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ETSI STANDARD

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

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Foreword

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

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Modal verbs terminology

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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.

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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.

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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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[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.

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[i.32] Y. Yang, Y. Park, T. M. Smith, T. Kim, H.-S. Park: "High-Resolution Environmentally Extended Input-Output Model to Assess the Greenhouse Gas Impact of Electronics in South Korea".

[i.33] Greenhouse Gas Protocol: "Corporate Value Chain (Scope 3) Standard".

[i.34] Greenhouse Gas Protocol: "Corporate Standard".

[i.35] ETSI EN 303 808: "Environmental Engineering (EE); Applicability of EN 45552 to EN 45559 methods for assessment of material efficiency aspects of ICT network infrastructure goods in the context of circular economy".

[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".

[i.38] ETSI ES 202 336-1: "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 1: Generic Interface".

[i.39] Greenhouse Gas Protocol: "Product Life Cycle Accounting and Reporting Standard".

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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.

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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

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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

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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.

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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: $kgCO_2e/kWh$ electricity, $kgCO_2e/(tonne \times km)$.

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.

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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.

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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.

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

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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.

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part: constituent of ICT goods and support goods

EXAMPLE: Cable.

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

part category: classification of a part e.g. by its type

EXAMPLE: Fibre cable.

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

primary data: See ISO 14046 [i.37], clause 3.6.1.

primary energy: energy content of natural resources which can be used for energy production

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

primary raw material: material which originates from natural resources

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

process category: classification of a process type

EXAMPLE: Landfill, air, ship and train.

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

product system: See ISO 14040 [3], clause 3.28.

public data: data which is available to the public without access being restricted by requirements on membership, none-disclosure agreements, or similar restrictions

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

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raw material: See ISO 14040 [3], clause 3.15.

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raw material extraction: production of extracted raw materials used in raw material processing

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

raw material processing: production of processed raw materials used in in Part production

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

raw material recycling: production of raw materials from recycled products

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

recycling rate of disposed raw material: rate at which disposed goods end up in a recycling process is part of the scope of the LCA

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

reference product system: system (basically non-ICT but can also be ICT) which is replaced by ICT

EXAMPLE: Traditional service which is replaced by an ICT service.

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

re-use: process by which a product or its parts, having reached the end of their first use, are used for the same purpose for which they were conceived

NOTE 1: Reuse after second or subsequent usage is also considered as reuse, but normal, regular or sporadic use is not considered as reuse (TR 45550:2020 [i.36] and ETSI EN 303 808 [i.35]).

NOTE 2: ICT goods usage by a new user or in a new context is considered to be reuse.

NOTE 3: Definition amended from ETSI EN 303 808 [i.35] with additional note 2.

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

scope 3 emissions: scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company

NOTE 1: Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.

NOTE 2: Relevant Scope 3 categories for ICT companies are listed in Recommendation ITU-T L.1420 [i.1].

NOTE 3: See Corporate Standard [i.34].

secondary data: See ISO 14046 [i.37], clause 3.6.2.

secondary raw material: material which origins from recycled primary raw materials

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

service provider: organization operating a service (could be the same organization as the operator)

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

simplified Life Cycle Assessment: methodology to assess the environmental impact of a product or service with a more streamlined evaluation approach compared to a LCA following Recommendation ITU-T L.1410 [1] / ETSI ES 203 199 [2]

NOTE: It aims to provide a fast and cost-effective overview of the environmental performance of a product or service, enabling informed decision-making for product design and manufacturing.

storage time: length of time for which the goods are stored, including for both before and after its use stage

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

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support activity: activities supporting unit processes associated with the function of the good, network or service

NOTE 1: Examples of support activities are activities directly associated with the product system, such as marketing, development and sales and also more general activities of the organization, such as data support, communication, and financial support.

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

support goods: device, system or object needed to realize the function of supporting the use of ICT goods

EXAMPLE: Goods for power supply and temperature regulation.

NOTE 1: See ETSI ES 202 336-1 [i.38] for an explanation which defines support goods for networks as infrastructure goods.

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

the 50/50 method: allocation method that allocates the credits equally to the life cycle using and the one supplying recycled material

NOTE 1: In reuse/refurbishment scenarios, the LCA practitioner needs to clearly declare how the allocation of raw materials has been handled in the assessment.

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

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

NOTE 1: See also ISO 14040 [3] and ISO 14044 [4].

EXAMPLE: Part unit process such as IC Encapsulation and Display module assembly.

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

waste: See ISO 14040 [3], clause 3.35.

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