International Standard

ISO 14075

First edition
2024-10

Environmental management — Principles and framework for social life cycle assessment

Management environnemental — Principes et cadre pour l'analyse sociale du cycle de vie

Reference number
ISO 14075:2024(en)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

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

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

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

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

This document was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 5, *Life cycle assessment*.

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

Introduction

There is increasing demand for the assessment of social aspects in life cycle assessment or sustainability evaluations. This has created interest in the development of frameworks to better understand and address the social impacts over the life cycle of products.

A social life cycle assessment (S-LCA) of a product can assist in:

— assessing the magnitude and significance of the potential social impacts of a product system;

— analysing current potential social impacts associated with a system or forecasting future potential social impacts.

This document provides requirements and guidance for practitioners from industries, government, universities and non-governmental organizations (NGOs) in the efficient and credible development and implementation of practices for assessing social impacts.

An S-LCA comprises the following four phases:

a) goal and scope definition;

b) social life cycle inventory analysis (S-LCI);

c) social life cycle impact assessment (S-LCIA);

d) interpretation.

Following the requirements and recommendations presented in this document, S-LCA can be implemented using different methods and assessment approaches. An S-LCA or S-LCI study can be used as part of a more comprehensive decision process that involves a variety of interested parties with different knowledge and background.

However, comparing the results of different S-LCA or S-LCI studies is only possible if the goal and scope, assumptions and context of each study are equivalent. This document is not intended to inform a ranking of the human rights performance of products. Therefore, this document contains several requirements and recommendations to support transparency on these issues.

Environmental management — Principles and framework for social life cycle assessment

1 Scope

This document establishes principles and framework, specifies requirements and gives guidance for the social life cycle assessment (S-LCA) of a product. The framework supports addressing the United Nations (UN) Sustainable Development Goals (SDG) and reaching the targets by identifying the enabling aspects from the inhibiting ones (with detrimental contributions).

The document provides goal and scope definition, inventory analysis, impact assessment, interpretation and reporting of the S-LCA of a product.

2 Normative references

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

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

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

ISO 14050, *Environmental management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14040, ISO 14044, ISO 14050 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
social aspect
element of an *organization's* (3.31) activities or products that interacts or can interact with human well-being of any *interested party* (3.4) which can cause a *social impact* (3.12)

3.2
social life cycle assessment
S-LCA
social LCA
compilation and assessment of the socially relevant inputs and outputs and the potential *social impacts* (3.12) of a *product system* (3.6) throughout its *life cycle* (3.3)

[SOURCE: ISO 14044:2006, 3.2, modified — "social" added to the term. "assessment" replaced "evaluation", "socially relevant" added and "social" replaced "environmental" in the definition.]

3.3
life cycle
consecutive and interlinked stages, from raw material acquisition or generation from natural resources to final disposal

[SOURCE: ISO 14040:2006/Amd.1:2020, 3.1, modified — "of a product system" deleted.]

3.4
interested party
stakeholder
person or *organization* (3.31) that can affect, be affected by, or perceive itself to be affected by a decision or activity

Note 1 to entry: To "perceive itself to be affected" means the perception has been made known to the organization.

3.5
functional unit
quantified performance of a *product system* (3.6) for use as a reference unit

Note 1 to entry: The functional unit can include a qualitative description of social functions.

[SOURCE: ISO 14040:2006, 3.20, modified — Note 1 to entry added.]

3.6
product system
collection of *unit processes* (3.7), performing one or more defined functions, and which models the *life cycle* (3.3) of a product

[SOURCE: ISO 14040:2006, 3.28, modified — "with elementary and product flows" deleted.]

3.7
unit process
smallest element considered in the life cycle inventory analysis for which input and output data are quantified

Note 1 to entry: Input and output data can be also qualitative.

[SOURCE: ISO 14040:2006, 3.34, modified — Note 1 to entry added.]

3.8
relevant product market
market comprising all products that are regarded as interchangeable or substitutable by the customers, by reason of the products' characteristics, and their intended use

Note 1 to entry: Prices and/or costs can be considered in some instances.

[SOURCE: European Commission Notice no. 97/C 372/031997, modified — "and/or services" and "their prices" deleted, and "customers" replaced "consumer" in the definition. Note 1 to entry added.]

3.9
social elementary flow
practice or condition related to the product or the *product system* (3.6), and which can lead to *social impacts* (3.12) on human well-being

3.10
elementary flow
material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation

[SOURCE: ISO 14040:2006, 3.12]

3.11
value choice
subjective decision based on a judgement of what is important

[SOURCE: ISO/TS 14074:2022, 3.7]

3.12
social impact
beneficial or harmful consequences ensuing from the causal relationship between a process or activity related to the *product system* (3.6) under study and aspects relating to human well-being of *interested parties* (3.4)

Note 1 to entry: The aspects related to the human well-being of interested parties are covered by *social impact categories* (3.27).

3.13
social performance
performance of a product and an *organization* (3.31) related to its *social aspects* (3.1) and *social impacts* (3.12)

3.14
social life cycle performance assessment
S-LCPA
compilation and assessment of information on the *social performance* (3.13) of a *product system* (3.6) throughout its *life cycle* (3.3)

3.15
reference scale assessment
phase of *social life cycle assessment* (3.2) aimed at assessing the *social performance* (3.13) of the *product system* (3.6) based on specific *reference scales* (3.18)

3.16
social life cycle impact assessment
S-LCIA
phase of *social life cycle assessment* (3.2) aimed at understanding and evaluating the magnitude and significance of the potential *social impacts* (3.12) for a *product system* (3.6) throughout the *life cycle* (3.3) of the product

[SOURCE: ISO 14050:2020, 3.6.5, modified — “social” added to the term and definition. “social” replaced “environmental” in the definition.]

3.17
social hotspot
unit process (3.7) or group of unit processes that contribute significantly to a potential *social impact* (3.12) considered to be threatening human well-being or that can contribute to its further development

3.18
reference scale
ordinal scale in which data are used to define an attribute or several specific intensity levels of a given attribute

[SOURCE: ISO 5492:2008, 4.32, modified — “ordinal” added, “data” replaced “reference samples", and “several specific intensity levels” replaced “specific intensities”.]

