
Okoljski inženiring (EE) - Smernice za poenostavljene ocene življenjskega cikla (LCA) informacijskih in komunikacijskih tehnologij (IKT)

Environmental Engineering (EE) - Guidance on simplified Life Cycle Assessments (LCA) of Information and Communication Technologies (ICT)

Sample Document

Ta slovenski standard je istoveten z: ETSI ES 204 085 V1.1.1 (2026-06)

ICS:

35.020

Informacijska tehnika in
tehnologija na splošno

Information technology (IT) in
general

SIST ES 204 085 V1.1.1:2026

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Reference

DES/EE-EEPS62

Keywords

energy consumption, environment, environmental
impact, green-house gas emission, ICT, LCA,
smartphone

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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Environmental Engineering (EE).

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Executive summary

The present document provides guidance on how to perform, use and report simplified LCAs.

Moreover, it gives guidance on when the use of simplified approaches is relevant and recommended.

Introduction

A Life Cycle Assessment (LCA) is a systematic methodology which gives an understanding of the relative importance of the different life cycle stages/activities. LCAs assist companies in determining where to put their efforts to improve life cycle environmental performance and also to monitor how this performance changes over time. However, it is important to keep in mind that the results of an LCA are always model-based representations of real environmental impact, and the absolute impact of a certain product, network, service or organization is beyond reach. This is true for all kinds of product systems, but especially so for the complex product systems of the ICT sector.

An LCA addresses potential environmental impact; an LCA does not predict absolute or precise environmental impact due to the relative expression of potential impacts to a reference unit, the integration of environmental data over space and time, the inherent uncertainty in modelling environmental impact, and the fact that some possible environmental impacts are clearly future impacts (ISO 14040 [3], clause 4.3).

In practice, it is virtually impossible to collect enough data for an assessment to give the absolute performance of a product system. Even then, the results would still have model and scenario uncertainty.

Consequently, any LCA result is only valid under the assumptions of the study and is still associated with substantial uncertainty, which needs to be considered so the outcome of the assessment is interpreted in a correct way. This goes for detailed LCA assessment approaches described in Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2], and even more so if further simplifications are needed.

Yet, simplified approaches are needed in different situation to give an approximation of the environmental impacts of products. The present document will outline when such approaches are relevant and how they could be performed, used and reported.

Providing a LCA fully respecting Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2] is a very complex and time-consuming task. Not all companies and organizations have the financial and human resources to meet the requirements demanded. Hence, to onboard a large community across the industry and monitor the achievements of environmental targets it seems useful to provide relevant parties (operators, OEMs, integrators, service providers and software developer) with simplified approaches to assess environmental impacts of ICT goods and services. This can be viewed as a "Minimal Viable" approach that encourage parties to deliver life cycle impact estimates with limited investment, time and costs.

As for detailed LCA in line with Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2], techniques such as uncertainty analysis and sensitivity analysis are important to understand the results of a study and what conclusions can be made.

Quantitative results of detailed LCA's by different LCA practitioners cannot be compared without considerations of assumptions, limitations in data, differences in data sets and scenarios as described in Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2]. This is even more true for simplified approaches which are to a larger extent based on generic data, simplifying assumptions etc. To allow for comparability of results, whether based on detailed or simplified approaches, product category rules would need to be developed at product category level that allows for developing common detailed scenarios and assumptions. Results based on such Product Category Rules would be comparable but at the expense of being less representative to the actual conditions of the individual product.

1 Scope

The present document provides guidance on how to perform, use and report simplified LCAs for ICT products and services.

Moreover, it gives guidance on when the use of simplified approaches is applicable and what are the limitations.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] [Recommendation ITU-T L.1410 \(11/24\)](#): "Methodology for environmental life cycle assessments of information and communication technology goods, networks and services".
- [2] [ETSI ES 203 199 \(V1.4.1\)](#): "Environmental Engineering (EE); Methodology for environmental Life Cycle Assessment (LCA) of Information and Communication Technology (ICT) goods, networks and services".

NOTE: References [1] and [2] are technically equivalent.

- [3] [ISO 14040:2006](#): "Environmental management — Life cycle assessment — Principles and framework".
- [4] [ISO 14044:2006](#): "Environmental management — Life cycle assessment — Requirements and guidelines".

