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Sustainability of construction works — Guidance for the implementation of EN 15804

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National foreword

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Sustainability of construction works - Guidance for the implementation of EN 15804

Contribution des ouvrages de construction au développement durable - Lignes directrices pour la mise en application de l'EN 15804

Nachhaltiges Bauen - Leitfaden für die Anwendung von EN 15804

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European foreword

This document (CEN/TR 16970:2016) has been prepared by Technical Committee CEN/TC 350 "Sustainability of construction works", the secretariat of which is held by AFNOR.

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Introduction

This Technical Report is a complementary document to EN 15804 “Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products”. It is intended to assist the understanding and use of EN 15804 by giving guidance and further explanation.

This document does not replace any of the standard’s requirements or introduce any new rules and it is not intended to be used as a stand-alone document.

This document provides guidance to CEN Technical Committees for construction products and other bodies such as Environmental Product Declaration programme operators in the construction sector developing Product Category Rules complementary to EN 15804.

According to decision BT 3/2013, CEN Technical Committees for construction products are asked to inform CEN/TC 350 at the earliest stage when a complementary PCR document will be developed, allowing CEN/TC 350 to arrange a liaison and ensure they can review the document when necessary.

1 Scope

This Technical Report provides general guidance to the users of EN 15804 and those preparing complementary Product Category Rules (c-PCR's) by:

— stating general principles for the use of EN 15804 by CEN Technical Committees for construction products (Product TC's) in order to ensure consistency among the complementary PCR produced by Product TC's;

— addressing the questions raised by Product TC's, manufacturers or their sub-contractors who provide LCA studies underlying an Environmental Product Declaration (EPD) and by EPD programme operators who include c-PCR of specific subcategories in their PCR registry.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15804:2012+A1:2013, *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*

EN 15978, *Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method*

EN ISO 14025:2010, *Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)*

ISO 15686 (all parts), *Buildings and constructed assets — Service life planning*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15804:2012+A1:2013 and the following apply.

3.1
complementary product category rules, c-PCR
product group specific or horizontal PCR, which provide additional, compliant and non-contradictory requirements to EN 15804

Note 1 to entry: c-PCR are meant to be used together with EN 15804.

3.2
default values
pre-defined results without further calculation

3.3
freshwater
water having a low concentration of dissolved solids

Note 1 to entry: Freshwater typically contains less than 1 000 mg per litre of dissolved solids and is generally accepted as suitable for withdrawal and conventional treatment to produce potable water.

Note 2 to entry: The concentration of total dissolved solids can vary considerably over space and/or time.

[SOURCE: ISO 14046:2014, 3.1.1]

3.4
water use
use of water by human activity

Note 1 to entry: Use includes, but is not limited to, any water withdrawal, water release or other human activities within the drainage basin impacting water flows and/or quality, including in-stream uses such as fishing, recreation, transportation.

Note 2 to entry: The term "water consumption" is often used to describe water removed from, but not returned to, the same drainage basin. Water consumption can be because of evaporation, transpiration, integration into a product, or release into a different drainage basin or the sea. Change in evaporation caused by land-use change is considered water consumption (e.g. reservoir). The temporal and geographical coverage of the water footprint assessment are defined in the goal and scope.

[SOURCE: ISO 14046:2014, 3.2.1, modified]

4 Abbreviations

ADP	Abiotic depletion potential
CF	Characterization factor
c-PCR	Complementary product category rules
EPD	Environmental product declaration
EoW	End-of-waste status
ETICS	External Thermal Insulation Composite Systems
GHG	Greenhouse gas
GWP	Global warming potential
LCA	Life cycle assessment
LCI	Life cycle inventory
LCIA	Life cycle impact assessment
PCR	Product category rules
Product TC	CEN Technical Committees for construction products (Product TC's), i.e. Technical Committee in CEN responsible for developing harmonized and other standards for product groups
RSL	Reference service life

5 General aspects

5.1 Objectives

5.1.1 Objectives of core PCR

The main objective of EN 15804 is to provide horizontal core PCR for all construction products and services. They are applicable for developing Type III EPD for any construction product or service but can be further detailed in c-PCR.

It is possible to develop and to verify a Type III EPD directly to the EN 15804 standard. If there is no c-PCR available, EPD for construction products are developed only according to EN 15804. The EPD always states according to which standard the EPD was made (EN ISO 14025:2010, 7.2.1, e).

5.1.2 Objectives of the guidance

If more detailed specifications and descriptions for a product group are needed it is advisable to develop a c-PCR in compliance with EN 15804. The grouping of products follows the grouping of the Product TC's.

Compliance with this Technical Report is not a requirement for compliance with EN 15804, but product TCs and Program Operators are encouraged to follow this guideline to enhance harmonization

The guidance document supports the following principles for developing c-PCR:

a) Any c-PCR using EN 15804 as a normative reference needs to be compliant with EN 15804.

NOTE 1 CEN/TC 350 homepage [1] lists c-PCR documents prepared by Product TC's, that were reviewed to be compliant with EN 15804, or are under review by CEN TC 350/WG 3.

b) A common structure of EN 15804 and c–PCR provided by Product TC's in order to assist the development of a consistent set of principles and rules for the construction sector.

1) C-PCR developed by Product TC's use the following common title structure:

"[title of Product TC] - Environmental product declarations – Product category rules complementary to EN 15804 [product group, depending on name]"

EXAMPLE [Round and sawn timber] - Environmental product declarations - Product category rules complementary to EN 15804 [for wood and wood-based products for use in construction].

2) The structure of the document maintains the structure of EN 15804.

When developing c-PCR Product TC's are recommended to use a format as described in Table 1.

Table 1 — Format for the development of complementary PCR in accordance with EN 15804

Clause	Text for new c-PCR	EN 15804	Comment
5 general aspects, 5.1 Objective of the PCR	**As in EN 15804, in addition:** **xxxxxxxx**	**An EPD according to this standard provides quantified environmental information for a construction product or service...**	**...**

c) C-PCR provided by Product TC's and considered compliant with EN 15804 by CEN/TC 350 provide a consistent set of principles and rules. In the development of c- PCR the following aspects are considered:

1) Complementary specifications to the core rules provided by EN 15804, particularly related to:

i) the scope of the c-PCR, related to the product group, product type, intended application and use of the product, type of EPD (cradle to gate, cradle to gate with options, cradle to grave);

ii) the scope with respect to any required information modules A1-C4 and D;

iii) specification of the declared or functional unit;

iv) allocation rules;

v) system boundary setting;

vi) application of the rules for the exclusion of inputs and outputs.

