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Graphic technology — Quantification and communication for calculating the carbon footprint of print media products

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

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Graphic technology — Quantification and communication for calculating the carbon footprint of print media products

Technologie graphique — Quantification et communication relatives au calcul de l'empreinte carbone des produits imprimés

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 130, *Graphic technology*.

Introduction

Reduction of worldwide greenhouse gas (GHGs) emissions is central to the mitigation of climate change (see Annex A), considered to be arising from natural and anthropogenic activities. Industry and governments are already aware of the importance of contributing to this reduction, both nationally and internationally. The printing and associated industries (prepress, finishing, postpress, paper making and related services) have substantially reduced their GHG emissions in recent years. Although this data reduction can be formally captured and measured, it is difficult to compare without a common reference methodology.

This International Standard has been developed to provide a consistent framework methodology for carbon footprint calculation. It is written for prepress, print service providers, printers, media companies, other print content publishers, related industry associations and providers of carbon footprinting tools. It offers a program-neutral method for calculating and communicating the life cycle GHG emissions of print media products, based on calculated CO_2e values, for the single impact category of climate change. This single criteria approach provides the foundation for future work addressing multicriteria impacts which assess all potential impacts that a print media product can have on the environment. This International Standard is based on work done for ISO/TS 14067 and PAS 2050 to provide a specific implementation for the graphic arts industry. Multicriteria calculations based on all four phases of Life Cycle Assessment (LCA), as outlined in ISO 14040, are not within the scope of this International Standard. Further information for conducting LCA are outlined in ISO 14044.

According to this International Standard, quantification of the carbon footprint of a print media product requires a defined goal and scope for the carbon footprinting study. This International Standard also requires a specification of the system boundaries and process inventory as the basis for calculations. It allows for calculations of the whole or part life cycle of print media products.

This International Standard provides consistency, transparency, flexibility and accountability for print media carbon footprint quantifications and their communication. It may provide the following benefits to companies, public bodies and consumers, industry and regulatory bodies:

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

— provide print buyers and consumers with a means of quantifying and communicating the carbon footprint of print media products using a common methodology and defined boundaries;

— provide the printing industry with a framework for quantifying and communicating the carbon footprint of print media products using a common methodology and defined boundaries;

— encourage media buyers and consumers of print media products to make informed media investment, purchase and usage decisions, using information validated with calculation, communication and reporting tools that are consistent with this International Standard;

— facilitate the continuous monitoring of the carbon footprint of print as part of its overall environmental impact, and encourage constant improvement within all print sectors;

— enhance the credibility of the printing industry's efforts to quantify, communicate and reduce the carbon footprints of print media products and their raw materials;

— be used as part of GHG emissions management; and

— facilitate performance tracking and progress in GHG emissions reduction for the printing industry.

This International Standard provides a framework methodology for calculating the life cycle GHG emissions of print media products. It aids the print customer's contribution to national and international CO_2e reduction targets, via government schemes or through industry associations. A common framework for calculation and parameter requirements minimizes ambiguity and enables the comparison of the carbon footprints of print media products, based on the goals and scopes of individual carbon footprinting studies (see Annex E). This framework allows contributors to print media supply chains to

calculate partial carbon footprints for use in the supply chain. This International Standard can also be used to calculate carbon footprint values for use in carbon offsetting programs.

A print media product's carbon footprint calculated in compliance with this International Standard can be benchmarked against similar products. This, over time, may provide the following benefits:

— reduced environmental impact of print media products;

— assistance for print buyers making media purchase decisions;

— a framework for comparative estimates of average carbon footprints in different print media sectors, such as newspapers, magazines, books, signs and displays, etc.;

— greater appreciation of the differences in media carbon footprints, and more informed process and supply chain choice for print buyers, printers, service providers, customers and other interested parties;

— enhanced market awareness of print's sustainability and environmental impact;

— criteria for selecting a carbon footprinting tool to calculate the carbon footprint or partial carbon footprint of print media products; and

— comparable preliminary estimations of the carbon footprint of a print media product, based on a pre-existing study.

This International Standard includes examples of carbon footprinting studies and guidance for communicating and verifying carbon footprint information to printers, print buyers, consumers, industry and any other interested parties.

Use of this International Standard facilitates the comparison of the carbon footprint of cross media content and media products delivered digitally, for instance to websites, in emails, on DVDs, mobile devices and so on. However the carbon footprint of specific digital media is outside the scope of this International Standard.

INTERNATIONAL STANDARD ISO 16759:2013(E)

Graphic technology — Quantification and communication for calculating the carbon footprint of print media products

1 Scope

This International Standard specifies the requirements for quantifying the carbon footprint of those processes, materials and technologies required to produce print media products using any form of printing technology and that are within the user's knowledge and control. 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. This data can be referenced throughout supply chains for individual print media products.

Together with ISO 14020 and other ISO standards, this International Standard defines standards of completeness to be followed when communicating the results of a carbon footprint study for print media products to business and consumers.

This International Standard 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 print media products that can be validated and verified.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14044, *Environmental management — Life cycle assessment — Requirements and guidelines*

ISO/TS 14067, *Carbon footprint of products — Requirements and guidelines for quantification and communication*

3 Terms and definitions

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

3.1 Terms relating to carbon footprint

3.1.1
carbon footprint (CF)
net amount of GHG emissions and GHG removals, expressed in CO_2 equivalents

3.1.2
carbon footprint of a product
CFP
carbon footprint of a product system

3.1.3
carbon footprinting tool
means of calculating the carbon footprint of an object or process

3.1.4
carbon storage
carbon removed from the atmosphere and stored as carbon

3.1.5
product system
collection of processes with elementary and product flows performing one or more defined functions and which models the life cycle of a product

3.1.6
product category rules
set of specific rules, requirements and guidelines for one or more product categories

3.2 Terms relating to greenhouse gases

3.2.1
carbon dioxide equivalent
CO_2e
CO_2 equivalent
unit for comparing the radiative forcing of a GHG to carbon dioxide

Note 1 to entry: The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential.

[SOURCE: ISO 14064-1:2006; 2.19, without Note 2]

3.2.2
global warming potential
GWP
factor describing the radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period of time

Note 1 to entry: Annex A contains a list of GHGs and their global warming potentials published by the Intergovernmental Panel on Climate Change.

[SOURCE: ISO 14064-1:2006; 2.18, modified]

3.2.3
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: See Annex A for a list of GHGs and their CO_2e values, per Kyoto.

Note 2 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 potentials.

[SOURCE: ISO 14064-1:2006; 2.1, modified]

3.2.4
greenhouse gas emission
mass of a GHG released to the atmosphere

[SOURCE: SOURCE: ISO 14064-1:2006, 2.5, modified]

3.2.5
greenhouse gas emission factor
mass of a GHG emitted relative to an input or an output of a unit process or a combination of unit processes

3.2.6
greenhouse gas removal
mass of a GHG removed from the atmosphere

3.2.7
greenhouse gas sink
process that removes a GHG from the atmosphere

3.2.8
greenhouse gas source
mechanical or natural process that releases a GHG 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 print media products

3.3.2
cumulative method
method by which values for inputs and outputs for print media products are accumulated throughout the supply chain

3.3.3
end-of-life
stage which begins when the used product is ready for disposal, recycling, reuse, etc. and ends when the product is returned to nature (combustion, deterioration), or is recycled or reused

3.3.4
energy
sources of GHG emissions used for the provision and use of the product

3.3.5
functional unit
quantified and defined single iteration of a printed product, used as a reference unit in a carbon footprinting study

Note 1 to entry: to entry See Figure B.1.

EXAMPLE An A4 page, one square metre printed, a single iteration of a printed product or a complete print run.

[SOURCE: ISO 14040:2006; 3.20, modified to be specific to ISO 16759]

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

3.3.7
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal

[SOURCE: SOURCE: ISO 14044:2006; 3.1]

3.3.8
life cycle assessment
LCA
compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle

3.3.9
life cycle impact assessment
LCIA
phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product

3.3.10
life cycle inventory
LCI
phase of life cycle assessment involving the compilation and qualification of inputs and outputs for a product throughout its life cycle

3.3.11
process
set of interrelated or interacting activities transforming inputs into outputs

[SOURCE: SOURCE: ISO 14044:2006; 3.11, modified to be specific to ISO 16759]

3.3.12
product group
collection of print media products that share common physical characteristics

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 print media products to consumers

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

[SOURCE: SOURCE: ISO 14040:2006, 3.34]

3.4.5
user
individual using print media products

3.5 Terms relating to printed media product and process — Prepress

3.5.1
prepress
preparation of data files in analogue or digital format for printing

EXAMPLE Separating RGB files into CMYK.

