

First edition  
2014-06-01

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**Environmental management — Life  
cycle assessment — Critical review  
processes and reviewer competencies:  
Additional requirements and  
guidelines to ISO 14044:2006**

*Management environnemental — Analyse du cycle de vie — Processus  
de revue critique et compétences des vérificateurs: Exigences et lignes  
directrices supplémentaires à l'ISO 14044:2006*



Reference number  
ISO/TS 14071:2014(E)



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Published in Switzerland

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## Foreword

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

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

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

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 5, *Life cycle assessment*.

## Introduction

For life cycle assessment, critical review is the conformity assessment approach according to ISO 14040 and ISO 14044. These standards contain the overarching requirements for critical review in concise form.

Based on these requirements, a common critical review practice emerged that satisfied stakeholders. For the mandatory case of life cycle assessment (LCA) studies intended to be used in comparative assertions intended to be disclosed to the public, the performance of a critical review is established as key feature for the acceptance of the study by stakeholders. However, even in the broad range of applications of LCA, for which a critical review is not mandatory, the commissioners of the LCA study often decide today to perform a voluntary critical review to improve the robustness of their studies and to increase credibility.

It is one of the key features of critical review that it does not relate to an accreditation scheme, but ensures quality by making the individual reviewer personally responsible for the work and by giving priority to the content rather than the form.

Because of the increasing use of LCA itself, as well as the broader application in tools like carbon footprinting or upcoming labelling initiatives, it is the intention of this Technical Specification to document the established critical review practice in a more comprehensive way by providing additional requirements and guidelines for conducting a critical review and the competencies required.

This Technical Specification might be applicable to other standards that require independent review of LCA-based procedures and information (e.g. ISO 14045, ISO 14025, ISO/TS 14067), but might need to be adapted to the specific fields of application. Other reference standards can be included in the critical review process.

This Technical Specification does not apply to critical reviews performed prior to its publication.



# Environmental management — Life cycle assessment — Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006

## 1 Scope

This Technical Specification provides additional specifications to ISO 14040:2006 and ISO 14044:2006. It provides requirements and guidelines for conducting a critical review of any type of LCA study and the competencies required for the review.

This Technical Specification provides:

- details of a critical review process, including clarification with regard to ISO 14044:2006;
- guidelines to deliver the required critical review process, linked to the goal of the life cycle assessment (LCA) and its intended use;
- content and deliverables of the critical review process;
- guidelines to improve the consistency, transparency, efficiency and credibility of the critical review process;
- the required competencies for the reviewer(s) (internal, external and panel member);
- the required competencies to be represented by the panel as a whole.

This Technical Specification does not cover the applications of LCA (as illustrated in ISO 14040:2006, Figure 1).

## 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.

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

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

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **independent internal expert**

competent person, employed in a full-time or part-time role the *commissioner of the LCA study* (3.4) or by the *practitioner of the LCA study* (3.6), but not involved in defining the scope or conducting the LCA study

Note 1 to entry: An expert is considered to be involved if he/she is part of the commissioner's or practitioner's project team.

### 3.2

#### **independent external expert**

competent person, not employed in a full-time or part-time role by the *commissioner of the LCA study* (3.4) or the *practitioner of the LCA study* (3.6), and not involved in defining the scope or conducting the LCA study

Note 1 to entry: An expert is considered to be involved if he/she is part of the commissioner's or practitioner's project team or has vested financial, political or other interests in the outcome of the study.

### 3.3

#### **panel member**

*reviewer* (3.10) taking part in a critical review panel

### 3.4

#### **commissioner of the LCA study**

organization (or group of organizations) that finances the LCA study according to ISO 14040 and ISO 14044

### 3.5

#### **commissioner of the critical review**

organization (or group of organizations) that finances the critical review of the LCA study according to ISO 14040 and ISO 14044

Note 1 to entry: Financing the review is not restricted to contracting the *reviewers* (3.10). The contract may be carried out by a third party, e.g. the *practitioner of the LCA study* (3.6) or the *commissioner of the LCA study* (3.4).

### 3.6

#### **practitioner of the LCA study**

organization (or group of organizations) that performs the LCA study according to ISO 14040 and ISO 14044

Note 1 to entry: An organization can act as the *commissioner of the LCA study* (3.4), the *commissioner of the critical review* (3.5) and/or the practitioner of the LCA study at the same time.