2.2 Informative references

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

- [i.1] Recommendation ITU-T L.1420 (2012): "Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations".
- [i.2] Void.
- [i.3] Recommendation ITU-T L.1451 (2019): "Methodology for assessing the aggregated positive sector-level impacts of ICT in other sectors".
- [i.4] Void.

- [i.5] Recommendation ITU-T L.1450 (2018): "Methodologies for the assessment of the environmental impact of the information and communication technology sector".
- [i.6] Supplement ITU-T L. Suppl. 57 (2023) - Recommendation ITU-T L.1420: "Scope 3 guidance for telecommunication operators".
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- [i.36] CLC/TR 45550:2020: "Definitions related to material efficiency", (produced by CEN).
- [i.37] ISO 14046:2014: "Environmental management — Water footprint — Principles, requirements and guidelines".
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- [i.39] Greenhouse Gas Protocol: "[Product Life Cycle Accounting and Reporting Standard](#)".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

activity data: quantitative measure of a level of activity that results in GHG emissions

NOTE: See Corporate Value Chain (Scope 3) Standard [i.33], clause 7.2.

black box module: device, system or object which can be viewed solely in terms of its input, output and transfer characteristics without any knowledge of its internal workings

NOTE 1: In this context the black box module may consist of several part categories such as integrated circuits, mechanics, cables, etc., e.g. a power module on a PCBA.

NOTE 2: See ETSI ES 203 199 [2], clause 3.1.

CO₂ equivalent (CO₂ e): universal unit of measurement to indicate the Global Warming Potential (GWP) of each of the seven greenhouse gases, expressed in terms of the GWP of one unit of carbon dioxide

NOTE 1: It can be used to evaluate releasing (or avoiding releasing) different greenhouse gases against a common basis.

NOTE 2: See Corporate Standard [i.34], glossary.

commercial lifetime: length of time that a good is owned for before a new one is bought to replace it

NOTE 1: This term may be used to estimate the lifetime of consumer products.

NOTE 2: See ETSI ES 203 199 [2], clause 3.1.

comparative analysis: analysis aiming to compare two different product systems based on the same functional unit

NOTE: This definition comes from ETSI ES 203 199 [2].

cradle-to-gate: partial life cycle of ICT goods or parts, from material acquisition through to when they leave the factory gate (e.g. immediately following the production)

NOTE 1: See ETSI ES 203 199 [2], clause 3.1. This definition has been amended from GHG Protocol Product Standard [i.39].

NOTE 2: E.g. ICT goods ready to be put on the market/sales with no need for further processing.

cut-off: amount of energy or material flow, or the level of environmental significance associated with unit processes or product systems excluded from the study

NOTE: Unit processes excluded from the studied product system in an LCA.

data gap: LCI flows excluded from a unit process within the studied product system

NOTE: See ETSI ES 203 199 [2], clause 3.1.

depreciation time: time during which a (new) revenue-generating asset reaches its residual economic value

NOTE: The depreciation time is sometimes referred to as the legal lifetime.

Economic Input-Output approach (EIO): method using tables, called Input-Output (IO) tables, that describe financial transactions between economic sectors in a national economy, to approximate environmental impacts

embodied emissions: life cycle(s) emissions from the following life cycle stages:

- raw material acquisition;
- production; and
- end-of-life treatment.

EXAMPLE: All life cycle stages other than the use stage.

NOTE 1: See ETSI ES 203 199 [2], clause 3.1.

NOTE 2: Each life cycle includes transportation as generic process as described in ETSI ES 203 199 [2].

embodied environmental impact: life cycle(s) environmental impact from the following life cycle stages:

- raw material acquisition;
- production; and
- end-of-life treatment.

EXAMPLE: All life cycle stages other than the use stage.

NOTE 1: See ETSI ES 203 199 [2], clause 3.1.

NOTE 2: Each life cycle includes transportation as generic process as described in ETSI ES 203 199 [2].

emission factor: factor allowing GHG emissions to be estimated from a unit of available activity data (e.g. tonnes of fuel consumed, tonnes of product produced) and absolute GHG emissions

NOTE 1: See Corporate Standard [i.34], glossary and Recommendation ITU-T L.1451 [i.3].

NOTE 2: Another example is: $\text{kgCO}_2\text{e/kWh}$ electricity, $\text{kgCO}_2\text{e}/(\text{tonne} \times \text{km})$.

environmental impact: impact including positive and negative aspects on the environment

NOTE: See ETSI ES 203 199 [2], clause 3.1.

extended operating lifetime: aggregated duration of the actual use periods of the first user and consecutive use periods associated with reuse

NOTE 1: The user in different life cycles can be the same or different user.