3.5.2
prepress consumables
materials used as part of the prepress process, including materials which can be recycled or otherwise reused

3.5.3
data
information known or assumed as fact

3.5.4
data management
process of keeping track of all data and/or information related to the creation, production and distribution of a print media product, and associated processes

3.5.5
colour management
process of managing all data in a colour production workflow, such that the colours are accurate and consistent in appearance across substrates and imaging processes, including print and electronic rendering

3.5.6
file preparation
readying data files for subsequent production in the print media product supply chain

3.5.7
preflight checking
file inspection to determine that the digital data contained therein will process such that all data can be accurately imaged to a image carrier or substrate

3.5.8
file delivery
delivery of print media data files within the supply chain

3.5.9
proofing
process of evaluation of pre-production files used to check the accuracy of content and colour reproduction

3.5.10
imposition
arrangement of pages on the image carrier such that when cut, trimmed and finished the pages are in the correct reading sequence

3.5.11
raster image processing
conversion of content data into a bitmap file including screening, trapping, imposition and all other process data, relevant to the output constraints

3.5.12
screening
predominantly electronic process to create the printing and nonprinting elements of a page to mimic the halftone values of an original contone

3.5.13
trapping
process of how overprinted colours should be defined so that on press the positioning of separations disguises any misregistration

3.5.14
workflow management
process of managing all tasks in the print media supply chain

3.6 Terms relating to printed media product and process — Press

3.6.1
press consumables
materials used as part of the printing process, including materials which can be recycled or otherwise reused

3.6.2
image carrier
surface prepared such that some parts of it transfer printing ink whereas other parts do not

3.6.3
ink
substance containing pigment(s) or dye(s), resin(s) and carrier fluid(s)

3.6.4
toner
solid material, which might or might not include colorant, capable of taking on an electrostatic charge, designed for deposition onto a substrate under the control of electrostatic forces in conjunction with a surface having a controlled distributed charge

3.6.5
plastic
synthetic or semi-synthetic organic material used to produce certain categories of print media products

3.6.6
substrate
material onto which inks, coatings and varnishes are printed or laid down

3.6.7
print
material onto the surface of which a mark or impression has been made

EXAMPLE Printed documents, sign and display material, magazines, newspapers.

3.6.8
printing
process of transferring text, line art and graphic content in one or more colours to a substrate

3.6.9
printing process
technology used to produce print, including analogue and digital methods

3.6.10
coating
process of applying an additional layer on top of printed inks

3.6.11
coatings and varnishes
substances applied to a substrate in addition to printed inks

3.6.12
drying
process of removing moisture, solvents or co-solvents from a substrate, localized environment or film formation by resins

3.6.13
laminating
process of applying a transparent layer to protect a printed substrate

3.6.14
oxidation
process resulting from the combination of a substance with oxygen

3.7 Terms relating to printed media product and process — Postpress

3.7.1
postpress consumables
materials consumed as part of the finishing process, including materials which can be recycled or otherwise reused

3.7.2
binding
process of holding materials together by means of staples, adhesives, thread, wire or other means

3.7.3
stitching
process of securing printed, folded and gathered pages in their folds

3.7.4
finishing
process associated with manipulating printed materials into a final product

EXAMPLE Cutting, slitting, binding.

3.7.5
stacking
piling up printed media as it comes off the press

3.7.6
cleaning materials
materials used to clean machinery and equipment used to create, produce and distribute print media products

3.7.7
distribution
process of ensuring that print media products can be made available to consumers

3.7.8
print media product
product created using printing and/or finishing processes

3.7.9
colorant
substance added in order to change colour appearance

3.8 Terms relating to data and data quality

3.8.1
primary data
directly measured, calculated or obtained quantified value of a unit process or activity and related information within a product system or company, based on specific original source measurements

Note 1 to entry: Primary data can be emissions factors from recognized reference sources.

3.8.2
secondary data
indirectly measured, calculated or obtained quantified value of a unit process or activity and related information within a product system or company, not based on specific original source measurements

3.8.3
site-specific data
data obtained from a direct measurement or a calculation based on direct measurement at its original source within the product system

3.8.4
transparency
open, comprehensive, accessible, clear and understandable presentation of information

[SOURCE: SOURCE: ISO 14040:2006; 3.7, modified to be specific to ISO 16759]

3.8.5
uncertainty
parameter associated with the result of quantification which characterises the variability of the values that could be reasonably attributed to the quantified amount

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 14064-1:2006[2]; 2.37, modified to be specific to ISO 16759]

4 Principles for carbon footprint quantification

4.1 General requirements

The following principles are the basis for and shall be used to guide the application of the requirements of this International Standard.

4.2 Life cycle perspective

In the assessment of the carbon footprint of a print media product and its communication, all stages defined in the goal and scope of the study shall be included. The goal and scope defines the parameters of the system boundary and is the basis for the study's inventory of calculations. This allows for partial carbon footprint calculations, relating to defined parts of a print media supply chain. A partial CFP shall as a minimum, represent the cradle-to-gate emissions and removals arising from all stages relating to print media product manufacture, up to the point where the product leaves the production site. The goal and scope may include everything from raw material acquisition to end of life including collection, sorting and recycling, or only those parts of the print media product's life cycle for which data are available.

NOTE This may include separate disclosure of GHG emissions and storage or removal in order to demonstrate and clarify GHG emissions values (see Annex D).

4.3 Relative approach and functional unit

The carbon footprint study shall be structured around a single defined functional unit of a print media product and the results calculated relative to it. The functional unit shall be defined as specifically as possible, including all criteria relating to its raw materials and components, as determined in the goal and scope of the study. A functional unit is a reference to which input and output data are normalized and represents the performance of a product system for use as a reference in a carbon footprinting study. As such it can refer to individual instances of print media products, or complete print runs. Comparisons of different carbon footprints can only be made if the functional units are the same, i.e. normalized to the same functional unit (see Annex E). Examples of functional units and their determinant criteria are available in Annex B.

4.4 Relevance

According to the goal and scope of the carbon footprinting study, GHG sources and sinks together with carbon storage, data and methods selected, shall be suitable for the assessment of the GHG emissions, storage and removals arising from print media products.

NOTE This may include separate disclosure of GHG emissions and storage or removal in order to demonstrate and clarify GHG emissions values (see Annex D).

4.5 Completeness

According to the goal and scope of the carbon footprinting study, all relevant GHG sources and sinks together with carbon storage that provide a direct and meaningful contribution to the assessment of GHG emissions, storage and removals arising from print media products, shall be included.

4.6 Consistency

According to the goal and scope of the carbon footprinting study, assumptions, methods and data shall be applied and gathered in the same way throughout the carbon footprint of a print media product study.

4.7 Accuracy

According to the goal and scope of the carbon footprinting study, bias and uncertainties shall be reduced as far as is practical; inaccuracies and influencers shall be stated as part of the CFP study.

4.8 Transparency

All relevant issues shall be addressed within the goal and scope of the carbon footprinting study and documented accurately, with full disclosure and a clear audit trail. Assumptions, reference methodologies and data sources used shall be disclosed. Estimates and areas of possible bias shall be explained and highlighted.

4.9 Avoidance of double counting

4.9.1 General

Double counting of GHG emissions and removals shall be avoided.

EXAMPLE Content creation and calculations done by a publisher and subsequently repeated by a prepress house.

4.9.2 Option to separate carbon dioxide emissions of by-products

If during the printing process second, third or multiple by-products are produced (for example recovered toluene in publication rotogravure) there is the option to separate the carbon dioxide emissions value caused by the by-products.

4.10 Implementation criteria

Calculations shall be based on the following unit processes:

a) those which are expected to make a measurable contribution to the carbon footprint;

b) those for which emissions data are not expected to make a measurable contribution to the carbon footprint and which can therefore be estimated; and

c) those for which several unit processes can be merged, for instance content proofing.

NOTE As a minimum this includes energy, transportation, paper and may include other factors.

5 Methodology

5.1 General requirements

For the calculation of the carbon footprint of a printed product to conform to this International Standard, its life cycle GHG emissions shall be calculated using the methodological framework outlined here or a carbon footprinting tool that is consistent with this International Standard. The study shall be based on goal and scope definition, inventory analysis, impact assessment and interpretation, and the communication of the results.