### 3.7

#### **critical review report**

documentation of the critical review process and findings, including detailed comments from the *reviewer(s)* (3.10) or the critical review panel, as well as corresponding responses from the *practitioner of the LCA study* (3.6)

### 3.8

#### **critical review statement**

conclusive document aggregating the conclusions from the *reviewer(s)* (3.10) regarding the LCA study, and stating unambiguously whether the LCA study is in conformance with ISO 14040 and ISO 14044

### 3.9

#### **interested party**

individual or group concerned with or affected by the environmental performance of a product system, or by the results of the life cycle assessment

[SOURCE: ISO 14040:2006, definition 3.46]

### 3.10

#### **reviewer**

*independent internal expert* (3.1) or *independent external expert* (3.2) performing a critical review, or *interested party* (3.9) taking part in a critical review panel

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## 4 Critical review process and tasks

### 4.1 Defining the scope of the critical review

As stated in ISO 14044:2006, 6.1, the critical review process shall ensure that:

- the methods used to carry out the LCA are consistent with this International Standard;
- the methods used to carry out the LCA are scientifically and technically valid;
- the data used are appropriate and reasonable in relation to the goal of the study;
- the interpretations reflect the limitations identified and the goal of the study; and
- the study report is transparent and consistent.

NOTE “LCA report” and “study report” are used as synonyms and can contain confidential information which can be excluded from the third-party report, according to ISO 14044:2006, 5.2.

There are several options as to how to perform a critical review for a given study, including the following:

- a) the review is performed based on expert review (see ISO 14044:2006, 6.2) or panel review (see ISO 14044:2006, 6.3);
- b) the review is performed concurrently or at the end of the study;
- c) the review includes or excludes an assessment of the life cycle inventory (LCI) model;
- d) the review includes or excludes an assessment of individual data sets.

The critical review process shall clearly define and document which options have been covered.

The critical review should cover all aspects of an LCA, including data appropriateness and reasonability, calculation procedures, life cycle inventory, impact assessment methodologies, characterization factors, calculated LCI and life cycle inventory analysis (LCIA) results, and interpretation.

As explained in ISO 14040:2006, 7.1, a critical review can neither verify nor validate the goals that are chosen for an LCA by the commissioner of the LCA study, nor the ways in which the LCA results are used.

Whether a critical review is conducted concurrently with or at the end of the LCA study does not change the deliverables of the critical review process.

Concurrent reviews may help to avoid major revisions of the LCA study at the end of the process, which can cause extra work and delays. Therefore, when the critical review is done concurrently with the study, the workload tends to be typically higher for the reviewer(s), but often lower for the practitioner of the LCA study.

Independent experts conducting a concurrent critical review shall maintain their independency throughout the entire review process and limit their role to the review tasks.

If the independence of an expert (see [3.1](#) and [3.2](#)) is compromised before the critical review process has been finalized, the reviewer shall be replaced following the guidelines given in [4.2.2](#).

### 4.2 Selecting, contracting and replacing external reviewer(s)

#### 4.2.1 Selecting reviewer(s)

In the case of an expert review (see ISO 14044:2006, 6.2), the commissioner or practitioner of the original LCA study may select the internal or external independent expert to perform the review. Based on the goal and scope of the study, additional experts may be included in the review process.

In the case of a panel review (see ISO 14044:2006, 6.3), an external independent expert should be selected by the commissioner of the original LCA study to act as a chairperson of the review panel. Based on the goal and scope of the study, the chairperson should select other independent qualified reviewers and may include interested parties. The practitioner and the commissioner of the LCA study may propose potential candidates to serve as independent expert(s) or interested parties.

In order to facilitate the selection process, the potential reviewer(s) shall submit a self-declaration (see example in [Annex B](#)) to the organization that is contracting the reviewer(s).

### 4.2.2 Contracting reviewer(s)

Independent external expert(s) shall be contracted. Independent internal experts and interested parties may be contracted. The contract(s) of the external reviewer(s) shall not include any conditions predetermining the result of the conformity assessment of the critical review.

The independence of the reviewers is not infringed if they have a contract for that critical review with the commissioner of the original LCA study, the commissioner of the critical review, or the practitioner of the LCA study.

