PRODUCT CATEGORY RULES (PCR) – BASIC MODULE

CONSTRUCTION PRODUCTS AND SERVICES

ACCORDING TO THE EN 15804:2012+A2:2019

centroHabitat
Plataforma para a Construção Sustentável

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TABELA DE ESQUEMAS

1. INTRODUCTION

The DAPHabitat System is a Portuguese registration program of Type III Environmental Product Declarations (EPD) for product from habitat field. The Habitat field includes all the products and services involved in buildings and construction works.

This national registration program allows any company or interest entity the development or approval of Product Category Rules (PCR) and the registration of EPD, independent from its home country.

An EPD presents information about environmental performance of products over the life cycle, demonstrating quantitatively, the environmental impacts caused by the product during its service life. In Europe, an EPD for construction products and services must be elaborated according with the requirements of the EN 15804, his standard being considered "core PCR". This standard was published in 2012 and reviewed in 2013, and then in 2019, by CEN (*European Committee for Standardization*) and is part of a set of standards dedicated to the assessment of the sustainability of construction work, both at the product and at building level.

The concept adopted by DAPHabitat System for the EPD elaboration, is that these documents must give the environmental data of products based in studies of Life Cycle Assessment (LCA), and these studies must guide through a set of specific rules, determined since 2012 by the standard EN 15804. Consolidating this idea, an Environmental Product Declaration to be registered in the DAPHabitat System must be carried out based on Complementary Product Category Rules (c-PCR) published by CEN TC, or, in the absence of a c-PCR published in the form of a European normative document to support the EPD, specific PCR provided by the DAPHabitat System must be available. **It is important that this verification is carried out since c-PCR supersedes out the PCR documents published by Programme Operators related to the products of interest category**. Some examples of c-PCR published by CEN TC can be consulted:

EN 16757 "Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements".

EN 16908 *"Cement and building lime - Environmental product declarations - Product category rules complementary to EN 15804".*

EN 16485 "*Round and sawn timber – Environmental Product Declarations – Product category rules for wood and wood-based products for use in construction".*

EN 17160:2019 *"Product category rules for ceramic tiles".*

EN 17213 "Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets"

…

If this situation is also not possible, the EPD must be prepared in accordance with this document (PCR basic model), and in accordance with EN 15804.

This document, PCR – basic module for construction products and services, is part of the official documentation and the work of DAPHabitat System, stablishing the general rules for the elaboration of the studies of Life Cycle Assessment according to the referred standard, the EN 15804, for construction products and services.

2. ABBREVIATIONS

EPD	Environmental Product Declaration
PCR	Product Category Rules
c-PCR	Complementary Product Category Rules
LCA	Life Cycle Assessment
RSL	Reference Service Life
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment

3. CONTEXT

The present document (PCR – basic module specific for construction products and services) was prepared based on EN 15804, and its general content is applicable to any specific PCR document developed by DAPHabitat System. The PCR basic model document may not specify some requirements considered important for conducting a comparable LCA. However, in the DAPHabitat system, if there is no supplementary PCR document published by the CEN TC in the form of European standards or a specific PCR for a particular category of product, the entity may carry out LCA studies in accordance with the principles of the **PCR – basic module for construction products and services of DAPHabitat System**, together with the EN 15804.

A specific PCR document for a certain product category, in the context of construction products and services, must define, at least, the Reference Service Life, the functional unit and the declared unit, relevant to the group of products that represents. All the specific PCR have to be published in the DAPHabitat System database and submitted to a public consultation process through the PCR Forum (tool available at www.daphabitat.pt), as well as submitted to the Technical Committee evaluation.

The LCA supporting study is based on the present document that agrees with the standards that are listed below:

- NP ISO 14025:2009 – ""*Environmental labels and declarations – Type III environmental declarations – Principles and procedures* ;
- ISO 21930:2017 – "Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services";
- EN 15804:2012 + A2:2019/AC:2021 – "Sustainability of construction works - Environmental

productdeclarations - Core rules for the product category of construction products";

- NP EN ISO 14044:2010 – "; *Environmental management – Life cycle assessment – Requirements and guidelines*
- NP EN ISO 14040:2008 – *"Environmental management – life cycle assessment – Principles and framework"*
- CEN/TR 15941 – "Sustainability of construction works – Environmental product declarations – Methodology and Data for Generic Data". CEN/TR 15941:2010;
- FprEN 15942:2021 – "Sustainability of construction works. Environmental product declarations. Communication format business-to-business".

4. CONTEXT AND OBJECTIVE

This document specifies the general calculation rules, according to the EN 15804, for conducting LCA studies supporting the preparation of an EPD to be registered in DAPHabitat System, for all construction products and services for buildings and other construction works, stablishing guidance for the elaboration of the Project Report delivering the EPD for the verification assessment.

In the DAPHabitat System, the LCA study of a product must be conducted according to:

- the complementary PCR (c-PCR) published by CENT TC, as European standards according to different product categories. C-PCR must be used together with this document and EN 15804.
- the "PCR: basic module for construction products and services (updates version)" document. C-PCR must be used together with this document and EN 15804.
- the respective specific PCR and the support of the PCR: basic module.

Figure 1 represents the context of the use of a PCR – basic module document, the specific PCR document published by DAPHabitat System, and the European complementary PCR document.

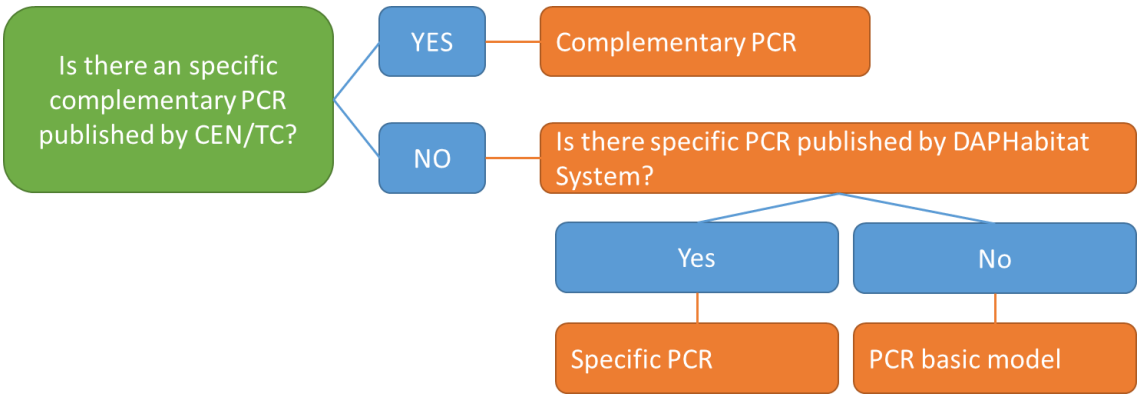

Figure 1. Context of the use of a PCR - basic module document and a specific PCR.

It is allowed the elaboration of an EPD based on the PCR – basic module and on the current version of EN 15804 if:

- there is no complementary PCR document related to the interested product' category published by CENT TC as European standard available to use;

- there is a PCR document in other registration program belonging to DAPHabitat system or another ECO Platform programme operator that can't be recognized and adopted.

However, it should always be efforts for the achievement of complementary PCR documents or specific PCR documents (when the first ones are not available), once these allows to focus the LCA study for a determined product category, making this work more concise, consistent, restricted and economic.

5. LCA CALCULATION RULES

5.1. Life cycle steps and information modules according to EN 15804:2012+A2:2019

The environmental information to declare an EPD can include all the life cycle steps of the product, i.e., from cradle-to-grave. However, it is assumed that an EPD should report at least the life cycle corresponding to cradle-to-gate. All the life cycle steps considered should be reported in the EPD in the form of information modules (Table 1).

Table 1. Information modules (source: EN 15804:2012+A2:2019)

Module	Life cycle stages
A1 – A3 **Product stage**	**A1)** Raw materials supply
	A2) Transport
	A3) Production
A4 – A5 **Construction process stage**	**A4)** Transport
	A5) Construction installation process
B **Use stage**	**B1)** Use
	B2) Maintenance
	B3) Repair
	B4) Replacement
	B5) Refurbishment
	B6) Operational energy use
	B7) Operational water use
C **End of life stage**	**C1)** Deconstruction, Demolition
	C2) Transport of the product
	C3) Waste processing
	C4) Waste Disposal
D **BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY**	**D)** Re-use, recovery, recycling potential

An Environmental Product Declaration for construction products referred to Electrical and Electronic Equipment (EEE) must be developed in coherence with EN 15804 and EN 50693. In these declarations, module B should be declared. The scenarios to be considered in module B6 should consider the representative geographical region and current regulations.

5.2. Functional or Declared Unit

Given the possibility that a construction product may have multiple functions, depending on the purpose and scope of the EPD, it can adopt a functional unit, when associated with a specific function or scenario, or a declared unit, when associated with a variety of functions and scenarios.

