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Full document details: 23/30478879 DC

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Bio-based products - Life cycle assessment - Additional requirements and guidelines for comparing the life cycles of bio-based products with their fossil-based equivalents

Biobasierte Produkte - Ökobilanzen - Zusätzliche Anforderungen und Leitlinien für den Vergleich der Lebenszyklen von biobasierten Produkten mit ihren fossilen Pendanten

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 411.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (prEN 18027:2023) has been prepared by Technical Committee CEN/TC 411 “Bio-based products”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document is complementary to EN 16760:2015 *Bio-based products – Life cycle assessment*.

Introduction

Bio-based products from forestry and agriculture have a long history of application, such as paper, board and various chemicals and materials. The last decades have seen the emergence of new bio-based products in the market. Some of the reasons for the increased interest lie in the benefits of bio-based products in relation to the depletion of fossil resources and climate change. Bio-based products can also provide additional product functionalities. These developments have triggered a wave of innovation with the development of knowledge and technologies allowing new transformation processes and product development.

Acknowledging the need for common standards for bio-based products, the European Commission issued mandate M/492¹, resulting in a series of standards developed by CEN/TC 411 during 2012-2017, with a focus on bio-based products other than food, feed and biomass for energy applications. This document was developed after the expiration of the mandate, upon the initiative of CEN/TC 411/WG 4.

The standards of CEN/TC 411 “Bio-based products” provide a common basis on the following aspects:

- common terminology;
- bio-based content determination;
- life cycle assessment (LCA);
- sustainability aspects; and
- declaration tools.

It is important to understand what the term bio-based product covers and how it is being used. The term ‘bio-based’ means ‘derived from biomass’. Bio-based products (bottles, insulation materials, wood and wood products, paper, solvents, chemical intermediates, composite materials, etc.) are products which are wholly or partly derived from biomass. It is essential to characterize the amount of biomass contained in the product by, for instance, its bio-based content or bio-based carbon content.

The bio-based content of a product does not provide information on its environmental impact or sustainability, which may be assessed through LCA and sustainability criteria. In addition, transparent and unambiguous communication within bio-based value chains is facilitated by a harmonized framework for certification and declaration.

This document has been developed with the aim to set a framework for fair comparisons between fossil-based and bio-based product systems through LCA. Today, some comparisons are made in a way which (consciously or unconsciously) disadvantages the bio-based product systems related to a number of aspects. Often, this is due to an incorrect application of LCA, and not being in full conformance with the international LCA standard EN ISO 14044. In this document some of these issues are addressed when setting the framework for how a correct study is to be performed.

The general methodology to perform LCAs of products is described in the standard mentioned above as well as in EN ISO 14040, EN ISO 14067 and, more specific for bio-based products, in EN 16760 and EN ISO 22526-1 to EN ISO 22526-4. However, significant problems often arise when it comes to making well-balanced comparative LCAs between bio-based and fossil-based product systems. This document provides additional requirements and guidelines to enable practitioners to perform comparative LCA studies involving bio-based products with equivalent fossil-based products and disclose the results. Fossil resource use increases the total amount of carbon in the biosphere while bio-based systems can

¹ A mandate is a standardization task embedded in European trade laws. Mandate M/492 was addressed to the European Standardization bodies, CEN, CENELEC and ETSI, for the development of horizontal European Standards for bio-based products.

operate in a renewable way within this system (provided that the biomass grows at at least the same rate as it is harvested). Biogenic carbon returns to the atmosphere and this carbon can then be absorbed as plants, trees and algae grow.

This document sets requirements for comparisons between fossil-based and bio-based product systems. There can in some cases be many other options (which can be better than both the fossil-based and bio-based option), but this is outside of the scope of this document.

1 Scope

This document provides requirements and guidelines for comparing the life cycles of bio-based products with their fossil-based equivalents.

NOTE The term “equivalents” generally refers to the “functional equivalence”.

This document builds on existing LCA methodology and provides requirements and guidance on specific topics relevant for making well-balanced comparisons.

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.