Assessments of product GHG emissions shall be carried out using the principles of LCA. Unless otherwise indicated, the assessment of a print media product's life cycle GHG emissions shall be made based on the product's attributes and the functional unit, as defined in the goal and scope.

The functional unit for a print media product is defined according to its physical characteristics (see Annex B for suggested criteria).

Assessment of the GHG emissions based on a product's life cycle or partial life cycle shall be done so that the mass of CO_2e is reported for each functional unit, as defined in the goal and scope of the carbon footprinting study.

Assessments shall perform the following functions:

a) define the goal and scope of the study, the processes measured in order to calculate a print media product's life cycle or partial life cycle GHG emissions based on the defined system boundary and inventory as defined in the goal and scope;

b) determine the sequence and interaction of these processes based on the production workflow and unit process definitions;

c) identify the criteria to be included in a carbon footprint calculation for the measurement of the print media product's life cycle or partial life cycle GHG emissions;

d) avoid double counting;

e) provide resources and data required for calculation of the print media product's life cycle or partial life cycle GHG emissions; and

f) for outsourced processes, the organization shall ensure that GHG emissions measurements are transparent and that they are consistent with recognized standards applied throughout the supply chain.

5.2 Goal and scope

5.2.1 General

The goal of a print media product carbon footprint study is to quantify the GHG emissions of a print media product over its life cycle, or partial life cycle, based on either LCA, or over that part of its life cycle for which the criteria for calculating the carbon footprint are known and within control of the entity conducting the carbon footprinting study.

5.2.2 LCA partial carbon footprint

LCA partial carbon footprint studies shall include the following mandatory elements:

a) why the study is being done;

b) for and by whom and on what date;

c) the intended use of the study;

d) a definition of the functional unit;

e) the start and completion dates for the study's data collection period;

f) the calculation techniques to be used;

g) reporting processes; and

h) the location of where the study including data collection, compilation and calculation, is conducted.

5.2.3 System boundary

A definition of the system boundary for the carbon footprinting study shall include the following mandatory elements:

a) an explanation of how the system boundaries have been drawn;

b) an explanation of why the system boundaries are drawn as they are;

c) an inventory analysis listing all processes, materials, life cycle stages, to be addressed in the calculation (examples of processes to consider are listed in Annex C);

d) definitions of the relationships between LCA and LCI phases and how the study can be used for subsequent calculations;

e) a statement to account for what is excluded from the study and why;

f) an explanation of any uncertainties, ambiguities or assumptions; and

g) conditions for use of value choices and optional elements.

5.2.4 Scope of print media product carbon footprint study

The scope of a print media product carbon footprint study shall be consistent with the goal of the study. In defining its scope, the following criteria shall be considered:

a) the functional unit;

b) assumptions for lifecycle;

c) the system boundary;

d) the inventory of processes which are the basis of calculations;

e) allocation procedures;

f) data and data quality requirements and expectations;

g) limitations;

h) uncertainties; and

i) reporting.

The scope of the study may be revised due to unforeseen limitations, constraints or additional information. Modifications and explanations shall be documented.

NOTE A summary of processes which may be considered for inclusion in the inventory of processes is included in Annex C.

5.2.5 Life cycle stages

The life cycle stages and the inventory of processes to be included in the carbon footprinting study of a print media product shall be defined in the goal and scope of the study. Each life-cycle stage and process shall be individually quantified.

5.3 System boundary definitions

The system boundary determines which unit processes shall be included in the carbon footprinting study, based on its goal and scope. A production workflow schematic shall be determined specific to the functional unit under study as the basis for calculating the input and output data of each process

in the flow. The goal and scope and therefore the system boundary setting shall be consistent with the objectives for the intended use of the study.

In defining the system boundary, the unit processes in Annex C shall be considered. Where processes are iterative the number of iterations shall be stated alongside the emissions. This number can be estimated unless the impact on the overall assessment is likely to be more than 5 %.

The examples of operations and materials in processes may include, but are not limited to, the processes listed in Annex C which also shows mandatory items for the calculation.

Calculations done in accordance with this International Standard shall include all emissions of those unit processes within the defined system boundary that contribute to a total of at least 95 % of the total carbon footprint. The 5 % of GHG emission remaining means cut-off criteria. Care shall be taken to avoid double counting, and to take into account accumulative numbers. Any unit process with a contribution of more than 1 % of the total carbon footprint shall be included in the calculations and shall be considered as a contribution as required in ISO 14044.

NOTE An example of the impact of raw materials, energy and of system boundaries applicable to print products is provided in the Intergraf recommendations in Annex D.

5.4 Time boundary for data

The time boundary shall be representative of the life cycle of the specified functional unit of a print media product, as defined in the goal and scope of the study. Its assumptions shall be accurately specified and justified according to the life cycle for the print product, as defined in the goal and scope of the carbon footprinting study.

5.5 Carbon footprint quantification of life-cycle stages

5.5.1 Inventory analysis

Following description of the goal and scope, inventory analysis is the second step in calculating the carbon footprint of print media products. It consists of several stages (see ISO 14044): data collection, data validation and checking, relation of data to unit processes and functional units, refining the system boundary (for instance, excluding processes that make no significant contribution, or including previously excluded data that do have an impact), and allocation (so that shared processes are not double counted, including for recycling).

The inventory analysis shall begin with an inventory of all stages necessary to produce and distribute a print media product, as defined in the goal and scope of the carbon footprinting study.

Preliminary inventory analysis shall refine the following with reference to data used in the calculation of carbon footprint of print media products:

a) determine the print media product's functional unit (see Annex B); and

b) system boundary (see C.1).

5.5.2 Data collection for each life-cycle stage

Data are used to quantify the inputs and outputs of unit processes. Data related to a print media product's GHG emissions shall be included according to the system boundary. Process specific data shall be collected for all processes included in the system boundary and listed in the inventory of the carbon footprinting study.

The data shall be identified as primary or secondary data for which all sources shall be listed. Site-specific data shall be used wherever possible.

Secondary data shall only be used for inputs where it is not possible to collect primary data and its use shall be clearly identified.

NOTE Secondary data may be published material, national inventories and such like generic sources.

When data are collected from sources in multiple locations, measures shall be taken to ensure uniformity and consistency. These measures shall be fully explained. Data quality shall be defined for all sources, particularly for raw materials, energy, manufacturing and transportation data.

Allocation of embedded emissions values shall also be transparent, and a mechanism for normalizing variability shall be implemented and fully described.

Data collection methods shall be outlined and explained, including explanations of uncertainties.

Data requirements should be complementary and compatible with requirements as stated in ISO standards used in the printing industry such as ISO 15930 (all parts) and ISO 12647.

5.5.3 General requirements applied to all stages

5.5.3.1 General

Data for all stages shall be checked for accuracy and robustness, and related to unit processes and their expected usage. Data relevance shall be explained and documented for each unit process and functional unit. To ensure reliability and quality, data for all stages shall include a definition of the characteristics of the data needed for the study.

5.5.3.2 Precision of data

Primary data shall be used for all individual processes where the collection of primary data are possible. The type of data to be collected is to be clarified (e.g. primary, site specific, secondary, approximate, estimated).

Where data are estimated, the basis of the estimation and justification for it shall be given. Missing data and data allocations for instance for recycled substrates, embedded emissions or shared resource uses shall be documented. A measure of variability for data from each component process shall be allowed, if the impact is expected to be less than 5 % overall. Data comparisons from print run to print run with the same workflow shall be used to document that data variances are reproducible. It should be possible for data for a given process to be reproduced or replicated in an equivalent system.

5.5.3.3 Cumulative and allocation method

5.5.3.3.1 General

Data accumulations for the production and distribution of the functional unit shall be based on the inventory of processes, avoiding double counting and be fully documented. Data allocations shall be made according to their applicability to the functional unit and the allocation model documented.

5.5.3.3.2 Allocation procedure

The study shall identify processes shared with other print media production, such as prepress and finishing and deal with them according to the following considerations:

— allocation should be avoided by dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes;

— alternatively the product system should be expanded to include the additional functions related to the shared processes;

— where allocation is unavoidable, the inputs and outputs of the system shall be allocated uniformly between its different print media products.

5.5.3.4 Related scenarios

Related scenarios should seek to represent the actual pattern of shared resource use at each stage. Where not otherwise justified, the determination of the related scenarios shall be based on the functional unit.

