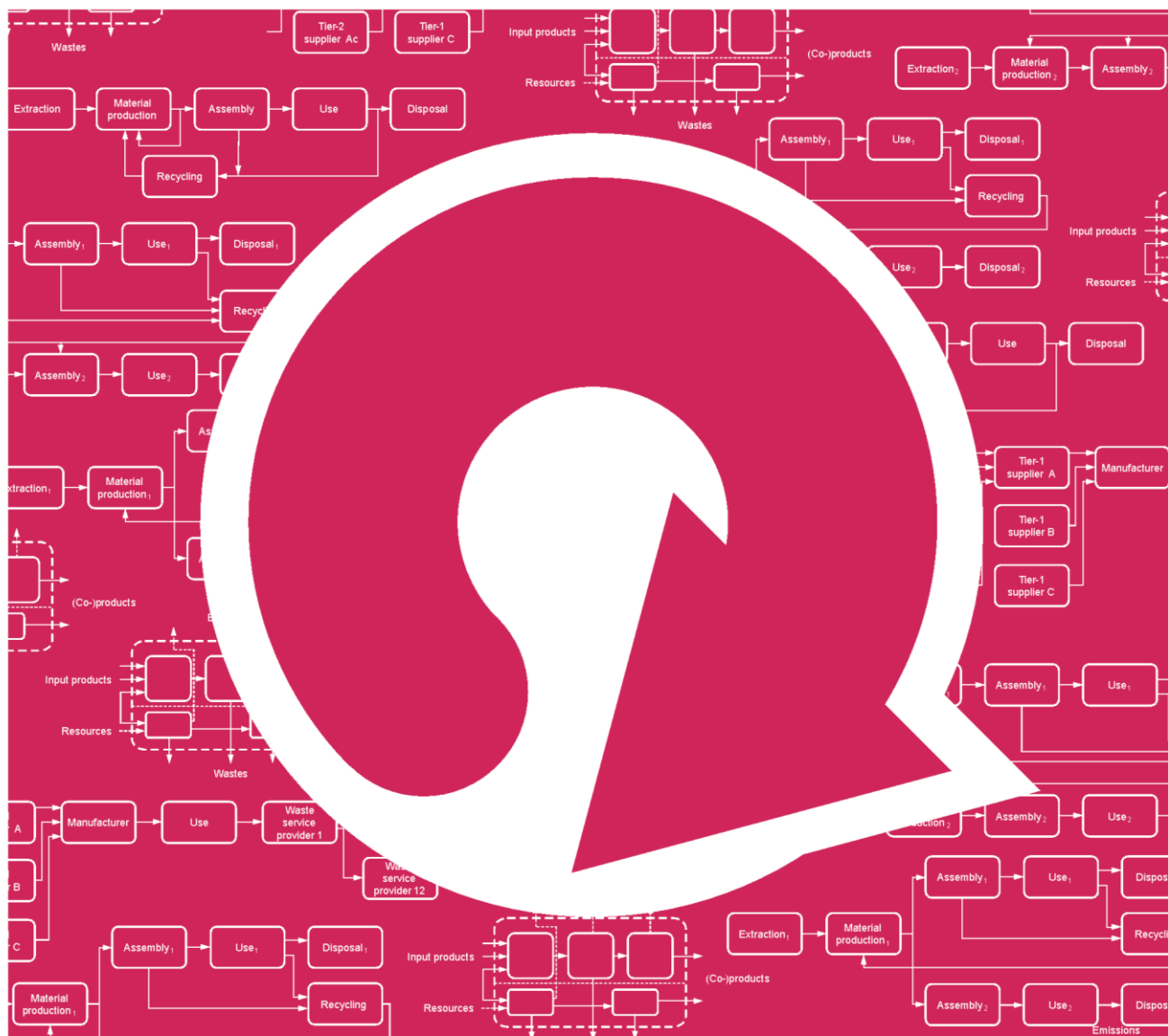


ILCD handbook

International Reference Life Cycle Data System



EUR 24379 EN - 2010

Reviewer qualification for Life Cycle Inventory data sets

First edition

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Preface

To achieve more sustainable production and consumption patterns, we must consider the environmental implications of the whole supply-chain of products, both goods and services, their use, and waste management, i.e. their entire life cycle from “cradle to grave”.

In the Communication on Integrated Product Policy (IPP), the European Commission committed to produce a handbook on best practice in Life Cycle Assessment (LCA). The Sustainable Consumption and Production Action Plan (SCP) confirmed that “(...) *consistent and reliable data and methods are required to assess the overall environmental performance of products (...)*”. The International Reference Life Cycle Data System (ILCD) Handbook provides governments and businesses with a basis for assuring quality and consistency of life cycle data, methods and assessments.

This document provides the detailed provisions on the minimum qualifications required of reviewers, to appropriately review Life Cycle Inventory (LCI) data sets (i.e. emissions and resource consumption data sets). The principle target audience for this guide are the LCA reviewers who are interested to be identified as qualified reviewer within the ILCD System and the system operator of ILCD-based schemes.

Executive summary

Overview

Life Cycle Thinking (LCT) and Life Cycle Assessment (LCA) are the scientific approaches behind modern environmental policies and business decision support related to Sustainable Consumption and Production (SCP).

