SLOVENSKI STANDARD
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Bioizdelki - Ocenjevanje življenjskega cikla

Bio-based products - Life Cycle Assessment

Biobasierte Produkte - Ökobilanzen

Produits biosourcés - Analyse du cycle de vie

Ta slovenski standard je istoveten z: **prEN 16760**

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13.020.60 Življenjski ciklusi izdelkov Product life-cycles

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Bio-based products - Life Cycle Assessment

Produits biosourcés - Analyse du cycle de vie

Biobasierte Produkte - Ökobilanzen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 16760:2014) 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.

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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 bio-based products' benefits in relation to the depletion of fossil resources and climate change. Bio-based products may also provide additional product functionalities. This has 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/492[1], resulting in a series of standards developed by CEN/TC 411, with a focus on bio-based products other than food, feed and biomass for energy applications.

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

— 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, et cetera) 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 European Standard aims to provide specific life cycle assessment requirements and guidance for bio-based products, excluding food, feed and energy, based on EN ISO 14040 *Environmental management — Life cycle assessment — Principles and framework* and EN ISO 14044 *Environmental management — Life cycle assessment — Requirements and guidelines*.

This European Standard informs and guides life cycle assessment and applications including for example Product Category Rules (PCR) development for bio-based products.

An LCA assessment carried out according to this standard can be used as a basis to assess certain criteria as laid down in prEN 16751[1].

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

1 Scope

This European Standard provides specific life cycle assessment (LCA) requirements and guidance for bio-based products, excluding food, feed and energy, based on EN ISO 14040 *Environmental management — Life cycle assessment — Principles and framework* and EN ISO 14044 *Environmental management — Life cycle assessment — Requirements and guidelines*.

This European Standard covers bio-based products, derived wholly or partly from biomass.

This European Standard provides guidance and requirements to assess impact over the life cycle of bio-based products.

The applications of LCA as such are outside the scope of this European Standard. Clarifications, considerations, practices, simplifications and options for the different applications, are also beyond the scope of this European Standard.

In addition, this European Standard may be applied in studies that do not cover the whole life cycle, with justification e.g. in the case of business-to-business information, such as cradle-to-gate studies, gate-to-gate studies, and specific parts of the life cycle (e.g. waste management, components of a product).

For those studies most requirements of this European Standard are applicable (e.g. data quality, collection and calculation as well as allocation and critical review), but not all the requirements for the system boundary.

2 Normative references

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

prEN 16575, *Bio-based products — Vocabulary*

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

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

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

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in prEN 16575, EN ISO 14040 and EN ISO 14044 apply.

4 Methodology for LCA of bio-based products

4.1 General description of an LCA

The general description of life cycle assessment is defined in EN ISO 14040:2006 clause 4, with clauses 4.1 *Principles of LCA*, 4.2 *Phases of an LCA*, 4.3 *Key features of an LCA*, 4.4 *Product system*.

4.2 General aspects of LCA for bio-based products

The LCA of a bio-based product shall cover the whole product, not only the bio-based part, see Figure 1. However, the focus of this European Standard is on how to handle the specificities of the bio-based part.

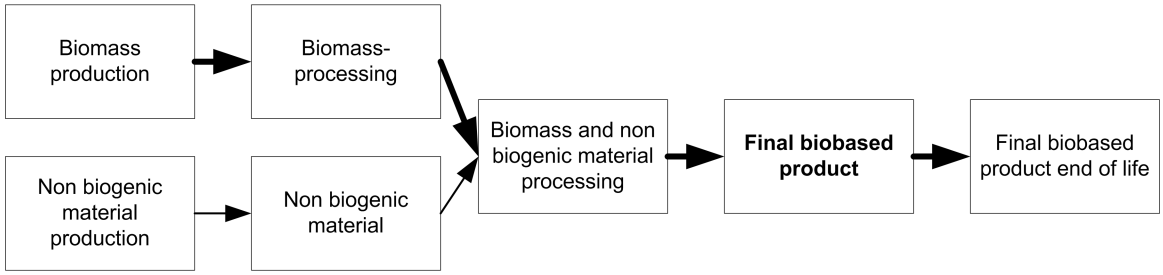

Figure 1 — Example of a product system of a bio-based product which includes biomass as well as non-biogenic material feedstocks

NOTE 1 The boxes linked with bold arrows in Figure 1 represent the flows of bio-based products (partly or fully derived from biomass) that can be raw materials, intermediary products and final product.

NOTE 2 For simplification purposes, transportation steps have not been reported in Figure 1, but transportation can occur between any of the unit processes.

This European Standard provides additional requirements and guidelines for bio-based products: Goal and scope (see 4.3), LCI (see 5), LCIA (see 6) and Interpretation and reporting (see 7).

An LCA for a bio-based product shall include the four phases of LCA. LCA requirements and guidelines are provided in EN ISO 14044:2006, clauses 4.2, 4.3, 4.4 and 4.5.

