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Environmental Engineering (EE); An information model for digital product information on sustainability and circularity

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Foreword

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

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Executive summary

The present document relates to, builds on, and complements Recommendation ITU-T L.1070 [i.43] and ETSI TS 103 881 [3] standards, which define opportunities for a global digital sustainable product passport to achieve a circular economy.

The present document defines an information model to describe environmental sustainability and circularity information details about ICT goods (products) in a digital form to be part of a digital product passport as environmental information that can be compared with information requirements in relevant environmental sustainability and circularity standards, specifically ETSI standards and Recommendations ITU-T. The information details can represent products at any time of their circular lifespan: design, manufacturing, use, hardware changes, and final recycling as e-waste. Several product-related standards can be expressed as a list of environmental information templates. The comparison of product information to standards' information templates allows for alignment verification of products to the requirements of different standards when relevant.

The aim is to complement and contribute to regional (European digital product passport) and global (UNECE B2B digital product passport) standards.

Introduction

The present document complements other standards (ITU-T Recommendations and ETSI standards) that rely on product information in the context of the digital product passport to express environmental sustainability and circularity information about ICT products and to facilitate alignment verification of ICT products to other standards. For that, the present document presents:

- Related regional and global standards and Recommendations about the digital product passport are described in clause 5.
- An overview of information requirements raised from existing environmental standards in clause 6.
- A mapping of the requirements to an information model that supports expressing environmental information about a product and environmental information templates about a standard in clause 7.
- A mapping of environmental information to digital data or represented as a table for digitalized conformance statements and checking the alignment to ICT standards in clause 7.4.
- A feasibility analysis of implementing these information items in a global DPP system in clause 9.

The present document provides a basis for expressing circularity and environmental sustainability information about products and standards for DPPs.

The present document was developed jointly by ETSI TC EE and ITU-T Study Group 5. It is published respectively by ITU and ETSI as Recommendation ITU-T L.1071 [i.44] and ETSI ES 204 082 (the present document), which are technically equivalent.

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1 Scope

The present document provides a structure for collecting information items organized to represent circularity and environmental sustainability information about ICT products and product-related standards. This will facilitate alignment verification of ICT products to standards to various actors during the product lifespan up to final recycling.

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.

Referenced documents which are not found to be publicly available in the expected location might be found in the [ETSI docbox](#).

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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

- [1] [Recommendation ITU-T L.361](#): "ID tag requirements for infrastructure and network elements management".

NOTE: Former Recommendation ITU-T L.64 renumbered as Recommendation ITU-T L.361 on 2016-02-15 without further modification and without being republished.

- [2] [Recommendation ITU-T L.1022](#): "Circular economy: Definitions and concepts for material efficiency for information and communication technology".

- [3] [ETSI TS 103 881](#): "Environmental Engineering (EE); Global digital sustainable product passport opportunities to achieve a circular economy".

- [4] [Recommendation ITU-T L.1100](#): "Procedure for recycling rare metals in information and communication technology goods".

- [5] [Recommendation ITU-T L.1102](#): "Use of printed labels for communicating information on rare metals in information and communication technology goods".

2.2 Informative 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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI ES 203 199: "Environmental Engineering (EE); Methodology for environmental Life Cycle Assessment (LCA) of Information and Communication Technology (ICT) goods, networks and services".