The requirement to specify the functional or declared unit is because they provide a reference related to which material input and output flows attributed to the construction product are normalized (in a mathematical sense) to produce data expressed on a common basis. In addition, the functional or declared unit also allows the calculation of the environmental impacts of a building or construction work (EN 15978), by adding up the quantified impacts per indicator and selected life cycle stages of the construction products at the building level.

5.3. Functional Unit

The functional unit provides a reference for the quantification of the environmental performance of the product, being required for a cradle-to-grave EPD. This unit is defined in a specific/complementary PCR document following the guidance of EN 15804, no point 6.3.2.

The functional unit expresses the function or the performance characteristics of the product in a quantifiable manner on a common basis, which makes it possible to compare product systems with the same functional unit. For construction products the functional unit is identified according to the function that a certain product can perform in the building and other construction works. The functional unit of a construction product must be based on its Reference Service Life (RSL) (see 5.4.1.) or the building RSL, according to the conditions of use defined.

For the functional unit to be well defined, the product and material should be well specified, and it should be precise and objective so that the product can be unambiguously identified. In the case of scenarios such as for transport and disposal, conversion factors to mass per declared or functional unit shall be provided.

The future function of a building or construction product is often uncertain since the full functionality of a product may not be required at the building level. Thus, it is difficult to define a complete functional unit that contains the information about the required technical performance of the product throughout its entire life cycle. However, in a cradle-to-grave EPD with a functional unit, a default (typical) application and the key functionalities must be defined. These functionalities are normally required from the product in this application and provide other functional information as additional technical information.

The specific/complementary PCR indicates which functional unit to use for the LCA of the product studying, considering the technical and functional characteristics of the product type.

5.4. Declared Unit

The declared unit is used instead of the functional unit when the functional unit cannot be unambiguously described. This happens when the exact function of the product or usage scenarios are not clearly identified, or are unknown, or cannot be defined because the product can be applied in many ways in the context of construction works. The EPD based on a declared unit may cover the whole life cycle of the construction product. The declared unit must be related to the typical applications of the product.

The declared unit must be one of the listed in point 6.3.3 of the EN 15804 standard. When choosing for a different declared unit, this choice should be duly justified. An EPD should provide additional information that allows the conversion of the unit into one or more "type of units".

In the case of scenario development, such for transport and disposal, conversion factors to mass per unit declared should be provided. Additional conversion factors may also be required by product standards or a c-PRCs.

5.4.1. Reference Service Life

The information about the Reference Service Life (RSL) of a construction product is determined according to the product function in the use stage and it is provided by the manufacturer (this information must be verifiable, justified and declared). The RSL should express the technical and functional performance of the construction system, being stablished according to European standards or, if not available, a c-PCR. For estimating the RSL value of the product that is not available, the specifications of ISO 15686-1, ISO 15686-2, ISO 15686-7 e ISO 15686-8 must be followed, as well as other requirements stablished in standards and legislation about construction products[4] shall be followed. In the presence of European product standards or c-PCR that provide guidance on how to derive RSL, such guidance will have priority.

In order to achieve the declared functional technical performance, the reference conditions of use and the declared RSL must contain the information described in point 6.3.4.1 of EN 15804.

The Reference Service Life of a product depends on the properties and characteristics of a certain product and its reference conditions; thus, it shall also be declared. Thus, it should be noted in the EPD that the information about the reference product RSL only is valid with the declared reference conditions.

[4] In the ANNEX A of the standard EN 15804:2012+A2:2019 we can find some requirements and guidance lines to estimate the RSL.

5.4.1.1. RSL Scenarios and Functional Unit

In EPDs based on functional units, the reference conditions of use applied in defining the RSL, the functional unit and all scenarios developed must be consistent.

The declared RSL for a construction product must be related to its declared technical performance and any maintenance or repair, in order to provide the performance during the RSL. Therefore, all scenarios included in modules A4, A5 and B1-B7 must be based on the reference conditions of use specific to RSL. Likewise, the scenarios of a cradle-to-grave must also comply with the reference conditions of use.

5.5. System Boundaries

The system boundaries determine which information modules and unit processes that should be include in the LCA. It should be defined the detail level in which the unit processes should be studied. The criteria used to establish the system boundaries should be identified and duly substantiated in the ProjectReport.

The system boundaries, according to 6.3.5.1 in the EN 15804, should be based on two principles:

- Principle of "modularity" – the processes that influence the environmental performance of products throughout their life cycle, should be charged to the life cycle of the module where they occur. All aspects and environmental impacts are declared in the life cycle stage where they occur;

- The "polluter-payer" principle - waste processing procedures should be allocated where they are generated until the end-of-waste status is reached.

These principles are applied throughout the life cycle of the product or construction material, and are reflected in formulas that can support the calculations to be carried out, in Annex D of the EN 15804. No other formula should be used for the implementation of these principles.

The boundary definition can lead to five EPD types (Table 2):

- Cradle-to-gate EPD with modules C and D – where is mandatory to consider the information modules A1 to A3, C1 to C4 and D;
- Cradle-to gate EPD with options, modules C and D - where is mandatory to consider the information module A1 to A3, C1 to C4 and D. Additionally, some optional modules from A4 to B7 can be selected;
- Cradle-to-grave EPD and module D – where the entire information modules, from A to D, are mandatory.
- Cradle-to-gate EPD – where is mandatory to consider the information module A1 to A3;

- Cradle-to gate EPD with options - where is only mandatory to consider the information module A1 to A3. Optional modules can be A4 and/ or A5.

Table 2. *Different EPD typologies according with the information modules included*

Module	Life Cycle Stages	EPD typologies				
		Cradle-to-gate with modules C, D	**Cradle-to-gate with options modules C, D**	**Cradle-to-grave and module D**	**Cradle-to-gate**	**Cradle-to-gate with options**
		Declared Unit/ Functional Unit	Declared Unit/ Functional Unit	Functional Unit	Declared Unit/ Functional Unit	Functional Unit
A1 – A3 Product stage	**A1)** Raw materials supply	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
	A2) Transport					
	A3) Production					
A4 – A5 Construction process stage	**A4)** Transport	-	Optional	Mandatory	-	Optional
	A5) Construction installation process					
B Use stage[5]	**B1)** Use	-	Optional	Mandatory	-	Optional
	B2) Maintenance					
	B3) Repair					
	B4) Replacement					
	B5) Refurbishment					
	B6) Operational energy use					
	B7) Operational water use					
C End of life stage	**C1)** Deconstruction, Demolition	Mandatory	Mandatory	Mandatory	-	Optional
	C2) Transport of the product					
	C3) Waste processing					
	C4) Waste Disposal					
D BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY	**D)** Reuse, recovery, recycling potential	Mandatory	Mandatory	Mandatory	-	Optional

All construction products or/and materials must declare modules A1-A3, C and D. Only products that meet the following three conditions can be exempted from this requirement:

- The product or construction material is physically integrated with other products during installation, and it is impossible to physically separate them at end-of-life;

Nota

[5] In the Use stage (B1-B7) it is mandatory to consider the RSL

- The construction product or material is not identifiable at end-of-life as a result of physical or chemical transformation processes;
- The product or material does not contain biogenic carbon.

When certain module(s) and indicator(s) are not declared, they should be marked as "ND". If it is observed that any indicator has been assigned a result equal to zero, then "0" must be declared for this indicator. The "-" statement is not allowed. These situations must be documented in the Project Report. If an indicator is declared, it must be declared in all chosen modules. If an optional module is declared, all chosen indicators must be declared.

The construction process stage and the use stage are optional for a cradle-to-gate with options EPD (module C and D), but it should be identified and specified separately from the product stage. Additional modules can be A4 and/or A5.

In a cradle-to-grave EPD, it should be considered all stages of the life cycle, and the environmental impacts should be presented separately, in order to ensure comparability between the EPD.

In the specific/complementary PCR documents there are examples of unit processes to consider in certain modules in any of the stages, in order to illustrate what is intended for the LCA study and thus for the EPD. Within the system boundary definition must be made a description for each module included in the life cycle stages of the product, as well as the establishment of a flowchart to include both in the Project Report as in the EPD.

5.5.1. Life cycle stages

The description here in is a general one, since not all the above processes are relevant or sufficient for all types of construction products. In the specific PCR to be developed, it is possible to add or reduce unit processes to consider for the specific product category.

A. Product Stage (Mandatory)

The product stage is composed by information modules related to the extraction and processing of raw materials, its transport until the production site and the product production.

