

Relevant Standards for Life Cycle Assessment (LCA) Studies

Guideline 2 in the CSIR's LCA Guideline Series

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1. Introduction

This Guideline forms part of the **CSIR’s Life Cycle Assessment (LCA) Guideline series**.

Guideline 1 is the main guideline, providing information on how to conduct an LCA study in the South African context.

This accompanying guideline, **Guideline 2**, provides a list of the available standards relevant to Life Cycle Assessment.

According to Regulation 5, sub-regulations (1)(k) and (1)(l) of the Extended Producer Responsibility (EPR) Regulations; producers must *“conduct a life cycle assessment, in relation to the identified product, in accordance with the applicable standards within 5 years of implementation of their extended producer responsibility scheme”*.

This guideline therefore provides an overview of applicable standards. The specific standard to be followed in each case will depend on the goal and scope of the study (refer to Guideline 1 for more information).

Finally, this Guideline also provides an overview of the international landscape, focusing on countries that have developed specific LCA methodologies, databases, guidelines, or toolkits. In most cases, a national or regional LCA Centre, Network or Platform takes the lead in the development of these LCA building blocks, and in promoting the implementation and uptake of LCA.

2. Overview of relevant standards to conduct Life Cycle Assessment

According to Regulation 5, sub-regulations (1)(k) and (1)(l) of the EPR Regulations; producers must *“conduct a life cycle assessment, in relation to the identified product, in accordance with the applicable standards within 5 years of implementation of their extended producer responsibility scheme”* (DFFE, 2021).

Table 1 provides an overview of the possible applicable standards relevant to conducting LCA studies. The relevant standard to be followed will depend on the goal and scope of the study in each case. For the purposes of compliance with the EPR Regulations, **it is recommended that LCA studies be conducted in accordance with ISO 14040 (2006a) and ISO 14044 (2006b); and following the recommendations provided in Guideline 1.**

Table 1: LCA related standards

| Typology | Standard Name | Description | Link to the standard |
|-----------------------|---|---|--|
| Overarching Standards | ISO 14040 (2006) – Environmental management – Life Cycle Assessment – Principles and framework | <ul style="list-style-type: none"> Covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies. It does not describe the LCA technique in detail, nor does it specify methodologies for the individual phases of an LCA study. The intended application of LCA or LCI results is considered during the goal and scope definition, but the application itself is outside the scope of this standard. | <p>Available at ISO standards website (ISO 14040:2006 - Environmental management — Life cycle assessment — Principles and framework)</p> <p>Republished by SABS in SA (SANS 14040:2006 (Ed. 2.00)) (sabs.co.za)</p> |
| | ISO 14044 (2006) - Environmental Management – Life Cycle Assessment – Requirements and guidelines | <ul style="list-style-type: none"> Covers LCA and LCI studies in more detail. Replaces the old standards and can be used jointly with ISO 14040. Specifies requirements and provides guidelines for LCA including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements. | <p>Available at ISO standards website (ISO 14044:2006 - Environmental management — Life cycle assessment — Requirements and guidelines)</p> <p>Republished by SABS in SA (SANS 14044:2006 (Ed. 1.00)) (sabs.co.za)</p> |
| | ISO/TR 14047 (2012) - Environmental management – Life cycle assessment – Illustrative examples on how to apply ISO 14044 to impact assessment situation | <ul style="list-style-type: none"> This Technical Report provides examples to support ISO 14044:2006. It uses several examples on key areas of ISO 14044 in order to enhance understanding of the requirements of the standard. The examples only provide a sample of approaches to satisfying the provisions of ISO 14044, which are open to interpretation. They should not be seen as prescriptive of the many ways in which ISO 14044 could be interpreted and applied. The examples also reflect the key elements of the life cycle | <p>Available at ISO standards website https://www.iso.org/obp/ui/en/#iso:std:iso:tr:14047:ed-2:v1:en</p> |