The International Reference Life Cycle Data System (ILCD) provides a common basis for consistent, robust and quality-assured life cycle data and studies. Such data and studies support coherent SCP instruments, such as Ecolabelling, Ecodesign, Carbon footprinting, and Green Public and Private Procurement

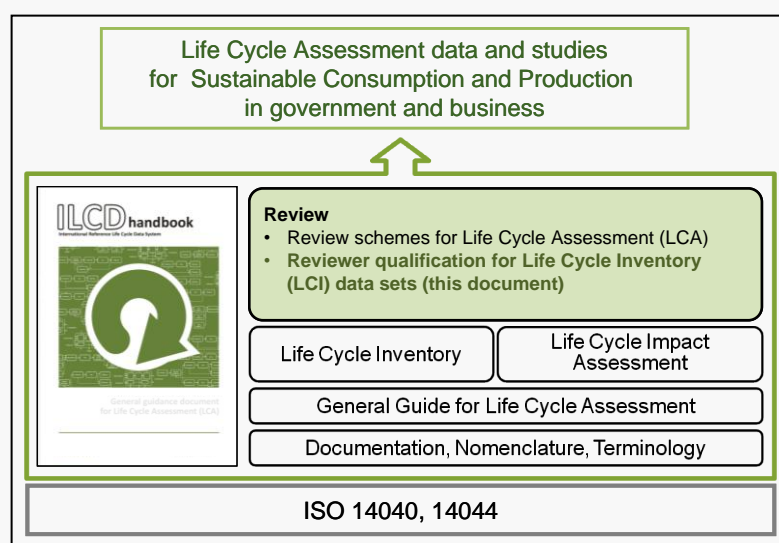
This guide is a component of the International Reference Life Cycle Data System (ILCD) Handbook (see figure). It provides the detailed provisions on the minimum qualifications required of reviewers, to appropriately review Life Cycle Inventory (LCI) data sets (i.e. emissions and resource consumption data sets).

The principle target audience for this guide are the LCA reviewers who are interested to be identified as qualified reviewer within the ILCD System and the system operator of ILCD-based schemes.

About the International Reference Life Cycle Data System (ILCD)

The International Reference Life Cycle Data System (ILCD) consists primarily of the ILCD Handbook and the ILCD Data Network. The ILCD Handbook is a series of technical documents providing guidance for good practice in Life Cycle Assessment for business and government. The ILCD Handbook also serves as a "parent" document for ILCD-compliant sector and product-specific guidance documents, criteria and simplified tools.

Role of this guidance document within the ILCD Handbook



This document specifies the requirements for reviewers of Life Cycle Inventory (LCI) data sets. It provides a comprehensive set of rules, including the evaluation process required, to confirm the qualification of the reviewer.

The principle requirements for reviews are very briefly addressed in the ISO 14040 series. While other LCA-based standards define some review requirements in more detail,

none of them provides information on the required qualifications of reviewers. Therefore, more specific requirements are given in the ILCD Handbook. The ILCD reviewer qualification requirements conform to the LCA-based ISO standards.

This guide is complemented by two documents on “Review schemes for Life Cycle Assessment (LCA)” and “Review scope, methods, and documentation”. Together with the other components (see figure) and supporting tools, these guidance documents form the International Reference Life Cycle Data System (ILCD) Handbook.

Reviewer qualification requirements addressed in this document

For all types of review, independency, expertise and experience of the reviewer(s) is vital. The requirements on eligible reviewers for Life Cycle Inventory data sets are stated in this document in the form of a set of ‘rules’. The four main qualification aspects are Life Cycle Assessment methodology expertise, knowledge of applicable review rules, review or verification experience, and technical expertise on the process or product that is represented by the data set that is to be reviewed.

The approach taken allows for different mechanisms and means of qualification (e.g. work experience, formal qualifications, and experience in conducting reviews or verifications). The aim is flexibility. Differentiation of the level of qualification is achieved using a scoring system. It includes minimum ‘hurdles’ in the four above-mentioned qualification aspects that need to be passed.

The ILCD review schemes can be operated by public authorities or private organisations. During the establishment phase of the scoring system, system operators may organise the reviewer qualification scheme in the form of a self-declaration. Such as reviewer self-declaration registry shall be performed based on the scoring system provided in this document. The preliminary status of such a self-declaration based system shall be clearly communicated.

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1 Definitions

1.1 Definitions specifically related to this document

Applicant: The body that submits the LCA case for review; typically the commissioner or developer of the LCA work, or user of LCA work carried out by others that is to be reviewed.

Comparison: An LCA study comparing alternative systems (e.g. products) that perform a similar or different function, but without explicitly stating superiority of or equality to any of the alternative systems.

Comparative assertion: An environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function [ISO 14040:2006, ISO 14025:2006].

Consumer: An individual member of the general public purchasing or using goods, property or services for private purposes [ISO 14025:2006].

Critical Review: Process intended to ensure consistency between an LCA and the principles and requirements of the international ISO 14040 series standards on LCA and/or other references (e.g. ILCD Handbook). It can be carried out by an expert (internal or external) or a panel of interested parties, depending on the requirements. [Adapted from ISO 14040:2006].

Data set (LCI or LCIA results data set): A document or file with life cycle information for a specific product or other reference (e.g. site, process, etc.), covering descriptive metadata as well as the quantitative life cycle inventory and/or life cycle impact assessment results data.

Disclosed to the public: Where the audience includes the general public, being non-technical and 'external', i.e. the study is publicly accessible¹

Independent external reviewer: This is the reviewer, recognised by the system operator. They are not involved in the definition or development of the reviewed case and are therefore independent. This includes both the reviewer as a person and their employer as an organization. They are external, and are not part of or have no relevant relations for at least one year to any organization that performed, commissioned, financed or otherwise had relevant influence on the study to be reviewed (i.e. is external). The phrase "relevant relations" includes financial, legal or similar ties that would result in a conflict of interest such as subsidies, joint-venture partners, development partners, sales partners, or any other strategic cooperation partners.

Independent internal reviewer: A Reviewer recognised by the system operator, who is not involved in the study to be reviewed, or quantitatively relevant parts (e.g. background data) but can be part of the organization that performed or commissioned the LCA work.

Independent external review: A critical review carried out by an independent external reviewer. In case a single reviewer does not fulfill the skill requirements within the review case, more than one reviewer is required ("review team") to meet the required qualification.

Intended audience: Audience to whom the results of the study are intended to be communicated [Adapted from ISO 14044:2006].

LCA Case: One of the types of LCA work that are differentiated within this review frame and scheme.

¹ Note that this includes, for example, websites and scientific journals. The peer review process of journal papers is a separate issue that is not addressed here, while the underlying LCA study is.

LCA review: A process intended to ensure consistency between an LCI or LCA work and the principles and requirements of an LCA scheme. In the context of the ILCD, this LCA scheme is the ILCD Handbook and the underlying ISO 14040 and 14044 standards.

LCA scheme owner: See 'system operator' (below).

LCA Verification: See 'LCA review' (above).

