INTERNATIONAL STANDARD

ISO 20294

First edition
2018-11

Graphic technology — Quantification and communication for calculating the carbon footprint of e-media

Technologie graphique — Quantification et communication pour calculer l'empreinte carbone des médias électroniques

Reference number
ISO 20294:2018(E)

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Published in Switzerland

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**
3.1 Terms relating to carbon footprint 1
3.2 Terms relating to greenhouse gases 2
3.3 Terms relating to life cycle assessment 3
3.4 Terms relating to organisations and consumers 4
3.5 Terms relating to electronic media 5
3.6 Terms relating to electronic media delivery 6
3.7 Terms relating to information and communication technology 6

4 Principles for carbon footprint quantification **7**
4.1 General requirements 7
4.2 Life cycle perspective 7
4.3 Relative approach and functional unit 7
4.4 Relevance 7
4.5 Completeness 7
4.6 Consistency 7
4.7 Accuracy 7
4.8 Transparency 8
4.9 Assumptions for content use 8
4.10 Avoidance of double counting 8
4.11 Implementation criteria 8
4.12 Uncertainty 8

5 Methodology **8**
5.1 General Requirements 8
5.2 Goal and scope 9
5.2.1 General 9
5.2.2 LCA carbon footprint 10
5.2.3 System boundary 10
5.2.4 Scope of e-media carbon footprint studies 10
5.2.5 Life cycle stages 11
5.3 System boundary definitions 11
5.4 Time boundary for data 12
5.5 Carbon footprint quantification of life-cycle stages 12
5.5.1 Inventory analysis 12
5.5.2 Data collection for each life-cycle stage 12
5.5.3 General requirements applied to all stages 13
5.5.4 Production stage for contents 16
5.5.5 Distribution stage for contents (optional) 16
5.5.6 Use stage for contents 16
5.5.7 Production stage for e-media devices 17
5.5.8 Distribution stage for e-media devices 17
5.5.9 Use stage for e-media devices 17
5.5.10 End-of-life stage for e-media devices (optional) 18

6 Reporting **18**
6.1 General 18
6.2 Documentation requirements 18
6.2.1 General 18
6.2.2 Reporting requirements 18
6.3 Interpretation of the carbon footprint of a product 19

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6.3.1 General 19
6.3.2 Life cycle interpretation phase 19
6.3.3 Allocation method 19

7 Communication requirements 19
7.1 General 19
7.2 Interpretation and comparison 20
7.3 Product definitions and product category rules 20

Annex A (informative) **Inventory analysis of input criteria used to define the product profile 21**

Annex B (normative) **Operations and materials in processes and data collection itemswithin the system boundary 22**

Annex C (normative) **Allocation method regarding e-media devices 24**

Annex D (informative) **Method regarding the number of downloads 26**

Annex E (informative) **Calculation examples 27**

Annex F (normative) **Information to be included in e-media carbon footprint comparisons 28**

Annex G (normative) **Limitations of the CFP 29**

Bibliography 31

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared jointly by Technical Committee ISO/TC 130, *Graphic technology* and Technical Committee IEC/TC 100, *Audio, video and multimedia systems and equipment*. The draft was circulated for voting to the national bodies of both ISO and IEC.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Reduction of worldwide greenhouse gas (GHG) emissions is central to the mitigation of climate change (see Annex A), considered to be arising from natural and anthropogenic activities. Specificity and consistency in calculating GHG emission values is important for governments, non-governmental organisations (NGOs), industry and consumers involved in climate change discussions and policy development. Global markets and financial interests demand transparency and there is no common model used for carbon footprint studies, which leads to confusion and misinformation: data sets are very difficult to compare if they are calculated using different models and criteria. The publishing industry and associated industries [manufacturers of electronic media (e-media) devices, servers, networks, cloud-based data management systems and digital content developers] have made progress in recent years as the reach of digital technology has extended to all parts of society and commerce across the globe. However, it is extremely difficult to track and quantify emissions associated with e-media.

Standards can provide a common model that minimises variability and complexity and provides the market with a method for developing tools that are easy to use and that follow a common methodology. The results of carbon footprint studies can be used to provide the basis of a data corpus that governments, NGOs, industry, and media consumers and specifiers can use for reference to further refine carbon footprinting processes. These data must be gathered using tools which use a consistent calculation method and must be accurate, defensible and trustworthy. This document is intended as a first step towards subsequent work that can provide such assurance. It is a framework for calculating and communicating the carbon footprint of examples of e-media and follows an equivalent methodology to that outlined in ISO 16759.

