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TECHNICAL REPORT

Environmental aspects for lighting - Literature review on lighting products and systems

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Environmental aspects for lighting - Literature review on lighting products and systems

FOREWORD

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IEC TR 63645 has been prepared by IEC Technical Committee 34: Lighting. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
34/1421/DTR	34/1438/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

Increasingly, there is a focus on preserving the natural environment for the good of future generations. For this to be achieved, efficient use of energy and materials throughout the life cycle of every product and process is essential to conserve the world's finite natural resources. In addition, release of substances and materials that might be harmful for the environment or induce climatic changes must be avoided or minimized. From conception to the end of life of a product, the environmental impact of all the relevant processes should be considered, including how materials are disposed of or recovered for future use.

To contribute to conserving natural resources, manufacturers and suppliers of lighting products are implementing environmentally conscious design involving:

– efficient use of energy and materials in the manufacture of products;
– phasing-out or minimizing use of hazardous substances or materials;
– at the end of product life, sorting and recycling materials for future use.

Environmental product declarations and environmentally conscious design are being increasingly required, and in some instances mandated. These can take several forms, for example, Type II (self-declaration) or Type III (third-party declaration) environmental declarations, or material declarations.

Green Public Procurement is a process defined by the European Commission, which can be applicable and/or environmentally conscious design as part of ISO 14001 certification. Some countries and regions are actively striving for environmental conservation, for example, the European Union through its Ecodesign Directive and China through Ecodesign Initiative. Systematic demands for environmentally conscious design will be required by most, if not all, lighting product customers, in the medium term.

The literature review in this document covers environmental aspects related to lighting products and is intended to provide a focused inventory of references that will assist with access to relevant documents on standardized environmental strategies, techniques, and reporting.

The information available can help to facilitate improved product environmental performance, foster effective communication using common references and terminology for environmental information throughout the supply chain, and help identifying future standardization needs related to environmental aspects.

1 Scope

This document provides a comprehensive range of environment related information sources to assist with understanding, assessing, and advancing the environmental performance of lighting products.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

3.2 Abbreviated terms

3.2.1 Abbreviated terms - Technical

CE	circular economy
CFP	carbon footprint of a product
CRM	critical raw material
EEE	electrical and electronic equipment
ECD	environmentally conscious design
EOL	end of life
EPD	environmental product declaration
ERP	energy related product
EUP	energy using product
GPP	green public procurement
GWP	global warming potential
LCA	life cycle assessment
LCI	life cycle inventory
LCIA	life cycle impact assessment
MD	material declaration
ME	material efficiency
PCR	product category rules
PEP	product environmental profile
PSR	product specific rules
RSL	reference service life

3.2.2 Abbreviated terms - Organisations

ACEA	Advisory Committee on Environmental Aspects (An IEC Advisory Group)
BSI	British Standards Institution
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CIBSE	Chartered Institution of Building Services Engineers
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NGO	Non-Government Organisation
SDO	Standards Development Organisation

3.3 Programme operators

Operator	Origin	Websites
EPDItaly	Italy	https://www.epditaly.it/en/il-programma-epditaly/
PEP Ecopassport	France	http://www.pep-ecopassport.org
Smart EPD	North America	https://smartepd.com

4 Literature review - Overview

4.1 Visualisation diagram

The Figure 1 diagram is a visual representation to map the scope and content of the publications in this document. Figure 1 provides an overview visual representation of the environmental standardization topics.