| Typology | Standard Name | Description | Link to the standard |
|---------------------|--|--|---|
| | ISO/TR 14049 (2012) - Environmental management — Life cycle assessment — Illustrative examples on how to apply ISO 14044 to goal and scope definition and inventory analysis | <p>impact assessment (LCIA) phase of an LCA. However, the examples are not exhaustive, and other examples exist to illustrate the methodological issues described.</p> <ul style="list-style-type: none"> • Similar to ISO/TR 14047, this Technical Report provides supplemental information to ISO 14044:2006, based on several examples on key areas of ISO 14044 in order to enhance understanding of the requirements. • With respect to the various phases of LCA, methodological requirements for conducting LCA studies are provided in ISO 14040 and ISO 14044. | Available at ISO standards website https://www.iso.org/obp/ui/en/#iso:std:iso:tr:14049:ed-2:v1:en |
| | ISO/TS 14071 (2024) Environmental management – Life cycle assessment – Critical review process and reviewer competencies | <ul style="list-style-type: none"> • This document specifies requirements and gives guidance for conducting a critical review of any type of LCA study, and the competencies required for the review. It provides additional requirements and guidance to ISO 14040 and ISO 14044. • This document can be applicable to other standards that require independent review of LCA-based procedures and information (e.g. ISO 14045, ISO 14046, ISO 14025, ISO 14067), and can be adapted to the specific fields of application. Other reference standards can be included in the critical review process. | Available at ISO standard website ISO 14071:2024(en), Environmental management — Life cycle assessment — Critical review processes and reviewer competencies |
| Single Issue | ISO 14067 (2018) – Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantifications | <ul style="list-style-type: none"> • Specifies principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product (CFP), based on International Standards on life cycle assessment (ISO 14040 and ISO 14044) for quantification, and on environmental labels and declarations (ISO 14020, ISO 14024 and ISO 14025) for communication. • Requirements and guidelines for the quantification of a partial CFP are also specified. • This document is applicable to CFP studies, the results of which provide the basis for different applications. | Available at ISO standards website (ISO 14067:2018 - Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification) Republished by SABS in SA (earlier edition) (SATS 14067:2014 (Ed. 1.00)) (sabs.co.za) |

| Typology | Standard Name | Description | Link to the standard |
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| | | <ul style="list-style-type: none"> Addresses only a single impact category, namely climate change. Carbon offsetting and communication of CFP or partial CFP information are outside the scope of the standard, as are social and economic aspects or impacts, and any other environmental aspects and related impacts potentially arising from the life cycle of a product. | |
| | <p>ISO 14046 (2014) – Environmental management – Water footprint – Principles, requirements and guidelines</p> | <p>Specifies principles, requirements and guidelines related to water footprint assessments of products, processes and organizations, based on LCA.</p> <ul style="list-style-type: none"> It also provides principles, requirements and guidelines for conducting and reporting a water footprint assessment as a stand-alone assessment, or as part of a more comprehensive environmental assessment. Only air and soil emissions that impact water quality are included in the assessment; other air and soil emissions are excluded. The result of a water footprint assessment is a single value or a profile of impact indicator results. Whereas reporting is within the scope of ISO 14046 (2014), communication of water footprint results, for example in the form of labels or declarations, is outside the scope of ISO 14046 (2014). | <p>Available at ISO standards website (ISO 14046:2014 - Environmental management – Water footprint – Principles, requirements and guidelines)</p> <p>Republished by SABS in SA (SANS 14046:2016 (Ed. 1.00) (sabs.co.za))</p> |
| | <p>ISO/TR 14073 (2017) – Environmental management – Water footprint – Illustrative examples on how to apply ISO 14046</p> | <p>Provides illustrative examples of how to apply ISO 14046, in order to assess the water footprint of products, processes and organizations based on LCA.</p> <ul style="list-style-type: none"> The examples are presented to demonstrate particular aspects of the application of ISO 14046, but do not present all of the details of an entire water footprint study report as required by ISO 14046. The examples are presented as different ways of applying ISO 14046, and do not preclude alternative ways of calculating the | <p>Available at ISO standards website (ISO/TR 14073:2017 - Environmental management – Water footprint – Illustrative examples on how to apply ISO 14046)</p> <p>Republished by SABS in SA (ISO/TR 14073:2017(en), Environmental management – Water footprint –</p> |