3.19
reference flow
measure of the outputs from processes in a given *product system* (3.6) required to fulfil the function expressed by the *functional unit* (3.5)

3.20
activity variable
measure of process activity which provides information on the relative importance (or intensity) of the processes in the *product system* (3.6), and can be related to a *functional unit* (3.5)

Note 1 to entry: An often-used activity variable is “worker hours”, which provides information on the number of hours worked that are necessary in each process to produce a given amount of process output.

Note 2 to entry: Activity variables, scaled by the output of each relevant process, are used to reflect the share of a given activity associated with each *unit process* (3.7).

3.21
social life cycle inventory analysis
S-LCI
phase of a *social life cycle assessment* (3.2) involving the compilation and quantification of inputs and outputs for a product throughout its *life cycle* (3.3)

[SOURCE: ISO 14040:2006, 3.3, modified — “social” added in the term and definition.]

3.22
social comparative assertion
claim regarding the social superiority or equivalence of one product versus a competing product in the *relevant product market* (3.8) that performs the same function

[SOURCE: ISO 14040:2006, 3.6, modified — “social” added in the term and definition and "in the relevant product market" added in the definition. “claim” replaced “environmental claim” in the definition.]

3.23
qualitative data
non-numerical data describing the attributes or properties that a process unit possesses

3.24
quantitative data
numerical data item that includes its unit, or context for non-dimensional data

3.25
semi-quantitative data
data representing an ordinal ranking based on defined characteristics/criteria

3.26
characterization factor
factor derived from a characterization model which is applied to convert an assigned life cycle inventory analysis result to the common unit of the category indicator

Note 1 to entry: The common unit allows calculation of the category indicator result.

[SOURCE: ISO 14040:2006, 3.37]

3.27
social impact category
class of *social impacts* (3.12) to which *social life cycle inventory analysis* (3.21) results can be assigned

3.28
social impact subcategory
subsection of a *social impact category* (3.27) that can be related to a specific *interested party* (3.4)

3.29
impact pathway
series of consecutive, causal relationships, ultimately starting at a *social aspect* (3.1) and ending at a *social impact* (3.12)

Note 1 to entry: A synonym for impact pathway is “cause-effect chain”.

Note 2 to entry: In this document, it can be considered a system of interlinked social mechanisms.

[SOURCE: ISO 14008:2019, 3.1.9, modified — "environmental" deleted in the term. "social" replaced "environmental" in the definition.]

3.30
social responsibility
responsibility of an *organization* (3.31) for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour that

— contributes to sustainable development, including health and the welfare of society;

— takes into account the expectations of *interested parties* (3.4);

— is in compliance with applicable law and consistent with international norms of behaviour;

— is integrated throughout the organization and practised in its relationships

Note 1 to entry: Activities include products, services and processes.

Note 2 to entry: Relationships refer to an organization's activities within its sphere of influence.

Note 3 to entry: Sphere of influence refers to range/extent of political, contractual, economic or other relationships through which an organization has the ability to affect the decisions or activities of individuals or organizations.

[SOURCE: ISO 26000:2010, 2.18, modified — "interested parties" replaced "stakeholders". Note 3 to entry added.]

3.31
organization
person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives

Note 1 to entry: The concept of an organization includes, but is not limited to sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.

[SOURCE: ISO 14001:2015, 3.1.4]

4 Principles of S-LCA

4.1 General

These principles are fundamental and should be used as guidance for decisions relating to both the planning and the conducting of an S-LCA.

4.2 Life cycle perspective

S-LCA considers the entire life cycle of a product, including any raw material extraction and acquisition, through energy and material production and manufacturing, to use and end-of-life treatment which includes recovery operations and final disposal. It considers interested parties relevant and/or significant throughout the product life cycle. Such a perspective can identify and possibly avoid the shifting of potential social burdens between life cycle stages, individual processes, or different interested parties, and can maximize the beneficial social impacts.

4.3 Social focus

S-LCA addresses the social aspects and impacts of a product system. Other tools may be combined with S-LCA for more extensive sustainability assessments such as life cycle costing and LCA in accordance with ISO 14040 and ISO 14044.

4.4 Relative approach and functional unit

S-LCA is a relative approach, which is structured around a functional unit. This functional unit defines what is being studied. All subsequent analyses are then relative to that functional unit, as all inputs and outputs in the S-LCI and consequently the S-LCIA are related to the functional unit.

4.5 Iterative approach

S-LCA is an iterative technique. The individual phases of an S-LCA use results of the other phases. The iterative approach within and between the phases contributes to the comprehensiveness and consistency of the study and the reported results.

4.6 Transparency

Sufficient and relevant information is disclosed to enable users of the information to make decisions with reasonable confidence.

4.7 Comprehensiveness

S-LCA considers, but is not limited to, a wide range of attributes or aspects of human well-being, human rights, human dignity and ethical behaviour. By considering all relevant and significant attributes and aspects within one study, potential trade-offs can be identified and assessed.

4.8 Scientific approach

Decisions within an S-LCA are preferably based on scientific evidence.

4.9 Recognition of international conventions

S-LCA recognizes major international conventions on human rights such as the Universal Declaration of Human Rights and International Labour Organization (ILO) standards.

5 General description of social life cycle assessment (S-LCA, S-LCPA and S-LCI)

5.1 Phases of S-LCA, S-LCPA and S-LCI studies

Social life cycle assessment is a technique for assessing social and socio-economic aspects, both positive and negative, of products from a life cycle perspective. The technique can be used to conduct an S-LCA study, an S-LCPA study or a S-LCI study.

S-LCA studies comprise the following four phases:

— goal and scope definition;

— social life cycle inventory analysis;

— social life cycle impact assessment (see 6.4);

— interpretation.

S-LCPA studies comprise the following four phases:

— goal and scope definition;

— social life cycle inventory analysis (see 6.2);

— reference scale assessment (see 6.3);

— interpretation.

S-LCI studies comprise the following three phases:

— goal and scope definition;

— social life cycle inventory analysis (see 6.2);

— interpretation.

5.2 Use of the S-LCA results

5.2.1 Type of results of an S-LCA study

Different results can be obtained from an S-LCA, depending on the goal and scope, data, and performance or impact assessment approach of the study. The results are grouped as follows:

— A social hotspot: A unit process or group of unit processes that contribute significantly to a potential social impact considered to be threatening human well-being or that can contribute to its further development.

