

**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 2.1

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EPD Ireland PCR Review Statement (Version 2.0)

The following experts in LCA and construction product EPD undertook a review of the revised EPD Ireland PCR Part A Version in line with EN 15804:2012+A2:2019, after which EPD Ireland responded and the final Review Statement below was issued on 20 August 2021.:

- Chair: Jane Anderson MSc DipLCM; Director, ConstructionLCA Limited. Accredited Verifier, International EPD® Programme, IBU EPD Programme, EPD Ireland EPD Programme and EPD Norge Programme.
- Marcel Gomez MSc; Director, Marcel Gómez Consultoría Ambiental. Accredited Verifier, International EPD® Programme and CATEEB EPD Programme.
- Kim Allbury MSc; Sustainability Project Manager, Intertek GmbH. Accredited Verifier, EPD Ireland EPD Programme and IBU EPD Programme.

The PCR Review Panel have considered the following documents provided by EPD Ireland:

- PCR Part A Rev A v2.0 (versions dated 7 January 2021 and 17 August 2021)
- General Programme Instructions (version 1.3 dated 14 January 2021 and version 2 dated 17 August 2021)
- Verifier Checklist (version 2021-08-17)
- EPD template (revision F dated 17 August 2021).

The review has been carried out in line with Clause 8.1.2 of ISO 14025: 2006. We have also checked compliance with EN 15804:2012+A2:2019, and with EN 15804:2012+A1:2013 and CEN TR 16970:2016 (where relevant).

Generally, the panel found the versions of the PCR and Programme Documents revised to address EN 15804:2012+A2:2019 were largely compliant, but we noted some issues in comments provided to EPD Ireland, for example in relation to clarity around average EPD, biogenic carbon, use of traded certificates for renewable energy, and wastage rates.

EPD Ireland's responses to these comments were satisfactory, as were the revised documents submitted to us, and this has resulted in a final set of documents dated 17 August 2021 which we agree comply with the standards, ISO 14025 and EN 15804+A2 and when relevant with EN 15804+A1 and CEN TR 16970.

Jane Anderson

Jane Anderson, PCR Review Panel Chair

Date: 8th September 2021

Version 2.1

This PCR was amended without a full panel review on 22/02/2022 with the approval of PCR Panel Review Chair Jane Anderson. The new version includes the following changes:

1. A new paragraph called "6.1.3 Treatment of GWP from waste and secondary fuels in production of cement"

2. The following sentence at “2.1 Modules” : “For the development of scenarios, for example for transport and disposal, conversion factors to mass per declared or functional unit shall be provided”

Jane Anderson

Jane Anderson, PCR Review Panel Chair

Date: 5th March 2022

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1.0 Overview

I.S. EN 15804¹ and associated guidance document CEN TR 16970:2016 [2] form the core Product Category Rules Part A for the development of EPD in Ireland. This document should be read together with the General Programme Instructions and its annexes.

This document sets out further rules for the implementation of the core PCR as follows.

Types of EPD that may be published in the EPD Ireland programme, and life cycle stage modules that are mandatory for inclusion in the different types of EPD

1. Requirements concerning data and data quality
2. Default values for use in calculations for particular modules
3. Requirements concerning the content of EPD
4. Environmental impact categories that are mandatory for use in the environmental impacts in the Environmental Product Declarations (EPD).
5. Resource use categories that are mandatory for inclusion in the EPDs.

At the outset of work to produce new EPD, the practitioner shall check for the existence of specific PCR developed by CEN Product Technical Committees for the product type or other applicable PCR in the order of preference set out in Section 5.3.2 of the General Programme Instructions. If no such PCR is found that absence shall be confirmed in the LCA Project Report.

EPD shall include all information specified in clause 7 of the relevant version of EN15804 and use the appropriate EPD Ireland template specified in the General Programme Instructions.

2.0 EPD Scope

2.1 Modules

The building life cycle and the modular structure by which it is represented in IS EN 15804 and IS EN 15978 is shown in Figure 1.