To this life cycle stage some important considerations are listed:

- The product stage is completed with the product finalization and ready to be delivered (including the package);
- The residual heat emission doesn't need to be declared, being considered indirectly in the energy consumption;
- The waste production that is reintroduced in the production process, replacing raw materials, has to be included within the system boundaries (closed loop). They are recorded as secondary material;

- Benefits and charges allocated to coproducts cannot be declared in the module D. If this allocation cannot be performed clearly, other methods must be used but must be duly justified. As a general adopted rule, the benefits and loads resulting from the A1 -A3 module should not be considered in module D (see EN 15804 point 6.3.5.2);
- For products with incorporated biogenic carbon, the amount of biogenic carbon in the construction product that leaves the factory gate must be declared separately for both the product and any accompanying packaging;
- The useful energy obtained from the energy recovery of waste production generated in A1 -A3 modules can be considered in a closed loop within the A1 -A3 module, but only until the amount of energy (MJ) which is required for production (assumption: the product of stage A1 - A3 is considered as a module) . For the energy that exceeds the amount consumed in a closed loop, an economic allocation between the excess energy flows and the flow of product can be made.

For each information submodule the following processes are indicated:

- **A1) Extraction and processing of raw material:**
  - Extraction and processing of raw material and production and processing of biomass;
  - Reuse of products or materials of previous production systems;
  - Secondary materials processing used as inputs in the product manufacture, but not included in the processes that made part of the waste processing in previous production systems;
  - Electricity production, steam and from primary energy resources, including their extraction, refining and transportation;
  - Energy recovery or other recovery process from secondary fuels, but not including processes which are part of the waste processing in previous production systems.

- **Transport to the production site:**
  - Transports to the factory gate and internal transports.

- **A3) Production:**
  - Production of auxiliary materials and pre-products (if applicable);
  - Product and coproduct production;
  - Package production (if applicable, included for raw materials).

- **A1-A3):**
  - Waste processing by the end-of-waste status or their final destination, including any packaging not associated with the exit of the product.

B. Construction process stage

The construction stage is an optional stage and includes the information modules about the transport of products to the construction site and its installation in the building or in other construction works, including all materials supply and energy, as well the waste processing by the end of waste status or their destination.

For each information submodule the following process are indicated:

❖ **A4) Transport:**

- Transport from the factory gate until the construction site (for example work). This should include an estimative of transport of all goods necessary since the end of product stage to the construction site, including any shipping to distributors, shops, etc. The transport of persons doesn't need be considered.

❖ **A5) Product installation process:**

- Product installation in the building or other construction work, including the production and transport of auxiliary materials and any energy or water required for the installation or operation of the construction site.

❖ **A4-A5):**

- storage of the products, including the provision of heating and cooling and humidity control among others, in order to maintain the necessary conditions for their storage;
- the loss of construction products (additional production processes to compensate for the loss of products);
- Waste processing resulting from product packaging and product losses by the end of waste status or final destination.

The defined scenarios and foundations established for the calculation shall be properly documented in the Project Report, and properly presented in the EPD, as indicated in section 7.3.2.1 and 7.3.2.2 of the EN 15804:2012 + A2:2019, in Tables 10 and 11.

C. Use stage

For Electrical and Electronic Equipment (EEE), including Heating, Ventilation, and Air-conditioning (HVAC) systems permanently installed in the building, this stage is mandatory.

For the others construction products, the use stage is an optional step and is constituted by information modules covering the period from the delivery of the building or construction works as completed to its deconstruction or demolition. The duration of the use stage relative to the product may be different from the required lifetime of the building or construction work (for which the construction was

designed).

The use stage includes information modules related to the function of the products, equipment and construction services. This step also includes protection, conservation, monitoring and building control or other construction work, for example modules that describe the operation of the building for services such as heating, cooling, lighting, water supply and internal transport (supplied by example by stairs and elevators). Also, should include maintenance (including cleaning), repair, replacement and rehabilitation.

The information modules are grouped on the B1 to B5 and B6 B7. In the case of deviations from the group of information on these two sets of modules (recognizing the possible difficulty of separating the processes with associated impacts on defined information modules) this should be properly declared and justified in the EPD.

D. Modules step of using information for the construction of the components (B1-B5)

For each information submodule to indicate the following procedures:

- **B1) Use of the installed product:**

  - the module relative to the "use of the installed product" covers the aspects and environmental impacts of building components (or other construction work) during their normal use (planned), (emissions into the environment not covered by modules B2 -B7).

- **B2) Maintenance:**

  - the information module on "maintenance" covers information of all the techniques or actions during the lifetime of the product, in order to maintain the same operating conditions, as well as the preservation of aesthetic characteristics of the product, for example cleaning or other kind of preventive maintenance. The consumption of energy and water cleaning should be reported in this chapter and not in B6 and B7 information modules. It is also in this chapter that the production and transport of necessary ancillary products as well as the transport and management of any waste produced during the various types of maintenance should be considered.

- **B3) Repair:**

  - The information module about the “repair” consists of the compilation of environmental aspects and impacts resulting from a product repair process or when part of the product is damaged to which resume a necessary condition to perform its function (including its technical requirements and functional) . This module also covers a production and transport of auxiliary products, required use of water and energy as well as transport and management of any residual

produced in the repair actions. This module also must include the repair to preserve the aesthetic qualities of the product.

Note: The change of damaged components (partial or total) an element should be assigned to the information module concerning the repair, while the total exchange element should be assigned to the information module about the replacement.

- **B4) Replacement:**

  The "replacement" module considers the aspects and environmental impacts related to the replacement of a construction product, so that it resumes its condition to technical and functional performance, for total replacement of a construction element. In the case of replacing the entire construction element, part of a concerted plan of the building (or other construction work), that should be considered as a rehabilitation/renovation (report to the information module B5). The production and transport of auxiliary materials necessary to this stage, use of water and energy, the transport and management of any produced waste, as well as the end-of-life processes of both the losses observed during transport and the replacement process, as well as the auxiliary components/materials removed, should be considered.

- **B5) Rehabilitation/Renovation:**

The "rehabilitation" module covers all the activities included in concerted plan maintenance, repair and/or replacement related to a significant part or to all building or other construction works. The restoration activities should be included in this module. The production and auxiliary product transportation needed, use of water and energy, the transport and management of any waste produced should be considered.

E. Information modules of use stage concerning the exploitation of construction (B6-B7)

In this information modules, only energy and water consumed directly by the studied product can be consider (for example, the energy savings resulting from the thermal isolation application shouldn't be declared in this module).

For each information submodule, the following modules are indicated:

- **B6) Energy consumed with the integrated operation of technical systems in the building operational stage:**

The "Energy consumed with the integrated operation of technical systems in the building" module should include, according to the EN 15804, the energy consumption during operation of the product (technical system integrated in the building), as well the aspects and environmental impacts which are associated, including the process and transport of wasted produced by the energy use.

The integrated technical system in the buildings that support its operation or of a construction work, include the heating, cooling, ventilation, lighting, hot water and other systems for sanitation, protection, fire safety, internal transport and other as specified in EN 15804.

The aspects related to the production, transport and required equipment installation to supply energy to the building must be assigned to the modules A1-A5. The energy consumption during the maintenance activities, repair, replacement or rehabilitation of equipment must be accounted in the modules B2-B5. The aspects related to the waste process and final equipment removal (required to supply energy to the building) should be assigned to the modules C1-C4.

For Electrical and Electronic Equipment (EEE), including HVAC systems, permanently installed in the building, energy consumption must be added to the calculation of final products that consume energy directly or indirectly, such as the presence of a cable that consumes energy through dissipation or loss when electric current passes through it.

- **B7) Water consumption by the integrated technical systems in the building operational stage:**

The boundary module of "Water consumption by the integrated technical systems in the building operational stage", according to the EN 15804, should include the water consumed during the product operation (integrated technical system in the building), as well the aspects and environmental impacts associated to that consumption, considering the water use cycle, including the production and water transportation and the collection and treatment of wastewater.

The integrated technical system in the building that support the building operation, include the technical systems of the buildings for cooling, ventilation, humidification, sanitary hot water and others sanitation systems, the protection, security against fire and internal transport.

F. End of life stage (mandatory)

The product "end-of-life" stage begins when it is replaced, dismantled or deconstructed and doesn't present any other functionality. This may also begin with the end of life of the building, in function of the scenario choice of end of life of the product.

According to EN 15804, during the end of life stage of the product or the building, all outputs resulting from the disassembly, of deconstruction or demolition of the building, maintenance process, repair, replacement or rehabilitation, all waste, all the construction products, materials or construction elements, etc., leaving the building are considered waste. However, these outputs reach the end of waste status when they meet all of the following criteria in accordance with EN 15804:

- The material, product or element of construction recovered is generally used for specific ends;
- There is a market or a search, identified for example by a positive economic value, for such material, product or repaired construction element;

- The material, product or recovered construction element meets the technical requirements for the specific use, complies with regulations and existing product standards;
- The material use, product or recovered construction element won't have negative globalimpacts on the environment or human health.

The boundary of end of life of the system about the module D is fixed at the point where the outputs, i.e. the materials or secondary fuels, reach the end of waste status (see section 6.3.5.5. of EN 15804, Note 2).