— A social footprint: The overall beneficial and harmful effects related to a functional unit, possibly specified by, for example, social impact category or subcategory.

— An overview of social performance and status of social responsibility for the product system.

5.2.2 Role of S-LCA results for decision-making processes

The results of S-LCA or S-LCI studies can be used as inputs to support decision-making processes that involve a variety of interested parties with different knowledge and backgrounds. Depending on the intended goal and scope, an S-LCI or an S-LCA study can be used, for example, for product development and design, strategic planning, communication and marketing, and for identifications of positive and negative impacts.

Results from S-LCA can be used for assessing and extending the social responsibility of organizations involved in the studied product system. S-LCA can be useful for identifying and mitigating potential social risks in the product life cycle.

5.2.3 Key features of an S-LCA

The following list summarizes the key features of the S-LCA technique:

a) S-LCA assesses, in a systematic way, in accordance with the stated goal and scope, the social aspects and impacts of product systems from raw material acquisition to final disposal, on the relevant interested parties.

b) S-LCA involves identification and possible consultation with interested parties (e.g. workers, local communities, consumers, users, children).

c) The depth of detail and time frame of an S-LCA can vary to a large extent, depending on the goal and scope definition.

d) S-LCA is open to the inclusion of new development and methodological improvements in the state of the art of the technique.

e) S-LCA is different from many other techniques (e.g. social impact assessment of project, corporate social accounting) as it is a relative approach based on a functional unit; S-LCA may, however, use information gathered by these other techniques for its inventory.

f) S-LCA uses an iterative procedure both within the interpretation phase and with the other phases of an S-LCA.

g) S-LCA may use both quantitative and qualitative input data and, depending on the selected assessment approach, the results may be expressed in a quantitative, semi-quantitative or qualitative format.

h) Social life cycle interpretation of the results uses a systematic procedure to identify, qualify, check, evaluate and present the conclusions based on the findings of an S-LCA, in order to meet the requirements of the application as described in the goal and scope of the study.

i) Social life cycle interpretation makes provisions for links between S-LCA and other techniques for social responsibility by emphasizing the strengths and limits of an S-LCA in relation to its goal and scope definition.

6 Methodological framework

6.1 Goal and scope definition

6.1.1 General

S-LCA models the life cycle of a product as a product system, which includes all unit processes, input and output flows, determines all relevant interested parties, and assesses the social performance or social impacts related to the relevant interested parties.

The level of modelling detail and each unit process included in the system boundary are determined by the goal of the study.

In defining the goal of an S-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 social comparative assertions and/or intended to be disclosed to the public.

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

In defining the scope of an S-LCA, the following items shall be clearly described:

— the product system to be studied;

— the functions of the product system or, in the case of comparative studies, the systems;

— the functional unit;

— the meaningful description of material and producers needed to produce the product under study (reference flow);

— description of the product system included in the assessment (the system boundaries);

— the activity variable, if relevant;

— selection of all relevant interested parties to be included, and justification of any exclusions;

— the context in which locations of the activities of the product life cycle is embedded, which accounts for location and culture and values (because the social impact strongly depends on the local conditions);

— social impact categories and interested party categories included (sub-categories should be used everywhere where relevant, given the predominance of the use of subcategories compared to categories);

— the performance assessment method, or the social impact assessment method, and the justification for choosing one or the other method;

— procedures to select the social impact categories and subcategories according to the interested parties;

— data collection strategies (inventory indicators, data type and data collection method);

— data quality requirements;

— allocation procedures;

— assumptions and value choices;

— limitations;

— communication strategies for the results (selection of results to be communicated, communication format and specifications, type and format of report, other communication).

S-LCA is an iterative technique, and as data and information are collected, various aspects of the scope can require modification to meet the original goal of the study.

6.1.2 Interested party categorization and involvement

The list of interested party categories considers individuals, groups or organizations potentially impacted by processes within the life cycle of a product, including, but not limited to, workers, consumers, local communities, small holders, children, value chain actors and society.

Relevant interested parties should be involved when conducting an S-LCA (in line with the goal and scope). Interested parties to be addressed can be identified through different approaches. The most relevant interested parties shall be identified and the social impacts related to them shall be included in the assessment. The criteria used for identifying relevant interested parties shall be transparently reported. Additionally, the exclusion of interested parties shall be justified transparently. Engagement of most relevant interested parties in the S-LCA is recommended.

To identify interested parties, the following questions can be used:

— To whom does the organization involved in the product life cycle have legal obligations?

— Who is likely to be positively or negatively affected along the product life cycle?

— Who is likely to express concerns about the activities related to the product life cycle?

NOTE 1 Further information can be found in ISO 26000.

A materiality assessment can support the selection of interested parties and impact categories. An approach to the selection of interested parties can use the following three criteria:

— Impact: This criterion consists of identifying those that are mainly affected by a certain production process within the product system under study.

— Legitimacy: This consists of identifying the representativeness of interested parties.

— Completeness: This consists of including interested parties which have different social representations and attributes.

NOTE 2 In this context, “materiality” refers to the relevance and importance of a social aspect that can substantially influence the conclusions of the study and the decisions and actions based on those conclusions.

6.1.3 Product functions and product properties

The scope of an S-LCA shall clearly specify the functions (performance characteristics) of the system being studied. The functions define in measurable terms the obligatory product properties, i.e. the properties that the product shall have in order to be considered by customers when identifying alternatives in the relevant product market. The obligatory product properties can differ depending on the customers in the market as well as the geographical location and time. Therefore, it is important to be precise in describing the relevant product market, in terms of its delimitation in space and time, and in terms of the customers in the market.

6.1.4 Functional unit

The functional unit quantifies the identified functions (performance characteristics) of the product.

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 basis to which the social input and output data can be normalized (in a mathematical sense). Therefore, the functional unit shall be clearly defined and measurable. Comparisons between product systems shall be made based on the same function(s), quantified by the same functional unit(s).

The functional unit should, as far as possible, relate to the functions of the product rather than to the physical product.

EXAMPLE 1 Use “minimum 7 years of computer workstation seating support for 8 h/day in a European office” rather than “1 office chair used in an office 8 h/day”.