For EPD compliant with IS EN 15804:2012+A1:2013, Modules A1-A3 are mandatory for the EPD. Additional modules can also be added, at the discretion of the producer.

For EPD compliant with IS EN 15804:2012+A2:2019, each EPD shall have one of the scopes listed below:

1. Modules A1-A3, C1-C4 and D: "cradle-to-gate with modules C1 -C4 and D". These EPD must be based on a declared unit of product.

¹ In this document, references to EN15804 without a version number indicate that the reference is valid for both I.S.EN15804+A1 and I.S.EN 15804+A2 until their respective expiry dates

2. Modules A1-A3, C1-C4, D and additional modules: "cradle-to-gate with options, modules C1 -C4 and D". Additional modules may be A4 and/or A5 and/or B1-B7. These EPD may be based on either a declared unit of product or a functional unit.
3. Modules A, B, C, D: "cradle to grave and module D". These EPD may be based on either a declared unit of product or a functional unit.

EPD of certain products are exempt from the requirement for inclusion of modules C&D within the EPD. Exempt products shall meet **all three** of the following criteria set out in IS EN 15804:2012+A2:2019 clause 5.2:

- the product is physically integrated with other products during installation so that it cannot be physically separated from them at the end of life.
- the product is no longer identifiable at the end of life as a consequence of a physical or chemical transformation.
- the product or material does not contain biogenic carbon.

The exemption must be justified in the project report. EPD for such exempt products may have the following scopes, as alternatives to those listed above:

4. Modules A1 - A3: "cradle-to-gate"
5. Modules A1-A3 and additional modules A4 and/or A5: "cradle-to-gate with options".

For any EPD relating to a product for which specific Product Category Rules (PCRs) have been approved, the modules and functional or declared units specified in the applicable PCR shall be used.

For EPD based on a functional unit, the functional unit shall be defined according to the method set out in clause 6.3.2 of I.S. EN 15804:2012+A2:2019. Reporting of the functional unit in any EPD shall include those elements of its definition specified in clause 6.3.2.1 of that standard. The functional unit definition requires that a Reference Service Life (RSL)² is specified; this shall be reported in the EPD and be verifiable.

For the development of scenarios, for example for transport and disposal, conversion factors to mass per declared or functional unit shall be provided

2.2 Averages and product variability in EPD

EPD apply to specified products produced in specified locations.

Where the EPD applies to a product produced in more than one location, the overall LCA calculation shall represent production in all locations in appropriate proportions. The way in which production in the separate locations is combined in the overall LCA shall be described and justified in the project report.

²For definition of RSL, and requirements relating to its determination, refer to clauses 3.26 and 6.3.4 of I.S. EN 15804:2012+A2:2019



An EPD may be developed for an “average product” representative of a range of products of similar composition. The products included in an EPD for an “average product” shall not differ in any environmental impact indicator results by more than +/- 10%.