Non-technical audience: Audience that has no real knowledge or distinct skills in LCA methodology.

Pre-reviewed information: Life Cycle Inventory (LCI) or Life Cycle Impact Assessment (LCIA) data sets or other information that is used in LCA work and has already been reviewed under this scheme.

Pre-verified information: See 'Pre-reviewed information' (above).

Review: See 'critical review' (above).

Review frame: Concept defining the general review needs and types, types of actors, principal roles and responsibilities, scope, methods, reporting, and reviewer qualification aspects to be addressed.

Review scheme: Specific provisions for review of an LCA work, defining the respective requirements on review type and reviewer qualification and independence.

System operator: An organization that defines develops or adopts the rules, both structural and procedural. The system operators typically also recognize reviewers, whether of a private scheme such as the EPD program operator, or of a public scheme such as an governmentally recognized national/regional organization responsible for the national/regional application.

Technical audience: An audience with proven skills in LCA methodology.

Third party: A person or body that is recognized as being independent of the parties involved, as concerns the issues in question [ISO 14025:2006]. For example an interested party, other than the commissioner or the practitioner of the study. [ISO 14044:2006].

1.2 Other definitions

Accreditation Body: An organisation that acts as an accreditation party in the review scheme, which recognizes that the review qualifications and review management are in line with the review rules (established by the system operator). Its responsibility is to assure the qualification, capability and independency of the reviewer. [Adapted from ISO 9001].

Accreditation Party: Represents the independent body for the accreditation of the third party. Its responsibility is to ensure the qualification, capability and independency of the third party.

Accredited third party review: Where the critical review is carried out by an accredited independent external reviewer².

Background system: Part of the life cycle of a system (e.g. product system) on which the operator of the analysed process, product or other system has no direct information access, control or decisive influence. For example, this typically covers most of the upstream/supply-chain processes, and generally all processes further downstream not under direct contractual or other control or influence of the process operator.

² An accredited third party review is not used in the ILCD review schemes. Please note however, that accreditation may be an additional requirement imposed by the specific application scheme that is supported by the to-be-reviewed LCA work.

Business to Business (B2B): Describes commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer.

Business to Consumer (B2C): The communication between business and an individual member of the general public purchasing or using goods, property or services for private purposes.

Carbon footprint / label / declaration: Private and public schemes that calculate and/or communicate information related to the contribution to climate change that is related to a product or other reference (e.g. site, company, activity).

Eco-design: An approach to design of a product with special consideration for the environmental impacts of the product throughout its whole lifecycle.

Environmental Label or Environmental declaration: A claim which indicates the environmental aspects of a product or service. An environmental label or declaration may take the form of a statement, symbol or graphic, found for example on a product or package label, in product literature, in technical bulletins, or in advertising or publicity. [Adapted from ISO 14020:2000].

Environmental Label and Declarations - Type I Environmental Labelling (Ecolabel): A voluntary, multiple-criteria-based third party programme that awards a licence, authorizing the use of environmental labels on products. These labels indicate overall environmental desirability of a product within a particular product category based on life cycle considerations. [ISO 14024:1999] Examples include the Japanese EcoMark, the European Union EU Flower, the Scandinavian Swan, the German Blue Angel, and the Thai Green Label.

Environmental Label and Declarations - Type III environmental declarations: The Type III declaration (e.g. Environmental Product Declaration, EPD) reports the environmental performance of specific products over their entire life cycle or defined parts thereof. It is standardised in ISO 14025 and has initiated various private schemes, e.g. the International EPD System (consortium in Sweden), EcoLeaf (by JEMAI in Japan), the AUB scheme (building industry in Germany) etc.

Environmental Management Systems (EMS) Designed for sites and companies etc, the EMS is a structured approach which sets out environmental targets and methods that enable these targets to be achieved. EMS was standardised as ISO 14001 with national and regional schemes, such as the Environmental Management and Auditing Scheme (EMAS) of the European Commission.

Environmental Product Declaration (EPD): see 'Environmental Label and declarations - Type III environmental declarations' (above).

Foreground system: Part of the life cycle of a system (product or other reference) around which the life cycle model is built and to which the study relates. This is where the process or product operator has direct information access and control, for example the producer's site and other processes operated by their company or contractors (e.g. goods transport, head-office services, etc).

Independent review panel: A panel of independent external reviewers with at least two members in addition to the panel chair. Each of them has to guarantee an independent review of the study.

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 [ISO 14044:2006].

Key Environmental Performance Indicator (KEPI): A set of technical and management parameters of a system (e.g. a product or process) over its life cycle that quantitatively

represent the system's environmental life cycle performance. It is identified with the help of detailed LCAs of the product / product-group and is used in product(-group) specific Ecodesign.

Life Cycle Assessment (LCA): Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a system (e.g. product) throughout its life cycle. [Adapted from ISO 14044:2006].

LCA application: The use of LCA information in instruments for decision support, monitoring, reporting, communication etc. Examples are Ecodesign, identifying criteria for Type I Ecolabels, LCA-based product comparisons, monitoring development of environmental performance of products / product groups / nations, addressing indirect effects in environmental management schemes, communicating product life cycle performance with EPDs/Type II Ecolabels, etc.

LCA work: Any activity that applies LCA methodology, resulting in an LCI data set, an LCIA model, method or characterisation factor, or an LCA study of any kind.

Life Cycle Impact Assessment (LCIA): Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product. [ISO 14044:2006]

Life Cycle Inventory analysis (LCI): Phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a given system (e.g. product) throughout its life cycle. [adapted from ISO 14044:2006] It results in LCI data for the system, such as single operations/processes, whole systems, etc, over the life cycle.

Product category rules (PCR): set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories [ISO 14025:2006].

Stakeholder panel: A group of interested parties involved in the review following an open invitation. Their opinion is to be considered in the review and if requested be included in the final review report. These interested parties can include such bodies and individuals as government agencies, non-governmental groups, competitors and affected industries. The confidentiality concerns of the applicant are to be met, without unduly compromising the value of the involvement of the interested parties.