The end of life stage includes the following optional information modules:

- **C1) Deconstruction and demolition:**
  - The "deconstruction and demolition" module, include the dismantling or demolition of the product present in the construction, including the initial separation of the materials on site;
- **C2) Transport of the product:**
  - The "transport of the product" module in the context of waste management could be translated, for example, in the product transport from the local of deconstruction or demolition to a recycling installation, and the transport for its final disposal.
- **C3) Waste processing:**
  - The "waste processing" module includes the waste fraction collection from deconstruction and processing of waste from materials flows for reuse, recycling and energy recovery. The waste processing should be modeled and the elementary flows should be included in the inventory. The materials for the recovery of energy are identified based on the efficiency of energy recovery above 60%, respecting the existing regulation. The materials that allow a recovery of energy with efficiency over 60% aren't considered as materials for the energy recovery.

    Note: the impacts associated to the waste valuation processes (after the end of waste status) and the benefits associated shouldn't be considered in this module.
- **C4) Waste disposal:**
  - The "waste disposal" module includes the elimination process including the physics pre-treatment of waste that can't be recovery or reuse and the elimination local management.

The degradation of biogenic carbon contained in a product occurring at a solid waste disposal site, declared as GWP-biogenic, shall be calculated without time limit. Any remaining biogenic carbon is treated as a biogenic CO_2 emission from the technosphere to nature.

The loads (for example, emissions) induced by the waste disposal in the module C4 are as part of the product system under study, according to the "polluter pays principle". However, if this process generates energy, such as heat and electricity generated by incineration or by landfill of waste, the potential benefits arising from the use of this energy in the following product system are assigned to the D module product under study and are calculated using the "substitution method" (expansion system) considering average values.

G. Benefits and environmental loads beyond the system boundaries – D module

The information module "D" regard to the benefits or to the loads for environmental created by reused products, recycled materials and/or energy transfer to the outside of the product system (as secondary materials or fuels). This module allows the recognition of the reuse concept, recycling and recovery used at construction, through the indication of potential benefits avoid with the future use of materials and primary fuels, considering the loads associated to the processes of recycling and recovery beyond the studied product system.

It is considered essential the following considerations:

- All the benefits and liquid loads declared results in the liquid flows, leaving the product system which weren't attributed as coproducts and who have reached the end of waste status, must be included in the D module (see point 6.3.5.6 of the EN 15804);
- The impacts avoided associated to the coproducts attributed shouldn't be included in D module;
- For receiving the benefits resulting from recycling/product additional processing in the D module, the treatment of the product must be declared in C module;
- In the D module, the benefits resulting from exported energy from waste elimination processes declared in C4 module (see EN 15804, point 6.4.3.3., note 1) are also considered;
- In the D module, the environmental damages (liquid value) avoided resulting from flows leaving the system (that is, mainly from the modules A5 and C3) minus the flows that entering the system (i.e., mainly module A1) should be declared.

5.6. Information about the biogenic carbon content

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product that leaves the factory gate and must be declared separately for the product and any packaging that constitutes it. The declaration of the biogenic carbon content can be omitted if:

- the mass of the materials containing biogenic carbon in the product is less than 5% of the product mass;
- the mass of materials containing biogenic carbon in the packaging is less than 5% of the total packaging mass, the mass of the packaging must always be declared.

The biogenic carbon content of wood products can be measured or calculated according to EN 16449.

5.7. Cut-off criteria

The cut-off criteria of inputs and outputs of the LCA study, the information modules and any additional information, stablish the materials and energy flows, associated to a product system, which may be excluded. These criteria shouldn't be applied to hide data, but to make the calculation process more

efficient.

When all the inventory data are available, it should be included in the calculation. If there are gaps in the data, conservative assumptions can be used, based on average data and generic data, which should be documented and well-founded.

When it is not possible to fill those gaps or the data is insufficient, according with the point 6.3.6 of the EN 15804, the cut-off criteria for each unitary process should be 1% of the total of consumed energy and 1% of the total mass of inputs. However, for each information module (A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and D) it cannot exceed a total of 5% of energy and mass flows excluded. Use of the exclusion criteria should be based on considerations or expert opinions.

For energy and mass flows with potential to cause significant environmental impacts, cannot be use the cut-off criteria.

5.8. Data selection/ Data description

Wherever it is possible, real and specific data unit processes must be used, or average data obtained from specific production processes. They may be used to present data representing generic database of the LCA studies, in the absence of the specific data and where these are representative for the purpose (Table 3).

In addition, apply the following rules in accordance with EN 15804 (section 6.3.7.):

- An EPD describing a specific product should be calculated using specific data at least for the process over which the producer has influence. It can be use generic data for the processes which the producer cannot has influence, for example the process that deal with the production of essential goods which are inputs, for example the extraction of raw materials or the production of electricity, often referred to as upstream data;
- A specific covering all life cycle stages (cradle-to-grave) can be calculated using generic data for certain downstream processes, for example the waste incineration. For comparability reasons the calculation of the use stage should be based in the additional technical information (see item 7.3. of the EN 15804);
- The additional technical information for the elaboration of scenarios of the life cycle stages of the building should be specific information or average specific information when an average product or product class are declared;
- A documentation related to technological representation, geographic and temporal relative to generic data should be provided in the project report.

Table 3. Generic data application and specific data

Module	A1 – A3		A4 e A5	B1 – B7	C1 – C4
	Production of goods and raw materials	**Production**	**Installation**	**Use**	**End-of-life**
Process type	upstream	Process on which the producer has influence	Downstream		
Type of data	Generic data	Medium or specific data/real	Generic data		

Note: For a proper selection and characterization of the data should consult the requirements of CEN/TR 15941 *"Sustainability of construction works – Environmental product declarations – Methodology for selection and use of generic data"*.

The generic data can be obtained:

- in databases of LCA, namely European Life Cycle Database (ELCD) promoted by the European Commission and others like Ecoinvent, GaBi;
- in others sources (for example: stoichiometric models, patents, legal limits, technical standards, encyclopedias, or data from other DAP registration programs).

5.9. Data quality requirement

The quality of the data used to calculate an EPD should be treated in the project report (see section 8 and the EN 14044:2006, section 4.2.3.6.). Besides, apply to construction products the following specific requirements:

- The format of the documentation and data sets for the life cycle inventory used in the development of the LCA must be converted into the current format of the International Life Cycle Data (ILCD) system, as indicated in the document "Manual of the Life Cycle Data System International Reference Life (ILCD) - Nomenclature and other conventions";
- The guidance for selection and uses of generic data is provided in CEN/TR 15941 and such generic data should be checked for plausibility by means of mass or energy balances, comparison of indicators with data sets reviewed or verified in accordance with this standard, or comparison of flows or indicators with other relevant sources of information;
- The data sets must be complete according to the boundaries of the system, but within the boundaries established by the criteria for the exclusion of inputs and outputs (see point 6.3.6 of EN 15804);
- Should be representative and the most updated possible (updated data when the EPD verification is going on). In case of generic data, this shouldn't have more than 10 years and the specific data shouldn't have more than 5 years;

- The reference year is not necessarily the year of calculation or year of publication of the data, but the year which the inventory represents best, considering the age/representativeness of the various specific and background data. The validity of the data sets extends until the date when the inventory is still judged sufficiently valid with documented technological and geographical representativeness;
- The compiled data set should refer to an average 1 (one) year (if used other reference periods this should be duly justified);
- The time period over which the inputs and outputs of the system should be accounted for is 100 years from the year for which the data set is deemed representative. However, for the solid waste disposal of products containing biogenic carbon declared as GWP-biogenic see paragraph 6.3.5.5 of EN 15804);
- A technological representative should reflect the product reality or the declared product class;
- For an average EPD data including several unit productions, the geographic scope should represent the average or general data of the region(s) where the unit(s) production is, considering the representativeness of technology, input materials and input energies;

- An average EPD (as defined in the General Instructions for the DAPHabitat System in the chapter typology) should be calculated using the representative data of the declared products in the EPD;
  - similar products from one or more manufacturers, covered by the same CPR document, can be grouped in the same EPD document in the form of: a) average EPD, b) representative EPD or c) worst case EPD (see section 8.2 of this document). These options are only possible when the environmental impact indicators declared in modules A to D do not vary by more than 10% between the products in the set to be declared.
  - For generic data, the guidance lines for their selection and use are supplied in the CEN/TR 15941. The likelihood of generic data should be checked;
  - the data set using should be completed and according with the system boundaries defined;
  - The energy and material flows should be based in a 12 months average. Continuous measurements and rules for dosing or measuring, power monitoring, shopping lists or lists of waste can be taken as a database;
  - The outputs, for example, the emissions, that weren't a target of continuous measures, can be collected through individuals' representative measures. These measurements should be executed in the same reference year such as energy and recovery materials flow and must be performed with representative values of the product(s). If there are no measurements, it is allowed an technical or scientific approach that emissions can be estimated using stoichiometric equations;
  - Extraordinary accidents and incidents don't have to be considered.