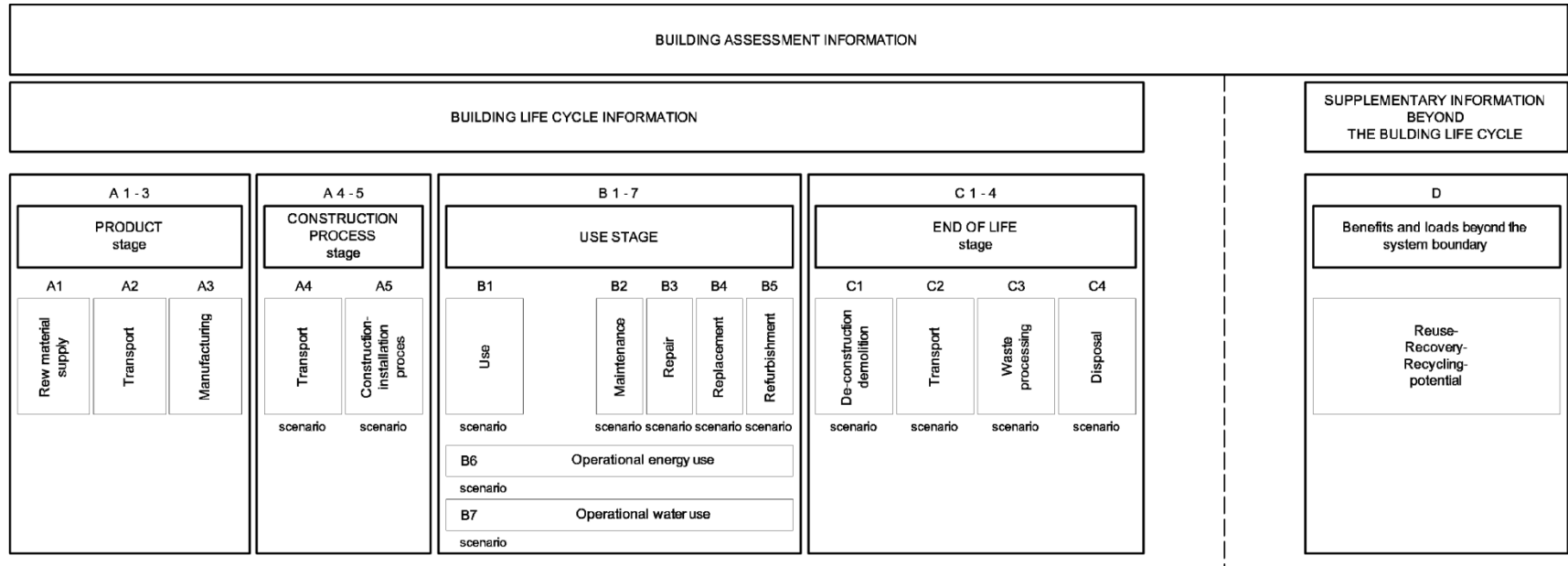


Figure 1 — Life cycle stages and modules for assessment of the environmental performance of buildings

3.0 Data and Data Quality

3.1 Reference Database

The most recent version of the reference database should be used; where the latest version is not used, this shall be justified in the project report. ie ecoinvent database 3.6, or later version, Gabi 2018 or later version. The “allocation, cut-off by classification” system model approach in ecoinvent (called "Allocation, recycled content" in Simapro) most closely follows EN 15804 rules and should be used in EPD. In choosing the reference database, the best available data should be used³.

Note 1. The use of a single database would maximise the comparability of EPD data within the EPD Ireland programme and aid the development of a product database for use in building level LCA in Ireland. All things being equal where data quality is not compromised ecoinvent is preferred for use in EPD Ireland.

3.2 Generic Data

In addition to the requirement of EN 15804, for the production of materials, it is preferred to use data originating from the producer’s own supplier. For generic data (where the data from suppliers is not available) use the values given in Section 7. For other generic data, use the chosen reference database.

The long-term (> 100 years) emissions shall not be included in this assessment methodology except for disposal of products containing biogenic carbon declared as GWP-biogenic, see EN 15804+A2 6.3.5.5;. These are modelled separately within the named database and apply especially for mechanisms such as leaching. The long-term emissions cut-off after 100 years applies to all modules A-D and to all data except disposal of products containing biogenic carbon declared as GWP-biogenic, see EN 15804+A2 6.3.5.5, and should also be selected for generic data (as well as specific data).

As stipulated in EN15804+A2:2019, clause 6.3.8.3, the generic data used shall include data quality assessment information according to EN ISO 14044:2006 clause 4.2.3.6.

3.3 Data Quality Assessment

A data quality assessment shall be conducted and documented in the project report. In accordance with EN15804+A2:2019 6.3.8.3, this assessment shall use one of the data quality systems specified in EN15804+A2:2019 Annex E.

4.0 Generic default values for use in calculations and scenarios

To ensure consistency and facilitate interpretation, default generic data are specified here for the electricity supply mix, and for parameters relevant to the scenarios used for calculations in modules other than A1-A3.