This European Standard provides further guidance on the following, which can be important for bio-based products, due to their biomass origin:

— geographical (see 5.2.2) and temporal scope (see 5.2.3) to be representative for the biomass acquisition phase considering agricultural, forest and aquaculture specificities;

— allocation procedures(see 5.3) as the production stages typically generates co-products;

— consideration for resource elementary flows (see 5.4.1);

— data collection and modelling for land use (5.4.2) , water use (5.4.3), and fossil and biogenic carbon flows (see 5.5);

— modelling of agro-forestry and aquaculture systems (see 5.6) inventory and modelling requirements for bio-based products end-of-life (see 5.6.4 and the proposed Technical report (TR) on end-of-life).

4.3 Goal and Scope of the LCA study

4.3.1 Goal of the LCA study

When defining the goal and scope of the LCA study, the requirements of EN ISO 14040:2006, clause 5.2.1 and EN ISO 14044:2006, clauses 4.2.2 and 4.2.3 shall apply.

There is no single solution as to how LCA can best be applied, it will depend on the goal of the LCA and on each organization size and culture, its products, the strategy, the internal systems, tools and procedures and the external drivers.

In defining the goal of an LCA, the following items shall be unambiguously stated:

— the intended application;

— the reasons for carrying out the study;

— the intended audience, i.e. to whom the results of the study are intended to be communicated;

— whether the results are intended to be used in comparative assertions intended to be disclosed to the public.

4.3.2 Scope of the LCA study

4.3.2.1 General

The scope should be sufficiently well defined to ensure that the breadth, depth and detail of the study are compatible and sufficient to address the stated goal.

In addition to the definition of the scope of the LCA study in EN ISO 14044:2006, clause 4.2.3, the limitations, assumptions and methods to assess issues specific to bio-based products should be explained (e.g. assumptions for use stage, for end-of–life stage, carbon storage)

In some cases, the goal and scope of the study may be revised due to unforeseen limitations, constraints or as a result of additional information. Such modifications, together with their justification, should be documented.

It shall be determined which impact categories, category indicators and characterization models are included within the LCA study. The selection of impact categories, category indicators and characterization models used in the LCIA methodology shall be consistent with the goal of the study and considered as described in EN ISO 14044:2006, clause 4.4.2.2.

4.3.2.2 Function and functional unit

In defining the functional unit, the requirements of EN ISO 14040:2006, clause 5.2.2 and EN ISO 14044:2006, clause 4.2.3.2 shall apply.

The scope of an LCA shall clearly specify the functions (performance characteristics) of the product system being studied. The functional unit shall be consistent with the goal and scope of the study. One of the primary purposes of a functional unit is to provide a reference to which the input and output data are related. This reference is necessary to ensure comparability of LCA results, in particular when different systems are being assessed to enable comparison on a common basis. Therefore the functional unit shall be clearly defined and measurable.

An appropriate reference flow shall be determined in relation to the functional unit. The quantitative input and output data collected in support of the analysis shall be calculated in relation to this flow. For bio-based products which are intermediates or which can serve several functions or service, it is recommended to use a reference flow such as weight or volume (e.g. 1kg of product), and to provide information whether it refers to dry matter weight, gross weight, etc.

EXAMPLE In the function of drying hands, both a paper towel and an air-dryer system are studied. The selected functional unit may be expressed in terms of the identical number of pairs of hands dried for both systems. For each system, it is possible to determine the reference flow, e.g. the average mass of paper or the average volume of hot air required for one pair of hand-dry, respectively. For both systems, it is possible to compile an inventory of inputs and outputs on the basis of the reference flows. At its simplest level, in the case of paper towel, this would be related to the paper consumed. In the case of the air-dryer, this would be related to the mass of hot air needed to dry the hands (copied from EN ISO 14040:2006 5.2.2).

4.3.2.3 System boundary

In defining the system boundary, the requirements of EN ISO 14040:2006, clause 5.2.3 and EN ISO 14044:2006, clause 4.2.3.3 shall apply.

The system boundary shall be explained clearly and in an unambiguous way, preferably in a flow chart figure. The exclusion of any life cycle stages shall be documented and explained.

LCA technique with proper justification may be applied in studies that are not LCA or LCI studies. Examples are:

— cradle-to-gate studies;

— gate-to-gate studies; and

— specific parts of the life cycle (e.g. waste management, components of a product).

4.3.2.4 Cut-off criteria

When using cut-off criteria to decide on inclusion of inputs and outputs, the requirements of EN ISO 14044:2006, clause 4.2.3.3.3 shall apply.

The choice of elements of the physical system to be modelled depends on the goal and scope definition of the study, its intended application and audience, the assumptions made, data and cost constraints, and cut-off criteria. The models used should be described and the assumptions underlying those choices should be identified. The cut-off criteria used within a study should be clearly understood and defined within the goal and scope definition phase. The effect on the outcome of the study of the cut-off criteria selected shall also be assessed and described in the final report.

All mass, energy elementary flows should be accounted. If not, the final report shall include the estimation of completeness, based on:

— Mass cut-off (in % of total product mass): best estimation of the mass all non-accounted components of the product.

— Energy cut-off (in % of total energy consumption): best estimation of all energy consumption of non-accounted mass inputs.