Generic data shall include data quality assessment information according to EN ISO 14044:2006. The

data quality assessment information shall cover at least temporal, geographical and technological representativeness. In Annex E of EN 15804 the two systems on which it should be based are described.

"Relevant data" are data that together contribute to at least 80% of the absolute impact of any core environmental indicators included in the EPD, considered throughout the full life cycle, excluding module D, or across those life cycle modules evaluated in the EPD. The quality of module D data should also be assessed. The type of data quality assessment system used and the results of the data quality should be documented in the project report.

Note: These criteria apply with without prejudice of the requirements of the CEN/TR 15941 "Sustainability of construction works – Environmental product declarations – Methodology for selection and use of generic data" and the requirements of the ISO 14044:2006.

5.10. Development scenarios at the product level

Scenarios should only be provided for the environmental assessment and should be based on the relevant technical information defined (see EN 15804 sections 5.4 and 7.3). With the help of the scenario, the predetermined EPD indicators are obtained by applying the calculation rules given in EN 15804.

The scenarios shall support the calculation of information modules covering processes associated with any or all of the life cycle stages of the construction product, except for modules A1 - A3. The assessment of the environmental performance of a building in the life cycle stages "construction, use stage, end-of-life" is also supported by the scenarios.

A scenario should be realistic and representative of one of the most likely alternatives. For example, if there are three different applications, to be declared the most representative application or all three scenarios. The scenarios should not include processes or procedures that are not commonly used or has not been shown to be viable.

For example:

Transport scenario A4: The transport from the factory to the construction site. The product will be transported in a truck with respect to Euro 4 standard with a 25 t load capacity. The average distance traveled is 100 km. The trip back will not be considered.

Use scenario B1: Relatively to use, if the product is cleaned periodically (e.g., once a week for domestic use, once a day for commercial use), the time interval specified by the manufacturer must be obtained.

6. LIFE CYLE INVENTORY

The inventory analysis involves procedures for the collection and data calculation for the quantification of the relevant inputs and outputs of the product system.

In the Project Report (according to EN 15804 point 8.2) should be in the following information relative to LCI analysis:

- Qualitative/quantitative description of the unit processes required for modelling the life cycle stages of the declared unit, considering the requirements of EN ISO 14025 on confidentiality of data;
- An overview of the transfers, emissions and removals of biogenic carbon in the different modules, between the system under study, the nature and other product systems, and the biogenic carbon content of the functional or declared unit at the factory gate;
- Generic data sources or literature used in the LCA realization;
- Data validation, including:
  - Data quality validation; and
  - Missing data processing;
- Principles and allocation procedures, including:
  - Documentation and justification of allocation procedures; and
  - Uniform application of allocation procedures.

6.1. Data collection

The data collected for the inventory can be measured, calculated or estimated and, aim to quantify the inputs and outputs of a unit process. For this reason, all the data included in the inventory must be collected for each unit process considered in the boundary of the system. The collected data can have different sources, so it is necessary to document their origin and their reference year. If it is necessary to use generic data, the sources that are used must be properly referenced.

6.2. Calculation procedure

All calculation procedures and assumptions should be documented. These procedures should be applied consistently throughout the study, according to the requirements and guidelines described in section 4.3.3 of the ISO 14044:2006.

When inputs and outputs of fuel become into inputs and outputs of energy, the lower calorific value of the fuel must be applied in accordance with the accepted and scientifically based specific values for combustible material.

6.3. Allocation rules

The allocation should be avoided, whenever possible, through the subdivision of the unit process to be allocated into two or more sub-processes, or expanding the system boundaries in order to include the additional functions related to the coproducts.

According to the EN 15804, when allocation cannot be avoided, it should be made based on:

- the physical properties (e.g., mass and volume) when the difference of recipes generated by coproducts is low (less than 9%);
- in all other cases the allocation must be based on economic values;
- the material flows that have specific inherent properties, for example elemental composition and energy content (e.g., content of biogenic carbon), should always be allocated in order to reflect the physical flows, whatever the chosen allocation for the process.

Allocation procedures used must be properly specified, justified and documented.

The sum of the inputs and outputs of a unit process after the accomplish of the allocation must be equal to the sum of the inputs and outputs of the unit process before the allocation rules are applied, i.e. double counting or omitting inputs and outputs through the application of allocation rules is not allowed.
Information regarding specific allocation rules (rules, factors, interpretation, …) that are not described in EN 15804+A2 or the applicable RCP-c must be justified in the project report and in the DAP.

6.3.1. Coproducts allocation

The allocation of coproducts should be carried out considering the guidelines of EN 15804, point 6.4.3.2.

6.3.2. Allocation for multiple-input processes

Different products are produced together in a single process, for example, in a waste incineration plant, a central biomass or a waste disposal site. The allocation must be based on the physical properties of the material flow. If necessary, the environmental impact of the inputs is allocated so as to refer its influence on the following production process.

6.3.3. Allocation in case of reuse, recycling and recovery

The allocation procedure for these processes must be carried out according to the guidelines outlined by the EN 15804 in paragraph 6.4.3.3. However, some further considerations are described:

- Secondary Materials:
  - The collection and sorting of waste should be allocated to the waste disposal system of the previous product system.
- Waste production:

- The production of waste for which a sale can be achieved must be considered as a coproduct;
- The production of waste with no market value should be treated as waste (since it does not reach the end of waste status), even if it is transferred to external processes of recycling or energy recovery. In any case, the benefits could not be attributed to the substitution of other energy sources;
- Packaging waste (one way), generated in the production and that have to be deposited should be treated as waste, even if transferred to an external recycling process or energy recovery (without allocation of material or energy savings).

❖ Waste on site (construction site)

- Waste on the construction site that return to the place of production are considered as a closed loop and don't need any allocation. In the case of residues which replace materials (e.g. Raw materials) are included in the inventory analysis;
- Waste on the construction site that have no market value should be calculated as residues, even if transferred to external processes of recycling or recovery of energy. Shouldn't be in the D module;
- Packaging waste from other modules which aren't A1-A3, should be calculated as a residue, even if transferred to external processes of recycling or energy recovery. In any case, the benefits could be attributed by the replacement of other energetic sources;

❖ Demolition waste

- For the reuse and recycling of construction materials after the end of life stage, the close loop procedure shouldn't be used. Benefits and loads of recycling are attributed to D module.

7. LIFE CYCLE IMPACT ASSESSMENT

Life Cycle Impact Assessment (LCIA) evaluates the significance of potential environmental impacts using the LCIA impact category indicators and the results of the product life cycle inventory. The assessment links inventory data to category indicators to understand the impacts.

The core indicators to consider, in each module declared in the EPD, according to EN 15804 (point 7.2.3.1.) Are:

- Global warming potential total;
- Global warming potential fossil;
- Global warming potential biogenic;
- Global warming potential luluc;
- Depletion potential of the stratospheric ozone layer;
- Acidification potential;
- Eutrophication potential, fraction of nutrients reaching freshwater end compartment;
- Eutrophication potential, fraction of nutrients reaching marine end compartment;

- Eutrophication potential terrestrial;
- Formation potential of tropospheric ozone;
- Abiotic depletion potential for non-fossil resources;
- Abiotic depletion for fossil resources potential;
- Water (user) deprivation potential.

The EPD may have additional impact indicators, such as emission of particulate matter or toxicity, listed in point 7.2.3.2. of EN 15804.

The impact assessment shall be conducted in accordance with section 6.5 of EN 15804:2012+A2:2019. The impact categories, indicators, characterization methods, units and characterization factors to be used are listed in Annex C of EN 15804:2012 + A2:2019.

If the specific values are known for the impact category of Potential for abiotic depletion of resources - fossil fuels (ADP fossil fuels) this should be used and duly documented and justified.

Additional and specific factors can be used in order to achieve consistency between the LCI data and characterizing factors available.

Note: The characterization factors for fossil fuels are based in lower calorific values (LCV) at the point of extraction of these fuels.

In the Project Report, according to EN 15804 point 8.2, the contents listed below regarding the Life Cycle Impact Assessment under study should be presented and justified:

- LCIA procedures, calculations and results of the study, including all the results of additional impact indicators;
- Respect the results of the LCIA and the results of the LCI;
- Refer to all model's characterization, characterization factors and methods, as defined by European Standard 15804;
- Mention stating that the LCIA results are relative terms and do not predict the final impact by category exceed the limit values, safety margins or risks.