³ ISO 14025 Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006, IDT)

Where the relevant modules are included in the EPD, the information set out in Tables 10-15 of in I.S. EN 15804:2012+A2:2019 (for EPD compliant with that version of the standard) or Tables 7-12 of in I.S. EN 15804:2012+A1:2013 (for EPD compliant with that version of the standard) shall be reported in the EPD

4.1 Electricity

The electricity mix used in modules A1-A3, A5, and B1-B7, and the treatment of renewable generation, should be transparently reported in the EPD and project report.

The modelling of electricity in Module A3 shall adopt the following principles:

4.1.1 Internally generated electricity

For internally generated electricity (e.g. on-site generated electricity) consumed for a product under study and for which no contractual instruments have been sold to a third party, the life cycle data for that electricity shall be used for that product.

4.1.2 Electricity from a directly connected supplier

Life cycle data representing the consumed electricity obtained from the supplier to facilities within the scope of Module A3 may be used if there is a dedicated transmission line between the organization and the generation plant from which the emission factor is derived, and no contractual instruments have been sold to a third party for that consumed electricity.

4.1.3 Electricity from the grid

If the facilities within the scope of Module A3 purchase electricity under a contract in which no specific mix of fuels or generation types is specified, then the relevant residual electricity mix⁴ shall be applied. The selection of the residual mix to apply shall take account of the time period covered by data for the facilities.

Life cycle data representing a specific electricity product as generated, or purchased, from an electricity supplier may be used instead of the residual mix, provided that the organisation has a commitment to purchase this green electricity for the duration of the EPD's validity, and that the electricity supply contract:

- conveys the information associated with the unit of electricity delivered together with the characteristics of the generator.
- is supported by Guarantees of Origin or equivalent, which
 - is tracked and redeemed, retired or cancelled by or on behalf of the reporting entity correspond as closely as possible in time to the period to which the contractual instrument is applied
 - are produced within the country or within Europe in the case of facilities in Ireland or elsewhere in Europe, or within an electricity market interconnected to the market where the facility is located in the case of facilities in other regions.

If the characteristics of the supply mix change during the validity of the EPD and this has a material effect on the indicator values reported in the EPD, then the EPD shall be updated.

4.2 Transportation distances

⁴ residual mix information can be found at: <https://www.aib-net.org/facts/european-residual-mix>

4.2.1 Transportation (Module A2)

For transportation of raw materials to the manufacturing factory gate, actual transportation distances and modes must be used.

4.2.2 Transportation (Module A4)

If data for the transportation distances from production place to construction site are available, these shall be used. If it can be verified that there is no specific data available, because this supplier cannot or does not want to provide it, it is permitted to use generic data.

The following generic default values are applicable to transportation (summarised in Table 1).

One-way transportation distance to the construction site if the construction product is manufactured in Ireland:

- for bulk material: 100 km
- for other materials, products, and elements: 200 km.

In the case of civil engineering works, the transportation distance of each work is included in the calculation.

If the construction material/product is imported into Ireland, the actual transportation distances and modes from the manufacturing factory gate to the port of entry in Ireland must be used. From that point, the generic default values for transportation distance in Ireland can be used.

Return transportation distances should be included in the calculation assuming that the vehicle is empty, unless it can be shown that the return transport is loaded. If specific data for capacity utilisation² is available, this shall be used. Otherwise, capacity utilisation (including return transport) of the UK's average for freight vehicles of 46% [4] or other justifiable generic loading factors shall be used.

4.2.3 Transportation to waste treatment (Module C2)

- For removal of materials from a site to landfill or breaking/sorting sites, the default distance is 50km.
- For removal of materials from a site to a waste to energy plant (WtE), the default distance shall be specified as the transport distance from the site to the closest of three locations (Dunleek, Co. Meath; Ringsend, Co Dublin or Ringaskiddy, Co. Cork) or as a default transport distance of 250 km, whichever is less.

Note 2. Capacity utilisation is the ratio of the actual goods moved to the maximum tonne-kms achievable if the vehicles, whenever loaded, were loaded to their maximum carrying capacity.

