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Sustainability in buildings and civil engineering works — Data templates for the use of environmental product declarations (EPDs) for construction products in building information modelling (BIM)

Développement durable dans les bâtiments et ouvrages de génie civil — Modèles de données pour l'utilisation des déclarations environnementales de produits (DEP) pour les produits de construction dans la modélisation des informations de la construction (BIM)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 17, *Sustainability in buildings and civil engineering works,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 350, *Sustainability of construction works,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Environmental product declarations (EPDs) are Type III environmental declarations (see ISO 14025) that provide quantified environmental data using predetermined parameters based on ISO 14040 and ISO 14044 and, where relevant, additional environmental information. ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019 are standardized sources of the core product category rules (PCR) to develop EPDs for construction products to provide modular data to enable consistent assessment of environmental impacts at the construction works level.

All types of assessment at construction works level are complex; and building information modelling (BIM) provides a process for describing and displaying information required in the planning, design, construction, operation and end-of-life of constructed facilities. The BIM approach is expanding to encompass all aspects of the built environment, including civil infrastructure, utilities and public spaces. Designers, owners and other stakeholders in the construction sector are increasingly looking to BIM to assist them in addressing the environmental impacts of construction works.

The ISO 19650 series sets out the recommended concepts and principles for business processes to support the management and production of information during the life cycle of constructed assets when using BIM. To do this, standardization is of the highest importance. Machine-interpretable data are essential to providing a reliable and sustainable exchange of information; and a data template supports the standardized provision of data in machine-interpretable data sheet formats for use in BIM. The data provided in EPDs, like other construction product data, are therefore needed in a machine-interpretable format to enable their use in BIM.

Data templates enable construction project stakeholders to exchange information about construction objects throughout the life cycle of a constructed asset, using the same data structure, terminology, and globally unique identifiers to enable the data to be machine-interpretable and interoperable. Data templates should be standardized and made available across the built environment sector through data dictionaries based on ISO 12006-3.

This document provides and explains the data template structure to support the provision of both EPD and generic life cycle assessment (LCA) data in standardized machine-interpretable data sheet formats to assist in the assessment of the environmental performance of the construction works over its life cycle. The mechanism used in this document to enable this is a data template created following ISO 23386 and ISO 23387 and the resulting data sheet.

This includes both mandatory and optional data from different types of EPD, such as, average EPD (see ISO 21930:2017, Annex B), and other relevant information necessary for use of EPDs at the construction works level within a BIM environment. Figure 1 shows the relationship between data, data templates, data sheets, BIM and environmental assessment at the construction works level.

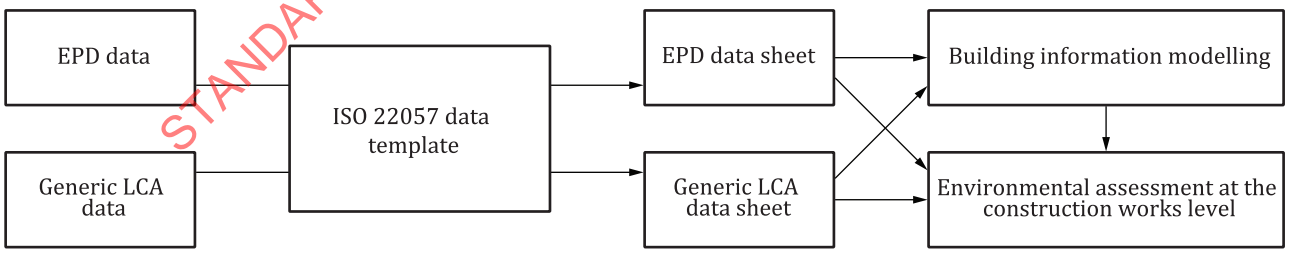

Figure 1 — Relationship between data, data templates, data sheets, BIM and environmental assessment at the construction works level

Providing the data from an EPD according to ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019 in machine-interpretable format means some information needs to be standardized in ways not considered in those standards. Historically, the indicator data for gate-to-grave information modules from a machine-interpretable EPD were often not used because the description of the scenario information was not concurrently provided in machine-interpretable format; and/or the data were not provided in a sufficiently flexible fashion to allow adaption for different scenarios at

the construction works level. Responding to these needs, this document provides specifications for the provision of gate-to-grave scenario data for an EPD in machine-interpretable formats, so the data are more appropriate for environmental assessment at the construction works level when using BIM.

Figure 2 shows the relationship between this document and other standards for buildings and civil engineering works related to BIM and sustainability.

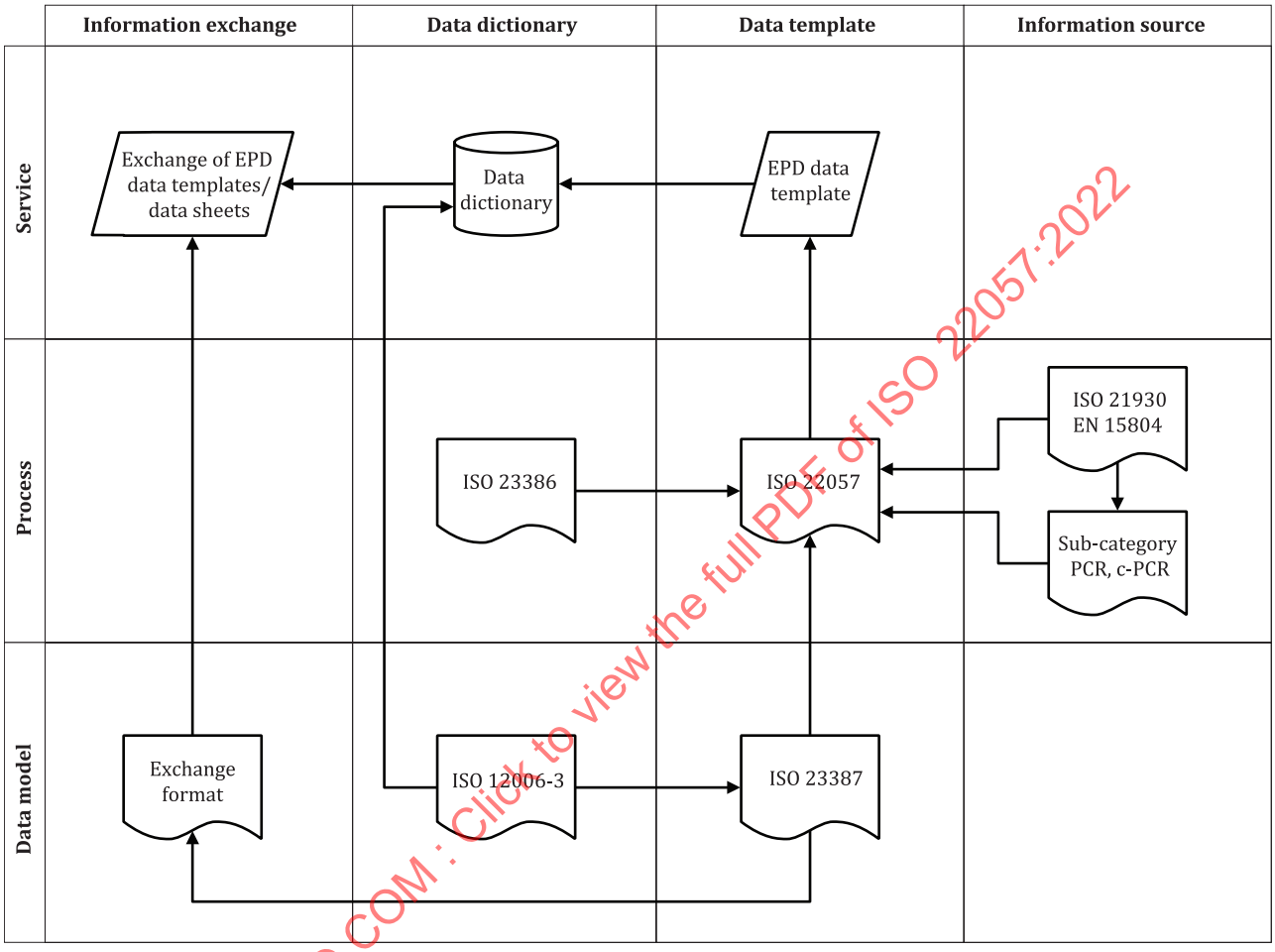

Figure 2 — Relationship between BIM standards and sustainability standards

The requirements in this document are further supplemented by technical information about construction products and services, construction elements and integrated technical systems so they can be machine-interpretable. Technical information means requirements and conditions as stated in standards and specifications relevant for construction products. This document recommends the use of the same principles for structuring information (data template concepts) and the use of existing technical information created by other domain experts. Annex D offers guidance on the delivery of information according to the principles of this document according to the principles described in CWA 17316 and smart CE marking.

EXAMPLE In Europe, Construction Products Regulation (CPR) experts are responsible for creating and maintaining technical information based on European harmonized standards.

This technical information in standards or technical specifications can already exist in a data dictionary; and EPD/LCA experts can use it for the technical description of products in an EPD.

This document is intended to help in understanding the different template concepts and their relation to EPD information and to enable users to create new concepts according to their specific needs.

NOTE For example, experts developing sub-category PCR according to ISO 21930 or complementary PCR (c-PCR) according to EN 15804:2012+A2:2019 can create a data template for additional specific requirements in the sub-category PCR or c-PCR for the relevant product group.

Users of this document should be able to find the data template described in this document in existing data dictionaries; but in case there is a data dictionary that does not support the structure, they should be able to recreate the data template structure in their own implementations using the information provided in Annex A.

This document also ensures the alignment between the proposed approach in it and already existing formats like ILCD + EPD, INIES and OpenEPD (see Annex B).

Sustainability in buildings and civil engineering works — Data templates for the use of environmental product declarations (EPDs) for construction products in building information modelling (BIM)

1 Scope

This document provides the principles and requirements to enable environmental and technical data provided in EPDs for construction products and services, construction elements and integrated technical systems to be used in BIM to assist in the assessment of the environmental performance of a construction works over its life cycle.

This document gives requirements on structuring EPD information using a data template according to ISO 23386 and ISO 23387, to make EPD data machine-interpretable and to enable their integration into information-driven design, construction, use and end-of-life stages.

This document is applicable to structuring generic LCA data for use within a BIM environment, as these data are required in the absence of suitable EPD data to enable assessment of the environmental performance at the construction works level.

The assessment of environmental performance at the construction works level is not covered by this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6707-1, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

ISO 14040, *Environmental management — Life cycle assessment — Principles and framework*

ISO 14050, *Environmental management — Vocabulary*

ISO 21930, *Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services*

ISO 23386, *Building information modelling and other digital processes used in construction — Methodology to describe, author and maintain properties in interconnected data dictionaries*

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

EN 15804:2012+A2:2019, *Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1, ISO 14040, ISO 14050, ISO 21930, EN 15804:2012+A2:2019 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms relating to environmental labelling and construction products

3.1.1
construction object
object (3.2.3) of interest in the context of a construction process

EXAMPLE 1 The construction object "wall" is a type of system.

EXAMPLE 2 The construction object "calcium silicate masonry unit" is a type of construction product.

Note 1 to entry: See ISO 21931-1:2010, 3.11 for the definition of "process" and ISO 6707-1:2020, 3.3.5.6 for the definition of "construction."

[SOURCE: ISO 12006-2:2015, 3.1.2, modified — EXAMPLEs 1 and 2 and note 1 to entry have been added.]

3.1.2
information module
compilation of *data* (3.3.1) to be used as a basis for an EPD, covering a unit process or a combination of unit processes that are part of the *life cycle* (3.1.3) of a product

[SOURCE: ISO 14025:2006, 3.13, modified — Reference to "a Type III environmental declaration" has been replaced by "an EPD".]

3.1.3
life cycle
consecutive and interlinked stages of a product (or service) system, from raw material acquisition or generation from natural resources to final disposal

Note 1 to entry: The life cycle stages include acquisition of raw materials, design, production, transportation/delivery, use, end-of-life treatment and final disposal.

[SOURCE: ISO 14001:2015, 3.3.3]

3.2 Terms relating to concepts, objects and properties

3.2.1
concept
unit of knowledge created by a unique combination of *characteristics* (3.2.2)

[SOURCE: ISO 1087:2019, 3.2.7, modified — Notes 1 and 2 to entry have been removed.]

3.2.2
characteristic
abstraction of a *property* (3.2.5)

Note 1 to entry: Characteristics are used for describing *concepts* (3.2.1) and *construction objects* (3.1.1).

[SOURCE: ISO 1087:2019, 3.2.1, modified — EXAMPLE has been removed; reference to "construction objects" has been added to note 1 to entry.]

