E+03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c ^[2]	CTUe	1.24E-01	7.86E-10	5.23E-09	1.24E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc ^[2]	CTUe	6.83E-07	2.33E-08	1.40E-07	8.46E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP ^[2]	dimensionless	1.48E+02	1.48E+01	1.94E+01	1.82E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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.

The measurement of environmental impacts uses the recommended default LCIA methods for the PEF 3.0 method [\[8\]](#). These methods include amongst others: USEtox® 2.0, ReCiPe (2016), CML -2001.

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 LCA tool. This data portfolio contains a summary of all the data used in this LCA.

Cut-off criteria

The cut-off criteria of section 6.3.6 of EN15804:2012+A2:2019 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 2019. The data Quality Level, according to Table E.1 of EN15804:2012+A2:2019, Annex E, is 'very good'.

Allocations

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

Flows related to human activities such as employee transport are excluded. The construction of capital assets such as buildings, manufacture of machines and transportation systems are also excluded since the related flows are assumed to be negligible compared to the manufacture of the building material when compared to these systems over a full lifetime of operation.

6. Scenarios and additional technical information

Declaration of biogenic carbon content at the production gate

Biogenic carbon per declared unit	Unit	Quantity
CEM I bulk	kg of carbon, C	0.096

Additional Technical Information

	Electricity	Fuels (% tonnes used)		
		Coal	Light oil	Alternative fuels
Clinker production	100% renewable	21	0.4	78.6
Cement grinding and blending	100% renewable	Not used		

Energy mix of used fuels

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

	kg CO ₂ per tonne	Notes
Net CO ₂ emissions per tonne	633	Excludes CO ₂ from waste combustion to make clinker
Gross CO ₂ emissions per tonne	734	Includes CO ₂ from waste combustion to make clinker
Biogenic CO ₂ emissions	unavailable	Because this information is not available, it is not possible to calculate emissions of biogenic origin

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 15804:2021+A2:2019 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-16908 Cement and building lime. Environmental product declarations. Product Category Rules complementary to EN 15804.
- [8] PEF methodology final draft.pdf (europa.eu)
- [9] EPD Ireland General Programme Instructions V 2.0 17-08-2021

10. Annex

N/A.