2 Introduction and overview

The global market place is increasingly demanding science-based, verified and comparable information about the environmental performance of products and services. Life Cycle Assessment (LCA) is widely recognised as the most advanced method for obtaining such information on a quantitative, comparable basis. LCA is internationally standardized in the ISO 14040 series.

Critical review of LCA is addressed in the ISO 14040 series in a broad manner, giving a framework for conducting such a review. Other LCA-based standards define some review aspects (ISO 14025 on Type III environmental declarations). Details on reviewer qualifications and review procedures are however not provided. This means that the relevant ISO 14020ff and 14040ff standards alone, do not provide practical guidance for reviewing Life Cycle Inventory data (LCI, emissions and resource consumption), data for environmental Impact Assessment for LCA (LCIA) nor overall LCA studies and associated applications. Therefore detailed and specific guidance for reviewing LCA work is required.

A review framework and coherent review schemes are expected to considerably increase validity and comparability of reviews, lower the efforts and costs for review, and support higher trustworthiness and acceptance of LCA. This is a pre-requisite for the regular use of LCA in stakeholder and public policy contexts.

The International Reference Life Cycle Data System (ILCD) provides, through the ILCD Handbook, a series of guidance documents as a foundation for consistent and quality-assured life cycle data and assessments. This is supported by the LCI data sets in the ILCD Data Network, for which the ILCD Handbook is also the basis. (See separate document “ILCD introduction and overview” for further details).

The purpose and scope of this Guidance Document is to specify the requirements for reviewers of Life Cycle Inventory data sets as part of the International Reference Life Cycle Data System (ILCD). It provides a complete set of rules, including the process which is necessary to qualify reviewers. Reviewer qualification requirements for other cases of LCA work is expected to be developed subsequently.

3 Reviewer qualification for Life Cycle Inventory data sets

3.1 Introduction

This document specifies the requirements for reviewers of LCI data sets. It provides a complete set of rules, including the necessary process to follow in order to qualify the reviewers.

The Applicant, for example the data set or database developer or commissioner, has to choose the reviewer from a qualified registered reviewer list (or ensure that they are qualified and recognised, as a preceding step) according to the flow diagram in figure 1.

Eligible reviewers have to meet the requirements detailed in this document, possess the necessary language skills, and demonstrate that they are independent and external. *For further information the latter two items are defined in the document "Review schemes for Life Cycle Assessment (LCA)".*

During the establishment phase of the scoring system, system operators may organise the reviewer qualification scheme in the form of a self-declaration as an alternative option. Such as reviewer self-declaration registry shall be performed based on the scoring system provided in this document. The preliminary status of such a self-declaration based system shall be clearly communicated.

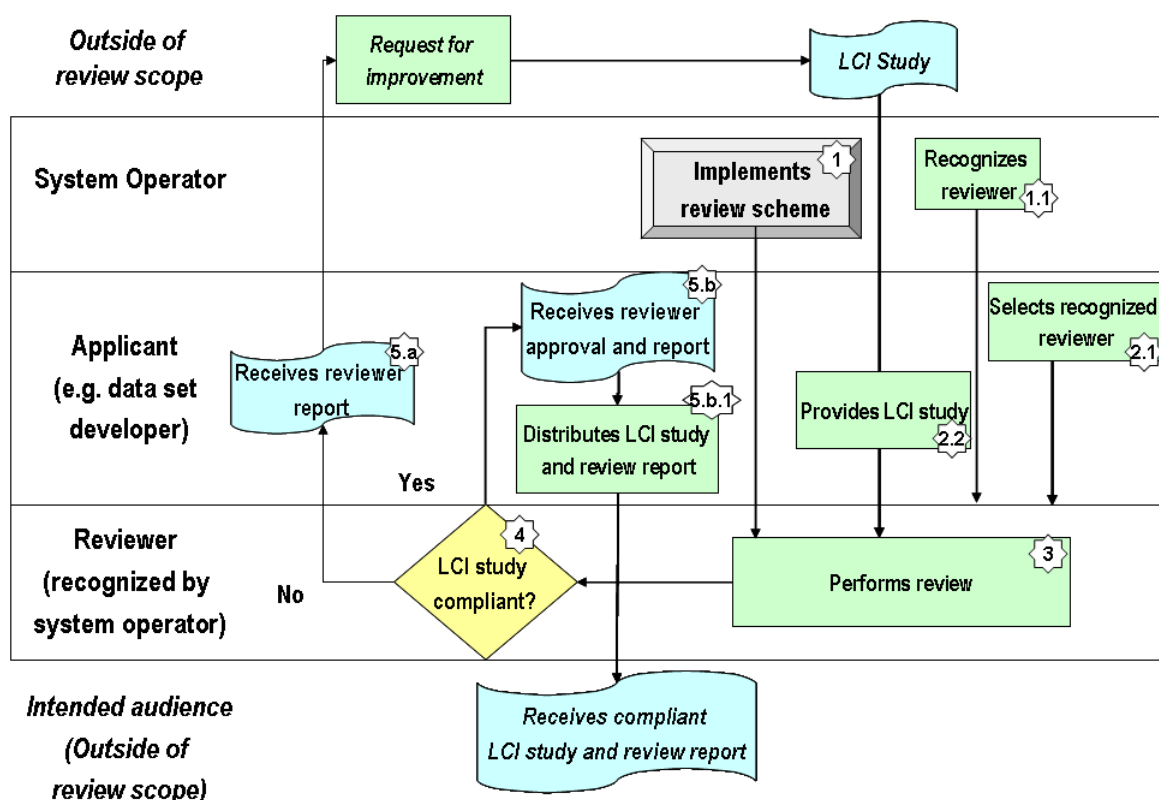
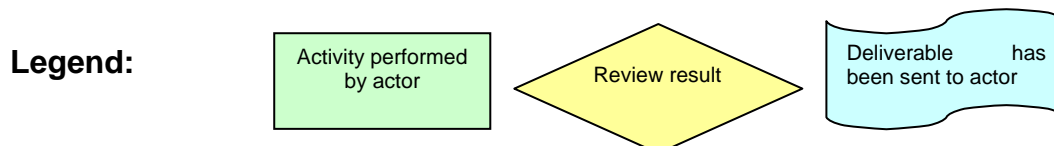


Figure 1 Review scheme for LCI data sets



3.2 Qualification process

A System Operator (or an organisation mandated by the system operator, which is also referred to here as "system operator") is responsible for the reviewer evaluation. This has to be performed through an evaluation of the candidate's profile. Moreover, in the initial step of the qualification process, the self registry of reviewers can be carried out for a maximum period of 3 years.