### 4.2.3 Replacing reviewer(s)

If, for any reason, a reviewer abandons the review process according to ISO 14044:2006, 6.2, the commissioner of the critical review should select a qualified replacement to continue the review process. If, for any reason, a panel member abandons the review process according to ISO 14044:2006, 6.3, before the critical review statement is provided by the panel chairperson, the chairperson and the commissioner of the critical review shall maintain the minimum number of reviewers according to ISO 14044, and the panel competencies. If, for any reason, the chairperson abandons the review process according to ISO 14044:2006, 6.3, the commissioner of the critical review should select a qualified replacement to continue the review process.

Any replacement of reviewer(s) during the process shall be documented in the critical review report and statement.

## 4.3 Critical review process

### 4.3.1 General

The reviewer(s) shall comment the draft LCA report and give the practitioner of the LCA study the opportunity to improve the work if necessary. Depending on the nature of comments, additional iterations of comments, recommendations and responses may be necessary.

Any changes made in response to reviewer(s) comments or recommendations should be documented.

Meetings (e.g. phone conferences, physical meetings, web conferences) between the practitioner of the LCA study, the commissioner of the LCA study and the reviewer(s) may help to exchange points of views and to reach a common understanding of the review comments and the actions taken on them.

The critical review report and the critical review statement shall be completed on the basis of the final LCA report. It is good practice to send the draft critical review statement to the practitioner of the LCA study and the commissioner of the LCA study, for editorial comments to be considered for minor revisions of the critical review statement.

All parties involved should strive to establish conformance with ISO 14040, ISO 14044 or this Technical Specification by working together constructively and cooperatively.

### 4.3.2 Type of critical review

A critical review may be carried out by one or more internal or external independent reviewer(s), or by a panel of reviewers, as defined in ISO 14044:2006, 6.2 and 6.3.

The critical review may be performed concurrently with, or at the end of, the LCA study.

If the critical review is performed at the end of the LCA study (see 4.3.3), the critical review process starts when the draft LCA report is provided to the reviewer(s). If the critical review is performed in concurrence with the study (see 4.3.4), the critical review process will start as soon as the commissioner and the practitioner of the LCA study decide it can start. A first set of comments may be produced when a draft goal and scope document is provided to the reviewer(s).

#### 4.3.3 Critical review at the end of the LCA study

All review tasks are performed at the end of the LCA study once the draft LCA report has been submitted to the reviewer(s). At least one iteration of review comments and associated modifications of the study should be performed and documented in the critical review report. The critical review report shall document the complete review process. In addition, and after completion of all review comment iterations, the critical review statement shall document the final outcome of the critical review process (see also 4.5).

#### 4.3.4 Concurrent critical review

Selected tasks will be carried out in concurrence with the LCA study.

The milestones at which the reviewer(s) may submit comments and recommendations are the following:

- a) the goal and scope definition;
- b) inventory analysis, including data collection and modelling;
- c) impact assessment;
- d) life cycle interpretation;
- e) draft LCA report.

The critical review statement shall be issued for the final version of the LCA report.

### 4.4 Validity of critical review statement and report

A critical review report and a critical review statement shall refer only to one specific LCA study. The critical review report and the critical review statement shall unambiguously identify the specific LCA study under review (e.g. by including the title, the commissioner of the LCA study, the practitioner of the LCA study, etc.), together with the explicit version of the final LCA report to which the critical review report and the critical review statement apply (e.g. by including the report date, the version number, etc.). If the practitioner of the LCA study produces a new version of the final LCA report, the critical review report and the critical review statement no longer apply.

When an updated LCA study is based on a previous LCA study, with a similar goal and scope to the one that has been reviewed, the reviewer(s) of this updated LCA study may refer to the previous critical review process. The review may focus on the specifically added or modified elements of the LCA, but still shall assess the overall conformance of the updated LCA study with ISO 14040 and ISO 14044. The reviewer(s) may be the same as, or different from, the previous review. Any subsequent press releases, executive summaries or otherwise truncated summaries of the LCA study should be submitted to the practitioner of the LCA study and the reviewer(s), for feedback to ensure consistency with the LCA study.