3.2.3
object
any part of the perceivable or conceivable world

Note 1 to entry: An object is something abstract or physical toward which thought, feeling, or action is directed.

[SOURCE: ISO 12006-2:2015, 3.1.1]

3.2.4
domain
area of activity covering a science, a technique, a material, etc.

Note 1 to entry: A domain can be associated with a group to which the *property* (3.2.5) applies.

[SOURCE: ISO 23386:2020, 3.11]

3.2.5
property
inherent or acquired feature of an item or *object* (3.2.3)

EXAMPLE 1 Thermal efficiency, heat flow, sound reduction index, sound power level, colour.

EXAMPLE 2 'Being made of wood' as a property of a given construction product.

Note 1 to entry: One or more objects can have the same property.

[SOURCE: ISO 23386:2020, 3.17, modified — A reference to "object" in the definition, EXAMPLE 2 and note 1 to entry have been added.]

3.2.6
group of properties
collection enabling the *properties* (3.2.5) to be prearranged or organized

[SOURCE: ISO 23386:2020, 3.14, modified — Four notes to entry have been removed.]

3.2.7
identifier
string (3.3.12) of characters created by an organization to reference a *dataset* (3.3.5)

3.2.8
quantity
property (3.2.5) of a phenomenon, body, or substance, where the property has a magnitude that can be expressed by means of a number and a reference

EXAMPLE 1 Length, mass, electric current (ISQ base quantities).

EXAMPLE 2 Plane angle, force, power (derived quantities).

Note 1 to entry: Quantities can appear as base quantities or derived quantities.

[SOURCE: ISO 23386:2020, 3.16]

3.3 Terms relating to data

3.3.1
data
reinterpretable representation of information in a formalized manner suitable for communication, interpretation, or processing

[SOURCE: ISO 8000-2:2020, 3.2.2]

3.3.2
data template
data (3.3.1) structure used to describe the *characteristics* (3.2.2) of *construction objects* (3.1.1)

[SOURCE: ISO 23387:2020, 3.3, modified — Two EXAMPLES and two notes to entry have been removed.]

3.3.3
data sheet
completed *data template* (3.3.2) containing the relevant *values* (3.4.3) and other information representing the content of the EPD

3.3.4
data dictionary
centralized repository of information about *data* (3.3.1) such as meaning, relationships to other data, origin, usage and format

[SOURCE: ISO 23387:2020, 3.2, modified — The note to entry has been removed]

3.3.5
dataset
identifiable collection of *data* (3.3.1)

EXAMPLE Integer, Real, *Boolean* (3.3.15), *String* (3.3.12), Date, and GM_Point.

Note 1 to entry: A *data type* (3.3.7) is identified by a term, e.g. Integer.

[SOURCE: ISO/IEC 30182:2017, 2.6]

3.3.6
data quality
characteristics (3.2.2) of *data* (3.3.1) that relate to their ability to satisfy stated requirements

[SOURCE: ISO 14044:2006, 3.19]

3.3.7
data type
named set of *values* (3.4.3)

[SOURCE: ISO 10161-1:2014, 3.2.1, modified — The preferred term "type" has been removed.]

3.3.8
enumerated value
data type (3.3.7) consisting of a set of named *values* (3.4.3) called elements, members, enumeral, or enumerators of the type

[SOURCE: ISO 23387:2020, 3.5, modified — The preferred term has been changed from "enumerated type value" to "enumerated value".]

3.3.9
globally unique identifier
GUID
unique *identifier* (3.2.7) generated using an algorithm

[SOURCE: ISO 23386:2020, 3.13, modified — Note 1 to entry has been removed.]

3.3.10
building information modelling
BIM
use of a shared digital representation of an asset to facilitate design, construction and operation processes to form a reliable basis for decisions

[SOURCE: ISO 23386:2020, 3.6]

3.3.11
machine-interpretable data
data (3.3.1) that is in a specific context and format and can be read and stored in a computer system such that action may be taken based on the content of the data

[SOURCE: ISO 10303-232:2002, 3.5.3, modified — The preferred term has been changed from "computer interpretable data " to "machine-interpretable data"; the EXAMPLE has been removed.]

3.3.12
string
sequence of elements of the same nature, such as characters or bits, considered as a whole

Note 1 to entry: A string may be empty [*null* (3.3.13)] or contain only one element.

[SOURCE: ISO/IEC 2382:2015, 2121583, modified — Reference to "null" has been added in note 1 to entry; two notes to entry have been removed.]

3.3.13
null
containing no elements

3.3.14
float number
data type (3.3.7) of real numbers that is used to define floating decimal points

3.3.15
boolean
data type (3.3.7) having two values: one and zero [which are equivalent to true and false]

[SOURCE: ISO 2146:2010, 4.6.1]

3.4 Other terms

3.4.1
reference document
publication that is consulted to find specific information, particularly in a technical or scientific *domain* (3.2.4)

EXAMPLE See EN 771-1:2011+A1: 2015.

Note 1 to entry: A reference document can be associated with any *data* (3.3.1) present in a *data dictionary* (3.3.4). It can include the document date and version.

[SOURCE: ISO 23387:2020, 3.12]

3.4.2
unit
real scalar *quantity* (3.2.8), defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the second quantity to the first one as a number

[SOURCE: ISO 23386:2020, 3.19, modified — Two admitted terms have been removed.]

3.4.3
value
number and reference together expressing magnitude of a *quantity* (3.2.8)

EXAMPLE 1 Length of a given rod: 5,34 m or 534 cm.

EXAMPLE 2 Mass of a given body: 0,152 kg or 152 g.

[SOURCE: ISO 23386:2020, 3.20, modified — Two admitted terms and EXAMPLES 3 to 10 have been removed.]

3.4.4
M
mandatory
information indicating that a *data* (3.3.1) element is required to be present within a specific record

[SOURCE: ISO 2146:2010, 4.4.1, modified — "shall" has been replaced by "is required to".]

3.4.5
O
optional
information indicating that a *data* (3.3.1) element is permitted to be present within a specific record

[SOURCE: ISO 2146:2010, 4.4.2, modified — "may" has been replaced by "is permitted to".]

3.4.6
in-use condition grade
designation representing a qualitative description of an in-use condition

Note 1 to entry: In-use condition grades are designated qualitatively in terms of not available, very high/very mild, high/mild, normal, low/severe, very low/very severe and not applicable.

Note 2 to entry: In-use condition grades are designated numerically using numbers in the range from 0 to 5, with 3 representing a "normal" condition.

[SOURCE: ISO 15686-8:2008, 3.7, modified — Note 1 to entry has been removed.]

3.4.7
factor category
category of in-use conditions that are considered in the determination of an ESL from an RSL

EXAMPLE 1 Inherent performance level, design level, work execution level, indoor environment, outdoor environment, usage conditions and maintenance level.

EXAMPLE 2 In-use conditions, such as temperature and moisture level, can be considered under the factor category, outdoor environment, in determining factor E.

Note 1 to entry: Factor categories are used in the factor method to determine the factors A to G and can be applicable in a similar way in any feasible alternative method.

4 Abbreviated terms

c-PCR	complementary product category rules
CPR	Construction Products Regulation
EPD	environmental product declaration
ESL	estimated service life
ILCD	International Reference Life Cycle Data System
LCA	life cycle assessment
LCI	life cycle inventory analysis
LCIA	life cycle impact assessment
PCR	product category rules
RSL	reference service life
UML	unified modelling language

5 Purpose of data templates

5.1 General

This document is relevant for EPDs defined in accordance with ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019. This document is also relevant for LCA data prepared using the methodological requirements of ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019.

The requirements given in ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019 are structured following the ISO 23387 data template principles (see Clause 7). The intention of data templates is to provide a standardized data model to support the declaration of construction product information using a common technical language. When this construction product information is incorporated into the data templates, they become data sheets.

The properties and other terms defined here in the context of a digital EPD, and the data template, constitutes a part of a data dictionary. By using this document, the user should adopt these definitions and properties in their applied data dictionary, in order to facilitate communication of digital EPDs in information exchanges, see Figure 2.

Digital EPD information may be provided by different parties. It may also be modified at the construction works level under different circumstances and needs, which affect with whom the responsibility resides for the quality of data provided. The manufacturer or group of manufacturers have the responsibility for the information they provide for the digital EPD; any use, replacement or modification of the information is outside their responsibility.

EXAMPLE 1 The manufacturer providing the EPD supplies a "cradle to grave" data sheet and none of the parameters is changed. Thus, the manufacturer is responsible for data.

EXAMPLE 2 The manufacturer providing the EPD supplies a "cradle to grave" data sheet but a building assessor modifies the parameters of information modules B1 to C4 and module D so the data fits into the project's context. Thus, the manufacturer is responsible for the data in the unchanged information modules A1 to A5, but they are no longer responsible for the data used for information modules B1 to C4 and module D in the building assessment. The building assessor has responsibility for these data.

EXAMPLE 3 The manufacturer providing the EPD supplies a "cradle to gate" data sheet and a building assessor provides the data for information modules C1 to C4 and module D. Thus, the manufacturer is responsible for the data in the unchanged information modules A1 to A3 but is not responsible for the data used for information modules A4 and A5, information modules B1 to C4 and module D in the building assessment. The building assessor has responsibility for these data.

EXAMPLE 4 The manufacturer provides an EPD that is digitalised by another organization. Accurate digitalisation of EPD is the responsibility of the organization digitalising it.

5.2 EPD data and generic LCA data/information use

The purpose of providing EPD data and generic LCA data in data templates is to assist in the assessment of the environmental performance of the construction works over its life cycle and to align this information with any other construction product information, e.g. thermal transmittance, reaction to fire, warranty. Such an alignment makes the following processes more effective and efficient:

a) specifying and selecting products based on technical requirements;

b) comparing alternative products;

c) predicting performance based on more accurate data about scenarios from contractors or other parties including end-of-life, e.g. how the product has been installed previously;

d) setting out the basis for future benchmarks.

EXAMPLE Data sheets can cover panels, e.g. a wood-based panel, with and without surface protection, based upon the same data template.

5.3 Generic LCA data

Where EPDs are not available to describe the environmental aspects and impacts of a construction product's life cycle in an environmental assessment at a construction works level or the scenarios are not representative of the construction works being assessed, generic LCA data should be used to ensure that the complete impact of scenarios at the construction works level is considered.

This document enables generic LCA data to follow the same data template structure as EPD data.

EXAMPLE 1 Generic LCA data for 1 m of pipe made of polyethylene (PE-X) produced in the EU for a potable (domestic) water supply system.

EXAMPLE 2 Generic LCA data for a central ventilation system with heat recovery, a capacity of 5 000 m^3/h used in the EU.

EXAMPLE 3 Generic LCA data for 1 m^3 of bricks produced in a given country.

EXAMPLE 4 Generic LCA data for the consumption of 1 kWh of electricity in the Netherlands in construction works level scenarios for A5 and B6.

Data quality information shall be provided for generic datasets based on LCA on the basis of this document. Those properties described in this document that relate to data quality and sources of data shall be provided so as to clearly differentiate generic datasets based on LCA from verified EPD data, see 8.3.

NOTE The requirements of ISO 14025 intend that EPDs developed in accordance with ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019 have reasonable data quality; but the provision of generic datasets based on LCA has no similar requirement for data quality. It is important to check the methodology used and the data quality of LCA based generic datasets. Data is expected to be methodologically consistent and of at least equal quality to data from official sources, e.g., data provided at a national or regional level for this specific purpose.

6 Terminology alignment

In ISO 23387, a standardized data structure has been introduced for creating of data templates for construction objects, see Annex C. The terminology used in ISO 23387 is aligned with terminology used in other BIM standards developed by ISO/TC 59/SC 13 and CEN/TC 442.

ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019 provide core rules for the product category and environmental product declarations of construction products, including terminology to be used in an EPD.

As the approaches for BIM and EPDs use terminology differently, a correlation is provided in Table 1. Table 1 provides a list with concept names from ISO 23387 together with an interpretation that is more in line with the terminology in ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019.

Table 1 — ISO 23387 terminology and EPD terminology correlation

ISO 23387 terminology	EPD terminology
Construction object	Construction product; construction element
Data template	None
Property	Examples of properties: LCIA indicators, LCA indicators, product description, content declaration, programme operator description, scenarios' parameters
Group of properties	Examples of group of properties: sets of LCIA indicators, sub–scenarios, reference unit and RSL
Reference document	Examples of reference documents: ISO 21930, EN 15804:2012+A1:2013, EN 15804:2012+A2:2019, Standard PCR, Characterization factors document, Sub-category PCR, c-PCR

The terminology from ISO 23387 is used throughout this document where a description of a concept is provided. For text related to the content in EPDs, EPD terminology is used.