In order to obtain all relevant information on the candidates, the System Operator will request the curriculum vitae (CV) and additional documents, as required depending on the case, reporting the experiences of the candidate and certifying acquired qualification. The System Operator may request that the CV is in compliance with a later-specified format.

In the case of an Applicant requesting a review to be carried out by an unregistered reviewer, the Applicant must ensure that the candidate successfully applies for the recognition beforehand.

The qualification process should ascertain that the candidate possesses the necessary experience, competence and skills that are specified below in this document, and that these are demonstrated within the CV as well as through supporting documentation (e.g. certificates, etc).

The System Operator then analyses the CV and any additional documentation provided by the candidate:

- The CV must demonstrate that the candidate fulfils all the mandatory qualification requirements. If this is the case, then the candidate is qualified. The mandatory qualification requirements are reported in page 16 of this document.
- If the candidate lacks specific competence, experience or skills, the CV must be refused. The candidate then has the option to fill the gap and resubmit the candidacy another two times within the same calendar year, i.e. a maximum of three attempts are granted per calendar year; the System Operator can reduce this number.

The analysis of qualification, recognition, and a potential registration may involve a fee to be paid by the candidate to cover the expenses of the System Operator. No requirements or restrictions are foreseen in this guidance for such a fee.

Figure 2 presents the operational procedure for qualification of a reviewer.

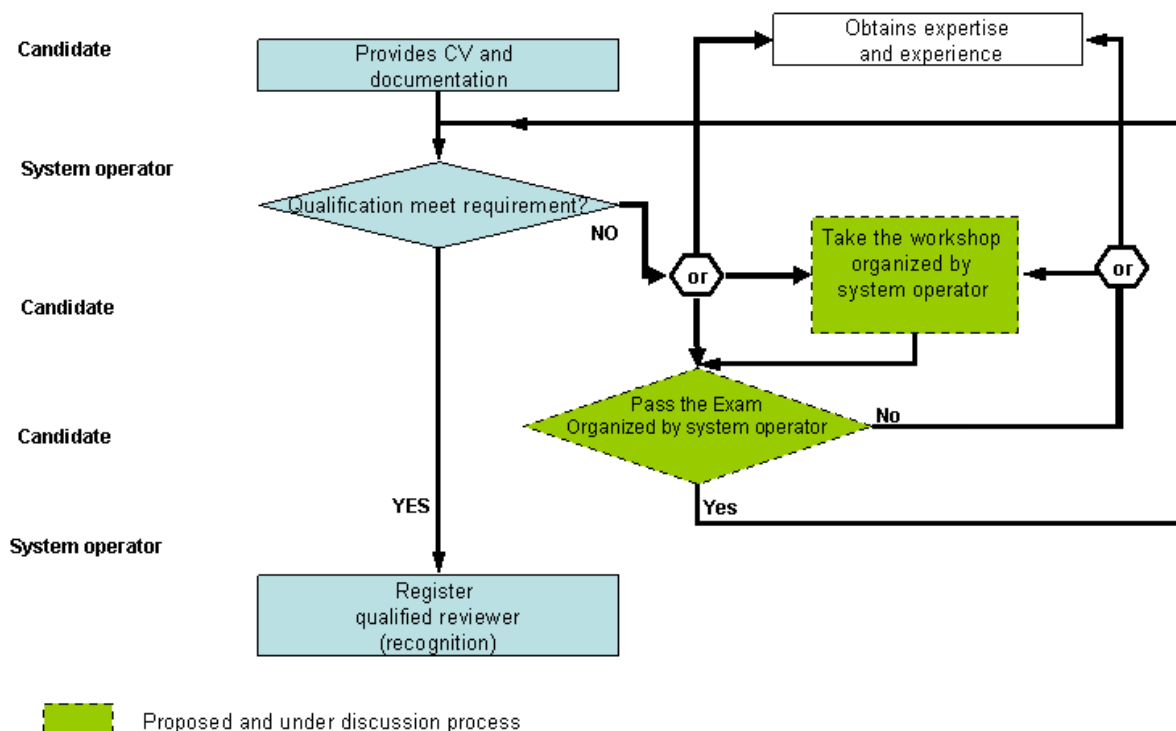


Figure 2 Process and decision chart for evaluation of qualification and recognition

The results of the qualification process have to demonstrate the fulfilment of competence and skills within the following topics:

- Review scheme, rules and standards;
- LCA methodology and practice;
- Review, verification and audit practice;
- Knowledge of processes and technologies modelled and being related to specific sectors, ³ and use phase (as applicable), gained through work experience related to these sectors, and/or other relevant means.

General and specific reviewer skills

The **general reviewer skills** required, are knowledge of:

- International Standards, applicable regional/national legislation, and rules on:
 - LCA methodology;
 - Review, verification, and audit practice;
 - Environmental legislation for the technologies or other activities represented by the LCI data set. NB this also relates to any potentially included and quantitatively relevant unit processes, if this data has not been verified before.

³ For the EU, the qualification of the knowledge about technologies or other activities is assigned according to the classification of NACE codes (Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2). Equivalent classifications of other international organisations can also be used.

- LCA methodology and practice, particularly in the context of LCI.
- Applicable review scheme and rules for LCI data sets.
- Procedures linked to review and audit practice.
- Environmental, technical and other performance aspects of the technologies or other activities represented in the LCI data set. NB this also relates to any potentially included and quantitatively relevant unit processes, if this data has not been verified before.

The **specific reviewer skills** required are outlined in the following documents:

- International Reference Life Cycle Data System (ILCD) Handbook – General guide for Life Cycle Assessment (LCA).
- International Reference Life Cycle Data System (ILCD) Handbook – Specific guide for Life Cycle Inventory (LCI) data sets.
- International Reference Life Cycle Data System (ILCD) Handbook - Review scope, methods, and documentation for Life Cycle Assessment (LCA).