2) Guidance for the life cycle inventory specifically related to the product group and/or product type for the information modules covered by the type of EPD.

3) Selection of information modules for which more specific requirements and guidance are given.

4) Inclusion of default scenarios related to a specific application of the product including guidance on:

i) the specific content of all information modules of the life cycle and information module D, for default scenarios (e.g. use, typical waste processing, for energy recovery, recycling and reuse and disposal);

ii) the definition of the end-of-waste status;

iii) the technical scenario information for all information modules of the product system and information module D;

iv) the determination of the RSL and related in-use conditions for a specific application of the product.

The following aspects are not part of c-PCR:

5) classes, benchmarks or threshold values for the indicators;

6) new indicators as part of the EN 15804 implementation.

NOTE 2 New indicators as part of the pre-set basket of indicators are developed in a horizontal standardization process.

NOTE 3 Additional LCA based indicators required or permitted by a c-PCR are communicated as additional information.

5.2 Types of EPD with respect to life cycle stages covered

5.2.1 Information Modules

In order to structure the sustainability assessment of buildings and to organize the use of data from products for such an assessment, the life cycle of a product and the life cycle of a building are presented identically in 3 life cycle stages:

— the before use stage: A, i.e. product and construction stage;

— the use stage: B, i.e. use stage;

— the after use stage: C, i.e. end-of-life stage.

Within the life cycle stages information modules are described. The environmental assessment methodology, as described by EN 15804 and EN 15978 is further broken down in the information modules specified by EN 15804:2012+A1:2013, Figure 1.

5.2.2 Beyond the product life cycle: information module D

During the life cycle of the product or building it is possible that secondary material and energy flows leave the system boundary and have a new role to play in another product or building life cycle. In other words, a product can have a positive or negative environmental contribution beyond the product life cycle (or product system) under study. Reuse or recycling therefore can bridge two life cycles.

However, the output flows from the production stage and from the rest of the life cycle stages, i.e. construction, use and end-of life stage, are treated differently.

— The information given for output flows from the construction stage and other modules up to the end-of life stage of the life cycle under study and thus for potential input flows into a next life cycle beyond its system boundary, is provided as net potential benefits and loads. This information of net potential benefits and loads is provided in information module D. Contributions to module D can only come from modules A4-C4 (see EN 15804:2012+A1:2013, Figure 1).

— Output flows coming from the production stage (A1-A3), are principally considered as co-products (when they are not waste), which themselves carry benefits or loads from their production history in A1-A3. This information is not provided in information module D. Co-products leaving one product system are treated like any other commodity when they become input into another product system.

5.2.3 Scenarios

Information modules A1, A2 and A3 are based on the actual and specific data of the production process of the product. However, as soon as a construction product leaves the factory gate the assessment is based on scenarios and assumptions: the fate of the product in the building chain will depend on locations, types of transport, installation and constructing methodologies, building type, use of the building, maintenance, repair and waste handling. The manufacturer cannot control these processes completely. An assessment thus requires scenarios to be specified for each module, i.e. for modules A4, A5, all B-modules, all C-modules and for information module D.

In a c- PCR-document for a specific product group, scenarios for each information module are more easily developed and default scenarios defined than at the horizontal level.

5.2.4 Types of EPD with respect to applied modules

It is possible for a Product TC to define any of the optional modules as mandatory.

5.2.5 Default values for indicator results for the use in c-PCR

Default values for the indicators defined in EN 15804 are considered part of an EPD, developed according to the c-PCR of the Product TC, which is based on the normative reference of EN 15804 and such default values are reviewed according to EN ISO 14025.

NOTE Default values are not verified by CEN/TC 350.

When Product TC's are providing default values for the indicators defined in EN 15804 to be included in harmonized product standards these default values are then worst-case values.

It is not recommended that Product TC's provide default values, due to the difficulty of calculating worst-case values. They can be counterproductive to average EPD and are not as useful for building assessment as average values.

5.3 Comparability of EPD for construction products

No guidance provided.

5.4 Additional information

No guidance provided.

5.5 Ownership, responsibility and liability for the EPD

No guidance provided.

5.6 Communication formats

No guidance provided.

6 Product Category Rules for LCA

6.1 Product Category

No guidance provided.

6.2 Life cycle stages and their information modules to be included

6.2.1 General

No guidance provided.

6.2.2 A1-A3, Product stage, information modules

Module A1 specifies the processes of raw material provision for the manufacturing processes, the latter being specified in information module A3. Inputs to A1 can be, e.g. ores, minerals, fossil oil or gas, products like fertilizer, as well as secondary materials or products.

The "polluter pays" principle is applied in EN 15804. This becomes relevant when some unit processes, such as firing in a kiln, composting etc., process waste originating from a previous product system. In such cases the production process for the assessed product is acting as waste management for the other product system. This means that the waste processing of the other product system is "out-sourced" to the product system using the waste. This waste management process sometimes provides energy and/or materials for the production process of the product system under study.

It is important to clarify whether the substance entering the production process under study is classified as "waste" or as "secondary product", i.e. secondary material or secondary fuel. EN 15804 includes the following requirements for the polluter pays principle:

— Emissions and resulting impacts from waste managing processes are accountable to the system that generated the waste.

— Any emissions and resulting impacts or waste resulting from further processing secondary material or secondary fuel, although the latter come without burden from their previous product system, are accountable to the assessed product.

Table 2 provides guidance on the assignment of waste management processes and use of secondary materials and fuels to the different modules C or D.

The legal definition of the end of waste status can differ from member state to member state or even regionally.

For transparency reasons the following conservative approach has been introduced: if wastes are used for energy or material recovery and do not have the same waste status in all member states two values can be declared in the communication of the LCA results in module A1 to A3:

a) the environmental impacts caused by the emissions including processing, incineration and co-incineration of waste (gross value); and

b) the environmental impacts caused excluding the incineration of waste (net value), see Table 2.

6.2.3 A4-A5, Construction process stage, information modules

When setting system boundaries the general principle of EN 15804 is to consider all processes in the modules where they occur. This also applies to losses (product waste from transport to site, storage on site and incorporation in construction). Such losses are not part of the input flows in modules A1-A3 but are calculated as additional input according to the rules of A1-A3 and declared in A4-A5.