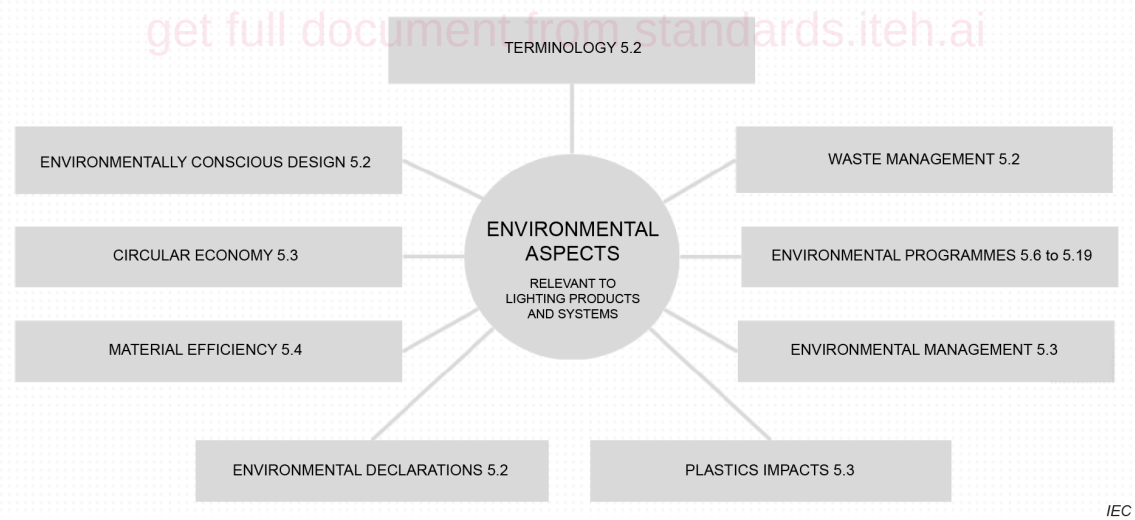

Figure 1 – Environmental standardization topics

4.2 Organisation

This document includes publications from various types of Standards Development Organisations (SDOs) and Programme Operator Non-Government Organisations (NGOs). These are:

– International Standards Development Organisations (SDOs) - International member-supported organizations which develop and maintain technical standards to meet industry needs (e.g. IEC, ISO).

– Regional Standards Development Organisations (SDOs) - Geographically-based member-supported organizations which develop and maintain technical standards to meet industry needs (e.g. CEN, CENELEC).
– National Standards Development Organisations (SDOs) - Nationally based member-supported organizations which develop and maintain technical standards to meet industry needs (e.g. BSI, ANSI).
– Programme Operator Non-Government Organisations (NGOs) - Regionally or nationally based member-supported organizations which develop and maintain LCA and EPD rules to meet industry needs (e.g. EPDItaly, PEP Ecopassport, Smart EPD North America).

5 Literature review - Documents and sources

5.1 Literature review overview - General

This document on standards and other documents describes the scope and content of publications from International Standards Development Organisations (SDOs) relevant regional SDOs and Non-Government Organisations (NGOs). It is intended to provide a focused inventory of references that will assist with access to relevant documents on standardized environmental strategies, techniques, and reporting.

Annex A contains IEC Advisory Committee on Environmental Aspects (ACEA) guidance publications.

Annex B contains examples of environmental product publications from other IEC committees.

The following is a list of the literature reviews identifying the document titles. The content is presented in Clause 6, Literature review reports.

5.2 IEC Literature reviews

IEC- Terminology

IEC FDIS 60050-193 [1], *International Electrotechnical Vocabulary (IEV) - Circular economy and material efficiency*[1]

IEC 62542:2013 [2], *Environmental standardization for electrical and electronic products and systems*

IEC 62430:2019 [3], *Environmentally conscious design (ECD) - Principles, requirements and guidance*

IEC TR 63212:2020 [4], *Harmonization of environmental performance criteria for electrical and electronic products - Feasibility study*

IEC 63333:2023 [5], *General method for assessing the proportion of reused components in products*

IEC 63366:2025 [6], *Product category rules for life cycle assessment of electrical and electronic products and systems*

IEC TR 62635:2012 [7], *Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment*

[1] Under preparation. Stage at time of publication: IEC RFDIS 60050-193:2025.

IEC 62474:2018 [8], *Material declaration for products of and for the electrotechnical industry*

IEC 62474:2018/AMD1:2020 [9]

IEC FDIS 63372:2025 [10], Quantification and communication of carbon footprint, GHG emission reductions and avoided emissions from electric and electronic products and systems - Principles, methodologies, requirements and guidance[2]

IEC FDIS 63395:2025 [11], Sustainable management of waste electrical and electronic equipment (e-waste)[3]

5.3 ISO Literature reviews

The following is a list of the literature reviews, identifying the document titles.

