IVL rapport C 367
ISBN 978-91-7883-009-1

Efficient use of digital EPD via ILCD+EPD+

INCLUDING FORMAT ADDITIONS SUGGESTED
BY SMART BUILT ENVIRONMENT (SBE)

SMART BUILT
ENVIRONMENT

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Med stöd från:

VINNOVA

Energimyndigheten

formas

STRATEGISKA INNOVATIONS-PROGRAM

Preface

The Smart Built Environment (SBE) is a strategic innovation program for how the built environment focuses sector can contribute to Sweden's journey towards becoming a globally pioneering country that realizes the new opportunities that digitalisation will bring. Smart built Environment is one of 16 strategic innovation programme that have received support within the framework of strategic innovation areas, a joint venture between Vinnova, the Swedish Energy Agency and Formas. The aim of the initiative is to create conditions for Sweden's international competitiveness and contribute to sustainable solutions to global societal challenges.

SBE Lifecycle Perspective is one of the focus areas of the program. It has been led by Kajsa Byfors (project coordinator) and Jeanette Sveder Lundin and Martin Erlandsson (sub leaders).

The goal of the focus area lifecycle perspective is to integrate life cycle cost (LCC) and life cycle assessment (LCA) into community building information structures and processes, in order to achieve greater efficiency throughout the life cycle and thus a more sustainable built environment. In order to achieve sustainable community building, it is necessary to take into account a lifecycle perspective in terms of planning, design, construction and use of our built environment. The vision is that the integration of life cycle costs (LCC) and Life Cycle Assessments (LCA) into the sector's information structures and processes is an important part of achieving the environmental objectives that we have before us.

In the focus area we coordinate and catalyse ongoing good initiatives and expertise in the field. In this way, we can use the expertise that already exists in the sector to ensure that we have a clear system of lifecycle perspectives. We will create national applications based on international standards and analyse how digitalization and object-based information management from other program activities can support the lifecycle perspective, at all stages of the community building processes

The work includes analyses of different scenarios for material selection and management in planning, design and construction as well as for operation, maintenance and use. It also includes procurement perspectives and how life-cycle issues are driving forces in the early stages.

This report has been conducted in collaboration with SBE 'Lifecycle Perspective' Part 1 (Diary No 2017-01821) and the project 'Digital environmental calculations complement and elaboration' (in Swedish *Digitala miljöberäkningar- komplement och fördjupning*, Diary No2018-00346).

Stockholm, 28 December 2018

Summary

The Project Smart Built Environment (SBE) Lifecycle Perspective develops support, implements and evaluates how a future digital environmental calculation for a construction work can be made as efficiently as possible. The future life cycle assessment (LCA) calculation is assumed to be made as part of the ICT tool already used in the construction or real estate sector for other purposes, as an additional environmental performance based information. An LCA makes it possible to calculate the environmental impact during the entire life cycle of any construction product or works.

This report focus on how Environmental Product Declarations (EPD) can be digitalised in a machine-readable format to facilitate unbroken information value chain from the product manufacturer, to the program operator publishing the EPD, the buyer of the product and construction product as part of any construction works, and finally as part of a digital model of the same construction works – like a digital twin. The de facto xml format specification for a digital LCA or EPD result for a construction product is based on a European format, ILCD, originally designed for exchange of life cycle inventory data between different LCA application tools.

This report describes the possibilities to add additional information, not necessary included in the 'graphical' pdf version of the EPD, but in the machine-readable format referred to as ILCD+EPD+. The extra plus "+" indicates that the format includes additional information in order to facilitate its use as a digital information source. The report includes an example on how the generic format with the potential extension format can be implemented as defined by the project Smart Build Environment (SBE) Lifecycle Perspective. The suggested aspects to be included in an SBE extension are called ILCD+EPD+SBE.

Content

Introduction

The Project Smart Built Environment (SBE) Lifecycle Perspective develops support, implements and evaluates how a future digital environmental calculation for a construction work can be made as efficiently as possible.

The future Life Cycle Assessment (LCA) calculation is assumed to be made as part of the ICT tools already used in the construction process or real estate sector that are originally designed for other purposes, as an additional environmental performance based add-on information feature. Environmental Product Declarations (EPD) includes third party verified LCA result for all kind of construction products and is used as source data for construction works LCA calculations. Such EPD user may be a non-trained person without LCA knowledge, where all machine readable figures available will be used without questioning them. It is therefore essential that the quality of the EPD and the LCA result is reported, i.e. Q metadata, as supplement information. The Q metadata will then help the end-user get an idea of what kind of decision support such figures can be used for. The Q metadata is published in a separate report (Erlandsson 2018).

The commonly included environmental impact indicators in an EPD that are calculated based on an LCA are for example; impact on climate change, acidification, eutrophication, ground-level ozone. One can therefore say that an LCA gives an environmental performance profile or footprint of a product, construction works etc. Today, there are several environmental assessment systems that only ask for climate impact. Moreover, the EPD may also include other environmental indicators that also can be reported in a machine-readable format such as; content declarations, material emission values (VOC), circularity indicators etc.

This report focus on how EPD can be digitalised in a machine-readable format to facilitate unbroken information value chain from the product manufacturer, to the program operator that publish the EPD, the buyer of the product and as part of construction product in any construction works, and finally as part of a digital model of the same construction work – like a digital twin. The de facto XML format specification for a digital LCA or EPD result for a construction product is found on a European format, ILCD, originally designed for exchange of life cycle inventory data between different LCA application tools and is here used as a common starting point of the machine-readable EPD and its development performed. The result in this report can also be seen as a contribution to ongoing standardisation work in ISO TC59 WG3.

The goal with the development of the EPD format described in this report is to allow additional information to supplement the LCA information, and make it possible to add other environmental product-related information in general to the EPD. By this developments is the vision that the role of EPD can be extended. The second goal with the work done here is to suggest a first implementation of this generic applicable extension format of the current ILCD+EPD format. The extension developed is done to meet additional requirement defined in the construction products EPD from EPD Norway, a content declaration and the Q metadata developed within the SBE Lifecycle project.

1 An open format for LCA and EPD results

In Europe there is a common format for transferring life cycle inventory (LCI) data based LCA methodology. The so-called ILCD[1] format is the way how the LCI data related to the EU product environmental footprint (PEF) is made digitalized. The ILCD format is then expanded to allow the inclusion of additional information from an EPD. The InData working group coordinates the work on the harmonization of the digital file format including the extensions for an EPD[2]. The basis for this work is the product category rules for EPD on construction products, as defined by the standard EN 15804 that is adopted for buildings according to EN 15978.