If a product is declared as installed in a building, e.g. ETICS, the production processes of the product components are declared in modules A1-A3. All the installation processes are declared in A5. Any production and transport processes which compensate for any losses and related waste treatment processes of wastage during installation are declared in module A5, see EN 15804:2012+A1:2013, 6.3.4.3. Any losses from the transport stage are dealt with in module A4.

6.2.4 B1-B5, Use stage, information modules related to the building fabric

No guidance provided.

6.2.5 B6-B7, use stage, information modules related to the operation of the building

No guidance provided.

6.2.6 C1-C4 End-of-life stage, information modules

Table 2 provides guidance on the assignment of waste management processes to the different modules.

For transparency reasons the same conservative approach as described in 6.2.2 can be applied. If wastes are used for energy or material recovery and do not have the same waste status in all member states two values can be declared in the communication of the LCA results in module C3:

a) The environmental impacts caused by the emissions including processing, incineration and co-incineration of waste (gross value); and

    1) the environmental impacts caused excluding the incineration of waste (net value), see Table 2.

Table 2 — Application of the "polluter pays" principle to the use of waste as substitute for primary fuels or materials

Reached end-of-waste state?	Energy recovery Efficiency rate	Use of waste considered as	System that generates waste	System that uses waste
Yes — the substance or object is commonly used for specific purposes; — a market or demand, exists for such a substance or object; — the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; — the use of the substance or object will not lead to overall adverse environmental or human health impacts. (EN 15804:2012+A1:2013, 6.3.4.5)	NA	Use of secondary material or secondary fuel, e.g. use of wood chips recovered from untreated wood.	Declare the — materials for recycling or recovery in module where the waste is generated, or if at end-of life in C3 (EN 15804:2012+A1:2013, 7.2.5, Table 6); and — impacts of recycling processes to achieve end of waste in C3; — impact to achieve substitution and benefits in module D (EN 15804:2012+A1:2013, 6.3.4.6 and 6.4.3.3).	Declare the — use of secondary material or secondary fuel; and — environmental impact from the use of secondary material or fuel in the module where it is used (usually in A1-A3; EN 15804:2012+A1:2013, 6.3.4.2).
No, when — the waste is legally defined as waste when used; and — the use of waste is permitted and regulated under European and/or national waste legislation as applicable.	> = 60 %	Waste recovery, e.g. material or energy recovery. Sometimes referred to as use of alternative or waste fuel, e.g. use of tyres as substitute for fossil fuels in the cement industry.	Declare the — environmental impact from waste processing e.g. incineration in the module where the waste is generated, or if end-of life in module C3; — exported energy in the module where the waste is generated (EN 15804:2012+A1:2013, 7.2.5, Table 6 – Exported energy in MJ per energy carrier); — substitution benefits in module D (EN 15804:2012+A1:2013, 6.3.4.6 and 6.4.3.3).	Do not declare the — impacts from waste processing, e.g. co-incineration of waste. Declare the — use of exported energy from the waste within "use of secondary fuel" as a more appropriate indicator does not currently exist. It is

Reached end-of-waste state?	Energy recovery Efficiency rate	Use of waste considered as	System that generates waste	System that uses waste
	< 60 %	Waste disposal	Declare the — environmental impact from waste disposal e.g. incineration in the module where the waste is generated, or if end-of life in module C4; — exported energy in the module where the energy is generated and the waste is disposed of (EN 15804:2012+A1:2013, 7.2.5, Table 6 – Exported Energy in MJ per energy carrier); — substitution benefits in module D (EN 15804:2012+A1:2013, 6.3.4.6 and 6.4.3.3).	recommended to note this below the table.

6.2.7 D, Benefits and loads beyond the system boundary, information module

No guidance provided.

6.3 Calculation rules for the LCA

6.3.1 Functional unit

The functional unit defines the way in which the identified functions or performance characteristics of the product are quantified.

The primary purpose of the functional unit is to provide a reference by which material flows (input and output data) of construction product's LCA results and any other information are normalized to produce data expressed on a common basis.

For construction products, being part of a building and applied in various situations, uses and construction types, using a declared unit (6.3.2) is often more appropriate, as the reference is independent from specific situations and conditions of the use stage, which is not addressed, e.g. in a cradle to gate EPD.

6.3.2 Declared Unit

The declared unit is applied when no functional unit can be defined, e.g. because the use of the product cannot be unequivocally described because it can be used in many different ways. In such cases the c-PCR can specify the declared unit for the products as listed in EN 15804:2012+A1:2013, 6.3.2. It can be useful to consider the reference unit used as the denominator in, e.g. the technical descriptions, specifications, Declarations of Performance, bill of materials, etc. Reasons for declaring units other than those listed are the wish to use units commonly used for design, planning, procurement or sale.

6.3.3 Reference service life (RSL)

The Product TC's task is to provide guidance for estimating the Reference Service Life (RSL) according to EN 15804. This means developing the RSL in line with the framework of ISO 15686- series, using test standards in accordance with ISO 15686-2, and feedback from practice in accordance with ISO 15686-7.

For product group specific applications and conditions c-PCR sometimes provide default values for the declared RSL. They are then based on corresponding default use scenario conditions including, e.g. relevant scenarios for maintenance and repair (see EN 15804:2012+A1:2013, 7.3.3.2, Table 10). Where products assembled from components or construction elements are concerned, the RSL development also considers scenarios for replacement of components.

Indicator results for the RSL are provided per information module. It is possible to give annual values of indicator results for the use stage (B1-B7) as additional information.

For practical examples see EN 15804:2012+A1:2013, Annex A.

6.3.4 System boundaries

6.3.4.1 General

The boundaries for construction products are defined for the typical production processes (A1-A3) and the scenarios applying to the product over the rest of its life cycle (A4-C4). For the information module D, the boundary includes all processes up to the point of functional equivalence with the substituted primary material and/or fuel.

Further aspects of system boundaries such as technological and time related aspects are considered under data quality in EN 15804. The data quality requirements are applicable for all data used in the assessment. Data for upstream or downstream processes taken from databases are checked for compliance with EN 15804.

A c-PCR can provide more precise default boundaries for the assessment as long as they comply with the requirements given in EN 15804. For consistency when using this data in building assessment the compliance with EN 15804 is essential.

In EN 15804:2012+A1:2013, 6.3.4.1, the Note indicates details for providing structure and transparency for the calculation of individual modules.

EXAMPLE Maintenance of a product, e.g. flooring, requires cleaning and the use of energy. Auxiliary products for maintenance, which can be tensides, abrasives, solvents, varnishes, etc. are used and their environmental aspects and impacts are declared in the information module "B2 maintenance of the flooring product. The environmental aspects and impacts coming from the production of the auxiliary products used, from the energy provision as well as from the waste processing during maintenance in B2, are included in the assessment of the flooring.

