

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

L.1023

(09/2020)

SERIES L: ENVIRONMENT AND ICTS, CLIMATE
CHANGE, E-WASTE, ENERGY EFFICIENCY;
CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

Assessment method for circular scoring

Recommendation ITU-T L.1023

ITU-T L-SERIES RECOMMENDATIONS

**ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION,
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Recommendation ITU-T L.1023

Assessment method for circular scoring

Summary

Recommendation ITU-T L.1023 outlines an assessment method for circularity scoring of information and communication technology (ICT) goods.

The assessment method consists of three steps:

- 1) Setting the relevance and applicability (R) of each criterion for circular product design (CCPD) for the ICT goods at hand,
- 2) Assess the margin of improvement (MI) of each criterion,
- 3) Calculate the circularity score (score) from 0 to 100% for the ICT good at hand for all three circular design guideline groups (CDGGs). This includes:
 - Using a predefined value matrix to identify the % score from 0 to 100 for each combination of R×MI.
 - Average the included criteria for the ICT good at hand separately for all three groups: product durability, ability to recycle, repair, reuse, and upgrade from equipment and manufacturer level.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T L.1023	2020-09-22	5	11.1002/1000/14301

Keywords

Circularity score, criteria, ICT goods, product durability, recycling, repair, reuse, upgrade.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Recommendation ITU-T L.1023

Assessment method for circular scoring

1 Scope

Realization of the circular economy requires incorporating elements in product design that support the reduction of material use, reuse, recycling and recovery of products, product parts, components and materials to circulate them in the value chain for as long as possible. This Recommendation contains a three-step methodology to identify an information and communication technology (ICT) good's circularity in three dimensions via three circular design guideline groups (CDGGs): first the ICT good durability, second the ICT good ability to be recycled, repaired, reused and upgraded, and third the manufacturers ability to recycle, repair, reuse and upgrade the ICT good put into the market. The three guideline groups are then divided into criteria for circular product design. These criteria are then assessed at four levels, both from how well circularity has been achieved, the margin of improvement, and the relevance and applicability of each criterion for the ICT good at hand. The margin of improvement (MI) score and relevance score are then combined and translated into a score for each criterion. The average of applicable criteria in each guideline group are calculated as the total circularity score for each guideline group.

No weighting of the guideline groups is included.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T L.1015] Recommendation ITU-T L.1015 (2019), *Criteria for evaluation of the environmental impact of mobile phones*.
<https://www.itu.int/rec/T-REC-L.1015-201905-I>
- [ITU-T L.1020] Recommendation ITU-T L.1020 (2018), *Circular economy: Guide for operators and suppliers on approaches to migrate towards circular ICT goods and networks*.
<https://www.itu.int/rec/T-REC-L.1020-201801-I>
- [ITU-T L.1021] Recommendation ITU-T L.1021 (2018), *Extended producer responsibility – Guidelines for sustainable e-waste management*.
<https://www.itu.int/rec/T-REC-L.1021-201804-P>
- [ITU-T L.1022] Recommendation ITU-T L.1022 (2019), *Circular economy: Definitions and concepts for material efficiency for information and communication technology*.
<https://www.itu.int/rec/T-REC-L.1022-201910-I>

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 ICT goods [b-ITU-T L.1410]: 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 – [b-ETSI TS 103 199] used the word "equipment" instead.

3.1.2 component [b-ETSI TR 103 679]: Part of a product that cannot be taken apart without destruction or impairment of its intended use.

3.1.3 product part [b-ETSI TR 103 679]: Sub-unit of a product.

NOTE – HDD is an example of a product part within a computer.

3.1.4 upgrade [b-EN 45554]: Process of enhancing the functionality, performance, capacity or aesthetics of a product.

3.1.5 reliability [b-EN 45552]: Probability that a product functions as required under given conditions, including maintenance, for a given duration without limiting event.

3.1.6 refurbishment [b-EN 45553]: Functional and/or aesthetic restoration of an energy-related product.