This current ILCD+EPD[3] extension includes the most relevant information given in an environmental product declaration (EPD), and the required format for reporting of the LCA result divided in life cycle stages from A to D, and sub-oriented LCA information modules. This modular structure of products is equal to any constructions works life cycle. The LCA result in an EPD includes LCI indicators as well as the results from the life cycle impact assessment (LCIA). The results for the LCIA are calculated by characterizing relevant results from the LCI into specific groups of environmental concern, e.g. impact on climate change. In practice does this means that hundreds of in and out flows of emissions/substances/resources can be transformed to one equivalent figure per impact category that is communicated in the EPD. We currently recognize 25 environmental indicators reported in an EPD

[1] http://eplca.jrc.ec.europa.eu/LCDN/developer.xhtml
[2] https://www.oekobaudat.de/en/info/working-group-indata.html
[3] http://www.oekobaudat.de/en/database/schnittstellen1.html

according to LCA specifications given in the standard EN 15804 related to construction products or EN 15978 for buildings.

Specifications on the latest development of the ILCD+EPD format can be found on the ÖKOBAUDAT web page[4]. This information includes a description of how this format is available and facilitates IT consultants to implement the file format. For those who want to create (or read) a machine-readable EPD file today may use the so called EPD Editor[5], for the transformation of the results in the machine-readable xml-format and the upload to an online database. Future developments by LCA tool developers and programme operators are expected to facilitate the creation and application of machine-readable data. An extension of the EPD Editor will be done in a near future to handle ILCD+EPD+SBE and will be reported separately.

The aim here is to add potential possibilities to add additional information, not necessary included in the 'graphical non-machine-readable pdf version of the EPD, referred to as ILCD+EPD+. The extra plus "+" indicates that the format includes additional information in order to facilitate its use as a digital information source but also an potential possibility to address more aspect than the ones included in the common domain handled by the InData working group. The latter is handled with a typically question/answer approach. The project scope also includes an example on how the generic format extension can be implemented as defined by the project Smart Build Environment (SBE) Life cycle perspective. The suggested aspects to be included in an SBE extension will be called ILCD+EPD+SBE.

4 http://www.oekobaudat.de/en/database/schnittstellen1.html. Go then to "Information for software developers"
5 http://www.openlca.org/wp-content/uploads/2015/11/EPD-Editor-EN.pdf

Instructions for reading:
The exemplification of the format extension ILCD+EPD+ as implemented by SBE is given in grey arrowed fields in the main part of the report.

The report includes an appendix part. Appendix 1 describes the format extension ILCD+EPD+ on how to set and constitute a questions and reply and xml scheme for the format. Information on the format extension ILCD+EPD+ is only found on the web pages referred to in Appendix 1. In Appendix 2 described the LCA based environmental performance indicators used in IBU and Ökobau mapped with the indicators used by SBE. Appendix 3 describes an expansion of the common ILCD+EPD format to handle product content declaration.

The implementation of the format as defined by the project SBE Lifecycle perspective given on a general level in the main text of the report and the appendix is aimed to be understood by those working with implementation of the format and trained in programming.

2 The SBE implementation of ILCD+EPD+

This section describes the additions of the ILCD+EPD+ format that are suggested by the project SBE Lifecycle Perspective. These additions can be grouped into the following aspects:

- Identification on products group, article and classifications
- Q metadata for informed use of the data and improved transparence
- Implementation of additional requirements in EPD Norway extensions
- Product content declaration, which is part of the mandatory EPD and different national initiatives that expand the EPD to also be applicable as basis for a log-book.

A supplementary report on Q metadata is published (Erlandsson 2018) and included here only on a general structural level.

2.1 Identification on products group, article and classifications

Each machine-readable EPD data set has a unique identity (UUID) in accordance to the ILCD+EPD format. It is moreover efficient in the information value chain if the product included in the EPD can be categorized to a product group or a generic product. In future it is most likely that buildingSmart data dictionary (bsDD) will fit for this purpose. The problem today is that is not commonly used and organized (several implementations of the same product name and its related GUID is currently possible and therefore generates multiple entries). The new cooperation between the organization behind the product property set ETIM and bsDD is hopefully a solution that handle this needed development. The project SBE lifecycle perspective has established a resource library to handle this so called SBE resource registry (see http://sbehub.se).

The EPD may contain LCA results based on several products or a product that can be representative for several articles from a manufacturer. We recognize here the ETIM approach as one promising global operational alternative that gives a common format to communicate product properties, but we are aware that other alternatives exist. It is also noticed the CE-labeling and the declaration of performance (DoP) in relation the Construction product Regulation has a need to identify and classify products on a common internationally established format. The same is valid for classification of the product

where the product in an EPD may be classified as a building element, component or material according to different systems like for example CoClass, which is used in Sweden. Other systems are applied in other countries and we do not recognize a global system that is commonly used in several countries.

The general suggestion based on these findings given above is that the information on a unique ID for product types as such are asked for and will definitely improve the use of EPDs. It is likely that the same ID is suitable for the CE labeling and the Declaration of Performance (DoP). However, we will not at this stage recommend some alternative as default. Instead, we will make it possible to handle this kind of information by introducing the following information aspects to be used in the EPD and in its machine-readable version:

Generic product or product group valid for the declared product with,

- Name of a product identification/library/register system
- The product/group ID valid according to this system

and for all articles that are covered by the EPD,

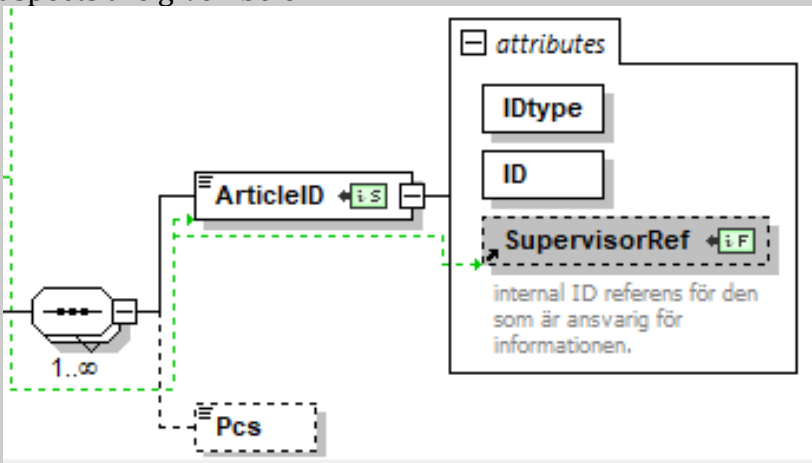
- Name of an articles system
- The articles ID valid according to this system

and the classification of the product covered by the EPD with,

- Name of an classification system
- The classification code valid for the Product declared.