7 Creating data templates

7.1 General

This clause describes the process of creating EPD data templates for construction products, including services, construction elements and integrated technical systems used in any type of construction works EPD that are according to ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019. This process has been followed in developing this document and its data template. The process describes how domain experts shall follow the documents providing the requirements for EPDs for construction products, e.g. sub-category PCR.

The process is based on the management rules to author and maintain properties and groups of properties according to ISO 23386.

This document refers to concept as a generic term covering the specific parts defining a data template. The types of concepts referred to in this clause are construction object, data template, groups of properties, property, and reference document, as defined in ISO 23387.

As a support to comply with the processes defined in this document, domain experts can find further descriptions and requirements for the information to be communicated in the data template in ISO 21930, EN 15804:2012+A1:2013, EN 15804:2012+A2:2019, or in a construction product specific PCR of relevance.

Figure 3 provides the process of creating a data template. It is not a prescribed process and is a suggested way of creating the data template.

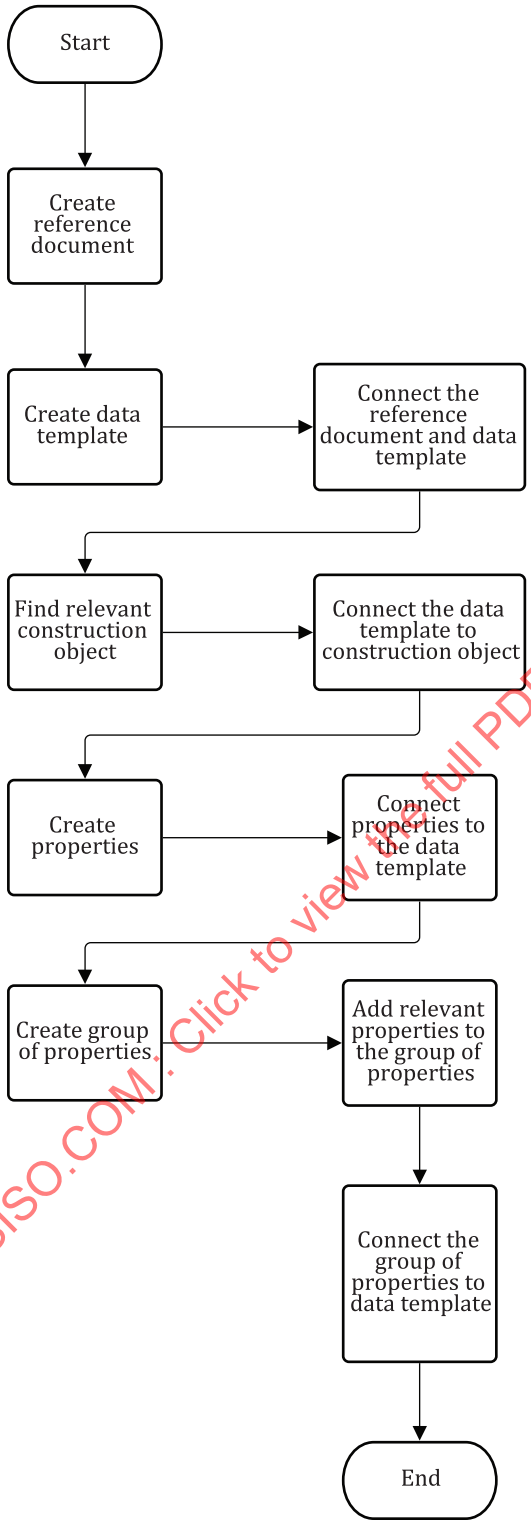

Figure 3 — Overall process of creating a data template

To avoid duplication of concepts, the process shall include a search in the data dictionary to check if a concept already exists. Any matching concept found through a search shall be used. See Figure 4.

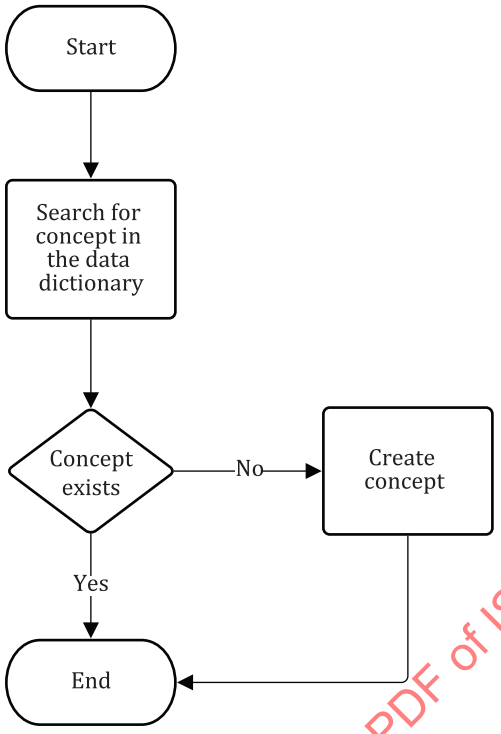

Figure 4 — Search for duplicates process

7.2 Creating a data dictionary concept representing a reference document

A data dictionary concept for a reference document represents a core PCR, a product-type-specific PCR, or another source providing information about environmental indicators or other technical data that shall be used for EPD or LCA data and building assessment. The name of the concept shall be given using a combination of the reference code, the dated reference, any amendments and corrigenda, and their dates, and the title of the reference document. The description shall be given according to the scope of the reference document.

EXAMPLE

Name: ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

Description: This International Standard provides core product category rules (PCR) for Type III environmental declarations for any construction product and construction service

The concept shall be created in accordance with the list of attributes for groups of properties in ISO 23386.

7.3 Create a data dictionary concept representing a data template

A data dictionary concept for a data template represents the properties relevant for an EPD for a construction product. The data template concept provides the purpose of the properties, based on the source of information, e.g. a sub-category PCR. A relationship needs to be created between the data template concept and the reference document concept to provide the purpose for this context.

EXAMPLE

Name: Scenario for information module A4

Description: Additional technical information in the EPD for transport from the production gate to the construction site

The data template concept shall be created in accordance with the list of attributes for groups of properties in ISO 23386.

7.4 Creating a data dictionary concept representing properties

The properties associated with a construction product provide the formal definition of the construction product as well as its typical behaviour.

The property concept shall be created based on the terms in ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019, as appropriate. These terms refer to LCA results from LCIA, LCA results from LCI, additional environmental information, parameters that describe EPD general information and methodological framework, and parameters that describe scenario assumptions.

Property names and definitions shall be described in a way that best indicates what is measured, tested, calculated etc. Much of the information that an EPD captures, and especially information about scenarios, is very complex. The values of some properties depend on the values of other properties; therefore, these properties shall be connected through the dependency relationship given in Annex A.

The property shall be provided with a name and a description shall be given according to the narrative of the assessment method.

EXAMPLE

Name: Global Warming Potential for Air Emissions

Description: A measure of how much heat a greenhouse gas traps in the atmosphere over a specific time horizon, relative to carbon dioxide

The property concept shall be created in accordance with the list of attributes for properties in ISO 23386.

7.5 Creating a data dictionary concept representing groups of properties

Based on the information need, different groups of properties are required to structure and exchange information in BIM. This document provides an exhaustive list of such groups of properties. However, in the case of new editions of ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019, it can be necessary to create new groups of properties. In such cases and for the development of other groups of properties, e.g. groups of properties from a c-PCR, the process is described in Figure 3.

In some cases, a more detailed segregation of groups of properties is needed. The example below shows options for the group of properties TRACI 2.1 Mandatory Indicators.

EXAMPLE

Name: TRACI 2.1 Mandatory Indicators

Description: The indicators that must be reported when assessing impact using the United States Environmental Protection Agency Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts (TRACI) version 2.1

The groups of properties concept shall be created in accordance with the list of attributes for groups of properties in ISO 23386.

8 Providing EPD content in data sheets using the data template concept

8.1 General

This document is relevant for EPDs defined in accordance with ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019. This document is also relevant for generic LCA data prepared using the

methodological requirements of ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019 for use in a construction works level assessment, as described in 5.2.

EPDs based on discrete products or declared units are useful for construction works level assessment as they can be used for any appropriate functional use of the product. EPDs based on functional units should not be used if the function provided is different in the construction works context.

The content of the EPD or LCA dataset should be provided according to ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019 as appropriate. Data for environmental indicator results and scenarios shall be provided in data sheets in accordance with the methodology described in this document.

The requirements for the content of an EPD developed according to either ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019 are set out in the respective standards. For the purposes of consistency and transparency, this document provides digital placeholders for information that can be mandatory or optional according to these standards.

The EPD data template provided in this document is applicable to any construction product. Domain users are expected to use this data template for each specific construction object, e.g. an exterior door, expanded polystyrene board (EPS), a roof tile to provide the information from an EPD as shown in Figure 5. The provision of data for a specific construction object within the data template produces a data sheet as shown in Figure 5.

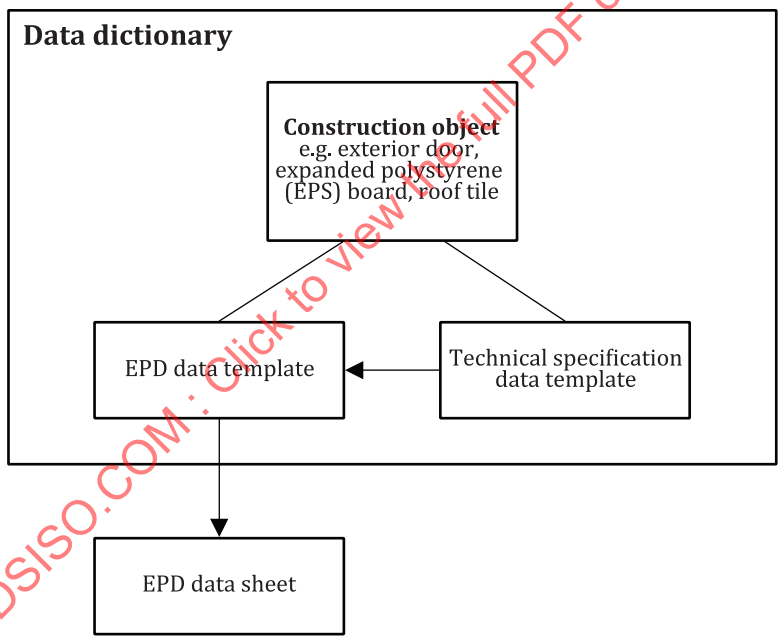

Figure 5 — Example of relationship of an EPD data template to a construction object, technical specification data template and EPD data sheet

The EPD data template consists of several groups of properties that are further described in 8.2 to 8.6.

8.2 EPD general information – group of properties

8.2.1 General

The EPD general information group of properties provides all the general information regarding the EPD, that must be provided by the manufacturer, as prescribed in ISO 21930, EN 15804:2012+A1:2013, EN 15804:2012+A2:2019, sub-category PCR and c-PCR.

The EPD general information group of properties consists of several sub-sets of properties, each of them being a group of properties itself – the product information, the content declaration, the EPD type,

the programme operator and the technical data. Information about each more detailed sub-set of the EPD general information group of properties is provided in 8.2.2 to 8.2.6.

8.2.2 Product information – sub-set of EPD general information group of properties

Table 2 and Table 3 provide a list of properties describing the product information, including the declaration owner and construction product respectively, with their corresponding data types and units. These properties are described in ISO 21930:2017, Clause 9, EN 15804:2012+A1:2013, Clause 7, and EN 15804:2012+A2:2019, Clause 7 respectively. Properties can be repeated if needed.

EXAMPLE The property product name is included twice for an EPD covering products with two names, one for each product name.

Table 2 — List of properties, with their corresponding data types and units, for the declaration owner information sub-set of the EPD general information group of properties

Property	Data type	Unit	Mandatory/Optional
name of owner	string	null	M
alternative name	string	null	O
organizations related	string	null	O
unique identifier (VAT number if available)	string	null	M
web domain	string	null	O

Table 3 — List of properties, with their corresponding data types and units, for the construction product information sub-set of the EPD general information group of properties

Property	Data type	Unit	Mandatory/Optional
product name	string	null	M
organizations authorised by the owner(s) to use the data to represent their products	string	null	O
manufacturer(s) providing data	string	null	O
production site(s) name	string	null	M
production site (s) in GML according to ISO 19136-1	string	null	O
plus code(s) according to Open Location Code (OLC)	string	null	O
region(s) according to ISO 3166-2	string	null	M
production technology	string	null	O
language according to ISO 639-1	string	null	O

8.2.3 Content declaration – sub-set of EPD general information group of properties

Table 4 provides a list of properties describing the content declaration, with their corresponding data types and units.