| Typology | Standard Name | Description | Link to the standard |
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| | | water footprint, provided they are in accordance with ISO 14046. | Illustrative examples on how to apply ISO 14046) |
| | ISO 14045 (2012) – Environmental management – Eco-efficiency assessment of products – Principles, requirements and guidelines | <p>Describes the principles, requirements and guidelines for eco-efficiency assessment for product systems, including:</p> <ul style="list-style-type: none"> • the goal and scope definition of the eco-efficiency assessment; • the environmental assessment; • the product-system-value assessment; • the quantification of eco-efficiency; • interpretation (including quality assurance); • reporting; and • critical review of the eco-efficiency assessment. <p>Requirements, recommendations and guidelines for specific choices of categories of environmental impact and values are not included. The intended application of the eco-efficiency assessment is considered during the goal and scope definition phase, but the actual use of the results is outside the scope of ISO 14045 (2012).</p> | <p>Available at ISO standards website (ISO 14045:2012 - Environmental management — Eco-efficiency assessment of product systems — Principles, requirements and guidelines)</p> <p>Republished by SABS in SA (SANS 14045:2014 (Ed. 1.00) (sabs.co.za))</p> |
| Environmental label standards | ISO 14020 (2000) – Environmental labels and declarations – General principles | <ul style="list-style-type: none"> • Establishes guiding principles for the development and use of environmental labels and declarations. It is intended that other applicable standards in the ISO 14020 series be used in conjunction with this standard. • Other standards in the series are intended to be consistent with the principles set forth in ISO 14020 (2000). Other standards currently in the ISO 14020 series are ISO 14021, ISO 14024 and ISO/TR 14025. • This standard is not intended for use as a specification for certification and registration purposes. | <p>Available at ISO standards website (ISO 14020:2022 - Environmental statements and programmes for products — Principles and general requirements).</p> <p>Republished by SABS in SA (earlier edition) (SANS 14020:2003 (Ed. 2.00) (sabs.co.za))</p> |
| | ISO 14021 (2016) – Environmental labels and declarations – Self-declared environmental | <ul style="list-style-type: none"> • Specifies requirements for self-declared environmental claims, including statements, symbols and graphics, regarding products. It further describes selected terms commonly used in environmental claims and gives qualifications for their use. This | <p>Available at ISO standards website (ISO 14021:2016 - Environmental labels and declarations — Self-declared environmental claims (Type</p> |

| Typology | Standard Name | Description | Link to the standard |
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| | claims (Type II environmental labelling) | <p>standard also describes a general evaluation and verification methodology for self-declared environmental claims.</p> <ul style="list-style-type: none"> • ISO 14021 (2016) does not preclude, override, or in any way change legally required environmental information, claims or labelling, or any other applicable legal requirements. | <p>II environmental labelling) Republished by SABS in SA (SANS 14021:2017 (Ed. 2.00) (sabs.co.za))</p> |
| | ISO 14024 (2018) – Environmental labels and declarations – Type I environmental labelling – Principles and procedures | <p>Establishes the principles and procedures for developing Type I environmental labelling programmes, including the selection of product categories, product environmental criteria and product function characteristics, and for assessing and demonstrating compliance. ISO 14024 (2018) also establishes the certification procedures for awarding the label.</p> | <p>Available at ISO standards website (ISO 14024:2018 - Environmental labels and declarations – Type I environmental labelling – Principles and procedures)</p> <p>Republished by SABS in SA (ISO 14024:2018(en), Environmental labels and declarations – Type I environmental labelling – Principles and procedures)</p> |
| | ISO/TR 14025 (2006) – Environmental labels and declarations – Type III environmental déclarations – Principles and procedures | <p>Establishes the principles and specifies the procedures for developing Type III environmental declaration programmes and Type III environmental declarations. It specifically establishes:</p> <ul style="list-style-type: none"> • The use of the ISO 14040 series of standards in the development of Type III environmental declaration programmes and Type III environmental declarations. • The principles for the use of environmental information, in addition to those given in ISO 14020 (2000). <p>Type III environmental declarations as described in ISO 14025 (2006) are primarily intended for use in business-to-business communication, but their use in business-to-consumer communication under certain conditions is not precluded.</p> | <p>Available at ISO standards website (ISO - ISO 14025:2006 - Environmental labels and declarations – Type III environmental declarations – Principles and procedures)</p> <p>Republished by SABS in SA (ISO 14025:2006(en), Environmental labels and declarations – Type III environmental declarations – Principles and procedures)</p> |
| | ISO 14026 (2017) – Environmental labels and declarations – Principles, | <p>Provides principles, requirements and guidelines for footprint communications for products addressing areas of concern relating to the environment.</p> | <p>Available at ISO standards website (ISO 14026:2017 - Environmental labels and declarations – Principles,</p> |