Future development of this matter is in progress and there is also ongoing work on machine-readable EPD by ISO TC59 and Product Data Templates CEN TC/442 WG 4 that hopefully can contribute in this area.

The specification of the ILCD+EPD+ to handle different identity aspects are given below:



To handle different article identities linked to an EPD and its product/-s and its articles identities, we have chosen to manage this with a list. This covers all identities that may appear as identification of the article to which the EPD applies and can be handled in this way. This is done in practice by typing each identity in the xml element ID type. In this way, a reference is made to the respective publisher of the identity. All types of identities can be thereby handled. If the product/article is sold packed in different ways with different quantities, it is possible to enter this additional information, which is done with the xml element Pcs (for example, how many roof tiles are available on the pallet, etc. if the article ID is linked to the packaging or how the product is sold). It is common that the same article like nails can be sold with different packing options.

2.2 Product content declaration

The standard for construction product EPD EN 15804 stresses that it is mandatory to report on substances of very high concern (SVHC). This is a legal requirement covered by the chemical legislation REACH. REACH stipulate a duty to communicate if an article contains SVHC that are included in what is known as the Candidate list. Suppliers' are obliged to communicate information on the substances in the Candidate List contained in their articles at levels of more than 0.1% by weight. The information must always be supplied to professional customers and upon request to consumers. In 2017, this requirement was further specified so that it now is clear that this requirement is valid for all components (see Article 33 in the REACH regulation for more

elaborated text). The components can easily be defined as those parts that appear when a product is dissembled. It is common that a product consists of components that can be sold separately. A door for instance includes screws, hinges, locks, presses, locking cylinder, etc. The benefit with this definition is that a component will have the same content declaration if it is sold separately or part of a building product or element where the SVHC might have lover than 0.1 weight-% is related to that assembled product or construction element.

The suggestion here is therefore as given below:

1. A mandatory requirement in the EPD is that a content declaration shall be included. This content declaration may either be given per component or (typically for a material) per auxiliary material that is used in the manufacturing of the product. Either of these alternatives will do, but only one option can be used per EPD.
2. A question is asked if an individual component in the declared product includes any SVHC substance (i.e. substances listed in the EC candidate list, or any other additional list given by the program operator such as the Norwegian Priority list or the Swedish Phase out list).
   Note that a product that consists of only one component/material may include several substances including SVHC.
3. If a component includes any listed SVHC a specification of the substance that creates this toxic property has to be listed by its CAS and/or EC number.
   Note if the product contains more than one component and more than one of these includes SVHC a content specification shall be reported for each component.
4. Besides toxic aspects will the content declaration allow assessment on circularity by adding information on; if the component/material is made of recycled material and if it is made of renewable resources.

Example of implementation of the content declaration and the SVHC reporting tables are given below.

Table 1 Mandatory content declaration for products. The alternative given include reporting of SVHC above 0.1 weight-percent and full content declaration and the alternative below is more in line with current practice.

Component/material	kg/m^3	weight-%	Including substance with CAS No	Including substance with EC No	Content of renewable mateials	Content of post-cosumer recycled materials	Comment
Spruce	430	97	NA	NA	100%	0%	
MUF adhesive	4,3	3	50-00-0	200-001-8	5%	40%	
Packaging materials	**kg/m^3**	**weight-%**	**CAS No**	**EC No**			
Straps, nylon	0.11	0.03	32131-17-2	ND	100%	50%	
Clingwrap, polyeten	1.1	0.3	9002-88-4	ND	100%	0%	

ND, not declared. NA, not applicable

Component/material	kg/m^3	weight-%
Spruce	430	99
MUF adhesive	4,3	1
Packaging materials	**kg/m^3**	**weight-%**
Straps, nylon	0.11	0.03
Clingwrap, polyeten	1.1	0.3

The CAS or EC No. is optional according to EN15804, but becomes mandatory if any SVHC above 0.1 % weight occur in any material/component. For weight percentage and mass in Table 2 a discrete value or a range of values can be specified. Optionally, the percentage of renewable resource content, recycled content and recyclable content can be specified for each component or material. Note that a material/component may result in several CAS and EC No.

Table 2 Mandatory reporting on SVHC and additional requirement by the program Operator EPD Norway and the Phase out list as implemented in the Swedish self-claim building declaration called eBVD.

	The component does not include any substances given by lists given below			
SVHC accordinf to	REACH candidate list of substances of very high concern	Norwegian list of priority substances	Phase-out substances found in the Swedish PRIO tool	EC hazardous waste, annex III of Directive 2008/98/EC
Spruce	no	no	no	no
MUF adhesive	no	no	no	no
Packaging materials	EC/REACH	Norwegian Priority list	Swedish Phase out list	EC hazardous waste
Straps, nylon	no	no	no	no
Clingwrap, polyeten	no	no	no	no
Market that are concerned	EC/REACH	Norwegian Priority list	Swedish Phase out list	EC hazardous waste
Country or region	European union	Norway	Sweden	European union

It should be noticed that product content is in fact part of the mandatory EPD according to EN 15804 why it more correct should be part of the specification of the current format ILCD+EPD.

The detailed technical specification to handle **product content** which is suggested to be part of the core format ILCD+EPD is given in the XML Schema documentation for revision 1.1 of the ILCD+EPD format, which is also contained in the appendix, in the section “Content Declaration”. For details see appendix 3

2.3 EPD Norway additions

The content declaration is part of the Norwegian additional EPD requirements. Besides this requirement there are also additional mandatory Norwegian requirements as listed below:

- What is the GWP $_{GHG}$ contribution of the electricity used in the core process in the manufacturing (module A3 but reported in A1 according to EN15804: 2014 and in A¤ according to ISO21930:2017)?
- Is a climate declaration worked out?
- Is there a material emission value to report on VOC to indoor air?

The first additional requirement concerning performance related to the impact on climate change of electricity at the core manufacturing site is handled with three questions as described in Figure 1.

Greenhouse gas emission from the use of electricity in the manufacturing phase
National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Data source	Amount	Unit
GaBi Database 2017 Edition	0.043	kg CO_2-eqv/kWh

Figure 1 Additional mandatory requirement on climate performance on electricity used, compared to EN15804 in the EPD for construction products in EPD Norway.