This document is a starting point, taking the first steps towards developing accurate and comprehensive carbon footprint data for examples of e-media. It is important to understand that we are at the beginning of a process that will take years to stabilize, define and implement fully. What we can achieve now is necessarily primitive because of the lack of data, practice and plural experience. Over time, carbon footprint studies will create a body of sector-specific data. Capturing all of the data associated with e-media products is currently extremely difficult because e-media data products exist only in digital form. They can be used in many contexts and viewed on many different devices, so their carbon footprint can be substantial, even though it bears no relation to the value of the content. To understand the environmental impact of e-media, a framework methodology for capturing carbon footprint data is required as a starting point for consistent carbon footprint calculations over time.

This document has been developed to provide such a model for e-media, including the tools required to access the data and devices on which e-media are stored for streamed or downloaded use. It references the delivery devices and the data components that together deliver electronic content to end users. It is written for manufacturers of electronic e-media devices, servers, networks, cloud-based data management systems, digital content developers, consumers, related industry associations and providers of carbon footprinting tools. It offers a program-neutral method for calculating and communicating the carbon footprint of e-media content products, based on calculated carbon dioxide equivalent (CO_2e) values, for the single impact category of climate change. Life span is distinguished from life cycle because digital data do not reach end of life. Digital data (contents) are perpetual; however, digital data (contents) also have a life span during which time they are viable and usable, and after which they are generally stored or deleted. This single criteria approach provides the foundation for future work addressing multi-criteria impacts which assess all potential impacts that e-media can have on the environment.

Multi-criteria calculations based on all four phases of life cycle assessment (LCA), as outlined in ISO 14040, are not within the scope of this document. Further information for conducting LCA is outlined in ISO 14044. This document also references IEC/TR 62921, a quantification methodology for GHG emissions for computers and monitors, developed as part of international efforts to provide GHG calculation guidance for electronic products. According to IEC/TR 62921, quantification of the carbon footprint of e-media content products requires a defined goal and scope for the carbon footprint of a product (CFP) study. IEC/TR 62921 also requires a specification of the system boundaries and process inventory as the basis for calculations. It allows for calculations of the whole or partial life span of

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contents and the life cycle of e-media devices, while e-media are constituted of contents and e-media devices. The life span is assessed using the same method as LCA.

This document provides the foundation to develop calculation models that will increase over time in consistency, transparency, robustness and accountability for e-media carbon footprint quantifications and their communication. It can provide the following benefits to companies:

— enables accountable and transparent carbon footprint information to be obtained for all parties in the supply chain, including consumers and media buyers;

— enables consistency in carbon footprint calculator design, to aid relevance and applicability for different e-media product sectors and geographies;

— provides e-media publishers, distributors, buyers and consumers with a means of quantifying and communicating the carbon footprint of e-media using a common methodology and defined boundaries;

— encourages media buyers and consumers of e-media to make informed media investment, purchase and usage decisions, using information validated with calculation, communication and reporting tools that are consistent with this document;

— facilitates continuous monitoring of the carbon footprint of e-media as part of their overall environmental impact, and encourages constant improvement;

— provides reliable and consistent CO_2 emissions data for e-media;

— provides a model for gathering e-media data for emissions management and reduction;

— provides a model for data assumptions for media usage;

— can be used as part of GHG emissions management;

— facilitates performance tracking and progress in GHG emissions reduction.

This document includes examples of carbon footprint studies and guidance for communicating and verifying carbon footprint information to device developers, content creators, distributors, publishers, consumers, industry and any other interested parties.

Use of this document facilitates the calculation of the carbon footprint of e-media products and similar digital content delivered digitally to an electronic device such as a desktop computer, laptop, tablet, smartphone, e-reader or equivalent electronic device. Its principles can be extended to all digitally delivered media, including movies and audio and are not restricted to media that are alternatives to print.

Where the results of a carbon footprint study for e-media are intended to be communicated to businesses and consumers, the communication should follow standards of completeness as defined here and in other ISO standards, such as ISO 14020.

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Graphic technology — Quantification and communication for calculating the carbon footprint of e-media

1 Scope

This document specifies the requirements for quantifying the carbon footprint of those processes, materials and technologies within the user's knowledge and control that are necessary for the delivery and use of e-media. It covers requirements to account for e-media archiving, distribution, use and storage. It is based on a life cycle assessment (LCA) approach, using defined system boundaries and a specified functional unit as the basis for complete or partial carbon footprinting studies. These data can be referenced throughout supply chains for individual e-media products.