Table 4 — List of properties, with their corresponding data types and units, for the content declaration sub-set of the EPD general information group of properties

Property	Data type	Unit	Mandatory/Optional
main product components or materials - type	string	null	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
main product components or materials - percentage by mass	float number	%	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
[a] When their content exceeds the limits for registration with the European Chemicals Agency.			

Table 4 *(continued)*

Property	Data type	Unit	Mandatory/Optional
content of regulated hazardous substances	string	null	O
content of substances of very high concern	string	null	M for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019[a], O for ISO 21930
biogenic carbon content within bio-based products according to ISO 21930	float number	kg CO_2 equiv.	M for ISO 21930
biogenic carbon content within bio-based products according to EN 15804:2012+A2:2019	float number	kg C	M for EN 15804:2012+A2:2019
packaging type	string	null	M for ISO 21930 and EN 15804:2012+A1:2013, O for EN 15804:2012+A2:2019
packaging amount	float number	kg	M for ISO 21930 and EN 15804:2012+A1:2013, O for EN 15804:2012+A2:2019
biogenic carbon content packaging according to ISO 21930	float number	kg CO_2 equiv.	M for ISO 21930
biogenic carbon content packaging according to EN 15804:2012+A2:2019	float number	kg C	M for EN 15804:2012+A2:2019

[a] When their content exceeds the limits for registration with the European Chemicals Agency.

The requirements for provision of data on product composition are set out in ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019 respectively. The requirements on biogenic content and on packaging are set out in ISO 21930 and EN 15804:2012+A2:2019. However, for the purposes of consistency and transparency, the information on the material or component content of the product and its packaging, including the content of biogenic carbon and substances of very high concern, should always be provided. As a minimum, the table shall be completed for the product as a whole and for its packaging.

8.2.4 EPD type – sub-set of EPD general information group of properties

Table 5 provides a list of properties describing the EPD type, with their corresponding data types and units.

Table 5 — List of properties with their corresponding data types and units, for the EPD type sub-set of the EPD general information group of properties

Property	Data type	Unit	Mandatory/Optional
EPD type - manufacturer representation according to ISO 21930	string	null	M
EPD type - manufacturer representation according to EN 15804	string	null	M
EPD type - product representativeness according to ISO 21930	string	null	M
EPD type - product representativeness according to EN 15804	string	null	M

The properties for EPD types have pre-defined values referred to as enumerated values, which are provided in Table 6. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 6 — Enumerated values for the property EPD type

Property	Enumerated values
EPD type - manufacturer representation according to ISO 21930	— Valid for a single manufacturing site — Valid for several manufacturing sites from the same company with variation below 10 % — Valid for several manufacturing sites from the same company with variation above 10 % — Valid for several companies' sites with variation below 10 % — Valid for several companies' sites with variation above 10 %.
EPD type - manufacturer representation according to EN 15804	— Valid for one manufacturer site where variation is not defined — Valid for one manufacturer site where variation is defined — Valid for one manufacturer with several sites where variation is not defined — Valid for one manufacturer with several sites where variation is defined — Valid for several companies' sites where variation is not defined — Valid for several companies' sites where variation is defined
EPD type - product representativeness according to ISO 21930	— Valid for a single product — Valid for several products with variation below 10 % — Valid for products with variation above 10 %
EPD type - product representativeness according to EN 15804	— Valid for a single product where variability is not described — Valid for a single product where variability is described — Valid for a range of products where variability is not described — Valid for a range of products where variability is not described

8.2.5 Programme operator – sub-set of EPD general information group of properties

Table 7 provides a list of properties for the programme operator, with their corresponding data types and units.

Table 7 — List of properties, with their corresponding data types and units, for the programme operator sub-set of the EPD general information group of properties

Property	Data type	Unit	Mandatory/Optional
EPD programme operator	string	null	M
publication date of EPD	date	null	M
revision date of EPD	date	null	O
data set valid until	date	null	M
EPD registration number	string	null	M
type of verification	string	null	M
name of verifier	string	null	M
name of verifier's organization	string	null	M
reference to original EPD	string	null	M
link to the other machine-readable datasets	string	null	O

Programme operators can suggest additional concepts, e.g. project registration number, language, mutual recognition, ECO-platform ID (see Clause 5).

For dates, the format YYYY-MM-DD should be used in accordance with ISO 8601-1.

The property "type of verification" has pre-defined values referred to as enumerated values, which are provided in Table 8. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 8 — Enumerated values for the property type of verification

Property	Enumerated values
type of verification	— independent external third-party verification — independent internal verification — verification using a verified EPD generator/tools — no independent verification performed

8.2.6 Technical data – sub-set of EPD general information group of properties

In order to fully describe a product and provide the information for further LCA, it is required that properties regarding technical data for the construction product are provided.

EXAMPLE Properties such as density, acoustic performance, dimensions, range.

NOTE There can be properties created as part of other domain processes, e.g. in Europe, for CE marking according to the Construction Products Regulation (CPR).

Such properties should be developed following the methodology and processes described in ISO 23386 and ISO 23387. These properties should be used together with the properties developed in accordance with this document.

When there are additional requirements not covered by other domains, e.g. CPR, experts developing specific sub-category PCR are responsible for defining these properties following the same methodology and processes.

8.3 EPD methodological framework – group of properties

8.3.1 General

The EPD methodological framework group of properties provides all the general information regarding the declaration that shall be provided by the manufacturer, as prescribed in ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019.

As there are a number of methodological differences between ISO 21930, EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019, it is unlikely that they result in an identical EPD being produced. The EPD data are dependent on the standard chosen as the core PCR. The programme operator horizontal PCR for construction products may also set specific requirements that lead to the same product having different EPDs in different programmes.

Figure 6 shows the data template structure for an EPD according to ISO 21930 providing results in North America using TRACI and in Europe using EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019.

In this case, completing the data template would result in two data sheets, one for each set of results.

Manufacturers can decide to provide different EPDs for the same product in different applications. If a manufacturer has more than one EPD for a product, using different standards, different PCRs or covering different applications, then they may provide these using the same data template but as

separate data sheets, because of the need to show the dependency of each set of EPD data in relation to the properties, core PCR, programme operator for a horizontal PCR, etc.

Multiple scenarios using the same methodological framework (e.g. a mixed scenario and its related 100 % scenarios for an EPD according to EN 15804:2012+A1:2013) may be provided on the same data sheet, as described in 8.4.

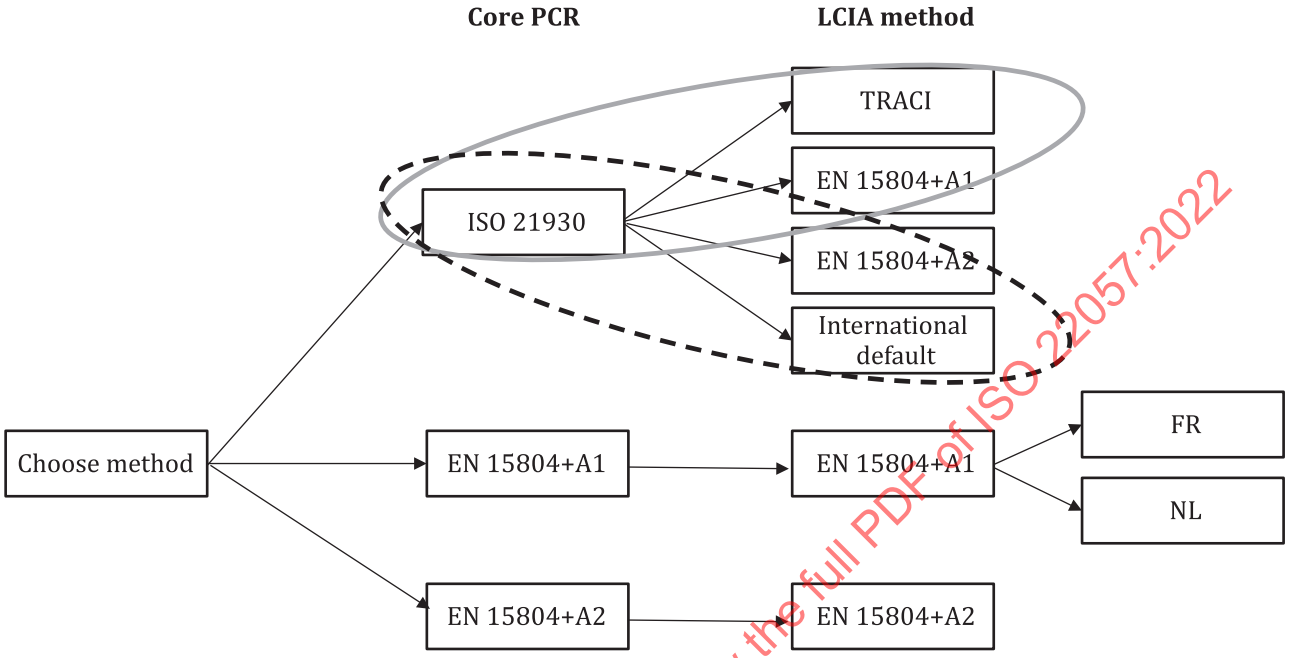

Figure 6 — The use of the single data template to provide different data sheets for EPDs with different methodological frameworks

The EPD methodological framework is a group of properties that consists of several sub-sets of properties, the EPD methodological specification, the reference unit and RSL and the reference quantity and scaling factor.

Information about each more detailed sub-set of the EPD methodological framework group of properties is provided in 8.3.2 to 8.3.4.

8.3.2 EPD methodological specification– sub-set of the EPD methodological framework group of properties

Table 9 contains the sub-set of properties describing the EPD methodological specification that are created by following the process described in this document.

Table 9 — List of properties, with their corresponding data types and units, for the EPD methodological specification sub-set of the EPD methodological framework group of properties

Property	Data type	Unit	Mandatory/Optional
core PCR	string	null	M
programme operator horizontal PCR	string	null	O
product level PCR standard	string	null	O
programme operator product level PCR	string	null	O
information module	string	null	M
cut-off rules comply with standard PCR	boolean	null	M
allocation complies with standard PCR	boolean	null	M
background LCI database and version	string	null	M

Table 9 *(continued)*

Property	Data type	Unit	Mandatory/Optional
use of upstream data which does not respect the allocation principles of the core PCR	boolean	null	M
generic LCA data	boolean	null	M
generic LCA host	string	null	O
generic LCA location	string	null	O

Some of the properties describing the EPD methodological specification sub-set have pre-defined values referred to as enumerated values, which are provided in Table 10. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 10 — Enumerated values for some of the properties describing the EPD methodological specification sub-set listed in Table 9

Property	Enumerated values
core PCR	— ISO 21930:2017 — EN 15804:2012+A1:2013 — EN 15804:2012+A2:2019
information module	— A1 — A2 — A3 — A1-A3 — A4 — A5 — B1 — B2 — B3 — B4 — B5 — B6 — B7 — C1 — C2 — C3 — C4 — D
cut-off rules comply with core PCR	— yes — no
allocation complies with standard PCR	— yes — no

Table 10 *(continued)*

Property	Enumerated values
use of upstream data which does not respect the allocation principles of the core PCR	— yes — no
generic LCA data	— yes — no

8.3.3 Reference unit and RSL – sub-set of the EPD methodological framework group of properties

Construction product EPDs use either functional units or declared units as the reference or denominator by which product, material and energy flows (input and output data) of a construction product's LCA results and any other information are normalized to produce data expressed on a common basis.

Both the functional unit and declared unit require a defined reference quantity, for example, an area, a mass, a volume; and one type of reference unit shall always be chosen. The mass conversion factor shall always be provided to enable the correct mass for transport and end of life to be considered. In addition, functional units have additional requirements covering the application, performance characteristics, and the defined period of time that the function is provided, which is normally the reference service life (RSL) specified under defined reference in-use conditions, though another time period based on the RSL may be used.

The functional unit, declared unit and RSL shall be developed according to ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019, as appropriate.

A declared unit is often more appropriate for construction products (being part of a building and applied in various situations, uses and construction types), as the product information is independent from specific situations and conditions of the use stage, which are not addressed, e.g. in a cradle to gate EPD or an EPD providing information modules A1 to A3 and C and module D.

Table 11 contains the sub-set of properties describing the reference unit and reference service life that are created by following the process described in this document.