Review team

If one reviewer alone does not fulfil all the above requirements, the review framework allows for having more than one reviewer to jointly fulfil the requirements, forming a "review team".

3.2.1 Scoring system for reviewer qualification

The CV and additional documents provided by the candidate must demonstrate that they possess the minimum required skills and experience in the following topics:

- Review and audit practice;
- LCA methodology and practice;
- Technologies, processes or other activities represented by the LCI data set;
- Personal attributes.

The qualification is based on a scoring system encompassing the attribution of a score for the first three of the four above-mentioned topics. Table 1 presents the scoring system for each relevant competence and experience topic.

Table 1 Scoring system for eligible reviewers/review teams and for qualification as a potential member of a review team.

		Barrier level (minimum required)	Score (points)				
			1	2	3	4	
Mandatory	Topic Verification and audit practice	Criteria					
		Years of experience ¹	3	3 – 4	5 – 8	9 – 14	> 14
		Number of reviews ²	3	3 – 5	6 – 15	16 – 30	> 30
	LCA methodology and practice	Years of experience ³	3	3 – 4	5 – 8	9 – 14	> 14
		"Experiences" of participation in LCI work ⁴	5	5 – 8	9 – 15	16 – 30	> 30
	Technologies or other activities represented by the LCI data set	Years of experience ⁵	3 (within the last 10 years)	3 – 5 (within the last 10 years)	6 – 10 (within the last 20 years)	11 – 20	> 20
Optional ⁶	Verification and audit practice	Optional scores relating to audit	<ul style="list-style-type: none"> ▪ 2 points: Accreditation as third party reviewer for at least one EPD Scheme, ISO 14001, or other EMS. ▪ 1 point: Attended courses on environmental audits (at least 40 hours). ▪ 1 point: Chair of at least one review panel (for LCA studies or other environmental applications). ▪ 1 point: Qualified trainer in environmental audit course. 				
	LCA methodology and practice	Relating to LCA methodology and practice	<ul style="list-style-type: none"> ▪ 1 point: At least 5 methodological articles on LCA in peer-review journals or books. ▪ 1 point: Active participation in at least 3 research projects on LCA-related methodological issues or case studies. 				
	Technologies or other activities represented by the LCI data set	Formal scientific qualification:	Work experience outside the private sector:	<ul style="list-style-type: none"> ▪ 1 point: At least one PhD obtained. ▪ 0.5 point: At least one Masters thesis or equivalent completed. 			
			Work experience within the private sector:	<ul style="list-style-type: none"> ▪ 1 point: At least 3 years work experience 			
		Work experience within the private sector:	<ul style="list-style-type: none"> ▪ 0.5 point per one additional industry sector (up to 2.5 points in total). 				

Notes:

1) Years of experience in the field of review and audit in the environmental field.

2) Number of reviews as a reviewer, or ISO 14040/14044 or 14025 compliant verifications of Environmental Product Declarations (EPD), or LCI data sets.

3) Years of experience in the field of LCA work, starting from University degree (Masters or equivalent) or Bachelor degree if Masters thesis predominantly includes LCA work.

4) Participation in the LCI work of the development/modelling of LCI data sets in a publicly accessible database (the specific role in database development/modelling has to be documented). 10 data sets = 1

"experience". Where the data set is not publicly accessible, the system operator should request the data set or similar evidence to prove the candidate's experiences under a confidentiality agreement.

5) Years of professional work experience in the sector or with the analysed technology or system represented by the LCI data set to be reviewed and its included, quantitatively relevant unit processes, if applicable. If this included data has not yet been verified beforehand, then it should relate to the same review type as applied to the LCI data set or a stricter one. "Experience" refers to having worked in production, monitoring, research or development. It also includes other production / operation-related, or environmental / waste-related activities in the related private sector production or operations, or in research. Please note: The qualification of knowledge about technologies or other activities is assigned according to the classification of NACE codes (*Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2*). Equivalent classifications of other international organisations can also be used. Experience gained with technologies or processes related to any sub-sector are considered valid for the whole sector.

6) The additional scores are complementary and can be totalled. Note that the named scores are the maximum that can be obtained (unless otherwise stated), e.g. under "LCA methodology and practice" a maximum of 1 point can be obtained for methodological articles on LCA in peer-reviewed journals or books, NOT 1 point for any five such articles.

As the minimum qualification can be met by one reviewer alone or by several reviewers that form a "review team", two cases need to be separately considered:

Quantitative scores for eligible reviewer/review team

The minimum qualification as an eligible reviewer or review team for "generic and average LCI data sets" is obtained by a reviewer or review team if a minimum total score of 10 points (out of a possible maximum of 32) is achieved, and that the given individual "barrier level" for each of the 5 mandatory single criteria is passed. This can be achieved by one individual reviewer or accumulated by the review team.

The eligibility refers to the one or more sectors for which the barrier level under "Technologies or other activities represented by the LCI data set" has been passed.

Quantitative scores for a potential member of a review team

At the level of an individual reviewer who does not independently achieve the minimum qualification as defined above, the following requirement is necessary for recognition as a potential member of a review team:

- For "Verification and audit practice": A minimum total score of 5 points (of a possible of 32) must be achieved, and the given individual "barrier level" for each of the 2 mandatory single criteria under this topic must be passed.
- For "LCA methodology and practice": A minimum total score of 5 points (of a possible of 32) must be achieved, and the given individual "barrier level" for each of the 2 mandatory single criteria under this topic must be passed.
- For "Technologies or other activities represented by the LCI data set": A minimum total score of 3 points (of a possible 32) must be achieved, and the given individual "barrier level" for the 1 mandatory single criteria under this topic must be passed.

Please note: Points can be obtained across all three topics, while the obtained qualification refers to at least one of the three topics. Reviewers with work experience in more than one sector can qualify for more than one sector with different scores depending on the extent of their experience.

Personal attributes

For any one individual reviewer and member of a review team, certain personal objectives have to be met. Verifiers responsible for performing the verification of data sets should have personal characteristics based on §7.2 ISO 19011:2002.