Table 1 – Details of generic default values for transportation distance in Ireland

Description	Units	Default Value
Factory gate to construction site, Irish bulk products, e.g. cement,	km	100

lime, gravel, bitumen		
Factory gate to construction site, Irish manufactured products, e.g. windows, insulation, cladding, paints	km	200
Factory gate to construction site, imported manufactured products	km	See note 3
Waste materials from construction site to landfill	km	50
Waste materials from construction site to waste to energy plant	km	250 (see note 4)
Vehicle Capacity Utilisation: Transport, lorry > 16t, fleet average / RER U	%	46 (see note 5)

Note 3. In the case of materials/products imported into Ireland, the actual transportation distances and modes must be used from the manufacturing factory gate to the port of entry in Ireland. From that point, the generic default values for transportation distance in Ireland can be used.

Note 4. Or use transport distance from the site to the closest of three locations (Dunleek, Co. Meath; Ringsend, Co Dublin; Ringaskiddy, Co. Cork), if less.

Note 5. Return transportation loading should not be included in the calculation, unless it can be shown that the return transport is loaded. If specific data for capacity utilisation² is available, this shall be used. Otherwise, capacity utilisation (including return transport) of the UK's average for freight vehicles of 46% [4] shall be used.

4.3 Loss in the form of construction waste (Module A5)

In the supply, storage of products and construction assembly process, some of the materials will be lost. A consequence of this loss is that more product must be manufactured to ensure that sufficient is available for the application.

The level of loss is dependent on the application, the construction site and the care with which activities are conducted. If data for losses are available, these shall be used. If it can be verified that there is no specific data available it is permitted to use generic data. The generic default values given in the following sub-sections are applicable to losses, based on the Dutch Assessment methodology SBK 2015 [5]:

4.3.1 Pre-assembled products

Product manufactured to size in a controlled off-site environment, for example doors and windows, can be expected to show relatively low rates of wastage, for example through occasional damage. A default wastage rate of 1% is applied

4.3.2 Prefabricated products

Prefabricated products manufactured in a controlled off-site environment (e.g. concrete blocks, roof-tiles, plasterboard, insulation): For these products, some waste can often be directly inserted back into the process. The assumption is that 5% of the materials are lost (on the construction site or during transportation to it).

4.3.3 In-situ products

Products manufactured on the construction site (e.g., site-mix mortars, carpentry works), commonly produce additional waste, and material is often lost due to damage or weather. The assumption is that 8% of materials are lost.

4.3.4 Ancillary and finishing materials

Ancillary and finishing materials refer to epoxies, glues, paints, and other materials which often remain and become obsolete after a period of time. Also, residue is left behind in packaging or on application instruments. The assumption is that 15% of the materials are lost.

Table 2 – Default values for loss in the form of construction waste⁵.

Type of product	Materials lost
Pre-assembled products	1%
Prefabricated products	5%
In Situ products	8%
Ancillary and finishing materials, epoxies, glues and paints.	15%

4.4 Disposal and Recycling (Modules C4, D)

4.4.1 Disposal methods and recycling rates

4.4.1.1 Packaging and Municipal Waste

For packaging and mixed municipal waste streams, the most recent available waste statistics for Ireland should be used. These are published by the Environmental Protection Agency at <http://www.epa.ie/nationalwastestatistics/nationalindicators/>

in the absence of more recent data, the following values (for 2017) may be applied:

Municipal Waste:

- landfill disposal: 23%
- recovery in waste-to-energy plant: 65%
- recycling: 12% (based on 17% of household waste collected in dedicated recycling bins, of which c.68% is fit for recycling⁶)

Packaging Waste:

- landfill disposal: 14%
- recovery (assumed incineration in waste-to-energy plants): 20%
- recycling: 66%

Mixed construction & demolition waste

⁵ Assessment Method Environmental Performance Construction and Civil Engineering Works (GWW) Version 2.0 November 2014 : Stichting Bouwkwalliteit, Holland

⁶ <http://www.epa.ie/nationalwastestatistics/household/>

Where the composition of non-specific construction & demolition waste and/or information about the waste management applied to its constituents is/are required, the information in the table below values should be used, based on statistics for Ireland for 2017⁷:

Table 3: Default Values for construction & demolition waste

Constituent	Percentage of non-specific C&D waste	Percentage recycled	Percentage recovered	Percentage to landfill
Soil & stone	81%	0	75%	25%
Concrete, bricks, tiles and similar	6.5%	0	100%	0
Segregated metals	4%	100%	0	0
Segregated wood, glass and plastic	0.5%	100%	0	0
Mixed materials	8%	0	0	100%

For specific packaging material streams and non-packaging material streams from manufacturing operations, default EU-27 post-consumer recycling rates collated for use with the European Commission's Product Environmental Footprint (PEF) LCA method should be used. These can be found in the file:

https://ec.europa.eu/environment/eussd/smgp/pdf/CFF_Default_Parameters_March2018.xlsx

(See column F of the tab labelled A-R1-R2)

4.4.2 Incineration in waste-to-energy plants (WtE)

Avoided energy production is taken into consideration when considering the incineration at the Waste to Energy plant (WtE). This information is included in module D, and the associated loads and benefits calculated following the method specified in IS EN15804+A2:2019 6.4.3.3

Note that electricity but not heat is recovered at the waste incineration plant in Ringsend, Dublin, while significant quantities of waste are used as fuel in cement kilns in Ireland. Average net return of Irish waste to energy plant (WtE) are yet to be determined across these facilities and for existing operational plants at Ringaskiddy and Duleek.

Pending further research and default values use appropriate data from the generic database.

To include the avoided energy production, the WtE plant is required to meet the threshold performance requirements specified in IS EN15804+A2:2019:

- For avoided electricity: the Ecoinvent process "Electricity mix/IE U" (>20 kV; production and import; no transformation and transportation / distribution loss); or equivalent processes from Gabi if this is used as the reference database for the EPD and

⁷ based on data at <http://www.epa.ie/nationalwastestatistics/constructiondemolition/> and assuming that all segregated metals, wood, glass and plastic are recycled; that segregated concrete, brick, tiles are recovered, and that the remainder of the overall 71% recovery is comprised of soil and stones.

- For avoided heat generation: 'Heat, natural gas, at industrial furnace >100kW/RER U' (process in MJ) [Ecoinvent] or equivalent from Gabi if used as the reference database.
- The calculation is based on the Lower Heating Values (LHV) that Ecoinvent provides in the process descriptions or based on the equivalent from Gabi.

5.0 Module D

Module D indicates "the potential benefits of avoided future use of primary materials and fuels while taking into account the loads and processes associated with recycling and recovery processes beyond the system boundary". Thus, Module D in a particular EPD reports potential benefits and loads accruing to future product systems that may or may not include the product covered by that EPD.

Indicator values in the EPD for Module D shall be calculated following IS EN 15804:2012+A2:2019 Clause 6.4.3.3; the applicable formula is stated in Annex D 3.4 of the standard.

Module D calculations are based on scenarios. The scenarios used should be consistent with other scenarios used in the EPD and based on current average practice or technologies (see Section 4 for relevant guidance on some aspects); where the average is unknown, the lowest-impact of possible primary-production technologies should be applied, which results in a conservative calculation of any benefits. Note that the benefits and loads of using wastes and secondary materials as fuels may be included in the Module D calculation.

The benefits and / or loads reported in Module D are calculated for net flows of secondary materials, energy, and fuels across the system boundary (secondary materials, fuels and energy leaving the system minus secondary materials, fuels and energy used in manufacture, and other modules declared in the EPD). The burdens of returning waste materials to functional equivalence of virgin materials must be accounted for in the Module D calculation. In cases where the output flow does not achieve functional equivalence, a justified value-correction factor shall be applied, in order to reflect this difference in the calculated benefits. Electricity produced at manufacturers' facilities (for example from on-site photovoltaic panel arrays) and exported to the grid does not constitute a flow of secondary fuel or recovered energy and shall not be included in the module D calculation unless the activity producing the electricity is a waste management activity in which wastes cross the end-of-waste state.