Table 11 — List of properties, with their corresponding data types and units, for the reference unit and RSL sub-set of the EPD methodological framework group of properties

Property	Data type	Unit	Mandatory/Optional
reference unit type	string	null	M
application	string	null	M for functional unit
thermal resistance	thermal insulation	m^2K/W	O
reaction to fire	string	null	O
time period	float number	years	M for functional unit
reference service life according to ISO 15686-8	float number	years	M for functional unit
factors and factor categories according to ISO 15686-8	string	null	M for functional unit
in-use condition grade according to ISO 15686-8	string	null	M for functional unit
reference quantity (item)	float number	null	O
reference quantity (mass)	float number	kg	O
reference quantity (length)	float number	m	O
reference quantity (area)	float number	m^2	O
reference quantity (volume)	float number	m^3	O
NOTE The properties shaded in grey are examples.			

Table 11 *(continued)*

Property	Data type	Unit	Mandatory/Optional
mass conversion factor	float number	null	M
NOTE The properties shaded in grey are examples.			

Some of the properties describing the reference unit and RSL sub-set have pre-defined values referred to as enumerated values, which are provided in Table 12. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 12 — Enumerated values for some of the properties describing the reference unit and RSL sub-set listed in Table 11

Property	Enumerated values
reference unit type	— functional unit — declared unit
factors and factor categories according to ISO 15686-8	— A-inherent performance level — B-design level — C-work execution level — D-indoor environment — E-outdoor environment — F-usage conditions — G-maintenance level
in-use condition grade according to ISO 15686-8	— 0 — 1 — 2 — 3 — 4 — 5 — NA

All properties that describe a functional unit and an RSL cannot be pre-defined as they are product specific and can already exist in a data dictionary (e.g. reaction to fire). Experts in specific sub-category PCR should engage and create these properties as shown in the example described in Figure 7.

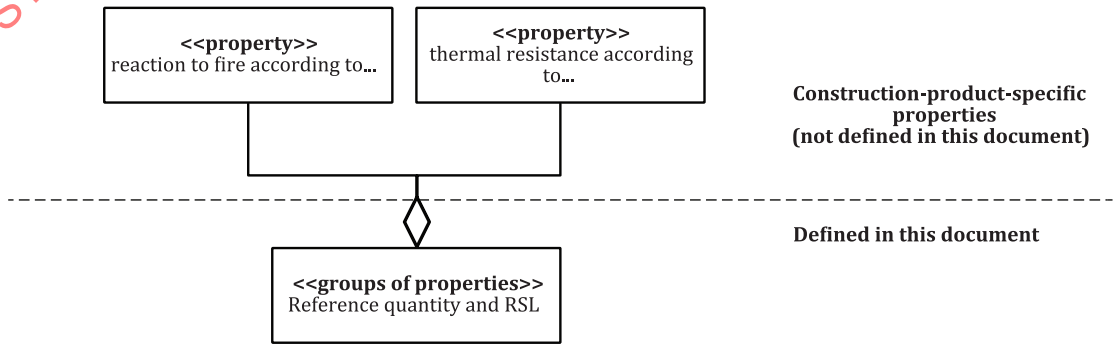

Figure 7 — Example of product specific properties required for the declaration of a functional unit

8.3.4 Reference quantity and scaling factor – sub-set of EPD methodological framework group of properties

An EPD is provided for a declared or functional unit related to a construction product. Often it is appropriate to use the data provided in the EPD for other similar products that are covered by the EPD, e.g. for different thicknesses or sizes. To enable this, EPDs provide scaling factors for these other product thicknesses or sizes. This is done by creating a dependency between a specific property, for example thickness or mass, and the scaling factor. Since such dependencies can be very dynamic for different products, this document does not pre-define the specific reference quantities and related scaling factors, but rather gives examples and guidance on how they may be addressed, e.g. for thickness, as shown in Table 13.

Table 13 — Examples of properties, with their corresponding data types and units, for the reference quantity and scaling factor sub-set of the EPD methodological framework group of properties

Property	Data type	Unit	Mandatory/Optional
scaling factor	float number	null	O
thickness	float number	mm	O
NOTE The properties shaded in grey are examples.			

8.4 Scenarios

8.4.1 General

Information modules are compilations of data to be used as the basis for an EPD, covering a unit process or a combination of unit processes that are part of the life cycle of a product. Each information module, except for A1 to A3, is described by one or more alternative scenarios, i.e. a collection of relevant assumptions and information for possible future events. In accordance with this document, data for scenarios shall be provided in order to facilitate and improve the processes of LCA at the construction works level.

Scenarios' information can be dependent on different aspects that are modelled as properties, e.g. core PCR, programme operator horizontal PCR, application. Where more than one scenario per information module is declared, these alternatives are solved by using the data template(s) for scenarios multiple times. Several different data sheets are created for the same construction product, so each alternative and its dependence is provided clearly (see example in Figure 8). The relation between scenarios and the product's application, or the reporting framework, or another property is not handled by the data template structure, but it should be handled in the way data sheets are created.

EXAMPLE A manufacturer can declare 3 alternatives for waste handling in information module C1 for one product: alternative 1 – 100 % to landfill, alternative 2 – 100 % incineration, and alternative 3 – 50 % landfill and 50 % incineration.

Data sheet 1: product x		
property	**value**	**unit**
core PCR	ISO 21930	-
program operator core PCR	program operator 1	-
application	roofs	-
global warming potential for air emissions	2,5	kg CO_2 equiv.
ozone depletion potential for air emissions	1,3	kg CFC-11 equiv.
transport distance	200	km
vehicle type	truck	-
fuel type	diesel	-
fuel consumption	25	l/100 km

Data sheet 2: product x		
property	**value**	**unit**
core PCR	ISO 21930	-
program operator core PCR	program operator 2	-
application	floors	-
global warming potential for air emissions	1,03	kg CO_2 equiv.
ozone depletion potential for air emissions	2,1	kg CFC-11 equiv.
transport distance	100	km
vehicle type	train	-
fuel type	diesel	-
fuel consumption	50	l/100 km

Figure 8 — Extract of different data sheets for different alternative scenarios

In addition, scenarios are further segregated into smaller scenarios, which in this document are called sub-scenarios. One example of a sub-scenario is “waste handling”, which is described by several properties – waste type by material, waste amount (mass) and end-of-life route. This sub-scenario is applicable to several information modules, e.g. A5, B2, B3, C1.

Sub-scenarios shall be modelled as groups of properties, which ensure their reuse within different information modules and allow for the possibility to query information about particular subjects, e.g. waste handling, transport, from either one information module or several information modules (see Figure 9).

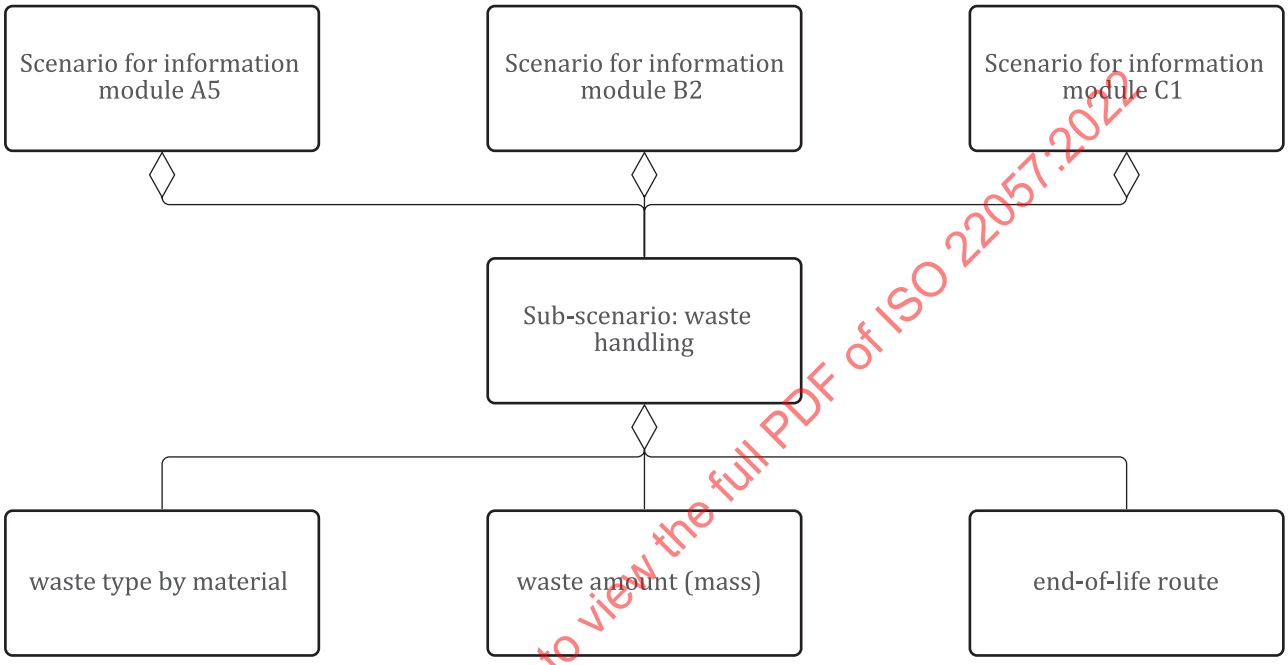

Figure 9 — Sub–scenario: waste handling group of properties used in scenarios for different information modules

8.4.2 Scenarios for transport for information modules A4, C2, and for transport in other information modules (e.g. B2 to B5) – data template

The scenarios for transport in information modules A4 and C2, and other information modules where relevant, can be described using the sub-scenario transport group of properties. Table 14 provides a list of properties, with their corresponding data types and units, for this sub-scenario shown as an example for module A4.

Table 14 — List of properties, with their corresponding data types and units, for the sub-scenario transport group of properties

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module A4	scenario type	string	null	O
Scenario for information module A4	geographical information	string	null	O
Scenario for information module A4	description of approach used	string	null	O
Sub-scenario: transport	vehicle type	string	null	O
Sub-scenario: transport	transport distance	float number	km	O

Table 14 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Sub-scenario: transport	transport type	string	null	O
Sub-scenario: transport	fuel type	string	null	O
Sub-scenario: transport	fuel consumption	float number	l/100 km; l/t km	O
Sub-scenario: transport	power consumption	float number	kWh/100 km; kWh/t km	O
Sub-scenario: transport	capacity utilisation	float number	%	O
Sub-scenario: transport	bulk density	float number	kg/m^3	O
Sub-scenario: transport	volume capacity utilisation factor	float number	%	O

Some of the properties describing the sub-scenario transport have pre-defined values referred to as enumerated values, which are provided in Table 15. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 15 — Enumerated values for some of the properties describing the sub-scenario: transport listed in Table 14

Property	Enumerated values
scenario type	— 100 % — mixed
description of approach used	— average — representative — indicative — case specific
transport type	— road — railway — inland water — coastal shipping — sea freight — air
fuel type	— diesel — petrol — CNG — hydrogen — fuel oil — electricity

Where a mixed scenario for information module A4 is provided, e.g. for transport over 150 km by road with a truck using 30 litres diesel per 100 km, and 100 km by rail with a train using 60 litres diesel

per 100 km, the description of the scenario can be provided using the transport sub-scenario and dependencies, as shown in Figure 10.