5.5.3.5 Energy sources and use

Energy use for the unit processes required to produce each functional unit in a print media production workflow shall use recognized country energy factors and document their source to account for the carbon impact for their region. If site-specific data are available from a local energy supplier this data shall be used. Transparency in multi-site production shall be used to avoid double-counting and ensure parity.

Electricity data in the calculation shall include emissions arising from the energy supply system where known and relevant. For the printing industry energy calculations reports shall include the total units consumed for all energy sources throughout the supply chain, as defined in the goal and scope of the carbon footprinting study. This shall include emissions arising from renewable and non-renewable energy including direct usage, indirect usage where energy is purchased from third parties, and other indirect emissions. When electricity is generated on site, such as solar or wind power, and consumed for a print media product under study, life cycle data for the electricity shall be used for that product. If mixed energy sources are used the amounts shall be allocated to the product under study.

If an electricity supplier can deliver a specific electricity product and can guarantee that the sale and associated emissions of that electricity are not double counted, the data for that electricity shall be used for the print media product under study. If specific GHG data for the electricity product are not provided, the GHG emissions associated with the national grid where the life cycle stage occurs shall be used. If a country has several unconnected grids or several countries share a common grid instead of having national grids, the relevant grid from which the power is obtained shall be used.

Data from recognized databases should be used if specific life cycle data on a process within the energy supply system is unavailable. Where energy usage varies throughout the unit process, such as a press where usage can vary throughout the run, an average shall be used based on the run length. The treatment of electricity shall be documented and double counting avoided.

The use of electrical energy shall be given as a CO_2e emission and the emission factor used shall be stated. To facilitate comparison the amount of electrical energy shall be communicated consistently using a constant unit, for instance kWh, MJs etc. Examples of energy use are shown as follows (see Annex C):

5.5.3.6 Supply and internal transport determination (optional)

If included in the goal and scope of the carbon footprinting study, the energy required to transport all stages of print media products shall be calculated including from the consumer, customer or printing plant (see C.1).

Examples of transport are shown as follows:

a) raw materials to processing site;

b) printed product to finishing facility;

c) print product to consumer; and

d) printed product from printer, print buyer or consumer to disposal facility (for landfill, recycling, reuse).

5.5.3.7 Regional differences and seasonal variations

Print media products produced at multiple sites and then assembled prior to final distribution shall be measured according to the parameters at each site and for each process contributing to the manufacture of the end product.

The data collection period of seasonal variations shall be the most recent and capable of site average data. If the data above cannot be collected, precision of the data used shall be ensured.

5.5.3.8 Performance tracking

Performance tracking can be used to monitor GHG emissions changes over time. If a carbon footprinting study is to be used to calculate the change in a print media product or product group's carbon footprint, either across or within production sites, the following requirements shall be met:

a) the time boundary shall be defined;

b) the change shall be calculated for print media products with an identical functional unit;

c) the change shall be calculated between two assessments or within one comparative assessment carried out in conformity with this International Standard; and

d) when two assessments are made, the change shall be calculated using equivalent goals and scopes, inventories, system boundaries, and reference data in order to make comparisons.

5.5.3.9 Disposal/recycle (optional)

If disposal and recycling are included in the goal and scope of a carbon footprinting study, the following GHG emissions arising from the disposal or recycling of a print media product shall be included in the study:

a) transport from printer, print buyer or consumer associated with the collection and removal of waste print media products;

b) readying for the recycling preparation and final disposal (e.g. compacting, sorting and deinking);

c) shredding;

d) incineration, composting, landfilling; and

e) recycling for reuse.

Any assumptions made regarding disposal/recycling shall be based on published factual information and shall be fully documented.

NOTE Waste generated during production is included in the calculation (see 5.2).

5.5.3.10 Corporate carbon footprint (optional)

Corporate carbon footprint calculations are not required by this International Standard. However if they are included in the goal and scope of the carbon footprinting study, they shall follow allocation procedures and include total GHG emissions and transportation.

NOTE Transportation can include employee and goods transportation to and from facilities.

5.5.4 Raw material acquisition stage

Where recycled or reused raw materials are used, they should be distinguished from new raw materials, and the scope of specific reuse or recycling process shall be clarified when it is available. The type of media, data source, and life cycle stages shall be included.

Collection items and collection methods for data on substrates and consumables shall be specified, with the following considerations:

a) in cases where raw material is acquired from two or more suppliers and only limited data are collected from a principal supplier, the supplier shall be identified;

b) the printer should obtain raw materials data from external sources where available; and

c) the data of GHG emissions and input amounts per unit related to raw materials acquisition and manufacture should be collected.

EXAMPLE Some examples of collection methods include:

the Intergraf recommendations and the 13 parameters cover at least 95 % of the CO_2 (see Annex D);

a widely accepted guideline for CO_2 emissions in Europe is the CEPI 10 Toes Method.

5.5.5 Production stage

5.5.5.1 General

The GHG emissions of all processes used to produce a print media product shall be included in the assessment, including consumables, production processes and the energy required to produce a print media product.

In line with the goal and scope of the carbon footprinting study, an inventory of consumables and equipment used to produce the functional unit of a print media product shall be made to provide the basis for calculations.

The carbon footprint study shall assess the emission factors associated with the production of the print media product using the inventory of activities relating to each process as the basis for the assessment according to the goal and scope.

The range of data to be collected for the production stage of the product shall be specified according to the goal and scope of the carbon footprinting study. Subject to these parameters, collection items and collection methods for data on energy consumption or input and discharged matter, etc., shall be specified, considering the following:

a) where products are produced at two or more sites and only limited data are to be collected from the principal site as defined in the goal and scope of the carbon footprinting study, this site shall be identified; and

b) the data of GHG emissions and input amounts per unit related to production should be collected.

5.5.6 Distribution stage

When part of the goal and scope of the carbon footprint study, data regarding the distribution stage of the finished product shall be acquired. The range of data to be collected concerning the distribution stage of the product shall be specified in the goal and scope and distribution stages included in the carbon footprinting study shall be included in the inventory of processes. If data are unavailable distribution values may be calculated based on common scenarios.

Collection items and collection methods for data on energy consumption, etc., shall be specified, considering the following subject to the goal and scope of the CF study:

a) the data of GHG emissions and input amounts per unit related to transport, storage, containers and packaging, etc., should be collected; and

b) where unsold goods are returned, quantities and method shall be clarified.

5.5.7 Use stage (optional)

The use stage may be excluded as the emissions of the print media products are usually negligible and very difficult to reliably determine.

5.5.8 End of life stage (optional)

This International Standard does not require end of life calculations, however if they are included in the goal and scope of a carbon footprinting study, the range of data to be collected concerning the disposal/recycling stage of a product shall be specified.

Collection items and collection methods for data on energy consumption, disposal of waste, etc., shall be specified, considering where end of life stage is produced at two or more sites and only limited data can be collected from the principal site, this site shall be identified.

6 Reporting

6.1 General

The format and purpose of the report shall be defined in the goal and scope of the study, and the results of the study objectively, accurately and completely reported without bias in a CFP report or communication in accordance with ISO/TS 14067. All information relating to the study shall be presented clearly and with sufficient data such that the reader can understand the complexities and uncertainties inherent to the work. Comparisons of the carbon footprint of print media products shall be possible for carbon footprint calculators that have been made using this International Standard. When performing product comparisons the guidelines shown in Annex E shall be observed.

Emissions and carbon footprint data shall be communicated consistently. Values shall reflect all emissions that have occurred in subsidiary systems used to produce a print media product.

The expectation for reporting is the same for private and public data reporting; however there is no requirement that carbon footprint studies for print media products shall be published.

6.2 Documentation requirements

The goal, scope, system boundary and inventory, shall be fully documented and reported in a CFP study report which can address CFPs or partial CFPs. Emissions shall be calculated at a frequency suitable for the print media product or product group as defined in the goal and scope.

NOTE Examples of product groups are newspapers or packaging.

Documents relating to emissions measurements should be controlled by the collector to provide evidence of conformity to interested internal and external parties. Documents may be summarized in a CFP study report. This report is used to disclose the quantification of a CFP study along with the basis of decisions for the study's goal and scope, system boundary and inventory of processes. It shall also show that the provisions of this International Standard are met.

6.2.1 Reporting requirements

The summary report of a carbon footprinting study for a print media product should be prepared as either a CFP external communication report or a CFP performance tracking report (see ISO 14044).