ISO- Environmental management

ISO 14040:2006 [12], *Environmental management — Life cycle assessment — Principles and framework*

ISO 14044:2006 [13], *Environmental management — Life cycle assessment — Requirements and guidelines*

ISO 14045:2012 [14], *Environmental management — Eco-efficiency assessment of product systems — Principles, requirements and guidelines*

ISO/TR 14047:2012 [15], *Environmental management — Life cycle assessment — Illustrative examples on how to apply ISO 14044 to impact assessment situations*

ISO/TS 14048:2002 [16], *Environmental management — Life cycle assesment — Data documentation format*

ISO/TR 14049:2012 [17], *Environmental management — Life cycle assessment — Illustrative examples on how to apply* ISO 14044 *to goal and scope definition and inventory analysis*

ISO 14071:2024 [18], *Environmental management — Life cycle assessment — Critical review processes and reviewer competencies*

ISO 14072:2024 [19], *Environmental management — Life cycle assessment — Requirements and guidance for organizational life cycle assessment*

ISO/TS 14074:2022 [20], *Environmental management — Life cycle assessment — Principles, requirements and guidelines for normalization, weighting and interpretation*

ISO 14020:2022 [21] *Environmental statements and programmes for products — Principles and general requirements*

ISO DIS 14021:2025 [22], Environmental labels and programmes for products — Self-declared environmental claims[4]

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2 Under preparation. Stage at time of publication: IEC FDIS 63372:2025.

3 Under preparation. Stage at time of publication: IEC FDIS 63395:2025.

4 Under preparation. Stage at time of publication: ISO DIS 14021:2025.

ISO DIS 14025:2025 [23], Environmental statements and programmes for products — Environmental product declarations (EPDs)[5]

ISO 14033:2019 [24], *Environmental management — Quantitative environmental information — Guidelines and examples*

ISO 14063:2020 [25], *Environmental management — Environmental communication — Guidelines and examples*

ISO**- Plastics**

ISO 11469:2016 [26], *Plastics — Generic identification and marking of plastics products*

ISO 17422:2018 [27], *Plastics — Environmental aspects — General guidelines for their inclusion in standards*

ISO 22526-1:2020 [28], *Plastics — Carbon and environmental footprint of biobased plastics — Part 1: General principles*

ISO 22526-4:2023 [29], *Plastics — Carbon and environmental footprint of biobased plastics — Part 4: Environmental (total) footprint (Life cycle assessment)*

ISO**- Circular economy**

ISO 59004:2024 [30], *Circular economy — Vocabulary, principles and guidance for implementation*

ISO 59010:2024 [31], *Circular economy — Guidance on the transition of business models and value networks*

ISO 59020:2024 [32], *Circular economy — Measuring and assessing circularity performance*

ISO/TR 59032:2024 [33], *Circular economy — Review of existing value networks*

ISO 59040:2025 [34], *Circular economy — Product circularity data sheet*

ISO 59014:2024 [35], *Environmental management and circular economy — Sustainability and traceability of the recovery of secondary materials — Principles, requirements and guidance*

5.4 CEN-CENELEC Literature reviews

JTC 10 Energy-related products - Material efficiency aspects for ecodesign

PD CLC/TR 45550:2020 [36], *Definitions related to material efficiency*

EN 45552:2020 [37], *General method for the assessment of the durability of energy related products*

EN 45553:2020 [38], *General method for the assessment of the ability to remanufacture energy-related products*

[5] Under preparation. Stage at time of publication: ISO DIS 14025:2025.

EN 45554:2020 [39], *General methods for the assessment of the ability to repair, reuse and upgrade energy-related products*

EN 45555:2019 [40], *General methods for assessing the recyclability and recoverability of energy-related products*

EN 45556:2019 [41], *General method for assessing the proportion of reused components in energy-related products*

EN 45557:2020 [42], *General method for assessing the proportion of recycled material content in energy-related products*

EN 45559:2019 [43], *Methods for providing information relating to material efficiency aspects of energy-related products*

5.5 CENELEC Literature reviews

TC 111X Environment

EN 50693:2019 [44], *Method for quantitative eco design via life cycle assessment and environmental declarations through product category rules for EEE*

5.6 PEP Ecopassport literature reviews

PEP - PSR-0014 ED 2.0 [45], *Specific rules for luminaires*

PEP - PSR-0007 ED 2.0 [46], *Specific rules for self-contained emergency electrical safety devices*

5.7 EPDItaly literature reviews

EPDItaly007 [47] - Core PCR for Electronic and electrical products and systems

EPDItaly 020 [48] - Sub PCR for electronic and electrical products and systems - Part B Public lighting equipment