EN ISO 14040:2006,² *Environmental management — Life cycle assessment — Principles and framework (ISO 14040:2006)*

EN ISO 14044:2006,³ *Environmental management — Life cycle assessment — Requirements and guidelines (ISO 14044:2006)*

EN ISO 14067:2018, *Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification (ISO 14067:2018)*

EN 16575:2014, *Bio-based products - Vocabulary*

EN 16760, *Bio-based products - Life Cycle Assessment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 14040:2006, EN ISO 14044:2006, EN 16575:2014 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

direct land use change

dLUC

change in the land-use category within the product system under study

Note 1 to entry: The change of land-use category can e.g. be from forest land to cropland.

[SOURCE: IPCC Guidelines 2006 [16]]

² As impacted by EN ISO 14040:2006/A1:2020.

³ As impacted by EN ISO 14044:2006/A1:2018 and EN ISO 14044:2006/A2:2020.

3.2

indirect land use change

iLUC

change in the use of land which is the consequence of direct land use change, but which occurs outside the relevant boundary

[SOURCE: EN ISO 14067:2018, 3.1.7.6, modified: Notes to entry and example deleted]

4 General principles for LCA studies which compare bio-based with fossil-based products

4.1 General

The principles from EN ISO 14040:2006, 4.1 apply for this document. They are followed in both planning, conducting, and reviewing an LCA study. These principles are further elaborated in 4.2-4.8 below to cover the comparison of bio-based products with their fossil-based equivalents.

4.2 Life cycle perspective

Due to different supply chains (agriculture and forestry vs. mining and extraction), data availability, quality and appropriateness can deviate considerably between the systems under study.

Also, end-of-life for products can differ considerably due to the specific properties (such as recyclability) and the availability of different treatment options.

The different attributes of bio-based and fossil-based carbon flows are treated consistently in comparative studies that are handling both flows, or in comparisons of studies that handles one or the other of the two flows.

4.3 Environmental focus

LCA focuses on addressing environmental aspects and impacts for distinctively different product systems related to the safeguards natural resources, human health, and ecosystems.

Due to the different nature of the supply chains also different economic and social impacts can be observed, see 6.4.1.2. These impacts are typically out of scope but can be addressed in broader assessments.

4.4 Relative approach (and functional unit)

Functional equivalence is the core condition for meaningful comparisons and corresponding interpretations. An absolute functional equivalence can be demonstrated for products during their use phase.

4.5 Iterative approach

Iterations between LCA phases help to support proper interpretation when making comparisons.

4.6 Transparency

Transparency is a key principle for LCA studies comparing bio-based and fossil-based product systems, as for all LCA studies. In particular, this is relevant where conventions (e.g. carbon modelling) and value choices are applied. Transparency along all four phases of an LCA study (goal and scope, inventory, impact assessment and interpretation) helps to ensure proper interpretation (7.3) and appropriate reporting (7.4), including the enabling of a critical review (7.5).

4.7 Comprehensiveness

The consideration of all aspects of the natural environment, human health, and resources in LCA avoids burden shifting and identifies trade-offs.

For bio-based and fossil-based product systems this includes impacts of both systems, understanding the different impact pathways in an overall perspective.

Impacts can be driven by emissions (contribution to global warming or eutrophication) which are harmful for the natural environment or can be related to other inventory data like land occupation or land transformation (6.4.1.1).

4.8 Priority of scientific approach

Decisions for comparing bio-based with fossil-based product systems are preferably based on natural science, in particular for modelling decisions related to carbon flows, carbon content, carbon storage and emissions and removals. If conventions or value choices are used to determine the difference between two product systems, they are transparently documented and investigated during interpretation.

5 General requirements for LCA studies which compare bio-based with fossil-based products

5.1 General

When performing LCA according to this document, the requirements in EN ISO 14040, EN ISO 14044, EN ISO 14067 and EN 16760 shall be met.

The comparison of bio-based and fossil-based products relates to many challenges as there are inherent differences between the systems and a balanced modelling can in practice not be achieved. To support a meaningful interpretation and appropriate reporting, data collection and documentation shall be guided by the principles for LCA in general and the specific aspects of comparing bio-based with fossil in particular, where e.g. the feedstock or raw material (oil, wood or crops) sourcing can be the dominating or discriminating stage of the life cycle.

Due to different supply chains data availability, quality and appropriateness can deviate considerably between bio-based and fossil raw material and the same can be valid for different end-of-life options. In addition, temporal boundaries can deviate.