Figure 1 visualizes the detailed information modules describing the life cycle stages of the maintenance service.

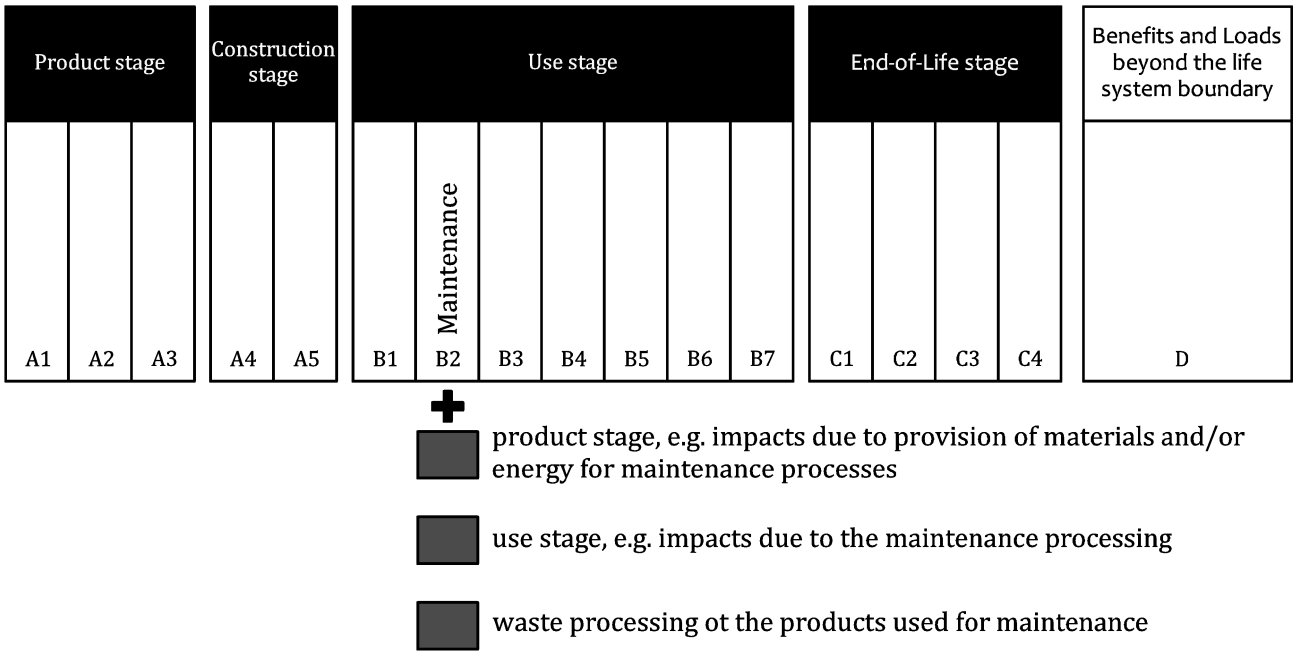

Figure 1 — Example of an information module scenario B2, Maintenance

The general rules for developing the scenarios are described in 7.3. A structured assessment of the information modules in the life cycle stage A4, B and C1, C3 and C4 could make use of nested information modules as described in Figure 1.

Such a structured approach also holds for the losses of products, e.g. during the transport module A4. The consequence of losses is the additional production of products compensating the wastage and its waste processing. This is an application of the "modularity principle".

6.3.4.2 Product stage

6.3.4.2.1 Biogenic carbon

The following guidance is given on how biogenic carbon is treated in the LCA underlying an EPD:

All bio-based materials (wood, linen, cork, etc. or biogenic manufactured polymers) contain biogenic carbon that originates from living organisms. The mass flows to and from nature and inherent stored biogenic carbon throughout the product system are reported as flow of biogenic carbon expressed in CO_2 in the life cycle inventory. When entering the product system, i.e. a flow to technosphere from

nature, this biogenic carbon flow is characterized with −1 kg CO_2e/kg CO_2 of biogenic carbon in the calculation of the GWP, since it represents a carbon storage that is part of the carbon cycle of bio-based materials.

This characterization factor is used for biomass coming from sustainably managed sources. For non-sustainably managed sources, a conservative approach is applied, e.g. by assuming that the biogenic carbon flow from non-sustainably managed sources is characterized with 0 kg CO_2e/kg CO_2. In such cases, double counting needs to be carefully avoided when including GHG emissions from land use change.

When the biogenic carbon within bio-based material – partly or as a whole – is converted to emissions, it will then be accounted for as emitted biogenic CO_2 and other emissions such as biogenic CH_4 in the information module where they are emitted to nature, depending on the end-of-life scenario. Emissions of biogenic CO_2 are characterized with +1 kg CO_2e /kg CO_2 of biogenic carbon in the calculation of the GWP.

NOTE 1 The flows of biogenic carbon expressed in CO_2 in bio-based materials (from sustainably managed sources) that are reused, recycled or combusted as the end-of-life scenario will result in zero net contribution to the GWP, when the GWP is added up over the whole life cycle (modules A-C), except for the part of biogenic carbon that is converted to CH_4 or other GHG emissions over the life cycle (see also 6.3.4.5.3).

For transparency, providing within the EPD separate information for the product and for its packaging on the amount of biogenic carbon included in the GWP impact in Module A1-A3 ensures this biogenic carbon can be correctly considered in any end of life scenarios. EN 16485 [2] provides one approach to address this.

Greenhouse gases emissions occurring as a result of land use change are included in the quantification of the GWP. They are assessed in accordance with internationally recognized methods in line with the provisions of the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories [3]. These GHG emissions are included in the LCI and LCIA and documented separately in the project report.

NOTE 2 This aspect is not restricted to bio-based materials, e.g. in the context of deforestation or conversion of grassland to energy crops, but also all other of materials and processes, e.g. related to the conversion of land to quarries, infrastructure, production plants, etc.

NOTE 3 According to EN 16485, wood from sustainably managed forestry's is accounted for zero emission concerning land use change. The concept of sustainably managed forests is linked but not limited to respective certification schemes. Other evidence such as national reporting under the United Nations Framework Convention on Climate Change (UNFCCC) [4] can be used to identify forests for which stable or increasing forest carbon stocks and thus zero emissions from land use change can be assumed.