These requirements, for their nature, cannot be the principal factor of qualification but they have to inspire the verifier's work. In order to include these personal attributes, the potential reviewer or member of a review team will be excluded in case they were found guilty in criminal court cases. This will be evaluated via an extract from the candidate's citizenship police registry not older than 6 months, and that is to be provided by the candidate to the System Operator.

Communication of demonstrated reviewer qualification

The attained sub scores for each of the three scoring topics and the total score will be made available upon request and/or listed next to the name of the registered verifier or potential member of a review team, if a publicly accessible registry is maintained. This serves to improve the choice of the applicants towards the more experienced reviewers within the registry. This, at the same time, serves as an incentive for the reviewers to maintain and improve their qualification.

Eligible/qualified reviewers and potential members of a review team can communicate their own recognition and achieved scores, through their own means of communication, such as via the internet for example.

3.2.2 Maintenance and updating of qualification

The qualification of a recognised reviewer and potential member of a review team must be renewed at least every three years.

In order to remain a recognised reviewer or potential member of a review team, the individual has to prove that in the last three years they have carried out at least three reviews.

If this requirement is not fulfilled then the qualification is no longer valid and the recognition is withdrawn. In this case the verifier has to request a new qualification and recognition, providing an up-to-date CV and demonstrate that they meet the requirements for the qualification.

The registered reviewer may also request an update of their registry within the period of validity to reflect an improved qualification with a higher score.

3.3 Outlook: Training and examination

In parallel to applying for the reviewer qualification scheme, and as detailed in the following subchapters, training and written exams may be developed, that provide an alternative means to allow potential reviewers to demonstrate their abilities. This will facilitate new reviewers to enter this system. The exact provisions and procedures are still in development, and the proposed procedure is shown (in green) in figure 2.

The working language for the training and exams shall be considered the language in which the candidate demonstrates their qualification.

3.3.1 Training

The training course is designed to help obtain additional (optional) points in the topics "Review or verification" and "LCA Methodology". This training excludes

“Technology/processes”. The training aims to increase, improve and support qualification and general capacity building.

Minimum hours of confirmed attendance: 40 (per topic) count as successful participation. It should be noted that the training is not necessarily linked to an exam.

3.3.2 Exams

The following areas and types of exams are proposed:

- “Review and audit practice”: Theoretical test about structure and procedures of verification and auditing as well as the relevant standards and guidance documents.
- “LCA methodology and practice”: Theoretical test examining depth of knowledge of the relevant standards and guidance documents. There is also a practical test applying a modified test LCA study, with methodological errors built in to be identified by the applicant.

The exam can substitute the barrier-level requirement for all topics. Theory and practice parts should be offered independently. The exams shall be prepared, approved and peer reviewed by reviewers that have successfully qualified through their CV (and preferably participated in earlier exams also).

There are currently at least two similar LCA examinations in operation (2009). The examination exclusive to LCA methodology knowledge “Life Cycle Assessment Certified Professionals Exam” began operation in the United States in 2008. Another LCA exam is operated by Japan Environmental Management Association for Industry (JEMAI). Experiences gained of these and other exams and training, can inform the definition of training courses, and particularly exams under the ILCD review schemes for LCA.

3.3.2.1 Theory (for “Review” and “Methodology” only)

This test shall be held in written format and examine the candidate’s knowledge on provisions of the relevant ILCD guidance documents, e.g. via multiple choice tests (with at least 5 possible answers to choose from) on specific provisions, terms/definitions, concepts and principles.

- Topic “Review or Verification”: The test shall cover at least the following number of questions per subject:
 - 3 Questions on actors and their roles;
 - 3 Questions on definitions of independence/external/review types;
 - 2 Questions on work flow of review and verification;
 - 15 Questions on scope and methods of review⁴;
 - 5 Questions on reporting of review.
- Topic “Methodology”: The test should cover at least the following number of questions per LCA phase on provisions, terms/concepts:
 - 6 questions on goal;
 - 15 questions on scope;
 - 10 questions on LCI;

⁴ The exam shall use the requirement and method provided in Review scope, methods, and documentation

- 5 questions on LCIA;
- 10 questions on interpretation;
- 10 questions on reporting.
- No supporting literature shall be allowed with the candidates into the exam; access to the internet or other means of external communication shall not be available.
- The theoretical exam should have been pre-tested anonymously with at least two or three qualified reviewers to demonstrate their suitability. They will also check that the difficulty level is appropriate and the exam may have to be adjusted based on the outcome of this pre-test.

3.3.2.2 Practice

- A test case⁵ shall be prepared by modifying existing and successful ILCD reviewed data sets, and building in errors that can be identified with the knowledge and experience of a qualified reviewer in the exam scenario.
- The following number/range of errors should be built in:
 - 2 to 4 errors – on method inconsistency goal and scope;
 - 2 to 4 errors – on method inconsistency scope and LCI;
 - 3 to 6 errors – on LCI (including values that are too low and too high, wrong/missing flows and technology errors);
 - 4 to 6 errors – incorrect/insufficient documentation regarding methodology aspects;
 - 4 to 6 errors – incorrect/insufficient documentation regarding technology aspects;In total 10 to 14 errors shall relate to “Method” and 10 to 12 to “Processes/technology”. The candidate will have to prepare a condensed review report and document the general workflow.
- Supporting raw data and technical literature should be made available to the candidates during the exam, including the ILCD guidance documents as well as review reporting templates. Access to the internet or other means of external communication will not be provided. The exam will allow more than sufficient time to identify the errors. Speed is not an issue to be evaluated, while the exam should typically last 4 to 8 hours, depending on the complexity of the data set (unit process, with potential parameterization, vs LCI results).
- In the exam evaluation, the identified errors – as documented in the review report - are counted separately for the topics “Method” and “Process/Technology”. If the candidate has also applied for the topic “Review and Verification”, the review report itself is judged for the topic “Review and Verification”, through its accuracy in terms of structure and appropriateness. However this does not account for any wrongly identified method or process/technology errors. The review report’s quality is to be checked through an expert judgment; this expert shall be an ILCD qualified reviewer.