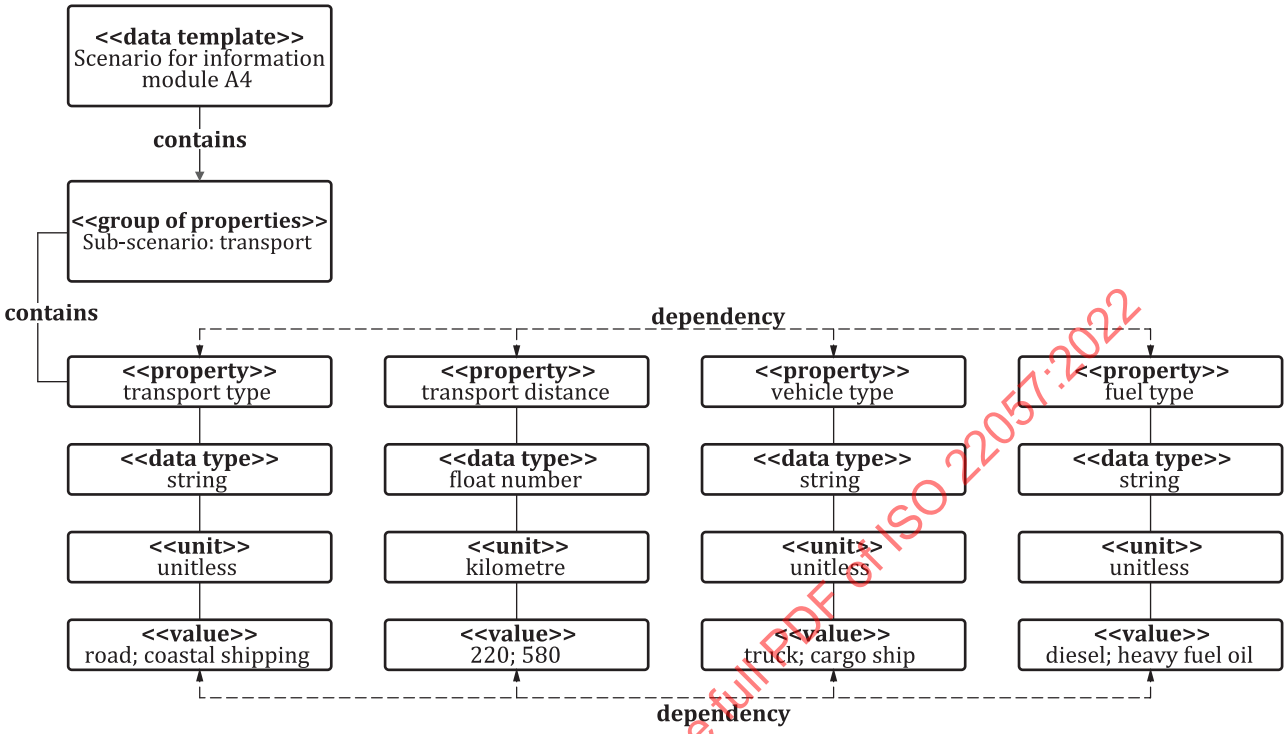

Figure 10 — Example properties and data structure for a sub-scenario transport group of properties for information module A4

8.4.3 Information module A5

Table 16 provides a list of properties, with their corresponding data types and units, for information module A5. As information on packaging should be provided even if A5 is not declared, this information is considered in 8.2.3 and Table 4.

Table 16 — List of groups of properties, with their corresponding properties, data types and units, for information module A5

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module A5	scenario type	string	null	O
Scenario for information module A5	description of approach used	string	null	O
Sub-scenario: energy, water and ancillary materials	ancillary materials	string	null	O
Sub-scenario: energy, water and ancillary materials	ancillary materials amount	float number	kg	O
Sub-scenario: energy, water and ancillary materials	water type	string	null	O
Sub-scenario: energy, water and ancillary materials	water use	volume	m^3	O
Sub-scenario: energy, water and ancillary materials	energy type	string	null	O
Sub-scenario: energy, water and ancillary materials	energy use	float number	MJ; kWh	O

Table 16 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Sub-scenario: waste handling	waste type by material	string	null	O
Sub-scenario: waste handling	waste amount (mass)	float number	kg	O
Sub-scenario: waste handling	end-of-life route	string	null	O
Sub-scenario: packaging waste handling	packaging waste type by material	string	null	O
Sub-scenario: packaging waste handling	packaging waste amount (mass)	float number	kg	O
Sub-scenario: packaging waste handling	packaging end-of-life route	string	null	O

Some of the properties related to the scenarios and sub-scenarios for information module A5 have pre-defined values referred to as enumerated values, which are provided in Table 17. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 17 — Enumerated values for some of the properties related to information module A5

Property	Enumerated values
scenario type	— 100% — mixed
description of approach used	— average — representative — indicative — case specific
end-of-life route	— landfill — reuse — recycling — recovery as secondary fuel — energy recovery — composting — incineration
packaging end-of-life route	— landfill — reuse — recycling — recovery as secondary fuel — energy recovery — composting — incineration

8.4.4 Information module B1

Table 18 provides a list of properties, with their corresponding data types and units, for information module B1.

Table 18 — List of groups of properties, with their corresponding properties, data types and units, for information module B1

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module B1	scenario type	string	null	O
Scenario for information module B1	description of approach used	string	null	O
Scenario for information module B1	released substance to air, soil and water	string	null	O
Scenario for information module B1	released amount	float number	kg/(FU/DU)	O
Scenario for information module B1	location of emission	string	null	O
Scenario for information module B1	basis for calculation or estimation	string	null	O

Some of the properties related to the sub-scenario release of emissions for information module B1 have pre-defined values referred to as enumerated values, which are provided in Table 19. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 19 — Enumerated values for some of the properties related to sub-scenario: release of emissions for information module B1

Property	Enumerated values
scenario type	— 100% — mixed
description of approach used	— average — representative — indicative — case specific
location of emission	— air — soil — water

8.4.5 Information module B2

Table 20 provides a list of properties, with their corresponding data types and units, for information module B2.

Table 20 — List of groups of properties, with their corresponding properties, data types and units, for information module B2

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module B2	scenario type	string	null	O

Table 20 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module B2	description of approach used	string	null	O
Sub-scenario: maintenance process	maintenance process	string	null	O
Sub-scenario: maintenance process	period of assessment	float number	years	O
Sub-scenario: maintenance process	process cycle - interval	float number	years	O
Sub-scenario: maintenance process	process cycle – number per RSL	float number	null	O
Sub-scenario: maintenance process	process cycle – number per year	float number	null	O
Sub-scenario: maintenance process	material type for maintenance	string	null	O
Sub-scenario: maintenance process	material amount (mass)	float number	kg	O
Sub-scenario: energy, water and ancillary materials	type of ancillary materials	string	null	O
Sub-scenario: energy, water and ancillary materials	ancillary materials amount	float number	kg	O
Sub-scenario: energy, water and ancillary materials	water type	string	null	O
Sub-scenario: energy, water and ancillary materials	water use	volume	m^3	O
Sub-scenario: energy, water and ancillary materials	energy type	string	null	O
Sub-scenario: energy, water and ancillary materials	energy use	energy	MJ;kWh	O
Sub-scenario: waste handling	waste type by material	string	null	O
Sub-scenario: waste handling	waste amount (mass)	float number	kg	O
Sub-scenario: waste handling	end-of-life route	string	null	O

Some of the properties describing the scenario type sub-set have pre-defined values referred to as enumerated values, which are provided in Table 21. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 21 — Enumerated values for some of the properties describing the scenario type sub-set listed in Table 20

Property	Enumerated values
scenario type	— 100% — mixed
description of approach used	— representative — average — indicative — case specific

8.4.6 Information modules B3, B4 and B5

Table 22 provides a list of properties, with their corresponding data types and units, for information modules B3, B4 and B5.

Table 22 — List of groups of properties, with their corresponding properties, data types and units, for information modules B3, B4 and B5

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information modules B3, B4 and B5	scenario type	string	null	O
Scenario for information modules B3, B4 and B5	description of approach used	string	null	O
Sub-scenario: repair process	repair process	string	null	O
Sub-scenario: repair process	inspection process	string	null	O
Sub-scenario: repair process	period of assessment	float number	years	O
Sub-scenario: repair process	process cycle - number per RSL	float number	null	O
Sub-scenario: repair process	process cycle - interval	float number	years	O
Sub-scenario: repair process	process cycle – number per year	float number	null	O
Sub-scenario: repair process	material type for repair	string	null	O
Sub-scenario: repair process	material amount (mass)	float number	kg	O
Sub-scenario: replacement process	replacement process	string	null	O
Sub-scenario: replacement process	period of assessment	float number	years	O
Sub-scenario: replacement process	process cycle - number per RSL	float number	null	O
Sub-scenario: replacement process	process cycle - interval	float number	years	O
Sub-scenario: replacement process	process cycle – number per year	float number	null	O
Sub-scenario: replacement process	material type for replacement	string	null	O
Sub-scenario: replacement process	material amount (mass)	float number	kg	O
Sub-scenario: refurbishment process	refurbishment process	string	null	O
Sub-scenario: refurbishment process	period of assessment	float number	years	O
Sub-scenario: refurbishment process	process cycle - number per RSL	float number	null	O
Sub-scenario: refurbishment process	process cycle - interval	float number	years	O
Sub-scenario: refurbishment process	process cycle – number per year	float number	null	O
Sub-scenario: refurbishment process	material type for refurbishment	string	null	O
Sub-scenario: refurbishment process	material amount (mass)	float number	kg	O

Table 22 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Sub-scenario: energy, water and ancillary materials	ancillary materials	string	null	O
Sub-scenario: energy, water and ancillary materials	ancillary materials amount	float number	kg	O
Sub-scenario: energy, water and ancillary materials	water type	string	null	O
Sub-scenario: energy, water and ancillary materials	water use	float number	m^3	O
Sub-scenario: energy, water and ancillary materials	energy type	string	null	O
Sub-scenario: energy, water and ancillary materials	energy use	energy	MJ; kWh	O
Sub-scenario: waste handling	waste type by material	string	null	O
Sub-scenario: waste handling	waste amount (mass)	float number	kg	O
Sub-scenario: waste handling	end-of-life route	string	null	O

Some of the properties describing the scenario type sub-set have pre-defined values referred to as enumerated values, which are provided in Table 23. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 23 — Enumerated values for some of the properties describing the scenario type sub-set listed in Table 22

Property	Enumerated values
scenario type	— 100% — mixed
description of approach used	— representative — average — indicative — case specific

8.4.7 Information modules B6 and B7

Energy and water using construction product manufacturers/technical committees (TCs) need to provide relevant information to allow modules B6 and B7 to be modelled correctly at the construction works level.

For energy using products, the information may include the energy type and energy consumption per unit of time, the power output, energy efficiency, emissions, variation of performance with capacity utilization, or scenario information such as frequency and period of use.

For water using products, the information may include the type of water used, the amount of water used per unit of time, the amount of wastewater generated per unit of time, and the fate of the wastewater, e.g. evaporation, discharge to sewer.

8.4.8 Information module C1

Most of the properties in the sub-scenario groups of properties are related to each other in a way that values of different properties are declared as they correspond to each other. The solution for this is seen by connecting certain properties with a dependency relationship, which allows for scenarios

and sub-scenarios to be declared as mixed ones (see Figure 11). The scenarios for C2, C3 and C4 are also dependent on the properties describing the scenario type (mixed or 100 %) and end-of-life route. Providing sub-scenarios for 100% of each relevant end-of-life option is also an option.

EXAMPLE 1 The scenario for information module C1 requires information about waste handling, e.g. 100 % to landfill. Modules C2, C3 and C4 reflect this by showing transport to landfill in C2, no waste treatment in C3 and landfilling in C4.

EXAMPLE 2 The scenario for information module C1 requires information about waste handling. Sometimes waste handling can be mixed, e.g. 50 % to landfill and 50 % to incineration. Modules C2, C3 and C4 reflect this by showing transport of 50 % of waste to landfill and 50 % to incineration in C2, no waste treatment in C3 and 50 % landfill and 50 % incineration in C4.

As the amount of biogenic carbon in the product should be provided even when modules C1 to C4 are not declared, this information has been included in 8.2.3 and Table 4.

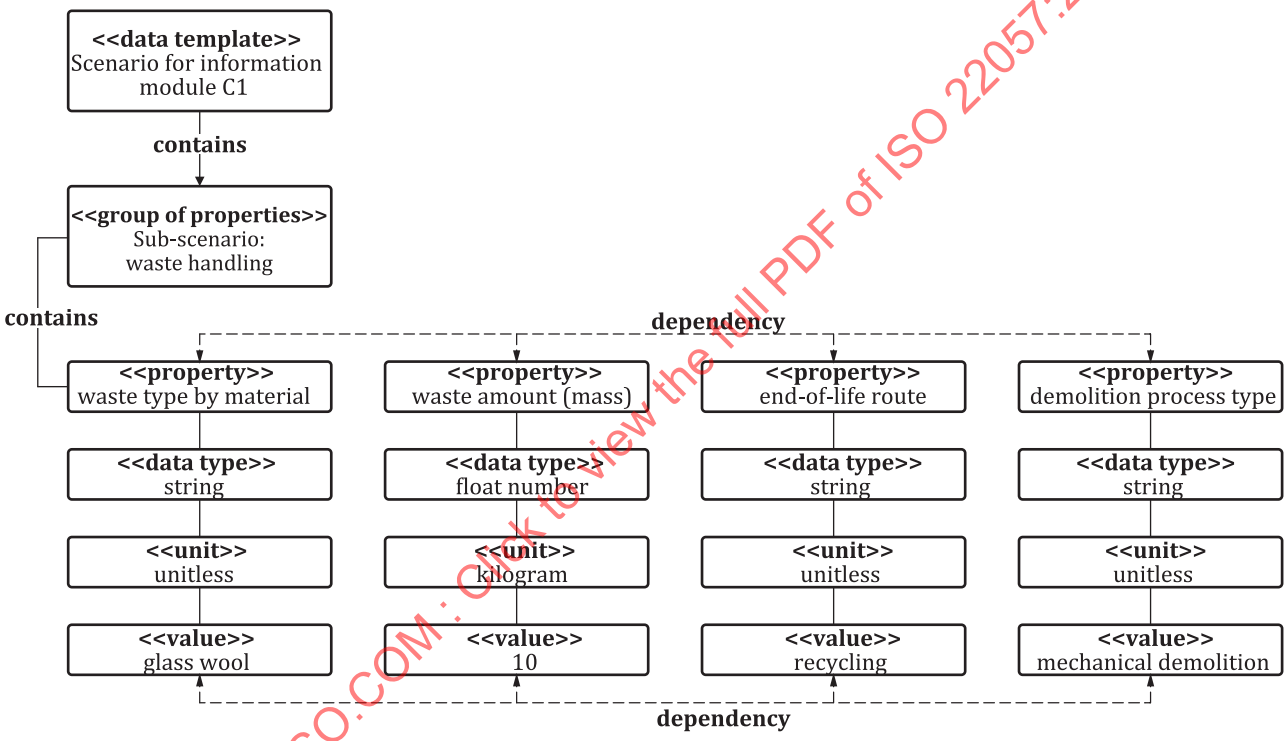

Figure 11 — Example properties and data structure for a sub-scenario waste handling group of properties for information module C1

EXAMPLE 3 A manufacturer can declare 3 alternatives for waste handling in information module C1 for one product: alternative 1 – 100 % to landfill, alternative 2 – 100 % incineration, and alternative 3 – 50 % landfill and 50 % incineration.