- [i.2] 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.3] Recommendation ITU-T L.1010: "Green battery solutions for mobile phones and other hand-held information and communication technology devices".
- [i.4] Recommendation ITU-T L.1021: "Extended producer responsibility - Guidelines for sustainable e-waste management".
- [i.5] Recommendation ITU-T L.1023: "Assessment method for circular scoring".
- [i.6] Recommendation ITU-T L.1031: "Guideline on implementing the e-waste reduction target of the Connect 2020 Agenda".
- [i.7] Recommendation ITU-T L.1061: "Circular public procurement of information and communication technologies".
- [i.8] Recommendation ITU-T L.1410: "Methodology for environmental life cycle assessments of information and communication technology goods, networks and services".
- [i.9] Recommendation ITU-T L.1604 (2022): "Development framework for bioeconomy in cities and communities".
- [i.10] Recommendation ITU-T L.1020 (2018): "Circular economy: Guide for operators and suppliers on approaches to migrate towards circular ICT goods and networks".
- [i.11] Ellen McArthur Foundation: "[What is the circular economy?](#)".
- [i.12] Recommendation ITU-T X.1400 (2020): "Terms and definitions for distributed ledger technology".
- [i.13] Recommendation ITU-T Q.5050 (2019): "Framework for solutions to combat counterfeit ICT devices".
- [i.14] European Commission (2022): "[Proposal for Ecodesign for Sustainable Products Regulation](#)".
- [i.15] OECD (2019): "[Going Digital: Shaping Policies, Improving Lives](#)". Paris: OECD Publishing. 168 pp.
- [i.16] [COM/2020/798 \(2020\)](#): "Proposal for a Regulation of the European Parliament and of the Council concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU) No 2019/1020".
- [i.17] ETSI TS 103 199 (2011): "Environmental Engineering (EE); Life Cycle Assessment (LCA) of ICT equipment, networks and services; General methodology and common requirements".
- [i.18] European Commission (2024): "[Commission implementing decision on a standardisation request to the European Committee for Standardisation, the European Committee for Electrotechnical Standardisation, and the European Telecommunications Standards Institute as regards digital product passports in support of Union policy on ecodesign requirements for sustainable products and on batteries and waste batteries](#)".
- [i.19] UN: Secretary-General; World Commission on Environment and Development (1987): "[Report of the World Commission on Environment and Development: Our common future](#)", New York, NY: United Nations. 374 pp.
- [i.20] Recommendation ITU-T Y.4108/Y.2213 (2008): "NGN service requirements and capabilities for network aspects of applications and services using tag-based identification".
- NOTE: Former Recommendation ITU-T Y.2213 renumbered as Recommendation ITU-T Y.4108 on 2016-02-05 without further modification and without being republished.
- [i.21] ISO 9000:2015: "Quality management systems - Fundamentals and vocabulary".
- [i.22] V. Rizos, P. Urban (2024): "Implementing the EU digital battery passport: Opportunities and challenges for battery circularity".
- [i.23] Carolyn Bernier, Fatme Danash (2024): "[D5.1: DPP Prototypes](#)".

- [i.24] E. Wagner et al. (2023): "[D2.1: Mapping of legal and voluntary requirements and screening of emerging DPP-related pilots](#)".
- [i.25] [CEN \(2024\) Technical Bodies, CEN/CLC/JTC 24](#): "Digital Product Passport - Framework and System".
- [i.26] Dykstra, C. A. (1939): "The quest for responsibility", Am. Political Sci. Rev. 33(1), pp. 1-25. doi:10.2307/1949761.
- [i.27] [Regulation \(EU\) 2024/1781 of the European Parliament and of the Council of 13 June 2024](#) establishing a framework for setting eco-design requirements for sustainable products and repealing Directive 2009/125/EC (COM(2022)0142 - C9-0132/2022 - 2022/0095(COD)).
- [i.28] [ETSI GR CIM 017 \(V1.1.1\) \(12-2022\)](#): "Context Information Management (CIM); Feasibility of NGSI-LD for Digital Twins".
- [i.29] ETSI (2020): "[A Guide to Writing World Class Standards](#)".
- [i.30] [International Electrotechnical Commission \(2023\), IEC 62683 - IEC/TC 121](#): "Tests - Common Data Dictionary (CDD - V2.0018.0001)".
- [i.31] ISO/IEC 8859-1:2003: "Information technology - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1".
- [i.32] Telecommunication standardization sector of ITU (09/2020): "ITU-T Editing Guidelines".
- [i.33] Luxembourg government (2021): "[The Product circularity Data Sheet decoded](#)".
- [i.34] A. Kurteva (2023): "[The RePlanIT ontology for Digital Product Passports of ICT](#)".
- [i.35] Schedler, A. (1999): "Conceptualizing accountability", In: Schedler, A., Diamond, L., Plattner, M.F., editors. The self-restraining state: Power and accountability in new democracies, pp. 13-28. Boulder, CO: Lynne Rienner Publishers.
- [i.36] M. Sporny, L. Rosenthal (2021): "[Cryptographic Hyperlinks](#)".
- [i.37] United Nations (2022): "['Zero tolerance for greenwashing', Guterres says at report launch](#)".
- [i.38] [UNECE Recommendation No. 49 \(2024\)](#): "Transparency at Scale (final draft)".
- [i.39] UNECE (2024): "[Digital Product Passport](#)", version: 0.4.0.
- [i.40] UNECE (2024): "[DigitalProductPassport](#)", version: working, Data Model of unece/DigitalProductPassport.
- [i.41] Recommendation ITU-T L.1015: "Criteria for evaluation of the environmental impact of mobile phones".
- [i.42] Recommendation ITU-T L.1470: "Greenhouse gas emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement".
- [i.43] Recommendation ITU-T L.1070: "Global digital sustainable product passport opportunities to achieve a circular economy".
- [i.44] Recommendation ITU-T L.1071: "An information model for digital product information on sustainability and circularity".
- [i.45] ISO/FDIS 59040: "Circular economy - Product circularity data sheet". .
- [i.46] ISO 59010:2024: "Circular economy - Guidelines for the Transition of Business Models and Value Networks".
- [i.47] ISO 59004:2024: "Circular economy - Vocabulary, principles and guidance for implementation".
- [i.48] ISO 59020:2024: "Circular economy - Measuring and assessing circularity performance".
- [i.49] IEC/FDIS 82474-1: "Material declaration Part 1: General requirements".