8. EPD CONTENT

According to the EN 15804 and the EN 15942, the EPD should declare general information relative to the following issues:

- Name and address of the manufacturer(s);
- Description of the use of the construction product/ product class and the functional unit or declared to which the data relates;
- Identification of the construction product/product class by its name (including any product code) and a simple visual representation of the construction product/product class to which the data relates;
- Description of the main components and/or product materials;
- Name of the program used as well the name and address of the Programme Operator and, when relevant, the logo and web page;
- Issue date of the declaration and validity period up to 5 years;
- information indicating the stages are not considered, if the statement is not based on an LCA covering all stages of the life cycle;
- mention indicating that the construction product EPD may not be comparable if they are not in accordance with EN 15804 and this PCR document;
- declaration of the content in materials of the product should at least enumerate the substances contained in the product that are in the " List of substances of very high concern candidates for authorization" (under REACH) when the content exceeds the limits for registration by the European Chemicals Agency;
- Information indicating where the explanatory elements can be obtained.

This information should be declared according to the requirements indicated in the General Instruction for DAPHabitat System and with the EPD **template** at www.daphabitat.pt for presentation of content in the EPD.

8.1. Declaration of environmental indicators derived from LCA

The additional information about the environmental performance of the product is based on a LCA study, setting up: the functional unit or the declared unit; life cycle stages and the inputs and outputs flow diagram; indicators that describe the potentials environmental impacts; indicators that describe the resources use; indicators that describe the waste production; other consider environmental indicators; additional environmental information. The numerical values calculated and entered into the EPD should not be written with more than three significant figures (eg: 1234 should be 1,23(4)E+2, or 0,01234 should be 1,23(4)E-2).

8.1.1. Rules for the information declaration of the LCA by module

In order to facilitate the application of the modular information of an EPD in the assessment of the environmental performance of a building and other construction works in the different stages of the life cycle, it is necessary to provide the information in a modular way. Information on environmental impacts and aspects related to modules A1 - A3, C1 - C4 and D must be included in all EPD (see 5.5). The information modules that generate any input or output flows considered in the module D declaration must also be declared.

An EPD should specify which type of study stated:

- "Cradle-to-gate EPD with modules C1 - C4 and module D" (A1 - A3, + C + D);
- "Cradle-to-gate EPD with options, modules C1 - C4 and module D" (A1 - A3 + C + D and additional modules. Additional modules can be one or more selected from A4 - B7);
- "Cradle-to-gate EPD" (A1-A3);
- "Cradle-to-gate EPD with options" (A1-A3 and additional modules. Additional modules can be one or more selected from A4 – A5);
- "Cradle-to-grave EPD and module D" (A + B + C + D). In this case, EPD covers all stages of the life cycle;

In some cases, certain modules may be not declared. In these situations, the module must be declared "ND". If the value of "zero" is plausible for any indicator, for example, there is no activity in the scenario, then this indicator should be declared as "0". The "-" declaration is not allowed.

8.1.2. Indicators describing the potential environmental impacts based on Life Cycle Impact Assessment

The Information related to environmental impacts is expressed by impact categories from the LCA study, using characterization factors (chapter 7). Where necessary, additional environmental impact indicators could also be declared to better characterize the product or construction material.

8.1.2.1. Environmental impact indicators

The impacts categories, as well as the unit in which they are expressed are defined in the Table 4.

Table 4. Indicators and environmental impacts

Impact category	Indicators	Unitary indicator expressed by functional/declared unit
Climate change – total[a]	Global Warming Potential total (GWP-total)	**kg CO_2 equiv.**
Climate change – fossil	Global Warming Potential fossil (GWP-fossil)	**kg CO_2 equiv.**
Climate change – biogenic	Global Warming Potential biogenic (GWP-biogenic)	**kg CO_2 equiv.**
Climate change – land use and land use change[b]	Global Warming Potential land use and land use change (GWP-luluc)	**kg CO_2 equiv.**
Ozone Depletion	Ozone Stratospheric Depletion Potential (ODP)	**kg CFC 11 equiv.**
Acidification	Acidification Potential (AP)	**mol H^+ equiv.**
Eutrophication aquatic freshwater	Eutrophication Potential fraction of nutrients reaching freshwater end compartment (EP-freshwater)	**kg (P) equiv.**
Eutrophication aquatic marine	Eutrophication Potential fraction of nutrients reaching marine end compartment (EP-marine)	**kg N equiv.**
Eutrophication terrestrial	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	**mol N equiv.**
Photochemical Ozone formation	Photochemical Ozone Creation Potential (POCP)	**kg NMVOC equiv.**
Abiotic depletion of resources – minerals and metals (ADP minerals&metals) [c,d]	Abiotic depletion of resources - elements (ADP-minerals&metals)	**kg Sb equiv.**
Abiotic depletion of resources - fossil fuels (ADP fossil fuels)[c]	Abiotic depletion of resources - fossil fuels (ADP-fossil)	**MJ, calorific value ([Hi] lower calorific value)**
Water use	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	**m^3 world equiv. deprived**

[a] The total global warming potential (GWP-total) is the sum of
- **GWP-fossil**
- **GWP-biogenic**
- **GWP-luluc**

[b] It is permitted to omit GWP-luluc as separate information if its contribution is < 5 % of GWP-total over the declared modules excluding module D.

[c] Abiotic depletion potential is calculated and declared in two different indicators: — ADP-minerals&metals include all non-renewable, abiotic material resources (i.e. excepting fossil resources); — ADP-fossil include all fossil resources and includes uranium.

[d] ultimate reserve model of the ADP-minerals&metals model

8.1.2.2. Additional environmental impact indicators

Additional environmental impact indicators must be calculated and included in the project report for each module declared, which can be declared in the DAP. If no additional indicators are added, they must be mentioned in the DAP as an "ND" entry (not declared) in the table.

The impact indicator "Potential human exposure efficiency relative to U235" focuses mainly on the possible impact of a low dose of ionising radiation on human health resulting from the nuclear fuel

cycle. It does not consider effects arising from possible nuclear accidents, occupational exposure or the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

The results of the indicators "Potential comparative toxic unit for ecosystems (ETP-FW)", "Potential comparative toxic unit for humans, cancer effects", "Potential comparative toxic unit for humans, not cancer effects" and "Potential soil quality index" should be used with caution as the uncertainties associated with them are high or there is little experience with the indicator.

The values indicated in the table should be presented with two significant figures or scientific notation. This numerical representation must be uniform for the same indicator. If there are non-defined values, the number should be filled in with "ND".

Additional environmental impact indicators are shown in Table 5.

Table 5. Additional environmental impact indicators

Impact category	Indicator	Unit (expressed per functional/declared unit)
Particulate Matter emissions	Potential incidence of disease due to PM emissions (PM)	Disease incidence
Ionizing radiation, human health	Potential Human exposure efficiency relative to U235 (IRP)	kBq U235 equiv.
Eco-toxicity (freshwater)	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe
Human toxicity, cancer effects	Potential Comparative Toxic Unit for humans (HTP-c)	CTUh
Human toxicity, non-cancer effects	Potential Comparative Toxic Unit for humans (HTP-nc)	CTUh
Land use related impacts/ Soil quality	Potential soil quality index (SQP)	dimensionless

8.1.3. Indicators that describe the use of resources and environmental information based on the Life Cycle Inventory (LCI)

For a greater transparency in the description of the environmental performance of construction products using environmental impact indicators, three groups of indicators and environmental information based on LCI should be declared.

8.1.3.1. Indicators that describe the use of resources

The following parameters describe the use of renewable and non-renewable materials, renewable and non-renewable primary energy and water and are compiled based on the LCA study of the inventory data. The information to include in an EPD should be according to Table 6.

Table 6. Parameters about the use of resources

Parameter	Parameter unit expressed by functional/declared unit
Use of renewable primary energy excluding the renewable primary energy resources used as raw materials	MJ, calorific value ([Hi] lower calorific value)
Use of renewable primary energy resources used as raw materials	MJ, calorific value ([Hi] lower calorific value)
Total use of renewable primary energy (primary energy and renewable primary energy resources used as raw materials)	MJ, calorific value ([Hi] lower calorific value)
Use of non-renewable primary energy excluding the non-renewable primary energy resources used as raw materials	MJ, calorific value ([Hi] lower calorific value)
Use of non-renewable primary energy resources used as raw materials	MJ, calorific value ([Hi] lower calorific value)
Total use of non-renewable primary energy (primary energy and non-renewable primary energy resources used as raw materials)	MJ, calorific value ([Hi] lower calorific value)
Use of secondary materials	kg
Use of renewable secondary fuels	MJ, calorific value ([Hi] lower calorific value)
22 Product Category Rules for Construction Products, Part A Use of non-renewable secondary fuels	MJ, poder calorífico inferior (PCI)
Use of fresh water resources*	m^3

*The calculation of this indicator must be realized according to the EN 14046. The parameter contains: evaporation (e.g. cooling towers), evapotranspiration (evaporation of irrigation water), and incorporated fresh water (e.g. in concrete), fresh water drains into the ocean.

In order to identify the inputs of renewable/non-renewable primary energy used as an energy carrier, and not as a raw material, the indicators “use of renewable primary energy excluding the renewable primary energy resources used as materials raw materials” and “use of non-renewable primary energy excluding the non-renewable primary energy resources used as materials raw materials” are considered and can be calculated as the difference between the total input of primary energy and the input of energy resources used as raw materials.