This document is applicable to a carbon footprint of a product (CFP) study of e-media regarding contents and e-media devices.

This document provides a framework for carbon calculators that organisations can follow and that can be used as the structure for market- or sector-specific carbon footprinting tools. Studies and tools constructed within this framework methodology provide carbon footprint quantifications of e-media that can be validated, verified and provide reference for future studies.

This document does not assess any social or economic aspects or impacts, or any other environmental aspects and related impacts potentially arising from the life cycle of a product.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1 Terms relating to carbon footprint

3.1.1
carbon footprint
net amount of *GHG emissions* (3.2.4) and GHG removals, expressed in *carbon dioxide equivalents* (3.2.2)

3.1.2
carbon footprint of a product
CFP
carbon footprint (3.1.1) of a *product system* (3.1.3)

3.1.3
product system
collection of processes with elementary and product flows performing one or more defined functions and which models the *life cycle* (3.3.5) of a product

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3.1.4
product category rules
PCR
set of specific rules, requirements and guidelines for developing Type III environmental declarations and footprint communications for one or more product categories

3.1.5
comprehensive carbon footprint
product-specific *carbon footprint* (3.1.1) that includes the carbon impacts for each component and process in the *life cycle* (3.3.5) of a product

3.1.6
streamlined carbon footprint
product-specific *carbon footprint* (3.1.1) that includes simplified calculations of the carbon impacts for each component and process in the *life cycle* (3.3.5) of a product

3.2 Terms relating to greenhouse gases

3.2.1
greenhouse gas
GHG
gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds

Note 1 to entry: Water vapour and ozone are also anthropogenic as well as natural GHGs but are not included as recognized GHGs due to difficulties in calculating their *global warming potential* (3.2.3).

[SOURCE: ISO 14064-1:2006, 2.1, modified — the original Note has been removed and Notes 1 and 2 to entry have been added.]

3.2.2
carbon dioxide equivalent
CO_2 equivalent
CO_2e
unit for comparing the radiative force of a *GHG* (3.2.1) to that of carbon dioxide

[SOURCE: ISO/TS 14067:2013, 3.1.3.2, modified — the Notes have been removed]

3.2.3
global warming potential
GWP
index, based on radiative properties of *GHGs* (3.2.1), measuring the radiative forcing following a pulse emission of a unit mass of a given GHG in the present-day atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide (CO_2)

[SOURCE: ISO/TS 14067:2013, 3.1.3.4, modified.]

3.2.4
greenhouse gas emission
GHG emission
release of a *GHG* (3.2.1)into the atmosphere

[SOURCE: ISO/TS 14067:2013, 3.1.3.5, modified.]

3.2.5
greenhouse gas emission factor
GHG emission factor
coefficient relating activity data with the *GHG emission* (3.2.4)

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3.2.6
greenhouse gas source
GHG source
mechanical or natural process that releases a *GHG* (3.2.1) into the atmosphere

EXAMPLE Electrical energy use where the electrical energy has been created from fossil fuel resources.

3.3 Terms relating to life cycle assessment

3.3.1
allocation method
method by which inputs and outputs are allocated to different examples of *e-media* (3.5.1)

3.3.2
energy
sources of *GHG emissions* (3.2.4) used for the provision and use of the product during its *life cycle* (3.3.5)

3.3.3
functional unit
quantified and defined single iteration of an example of *e-media* (3.5.1), for use as a reference unit in a *CFP* (3.1.2) study

EXAMPLE A single download of an e-book to an e-media device.

[SOURCE: ISO 16759:2013, 3.3.5, modified — In the definition "a printed product" has been replaced by "e-media" and a new example has been provided.]

3.3.4
interpretation
process of explaining the results of a *life cycle assessment* (3.3.6) such that it is relevant to the goal and scope of a *CFP* (3.1.2) study

3.3.5
life cycle
consecutive and interlinked stages related to a product from raw material acquisition or generation from natural resources to end-of-life treatment

[SOURCE: ISO/TS 14067:2013, 3.1.5.2, modified — definition revised and Note 1 to entry deleted.]

3.3.6
life cycle assessment
LCA
compilation and evaluation of the inputs, outputs and potential environmental impacts of a *product system* (3.1.3) throughout its *life cycle* (3.3.5)

3.3.7
life cycle inventory analysis
LCI
phase of *life cycle assessment* (3.3.6) involving the compilation and qualification of inputs and outputs for a product throughout its *life cycle* (3.3.5)

3.3.8
process
set of interrelated or interacting activities that transforms inputs into outputs

[SOURCE: ISO 16759:2013, 3.3.11]

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3.3.9
primary data
quantified value of a *process* (3.3.8) or an activity obtained from a direct measurement or a calculation based on direct measurements

Note 1 to entry: Primary data need not necessarily originate from the product system under study because primary data might relate to a different but comparable product system to that being studied.