The EPD Norway question about emissions to indoor air and Carbon footprint are not standardized, why these can be handled by a question followed by an answer that is currently given in free text field, see Figure 2.

Indoor environment
The product meets the requirements for low emissions of formaldehyde class E1 according to EN 14080:2013.

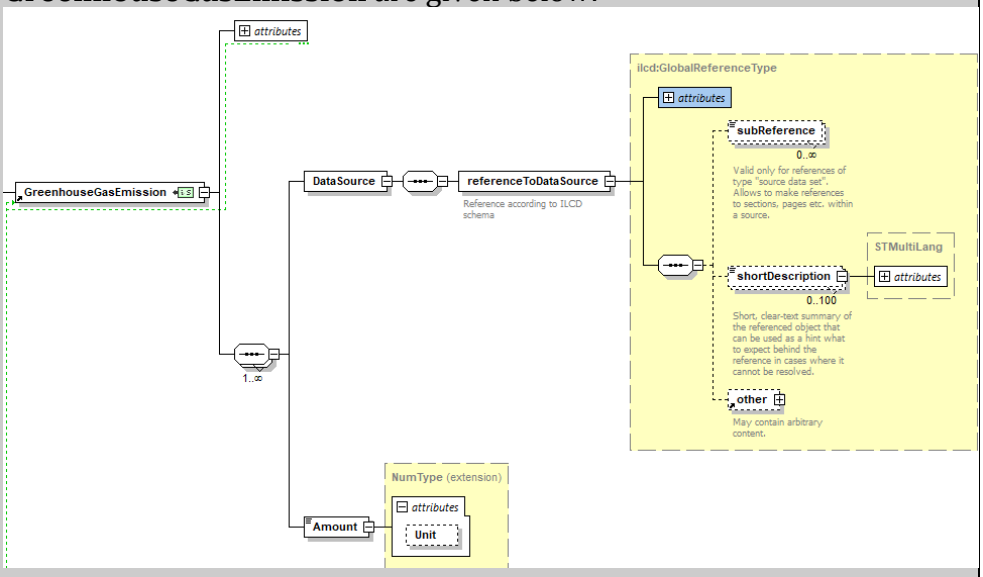
Carbon footprint
Separate carbon footprint has not been worked out for the product, but the EPD includes such information.

Figure 2 Additional mandatory requirement on climate performance on electricity used, compared to EN15804 in the EPD for construction products in EPD Norway.

In future is it most likely that there will be a CE labeling for VOC emissions. If so, it will in future be possible to declare emission rate on specific substances (mg/m^{2}h) in the EPD that we then have to adopt to make this possible to add this information.

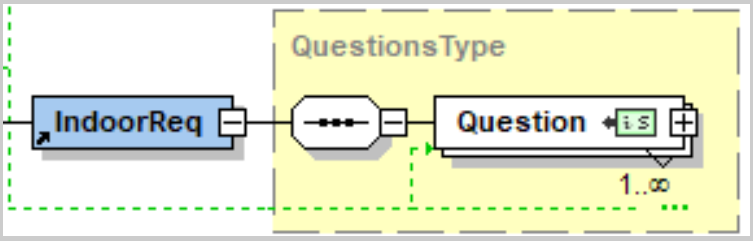
The carbon footprint that is asked for is for instance if a declaration in accordance to ISO14067 is developed, which differ slightly compared to EN15804.

The specification of the ILCD+EPD+ to handle **GreenhouseGasEmission** are given below:



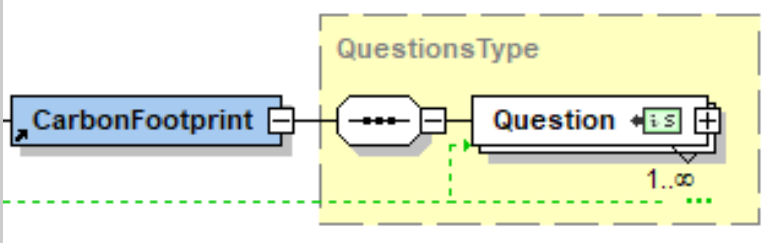
To handle greenhouse gas emissions, the DataSource is specified according to how data sources are handled in the general ILCD format and the calculated result is specified with the Amount and Unit.

The specification of the ILCD+EPD+ to handle these SBE aspects **VOC to indoor air** is given below:



This section is defined by answering and questions. The question is for instance “Do the product meet the low formaldehyde emission class E1 according to EN 14080:2013”, with the answer yes or no. The questions and their handling of the responses are handled in the same way as in the Q metadata and are described in more detail below.

The specification of the ILCD+EPD+ to handle **climate declaration** is given below:



The question is for instance "Is a separate carbon footprint declaration worked out for the product", with the answer yes or no.

2.4 Q metadata

Since EPDs can be made based on different interpretations of the standards, different levels of ambition and different representativeness, these factors must be clarified before deciding whether an EPD can be used for a particular purpose. In simplified terms, it is possible to divide the purpose of an LCA or EPD according to the LCA staircase, see Figure 1. That is to say, the first step is about to get information on the environmental performance and impact and to assess what is large or small, the seconds step is to support on how to make environmental improvements of the same product or construction works, and the final step is the potential use of LCA to actually make an comparison on different suppliers products, different constructions solutions or constructions works made of different materials that meet the same basic function as requested.

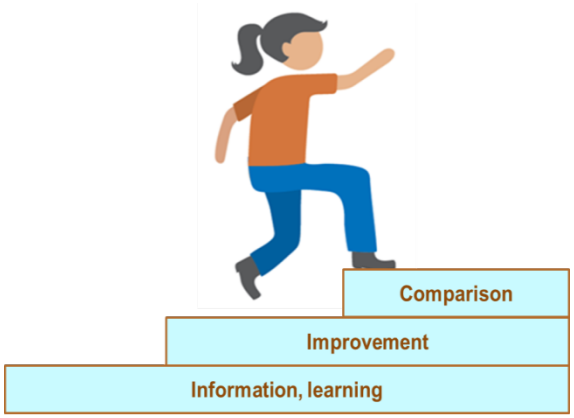


Figure 3 The LCA staircase where different quality of environmental data and ambition with the life cycle analysis leads to the result being used for comparison, improvement or just as part of a learning process of what is small or large (image based on Magnusson et al. 2016).