6.3.4.2.2 Packaging waste in the product stage

Packaging waste from the production process needs to be tracked to the end-of-waste state or final disposal. Where the fate is not known, national or European databases can be used as a source of typical percentages of packaging sent to different fates.

NOTE This link provides information: http://ec.europa.eu/eurostat

If the efficiency of energy recovery is not known, a recommended default scenario is that all combustible waste, (including from combustible products at end-of-life), is incinerated with an efficiency of energy recovery of less than 60 %. Hence, loads are declared where the waste is generated, exported energy and potential substitution benefits are reported in D.

EN 15804 requires allocation for all net flows crossing the product system boundary from modules A1-A3 and becoming secondary materials and/or exported energy after they have reached the end of waste state. A conservative approach would be to omit such an allocation and leave benefits and loads to the

system under study, as the effort of allocation may be disproportionate to any improvement in accuracy.

6.3.4.3 Construction stage

6.3.4.3.1 General

If a product is formed during installation in a building, e.g. *in situ* formed products such as ETICS or *in situ* formed thermal insulation covered by prEN 16783 [5], the production processes for the product are declared in modules A1-A3. All installation processes, production processes and associated transport to compensate for losses and waste treatment processes to deal with losses are declared in module A5. Refer to EN 15804:2012+A1:2013, 6.3.4.3.

In some cases, a c-PCR specifies information module A5 as being mandatory for a product group or a specific product, e.g. where the impacts of installation are significant and/or it is necessary to include information module A5.

EXAMPLE *In situ* produced formed products and building elements, such as ETICS, sprayed insulation, sprayed waterproofing systems, screeds, floating floor systems, etc.

6.3.4.3.2 Packaging waste in the construction stage

Packaging waste generated beyond the factory gate, e.g. from the construction stage, is similarly tracked to the end of waste state or final disposal and net flows of secondary material and exported energy reported in the inventory for the module.

For flows crossing the system boundary of modules other than modules A1-A3, EN 15804 states that rather than using allocation, the loads and benefits associated with the use of secondary materials or exported energy beyond the system boundary are reported in module D.

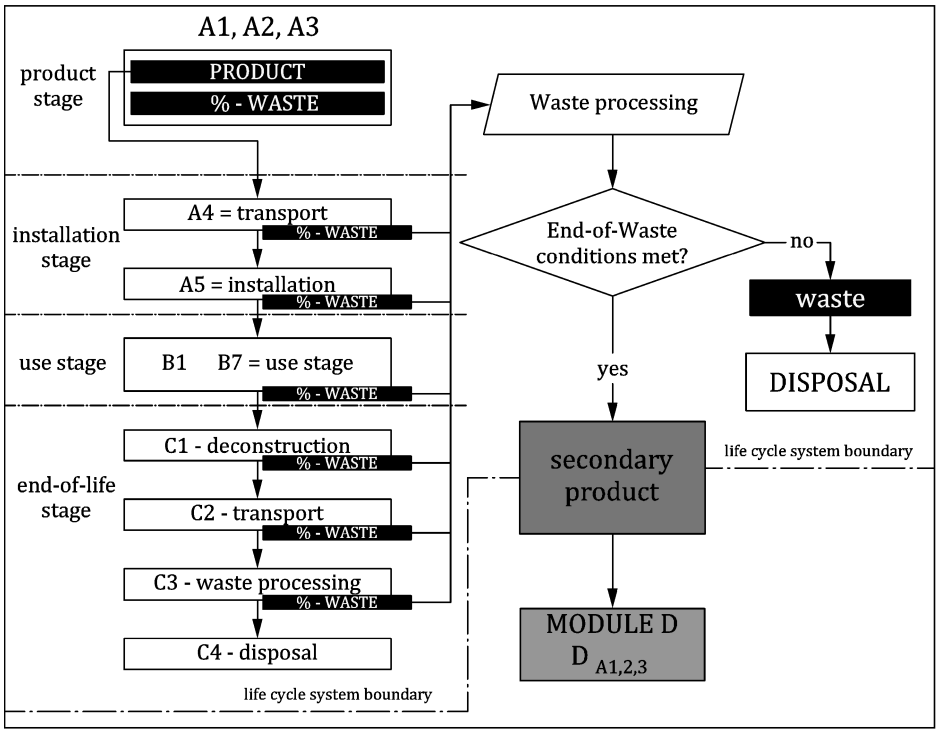

Figure 2 — Treatment of waste flows generated beyond the factory gate which have reached the end –of waste state

6.3.4.4 Use stage

6.3.4.4.1 General

The functional role and technical performance of construction products vary. Different construction product types, installed in different buildings in many different applications do not permit the standardization of all possible scenarios. Therefore, it is expected that Product TC's, dealing with specific groups of products, develop a set of default use conditions for the covered intended uses, e.g. maintenance and repair scenarios for default use conditions to facilitate the declaration of the Reference Service Life.

For calculating production processes resulting from the use stage scenario (e.g. replacement of some components), the calculation rules developed for A1-A3 are used. For calculating end-of-life processes during the use stage the calculation rules of C1-C4 are used.

Product related processes during the use stage of a product in a building are allocated to the modules where they occur. Waste management or recycling processes, e.g. during repair are allocated to "B3, repair" and resulting impacts are allocated according to Table 2. Replacement or processes during refurbishment of existing buildings are handled by the same logic.

Some construction products provide their technical or functional contribution over the service life of the building. Other products will require replacement during the lifetime of the building as illustrated in Figure 3.