EXAMPLE 2 Use “4 litres of semi-gloss water-based exterior paint” rather than “paint that will cover 15 square metres of exterior wall to a professional standard with white colour with a repaint period of minimum 10 years”.

6.1.5 Reference flows and activity variables

Based on the functional unit, the reference flow shall be defined for each product system. The reference flow is a measure of the outputs from processes in a given product system required to fulfil the function expressed by the functional unit. Thus, the reference flow translates the functional unit into specific amounts of product flows for each product system.

Social elementary flows for which data are only available at the aggregate level of, for example, an industry can only be used if the product in the S-LCA study is comparable at a very high level with the product of the aggregate level. A high level can mean using the same technology, located in the same region, produced by comparable companies, producing the same quality of the product, operating with the same legal frameworks.

If these criteria are fulfilled, the generic information can be related to a specific unit process using the activity variable that represents a relevant intensity measure for the activities in relation to the elementary flow in question, while considering the uncertainty of the relation. In this case, the social elementary flow can be aggregated over the life cycle.

EXAMPLE 3 Product X is produced by company A. The industry in the same region as company A is located, produces product X with the same technology. The industry publishes an average of fatal work injuries per 100 000 full-time equivalent workers for product A. In the S-LCA, the industry figures can be used instead of primary data of company A by using the aggregated industry level value at the product system boundary.

Example 4 describes in which situation the data of the industries average or companies shall not be used.

EXAMPLE 4 Using variables such as “worker-hours” depends on the granularity level of the S-LCA. Product X in company A is produced with 10 worker hours per ton and a rate of 10 fatal work injuries per 100 000 full-time equivalent workers. Product Y in company A is produced with 20 worker hours per ton and a rate of 5 fatal work injuries per 100 000 full-time equivalent workers. It would not be correct to use the aggregated company level value at the product system boundary.

If the social elementary flows of an S-LCA cannot be accurately used and many other social elementary flows within the system boundaries cannot be linked to applicable quantitative data, qualitative data should be used for the assessment and to enable the practitioner to aggregate data on the qualitative level.

6.1.6 System boundary

The system boundary determines which unit processes of the product system shall be included within the S-LCA. The selection of the system boundary shall be consistent with the goal of the study. The criteria used in establishing the system boundary shall be identified and explained.

When setting the system boundary, causality perspectives of the system should consider:

— the contribution of a unit process to the overall social impacts beyond only mass flows;

— the representativeness of regional and sector-specific inputs;

— the physical and economic causality based on the technological processes or economic flows that characterize the product life cycle;

— the social impact causality based on the interaction between organizations, interested parties and the relations among interested parties involved in the product life cycle, because of the activities carried out.

The physical and economic causality perspective allows to define the life cycle stages; the social impact causality perspective ensures that key interested parties of the product life cycle are considered.

The system boundary defines the unit processes to be included in the product system being assessed. Ideally, the product system should be modelled in such a manner that inputs and outputs at its boundary are social elementary flows.

The choice of the level of detail for the modelling of the product system depends on:

— the goal and scope definition of the study;

— the main interested party identified;

— its intended application and audience;

— the assumptions made, data and cost constraints;

— cut-off criteria.

The models used should be described and the assumptions underlying those choices should be identified. The cut-off criteria for initial inclusion of inputs and outputs and the assumptions on which the cut-off criteria are established shall be clearly described. Cut-off criteria should not only be based on mass, energy or environmental relevance. All relevant social elementary flows shall be accounted for. A social risk assessment can be initially carried out to identify the potential relevant social aspects, which cannot be cut-off.

6.1.7 Data quality requirements

6.1.7.1 Data quality requirements shall be specified to enable the goal and scope of the S-LCA to be met.

Data quality requirements specify in general terms the characteristics of the data needed for the study. They are important to understand the reliability of the study results and properly interpret the outcome of the study.

6.1.7.2 The data quality requirements should address the following:

a) time-related coverage: age of data and the minimum length of time over which data should be collected;

b) context: evaluation of the context, meant as geographic location, cultural belief and values, in which data for unit processes should be collected to satisfy the goal of the study;

c) technology coverage: specific technology or technology mix;

d) precision: measure of the variability of the data values for each data expressed (e.g. variance);

e) completeness: coverage of the relevant social elementary flows accounted for in the study;

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 the study methodology is applied uniformly to the various components of the 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 study;

i) sources of the data;

j) uncertainty of the information (e.g. data, models and assumptions).

Where a study is intended to be used in social comparative assertions intended to be disclosed to the public, the data quality requirements stated in a) to j) above shall be addressed.

6.1.7.3 The treatment of missing data shall be documented. For each unit process and for each reporting location where missing data are identified, the treatment of the missing data and data gaps should result in:

— a “non-zero” data value that is justified;

— a “zero” data value if explained; or

— a calculated value based on the reported values from unit processes employing similar technology.

Data quality should be characterized by both quantitative and qualitative aspects as well as by the methods used to collect and integrate those data.

Requirements and guidance as given in ISO 14044:2006, 4.2.3.6, shall apply for missing data.

6.2 Social life cycle inventory analysis (S-LCI)

6.2.1 General

S-LCI involves data collection and calculation procedures to qualify and quantify relevant inputs and outputs of a product system of social relevance. The process of conducting an S-LCI is iterative. As data are collected and more is learned about the system, new data requirements or limitations can be identified that require a change in the data collection procedures so that the goal of the study will still be met. Sometimes, issues can be identified that require revisions to the goal or scope of the study. Qualitative, quantitative and semi-quantitative data can be needed for an S-LCI.

6.2.2 Collecting data

Data for each unit process within the system boundary can be classified under major headings, associated to impact sub-categories, or interested party categories, such as:

— data on working conditions such as number of injuries, number of cases with occupational health problems;

— data related to local communities, such as creation of jobs from long-term unemployment.

Data collection can be a resource-intensive process. Practical constraints on data collection should be considered in the goal and scope and documented in the S-LCA report.

The data collection should include all inventory data for relevant impact categories identified and chosen under goal and scope. Data collected can be qualitative, quantitative and semi-quantitative as well as primary or secondary.

Information on data types can be found in Reference [8]. A list of types of data is given in Table 1.