This asymmetry between the systems shall be considered through a careful set up of any LCA study that intends to compare the product systems and shall be considered also when comparing the outcome of different studies of bio-based and fossil-based systems. Differences can be compared given that the modelling follows the same principles and assumptions, and the context of each study are equivalent.

LCA offers a variety of techniques to limit bias introduced by such asymmetries and ensure comparability. Main techniques are:

- sensitivity analysis for any modelling assumption based on value choices or conventions; and
- statistical procedures to explore the relevance of data gaps.

Given that asymmetries cannot be avoided, the transparent documentation of limitations related to goal and scope of the study and further reporting requirements of value choices, rationales, and expert judgements, followed up with a comprehensive critical review, are pre-requisites for meaningful conclusions to be drawn.

EN ISO 14044:2006 sets requirements for comparative studies, which shall be the basis when making comparisons between bio-based and fossil-based product systems, see text box below.

EN ISO 14044:2006, 4.2.3.7 Comparisons between systems

In a comparative study, the equivalence of the systems being compared shall be evaluated before interpreting the results. Consequently, the scope of the study shall be defined in such a way that the systems can be compared. Systems shall be compared using the same functional unit and equivalent methodological considerations, such as performance, system boundary, data quality, allocation procedures, decision rules on evaluating inputs, and outputs and impact assessment. Any differences between systems regarding these parameters shall be identified and reported. If the study is intended to be used for a comparative assertion intended to be disclosed to the public, interested parties shall conduct this evaluation as a critical review.

Furthermore, the requirements for comparability set in the bullet list of EN ISO 14025:2010, 6.7.2 shall be met, see below for the list (slightly adapted to the scope of this document):

- a) The product category definition and description (e.g. function, technical performance and use) are identical.
- b) The goal and scope definition for the LCA of the product, according to the ISO 14040 series, has the following characteristics:
 - the functional unit is identical;
 - the system boundary is equivalent;
 - the description of data is equivalent;
 - the criteria for the inclusion of inputs and outputs are identical;
 - the data quality requirements including coverage, precision, completeness, representativeness, consistency, reproducibility, sources and uncertainty are equivalent; and
 - the units are identical.
- c) For the inventory analysis:
 - the methods of data collection are equivalent;
 - the calculation procedures are identical; and
 - the allocation of material and energy flows and releases is equivalent.
- d) Impact category selection and calculation rules, if applied, are identical.
- e) Predetermined parameters for reporting of LCA data (inventory data categories and impact category indicators) are identical.
- f) Requirements for provision of additional environmental information, including any methodological requirements (e.g. specifications for hazard and risk assessment) are equivalent.
- g) Materials and substances to be declared (e.g. information about product content, including specification of materials and substances that can adversely affect human health and/or the environment, in all stages of the life cycle) are equivalent.

In order to compare bio-based and fossil-based product systems based on information modules, either the environmental impacts of omitted life cycle stages of the products shall not be significant, or the data of omitted life cycle stages shall be identical within the accepted uncertainty of the data.

6 Aspects to consider

6.1 General

For comparing bio-based with fossil-based product systems all aspects in Clause 6 for both systems shall be comprehensively addressed.

6.2 Guidance and requirements on biogenic and fossil carbon flows

6.2.1 Modelling considerations for carbon flows

6.2.1.1 General

There are different ways to handle carbon containing elementary flows in a life cycle inventory, different approaches to handle allocation of carbon flows for a process or processes shared by more than one product system, including those at end-of-life; and different approaches to treatment of fossil and biogenic carbon flows in life cycle impact assessment.

The main issues arising for fossil and biogenic carbon flows respectively are:

- Different methodological approaches can reveal or obscure that fossil carbon, once extracted from the ground, can ultimately be released as a CO₂ emission to the atmosphere.
- Some methodological approaches do not recognize that biogenic CO₂ has been removed from the atmosphere nor recognize any benefit where such CO₂ is not subsequently emitted.

NOTE Guidance on how to handle algae grown with fossil CO₂ can be found in B.1.1.

6.2.1.2 Life cycle inventory

Greenhouse gas (GHG) emissions and removals arising from fossil carbon sources and biogenic carbon sources and sinks shall be included and listed separately in the inventory.