Both shall include the following content:

a) the results of the quantification of the CFP according to life cycle inventory analysis (LCIA);

b) an evaluation based on the completeness, sensitivity and consistency checks;

c) an assessment of uncertainty of inputs, outputs and calculation methods; and

d) an explanation of any allocation methods used, plus associated documentation.

NOTE For more information see ISO 14044.

6.3 Interpretation of the carbon footprint of a product

6.3.1 General

A life cycle analysis GHG emissions policy and procedural document should be available to all parties involved in print media production, including print buyers.

6.3.2 Life cycle interpretation phase

The life cycle interpretation phase of a CFP study comprises several elements, as follows:

a) identification of the significant factors based on the results of the LCI and LCIA phases of LCA;

b) an evaluation that considers completeness, and consistency checks; and

c) conclusions, limitations and recommendations.

The results of the LCI or LCIA phases shall be interpreted according to the goal and scope of the study. The interpretation shall include an assessment and a sensitivity check of the significant inputs, outputs and methodological choices in order to understand any uncertainties of the results.

NOTE Examples of assessments and sensitivity checks as shown in Figure D.1.

6.3.3 Allocation method

The selected allocation method shall be reported in detail.

7 Communication requirements

7.1 General

This International Standard does not require communication of CFP reports, but an organization may decide to communicate their contents.

The CFP study report as defined in 6.3.2, either a CFP Communication Report or a CFP Performance Tracking Report (ISO/TS 14067), should be available to all interested parties involved in print media production, including print buyers, according to the purpose of the study.

The CFP study report should include the following content:

a) quantitative description of the carbon footprinting study's original goal and scope, and justification for any modifications to it;

b) a definition of the system boundary and the basis of its selection;

c) the life cycle stages covered in the study;

d) an inventory of unit processes that are the basis of calculations;

e) data;

f) interpretation of the results of the study, including conclusions and limitations;

g) the time period for which the CF study can be considered representative;

h) an assessment of any uncertainties;

i) an explanation of any allocation methods used.

NOTE For more information see ISO 14044.

7.2 Interpretation and comparison

The results of a CF study can be used for comparison only if the CFP quantification and communications are identical in all respects. This requires that they shall address the same product category definition and description based on function, performance and use expectations.

Such product definitions shall have identical functional units and equivalent system boundaries and data descriptions. Comparison of CFPs is only possible if the calculation of CFPs follows identical CFP quantification and communication models as referred to in Annex E.

7.3 Product definitions and product category rules (PCRs)

Where possible these product definitions should be elaborated into product category rules (PCRs), which can be applied to other functional units with the same characteristics. Users of a CFP study should then be able to understand how a print media product may be assigned to a particular product category, because their PCRs will be the same.

Communication may be in the form of a CFP External Report or a CFP Performance Tracking Report, which reports carbon footprint calculations over time (see Table 1).

Table 1 — General requirements and guidelines for CFP communications options

	CFP External Communication Report	**CFP Performance Tracking Report**
Publicly available CFP Communication	No programme No CFP-PCR Optional verification	No programme No CFP-PCR Optional verification
Not publicly available CFP Communication	Optional programme Optional CFP-PCR 3rd party verification or communication report	Optional programme Optional CFP-PCR 3rd party verification or communication report

CFP communications report the carbon footprint calculation of a specific set of product category rules. In this International Standard PCRs are expressed as a functional unit to provide the foundation for the CFP calculation. The CFP-PCRs resulting from a CFP study that follows this International Standard can be used as the basis of formal PCRs for print media products.

CFP External Communication Reports and CFP Performance Tracking Reports can be used as the basis for additional reports, including CFP-PCR claims, CFP-PCR labels and CFP-PCR declarations.

Annex A
(informative)

General requirements and guidelines for CFP communication options — Greenhouse gases

Table A.1 shows a list of GHGs and their CO_2e values, per Kyoto.

Table A.1 — The 100-year GWP for impact category "Climate Change"1

Industrial designation or common name (at date of publication)	Chemical formula	GWP for 100-year time horizon
Carbon dioxide	CO_2	1
Methane	CH4	25
Nitrous oxide	N2O	298
Substances controlled by the Montreal Protocol		
CFC-11	CCI3F	4 750
CFC-12	$CCI2F_2$	10 900
CFC-13	CCIF3	14 400
CFC-113	CCI2FCCIF2	6 130
CFC-114	CCIF2CCIF2	10 000
CFC-115	CCIF2CF3	7 370
Halon-1301	CBrF3	7 140
Halon-1211	CBrCIF2	1 890
Halon-2402	CBrF2CBrF2	1 640
Carbon tetrachloride	CCI4	1 400
Methyl bromide	CH3Br	5
Methyl chloroform	CH3CCI3	146
HCFC-21	$CHCI_2F$	151
HCFC-22	CHCIF2	1 810
HCFC-123	CHCI2CF3	77
HCFC-124	CHCIFCF3	609
HCFC-141b	CH3CCI2F	725
HCFC-142b	CH3CCIF2	2 310
HCFC-225ca	CHCI2CF2CF3	122
HCFC-225cb	CHCIFCF2CCIF2	595
Hydrofluorocarbons		
HFC-23	CHF_3	14 800
HFC-32	CH_2F_2	675
HFC-41	CH_3F	92
HFC-125	CHF_2CF_3	3 500
HFC-134	CHF_2CHF_2	1 100
NOTE Adapted from "Changes in Atmospheric Constituents and in Radiative Forcing"[[3]]		

Table A.1 *(continued)*

Industrial designation or common name (at date of publication)	Chemical formula	GWP for 100-year time horizon
HFC-134a	CH_2FCF_3	1 430
HFC-143	CH_2FCHF_2	353
HFC-143a	CH_3CF_3	4 470
HFC-152	CH_2FCH_2F	53
HFC-152a	CH_3CHF_2	124
HFC-161	CH_3CH_2F	12
HFC-227ea	CF_3CHFCF_3	3 220
HFC-236cb	$CH_2FCF_2CF_3$	1 340
HFC-236ea	CHF_2CHFCF_3	1 370
HFC-236fa	$CF_3CH_2CF_3$	9 810
HFC-245ca	$CH_2FCF_2CHF_2$	693
HFC-245fa	$CHF_2CH_2CF_3$	1 030
HFC-365mfc	$CH_3CF_2CH_2CF_3$	794
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	1 640
Perfluorinated compounds		
Sulphur hexafluoride	SF_6	22 800
Nitrogen trifluoride	NF_3	17 200
PFC-14	CF_4	7 390
PFC-116	C_2F_6	12 200
PFC-218	C_3F_8	8 830
PFC-318	c-C_4F_8	10 300
PFC-3-1-10	C_4F_{10}	8 860
PFC-4-1-12	C_5F_{12}	9 160
PFC-5-1-14	C_6F_{14}	9 300
PFC-9-1-18	$C_{10}F_{18}$	> 7 500
trifluoromethyl sulphur pentafluoride	SF_5CF_3	17 700
Perfluorocyclopropane	c-C_3F_6	> 17 340
Fluorinated ethers		
HFE-125	CHF_2OCF_3	14 900
HFE-134	CHF_2OCHF_2	6 320
HFE-143a	CH_3OCF_3	756
HCFE-235da2	$CHF_2OCHClCF_3$	350
HFE-245cb2	$CH_3OCF_2CF_3$	708
HFE-245fa2	$CHF_2OCH_2CF_3$	659
HFE-254cb2	$CH_3OCF_2CHF_2$	359
HFE-347mcc3	$CH_3OCF_2CF_2CF_3$	575
HFE-347pcf2	$CHF_2CF_2OCH_2CF_3$	580
HFE-356pcc3	$CH_3OCF_2CF_2CHF_2$	110
HFE-449sl (HFE-7100)	$C_4F_9OCH_3$	297
NOTE Adapted from "Changes in Atmospheric Constituents and in Radiative Forcing"[[3]]		