8.1.3.2. Environmental information that describes the waste categories

Table 7 presents indicators that describe the categories of waste derived from the LCI. These indicators should be included in each module declared in the EPD.

Table 7. Other environmental information describing waste categories

Indicators	Unit expressed per functional/declared unit
Hazardous waste for disposal	kg
Disposed of non-hazardous waste	kg
Disposed of radioactive waste	kg

Nota 1: The characteristic to consider in the hazardous waste classification should be consulted in the *European Waste Framework Directive*.

Nota 2: Disposed hazardous waste – Hazardous waste amount disposed in a location with a class III or IV. Radioactive waste is not included. **Disposed of non-hazardous waste –** non-hazardous waste amount that aren't disposed in a location with a class 0, I or II. **Disposed of radioactive waste –** Amount of radioactive waste disposed.

8.1.3.3. Environmental information that describes output flows

The indicators describing the outflows derived from LCI should be included in each declared module of an EPD and may also be part of the additional information for end-of-life scenarios. These indicators should be included in the EPD as shown in Table 8.

Table 8. Environmental information describing output flows

Indicators	Unit expressed by functional/declared unit
Components for reuse;	kg
Materials for recycling	kg
Materials for energy recovery	kg
Exported energy	MJ, by energetic vector

Note 1: These indicators are also part of the additional information for end-of-life scenarios and are calculated on the raw values leaving the system boundary when they reach the end-of-waste status, as described in Annex B of EN 15804.

Note 2: The indicators "Components for reuse" and "Materials for recycling" fulfils the conditions of the end of life stage.

Note 3: Material indicators for energy recovery do not include materials for waste incineration. Waste incineration is a method of processing waste and is allocated within the boundaries of the system.

Note 4: Exported energy refers to energy exported from waste incineration and landfill.

8.1.4. Biogenic carbon information

Information on the biogenic carbon content of the products used, as well as the packaging that comprise them, must be included in the EPD, as described:

Table 9. Parameters that describe the transport to the construction site

Biogenic carbon content	Indicators unit expressed by functional/declared unit
Biogenic carbon content in product	kg C
Biogenic carbon content in accompanying packaging	kg C
1 kg biogenic carbon is equivalent to 44/12 kg of CO_2	

This information can be omitted whenever the content of biogenic carbon in the product, or in the respective packaging, is less than 5% of the mass of the product, or the respective packaging.

8.1.5. Additional technical scenarios and information

The additional technical information supports the scenario development based on calculus and declared indicators from LCA defined in this section, relative to the additional stage of the life cycle. If the EPD includes all the life cycle stages, all mandatory and relevant optional modules should be calculated based on appropriated scenarios and the respective indicators of LCA should be declared.

For a cradle-to-gate EPD with options, modules C and D (A1-A3 + C + D and additional modules such as A4, A5), the optional modules are calculated and the indicators derived from LCA are declared. Alternatively, in this type of EPD, a manufacturer may choose to declare additional technical information without calculating the optional stages of the life cycle to ensure an adequate understanding of the function of a product in a building, and, thus, support the development of an appropriate scenario at the level of the building.

Any additional technical information must be documented separately from the LCA derived indicators, and this additional information must be declared in the module to which they refer (for example, additional technical information about the use of a product must be declared in modules B).

If the additional technical information is not complete at the product level as specified in 8.1.5, this must be stated.

8.1.5.1. Construction process stage

8.1.5.1.1. A4) Transport

If an EPD includes additional technical information relative to the transport from the factory gate to the construction site, the scenario specification of transport should contain the information presented in Table 10.

Table 10. Transport to the building site

Scenario information	Unit expressed by functional/declared unit
Type of used vehicle (according to the European Directive 2007/37/EC)	Not applicable

Fuel type	
Fuel consumption	l/ km (liter of fuel by distance)
Travelled distance	km
Capacity utilization (round trip)	% (useful load)
cargo transported	kg
volume transported	m^3
Charge Density	kg/m^3
Volume capacity utilization factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaged products)	Not applicable

8.1.5.1.2. A5) Installation process

If an EPD include the additional technical information relative to the installation of the product in the building, the respective scenario specification should have the presented information in the Table 11.

Table 11. Installation of the product in the local

Scenario information	Unit expressed by functional/declared unit
Accessories materials for installation (specified by materials)	kg or other units, as appropriate
Water use	m^3
Other resources used	kg
Quantitative description of energy sources (regional energy mix) and respective consumption during the installation process	kWh ou MJ
Waste production at the construction site resulting from the product installation and before processing (specified by waste type)	kg
Materials output (specified by type) as a result of waste processing on site, for example for recycling, energy recovery, landfill, disposal	kg
Direct emissions to the air, soil and water	kg

8.1.5.2. Use stage (B1 – B7)

8.1.5.2.1. Reference Service Life (RSL)

The description of reference service life can be based on collected data with medium value or at the beginning or end of life of the service. The conditions of reference use to achieve the technical performance and the declared functional and the declared RSL should include the indicated data in Table 12.

Table 12. Parameters about RSL

RSL information	Unit expressed by functional/declared unit
Reference service life	years
Declared properties of the product (at the factory gate), finishing, etc.	Appropriated unit
Application parameters (if instructed by the manufacturer), including reference to appropriate practices	Appropriated unit

The quality of estimated work when installed in accordance with the instructions of the producer	Appropriated unit
External environmental conditions (for outdoor applications), for example, climatic conditions, pollutants, orientation of the building, temperature, etc.	Appropriated unit
Indoor environmental conditions (for indoor applications), for example temperature, humidity, chemical exposure, etc.	Appropriated unit
Conditions of use for example frequency of use, mechanical exposure, etc.	Appropriated unit
Maintenance, for example required frequency,	Unidade apropriada
type, quality and component replacement	

8.1.5.2.2. B1) Use

The B1 concern to environmental emissions from the current use of the product installed in the building, for example, release of substances of the facades, roof, walls or other parts of the building. This module does not include the emissions from the use of energy and water.

- For products exposed to the air inside buildings after installation the information to be provided in order to support the use scenario is as follows: emissions into the indoor air in accordance with the rules on the measurement of emissions of hazardous substances regulated by construction material using harmonized testing methods in accordance with the provisions of the respective technical committees of European product standards (where these standards are not available, this information may be omitted);
- For products in contact with the ground or water after installation the information to be provided in order to support the use scenario is as follows: release to the soil and water in accordance with the standards relative to the measurement of hazardous substances emissions by construction materials using harmonized testing methods in accordance with the provisions of the respective technical committees of European product standards (where these standards are not available, this information may be omitted).

If an EPD includes information relative to products that need maintenance, repair, replacement or rehabilitation, the scenario(s) specification should contain at least the parameters described in the Table 13, Table 14 and Table 15.

8.1.5.2.3. B2) Maintenance

- description of the maintenance process or indication of the location where this information can be obtained.

Table 13. Scenario information about the maintenance process

Scenario information	Unit expressed by functional/declared unit
Cycle maintenance	Number of times during the RSL or per year

Auxiliary materials for maintenance, for example cleaning detergents	kg/cycle
Waste resulting from the maintenance process (please specify materials)	kg
Freshwater liquid consumption during maintenance	m^3
Power consumption during maintenance operations, for example in vacuum cleaning	KWh ou kWh/cycle

8.1.5.2.4. B3) Repair

- description of repair process or indication of where this information can be obtained;
- description of the inspection process or indication of where this information can be obtained.

Table 14. Scenario information about the repair process

Scenario information	Unit expressed by functional/declared unit
Repair cycle	Number of times during the RSL or per year
Auxiliary materials for repair, for example lubricants (specify material)	kg or kg/cycle
Waste resulting from the repair process (specify materials)	kg
Freshwater liquid consumption during repair	m^3
Power consumption (specify type of energy) during repair work, e.g. operations with machinery, etc.	kWh/RSL or kWh/cycle

8.1.5.2.5. B4) Replacement

Table 15. Scenario information about replacement

Scenario information	Unit expressed by functional/declared unit
Replacement Cycle	Number of times during the RSL or per year
Waste resulting from the replacement process (please specify materials)	kg
Power consumption (specify type of energy) during the substitution , for example operations with machinery , etc.	kWh/RSL or kWh/cycle
Replacement of worn parts during the product's life cycle (specify materials), for example zinc, steel plates , etc.	kg

8.1.5.2.6. B5) Rehabilitation/renovation

- Description of the rehabilitation/renovation process or indication of where this information can be obtained.

Table 16. Scenario information for the rehabilitation7renovation

Scenario information	Unit expressed by functional/declared unit
Rehabilitation cycle	Number of times during the RSL or per year
Materials used in rehabilitation, for example lubricants (specify material)	kg or kg/cycle

Waste derived from the rehabilitation process (specify materials)	kg
Power consumption (specify type of energy) during rehabilitation, for example operations with machinery, etc.	kWh/RSL or kWh/cycle

Other assumptions necessary for scenario development (in appropriated units) can be defined.