### 4.5 Critical review report and critical review statement preparation

In order to document all issues covered during the critical review process, the critical review report shall include the reviewer(s) comments and recommendations, and the corresponding responses given by the practitioner of the LCA study. The critical review statement and corresponding responses shall be included in the LCA report, in line with ISO 14044.

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The responses given by the practitioner of the LCA study may be either an indication of where a modification has been done, or a response to the reviewer(s).

The critical review statement may highlight any particular strengths, limitations and remaining improvement potentials of the LCA study or the critical review process.

In the case of data review, sample tests can be performed during the critical review process. Therefore, the reviewer(s) shall indicate which sampling methods have been used and shall mention any limitations of the data review (e.g. unavailability of data).

The chairperson shall sign the critical review statement. The other reviewer(s) should sign the critical review statement.

The independent expert(s) shall sign the critical review statement as individual(s), not representing any organization(s).

The critical review statement may be electronically signed.

The following elements and aspects shall be addressed in the critical review statement:

- title of the study;
- the commissioner of the LCA study;
- the practitioner of the LCA study;
- the exact version of the report to which the critical review statement belongs;
- the reviewer(s) or, in the case of a panel review, the panel members, including the identification of the panel chairperson;
- a description of the review process, including information on:
  - whether the review was performed based on ISO 14044:2006, 6.2 or 6.3;
  - whether the review was performed in parallel or at the end of the study;
  - whether the review included or excluded an assessment of the LCI model;
  - whether the review included an analysis of individual data sets;
- a description of how comments were provided, discussed and implemented;
- a statement of the result of the critical review, i.e. whether the study was found to be in conformance with ISO 14040 and ISO 14044 or not.

It may be stated which interested parties were involved in the critical review process.

The critical review statement, as well as the comments or any responses to recommendations made by the reviewer(s), shall be part of the final LCA report. The reviewer(s) or the review panel should decide at the beginning of the review process whether the critical review report is intended to be communicated or not.

If reviewers agree, in the interests of brevity, some editorial comments, including their recommendations and responses, as well as inadvertent mistakes, may be excluded from the critical review report.

Individual comments and recommendations, as well as the critical review statement, should be direct, unambiguous and free of conflicts. If comments or recommendations from different reviewers conflict with each other, this should be resolved. If conflicts cannot be resolved, the dissenting reviewer(s) may add a minority statement to the critical review statement, and the chairperson shall include this minority statement in the critical review statement. A statement of non-conformance shall be based exclusively on the failure to meet one or more of the requirements of ISO 14044:2006, 6.1.

## 4.6 Revision of an existing critical review

If technical flaws of the study are identified that compromise conformance with ISO 14040, ISO 14044 or this Technical Specification, but they have not been identified by the original critical review, then a revision of the critical review may be justified. The reasons for revising the critical review shall be documented and justified in the new critical review statement.

The commissioner of the new critical review that intends to revise the existing critical review shall make reasonable efforts to inform the commissioner of the original LCA study and of the critical review about the identified issues and its intention to revise the existing critical review.

NOTE The commissioner of the original LCA study can be involved in the revision of the existing critical review.

## 4.7 Critical review tasks

### 4.7.1 Chairperson of a critical review panel

The chairperson is a panel member with additional tasks. The chairperson shall:

- set up the panel, ensuring that the competencies of the panel are in accordance with [Clause 5](#) and that independence is in accordance with [3.1](#) and [3.2](#);
- distribute the tasks to be fulfilled between the panel members according to the specific competencies of the panel members, in order to get the full coverage of the tasks to be done and to use in the best manner the specific competencies of the panel members;
- coordinate the whole critical review process and ensure that all panel members have a common understanding of the tasks they need to fulfil, including the fact that the comments should be based on ISO 14040 and ISO 14044;
- ensure that the individual comments from the panel members are recorded and shared with the other panel members;
- ensure that the comments are communicated to the practitioner of the LCA study: the chairperson should intend to resolve any issues of understanding of the comments by the practitioner of the LCA study;
- resolve any conflicting statements between panel members which may lead to the inclusion of a minority position in the critical review statement;
- promote a good relationship between the panel members, the practitioner and the commissioner of the LCA study;
- ensure that the critical review report and the critical review statement are generated and approved by the panel.