Environmental significance: decisions on cut-off criteria should be based on best knowledge of environmental significance. Such information may e.g. be sought on Safety Data Sheets where substance classification can guide on possible cut-off or not but also other sources of information should be looked for. Inputs such as transport of staff, inputs producing human energy or user transport may be excluded as they are normally not significant.

Such simplifications shall be explicitly stated in the study report along with any supporting documentation showing these calculations, specifying the names of any flows which have not been taken into consideration.

4.3.2.5 LCIA methodology and types of impacts

It shall be determined which impact categories, category indicators and characterization models are included within the LCA study. The selection of impact categories, category indicators and characterization models used in the LCIA methodology shall be consistent with the goal of the study and considered as described in EN ISO 14044:2006, clause 4.4.2.2.

NOTE This text is copied from EN ISO 14044:2006, clause 4.2.3.4].

4.3.2.6 Data quality

Data quality requirements shall be specified to enable the goal and scope of the LCA to be met and should address what is listed in EN ISO 14044:2006, clauses 4.2.3.6.2 and 4.2.3.6.3.

Site-specific and primary data should be used when appropriate and in line with the goal and scope of the study.

The selection of level of geographical detail should be consistent with the goal and intended use of the LCA and be justified in view of the availability and quality of data.

4.3.2.7 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.

NOTE Above text is copied from EN ISO 14044:2006, clause 4.2.3.7]

A life cycle impact assessment shall be performed for studies intended to be used in comparative assertions intended to be disclosed to the public.

If comparative assertions are intended to be disclosed to the public, additional requirements as set in EN ISO 14044:2006 apply.

5 LCI – Life Cycle Inventory

5.1 General

Inventory analysis involves data collection and calculation procedures to quantify relevant inputs and outputs of a product system.

The process of conducting an inventory analysis is iterative. As data are collected and more is learned about the system, new data requirements or limitations may be identified that require a change in the data collection procedures so that the goals of the study will still be met. Sometimes, issues may be identified that require revisions to the goal or scope of the study.

The qualitative and quantitative data for inclusion in the inventory shall be collected for each unit process that is included within the system boundary. The collected data, whether measured, calculated or estimated, are utilized to quantify the inputs and outputs of a unit process.

When data have been collected from public sources, the source shall be referenced. For those data that can be significant for the conclusions of the study, details about the relevant data collection process, the time when data have been collected, and further information about data quality indicators shall be referenced.

If such data do not meet the data quality requirements, this shall be stated.

To decrease the risk of misunderstandings (e.g. resulting in double counting when validating or reusing the data collected), a description of each unit process shall be recorded.

Since data collection may span several reporting locations and published references, measures should be taken to reach uniform and consistent understanding of the product systems to be modelled.

5.2 Sources of data

5.2.1 General

Sources of inventory data should be specified and transparent.

Responsible sourcing and sustainable management practices can be found in the production of bio-based raw materials. Certification schemes usually address a broad array of management and performance aspects that can be used directly in determining elementary flows and in informing impact assessment and interpretation.

EXAMPLE Managing conformity with standards covering fertiliser application may be linked directly to levels of fertiliser run-off and therefore elementary flow determination.

If biomass has been produced in conformance with a relevant standard this shall be taken into account in determining elementary flows and in impact assessment and interpretation.

The most representative data should be used and the quality of data shall always be examined in order to guarantee that they are adequate for the purpose of the study and that they comply with the data quality requirements of the study.

5.2.2 Geographical data

Data should be assessed across an appropriate and representative geographical area for there to be a mean effect. The data and scales used should be clearly specified in the study in order to ensure optimal transparency. Mean values by region can be used only for part of agricultural data (contributions from fertilisers, yields, etc.), since other variables cannot yet be regionalised due to the lack of a recognized model (e.g. N_2O emissions).

Where there are significant differences within a geographical area, e.g. yield differences, this should also be taken into account.

5.2.3 Temporal data

Time period is an important issue in LCA, as emissions to air, water and soil are subject to variation over the management cycle of the system. The LCI should cover the relevant period in the life cycle of the product.

For industrials processes and systems, the inventory may cover the cycle of productions, e.g. seasonal production, start-up, maintenance, and temporary process shutdown.

For biomass production the collection of data and modelling should consider the management regime and cropping or harvesting cycle, e.g. the effect of inter- and intra-annual variation and when possible use values representing the selected period.

5.3 Allocation

5.3.1 Allocation procedure

In line with EN ISO 14044, the study shall identify the processes shared with other product systems and deal with them according to the stepwise procedure[2] presented below.

Step 1: Wherever possible, allocation should be avoided by:

1) dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes; or

2) expanding the product system to include the additional functions related to the co-products, taking into account the requirements of EN ISO 14044:2006, clause 4.2.3.3.

Step 2: Where allocation cannot be avoided, the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system.

Step 3: Where physical relationship alone cannot be established or used as the basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between co-products in proportion to the economic value of the products.

Annex A provides an example of allocation and a sensitivity analysis.

[2] Formally, Step 1 is not part of the allocation procedure.