Table 1 — List of types of data

Data type	Description
Primary data (or site-specific data)	Quantitative or qualitative value of a unit process or an activity obtained from a direct measurement or a calculation based on direct measurements or observations at the original source
Secondary data or generic data	Data that do not fulfil the requirements for primary data

NOTE 1 In accordance with ISO 14050:2020, primary data can be also obtained from interviews of affected interested parties or representatives of the organizations.

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 describe, and quantify or qualify 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 the data have been collected and further information about data quality indicators shall be stated. If such data do not meet the data quality requirements, this shall be reported.

To decrease the risk of misunderstandings (e.g. resulting in double counting when reusing the data collected), a description of each unit process shall be recorded. Since data collection can span several reporting locations and published references, actions should be taken to reach uniform and consistent understanding of the product systems to be modelled. Triangulation can be applied for collecting the data and improving their quality.

NOTE 2 Triangulation is the act of combining and cross-checking different sources and types of data or data collection methods.

6.2.3 Qualitative and semi-quantitative data collection

Collection of the data can include qualitative and semi-quantitative data depending on the chosen representation of the social aspect. Qualitative data can take the form of a descriptive text that can be collected using interviews, questionnaires, observation and written assignments. Semi-quantitative data uses a yes/no or rating scale responses, e.g. presence of a stress management program (yes-no).

6.2.4 Structure of the product system

The appropriate social elementary flows shall be determined. If using the functional unit for normalizing the results, the input and output data of the unit process shall be calculated in relation to the reference flow. Based on the flow chart and the flows between unit processes, the flows of all unit processes are related to the reference flow. The calculation should result in all system input and output data being referenced to the functional unit.

Care should be taken when aggregating the inputs and outputs in the product system. The level of aggregation shall be consistent with the goal of the study. Data should only be aggregated if they are related to equivalent substances and to similar social impacts. If more detailed aggregation rules are required, they should be explained in the goal and scope definition phase of the study or should be left to a subsequent impact assessment phase.

All calculation procedures shall be explicitly documented, and the assumptions made shall be clearly stated and explained.

6.2.5 Allocation

Social aspects (or social inventory flow) should be attributed in multi-output processes to each co-product on the same level. If subdivision of the process or system expansion is not possible, no allocation scheme shall be applied, and the social aspects are attributed with the same figure to each product generated in a multi-output process.

6.3 Reference scale assessment

6.3.1 General

Reference scale assessment is an optional phase of S-LCA for social life cycle performance assessment, parallel to S-LCIA (see 6.4). The choice to perform either a reference scale assessment or an S-LCIA shall be justified.

The reference scale assessment is aimed at assessing the social performance of the product system based on specific reference scales. Reference scales are ordinal scales comprising several levels. Each level corresponds to a performance reference point (PRP).

The implementation of the reference scale assessment consists of the conversion of S-LCI results to a score value according to an established pre-determined reference scales for each impact subcategory or subcategory indicator, when several indicators are considered under one subcategory; the reference scale is defined according to international and/or national norms, or according to best practices.

The reference scale assessment phase shall include the following mandatory elements:

— selection of impact categories, category indicators and reference scales with reference points,

— assignment of S-LCI results to the selected impact categories

— the application of a reference scale onto S-LCI results;

— the determination of a level on a reference scale.

Whenever impact categories, category indicators and reference scales are selected in a reference scale assessment, the related information and sources shall be clearly stated and documented. This also applies when new impact categories, category indicators are defined. Accurate and descriptive names shall be provided for the impact categories and subcategories and their indicators.

The selection of impact categories, category indicators and reference scales shall be both justified and consistent with the goal and scope of the S-LCA.

The selection of impact categories shall reflect a comprehensive set of social issues related to the product system being studied, in accordance with the goal and scope.

6.3.2 Use of reference-scale approach

Figure 1 illustrates the concept of category indicators based on a social cause-effect mechanism (widely quoted as "the theory of change"[8] mechanism). The social impact category can relate to the way workers are kept or are not kept safe by providing personal protection equipment and associated training. The inputs are the available resources such as equipment and training sessions to prevent work injuries and improve health and safety of the workers. The activities describe what is done in the management system.

The output is the first direct evidence describing the social impact category (e.g. number of work injuries).

The outcome can be a reduction of the number of injuries. The impact can be seen as better motivated workers, fewer lost worker hours, etc. Another outcome can be workers' increased or decreased awareness to address safety and health issues. The impact can be seen as increased or decreased health and safety of workers due to fewer or more work injuries.

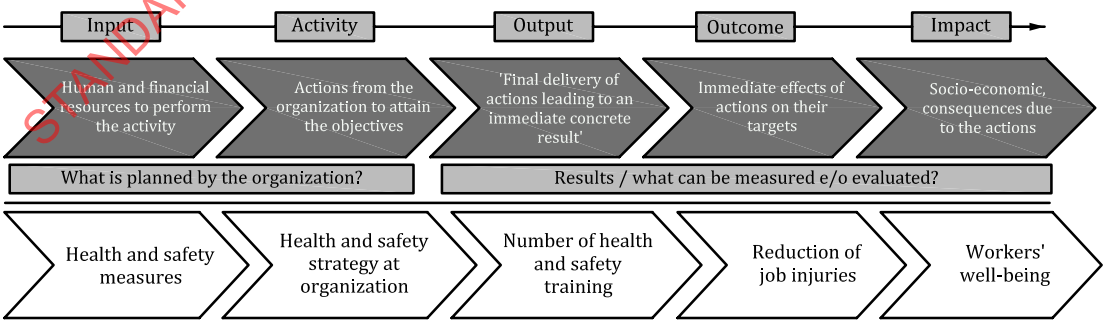

Figure 1 — Social cause-effect mechanism

Figure 2 illustrates the steps of the reference scale assessment. The first step is the definition of the impact categories. The definition of the reference scales follows. Different levels of performances are linked with a scaling system. In step 3, the assignment phase, the inventory data are assigned to the corresponding

reference scale. Different options from quantitative and semi-quantitative to qualitative should be used as alternative approaches for the selected and specific indicators. In the assessment stage, the association of inventory data with the corresponding reference scale levels is applied, followed by the interpretation with numeric figures or colour codes.