3.1.7 material [b-ETSI TR 103 679]: Substance or mixture of substances within a product or product part.

3.1.8 substance [b-ETSI TR 103 679]: Chemical element and its compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the declarable substance or changing its composition.

3.1.9 product [b-ETSI TR 103 679]: Good or service.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 circular economy: An economy closing the loop between different life cycles through design and corporate actions/practices that enable recycling and reuse in order to use raw materials, goods and waste in a more efficient way. The circular economy concept distinguishes between technical and biological cycles, the circular economy is a continuous, positive development cycle. It preserves and enhances natural capital, optimises resource yields, and minimizes system risks by managing finite stocks and renewable flows, while reducing waste streams.

NOTE – Definition adapted from [ITU-T L.1022] and [ITU-T L.1020].

3.2.2 priority part: A part having a high likelihood of needing repair, replacement or upgrading.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CS	Circularity Score
CDGG	Circular Design Guideline Group
CCPD	Criterion for Circular Product Design
CE	Circular Economy

CRM	Critical Raw Material
DfD	Design for Disassembly
DfR	Design for Recycling
DfRe	Design for Remanufacturing
DfX	Design for X
EEE	Electrical and Electronic Equipment
HDD	Hard Disc Drive
ICT	Information and Communication Technology
LCA	Life Cycle Assessment
MI	Margin of Improvement
MR	Material Recycling
PD	Product Durability
R	Relevance
RFP	Request for Procurement
sEEE	Small household electrical and electronic equipment
3RUe	Ability to Recycle, Reuse, Refurbish and Upgrade, equipment level
3RUm	Ability to Recycle, Reuse, Refurbish and Upgrade, manufacturer level

5 Conventions

Colours are used in the appendices of this Recommendation to graphically indicate circularity scores ranging from green (very good) to red (very bad).

6 Background

The principles of circular economy (CE) emphasize optimizing resource yields at all stages of a product's lifecycle [b-ITU-T L.Sup.28], [ITU-T L.1015], [ITU-T L.1021], [ITU-T L.1022].

CE ultimately aims to make products without causing or incentivizing additional extraction of Earth's resources. This means using recycled and renewable material, prioritizing efficient use of materials and recovery of wastes, designing products to be durable to maximize their useful life and finally, where necessary, contributing materials back to the market for making new products.

This requires incorporating elements in product design that support the reduction of material use, reuse, recycling, and recovery of products, product parts, components and materials to circulate them in the value chain for as long as possible. To achieve this objective, criteria for circular product design (CCPDs) that aim to reduce, reuse, recycle and recover should be considered, and corresponding design guidelines integrated from the early stages of product design.

To date, in ITU-T the standardization of implementation of CE principles has largely focused on waste management models, such as integrating extended producer responsibilities [ITU-T L.1021] into business practices, rather than evaluating criteria and proposing design guidelines to incorporate circular elements into product design. Multiple design for X (DfX) approaches exist including design for disassembly (DfD), design for recycling (DfR), and design for remanufacturing (DfRe).

The present methodology incorporates some selected parameters of the CENELEC series of product material efficiency standards [b-CENELEC].

Moreover, the present methodology also differs from the product circularity indicator [b-PCI].

However, the methodology outlined in this Recommendation is not to be confused with methods which aim to measure circularity from a materials flow and organizational perspectives, such as those under development by the Ellen MacArthur Foundation [b-EMF] or the World Business Council for Sustainable Business [b-WBCSD].

While not all criteria described in this Recommendation might work for all ICT good categories, they are applicable to improve ICT good circularity if they are applied at the early stage of product design.

Therefore, this Recommendation is intended to be a guideline and methodology for designers of ICT goods and systems to align product design to the most relevant criteria and incorporate design guidelines. This use of this Recommendation can result in increased circularity of ICT goods.