Q metadata describes the following aspects of the LCA data contained in an EPD;

1) Is it for a unique product or product group,
2) Is it for a manufacturer or several,
3) Is the environmental data based on specific process data or generic (database) data
4) How is the environmental indicator result verified
5) Are significant assumptions made in the underlying LCA
6) If the EPD is not verified how is the indicator result calculated
7) Who is responsible for establishing the Q metadata for the current product

In brief, Q metadata provides information on LCA data with the goal to increase transparency of the methodology settings and assumptions made. The supplementary report on Q metadata describes how individual questions are defined. However, the two different type of questions A and B, dealt with are described below on a generic level.

Table 3 Q metadata type A.

Criteria type A, equal to Q metadata No. 1 to 4 and 6	Answer
Vary precise data valid for comparative assertion	◎
Acceptable precise data applicable for most application	◎
Poor precision that limit the use of the data	◎
A non-precise answer or information is available to define an answer	◎
Comment:	

Table 4 Q metadata type B.

Criteria type B, equal to Q metadata No. 5	Answer
Is this methodology choice or assumption made?	Yes/No
Comment:	

It should be noticed that Q metadata can on a general level be characterized as a question-answer. This implies that this part of the generic ILCD+EPD+ format may be useful to handle almost any aspect that are asked for and the structure is described below.

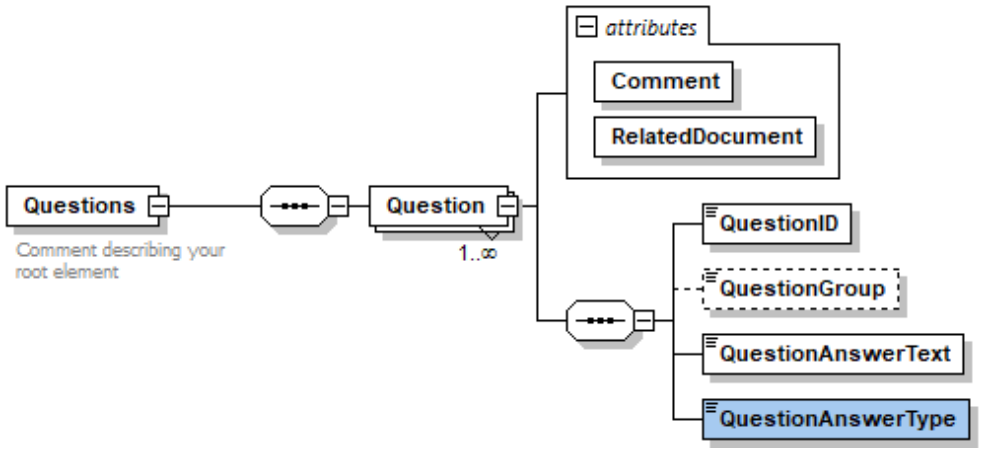


Figure 4 Elements involved to create a question and to control the response options according to the general ILCD-EPD+ approach that make it possible to create any type of question and its related answer.

The general format for additional information follows a question answer structure. Thus, the general ILCD+EPD+ format is provided with response options that match different question types and response options. To get a general query interface, different types of questions have been defined and how the answers to these questions can be specified. The different generic types of answers to the question types are, see also Figure 5:

- Text
- Multiple text rows
- Multiple list
- One in list (select one alternative in a list)
- Yes or No answer (bolean)
- Link to external information (URL)
- Discreet values with or without unit (DescreetValuesNumNoUnit/...WUnit)
- Range with or without unit (RangeValuesNoUnit/...WUnit)
- Discreet values as text.

In addition, each question can be defined if a reply comment or a related document is required. A separate xml schema is used to produce the questions and define which response options that should be used. See further in Appendix 1 for more detailed information about the XML schema.

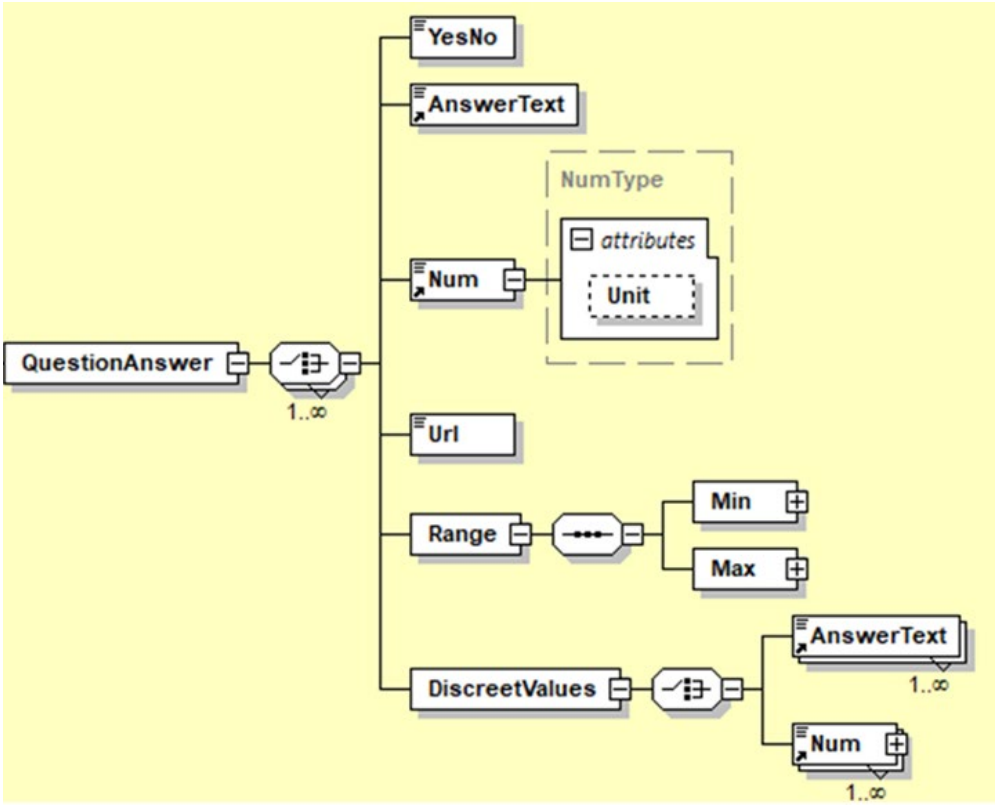


Figure 5 The schema on the different answering alternatives, besides the possibility to add a comment and a supporting document.

It is then possible to make any specification to this general format that then includes a defined fixed question whose responses then are predefined and typically possible to comment on. Q metadata is based on this question-answer approach. The quality criteria type A, equal to Q metadata No 1 to 4, in the ILCD+EPD+SBE format is specified as follows.

The specification of the ILCD+EPD+ to handle **Q meta data type A** is given below:

Questions of type A in Q Metadata are followed by an answer given as select a response from the list (OneInList) and it is possible to give an comment.