⁵ Test case can be single operation and/or black-box unit process LCI data set, with or without attached LCI report and an LCI result data set, with its key contributing and included e.g. 3 or 4 unit processes. Parameterize data set is preferable.

- The test cases should have been pre-tested anonymously with two or three qualified reviewers to demonstrate that this is possible, but also that the errors are not too obvious; they may have to be adjusted based on the outcome of the pre-test.
- Test cases for the different sectors should use processes or products that are typical for that sector. Test cases that have been used in exams shall not be used again in later exams, even if modified.

Evaluation of the exam

The System Operator needs to identify the appropriate mechanism as there are two mechanisms for evaluating the exam results - absolute and relative:

- "Absolute" means applicants pass that have achieved, for example, 90%.
- "Relative" means that, for example, 85% of the participants pass each year or any 6 months. This would potentially require time coordination and pool tests across several countries to achieve a more representative number of candidates.

4 Annex A: Development of this document

Development of this document

Based on and considering the following documents

This document has been developed starting from and further differentiating and specifying the provisions of the ISO standards 14024, 14025, 14040, and 14044. A large number of LCA manuals of business associations, national LCA projects, consultants and research groups, as well as scientific LCA publications have been analysed and taken into account (for further details see Explanatory Memorandum).

Drafting

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External expert meeting

The external experts have discussed earlier drafts of this document with the contractors and the JRC staff, during two dedicated one-day workshops.

Invited stakeholder consultation

An earlier draft version of this document has been distributed to more than 60 organisations and groups, covering EU Member States, European Commission (EC) Services, National Life Cycle Database Initiatives outside the European Union, Business Associations as members of the Business Advisory Group, Life Cycle Assessment Software and Database Developers and Life Cycle Impact Assessment Method Developers as members of the respective Advisory Groups, as well as other relevant institutions.

Public consultation

The public consultation was carried out on the advance draft guidance document from 10 June 2009 to 31 August 2009. This included a public consultation workshop which took place from June 29 - July 2, 2009 in Brussels.

Overview of involved or consulted organisations and individuals

The following organisations and individuals have been consulted or provided comments, inputs and feedback during the invited or public consultations in the development of this document:

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Invited consultation

Internal EU steering committee

- European Commission services (EC),
- European Environment Agency (EEA),

- European Committee for Standardization (CEN),
- European Topic Centre on Resource and Waste Management
- IPP representatives of the 27 EU Member States

National database projects and international organisations:

- United Nations Environment Programme, DTIE Department (UNEPDTIE)
- World Business Council for Sustainable Development (WBCSD)
- Brazilian Institute for Informatics in Science and Technology (IBICT)
- University of Brasilia (UnB)
- China National Institute for Standardization (CNIS)
- Sichuan University, Chengdu, China
- Japan Environmental Management Association for Industry (JEMAI)
- Research Center for Life Cycle Assessment (AIST), Japan
- SIRIM-Berhad, Malaysia
- National Metal and Material Technology Center (MTEC), Focus Center on Life Cycle Assessment and EcoProduct Development, Thailand

Advisory groups

Business advisory group

- Alliance for Beverage Cartons and the Environment (ACE), Europe
- Association of Plastics Manufacturers (PlasticsEurope)
- Confederation of European Waste-to-Energy plants (CEWEP)
- European Aluminium Association
- European Automobile Manufacturers' Association (ACEA)
- European Cement Association (CEMBUREAU)
- European Confederation of Iron and Steel Industries (EUROFER)
- European Copper Institute
- European Confederation of woodworking industries (CEI-Bois)
- European Federation of Corrugated Board Manufacturers (FEFCO)
- Industrial Minerals Association Europe (IMA Europe)
- Lead Development Association International (LDAI), global
- Sustainable Landfill Foundation (SLF), Europe
- The Voice of the European Gypsum Industry (EUROGYPSUM)
- Tiles and Bricks of Europe (TBE)
- Technical Association of the European Natural Gas Industry (Marcogaz)

LCA database and tool developers advisory group

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- CML Institute of Environmental Science, University of Leiden (The Netherlands)
- CODDE Conception, Developement Durable, Environnement – Paris (France)
- ecoinvent centre – (Switzerland)
- ENEA – Bologna (Italy)
- Forschungszentrum Karlsruhe GmbH - Eggenstein-Leopoldshafen (Germany)
- Green Delta TC GmbH – Berlin (Germany)

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- Ifu Institut für Umweltinformatik GmbH – Hamburg (Germany)
- IVL Swedish Environmental Research Institute – Stockholm (Sweden)
- KCL Oy Keskuslaboratorio-Centrallaboratorium Ab – Espoo (Finland)
- LBP, University Stuttgart (Germany)
- LCA Center Denmark c/o FORCE Technology – Lyngby (Denmark)
- LEGEP Software GmbH - Dachau (Germany)
- PE International GmbH – Leinfelden-Echterdingen (Germany)
- PRé Consultants – Amersfoort (The Netherlands)
- Wuppertal Institut für Klima, Umwelt, Energie GmbH – Wuppertal (Germany)

Life Cycle Impact Assessment method developers advisory group

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- CML Institute of Environmental Science, University of Leiden (The Netherlands)
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- PRé Consultants – Amersfoort (The Netherlands)
- LCA Center Denmark – Lyngby (Denmark)
- Musashi Institute of Technology
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Abstract

Life Cycle Thinking (LCT) and Life Cycle Assessment (LCA) are the scientific approaches behind modern environmental policies and business decision support related to Sustainable Consumption and Production (SCP). The International Reference Life Cycle Data System (ILCD) provides a common basis for consistent, robust and quality-assured life cycle data and studies. Such data and studies support coherent SCP instruments, such as Ecolabelling, Ecodesign, Carbon footprinting, and Green Public and Private Procurement. This guide is a component of the International Reference Life Cycle Data System (ILCD) Handbook (see figure). It provides the detailed provisions on the minimum qualifications required of reviewers, to appropriately review Life Cycle Inventory (LCI) data sets (i.e. emissions and resource consumption data sets). The principle target audience for this guide are the LCA reviewers who are interested to be identified as qualified reviewer within the ILCD System and the system operator of ILCD-based schemes.

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