The GHG inventory shall cover all carbon flows in such a way that the effect of choices related to stored or released carbon (bio- or fossil) and storage period(s) at the product end-of-life can be assessed in sensitivity analyses during the interpretation phase (see 7.3)

Multi-functionality shall be handled, if possible by subdivision or by system expansion to avoid allocation (following EN ISO 14044). Where allocation cannot be avoided it is important to realize that allocation can introduce problems for the accounting of biogenic carbon flows.

If the applied allocation is based on a physical relationship like mass or energy, the modelled biogenic carbon flows might not reflect the actual physical content and flows. Biogenic carbon content and flows shall be allocated reflecting the physical flows.

6.2.1.3 Impact assessment

To calculate life cycle impact assessments, all biogenic and non-biogenic carbon emissions and removals should be considered. The impacts shall be reported separately, e.g. climate change – biogenic, climate change – fossil. Two examples can be found in B.1.2.

6.2.2 Quantification of removal/emissions of biogenic carbon

6.2.2.1 General

There are different ways to deal with biogenic carbon removals and emissions in LCA. Annex A provides an overview of the different approaches used in LCA standards.

The main issues that can be observed are:

- There is a need for a harmonized and transparent approach on how the biogenic carbon removals and emissions are to be handled. The inconsistency in approaches of handling the removals and emissions of biogenic CO₂, in the life cycle inventory and when performing impact assessments results in different outcomes and interpretations.
- There are different approaches regarding how to report biogenic carbon emissions and removals in cradle to gate studies, whether biogenic carbon removals are to be included as a negative when the positive emissions from the end-of-life is not included in the scope.

6.2.2.2 Life cycle inventory

Biogenic carbon is captured as CO₂ from the atmosphere and sequestered during biomass growth, a process commonly referred to as photosynthesis. This biogenic carbon can at the end of the life cycle be emitted as CO₂, CO or CH₄ as a result of the oxidation and/or reduction of biogenic carbon in the product by means of its transformation or degradation (e.g. incineration, biodegradation, landfilling). The biogenic carbon can also flow into other products by mechanical, chemical, or organic recycling. The inventory of biogenic carbon flows shall include both the removals and the emissions with dedicated elementary flows e.g. carbon dioxide (biogenic). Biogenic GHG emissions and removals shall be included and shall each be reported separately in both cradle to gate and cradle to grave assessments.

For cradle to gate studies, biogenic carbon content in the intermediate products shall be reported separately to allow to calculate biogenic carbon emissions and removals when the intermediate product is used in a final product and a cradle to grave study is to be carried out.

6.2.2.3 Impact assessment

As described in EN 16760:2015, two main approaches may be applied for modelling CO₂ emissions and removals related to biomass:

- a) The CO₂ incorporated in biomass during the growth phase is inventoried as a removal during the cultivation/growth phase, and as an emission when it is released at end-of-life or throughout the life cycle. The characterization factor (CF) for CO₂ removal is then set equal to -1, while emissions of biogenic CO₂ correspondingly have a CF of 1 (referred to as the +1/-1 approach). Or,
- b) The CO₂ incorporated in biomass during the growth phase and the corresponding emissions throughout the entire life cycle are both characterized with a characterization factor of zero (referred to as the 0/0 approach).

NOTE Characterization factors are used to quantify the potential impact of the modelled CO₂ emissions and uptakes (within the climate change impact category).

Other biogenic GHG emissions (e.g. CH₄) should always be characterized as these are substances which are not by default part of the carbon cycle, but the result of conversion processes that lead to substances which have a higher radiative forcing than CO₂.

In the second (0/0) approach, the removal and emission of biogenic CO₂ is considered to be a net of zero. This simplified 0/0 approach can only be used when the biogenic carbon taken up is totally oxidized and released as CO₂. This can be the case for energetic use of biomass. However, for use of biomass in bio-based products there are different end-of-life options. This includes, besides incineration, mechanical and chemical recycling, industrial composting, *in situ* biodegradation, and landfilling. Thus, for bio-based products, the biogenic carbon shall be traced applying the -1/+1 approach.

A simplified approach that may be used to determine the net quantity of atmospheric carbon dioxide fixed in a product is by using stoichiometry or the biogenic carbon content.