The format for criteria No 5 follows the same approach but a comment is given for each sub-question addressed in criteria No 5 and a comment is possible for each sub-question. The specification in accordance to ILCD+EPD+ is then as given below:

The specification of the ILCD+EPD+ to handle **Q meta data type B** is given below:

Questions of type B in Q Metadata are followed by an answer given as Yes/No (Boolean) and it is required to comment on this if the alterative Yes is selected.

Recognition of support

Funds have been obtained from the Smart Built Environment Innovation Program, which is a joint venture between Vinnova, the Swedish Energy Agency and Formas, as well as the SBUF (Construction Development Fund).

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Appendixes

Appendix 1: Definition of the ILCD+EPD+ format

The appendixes and its link to an external webpage are developed by Jan-Anders Jönsson/Åkej AB and Emil Schönberg/Informationsbyggarna. The ILCD+ILD+ format is reviewed and commented by Oliver Kusche/ Oliver Kusche Research & Consulting, where actions are made to meet these comments.

More detailed information on the format extension made is available via the following internet link www.sbeilcd.se. On this webpage is the information divided in the following parts:

1. How to set and constitute a question: ILCDSBE_NORREQ_Question.xsd
2. How to answer a question: ILCDSBE_NORREQ_Collection.xsd
3. Schema of the flexible format for EPD additions – ILCD+EPD+

Appendix 2: Mapping of environmental performance indicators used in IBU and Ökobau versus the one used by SBE

EPD Norway and SBE additions

No:	SBE_GUID	CoClass_Attributnamn	Typ	Namn_SE	Definition_SE	Enhet	Källa	Förkortning	Engelsk benämning
1	a02eb108-0675-4cb3-ae31-d6b3f5aeabf6	ccEnvirImpGwpGhg	LCIA	Klimatpåverkan, växthusgaser (GWPGHG)	miljöegenskap som anger upptag och utsläpp av växthusgasers bidrag till den globala uppvärmningen (GWPGHG)	kg CO_2e	SS-EN 15804:2012+A1:2013, ISO 14067:2018, TRV_REF	GWP_{GHG}	Global warming potential, green house gases
2	4d3b7748-6c92-493a-b0fa-eacd45f9025e	ccEnvirImpGwpBio	LCIA	Klimatpåverkan, biogent kol (GWPBIO)	miljöegenskap som anger upptag och utsläpp av biogen koldioxid samt bundet kol i material omräknat till koldioxid och där denna biogena koldioxid räknat som en koldioxidekvivalent där 1 kg CO2 Biogen = 1 CO2e (GWPBIO)	kg CO_2e	SS-EN 16485:2014	GWP_{bio}	Global Warming Potential, removal and emission of biogenic carbondioxide
3	a7fe9ed1-b642-4f07-af13-7f5fa0ddc911	ccEnvirImpGwpGhgBio	LCIA	Klimatpåverkan, växthusgaser och biogent kol (GWPGHG+bio)	miljöegenskap som anger upptag och utsläpp av växthusgasers bidrag till den globala uppvärmningen som inkluderar upptag och utsläpp av biogen koldioxid samt bundet kol i material omräknat till koldioxid och där denna biogena koldioxid räknat som en koldioxidekvivalent där 1 kg CO2 Biogen = 1 CO2e (GWPHGH+bio)	kg CO_2e	SS-EN 16485:2014	$GWP_{GHG+bio}$	Global warming potential, green house gases including removal and emission of biogenic carbondioxide
4	aa78bd82-3560-442b-85af-3c0638fbf93b	ccEnvirImpGwpTempS	LCIA	Klimatpåverkan, lagring av biogent kol kortare tid än 100 år (GWPTempS)	miljöegenskap som anger upptag av biogent som bidrar till minskat bidrag till den globala uppvärmningen i form av lagring av biologent kol kortare än 100 år (GWPTempS)	kg CO_2e	ISO 14067:2018	GWP_{TempS}	Global Warming Potential, biogenic storage less than 100 years
5	addcf138-ded6-4b2a-9ef2-dc75c63a5bc9	ccEnvirImpGwpPermS	LCIA	Klimatpåverkan, lagring av biogent kol längre tid än 100 år (GWPPermS)	miljöegenskap som anger upptag av biogent som bidrar till minskat bidrag till den globala uppvärmningen i form av lagring av biologent kol längre än 100 år (GWPPermS)	kg CO_2e	ISO 14067:2018	GWP_{PermS}	Global Warming Potential, biogenic storage over 100 years