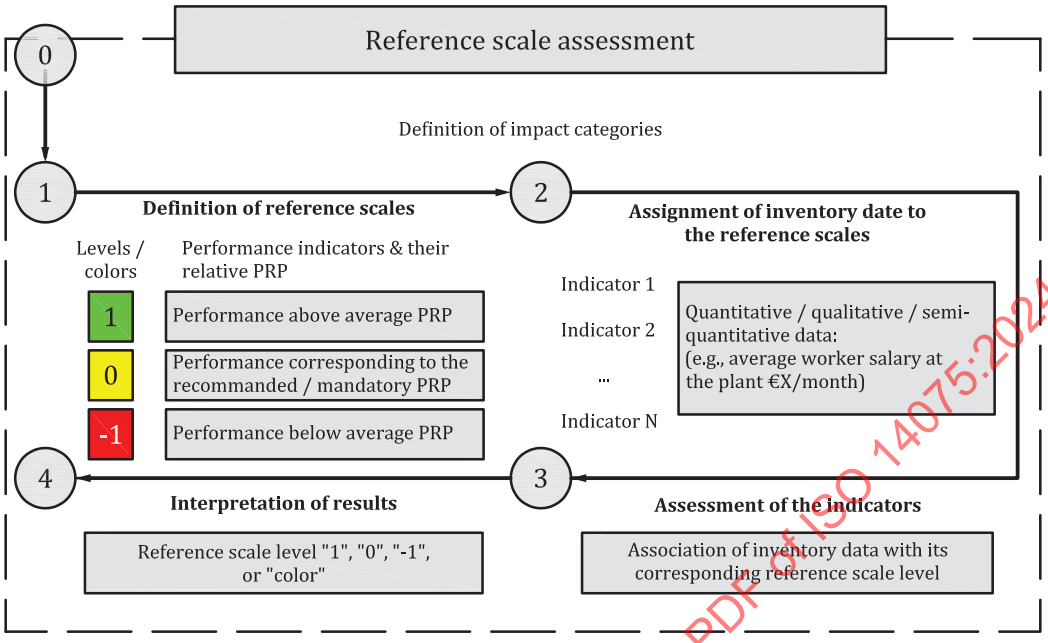

Figure 2 — Representation of the reference scale assessment

6.4 Social life cycle impact assessment

6.4.1 General

S-LCIA is an optional phase of S-LCA, parallel to the reference scale assessment (see 6.3). The choice to perform either a reference scale assessment or an S-LCIA shall be justified.

S-LCIA is a relative approach based on a functional unit. The following aspects are very important for S-LCIA:

The cause effect mechanisms can generally be understood as nonlinear (e.g. the addition of 1 h to a 20 h work week can be assessed as desirable and beneficial, while the same 1 h addition to a 48 h work week can be assessed as detrimental).

In S-LCIA, the cause effect mechanisms are studied by using both social and natural science.

The S-LCIA phase shall be carefully planned to achieve the goal and scope of an S-LCA study. The S-LCIA phase shall be coordinated with other phases of the S-LCA to consider the following possible omissions and sources of uncertainty:

a) whether the quality of the S-LCI data and results is sufficient to conduct the S-LCIA in accordance with the study goal and scope definition;

b) whether the system boundary and data cut-off decisions have been sufficiently reviewed to ensure the availability of S-LCI results necessary to calculate indicator results for the S-LCIA;

c) whether the social relevance of the S-LCIA results is decreased due to the S-LCI functional unit definition, averaging, aggregation and allocation.

The S-LCIA consists of mandatory and optional elements.

6.4.2 Elements of S-LCIA

6.4.2.1 General

The S-LCIA phase shall include the following mandatory elements:

— selection of impact categories, category indicators and characterization models;

— the application of characterization factors onto S-LCI results;

— assignment of S-LCI results to the selected impact categories (classification).

6.4.2.2 Selection of impact categories, social indicators and characterization models

Whenever impact categories, category indicators and characterization models are selected in an S-LCIA, the related information and sources shall be clearly stated and documented. This also applies when new impact categories, category indicators or characterization models are defined. Accurate and descriptive names shall be provided for the impact categories and subcategories and their indicators.

Before the selection of impact categories is performed, a clear and unambiguous area of protection (AoP) should be defined. This may be done per interested party. The selection of the AoP shall be well documented.

NOTE AoPs, also known as “safeguard subjects”[9] or “damage categories” [10], are the entities to respect in the social assessment. AoP acts as a benchmark defining the ideal situation.

The selection of impact categories, category indicators and characterization models shall be both justified and consistent with the goal and scope of the S-LCA.

The selection of impact categories shall reflect a comprehensive set of social aspects related to the product system being studied, in accordance with the goal and scope.

The social cause-effect mechanism and characterization model that relate the S-LCI results to the category indicator and provide a basis for characterization factors shall be described.

The appropriateness of the characterization model used for deriving the category indicator in the context of the goal and scope of the study shall be described.

For some S-LCA studies, existing impact categories, category indicators or characterization models are selected. When existing impact categories, category indicators or characterization models are not sufficient to fulfil the defined goal and scope of the S-LCA, new ones shall be defined. When new impact categories, category indicators or characterization models are defined, the recommendations in this subclause also apply.

It is not always easy to exactly describe impacts in S-LCIA because a single outcome can have many parallel impacts.

6.4.2.3 Calculation of category indicator results (characterization) in impact pathway approach

The calculation of category indicator results (characterization) involves the conversion of S-LCI results to common units and the aggregation of the converted results within the same social impact category. This conversion uses characterization factors (e.g. quality-adjusted life years per hour of discrimination of workers). The outcome of the calculation is a numerical category indicator result.

The method of calculating category indicator results shall be identified and documented, including the value choices and assumptions used.

If S-LCI results are unavailable or if data are of insufficient quality for the S-LCIA to achieve the goal and scope of the study, either an iterative data collection or an adjustment of the goal and scope shall be provided.

The usefulness of the category indicator results for a given goal and scope depends on the accuracy, validity and characteristics of the characterization models and characterization factors. The number and kind of simplifying assumptions and value choices used in the characterization model for the category indicator also vary between impact categories and can depend on the geographical region. A trade-off often exists

between the simplicity and accuracy of the characterization model. Furthermore, the quantification as input factor of the social impact assessment shall be meaningful and should not depend on statistical models. For example, doubling the working time does not necessarily double the number of accidents.