| Typology | Standard Name | Description | Link to the standard |
|--|--|--|---|
| | <p>requirements and guidelines for communication of footprint information</p> | <p>It also provides requirements and guidelines for footprint communication programmes, as well as requirements for verification procedures.</p> <p>It does not address the quantification of a footprint, nor does it address the communication of footprints that are not related to the environment, e.g. footprints addressing social or economic issues. In particular, footprint communications relating to the economic and social dimensions of sustainable development are outside the scope of ISO 14026 (2017). Footprint communications relating to organizations are also outside the scope of ISO 14026 (2017).</p> | <p>requirements and guidelines for communication of footprint information)</p> |
| <p>Product / Sector focused</p> | <p>ISO 22526 (2020) series: Plastics – Carbon and environmental footprint of biobased plastics.</p> <p>This series of documents is applicable to plastic products, plastic materials and polymer resins, which are based on biobased or fossil-based constituents.</p> | <ul style="list-style-type: none"> • ISO 25526-1: Part 1: General principles. This document specifies the general principles and the system boundaries for the carbon and environmental footprint of biobased plastic products. It is an introduction and a guidance document to the other parts of the ISO 22526 series. • ISO 22526-2: Part 2: Material carbon footprint, amount (mass) of CO₂ removed from the air and incorporated into polymer molecule. This document defines the material carbon footprint as the amount (mass) of CO₂ removed from the air and incorporated into plastic, and specifies a determination method to quantify it. • ISO 22526-3: Part 3: Process carbon footprint, requirements and guidelines for quantification. This document provides the requirements and guidelines for the quantification of a partial carbon footprint of a product (P-CFP) of plastic materials, which has to be carried out according to ISO 14067. Offsetting is outside of the scope of this document. Where the results of a P-CFP study are reported according to this document, procedures are provided to support transparency and credibility, and also to allow for informed choices, whether or | <p>Available at ISO standards website (ISO 22526-1:2020 - Plastics — Carbon and environmental footprint of biobased plastics — Part 1: General principles)</p> <p>Republished by SABS in SA (ISO 22526-1:2020(en), Plastics — Carbon and environmental footprint of biobased plastics — Part 1: General principles)</p> |

| Typology | Standard Name | Description | Link to the standard |
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| | | <p>not the results are intended to be publicly available.</p> <ul style="list-style-type: none"> • ISO/DIS 22525-4: Part 4: Environmental (total) footprint (Life Cycle Assessment) – under development. | |
| | ISO 20915 (2018) - Life cycle inventory calculation methodology for steel products | <p>This document specifies guidelines and requirements for conducting life cycle inventory (LCI) studies of steel products, reflecting steel's capacity for closed-loop recycling, including:</p> <ul style="list-style-type: none"> • specification of the functional unit used for LCI calculations of steel products; • definition of the system boundaries used for LCI calculations of steel products; • evaluation of scrap in LCI calculations of steel products; • evaluation of co-products in LCI calculations of steel products; • reporting of LCI calculation results of steel products. <p>The application of LCI results, including life cycle impact assessment (LCIA), is outside the scope of this document.</p> | <p>Available at ISO standards website (ISO 20915:2018 - Life cycle inventory calculation methodology for steel products) Republished by SABS in SA (ISO 20915:2018(en), Life cycle inventory calculation methodology for steel products)</p> |
| Others | PAS 2050 (2011) – Specification for the assessment of the life cycle GHG emissions of goods and services | <p>Publicly Available Specification (PAS) 2050 - Specification for the assessment of the life cycle greenhouse gas emissions of goods and services was developed by the British Standards Institution in 2008.</p> <p>PAS 2050 is the first consensus-based and internationally applicable standard on product carbon footprinting that has been used as the basis for the development of other standards internationally.</p> <p>Revised in 2011 to PAS 2050, it was developed through extensive consultation with international stakeholders, and in particular, through significant engagement with the wider PAS 2050 user community</p> | <p>Available at British Standards Institution PAS 2050-1:2012 31 Mar 2012 BSI Knowledge (bsigroup.com)</p> |
| | GHG Protocol (2011) – Corporate Value chain (Scope 3) Standard | <p>The Greenhouse Gas Protocol, a collaboration of the World Resources Institute and the World Business Council for Sustainable Development, provides the foundation for sustainable climate strategies and more efficient, resilient and profitable</p> | <p>Available at the Greenhouse Gas Protocol (Product Standard GHG Protocol)</p> |