No:	SBE_GUID	CoClass_Attributnamn	Typ	Namn_SE	Definition_SE	Enhet	Källa	Förkortning	Engelsk benämning
6	e7cbe99e-0e29-4806-82c0-71097957b2c8	ccEnvirImpOdp	LCIA	Stratosfäriska ozonnedbrytning (ODP)	miljöegenskap som anger potential för nedbrytning av det stratosfäriska ozonlagret (ODP)	kg CFC11e	SS-EN 15804:2012+A1:2013	ODP	Depletion potential of the stratospheric ozone layer
7	4fa7315b-8ab0-4c1d-a702-68d32051aa61	ccEnvirImpPocp	LCIA	Marknära ozon (POFP)	miljöegenskap som anger potential för fotokemisk oxidantbildning (POCP)	kg C_2H_4e	SS-EN 15804:2012+A1:2013	POCP	Formation potential of tropospheric photochemical oxidants
8	98662ff8-cf7a-42eb-938c-bb6db001eecc	ccEnvirImpAp	LCIA	Försurning (AP)	miljöegenskap som anger försurningspotential av mark och vatten (AP)	kg SO_2e	SS-EN 15804:2012+A1:2013	AP	Acidification potential of land and water
9	7dd63c34-5710-4cfe-98a4-4ebf3b5502ea	ccEnvirImpEp	LCIA	Övergödning (EP)	miljöegenskap som anger potential för eutrofering/övergödning (EP)	kg PO_4^3e	SS-EN 15804:2012+A1:2013	EP	Eutrophication potential
10	e7d25d04-15ef-47d6-af60-61cb815275f0	ccEnvirImpAdpm	LCIA	Utarmning av icke-fossila resurser (ADPM)	miljöegenskap som anger utarmning av icke-fossila resurser (ADPM)	kg Sb e	SS-EN 15804:2012+A1:2013	ADPM	Abiotic depletion potential for non fossil resources
11	9751d7da-46e1-417c-88af-d57515a0f3f3	ccEnvirImpAdpe	LCIA	Utarmning av fossila resurser (ADPE)	miljöegenskap som anger utarmning av fossila resurser (ADPE)	MJ	SS-EN 15804:2012+A1:2013	ADPE	Abiotic depletion potential for fossil resources
12	4f55716b-3753-4292-ba4c-d8f74f5d123b	ccEnvirBioC	LCI	Biogen kollagring i produkter (BioC)	Miljöegenskap som anger hur mycket biogent kol det finns lagrat i produkten, givet som elementärt kol	kg C	ISO 14067:2018	BioC	Biogenic carbon storage in products
13	bfa4785a-4c11-4af3-a7d8-0b8fe4575216	ccEnvirResUseRpee	LCI	Användning av förnybara primära energiresurser som energibärare (RPEE)	miljöegenskap som anger användning av förnybara primära energiresurser som energibärare (RPEE)	MJ	SS-EN 15804:2012+A1:2013	RPEE	Renewable primary energy resources used as energy carrier
14	5a199dac-2939-4e73-835b-acb888d0d16c	ccEnvirResUseRpem	LCI	Användning av förnybara primära energiresurser som material (RPEM)	miljöegenskap som anger användning av förnybara primära energiresurser som material (RPEM)	MJ	SS-EN 15804:2012+A1:2013	RPEM	Renewable primary energy resources used as raw materials
15	8a560434-6adc-428c-bd8d-0a49837ae13d	ccEnvirResUseTpe	LCI	Total användning av förnybara primära energiresurser (TPE)	miljöegenskap som anger total användning av förnybara primära energiresurser (TPE)	MJ	SS-EN 15804:2012+A1:2013	TPE	Total use of renewable primary energy resources
16	3cb5a4d0-4d17-4017-9baf-3fe1100beb47	ccEnvirResUseNrpe	LCI	Användning av icke förnybara primära energiresurser som energibärare (NRPE)	miljöegenskap som anger användning av icke förnybara primära energiresurser som energibärare (NRPE)	MJ	SS-EN 15804:2012+A1:2013	NRPE	Non renewable primary energy resources used as energy carrier

No:	SBE_GUID	CoClass_Attributnamn	Typ	Namn_SE	Definition_SE	Enhet	Källa	Förkortning	Engelsk benämning
17	5abc5781-2a33-4393-9694-5a9444bef213	ccEnvirResUseNrpm	LCI	Användning av icke förnybara primära energiresurser som material (NRPM)	miljöegenskap som anger användning av icke förnybara primära energiresurser som råvara (NRPM)	MJ	SS-EN 15804:2012+A1:2013	NRPM	Non renewable primary energy resources used as materials
18	a9834c0d-baca-40a5-ac69-8b1e45ec63b7	ccEnvirResUseTrpe	LCI	Total användning av icke förnybara primära energiresurser (TRPE)	miljöegenskap som anger total användning av icke förnybara primära energiresurser (TRPE)	MJ	SS-EN 15804:2012+A1:2013	TRPE	Total use of non renewable primary energy resources
19	1d92cc8b-3f59-475f-a07a-63aadd5760a7	ccEnvirResUseSm	LCI	Användning av sekundära material (SM)	miljöegenskap som anger användning av sekundära material (SM)	kg	SS-EN 15804:2012+A1:2013	SM	Use of secondary materials
20	e31170c5-2b8b-492c-9243-f08ff6d32b1e	ccEnvirResUseRsf	LCI	Användning av förnybara sekundära bränslen (RSF)	miljöegenskap som anger användning av förnybara sekundära bränslen (RSF)	MJ	SS-EN 15804:2012+A1:2013	RSF	Use of renewable secondary fuels
21	2484ac83-7ebc-4fc6-8e5a-221f3d387ded	ccEnvirResUseNrsf	LCI	Användning av icke förnybara sekundära bränslen (NRSF)	miljöegenskap som anger användning av icke förnybara sekundära bränslen (NRSF)	MJ	SS-EN 15804:2012+A1:2013	NRSF	Use of non renewable secondary fuels
22	3df247dc-2189-488d-b4d3-5ca16dc0c5a1	ccEnvirResUseW	LCI	Användning av färskvatten (W)	miljöegenskap som anger användning av färskvatten (W)	m^3	SS-EN 15804:2012+A1:2013	W	Use of net fresh water
23	eabbca63-8437-4faa-828a-67b2c49396b9	ccEnvirResUseCed	LCI	Kumulativt energibehov (TPR+TRPE)	miljöegenskap som anger kumulativt energibehov (TPR+TRPE)	MJ	Trafikverket	CED	Cumulative energy demand (=TPE+TRPE)
24	4093d3ac-1a62-447c-9da7-12a09a8f1d40	ccEnvirResUseTpsre	LCI	Total användning av primära och sekundära resurser som energi (TPRSE)	miljöegenskap som anger total användning av primära och sekundära resurser som energi (TPRSE)	MJ	IVL/SBE	TPSRE	Total use of primary and secondary resources used as energy; TPSE
25	ed8d5783-03cb-4472-88d7-6738fce44be6	ccEnvirWasteHw	LCI	Farligt avfall som bortskaffas (HW)	miljöegenskap som anger farligt avfall som deponeras (HW)	kg	SS-EN 15804:2012+A1:2013	HW	Hazardous waste disposed
26	c9451bff-2744-434e-bb7a-909e7bf12791	ccEnvirWasteNhw	LCI	Icke-farligt avfall som bortskaffas (NHW)	miljöegenskap som anger icke-farligt avfall som deponeras (NHW)	kg	SS-EN 15804:2012+A1:2013	NHW	Non hazardous waste disposed
27	edb2e0a5-2255-4f54-81d1-89a02439fd4f	ccEnvirWasteRw	LCI	Radioaktivt avfall som bortskaffas (RW)	miljöegenskap som anger radioaktivt avfall som bortskaffas (RW)	kg	SS-EN 15804:2012+A1:2013	RW	Radioactive waste disposed