Table A.1 *(continued)*

Industrial designation or common name (at date of publication)	Chemical formula	GWP for 100-year time horizon
HFE-569sf2 (HFE-7200)	$C_4F_9OC_2H_5$	59
HFE-43-10pccc124 (H-Galden1040x)	$CHF_2OCF_2OC_2F_4OCHF_2$	1 870
HFE-236ca12 (HG-10)	$CHF_2OCF_2OCHF_2$	2 800
HFE-338pcc13 (HG-01)	$CHF_2OCF_2CF_2OCHF_2$	1 500
	$(CF_3)_2CFOCH_3$	343
	$CF_3CF_2CH_2OH$	42
HFE-338pcc13 (HG-01)	$(CF_3)_2CHOH$	195
HFE-227ea	$CF_3CHFOCF_3$	1 540
HFE-236ea2	$CHF_2OCHFCF_3$	989
HFE-236fa	$CF_3CH_2OCF_3$	487
HFE-245fa1	$CHF_2CH_2OCF_3$	286
HFE-263fb2	$CF_3CH_2OCH_3$	11
HFE-329mcc2	$CHF_2CF_2OCF_2CF_3$	919
HFE-338mcf2	$CF_3CH_2OCF_2CF_3$	552
HFE-347mcf2	$CHF_2CH_2OCF_2CF_3$	374
HFE-356mec3	$CH_3OCF_2CHFCF_3$	101
HFE-356pcf2	$CHF_2CH_2OCF_2CHF_2$	265
HFE-356pcf3	$CHF_2OCH_2CF_2CHF_2$	502
HFE-365mcf3	$CF_3CF_2CH_2OCH_3$	11
HFE-374pc2	$CHF_2CF_2\ OCH_2CH_3$	557
	- $(CF_2)_4CH(OH)$ -	73
	$(CF_3)_2CHOCHF_2$	380
	$(CF_3)_2CHOCH_3$	27
Perfluoropolyethers		
PFPMIE	$CF_3OCF(CF_3)CF\ _2OCF_2OCF_3$	10 300
Hydrocarbons and other compounds - Direct Effects		
Dimethylether	CH_3OCH_3	1
Chloroform	$CHCI_3$	31
Methylene chloride	CH_2CI_2	8,7
Methyl chloride	CH_3CI	13
	CH_2Br_2	1,54
Halon-1201	$CHBrF_2$	404
Trifluoroiodomethane	CF_{3I}	0,4

NOTE Adapted from “Changes in Atmospheric Constituents and in Radiative Forcing”[[3]]

Annex B
(informative)

Inventory analysis of input criteria used to define the product profile

NOTE A print media product's characteristics are used to define the criteria that are the basis for calculating its carbon footprint. For instance, the functional unit can be a single page, a collection of pages, or a print run.

B.1 Inventory analysis of input criteria used to define the product profile

The following list includes the elements of a print media product which can be used to determine the functional unit. These various criteria apply to different categories and types of print media; however the specific characteristics applicable to different print media products will vary with the product type. For instance, only one substrate is used for a newspaper that has no inserts, whereas a bound book with a dust jacket will use several different substrates. See Figure B.1 for an example of a functional unit.

This list is a series of things to consider when defining the functional unit for a carbon footprinting study.

Substrates:

— dimensions

— weights

— composition

— number of pages

— covers

— dust jackets

— inserts

— cover mounts

— type of substrates

— other

B.2 Substrate treatments

— chemistry and coverage

— other

B.3 Inks

— chemistry

— coverage (CMYK plus specials)

— transport

— type of solvent

— solvent consumption

— boxing

— others

B.4 Coating and varnishes

— chemistry and coverage

— others

B.5 Fountain solution and wetting additives

— others

B.6 Finishing characteristics

— glue chemistry and amount

— stitching materials and amount

— coil binding and amount (wire or plastic)

— looseleaf hardware

— polywraps

— others

B.7 Examples of functional units

— a single printed sheet, the unit surface area dimensions defined and the coverage by ink or toner (CMYK plus specials)

— an A4 40 page full colour magazine printed on 115 gsm silk, saddle stitched

— a run of 1 000 business cards, 55 mm × 85 mm printed simplex on 400 gsm, with black and a spot colour

— full colour duplex A6 Leaflets and A7 Flyers, as part of a single campaign

— signs and displays

— packaging and labels

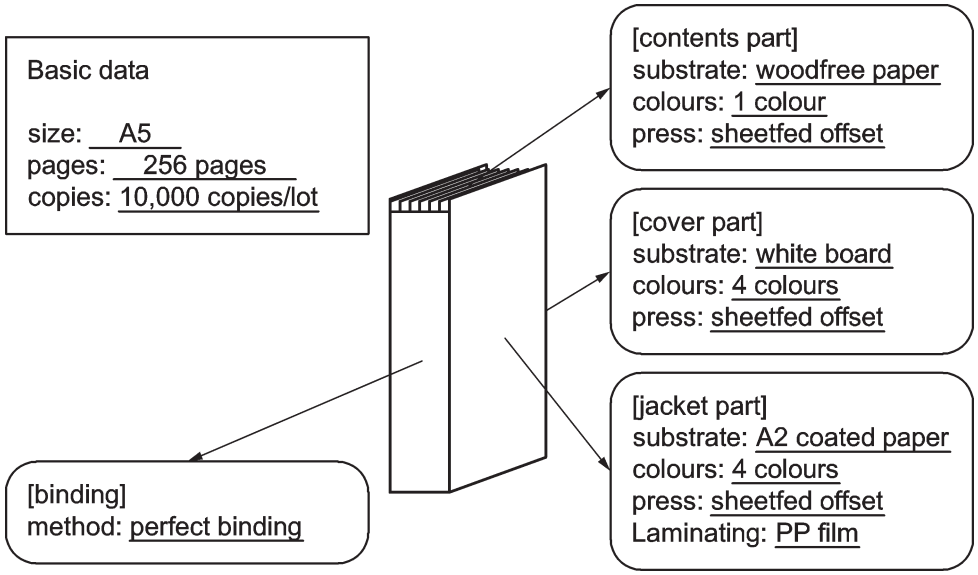


Figure B.1 — Example of functional unit

A functional unit such as that presented in Figure B.1 can also be described as a list of component parts, or product profile. Table B.1 illustrates this concept for a fictitious magazine, "My Weekly".

Table B.1 — Product profile of "My Weekly"

Size	A4
Pages	60
	4
Folds	1
Substrate weights	90 gsm
	150 gsm
Ink coverage (average)	65 %
Coating	None
Binding	Perfect bound
Inserts	None
Mounts	None
Polywrapped	Yes
Likely lifespan	One month
Assumed usage	15 hours
End-of-life	*n* % locally recycled with 25 km

Annex C
(informative)

Operations and materials in processes and data collection items within the system boundary

C.1 General

This International Standard requires a specification of a carbon footprinting study's system boundaries and a process inventory. Together the two provide the basis for calculations in a carbon footprinting study. Calculations may be made for the whole or part life cycle of print media products, for all processes in the production of a print media product.

The examples of operations and materials in processes may include, but are not limited to the processes listed here. Data sources for calculation of the CFP of print media products are listed in C.6 which also shows those items that are mandatory for the calculation.

C.2 Content creation (optional)

Content creation is not included in C.1 because content creation is optional.

— illustrations and graphics creation

— image processing

— file and data management

— colour management

— content proofing: on screen, hard-copy, collaborative (iterative)

C.3 Prepress

Specific data collection items relating to the operations and materials listed below are shown in 5.5.3 and prepress production as shown in Figure C.1.

— workflow management: process efficiency, based on data throughput rates and volumes (refer to < Prepress > Figure C.1)

— file layout: colour management, subediting, quality control (preliminary preflight checking) (refer to "DTP Process" Figure C.1)

— layout proofing (iterative) (refer to "DTP Process" Figure C.1)

— content and page approval (iterative) (refer to "DTP Process" Figure C.1)

— file preparation (individual and ganged jobs) (refer to "DTP Process" Figure C.1)

— colour management (iterative) (refer to "DTP Process" Figure C.1)

— preflight checking (iterative) (refer to "DTP Process" Figure C.1)

— page proofing (individual and ganged jobs) (can be iterative) (refer to "DTP Process" Figure C.1)

— imposition (refer to "DTP Process" Figure C.1)

— page pairing (refer to “DTP Process” Figure C.1)

— imposition proofing (refer to “DTP Process” Figure C.1)

— data management (variable data, versioning, zoning, microzoning) (refer to “DTP Process” Figure C.1)

— file delivery (refer to “DTP Process” Figure C.1)

— Raster Image Processing (screening, trapping, colour management, data management) (refer to “PC for RIP” Figure C.1)

— image carrier imaging (individual and ganged jobs) (refer to “DTP Process” Figure C.1)

— image carrier processing (refer to “DTP Process” Figure C.1)

— products (refer to < Prepress > Figure C.1)

— waste paper, plastic, oil, alkali acid, metal and discharged water (m^3) (refer to < Prepress > Figure C.1)

C.4 Press (individual and ganged jobs)

Specific data collection items relating to the operations and materials listed below are shown in 5.5.3, Raw material acquisition stage, and as shown in Figure C.1.