Table 24 provides a list of properties, with their corresponding data types and units, for information module C1.

Table 24 — List of properties, with their corresponding data types and units, for information module C1

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module C1	scenario type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
[a] The declaration of this indicator is optional for some product families according to EN 15804:2012+A2:2019, 5.2.				

Table 24 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module C1	description of approach used	string	null	
Sub-scenario: demolition/ deconstruction process	demolition process type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: demolition/ deconstruction process	Material type for demolition	string	null	
Sub-scenario: demolition/ deconstruction process	Material amount (mass)	float number	kg	
Sub-scenario: energy, water and ancillary materials	ancillary materials	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: energy, water and ancillary materials	ancillary materials amount	float number	kg	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: energy, water and ancillary materials	water type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: energy, water and ancillary materials	water use	float number	m^3	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: energy, water and ancillary materials	energy type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: energy, water and ancillary materials	energy use	energy	MJ; kWh	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: waste handling	waste type by material	string	null	
Sub-scenario: waste handling	waste amount (mass)	float number	kg	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Sub-scenario: waste handling	end-of-life route	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013

[a] The declaration of this indicator is optional for some product families according to EN 15804:2012+A2:2019, 5.2.

The properties related to scenario type and end-of-life route for information module C1 have pre-defined values referred to as enumerated values, which are provided in Table 17. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

8.4.9 Information module C2

Table 14 describes the sub-scenario transport group of properties that can be used in information module C2. The data in C2 is dependent on the data provided in C1. Some of the properties describing the sub-scenario transport for information module C2 have pre-defined values referred to as enumerated values, which are provided in Table 15.

8.4.10 Information module C3

Table 25 provides a list of properties, with their corresponding data types and units, for information module C3. The data in C3 is dependent on the data provided in C1.

Table 25 — List of properties, with their corresponding data types and units, for information module C3

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module C3	scenario type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C3	description of approach used	string	null	
Scenario for information module C3	recycling rate explanation	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C3	recycling rate	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C3	energy recovery explanation	string (text)	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C3	energy recovery	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C3	recovery rate explanation	string (text)	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C3	recovery rate	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013

[a] The declaration of this indicator is optional for some product families according to clause 5.2 of EN 15804:2012+A1:2019, 5.2.

8.4.11 Information module C4

Table 26 provides a list of properties, with their corresponding data types and units, for information module C4. The data in C4 is dependent on the data provided in C1 and C3.

Table 26 — List of properties, with their corresponding data types and units, for information module C4.

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module C4	scenario type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C4	description of approach used	string	null	
Scenario for information module C4	landfill type	string	null	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013

[a] The declaration of this indicator is optional for some product families according to clause 5.2 of EN 15804:2012+A1:2019, 5.2.

Table 26 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Scenario for information module C4	degradation rate in landfill	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C4	CO_2:CH_4 split	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C4	landfill gas capture rate	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C4	landfill gas energy recovery as heat	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
Scenario for information module C4	landfill gas energy recovery as electricity	float number	%	M[a] for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013

[a] The declaration of this indicator is optional for some product families according to clause 5.2 of EN 15804:2012+A1:2019, 5.2.

8.4.12 Module D

Information in module D provides the loads and benefits associated with the recovery of net output flows of material or energy from information modules A4, A5, B2 to B7 and C1 to C4. To provide flexibility to adapt scenarios to the specific context of the construction works, but use manufacturers' data, the information in module D should be broken down by different net output flows.

EXAMPLE 1 An EPD includes the recovery and recycling of plastic packaging in information module A5 with related benefits from the net output of plastic secondary material in module D, the incineration with energy recovery < 65 % of the waste product in information module A5 with the related benefits from substituting primary energy in module D, and the processing of the product to a secondary fuel in information module C3, and the related benefits of substituting primary fuels in module D. If all these benefits are aggregated and reported in module D, then it is not possible to use any module D information if, for example, for a particular building in A5, the product waste and packaging are both disposed of using incineration with energy recovery > 65 %.

EXAMPLE 2 Aluminium windows are complex products with many different components. For aluminium windows significant flows that can be reported separately are aluminium, glass, thermal break, fittings, gaskets, polymers, foams.

Table 27 provides a list of properties, with their corresponding data types and units, for module D information.

Table 27 — List of properties, with their corresponding data types and units, for module D information

Property	Data type	Unit	Mandatory/Optional
scenario type	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
description of approach used	string	null	
output flow module	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
output flow description	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013

Table 27 *(continued)*

Property	Data type	Unit	Mandatory/Optional
calculated net output flow	float number	kg	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
process to reach point of substitution	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
point of substitution	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
selected substitution processes	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
recovery rate explanation	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
recovery rate	float number	%	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013
assumption on correction factor	string	null	M for EN 15804:2012+A2:2019, O for ISO 21930 and EN 15804:2012+A1:2013

The properties related to scenario type and output flow module for module D information have pre-defined values referred to as enumerated values, which are provided in Table 28. Experts developing a specific sub-category PCR are responsible for defining additional pre-defined values, when relevant.

Table 28 — Enumerated values for some of the properties related to scenario type and output flow module for module D information

Property	Enumerated values
scenario type	— 100 % — mixed
description of approach used	— representative — average — indicative — case specific

Table 28 *(continued)*

Property	Enumerated values
output flow module	— A5 — B2 — B3 — B4 — B5 — B6 — B7 — C1 — C3 — C4

8.5 Environmental indicators derived from LCA

Environmental indicator results are first divided into groups of properties relating to LCIA indicators and groups of properties relating to LCI indicators. These two groups of properties are further divided. For example, LCI indicators are divided into inventory indicators describing resource use; additional inventory indicators describing emissions and removals of carbon; inventory indicators describing waste categories; and inventory indicators describing output flows. With such additional subdivision, users can query results either from the LCIA or LCI, as needed.

These groups of properties are collected within a single data template that is related to the construction object of interest. This allows information providers (e.g. manufacturers) to declare values for different construction objects, as the results vary from object to object.

In addition, information providers may use this single data template to declare values for the same construction object, but using different core PCRs, as the results vary depending on the core PCR chosen, and in some cases with different sub-category PCRs or c-PCRs, as this can alter results for scenarios.

EXAMPLE 1 The global warming potential for information modules A1 to A3 and C4 for a product can be different if a product is assessed for the European market using ISO 21930, EN 15804:2012+A1:2013 or EN 15804:2012+A2:2019, because of different approaches related to recovered waste leaving the system boundary in A1 to A3, and the treatment of biogenic carbon remaining in landfill after 100 years.

Each indicator result may also have multiple values declared for each information module, e.g. due to the use of mixed scenarios, or multiple 100 % scenarios. Therefore, the information modules should be created as enumerated values for a property that is connected through a dependency to each indicator result (see Figure 12). With such an approach, future implementations will be able to visualize the values in the form of tables, as in hard copy/electronic EPDs.

ISO 21930 also requires different characterization methods to be used for an EPD depending on the geographical market, which results in an EPD covering two markets having different indicator results.

EXAMPLE 2 An EPD developed according to ISO 21930 covering markets in North America and China provides LCIA results using TRACI 2.1 characterization factors for the North American market while the default international characterization methods described in ISO 21930:2017, Table 5 are used for the market in China.

The results for many indicators are different. For the global warming potential indicator, the two characterization methods should be created as two different properties.

When possible, properties shall be referred to the reference document where the user can find more detailed information about the test method, calculation procedure, characterization method etc. When referring to a reference document, the date shall always be stated.

EXAMPLE 3 ISO 21930:2017, EN 15804:2012+A1:2013, EN 15804:2012+A2:2019.

The names of the properties used in this document shall be consistent with the names of the properties in ISO 21930, EN 15804:2012+A1:2013, EN 15804:2012+A2:2019.

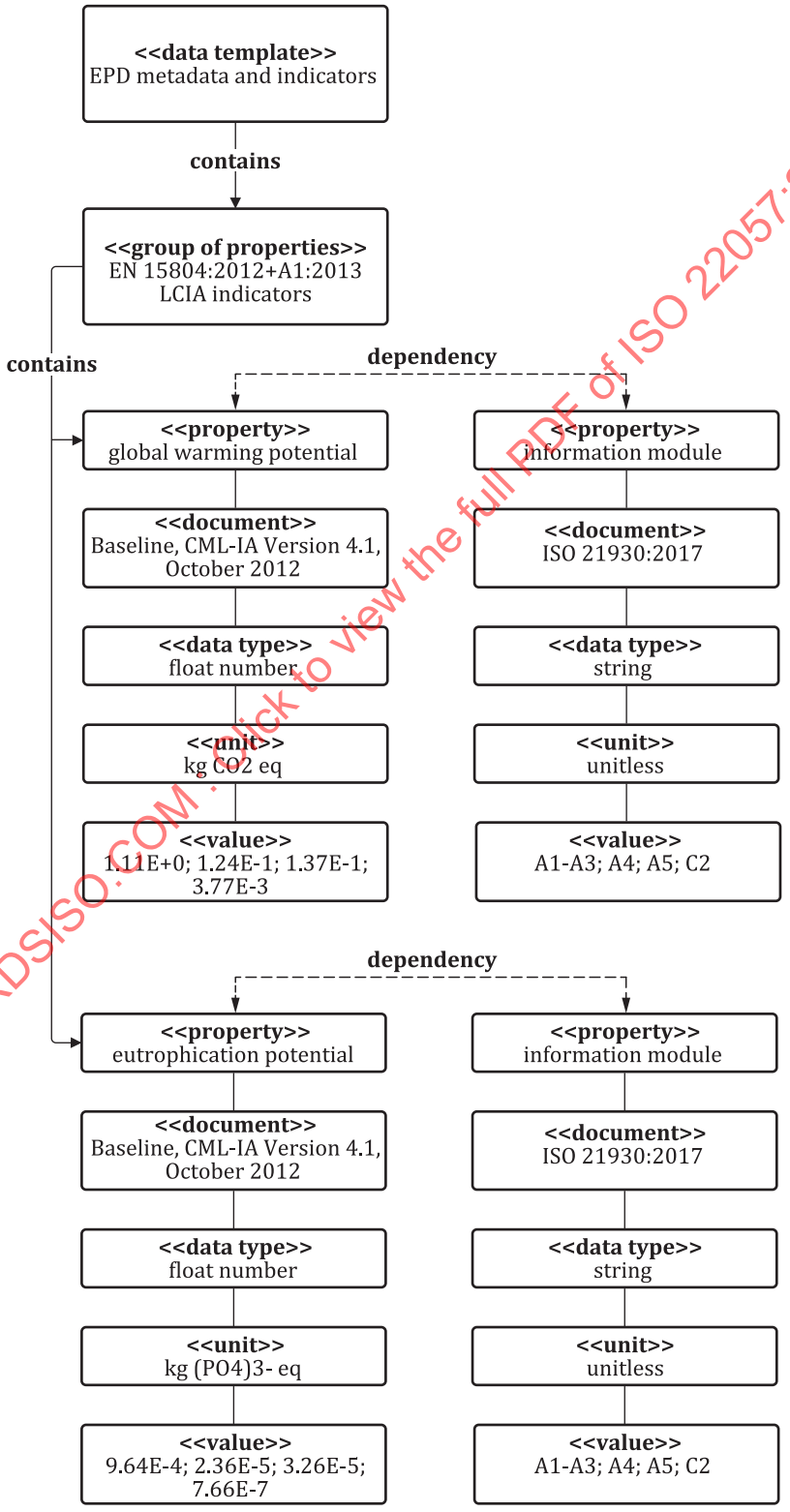

Figure 12 — Example property concepts for LCA indicators and data structure

Table 29 to Table 34 contain the properties from ISO 21930, EN 15804:2012+A1:2013, EN 15804:2012+A2:2019 following the methodology for creating properties in this document.