Note that in a case where a product contains a very high proportion of recycled content for a particular material constituent but the expected recycling &/or recovery rates for that material (as a proportion of the particular material waste stream) on leaving the system is lower than the proportion in the product, the calculated net flow of this secondary material leaving the system will be negative. This could lead to loads (negative benefits) resulting from the Module D calculation (i.e., imply that there is an environmental burden associated with recycling).

6.0 EPD Content

The EPD shall contain the information specified in EN15804+A2:2019.

For any product for which the mass of biogenic carbon-containing material in the product and any accompanying packaging exceeds 5% of the declared unit, information about the biogenic carbon content shall be included as specified in EN15804+A2:2019 6.4.4 EPD compliant with this version of the standard.

For EPD in which some modules are represented in the LCA using scenarios, the scenario parameters specified in EN15804+A2:2019 7.3.2, 7.3.3 and / or 7.3.4 - as appropriate to the modules included - shall be reported in the EPD

6.1 Environmental Indicators

6.1.1 Parameters describing environmental impacts

The impact assessment in the LCA shall be carried out applying the environmental impact categories and indicators:

- as specified in EN15804+A1:2013 clause 7.2.3, for EPD compliant with EN15804+A1:2013
- as specified in EN15804+A2:2019 clause 7.2.3, for EPD compliant with EN15804+A2:2019

Application of the above impact categories is mandatory and the results for all categories shall be included in the project report. For EPD compliant with EN15804+A2:2019, inclusion of the additional indicators listed in 7.2.3.2 in the published EPD is optional. EPD compliant with EN15804+A2:2019 shall include the disclaimers in relation to certain category indicator results that are specified in EN15804+A2:2019 7.2.3.3, Table 5.

EPD that are compliant with both EN15804+A1:2013 and EN15804+A2:2019 shall include both sets of environmental indicators and categories noted above. One shall be reported as "additional environmental information".

For EPD compliant with IS EN 15804:2012+A1:2013, the characterisation factors detailed in IS EN 15804:2012+A1:2013 Annex C [1] shall be used, which are based on the CML 2001 Baseline version that is dated October 2012 (Institute of Environmental Sciences, Faculty of Science University of Leiden, Netherlands).

For EPD compliant with IS EN 15804:2012+A2:2019, the impact assessment methods specified in Annex C, C.1 shall be used, applying additional calculation rules specified in Annex C, C.2 and the characterisation factors specified in C.4, published at:
<http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>

Additional environmental impact categories shall be included within the impact assessment underpinning EPD compliant with IS EN 15804:2012+A2:2019, for the categories specified in Clause 7.2.3.2. Indicators for these categories shall be calculated using the methods and

models specified in IS EN 15804:2012+A2:2019 Table C2 and the characterisation factors specified in C.4. Results shall be reported in the LCA project report.

The results of these and other non-mandatory impact categories may be included in the EPD for information or in order to allow validity in other jurisdictions.

6.1.2 Parameters describing resource use, waste and non-elementary flows crossing the system boundary

The indicators describing resource use, waste generation and non-elementary flows crossing the system boundary (energy, fuel or material inputs and outputs) specified in EN15804 clause 7.2.4.and 7.2.5 are mandatory and shall be included in the EPD.

6.1.3 Treatment of GWP from waste and secondary fuels in production of cement.

GWP should be based on emissions from primary fuels only, but GWP based on total (gross) CO₂ emissions from the facility shall be included as additional information.

Alternatively this additional information can be expressed as CO₂ emissions that have been excluded from the GWP calculation because they have been assigned to waste & secondary fuels. These can be split into biogenic / fossil if this information is available on the make up of the fuel.

References

1. *IS EN 15804:2012+A1:2013. Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products.* National Standards Authority of Ireland (NSAI), Dublin, Ireland.
2. *S.R. CEN/TR 16970:2016 Sustainability of construction works - Guidance for the implementation of EN 15804,* National Standards Authority of Ireland (NSAI), Dublin, Ireland.
3. 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>
4. N. Hill, R. Watson, K. James. *2016 Government GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors,* September 2016, Department of Business Energy & Industrial Strategy, London, UK. Should emission factors be required, the most recent version of the UK GHG emissions factors shall be used. These are found at:
<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020> or later.