— image carrier mounting (refer to “Printing Process” Figure C.1)

— printing (refer to “Printing Process” Figure C.1)

— makeready/waste (refer to “Printing Process” Figure C.1)

— consumables (substrates, inks and coatings, blankets, IPA, water, plates, powder) (refer to “Raw material acquisition stage” Figure C.1)

— drying (refer to “Printing Process” Figure C.1)

— cleaning materials (refer to “Raw material acquisition stage” Figure C.1)

— waste paper, plastic, oil, alkali acid, metal and discharged water (m^3) (refer to < Printing > Figure C.1)

C.5 Post-press and finishing

— Specific data collection items relating the operations and materials listed below are shown in subclause 5.5.3 and as shown in Figure C.1.Stacking (refer to “Punching and Cutting process” Figure C.1)

— Distribution (refer to “Transport” Figure C.1)

— Coating (refer to “Coating Process” Figure C.1)

— Laminating (refer to “Laminating Process”: Figure C.1)

— waste paper, plastic, oil, alkali acid, metal and discharged water (m^3) (refer to < Surface Treatment > and < Cutting and Binding > Figure C.1)

— cold/hot foiling (refer to “Laminating Process” Figure C.1)

— die cutting (refer to “Punching and Cutting Process” Figure C.1)

— embossing (refer to “Punching and Cutting Process” Figure C.1)

— drying (refer to “Coating Process” Figure C.1)

— oxidation

— slitting (refer to “Punching and Cutting Process” Figure C.1)

— cutting (refer to “Punching and Cutting Process” Figure C.1)

— creasing (refer to “Punching and Cutting Process” Figure C.1)

— bending (refer to “Punching and Cutting Process” Figure C.1)

— folding (refer to “Punching and Cutting Process” Figure C.1)

— stitching (refer to “Binding and Finishing Process” Figure C.1)

— gluing (refer to “Binding and Finishing Process” Figure C.1)

— trimming (refer to “Binding and Finishing Process” Figure C.1)

— perfect binding (refer to “Binding and Finishing Process” Figure C.1)

— bagging (refer to “Binding and Finishing Process” Figure C.1)

— cover mounts (refer to “Binding and Finishing Process” Figure C.1)

— inserting (refer to “Binding and Finishing Process” Figure C.1)

— labelling (refer to “Binding and Finishing Process” Figure C.1)

— stacking (refer to “Binding and Finishing Process” Figure C.1)

— packing (refer to “Binding and Finishing Process” Figure C.1)

— die cutting (refer to “Binding and Finishing Process” Figure C.1)

— box making (refer to “Binding and Finishing Process” Figure C.1)

— waste paper, plastic, oil, alkali acid, metal and discharged water (m^3) (refer to < Cutting and Binding > Figure C.1)

NOTE Some of these functions may be performed on press and considered as part of the press process.

C.6 Data collection items within system boundary

Figure C.1 summarizes the sources for data collection and definitions of a system boundary. These are the foundation for carbon footprinting studies for print media products.

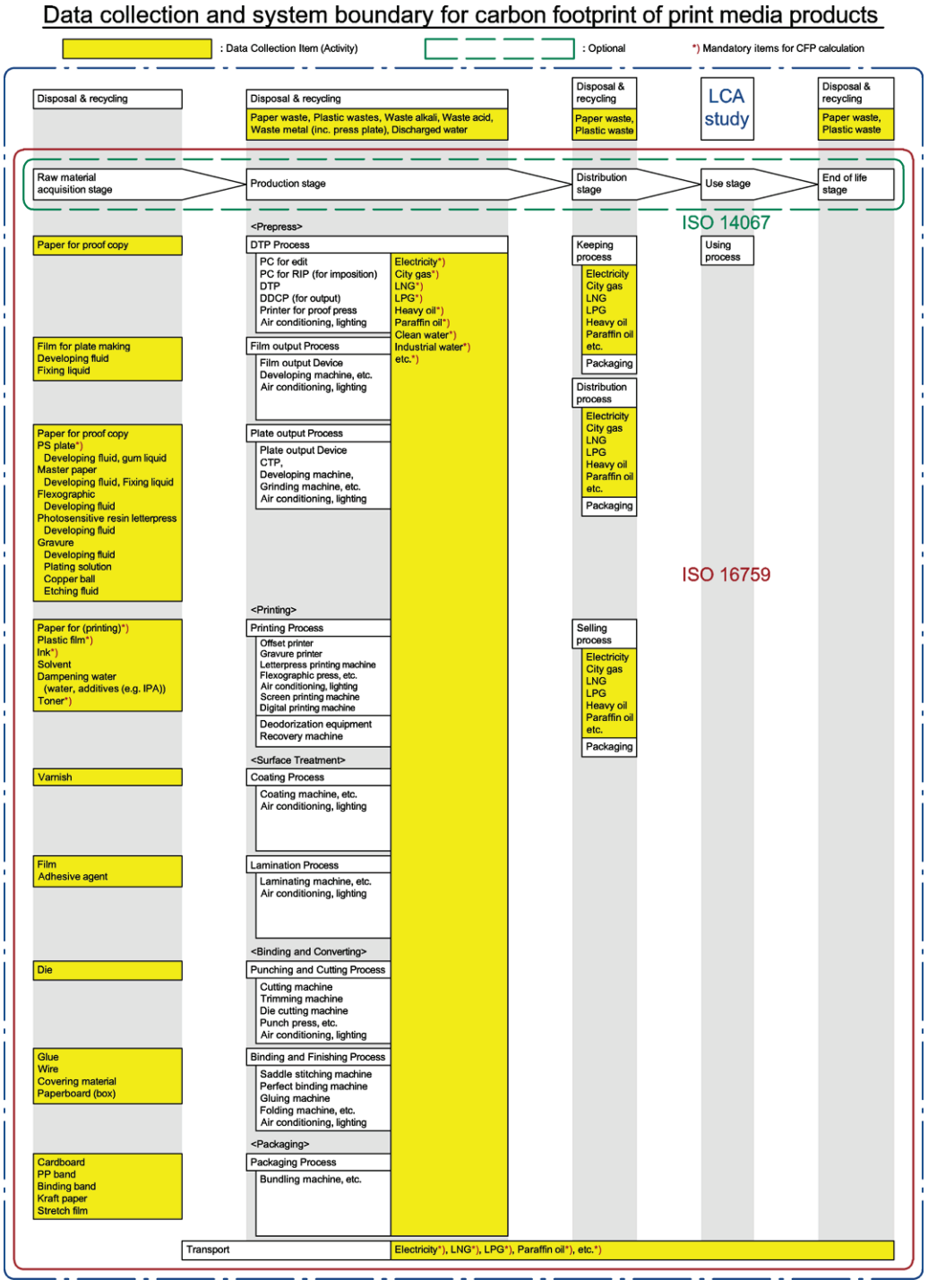


Figure C.1 — Data collection and system boundary for carbon footprint of print media products

Annex D
(informative)

Intergraf recommendations on CO_2 emissions calculation in the printing industry

D.1 Objective

Intergraf, the European association representing the printing industries, recommends best practices for calculation systems of CO_2 emissions from printing activities. The current analysis and cases used for calculations and comparisons of models were based on sheet fed and heatset offset as well as publication gravure printing but are representative of the overall printing industry. The Intergraf recommendations for calculating CO_2 emissions in the printing industry summarize this organization's approach to carbon footprint calculation for print media.

D.2 Calculation scope

The defined scope is based on the existing knowledge of production of printed matter in a life cycle approach according to the Intergraf recommendations: "Emissions of Green House Gases in the life cycle of printed material excluding emissions related to capital assets, customer distribution and end of life of printed material." This calculation scope is a modified version of the Intergraf recommendations.

The calculation should cover all six greenhouse gases (GHG) defined in the Kyoto protocol, expressed as carbon dioxide equivalents, provided relevant data are available. These gases are carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, and two groups of gases (hydrofluarocarbons and perfluorocarbons). Direct emissions from combustion cover exclusively fossil fuel.

The 13 parameters having the main influence on carbon emissions from printing activities are as shown in Figure D.1. The subsequent clauses (D.3 to D.16) contain references to Scope 1, 2 and 3 in the Green House Gas Protocol (GHGP). Scope 1 refers to GHG emissions from sources under the direct control of the company, apart from direct CO_2 emissions from biomass combustion. Scope 2 accounts for GHG emissions of purchased electricity for which the company is indirectly responsible, and Scope 3 for other indirect GHG emissions.