Variation in the quality of category indicators among impact categories can influence the overall accuracy of the S-LCA, because of, for example, differences in:

— the complexity of the social mechanisms between the system boundary and the category and subcategory impact;

— the spatial and temporal characteristics;

— the cause-effect characteristics.

Additional data about the social condition can enhance the meaning and usability of the category indicator results. This issue may also be dealt with in the data quality analysis.

6.4.2.4 Weighting and possible aggregation

Weighting is an assessment step for converting and possibly aggregating indicator results within impact subcategories (e.g. weighting and aggregation of indicators within a subcategory) or within impact categories (e.g. weighting and aggregation of subcategories within a category) using numerical factors based on value choices. Data prior to weighting shall remain available. Category indicator results with high relevance for specific interested parties may get higher weighting factors than others.

If S-LCA results are aggregated to a single overall score or number, aggregation should be done respecting good scientific practices and international norms of behaviour and the principle of transparency (e.g. respecting representative values of the affected population, including concern for equity and being without systematic biases). Aggregation to a single score shall be presented together with the results prior to the previous step of aggregation.

The application and use of normalization, grouping and weighting methods shall be consistent with the goal and scope of the S-LCA, and shall be fully transparent. All methods and calculations used shall be documented to provide transparency. For example, impact subcategories or categories that are deemed more important have greater weights, so that their associated results show a higher contribution in the final results. There is a range of approaches for deciding upon weighting values in S-LCA. However, all of them, even implicit weighting, rely on value choices and may change over time.

If weighting is applied, weights shall always be documented in a transparent manner. If this condition is not met, results derived from weighting can be a source of misleading conclusions if the weighting scheme is not accurately derived. As such, information should be provided by answering the following questions:

— Are the weights based on a specific framework?

— Were the weights established by interested parties affected by the product system or S-LCA experts?

— Which method was used for establishing the weights?

6.5 Comparison between systems and social comparative assertions

6.5.1 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.

6.5.2 Social comparative assertions

An S-LCIA and S-LCPA that is intended to be used in social comparative assertions intended to be disclosed to the public shall employ a sufficiently comprehensive set of category indicators. The comparison assessment shall be conducted category indicator by category indicator. Value choices, exclusion of spatial and temporal, threshold, relative approach, and the variation in precision among impact categories are examples of the limitations of S-LCPA and S-LCIA. Category indicators intended to be used in social comparative assertions intended to be disclosed to the public shall, as a minimum, be scientifically and technically valid, i.e. using a distinct identifiable social mechanism and/or reproducible empirical observation.

An analysis of results for sensitivity and uncertainty shall be conducted for studies intended to be used in social comparative assertions intended to be disclosed to the public. The uncertainty analysis should be done according to best practice International Standards. In the case of reference scale assessment, where models for uncertainty analysis are not in use, a textual analysis about the uncertainty in results should be performed.

The origin of category indicators used in social comparative assertions intended to be disclosed to the public shall be justified and shall come from an open access published source whose credibility can be readily assessed by members of the public.

If results after weighting are used, they shall be presented together with the results prior to weighting, irrespective of whether the results are presented aggregated or not.

6.5.3 Critical review

A critical review may be carried out by an internal or external expert. In such a case, an expert independent of the S-LCA shall perform the review. The review statement, comments of the practitioner and any response to recommendations made by the reviewer shall be included in the S-LCA report.

To decrease the likelihood of misunderstandings or negative effects on external interested parties, a panel of interested parties shall conduct critical reviews on S-LCA studies where the results are intended to be used to support a social comparative assertion intended to be disclosed to the public.

6.6 Social life cycle interpretation

6.6.1 General

The social life cycle interpretation phase of an S-LCA or an S-LCI study comprises several elements, as follows:

— identification of the significant issues based on the results of the S-LCI, S-LCIA phases of S-LCA;

— an evaluation that considers completeness, sensitivity and consistency checks;

— conclusions, limitations and recommendations.

The results of the S-LCI or S-LCIA phases shall be interpreted according to the goal and scope of the study, and the interpretation shall include an assessment and a sensitivity check of the significant inputs, outputs and methodological choices in order to understand the uncertainty of the results.

The interpretation shall also consider the following in relation to the goal of the study:

— the appropriateness of the definitions of the system functions, the functional unit and system boundary;

— limitations identified by the data quality assessment and the sensitivity analysis.

The documentation of the data quality assessment, sensitivity analyses, conclusions and any recommendations from the S-LCI and S- LCIA results shall be checked.

Decisions regarding the data to be included shall be based on a sensitivity analysis to determine their significance. The initial system boundary shall be revised, as appropriate, in accordance with the cut-off

criteria established in the definition of the scope. The results of this refining process and the sensitivity analysis shall be documented.

The S-LCI results should be interpreted with caution because they refer to input and output data and not to social potential impacts. In addition, uncertainty is introduced into the results of an S-LCI due to the compounded effects of input uncertainties and data variability. Whenever feasible, such analysis should be performed to better explain and support the S-LCI conclusions.

6.6.2 Identification of significant issues

The objective of this element is to structure the results from the S-LCI or S-LCIA phases in order to help determine the significant issues, in accordance with the goal and scope definition and interactively with the evaluation element. The purpose of this interaction is to include the implications of the methods used, assumptions made, etc., in the preceding phases, such as allocation rules, cut-off decisions, selection of impact categories, category indicators, characterization factors and reference scales.

Examples of significant issues are:

— inventory data, such as high worker hours, low living wage and questionnaire results;

— impact categories, such as fair wages for workers and preserving indigenous cultural heritage;

— significant contributions from life cycle stages to S-LCI or S-LCIA results such as individual unit processes or groups of processes like transportation and energy production.

The following four types of information shall be considered from the preceding phases of the S-LCA:

a) the findings from the preceding phases (S-LCI, S-LCIA) that shall be assembled and structured together with information on data quality;

b) methodological choices, such as allocation rules and system boundary from the S-LCI and category indicators and models used in S-LCIA;

c) the value choices used in the study as defined in the goal and scope section;

d) the role and responsibilities of the different interested parties as found in the goal and scope definition in relation to the application.

When the results from the preceding phases (S-LCI, S-LCIA) have been found to meet the demands of the goal and scope of the study, the significance of these results shall then be determined. All relevant results available at the time shall be gathered and consolidated for further analysis, including information on data quality.