Table 29 — Properties representing LCIA result indicators for the groups of properties TRACI 2.1 mandatory indicators and TRACI 2.1 optional indicators

Group of properties	Property	Data type	Unit	Mandatory/Optional
TRACI 2.1 mandatory indicators	global warming potential for air emissions	float number	kg CO_2 equiv.	M
TRACI 2.1 mandatory indicators	acidification potential for air emissions	float number	kg SO_2 equiv.	M
TRACI 2.1 mandatory indicators	eutrophication potential for air emissions	float number	kg N equiv.	M
TRACI 2.1 mandatory indicators	eutrophication potential for water emissions	float number	kg N equiv.	M
TRACI 2.1 mandatory indicators	ozone depletion potential for air emissions	float number	kg CFC-11 equiv.	M
TRACI 2.1 mandatory indicators	smog formation potential for air emissions	float number	kg O_3 equiv.	M
TRACI 2.1 optional indicators	acidification potential for water emissions	float number	kg SO_2 equiv.	O
TRACI 2.1 optional indicators	human health particulate (and secondary particulate matter precursors) potential for air emissions	float number	PM2.5 equiv.	O
TRACI 2.1 optional indicators	freshwater ecotoxicity potential for urban air emissions	float number	CTUeco	O
TRACI 2.1 optional indicators	freshwater ecotoxicity potential for rural air emissions	float number	CTUeco	O
TRACI 2.1 optional indicators	freshwater ecotoxicity potential for freshwater emissions	float number	CTUeco	O
TRACI 2.1 optional indicators	freshwater ecotoxicity potential for seawater emissions	float number	CTUeco	O
TRACI 2.1 optional indicators	freshwater ecotoxicity potential for natural soil emissions	float number	CTUeco	O
TRACI 2.1 optional indicators	freshwater ecotoxicity potential for agricultural soil emissions	float number	CTUeco	O
TRACI 2.1 optional indicators	human health cancer potential for urban air emissions	float number	CTUcancer	O
TRACI 2.1 optional indicators	human health non-cancer potential for urban air emissions	float number	CTUnoncancer	O
TRACI 2.1 optional indicators	human health cancer potential for rural air emissions	float number	CTUcancer	O
TRACI 2.1 optional indicators	human health non-cancer potential for rural air emissions	float number	CTUnoncancer	O
TRACI 2.1 optional indicators	human health cancer potential for freshwater emissions	float number	CTUcancer	O
TRACI 2.1 optional indicators	human health non-cancer potential for freshwater emissions	float number	CTUnoncancer	O
TRACI 2.1 optional indicators	human health cancer potential for seawater emissions	float number	CTUcancer	O
NOTE According to ISO 21930, TRACI is only a required indicator in the North American market, in which case the indicators are mandatory or optional as given in Table 27. In other regions, the use of all TRACI indicators is optional.				

Table 29 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
TRACI 2.1 optional indicators	human health non-cancer potential for seawater emissions	float number	CTUnoncancer	O
TRACI 2.1 optional indicators	human health cancer potential for natural soil emissions	float number	CTUcancer	O
TRACI 2.1 optional indicators	human health non-cancer potential for natural soil emissions	float number	CTUnoncancer	O
TRACI 2.1 optional indicators	human health cancer potential for agricultural soil emissions	float number	CTUcancer	O
TRACI 2.1 optional indicators	human health non-cancer potential for agricultural soil emissions	float number	CTUnoncancer	O
TRACI 2.1 optional indicators	fossil fuel depletion	float number	MJ	O
NOTE According to ISO 21930, TRACI is only a required indicator in the North American market, in which case the indicators are mandatory or optional as given in Table 27. In other regions, the use of all TRACI indicators is optional.				

Table 30 — Properties representing LCIA result indicators for the group of properties default international characterization method

Group of properties	Property	Data type	Unit	Mandatory/Optional
Default international characterization methods	global warming potential according to ISO 21930:2017	float number	kg CO_2 equiv. (100 years)	M
Default international characterization methods	depletion potential of the stratospheric ozone layer according to ISO 21930:2017	float number	kg CFC 11 equiv.	M
Default international characterization methods	acidification potential of soil and water according to ISO 21930:2017	float number	kg SO_2 equiv.	M
Default international characterization methods	eutrophication potential according to ISO 21930:2017	float number	kg $(PO4)^{3-}$ equiv.	M
Default international characterization methods	formation potential of tropospheric ozone according to ISO 21930:2017	float number	kg ethene equiv.	M

Table 31 — Properties representing LCIA result indicators for the group of properties EN 15804:2012+A1:2013 LCIA indicators

Group of properties	Property	Data type	Unit	Mandatory/Optional
EN 15804:2012+A1:2013 LCIA indicators	global warming potential	float number	kg CO_2 equiv. (100 years)	M

Table 31 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
EN 15804:2012+A1:2013 LCIA indicators	depletion potential of the stratospheric ozone layer	float number	kg CFC 11 equiv.	M
EN 15804:2012+A1:2013 LCIA indicators	acidification potential of soil and water	float number	kg SO_2 equiv.	M
EN 15804:2012+A1:2013 LCIA indicators	eutrophication potential	float number	kg $(PO4)^{3-}$ equiv.	M
EN 15804:2012+A1:2013 LCIA indicators	formation potential of tropospheric ozone	float number	kg ethene equiv.	M
EN 15804:2012+A1:2013 LCIA indicators	abiotic depletion potential for non-fossil resources	float number	kg Sb equiv.	M
EN 15804:2012+A1:2013 LCIA indicators	abiotic depletion potential for fossil resources	float number	MJ, net calorific value	M

Table 32 — Properties representing LCIA result indicators for the group of properties EN 15804:2012+A2:2019 core indicators and EN 15804:2012+A2:2019 additional indicators

Group of properties	Property	Data type	Unit	Mandatory/Optional
EN 15804:2012+A2:2019 mandatory LCIA indicators	global warming potential - total	float number	kg CO_2 equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	global warming potential - fossil fuels	float number	kg CO_2 equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	global warming potential - biogenic	float number	kg CO_2 equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	global warming potential - land use and land use change	float number	kg CO_2 equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	depletion potential of the stratospheric ozone layer	float number	kg CFC 11 equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	acidification potential, accumulated exceedance	float number	mol H+ equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	eutrophication potential, fraction of nutrients reaching freshwater end compartment	float number	kg P equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	eutrophication potential, fraction of nutrients reaching marine end compartment	float number	kg N equiv.	M

Table 32 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
EN 15804:2012+A2:2019 mandatory LCIA indicators	eutrophication potential, accumulated exceedance	float number	mol N equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	tropospheric ozone concentration increase	float number	kg NMVOC equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	abiotic depletion potential for non-fossil resources - minerals and metals	float number	kg Sb equiv.	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	abiotic depletion potential for fossil resources	float number	MJ, net calorific value	M
EN 15804:2012+A2:2019 mandatory LCIA indicators	water (user) deprivation potential, deprivation-weighted water consumption	float number	m^3 world equiv. deprived	M
EN 15804+A2:2019 optional indicators	potential incidence of disease due to particulate matter (PM) emissions	float number	disease incidence	O
EN 15804+A2:2019 optional indicators	potential human exposure efficiency relative to U235	float number	kBq U235 equiv.	O
EN 15804+A2:2019 optional indicators	potential comparative toxic unit for ecosystems	float number	CTUe	O
EN 15804+A2:2019 optional indicators	potential comparative toxic unit for humans - cancer effects	float number	CTUh	O
EN 15804+A2:2019 optional indicators	potential comparative toxic unit for humans - non-cancer effects	float number	CTUh	O
EN 15804+A2:2019 optional indicators	potential soil quality index	float number	null	O

Table 33 — Properties representing LCI result indicators

Group of properties	Property	Data type	Unit	Mandatory/Optional
Inventory indicators describing resource use	renewable primary resources used as an energy carrier (fuel)	float number	MJ	M
Inventory indicators describing resource use	renewable primary resources with energy content used as material	float number	MJ	M
Inventory indicators describing resource use	non-renewable primary resources used as an energy carrier (fuel)	float number	MJ	M
Inventory indicators describing resource use	non-renewable primary resources with energy content used as material	float number	MJ	M
Inventory indicators describing resource use	secondary materials	float number	kg	M
Inventory indicators describing resource use	renewable secondary fuels	float number	MJ	M
Inventory indicators describing resource use	non-renewable secondary fuels	float number	MJ	M

Table 33 *(continued)*

Group of properties	Property	Data type	Unit	Mandatory/Optional
Inventory indicators describing resource use	recovered energy	float number	MJ	M
Inventory indicators describing resource use	consumption of freshwater according to ISO 14046	float number	m^3	M for ISO 21930
Inventory indicators describing resource use	net use of freshwater according to ISO 14046	float number	m^3	M for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Additional inventory indicators describing emissions and removals of carbon	biogenic removals and emissions within bio-based products according to ISO 21930	float number	kg CO_2 equiv. (100 years)	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Additional inventory indicators describing emissions and removals of carbon	biogenic removals and emissions within packaging according to ISO 21930	float number	kg CO_2 equiv. (100 years)	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Additional inventory indicators describing emissions and removals of carbon	biogenic removals and emissions within bio-based products according to EN 15804	float number	kg C	M for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Additional inventory indicators describing emissions and removals of carbon	biogenic removals and emissions within packaging according to EN 15804	float number	kg C	M for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Additional inventory indicators describing emissions and removals of carbon	removals and emissions from calcination and carbonation according to ISO 21930	float number	kg CO_2 equiv. (100 years)	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Additional inventory indicators describing emissions and removals of carbon	biogenic CO_2 (combustion of waste) according to ISO 21930	float number	kg CO_2 equiv. (100 years)	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Inventory indicators describing resource use	biogenic CO_2 (leaving the product system) according to ISO 21930	float number	kg CO_2 equiv. (100 years)	M for ISO 21930, O for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019

Table 34 — Properties representing LCI result indicators for waste and output flow

Group of properties	Property	Data Type	Unit	Mandatory/Optional
Waste categories	hazardous waste disposed	float number	kg	M
Waste categories	non-hazardous waste disposed	float number	kg	M
Waste categories	total radioactive waste disposed (mass)	float number	kg	M for EN 15804:2012+A1:2013 and EN 15804:2012+A2:2019
Waste categories	total radioactive waste disposed (volume)	float number	m^3	
Waste categories	high-level radioactive waste disposed according to ISO 21930:2017 (mass)	float number	kg	O[a]

[a] Radioactive waste shall be declared in accordance with ISO 21930 either as mass or volume for ISO 21930 EPD.

Table 34 *(continued)*

Group of properties	Property	Data Type	Unit	Mandatory/Optional
Waste categories	intermediate and low-level radioactive waste disposed according to ISO 21930:2017 (mass)	float number	kg	O[a]
Waste categories	high-level radioactive waste disposed according to ISO 21930:2017 (volume)	float number	m^3	O[a]
Waste categories	intermediate and low-level radioactive waste disposed according to ISO 21930:2017 (volume)	float number	m^3	O[a]
Output flows	components for re-use	float number	kg	M
Output flows	materials for recycling	float number	kg	M
Output flows	materials for energy recovery	float number	kg	M
Output flows	exported electrical energy	float number	MJ	M
Output flows	exported thermal energy	float number	MJ	M

[a] Radioactive waste shall be declared in accordance with ISO 21930 either as mass or volume for ISO 21930 EPD.

8.6 Additional environmental information

Additional environmental information provided in an EPD is defined by others, e.g. relevant construction product TCs, ISO/TC 207. This document provides/describes placeholders for such properties.

In this clause, information from ISO Environmental Management Systems, etc. can be included.

Annex A
(normative)

List of all concepts with GUID

The list of property, property description, enumerated values and their GUIDs and units can be found via: https://standards.iso.org/iso/22057/ed-1/en/.