NOTE 2: Reuse and refurbishment, enable several use periods and consecutive life cycles.

NOTE 3: ETSI EN 303 808 [i.35] definition is aligned with TR 45550:2020 [i.36].

NOTE 4: See ETSI ES 203 199 [2], clause 3.1.

functional unit: See ISO 14040 [3], clause 3.20.

GHG emission intensity: numerical value of Greenhouse Gas (GHG) emissions per unit

Global Warming Potential (GWP): ratio of the warming of the atmosphere caused by one greenhouse gas to that caused by a similar mass of carbon dioxide

NOTE 1: GWP is calculated over a specific time frame generally 100 years.

NOTE 2: See ETSI ES 203 199 [2], clause 3.1.

ICT goods: tangible goods deriving from or making use of technologies devoted to or concerned with:

- the acquisition, storage, manipulation (including transformation), management, movement, control, display, switching, interchange, transmission or reception of a diversity of data;
- the development and use of the hardware, software, and procedures associated with this delivery; and
- the representation, transfer, interpretation, and processing of data among persons, places, and machines, noting that the meaning assigned to the data is preserved during these operations.

NOTE: See ETSI ES 203 199 [2], clause 3.1.

ICT network: set of nodes and links that provide physical or over the air information and communication connections between two or more defined points

EXAMPLE: Wireless network, fixed network, Local Area Network (LAN), home network and server network, access networks, core networks, cloud computing networks.

NOTE: See ETSI ES 203 199 [2], clause 3.1.

ICT service (application): use of ICT goods and/or networks to provide value to one or more users

EXAMPLE: Teleconferencing, teleworking, e-ticketing, e-learning, e-healthcare, smart transport and logistics, procurement systems, supply chain management systems, music/film distribution over the Internet or voice over IP, machine-to-machine systems.

NOTE: See ETSI ES 203 199 [2], clause 3.1.

ICT-specific EoLT: any disassembly/dismantling/shredding/recycling process which needs special adaptation for handling of ICT goods

NOTE: See ETSI ES 203 199 [2], clause 3.1.

ICT-specific infrastructure: basic structures needed for the operation of the goods, network or service

EXAMPLE: Antenna towers, cabling systems.

infrastructure: basic structures needed for the operation of the society

EXAMPLE: Transportation systems, buildings and power plants.

NOTE: See ETSI ES 203 199 [2], clause 3.1.

LCA practitioner: person(s) or organization(s) performing an LCA

NOTE: See ETSI ES 203 199 [2], clause 3.1.

life cycle: See ISO 14040 [3], clause 3.1.

life cycle stage: one of several consecutive and interlinked stages of a product system

NOTE: See ETSI ES 203 199 [2], clause 3.1.

lifetime: duration which may correspond to commercial lifetime, operating lifetime, extended operating lifetime or depreciation lifetime

NOTE: See ETSI ES 203 199 [2], clause 3.1.

location-based data: average grid emission factor data for the given locality or region

NOTE: Description is from Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2] main text.

market-based data: emissions from electricity that a company have purposefully chosen, e.g. derived from contractual instruments

NOTE: Description is from Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2] main text.

modelled data: assumption-driven estimates, such as estimates resulting from scenarios, which are forward looking or scaled up from smaller pilot studies

NOTE: See ETSI ES 203 199 [2], clause 3.1.

natural resource: material source, such as wood, water, or a mineral deposit, that occurs in a natural state

NOTE: See ETSI ES 203 199 [2], clause 3.1.

node: point in a network topology at which lines intersect or branch

NOTE: See ETSI ES 203 199 [2], clause 3.1.

operating lifetime: duration of the actual use period (consisting of both active and non-active periods) for the first user

NOTE 1: Storage time is not included in operating lifetime.

NOTE 2: See ETSI ES 203 199 [2], clause 3.1.

operator: organization operating networks and services

NOTE: See ETSI ES 203 199 [2], clause 3.1.

other EoLT: any disassembly/dismantling/shredding/recycling process which does not need special adaptation for handling of ICT goods but could be used for any kind of good

NOTE: See ETSI ES 203 199 [2], clause 3.1.