- [i.50] Recommendation ITU-T L.1101: "Measurement methods to characterize rare metals in information and communication technology goods".
- [i.51] [Regulation \(EC\) No 1907/2006 of the European Parliament and of the Council of 18 December 2006](#) concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (consolidated version 6/6/2024).
- [i.52] [Regulation \(EC\) No 1272/2008 of the European Parliament and of the Council of 16 December 2008](#) on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.
- [i.53] [Regulation \(EU\) 2017/1369 of the European Parliament and of the Council of 4 July 2017](#) setting a framework for energy labelling and repealing Directive 2010/30/EU.
- [i.54] [Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011](#) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast 1/8/2024).
- [i.55] [Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012](#) on waste electrical and electronic equipment (WEEE) (recast 8/4/2024).
- [i.56] [Regulation \(EU\) 2023/1542 of the European Parliament and of the Council of 12 July 2023](#) concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC.
- [i.57] [Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009](#) establishing a framework for the setting of ecodesign requirements for energy-related products (recast).
- [i.58] EN 45550:2020: "Definitions related to material efficiency", (produced by CEN).
- [i.59] EN 45552:2020: "General method for the assessment of the durability of energy-related products", (produced by CEN).
- [i.60] EN 45553:2020: "General method for the assessment of the ability to remanufacture energy-related products", (produced by CEN).
- [i.61] EN 45554:2020: "General methods for the assessment of the ability to repair, reuse and upgrade energy-related products", (produced by CEN).
- [i.62] EN 45555:2019: "General methods for assessing the recyclability and recoverability of energy-related products", (produced by CEN).
- [i.63] EN 45556:2019: "General method for assessing the proportion of reused components in energy-related products", (produced by CEN).
- [i.64] EN 45557:2020: "General method for assessing the proportion of recycled material content in energy-related products", (produced by CEN).
- [i.65] EN 45558:2019: "General method to declare the use of critical raw materials in energy-related products", (produced by CEN).
- [i.66] EN 45559:2019: "Methods for providing information relating to material efficiency aspects of energy-related products", (produced by CEN).

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

accountability: equivalent to answerability, liability, and the expectation of account-giving, with the obligation to inform about (past or future) actions and decisions to justify them

NOTE: Term adapted from [i.26] and [i.35] and ETSI TS 103 881 [3].

authenticity: ability of proving an assertion, such as the identity of a computer system user

NOTE: Term adapted from ETSI TS 103 881 [3].

centralization: data, function, process, system where a single entity, or a small group, has exclusive control or responsibility

NOTE: Term adapted from ETSI TS 103 881 [3].

circular economy: economy closing the loop between different life cycles through design and corporate actions/practices that enable activities like reuse, refurbishment, remanufacture and recycling in order to use raw materials, goods and waste in a sustainable and efficient way

NOTE 1: 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, optimizes resource yields, and minimizes system risks by managing finite stocks and renewable flows, while reducing waste streams.

NOTE 2: Term adapted from Recommendations ITU-T L.1022 [2], ITU-T L.1020 [i.10] and L.1604 [i.9].

circularity: designing out waste and pollution, keeping products and materials in use, and regenerating natural systems

NOTE: The term is based on EMF2021[i.11].

collective product: product batch or product model with common characteristics for multiple product items

NOTE: Term adapted from ETSI TS 103 881 [3].

compliance: adherence to specified requirements

NOTE: Term adapted from Recommendation ITU-T X.1400 [i.12].

component: hardware constituent of a product that cannot be taken apart without destruction or impairment of its intended use

NOTE 1: A populated printed circuit board may be considered a component and/or a part from the perspective of the present document.

NOTE 2: Term adapted from ETSI EN 303 808 [i.2].

conformity assessment: demonstration that specified requirements relating to a product, process, system, person or body are fulfilled

NOTE: Term adapted from Recommendation ITU-T Q.5050 [i.13].

decentralization: data, function, process, system that is not centralized, controlled by a single or few entities

NOTE: Term adapted from ETSI TS 103 881 [3].

digital product passport: structured collection of product-specific data conveyed through a unique identifier

NOTE 1: Term based on European Commission document [i.14].

NOTE 2: Term adapted from ETSI TS 103 881 [3].