Note 2 to entry: Primary data can include *GHG emission factors* (3.2.5) and/or GHG activity data.

3.3.10
secondary data
data which do not fulfil the requirements for primary data

Note 1 to entry: Secondary data can include data from databases and published literature, default emission factors from national inventories, calculated data, estimates or other representative data, validated by competent authorities.

Note 2 to entry: Secondary data can include data obtained from proxy processes or estimates.

3.3.11
transparency
open, comprehensive, accessible, clear and understandable presentation of information

[SOURCE: ISO 16759:2013, 3.8.4]

3.3.12
uncertainty
unpredictability of the consequences, extent or magnitude of circumstances, conditions or events

Note 1 to entry: Uncertainty information typically specifies quantitative estimates of the likely dispersion of values and a qualitative description of the likely causes of the dispersion.

[SOURCE: ISO 16759:2013, 3.8.5, modified — definition revised.]

3.3.13
aggregated data
data combined from different sources that relate to broad categories, classes or groups

3.3.14
life span
expected time of a product's serviceable use or period of use

Note 1 to entry: Life span refers exclusively to data in the context of this document.

3.4 Terms relating to organisations and consumers

3.4.1
consumer
individual purchasing products or services for personal or private use

3.4.2
organization
company, corporation, firm, business, authority or institution with its own administration and purpose

3.4.3
supply chain
linked and interdependent processes that result in the delivery of content with *e-media* (3.5.1) to end users

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3.4.4
unit process
smallest element considered in the *life cycle inventory analysis* (3.3.7) for which input and output data are quantified

[SOURCE: ISO 14040:2006, 3.34]

3.4.5
user
individual using *e-media* (3.5.1)

3.4.6
provider
publisher or printer offering and delivering content with *e-media* (3.5.1) for individual use

3.4.7
use profile
data associated with the likely usage of *e-media* (3.5.1)

3.4.8
usage pattern
data associated with the likely discernible regularity of *e-media* (3.5.1) use

3.5 Terms relating to electronic media

3.5.1
electronic media
e-media
digital *data* (3.5.3) contents unit accessed with an *e-media device* (3.5.2) and delivered electronically

3.5.2
e-media device
electronic device that presents digital content, such as a smartphone, computer (tablet, laptop, desktop) or digital audio player (DAP)

3.5.3
data
information known or assumed as fact

3.5.4
data management
process of keeping track of all *data* (3.5.3) and/or information related to the creation, production, distribution, storage and use of *e-media* (3.5.1), and associated processes

3.5.5
content management
processes involved in the creation, production, distribution, manipulation, storage and use of digital content

3.5.6
electronic device
device that performs specific tasks using electronic components

3.5.7
screen
monitor lit from behind on which *e-media* (3.5.1) content can be read or viewed

3.5.8
cloud
collection of networked remote servers

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3.5.9
operating system
computer program that manages electronic hardware and provides common services for software applications

3.5.10
e-media storage
process and location of digital *data* (3.5.3) in readiness for subsequent distribution and use

3.5.11
computer
general purpose device that can be programmed to carry out a finite set of arithmetic or logical operations

3.5.12
usage ratio
hours required for reading an example of *e-media* (3.5.1) divided by the service life of the *e-media devices* (3.5.2) based on hours per day

3.5.13
megabyte
1 000 000 bytes

3.6 Terms relating to electronic media delivery

3.6.1
streaming
process of delivering digital data direct to an *e-media device* (3.5.2) in real time via an electronic network

3.6.2
download
data moved from a remote to a local device

3.6.3
plastic
synthetic or semi-synthetic organic material used in certain categories of *e-media devices* (3.5.2)

3.7 Terms relating to information and communication technology

3.7.1
smartphone
mobile phone with an *operating system* (3.5.9) that allows it to perform additional functions, such as image capture, GPS navigation and media playing, in addition to basic telephony

3.7.2
tablet
self-contained mobile computer with integrated touchscreen, larger than a smartphone

3.7.3
distribution
process of delivering *e-media* (3.5.1) to end users

3.7.4
archive
storage of content for perpetual access

3.7.5
server
digital system of computer programmes operating in a client-server environment and running on single or multiple computers to provide network, archive and data management services to connected devices

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