7 The methodology

The methodology contains a three-step approach to support product designers in determining the most relevant criteria to be incorporated in their product design. Bovea and Pérez-Belis [b-Bovea] proposed which existing DfX guidelines are most relevant in product design from a circular economy perspective for small household electrical and electronic equipment (EEE). [b-AndraeVaija] proposed a new method based for ICT goods inspired by [b-Bovea]. These DfX guidelines proposed by [b-Bovea] and used for ICT goods by [b-AndraeVaija], are then reorganized and adopted further to the specificities of ICT goods based on CE principles as shown in Table 1, adapted from Table I in [b-AndraeVaija]. Additional criteria have been added and several have been removed compared to the original lists [b-Bovea], [b-AndraeVaija] in order to align with metrics included in the CENELEC product material efficiency standards [b-CENELEC] and EPEAT [b-EPEAT] and to reflect the variety of products in the ICT industry.

Noticeably, the far-left column of Table 1 – Groups – contains a list of circular principles that put all the criteria into different groups. The description of each group is as follows:

- 1) Product durability (PD): It includes criteria related to promoting the life span and durability of products by adapting their design and studying the possibility of upgrading software to a new version and service support by ensuring the product can be used for as long as possible by the first user or subsequent users.
- 2) Ability to recycle, repair, reuse, upgrade (3RUe) – equipment level: It includes criteria related to the product's structure and access to its priority parts for repair, connecting systems to facilitate disassembly and reassembly, spare parts, diagnostic and information availability. It relates to:
 - Possibilities to refurbish the ICT good;
 - Possibilities to reuse product parts and components within the ICT good (after first use) in refurbishment of similar or other ICT goods;
 - Facilitate the identification, separation and recycling of materials. Addresses separate collection of products for better recycling and development of designated recycling technologies.
- 3) Ability to recycle, repair, reuse, upgrade (3RUm) – manufacturer level:
It includes criteria related to the manufacturer ability (on company level) to facilitate recycling, repair, reuse and upgrade. These requirements are not directly connected to the equipment, but to the infrastructure and support to be developed or supported by the manufacturer. It relates to:
 - Availability of service support in terms of information, infrastructure and spare parts.

In summary, each group contains a set of criteria that directly address the group's topic. Each criterion is also assigned to a code with the group's initials followed by a numerical number.

The proposed method is in principle unlimited regarding the number of groups and criteria. For example, new criteria for scratch resistance for example for metals, glass, etc. can be added and margin of improvement (MI) levels defined. Also new groups can be added accordingly. Appendix III contains an example of a potential new criterion for 3RUe.

Table 1 – Circular design guidelines groups and criteria for circular product design of relevance for circular ICT

Group	Code	Criteria
Product durability	PD1	Software and data support
	PD2	Scratch resistance
	PD3	Maintenance support
	PD4	Robustness
	PD5	Battery for portable ICT goods
	PD6	Data security
Ability to recycle, repair, reuse, upgrade – equipment level	3RUe1	Fasteners and connectors
	3RUe2	Diagnostic support
	3RUe3	Material recycling compatibility
	3RUe4	Disassembly depth
	3RUe5	Recycled/renewable plastics
	3RUe6	Material identification
	3RUe7	Hazardous substances
	3RUe8	Critical raw materials
	3RUe9	Packaging recycling
Ability to recycle, repair, reuse, upgrade – manufacturer level	3RUm1	Service offered by manufacturer
	3RUm2	Spare parts distribution
	3RUm3	Spare parts availability
	3RUm4	Disassembly information
	3RUm5	Collection and recycling programmes
	3RUm6	Environmental footprint assessment knowledge available to improve the equipment material efficiency

The proposed methodology involves three main steps that shall be followed:

- 1) The first step is to estimate the relevance (R) of each criterion to the ICT good or ICT system (e.g., mobile site) at hand based on relevance characteristic such as customer relevance or life cycle assessment (LCA) calculation.
- 2) The second step involves determining the margin of improvement (MI) of each criterion based on the degree to which the criterion is met. (See Table 4 for guidance on how to determine MI for each criterion) for the ICT good category.