No:	SBE_GUID	CoClass_Attributnamn	Typ	Namn_SE	Definition_SE	Enhet	Källa	Förkortning	Engelsk benämning
28	d52d4a91-43b5-4e1d-a826-3eb26bbda871	ccEnvirOutputCr	LCI	Komponent som kan återanvändas (CR)	miljöegenskap som anger komponent som återanvändas (CR)	kg	SS-EN 15804:2012+A1:2013	CR	Components for reuse
29	133d0e88-8e1f-467c-bbb0-03cbb90d769e	ccEnvirOutputMr	LCI	Material för återvinning (MR)	miljöegenskap som anger material som återvinns (MR)	kg	SS-EN 15804:2012+A1:2013	MR	Materials for recycling
30	aa10d158-9a75-4570-9db8-36daf043b85f	ccEnvirOutputMer	LCI	Material för energiutvinning (MR)	miljöegenskap som anger material anvämds för energiutvinning (MER)	kg	SS-EN 15804:2012+A1:2013	MER	Materials for energy recovery
31	4e65f06d-ed26-4119-8a0f-a06719a980b0	ccEnvirOutputEee	LCI	Exporterad termisk energi (ETE)	miljöegenskap som anger exporterad elektrisk energi (EEE)	MJ	SS-EN 15804:2012+A1:2013	EEE	Exported electric energy
32	f1546b83-8290-4b70-b2b2-83773e467933	ccEnvirOutputEte	LCI	Exporterad termisk energi (ETE)	miljöegenskap som anger exporterad termisk energi (ETE)	MJ	SS-EN 15804:2012+A1:2013	ETE	Exported thermal energy

IBU and Ökobau

No:	UUID	Name_DE	EnglishName_DE	Einheit	Short name_DE
1					
2					
3	77e416eb-a363-4258-a04e-171d843a6460	Globales Erwärmungspotenzial (GWP)	Global warming potential (GWP)	kg CO2-Äqv.	GWP
4					
5					
6	06dcd26f-025f-401a-a7c1-5e457eb54637	Abbau Potential der stratosphärischen Ozonschicht (ODP)	Depletion potential of the stratospheric ozone layer (ODP)	kg R11-Äqv.	ODP
7	1e84a202-dae6-42aa-9e9d-71ea48b8be00	Bildungspotential für troposphärisches Ozon (POCP)	Formation potential of tropospheric ozone (POCP)	kg Ethen-Äqv.	POCP
8	b4274add-93b7-4905-a5e4-2e878c4e4216	Versauerungspotenzial von Boden und Wasser (AP)	Acidification potential of soil and water (AP)	kg SO2-Äqv.	AP
9	f58827d0-b407-4ec6-be75-8b69efb98a0f	Eutrophierungspotenzial (EP)	Eutrophication potential (EP)	kg Phosphat-Äqv.	EP
10	f7c73bb9-ab1a-4249-9c6d-379a0de6f67e	Potenzial für den abiotischen Abbau nicht fossiler Ressourcen (ADPE)	Abiotic depletion potential for non fossil resources (ADPE)	kg Sb-Äqv.	ADPE
11	804ebcdf-309d-4098-8ed8-fdaf2f389981	Potenzial für den abiotischen Abbau fossiler Brennstoffe (ADPF)	Abiotic depletion potential for fossil resources (ADPF)	MJ	ADPF
12					
13	20f32be5-0398-4288-9b6d-accddd195317	Erneuerbare Primärenergie als Energieträger (PERE)	Use of renewable primary energy (PERE)	MJ	PERE
14	fb3ec0de-548d-4508-aea5-00b73bf6f702	Erneuerbare Primärenergie zur stofflichen Nutzung (PERM)	Use of renewable primary energy resources used as raw materials (PERM)	MJ	PERM
15	53f97275-fa8a-4cdd-9024-65936002acd0	Total erneuerbare Primärenergie (PERT)	Total use of renewable primary energy resources (PERT)	MJ	PERT

No:	UUID	Name_DE	EnglishName_DE	Einheit	Short name_DE
16	ac857178-2b45-46ec-892a-a9a4332f0372	Nicht-erneuerbare Primärenergie als Energieträger (PENRE)	Use of non renewable primary energy (PENRE)	MJ	PENRE
17	1421caa0-679d-4bf4-b282-0eb850ccae27	Nicht-erneuerbare Primärenergie zur stofflichen Nutzung (PENRM)	Use of non renewable primary energy resources used as raw materials (PENRM)	MJ	PENRM
18	06159210-646b-4c8d-8583-da9b3b95a6c1	Total nicht erneuerbare Primärenergie (PENRT)	Total use of non renewable primary energy resource (PENRT)	MJ	PENRT
19	c6a1f35f-2d09-4f54-8dfb-97e502e1ce92	Einsatz von Sekundärstoffen (SM)	Use of secondary material (SM)	kg	SM
20	64333088-a55f-4aa2-9a31-c10b07816787	Erneuerbare Sekundärbrennstoffe (RSF)	Use of renewable secondary fuels (RSF)	MJ	RSF
21	89def144-d39a-4287-b86f-efde453ddcb2	Nicht erneuerbare Sekundärbrennstoffe (NRSF)	Use of non renewable secondary fuels (NRSF)	MJ	NRSF
22	3cf952c8-f3a4-461d-8c96-96456ca62246	Einsatz von Süßwasserressourcen (FW)	Use of net fresh water (FW)	m3	FW
23					
24					
25	430f9e0f-59b2-46a0-8e0d-55e0e84948fc	Gefährlicher Abfall zur Deponie (HWD)	Hazardous waste disposed (HWD)	kg	HWD
26	b29ef66b-e286-4afa-949f-62f1a7b4d7fa	Entsorgter nicht gefährlicher Abfall (NHWD)	Non hazardous waste dispose (NHWD)	kg	NHWD
27	3449546e-52ad-4b39-b809-9fb77cea8ff6	Entsorgter radioaktiver Abfall (RWD)	Radioactive waste disposed (RWD)	kg	RWD
28	a2b32f97-3fc7-4af2-b209-525bc6426f33	Komponenten für die Wiederverwendung (CRU)	Components for re-use (CRU)	kg	CRU
29	d7fe48a5-4103-49c8-9aae-b0b5dfdbd6ae	Stoffe zum Recycling (MFR)	Materials for recycling (MFR)	kg	MRF
30	59a9181c-3aaf-46ee-8b13-2b3723b6e447	Stoffe für die Energierückgewinnung (MER)	Materials for energy recovery (MER)	kg	MER
31	4da0c987-2b76-40d6-9e9e-82a017aaaf29	Exportierte elektrische Energie (EEE)	Exported electrical energy (EEE)	MJ	EEE
32	98daf38a-7a79-46d3-9a37-2b7bd0955810	Exportierte thermische Energie (EET)	Exported thermal energy (EET)	MJ	EET

Appendix 3: Suggested expansion of the common ILCD+EPD format to handle product content declaration

The appendixes and its link to an external webpage are developed by Oliver Kusche Research & Consulting.

ivl SVENSKA MILJÖINSTITUTET

Med stöd från:

VINNOVA

Energimyndigheten

formas

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