6.6.3 Evaluation of results

6.6.3.1 General

The objectives of the evaluation element are to establish and enhance confidence in, and the reliability of, the results of the S-LCA or the S-LCI study, including the significant issues identified in the first element of the interpretation. The results of the evaluation should be presented in a manner that gives the commissioner or any other interested party a clear and understandable view of the outcome of the study.

The evaluation shall be undertaken in accordance with the goal and scope of the study.

During the evaluation, the use of the following three techniques shall be considered:

— completeness check;

— sensitivity check;

— consistency check.

The results of uncertainty analysis and data quality analysis should supplement these checks.

The evaluation should take into account the final intended use of the study results.

6.6.3.2 Completeness check

The objective of the completeness check is to ensure that all relevant information and data needed for the interpretation are available and complete. If any relevant information is missing or incomplete, the necessity of such information for satisfying the goal and scope of the S-LCA shall be considered. This finding and its justification shall be recorded.

If any relevant information, considered necessary for determining the significant issues, is missing or incomplete, the preceding phases (S-LCI, S-LCIA) should be revisited or, alternatively, the goal and scope definition should be adjusted. If the missing information is considered unnecessary, the reason for this should be recorded.

6.6.3.3 Sensitivity check

The objective of the sensitivity check is to assess the reliability of the final results and conclusions by determining how they are affected by uncertainties in the data, allocation methods or calculation or reference of category indicator results, etc.

The sensitivity check shall include the results of the sensitivity analysis and uncertainty analysis, if performed in the preceding phases (S-LCI, S-LCIA). In a sensitivity check, consideration shall be given to:

— the issues predetermined by the goal and scope of the study;

— the results from all other phases of the study;

— expert judgements and previous experiences.

When an S-LCA is intended to be used in social comparative assertions intended to be disclosed to the public, the evaluation element shall include interpretative statements based on detailed sensitivity analyses.

The level of detail required in the sensitivity check depends mainly upon the findings of the inventory analysis and, if conducted, the impact assessment.

The output of the sensitivity check determines the need for more extensive and/or precise sensitivity analysis as well as shows apparent effects on the study results.

The inability of a sensitivity check to find significant differences between different studied alternatives does not automatically lead to the conclusion that such differences do not exist. The lack of any significant differences can be the end result of the study.

6.6.3.4 Consistency check

The objective of the consistency check is to determine whether the assumptions, methods and data are consistent with the goal and scope.

If relevant to the S-LCA or S-LCI study, the following questions shall be addressed:

a) Are differences in data quality along a product system life cycle and between different product systems consistent with the goal and scope of the study?

b) Have regional and/or temporal differences, if any, been consistently applied?

c) Have allocation rules and the system boundary been consistently applied to all product systems?

d) Have the elements of social impact assessment been consistently applied?

6.6.4 Conclusions, limitations and recommendations

The objective of this part of the life cycle interpretation is to draw conclusions, identify limitations and make recommendations for the intended audience of the S-LCA.

Conclusions shall be drawn from the study. This should be done iteratively with the other elements in the life cycle interpretation phase. A logical sequence for the process is as follows:

a) identify the significant issues;

b) evaluate the methodology and results for completeness, sensitivity and consistency;

c) draw preliminary conclusions and check that these are consistent with the requirements of the goal and scope of the study, including, in particular, data quality requirements, predefined assumptions and values, methodological and study limitations, and application-oriented requirements;

d) if the conclusions are consistent, report them as full conclusions; otherwise return to previous steps a), b) and c) as appropriate.

Recommendations shall be based on the final conclusions of the study and shall reflect a logical and reasonable consequence of the conclusions. Whenever appropriate to the goal and scope of the study, specific recommendations to decision-makers should be explained. Recommendations should relate to the intended application.

7 Reporting

7.1 General requirements and considerations

7.1.1 The type and format of the S-LCA report shall be defined in the scope phase of the study.

The results and conclusions of the S-LCA shall be completely and accurately reported without bias to the intended audience. The results, data, methods, assumptions and limitations shall be transparent and presented in sufficient detail to allow the reader to comprehend the complexities and trade-offs inherent in the S-LCA. The report shall also allow the results and interpretation to be used in a manner consistent with the goals of the study.

7.1.2 In addition to the items in 7.1.1 and those listed in 5.2 c), the following items should be considered when preparing third-party reports:

a) modifications to the initial scope together with their justification;

b) system boundary, including:

   1) type of inputs and outputs of the system as elementary flows;

   2) decision criteria;

c) description of the unit processes;

d) data, including:

   1) decision about data;

   2) details about individual data;

   3) data quality requirements;

e) choice of representation of social aspects, impact categories, and reference scales or category indicators.

A graphical presentation of S-LCI results and S-LCIA results as part of the report can be useful, but it should be considered that this invites implicit comparisons and conclusions.

7.2 Additional requirements and guidance for third-party reports

When results of the S-LCA are to be communicated to any third party (i.e. interested party other than the commissioner or the practitioner of the study), regardless of the form of communication, a third-party report shall be prepared.

The third-party report can be based on study documentation that contains confidential information that is not necessarily included in the third-party report.

The third-party report constitutes a reference document and shall be made available to any third party to whom the communication is made. The third-party report shall cover the following aspects:

a) General aspects:
   1) S-LCA commissioner, practitioner of S-LCA (internal or external);
   2) date of report;
   3) statement that the study has been conducted in accordance with the requirements of this document.

b) Goal of the study:
   1) reasons for carrying out the study;
   2) its intended applications;
   3) the target audiences;
   4) statement as to whether the study intends to support social comparative assertions intended to be disclosed to the public.

c) Scope of the study:
   1) function, including:
      i) statement of performance characteristics;
      ii) any omission of additional functions in comparisons;
   2) functional unit, including:
      i) consistency with goal and scope;
      ii) definition;
      iii) result of performance measurement;
   3) system boundary, including:
      i) omissions of life cycle stages, processes or data needs;
      ii) quantification of energy and material inputs and outputs;
      iii) assumptions about electricity production;
   4) cut-off criteria for initial inclusion of inputs and output, including:
      i) description of cut-off criteria and assumptions;
      ii) effect of selection on results;
      iii) inclusion of mass, energy and environmental cut-off criteria.

d) Social life cycle inventory analysis:
   1) data collection procedures;