### 4.7.2 Reviewer

The reviewer, including the chairperson:

- shall provide comments, including justifications regarding the whole content of the report;
- may use the template (see example in [Annex A](#)) when providing the comments;
- shall contribute to the critical review report;
- shall express agreement or disagreement on the critical review statement and provide the reasons for disagreement: justifications shall be based exclusively on the requirements of ISO 14040 or ISO 14044.

## 5 Reviewer(s) competencies

The reviewer(s) shall be familiar with the requirements of LCA according to ISO 14040 and ISO 14044, or shall have the appropriate scientific and technical expertise.

The reviewer(s) shall have knowledge of, and proficiency in, the following:

- ISO 14040 and ISO 14044;
- LCA methodology and current practice, particularly in the context of LCI, (including data set generation and data set review, if applicable);
- critical review practice;
- the scientific disciplines relevant to the important impact categories of the study;
- environmental, technical and other relevant performance aspects of the product system(s) assessed;
- the language used for the study.

The reviewer shall provide a curriculum vitae and a list of relevant references.

Additional competencies may be required, depending on the goal and scope of the LCA study.

The set of competencies can be provided by different panel members or a group of experts, apart from proficiency in the language used for the study.

There is no need to be accredited to be a reviewer.

The organization that contracts the reviewers shall request that the reviewers demonstrate their qualifications. [Annex B](#) provides an example of a self-declaration statement.

The reviewer should neither subcontract nor delegate his/her work.

## Annex A (informative)

### Template for critical review report

The following headers may be used in the tabular file which is dedicated to produce comments from the reviewer(s), and gather answers from the practitioner of the LCA study:

- “initials” of the reviewer(s), in case of a panel review;
- “index” of the comment (from 1 to...);
- “line number”;
- “clause/subclause” of the LCA report addressed by the comment;
- “paragraph / figure / table”;
- “type of comment”: the type may be referring to “general” (ge), “editorial” (ed) or “technical” (te);
- “reviewer comments”: short and clear phrases may be used to formulate the comments;
- “reviewer recommendation”: a place is left to the reviewer to propose recommendation;
- “practitioner of the LCA study response”: a place is left to the practitioner of the LCA study to elaborate about the comment; if the response does not resolve the comment, it can be resubmitted in the next round of feedback.

[Table A.1](#) provides an example of a template for a critical review report.

**Table A.1 — Example of template for critical review report**

Initials	Index	Line number	Clause/subclause	Paragraph/Figure/ Table	Type of comment	Reviewer comments	Reviewer recommendation	Practitioner of the LCA study response
AB	1	380	2.1	Figure 4	ed	Incorrect terminology	Use ISO language: “Life cycle assessment”, not “Life cycle analysis”	Accepted
CD	2	524	3.4	5th paragraph	te	Sensitivity analysis for allocation procedures is missing	Test alternative physical allocation procedures	Accepted and done in Clause 5
...	...	...	...	...	...	...	...	...



## Annex B (informative)

### Example of self-declaration of reviewer independence and competencies

I, the signatory, hereby declare that:

- I am not a full-time or part-time employee of the commissioner or practitioner of the LCA study (external reviewers only)
- I have not been involved in defining the scope or carrying out any of the work to conduct the LCA study at hand, i.e. I have not been part of the commissioner's or practitioner's project team(s)
- I do not have vested financial, political or other interests in the outcome of the study

My competencies relevant to the critical review at hand include knowledge of and proficiency in:

- ISO 14040 and ISO 14044
- LCA methodology and practice, particularly in the context of LCI, (including data set generation and data set review, if applicable)
- critical review practice
- the scientific disciplines relevant to the important impact categories of the study
- environmental, technical and other relevant performance aspects of the product system(s) assessed
- language used for the study

I attach a curriculum vitae and a list of relevant references.

I declare that the above statements are truthful and complete. I will immediately notify all parties involved (commissioner of the critical review, practitioner of the LCA study, reviewer(s)), as applicable, if the validity of any of these statements changes during the course of the review process.

Date:

Name (print):

Signature:



## Bibliography

- [1] ISO 14025, *Environmental labels and declarations — Type III environmental declarations — Principles and procedures*
- [2] ISO 14045, *Environmental management — Eco-efficiency assessment of product systems — Principles, requirements and guidelines*
- [3] ISO/TS 14067, *Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification and communication*