6.2.3 Delayed emissions

6.2.3.1 General

Carbon storage is the sequestration of carbon in products for a certain period resulting in a temporary reduction of the CO₂ concentration in the atmosphere. If biomass is harvested and biogenic carbon is stored in bio-based products, emissions can be temporarily delayed or permanently avoided. This can lead to a temporary or permanent reduction of CO₂ in the atmosphere, and, therefore, not increase global warming. A distinction is made between carbon that is released within a short-term (temporary storage) and long-term (beyond a longer and specified time-horizon, and which is then considered as “permanent” storage).

The main issues are:

- According to the standards and guidelines reviewed in Annex A, delayed emissions due to temporary carbon storage are not included in the final footprint result but some allow them to be provided as additional information. By using this approach, an advantage of some bio-based products, i.e. the possible delay in emissions can be missed. Yet, there is increased interest in standardization and in policy to incorporate this consideration of time and the potential of bio-based products to provide temporary or permanent carbon storage.

EXAMPLE One such effort is the Carbon removal certification within the EU.

- There is no harmonized methodological approach in calculating the benefit of delayed emissions. There are different approaches presented and further guidance and consensus are needed for the appropriate method for assessment.
- The benefit from delayed emissions depends on the chosen time horizon. Most often 100 years is used as the time horizon, this is a value choice and not based on a scientific definition. Most standards do not report any specific time horizon after which carbon removed from the atmosphere (e.g. during biomass growth) is considered as no longer released, and hence as permanently stored. Value choices also apply to the definition of a minimum time, if any, to factor in the benefits of a temporary carbon storage (e.g. minimum 10 or 20 or 50 years of storage in the product, before being released back to the atmosphere).
- The lifetime of many products is much shorter than 100 years. For many packaging products the lifetime is short and the possibility of the recycling of these products in new products and storing carbon for longer duration is not considered, although the same carbon sequestered can stay in the economy for a longer time period. If carbon can remain in the loop by stimulating recycling of bio-based products, this is advantageous.

6.2.3.2 Goal and scope

It shall be assessed whether accounting of time is relevant or not for the product in scope.

The choice of time period should be transparently reported and justified, based on scientific evidence to the extent possible, and sector guidance or product category rules can be a source of this information when available. If known science, sector guidance, or product rules do not exist, companies may assume a minimum time period of 100 years including the end-of-life stage.

6.2.3.3 Life cycle inventory

An inventory shall be made considering the temporal profile of the emissions and the possible period of storage of carbon in the product before reaching end-of-life stage, following what is stated in the goal and scope.

6.2.3.4 Impact assessment

6.2.3.4.1 Accounting for temporary storage

Where accounting of delayed emissions is relevant, it should be taken into account but reported separately. For the assessment of effects from any delayed emissions due to temporary carbon storage, the method proposed in the ILCD Handbook [13] may be followed. This is based on linear discounting of emissions over a 100-year time period. An example on how this can be calculated can be found in B.2.

To better capture the impact of time, dynamic approaches have been developed which consider use of time dependent characterization factors for the calculation of GWP. Dynamic LCA approach may be followed for such more accurate estimation of the impact of delayed emissions.

6.2.3.4.2 Accounting for permanent carbon storage

The portion of the removed carbon not emitted to the atmosphere within a 100-year time period may be treated as if it was no longer released back to the atmosphere, i.e. as “permanently” stored. Carbon storage below 100 years shall not be counted as permanent storage.

6.3 Guidance and requirements for establishing systems for a comparison based on functional relevance

6.3.1 Data requirements and sources / Data asymmetry

6.3.1.1 General

Data quality has an important influence on the outcome of the LCA study and shall be consistently handled and transparently reported for studies comparing bio-based and fossil-based products.

When there are differences in data quality between the compared bio-based and fossil-based product systems, these shall be addressed and justified in the LCA report and limitations related to the data quality shall be reported.

In case of significant differences in data quality between the systems, the peer review team shall make a statement thereof in the review report.

6.3.1.2 Goal and scope

6.3.1.2.1 General

The selection of data should be consistent with the goal and intended use of the LCA study results, and be justified in view of the availability and quality of data. Within the scope phase the data and data quality requirements shall be consistently defined for the two systems, in particular related to environmental aspects that are unique to the two systems.