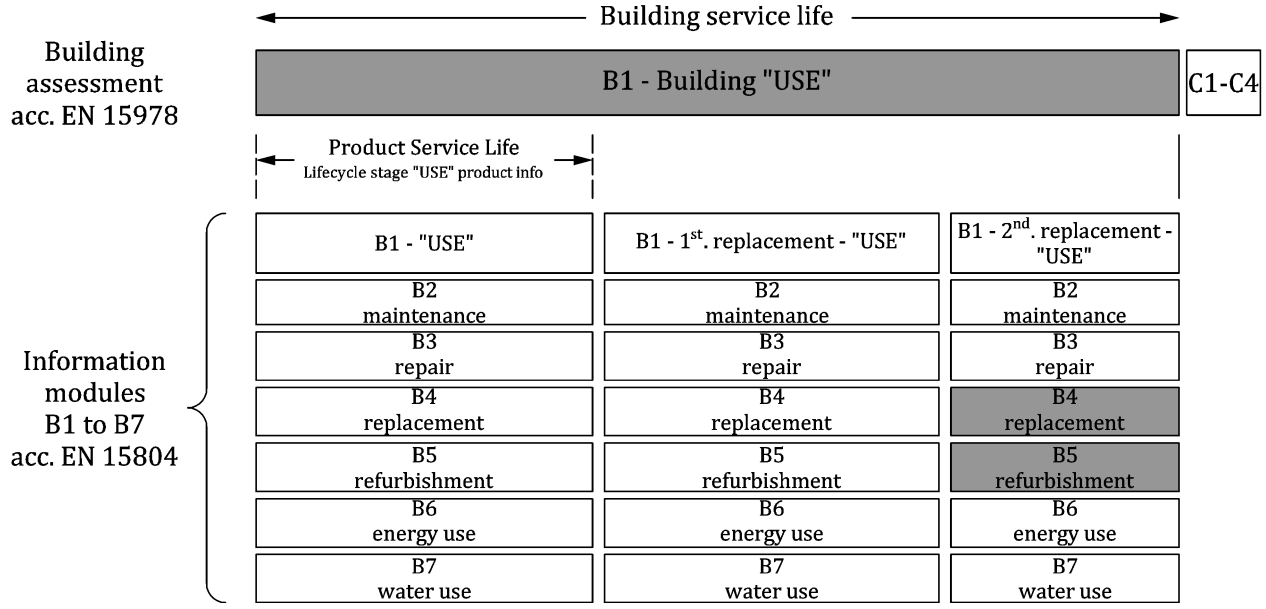

Figure 3 — Relationship of product reference service life and service life of the building

Depending on the assumed use and conditions for the product in a building context per information module use scenarios are specified for the product. The differentiations between the information modules cannot always be clearly formulated from a generic perspective, in particular between maintenance and repair or between replacement and refurbishment. A c-PCR is expected to provide more specific guidance on what is to be included in the scenario for the respective information modules, also as default scenarios.

6.3.4.4.2 B1-B5 Use stage information modules related to the building fabric

No guidance for B1 provided.

B2-B5: Declaration of the product performance in the information modules, maintenance, repair, replacement and refurbishment usually implies the use of auxiliary products, energy, and water and will generate waste. All these flows and processes are included within the boundaries of the respective information modules, see 6.3.4.1 and Figure 1.

The information modules B2-B5, describe processes and flows for, maintaining the appearance of products and meeting their required functional and technical properties, e.g. by painting doors, window frames or facades (maintenance), by replacing broken window panes or broken roof tiles (repair), by repairing a leakage (repair) or by overlaying waterproofing sheets (refurbishment), etc.

Maintenance scenarios also include regular cleaning specified for the products: e.g. for floor coverings specified in their respective scenarios with frequencies related to a specific use and specified with the cleaning products used.

The information modules B2-B5 include product relevant scenarios for waste management of any discarded product (or parts thereof) and the scenarios for waste processing of the auxiliary products used in the processes of repair, replacement or refurbishment, to be specified according to EN 15804:2012+A1:2013, 6.3.8 and 7.3.

6.3.4.4.3 B6 – B7 use stage information modules related to the operation of the building

No guidance provided.

6.3.4.5 End-of-life stage

6.3.4.5.1 General

Waste management scenarios for the end-of-life stage of a product clearly distinguish, identify and provide rules for quantification of:

a) products or share of products for re-use;

b) waste for material recycling into:

   1) a secondary material;

   2) a secondary fuel;

c) waste for energy recovery;

d) waste disposal by incineration;

e) waste disposal to landfill.

This quantification applies to all use stage modules.

If a building is dismantled or demolished the waste processing of the product under study is handled according to a scenario that can be different from the scenarios of waste management with respect to waste generated during maintenance, repair, replacement and refurbishment of the same product. This depends amongst other things on the deconstruction process.

6.3.4.5.2 End-of-waste state

In order to determine what is waste and what is a secondary product, EN 15804:2012+A1:2013, 6.3.4.5 and Annex B define the end-of-waste (EoW) criteria. The EoW-criteria are based on the Waste Framework Directive [6] and applied in context of system boundary setting they serve to implement the “the polluter pays” principle.

A material or part thereof is considered a secondary material or fuel when all four specified EoW-criteria are fulfilled. If it does not reach the status of secondary material or fuel then it stays as waste.

6.3.4.5.3 Biogenic carbon

If a material containing biogenic carbon leaves the product system at the end-of-waste state in module C (or any other module), this export of bio-based material and associated flow of biogenic carbon is reported as export of biogenic carbon expressed in CO_2 in the life cycle inventory and characterized with +1 kg CO2e/kg CO_2 of biogenic carbon in the calculation of the GWP in module C (or any other module). In analogy, any import of bio-based material to the product system as secondary fuel or secondary material is reported as input of stored biogenic carbon expressed in CO_2 in the life cycle inventory and shall be characterized with −1 kg CO_2e/kg CO_2e of biogenic carbon in the calculation of the GWP.

NOTE 1 The flows of biogenic carbon expressed in CO_2 in bio-based materials that are reused, recycled or combusted as the end-of-life scenario will result in zero net contribution to the GWP, when the GWP is added up over the whole life cycle (modules A-C), except for the part of biogenic carbon that is converted to CH4 or other GHG emissions over the life cycle.

NOTE 2 This system boundary is valid for all life cycle stages from A to C.

When a bio-based material is transformed to emissions other than CO_2 they are accounted for in the LCI and evaluated in the LCIA.

The amount of biogenic carbon contained in bio-based material leaving the product system is declared as technical scenario information in the module where the material is leaving the product system, irrespective of whether the environmental impacts and aspects of this module are declared. As a default for construction products, the quantity of stored biogenic carbon (expressed in kg CO_2) at the end-of-life per declared unit of the product is declared in module C3/C4.

NOTE 3 The quantity of biogenic carbon within the construction product provided as technical scenario information in modules A5 and/or modules C3/C4 will allow the correct calculation of end-of-life scenarios for the construction product when the module is not declared or the scenario is not appropriate for a particular building level assessment.

6.3.4.6 Benefits and loads beyond the product system boundary in module D

Information module D is not part of the product life cycle as described by the system boundary (see EN 15804:2012+A1:2013, Figure 1) but it can be part of the assessment. Information Module D provides important information on the benefits and loads of the recycling and energy recovery potentials coming out of a product to be used in a following product system.

6.3.5 Criteria for the exclusion of inputs and outputs

No guidance provided.