| Typology | Standard Name | Description | Link to the standard |
|---|---|--|--|
| | | <p>organizations.</p> <p>The GHG Protocol Product Standard is one of a suite of accounting tools developed by the GHG Protocol to encourage users to understand, quantify, and manage greenhouse gas emissions. The standards follows an inclusive, consensus-based multi- stakeholder process with balanced participation from businesses, government agencies, non-governmental organizations, and academic institutions around the world.</p> | |
| <p>EU Standards / Guidelines</p> | <p>Product Environmental Footprint Guide</p> | <p>The Product Environmental Footprint (PEF) is an LCA-based method to measure and communicate the potential life cycle environmental impact of products (goods or services). Together with the Organisation Environmental Footprint (OEF), it forms the basis for the EU Environmental Footprint. The overarching purpose of PEF and OEF is to provide information that can enable the reduction of environmental impacts of goods, services, and organisations; taking into account all the value chain activities (from extraction of raw materials, through production and use and to final waste management).</p> | <p>Publications Office (europa.eu)</p> |
| | <p>Product Environmental Footprint Category Rules Guidance (v 6.3)</p> | <p>This document provides instructions on how to develop Product Environmental Footprint Category Rules (PEFCRs).</p> | <p>PEFCR_guidance_v6.3.pdf (europa.eu)</p> |
| | <p>Understanding Product Environmental Footprint and Organisation Environmental Footprint methods</p> | <p>This report aims to describe the elements that characterise the environmental footprint and guide the reader in understanding the fundamentals of the methodology and the tools available for its application. Beginning with a description of the principles of LCA, additional aspects introduced by the PEF and OEF are discussed, including the system of PEFCRs and organisation environmental footprint sector rules.</p> | <p>Understanding Product Environmental Footprint and Organisation Environmental Footprint methods - Publications Office of the EU (europa.eu)</p> |

3. The international LCA landscape

In countries at the forefront of LCA research and development; national or regional LCA Centres, Networks or Platforms have taken the lead in driving advancement in the LCA space. These entities are usually non-profit organisations, with a membership including organisations and individuals from a range of sectors (industry, academia, government, consulting, NGOs, service organisations, etc.). They play an important role in promoting the uptake of LCA, and of driving the development of well-established and consistent methodologies and tools to foster environmental management and to support the use of LCA in business and policy.

Some of the key organisations are as follows:

[ACLCA](#) is the American Centre for Life Cycle Assessment, an NPO which consists of members from industry, academia, government, consulting, and NGOs; with a stake in the implementation and application of LCA. It provides education, awareness, advocacy and communications to build capacity and knowledge of environmental LCA. ACLCA also provides guidance for the development of Product Category Rules (PCRs), by providing a process and method toolkit ([PCR - ACLCA](#)).

[ALCAS](#) is the Australian Life Cycle Assessment Society, established in 2001 as an NPO to promote life cycle practices and sustainable development, and to coordinate the rapidly growing professional community in Australia. It involves individual and corporate members from industry, government, academia and service organisations in the use and development of LCA management and thinking. Jointly with its sister organisation in New Zealand ([LCANZ](#)), in 2014 it launched the Australasian Environmental Product Declaration (EPD) programme, aimed at bringing *“credibility, consistency and independence to environmental product declarations in the Australasian region, in partnership with the international EPD programme”*.

[EPLCA](#) is the European Platform on Life Cycle Assessment, established by the European Commission, through its DG Environment and Joint Research Centre (JRC). It was established in response to the necessity for a Platform on LCA to increase the availability of quality life-cycle data and methods, following the identification of LCA as the *“best framework for assessing the potential environmental impacts of products”* by the EU Commission’s Integrated Product Policy Report (2003). The main functions of EPLCA are: i) Supporting the use of LCA in business and policies; and ii) Fostering LCA as an essential integrated environmental assessment framework in support of the EU policy making process, including the Green Deal initiative, the Circular Economy Action Plan, the Farm-to-Fork Strategy, the Biodiversity Strategy, the Chemical Strategy, and many more. Details on the Product Environmental Footprint (PEF) methodology, updates, and all other relevant information can be found at the [European Platform on LCA | EPLCA \(europa.eu\)](#)

[JEMAI](#) is the Japan Environmental Management Association for Industry, a public corporation established in 1962, when industrial pollution was becoming a concern in Japan, with a membership of 700 organisations. It hosts the LCA Society of Japan, and over the years has contributed to developing tools for environmental management, as well as to the promotion of LCA and environmental management among its members.

NRC, the National Research Council Canada (NRC), is the primary national research and technology organization (RTO) of the Canadian government. Established in 1916, the NRC is dedicated to advancing scientific knowledge, promoting innovation, and supporting the development of new technologies across a wide range of industries and sectors. The NRC hosts LCI data, and offers a collaboration platform for the open source LCA software programme OpenLCA.

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