This can be relevant for temporal considerations related to the reversibility of environmental impacts (e.g. land use), to specifics regarding emissions to the environment (e.g. toxicity, persistence), the treatment of geographically explicit data and the treatment of data gaps and assumptions.

The definition of the goal and scope of a study provides the initial plan for conducting the life cycle inventory phase of an LCA, where data are collected and validated.

6.3.1.2.2 General data quality requirements

The following data quality requirements for an LCA study shall be established during goal and scope phase and transparently reported with the LCA study:

- a) time-related coverage: age of data and time period;
- b) geographical coverage: geographical area from which data for unit processes was used for the assessment;
- c) technology coverage: specific technology or technology mix;
- d) precision: measure of the variability of each data value expressed (e.g. variance);
- e) completeness: percentage of total flow that is measured or estimated;
- f) representativeness: qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period and technology coverage);
- g) consistency: qualitative assessment of whether or not the study methodology is applied uniformly to the various components of the sensitivity analysis;
- h) reproducibility: qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the assessment;
- i) sources of the data; and
- j) uncertainty of the information.

NOTE The numbered list above is adapted from ISO 14044:2006, 4.2.3.6.2.

A two-step approach shall be taken for the data quality evaluation:

- the data quality requirements according to items a) to d) above shall be characterized for the assessment; and
- data shall be assessed and validated with respect to the requirements for items a) to d) above.

6.3.1.2.3 Geographical and technology coverage of data

As a rule, site specific data for production of products shall be used as a basis for calculations.

Site-specific data shall be collected for individual industrial processes where the organization undertaking the study has financial or operational control. The data shall be representative of the process for which they are collected. Site-specific data should preferably be used for those unit processes that are most important and not under financial or operational control.

NOTE 1 The most important processes are those which together contribute at least 80 % to the GHG emissions, starting from the largest to the smallest contributions after cut-off.

NOTE 2 Site-specific data refer to either direct emissions (determined through direct monitoring, stoichiometry, mass balance or similar methods), activity data (inputs and outputs of processes that result in emissions or removals) or emission factors. Site-specific data can be collected from a specific site, or can be averaged across all

sites that contain the process within the system under study. They can be measured or modelled, as long as the result is specific to the process in the product's life cycle.

Primary data that are not site-specific data and which have undergone third-party review, shall be used when the collection of site-specific data is not practicable.

Secondary data shall only be used for inputs and outputs where the collection of primary data is not practicable, or for processes of minor importance.

NOTE 3 In some cases, default emission factors as secondary data are not life cycle based emission factors and require adaptation or modification.

Secondary data shall be justified and documented with references in the LCA study.

NOTE 4 This subclause is adapted from ISO 14067:2018, 6.3.5.

6.3.1.2.4 Time boundary for data

The time boundary for data is the time period for which the quantified figure for the assessment is representative and shall be specified and justified.

The choice of the time period for data collection should consider intra- and inter-annual variability and, when possible, use values representing the trend over the selected period.

NOTE This subclause is adapted from ISO 14067:2018, 6.3.6.

6.3.1.3 Life cycle inventory

6.3.1.3.1 General

To keep the same consistency of the LCA approach in bio-based and fossil-based product systems the same level of detail for the inventory data should be applied.

6.3.1.3.2 Data collection

The qualitative and quantitative data for inclusion in the assessment shall be collected for all unit processes that are included in the system under study. The collected data, whether measured, calculated or estimated, are used to quantify the inputs and outputs of a unit process. Significant unit processes shall be documented in the report.

NOTE This subclause is adapted from ISO 14067:2018, 6.4.2 and ISO 14044:2006, 4.3.2. For further guidance, see ISO 14044:2006, 4.3.2.2.

6.3.1.3.3 Validation of data

A check on data validity shall be conducted during the process of data collection to confirm and provide evidence that the data quality requirements specified in 6.3.1.2.3 have been met.

Validation should involve establishing mass balances, energy balances and/or comparative analyses of emission factors or other appropriate methods. As each unit process obeys the laws of conservation of mass and energy, mass and energy balances provide a useful check on the validity of the description of a unit process.

NOTE This subclause is adapted from ISO 14067:2018, 6.4.3 and ISO 14044:2006, 4.3.3.2.