8.1.5.2.7. B6) Energy needs and B7) Waster consumption, during the operation stage

If an EPD include additional technical information relative to the technical systems integrated in the building that use energy and water consumption during the building operation, the specification of the respective scenario(s) should contain the information presented in the Table 17.

Table 17. Scenario information for the energy use (B6) and water consumption (B7)

Scenario information	Unit expressed by functional/declared unit
Auxiliary materials specified per kg material	kg or appropriated units
Freshwater fluid consumption	m^3
Type of energy consumed, e.g. electricity, natural gas, etc.	kWh
Power equipment	kW
Performance characteristics, for example energy efficiency, emissions, performance variation depending on capacity utilization, etc.	Appropriated units

Other assumptions necessary for the scenario(s) development (in appropriated units) for B6 and B7 can be developed and duly indicated in the EPD.

8.1.5.3. End of life stage

If an EPD includes additional technical information relative to the end-of-life stages, the specifications of the respective scenario(s) should contain the information as indicated in Table 18.

Table 18. Process for the end-of-life stage

Process	Unit expressed by functional/declared unit of components products or materials and by type of material)
Collection procedures specified by type	kg of separately collected material
	kg of gathered material in the mix of construction waste
Recovery process specified by type	kg for reuse
	kg for recycling
	kg to energy recovery
Final destination specified by type	Kg of product or material for final disposal

Other assumptions necessary for the scenario(s) development (in appropriated units):

The scenarios should only model processes that are economically and technically viable. If two or more end of life processes is defined, the impact assessment should be presented by process, besides the result aggregate and weighted to all processes.

8.1.5.4. D module

If an EPD include additional technical information related to the benefits and environmental loads beyond the system boundaries, the additional information necessary for the description of the respective scenarios should be included in the EPD.

8.1.6. Additional environmental information

It should be included in the EPD additional information related to the environmental aspects (if relevant), in addition to environmental information of LCA, LCI or information modules.

Example 1: identification of hazards and environmental risks resulting from product handling at each life cycle stage.

Example 2: Identification of the amount of carbon removed from the atmosphere during the growth of the biomass that remains stored in the product (biogenic carbon).

Example 3: Identification of the amount of carbon removed from the atmosphere and fixed by the product during the life cycle.

8.1.7. Environmental information on the release of hazardous substance

The additional environmental information to declare in an EPD about the release of hazardous substances refer essentially to the environmental impacts caused in the indoor air of the buildings, soil and groundwater during product use stage.

8.1.7.1. Indoor air

The type of information to declare should refer to the exposed product to the indoor air after its installation in the buildings during the use stage, to support scenarios defined for this stage of the product life cycle, in regard to the health of users of the building level. Thus, it is considered important to state the following types of information:

- emissions to indoor air released by construction products in accordance with the rules on monitoring of emissions of regulated hazardous substances using standard test methods in accordance with the provisions of the Technical Committees in charge of the preparation of European standards of products or national regulations, when available.

Note: This information can be declared in the EPD when there are no horizontal rules on the measurement of release of regulated hazardous substances using standard test methods in accordance with the provisions of the Technical Committees responsible for European standards products or national regulations.

8.1.7.2. Soil and water

This type of additional environmental information should be supplied for products that could be in touch with the soil or emit substances to the groundwater, after its installation in the buildings (and other construction works) during the use stage, to support scenarios defined at this stage of the product life cycle, with regard to soil and water pollution to the building level. Thus, it is considered important to state the following types of information:

- Emissions to land and water, released by construction products in accordance with the standards relative to monitoring the regulated dangerous substances emissions regulated by construction products using harmonized test methods in accordance with the provisions of the Technical Committees responsible for preparing the European product standards or national regulations when available.

Note: An EPD cannot presented such information in the absence of horizontal rules on the measurement of release of hazardous substances using harmonized testing methods in accordance with the provisions of the Technical Committees responsible for European standards products or national regulations.

8.1.8. Aggregation of information modules

The declared indicated in the individual information modules of a product life cycle stages, A1 to A5, B1 to B7, C1 to C4 and D module, shouldn't be aggregated to get a total or subtotal of the life cycle stages A, B, C or D, with exception of information modules A1, A2 and A3 that could be aggregated.

8.1.9. Information related with the EPD verification and registration

All the information to include in the EPD, related with the verification and registration, is detailed in the document about the General Instruction of the DAPHabitat System, available on www.daphabitat.pt.

8.1.10. Comparability between EPD

The product comparability based on EPD is defined by the contribution they make to the environmental performance of the building. Thus, comparing the environmental performance of building products using the information of EPD should be based on the use of the product and its impact on the building and should consider the entire life cycle (all information modules). The EPD allows to compare the environmental performance of products based on its life cycle subject to compliance with certain conditions, which are described in the General Instructions of DAPHabitat System and EN 15804.

8.2. Additional rules for average EPDs

When an EPD is representative of more than one production unit and/or representative of a product class, the information available on the EPD should be unambiguous so that it is transparent, giving to the

user the necessary information on the correct use of the declared information and the average EPD representative. The calculation rules for the formation of the averages should be indicated.

The EPD, in order to declare the average environmental performance of a product class, should include a mention in this regard in the EPD and it is recommended that this is accompanied with a description of the variety/variability of the LCIA results, if this is significant (according to EN 15804, 7.1. i)).

An average EPD must still declare additional information about:

- how was done the selection of production units and/or the product class;
- average technical characteristics and the range of variation for the product class (such as density, heat resistance);
- the number of production units included in the EPD; and/or;
- the names of the manufacturers or brands entities;
- the relative volume of production covered by the EPD;
- geographical coverage;
- The product group to which the EPD is relevant.

9. LIFE CYCLE INTERPRETATION

The life cycle interpretation stage should supply consistent results with the defined objective and context, allowing obtaining the best conclusions about the environmental performance of the product. The LCA study results should be interpreted in the Project Report, as mentioned in the EN 15804 point 8.2., describing at least:

- the results interpretation;
- assumptions and limitations associated with the interpretation results as reported in the EPD, and with the additional environmental impact indicator results, both in relation to the system and with the data;
- the variance compared to the average of the LCIA results should be described, if the generic data come from various sources or refer to a range of similar products;
- quality data assessment;
- full transparency in terms of choice of values, justifications and expert reviews.

10. PROJECT REPORT

The project report should be systematic and complete to support the verification procedure of an EPD. The project report must register the LCA and additional information, as stated in the EPD, according to

EN 15804. This must be made available to the certification body recognized by DAPHabitat System respecting the confidentiality requirements specified in EN ISO 14025.

The elements of the Project Report should follow the requirements of the EN 15804 as well as the indications described in the document General Instructions of DAPHabitat System, available at www.daphabitat.pt.

11. EPD VERIFICATION AND VALIDATION

An EPD needs to be verified by an independent third party in order to guarantee the reliability of the document content, considering the consumer as one of the potential audiences. The verification procedure is reflected in the confirmation through the provision of objective evidence that specified that the requirements have been satisfied. This process is coordinated by a certification body recognized as independent from the stakeholders.

Only after the decision of the EPD validation, issued by the certification body, it is allow the document registration in DAPHabitat System so that environmental performance information and quantitative data contained in this environmental label can be in public www.daphabitat.pt.

The EPD is valid for up to five years from its issue date. After this period, should be reviewed and verified by a verifier according to the General Instructions DAPHabitat System. However, if during the period of validity of an EPD, if you notice any considerable change (greater than 9% in one or more parameters stated in the EPD) in the environmental performance of the product, this must be updated. If after 5 years of validity does not verify and confirm the existence of significant changes in data, the EPD will not need to be recalculated.

12. UNITS

The SI units should be used. The basic units to be used are: meter (m), kilogram (kg), molecular weight (mole). All resources must be expressed in kg with the exception:

- of energy resources must be used kWh or MJ;
- the temperature should be expressed in Celsius degrees;
- time should be expressed as a rating scale: minutes, hours, days, or years.

13. REFERENCES

- NP ISO 14025:2009 – "Rótulos e declarações ambientais – Declarações ambientais Tipo III – Princípios e procedimentos";
- ISO 21930:2007 – *"Building Construction – Sustainability in building construction"*;
- EN 15804:2012 + A2:2019 – *"Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products"*;
- NP EN ISO 14044:2010 – "Gestão ambiental – Avaliação do ciclo de vida – Requisitos e linhas de orientação";
- NP EN ISO 14040:2008 – "Gestão ambiental - Avaliação do ciclo de vida - Princípios e enquadramento";
- Instruções Gerais do Sistema DAPHabitat. Versão 2.1.; Edition July 2023;
- Product Category Rules and PCR Basic Module – Construction products and construction services. Version 1.0. 2012 (The International EPD System).