6.3.6 Selection of data with regard to average EPD

EPD are often developed for similar products from one or more manufacturing plants of one company using data specific to that product. EPD are also developed for groups of products, e.g. EPD from trade associations, using averaged data. Average EPD can in practice significantly reduce the effort associated with producing several specific EPD for similar products.

Ideally, an average EPD will provide the impact of an average product produced, for example by weighting impacts by production volume of all or a representative sample of the products. For some aspects of technical performance, a conservative approach comparable to a safety margin but ensuring correct technical performance of buildings might be relevant. Following from the above, if EPD are

representative of the products they cover, then buildings assessed using these EPD will, on average, have a representative calculated value.

The selection of products to be covered in one average EPD is done in such a way that the resulting average EPD is reasonably descriptive of the products covered in the EPD regarding the use of the EPD in a building assessment.

NOTE 1 With reference to CEN/TR 15941 [8] one might distinguish between:

a) product and brand specific EPD, based on specific data;

b) average EPD and the type of data – based on specific data, average data;

c) generic data

used in the assessment leading to an EPD.

NOTE 2 With reference to EN 15942 [7]: product specific EPD and average EPD have an owner specified in the EPD.

NOTE 3 Generic data or a generic EPD have no owner but specify the source and/or the assessor.

6.3.7 Data quality requirements

EN 15804:2012+A1:2013, 6.3.7 states: "the time period over which inputs to and outputs from the system shall be accounted for is 100 years from the year for which the data set is deemed representative. A longer time period shall be used if relevant". The standard does not define the assessment period of the building. However, on unit process level the time period over which inputs to and outputs from the system shall be accounted for is 100 years. The years are counted from the time when the material, pre-product or product enters the relevant process, e.g. landfill.

EXAMPLE If a product is separated from the building, e.g. due to demolition or repair and goes as waste to landfill, the long-term landfill emissions are calculated from the time the product is put to landfill. The landfill emissions are accumulated over 100 years. A longer time period is used, e.g. for the deposition of radioactive or hazardous waste.

6.3.8 Developing product level scenarios

When different scenarios are developed for information modules C1-C4 the most relevant scenarios are provided as 100 % versions. For example when 20 % of a product is recycled, 50 % is incinerated and 30 % is deposited, scenarios for 100 % of incineration, 100 % of recycling and 100 % of deposition are declared. This allows the building assessor to choose and calculate the correct scenario on building level as actual waste management practices vary in different member states.

If the waste management procedures are known, it is also possible to additionally reflect the actual flows of the waste management in the EPD to be used in the building assessment.

Table 3 — Waste treatment scenarios

Waste flow	100 %	Actual % waste flows (U+V+W+X+Y+Z = 100 %)	Calculated values in the building assessment according to EN 15978
Re-use (specify scenario)	[A = declared values on aspects and impacts for 100 % Re-use]	U %	U % · [A]
Recycling (specify scenario)	[B = declared values on aspects and impacts for 100 % Recycling]	V %	V % · [B]
Energy recovery from secondary fuels	[C = declared values on aspects and impacts for 100 % energy recovery]	W %	W % · [C]
Energy recovery from waste	[D = declared values on aspects and impacts for 100 % energy recovery]	X %	X % · [D]
Disposal by incineration	[E = declared values on aspects and impacts for 100 % incineration]	Y %	Y % · [E]
Disposal to landfill	[F = declared values on aspects and impacts for 100 % landfill]	Z %	Z % · [F]

6.3.9 Units

No guidance provided.

6.4 Inventory analysis

6.4.1 Collecting Data

No guidance provided.

6.4.2 Calculation procedures

Refer to chapter 5.2.5.

6.4.3 Allocation of input flows and output emissions

6.4.3.1 General

No guidance provided.

6.4.3.2 Co-product allocation

EN 15804:2012+A1:2013, 6.4.3.2 states: “Processes generating a very low contribution to the overall revenue may be neglected.” This cut off rule for neglecting allocation is intended to allow manufacturers to put all emissions onto the main product where it considers allocation too much effort for minor co-

products. However, if a low value co-product is being used as an input into a production process, allocation rules are used to understand the impact connected to that product.

The term "revenue" in EN 15804:2012+A1:2013, 6.4.3.2 means the revenue coming from the co-product after co-product as it leaves the joint co-production process. The revenue is the price multiplied by the output. For both price and output, representative values should be identified (e.g. annual averages). Prices alone are not considered to be the appropriate basis for the decision.

For an example of allocation on a purely economic basis see ISO/TR 14049:2012, 7.3.2 [9].

6.4.3.3 Allocation procedure of reuse, recycling and recovery

Module D aims at providing transparency relating to resource efficiency beyond the products life cycle.

To prevent double counting, recovered outputs must be linked to the same recovered inputs flows first and only net flows of recovered material, fuels or energy leaving the system boundary can be considered in module D.

Some products can be recycled for many cycles. However the allocation procedure for reused and recycled material considers only once the benefits of recycling in Module D, accounting for the potentially substituted primary material at the point of functional equivalence.

6.5 Impact assessment

In this chapter the requirements for the impact assessment are stated. EN 15804:2012+A1:2013, Annex C defines the characterization factors (CFs) to be applied. It is considered good practice to identify, in the project report, LCI data that have no CFs listed and for which CFs have been developed together with the significance of their inclusion. This can help to identify the need for complementary and consistent CFs for relevant LCI flows.

In a c-PCR common inventory flows without CFs in EN 15804:2012+A1:2013, Annex C are identified when they are likely to cause relevant impacts. If possible, robust complementary and consistent CFs for use in the LCIA are obtained and documented in the c-PCR. The calculation of CFs follow the same philosophy as has been employed for the calculated factors listed in EN 15804:2012+A1:2013, Annex C.

NOTE See EN 15804:2012+A1:2013, Table C.8 for the LCIA methodologies to be applied for the development of complementary CFs.

7 Content of the EPD

7.1 Declaration of general information

EN 15804:2012+A1:2013, 7.1, i): The description of the range or variability of the LCIA results is not necessarily a quantitative statement but can also be a qualitative description e.g. stating that the variability can be high or low for the calculated average value. This information gives the user an indication of the range of results that are likely for the products covered by the EPD.

When there is a selection of sites or products assessed, it is recommended that the following information is provided in the EPD for transparency and to give the user the necessary information to use the EPD correctly:

a) description of how the selection of the sites/products has been done and how the average has been determined;

b) information on the most influencing parameters in the LCA;

c) information on restrictions to the use of the EPD.