5.8 BSI United Kingdom literature reviews

BS 8887-221:2024 [49], *Design for manufacture, assembly, disassembly and end-of-life processing (MADE). Part 221: Remanufacture of luminaires - Code of Practice*

5.9 CIBSE United Kingdom literature reviews

CIBSE TM65.2:2023 [50], *Embodied carbon in building services: lighting* (2023)

CIBSE TM66:2021 [51], *Creating a circular economy in the lighting industry* (2021)

5.10 Smart EPD North America literature reviews

Smart EPD Part B - PCR for Luminaires (North America) [52]

6 Literature review - Detailed reports

6.1 General

Templated literature review reports of the standardisation documents that are comprised this document are given in this Clause 6. The reports are arranged into groups, identified by the publishing SDO or NGO.

6.2 IEC TC 1 Terminology

IEC FDIS 60050-193 [1], *International Electrotechnical Vocabulary (IEV) - Part 193: Circular economy and material efficiency*

1	**Publication Bibliographic Data**
	Publishing Organisation: IEC
	Title: IEC FDIS 60050-193 [1] - International Electrotechnical Vocabulary (IEV) Part 193: Circular economy and material efficiency[6]
	Type: International Standard (IS)
	Publication Number: N/A
	Edition Number: 1.0
	Amendment Number: N/A
	Date Published: FDIS Stage (IEC TC 1 – 1/2666/RVC)
	Number of Pages: 47
	Text Language(s): English, French, Russian. The terms and definitions are provided in French and English. In addition, the terms only are given in Arabic, Czech, German, Spanish, Finnish, Italian, Japanese, Korean, Mongolian, Dutch, Norwegian Polish, Portuguese, Slovenian, Serbian, Swedish and Chinese.
2	**Product/Service Scope**
	Terms and definitions for electrical and electronic products, systems, and services relating to circular economy and material efficiency.
3	**Environmental Aspect Scope**
	Topic: Terminology IEC 60050, Part 193 gives the general terminology used for the subject area of circular economy and material efficiency. This document has the status of a horizontal publication in accordance with IEC Guide 108, Guidelines for ensuring the coherence of IEC publications - Horizontal functions, horizontal publications and their application.
4	**Summary Information**
	The IEV (IEC 60050, International Electrotechnical Vocabulary) is a general purpose multilingual vocabulary covering the field of electrotechnology, electronics and telecommunication. The terms and definitions in the entries are given in two or more of the three IEC languages, (French, English and Russian). In each entry, the terms alone are also given in several of the additional IEV languages. Organization of a terminological entry: Each of the terminological entries corresponds to a concept, and comprises:

[6] Under preparation. Stage at time of publication: IEC FDIS 60050-193:2025

	– the IEV number – the term (accompanied by synonyms and abbreviations) – the definition of the concept – the source (if applicable) – the terms, in the additional IEV languages (if applicable) The preferred term is the term that heads a terminological entry in each language and can be followed by synonyms. Each term can be followed by attributes giving additional information. In some cases, an IEV concept is taken from another IEV part or from another authoritative terminology publication, either with or without modification. Overview of sections and terminological topics: – 193-01 - general terms relating to circular economy and material efficiency – 193-02 - general terms relating to product, process and organization – 193-03 - terms relating to resource types – 193-04 - terms relating to recycling – 193-05 - terms relating to product durability – 193-06 - terms relating to product life extension
5	**Other Information**
	N/A

6.3 IEC TC 111 - Environmental standardization for electrical and electronic products and systems

IEC 62430:2019 [3], *Environmentally conscious design (ECD) - Principles, requirements and guidance*

1	**Publication Bibliographic Data**
	Publishing Organisation: IEC
	Title: Environmentally conscious design (ECD) - Principles, requirements and guidance
	Type: International Standard (IS)
	Publication Number: IEC 62430
	Edition Number: 2.0
	Amendment Number: N/A
	Date Published: 2019
	Number of Pages: 62
	Text Language(s): English
2	**Product/Service Scope**
	Electrical products and systems (EEPS) ECD (environmentally conscious design)
3	**Environmental Aspect Scope**
	Topic: Environmentally conscious design Principles, requirements and guidance for design and development to minimize the adverse environmental impacts of products