Useful information in the EPD for the representativity of average EPD is:

d) a technical description of the average product group (such as density or a property like U-value);

e) the number of manufacturing plants included in the EPD; and/ or

f) the names of manufacturing companies or brands or associations;

g) sampling process if only representative companies are chosen;

h) description of the relative production volume covered by the EPD;

i) geographical coverage;

j) the range of products for which the EPD is relevant, even if data from some products has not been used directly in producing the EPD.

7.2 Declaration of environmental parameters derived from LCA

7.2.1 General

No guidance provided.

7.2.2 Rules for declaring LCA information per module

The modules A1-A3 are mandatory for all 3 types of EPD's. All other information modules including information module D are optional. A scenario is declared to each information module A4-D.

NOTE EN 15942 [7] provides a communication format for all information modules.

7.2.3 Parameters describing environmental impacts

Abiotic deletion potential (ADP) is a parameter indicating the availability of the total reserve of potential functions of resources due to the use beyond their rate of replacement. ADP is split into:

— "ADP elements", which sums up non-fossil, abiotic resources (e.g. minerals, uranium, sand); and

— "ADP fossil," which sums up fossil resources (oil, natural gas, coal).

ADP considers the yearly extraction of the resource and the reserve of the resource. The size of the reserves depends on what is considered to be technically and economically feasible. A distinction is made between "ultimate, ultimate reserve", i.e. resources in the earth crust, "reserve base" i.e. resources that have a reasonable potential for becoming economically and technically available and "economic reserve", i.e. part of the reserve base which could be economically extracted or produced at the time of determination. EN 15804:2012+A1:2013, Annex C lists the first type, so-called "ultimate, ultimate reserve".

It is possible however not always simple to derive ADP CFs for compounds from their composition, e.g. for Pyrite (FeS_2) from iron and sulphur. The calculation of CFs for an impact follows the same philosophy as has been employed for the calculated factors of that impact listed in EN 15804:2012+A1:2013, Annex C.

NOTE Additional, complementary characterization factors are often provided by software for LCA calculation. Further detail may be given regarding molecular mass, etc. to calculate actual ADP Elements.

7.2.4 Parameters describing resource use

7.2.4.1 Primary energy use

Primary energy use is declared using separate indicators for renewable and non-renewable primary energy. Resources used as energy carriers and resources used as raw material input into the product are declared as separate indicators.

The quantification on the indicator "use of primary energy resources used as raw materials" is calculated as energy content by multiplication of the mass (kg) of the resource (or its components) with the lower calorific value (MJ/kg) of this resource (or its components) for each functional or declared unit. The result is a value of MJ/functional or declared unit.

EXAMPLE Renewable primary energy is contained in timber products and paper, wool or cotton in carpets, linseed oil in linoleum, sunflower oil in polyvinyl chloride (PVC) products, etc. Non-renewable primary energy is contained in plastics and insulations paints, sealants, water-proofing, textiles, floor coverings, etc. derived from crude oil or natural gas.

The indicators for the "use of primary energy resources used as energy carrier" can be calculated as the difference from the total primary energy and the primary energy used as raw material input into the product. The total primary energy is usually given in life cycle assessment tools.

The term "primary energy excluding primary energy resources used as raw materials" means "energy carrier" or energy used in processes.

7.2.4.2 Net use of fresh water

This indicator is calculated in compliance with ISO 14046.

EN 15804 uses the term "net" as opposed to "gross" in relation to freshwater use, to show both: the intention that use of water, which it is not consumed (e.g. water used for river transport, used to power hydroelectric turbines or used as coolant and returned to the original source), is not considered within the indicator. The water which would have been lost from the original, natural system, e.g. from evaporation of rainwater or from a body or water is not considered within the losses from the studied technical system.

Evaporated fresh water is considered consumption unless it is demonstrated otherwise. For each process, the water flows are identified, in terms of volume extracted, volumes discharged and the source or the destination, e.g. surface water, ground water, sea water.

Where tap water (water from the public grid) is used, the water treatment and distribution systems are considered as an upstream process, which will have its own resource use and discharges.

Similarly, where water is discharged to the sewer, then the sewer and water treatment system are considered as a downstream process with its own resource use and discharges.

Other water flows, for example water which evaporates or water, which is incorporated into the product, are ideally be itemised in the process inventory so that a full water balance can be made.

For each process, the water consumed is the sum of the water, which is lost from a drainage basin. This can be more easily calculated as the sum of water, which evaporates, transpires from biomass, is incorporated into products or is discharged to a different drainage basin. This also, as mentioned, does not need to account for water, which would have been lost from the drainage basin in the natural system before the technical system was implemented.

EXAMPLE 1 Rainwater would normally be expected to drain to surface or ground water. If a factory or building is placed on the site, then water could instead be directed to the sewer and could be discharged, after treatment, to the sea, surface or ground water. Water, which is diverted through the water treatment system from its original drainage basin is consumed. If rainwater is used in the building before discharging it into the sewer then this will

be considered no differently than if the water was discharged directly to the sewer. However, if rainwater is used for cleaning and evaporates, then this water is consumed.

EXAMPLE 2 For an agricultural process, water that evaporates or transpires from the plants as a result of human activity (irrigation) is considered as consumption. Water such as rainwater, which evaporates or goes to the drainage basin in the same way as if it would, were there no agricultural process, is not consumption. The assumption is that natural vegetation would have the same effect.

EXAMPLE 3 Additional water evaporation from reservoirs and as a result of the hydro-generation process downstream occurring in addition to that from the original natural system is considered water consumption.

EXAMPLE 4 For a quarry, where de-watering takes place, if this water is returned to the same drainage basin it would naturally have drained to, then it is not consumption. If however, it is used in a process and evaporates, then it is consumption.

7.2.5 Other environmental information describing different waste categories and output flows

For describing the exported energy from incineration the net calorific value and the appropriate efficiency of incineration applies. Exported energy produced from waste incineration or landfill is reported in the module where it occurs. The differentiation between the indicators for materials for energy recovery (secondary fuels) and exported energy is described in EN 15804:2012+A1:2013, 7.2.5, Note 4.

Energy produced from waste landfill is not considered the same as energy produced from a biogas reactor.

7.3 Scenarios and additional technical information

No guidance provided.

7.4 Additional information on release of dangerous substances to indoor air, soil and water during the use stage

No guidance provided.

7.5 Aggregation of information modules

No guidance provided.

8 Project report

No guidance provided.

9 Verification and validity of an EPD

No guidance provided.

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