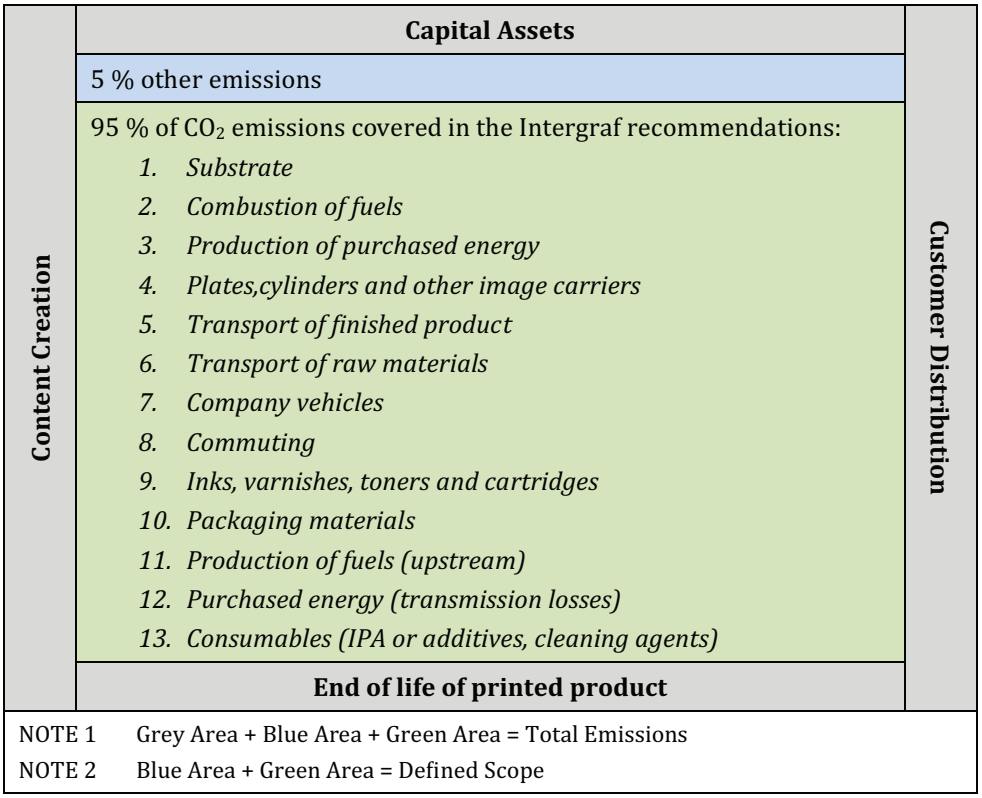


Figure D.1 — Parameters with main influence on carbon emissions

All the parameters are defined as either "Site relevant" or "Product relevant" to point out where the choice of the customer may influence the carbon footprint of the printed material. It is important to stress that both "Site relevant" and "Product relevant" parameters always shall be included in a calculation according to this recommendation. Dividing the parameters into "site" and "product" is intended for specific product calculations, where "site" parameters can be calculated based on average data for the company while "product" parameters shall be calculated according to the exact specifications of the product under consideration.

D.3 The Intergraf recommendations

In a general order of magnitude, 13 parameters are normally responsible for most CO_2 emissions that can be associated with printing activities or with the production of printed products.

When summing up these factors, a printer will be able to identify around 95 % of its total CO_2 emissions within the defined scope.

All calculation systems should provide a reference to the source of CO_2 equivalent data used in the respective models.

NOTE In normal operational conditions, some further parameters, with a lower relevance, represent a maximum of 5 % of the defined scope.

— Production of other materials like plate developing agents, fountain solution, gum, blankets and small supplies.

— Transport of other raw materials than the substrate.

— Transport and treatment of production waste and waste water.

— Business travel by employees and visitors.

— Emissions from VOCs.

D.4 Production of substrate

Product **Scope 3**

Emissions from production of purchased substrate used for printing (e.g. paper and plastic).

D.5 On-site combustion of fuels

Site **Scope 1**

Emissions from combustion of fuels in the company (direct emission):

(Natural gas, fuel oils, LPG gas, coal and oils in inks and solvents)

Production of the combusted fuels are described in D.14.

D.6 Production of purchased energy

Site **Scope 2**

Emissions from production of purchased energy consumed in the company (indirect emission):

(Electricity, steam, district heating, compressed air, cooled water)

Production of the fuels used for energy production and transmission losses is described in D.15.

D.7 Production of plates and cylinders and other image carriers

Site **Scope 3**

Emissions from production of purchased offset plates or gravure cylinders or other image carriers. This is based on the assumption that waste plates, cylinders and other image carriers are recycled.

D.8 Transport of finished product

Product **Scope 3**

Emissions from transport of the finished product to the first point of delivery of the primary customer should be included in the calculation. Further transport (to point of sale or end-users) is to be accounted by customers, such as publishers. Production of the combusted fuels are described in D.14.

D.9 Transport of raw materials

Product **Scope 3**

Emissions from transport of substrates from the production of the material to the printer should be included.

Transportation of other raw materials e.g. chemicals, printing plates and packaging materials can normally be left out due to low relevance. Production of the combusted fuels is described in D.14.

D.10 Company owned or leased vehicles

Site **Scope 1**

Emissions from combustion of fuels in company owned or leased vehicles (direct emission) including trucks, cars, landscaping equipment, fork lifts, etc.

Production of the combusted fuels is described in D.14.

D.11 Employees commuting

Site **Scope 3**

Emissions from commuting by workers from the home to the work place should always be considered in calculations. The travelling of workers and the emissions deriving from it depends on the geographic location of the company and its employees. For some companies it can therefore be an important source of emissions, so it should be considered in calculation models. The travelling of visitors to the company is however not considered. Production of the combusted fuels is described in D.14.

D.12 Production of inks, varnishes, toners and cartridges

Product **Scope 3**

Emissions from production of purchased inks, varnishes, toners and cartridges.

D.13 Production of packaging materials

Product **Scope 3**

Emissions from production of purchased packaging materials e.g. card and PE-plastic

D.14 Production of fuels (upstream)

Site **Scope 3**

Emissions from production and transportation of fuels for on-site combustion and transportation.

D.15 Purchased energy (upstream and transmission losses)

Site **Scope 3**

Emissions from production and transportation of fuels for production of purchased energy.

Transmission losses of purchased energy.

D.16 Production of Isopropanol (IPA), or alternative fountain solutions additives, and cleaning agents

Site **Scope 3**

Emissions from production of purchased IPA and cleaning agents.

Annex E
(normative)

Guidelines for comparisons of the carbon footprints of print media

This International Standard does not allow comparison of products according to environmental superiority and preference. Comparison of CFPs is only possible if the calculation of CFPs follows identical CFP quantification and communication models. Users of this International Standard shall acknowledge that CFPs developed in conformance with this International Standard may not be comparable.

Partial CFPs are not comparable unless they use identical functional units and the omitted processes of the product system are identical and/or not relevant for all compared products.

A CFP communication used for comparisons shall include the following information:

— the product category definition and description (e.g. function, technical performance and use);

— the product definitions for identical functional units;

— equivalent system boundaries;

— equivalent descriptions of data;

— identical criteria for inclusion of inputs and outputs;

— data quality requirements that have the same reproducibility;

— equivalent methods of data collection and data quality requirements;

— identical calculation procedures;

— equivalent allocations; and

— equivalent instructions on the content and the format of the CFP communication.

Annex F
(informative)

Calculation samples by Europe, Germany and Thailand

The following calculations are provided as examples to demonstrate and compare the results of different implementations of ISO 16759. These case studies are provided to show how ISO 16759 can be used to create carbon calculators and calculations that reflect the different needs of local markets, sectors and geographies, yet provide reasonably comparable results for different carbon footprinting studies.

The calculations shown in Figures F.1 to F.5 were done using the ClimateCalc Consortium (Europe), CO_2 calculator (bvdm) and PGG Cloud (Thailand). The results demonstrate how variations can occur due to differences in the goals and scopes of carbon footprinting studies, for example the inclusion or not of incineration, or with different postpress activities. Although incineration can be included in the system, it was not done here.

A summary of the carbon footprinting study of a book is shown in Table F.1.

Table F.1 — Book

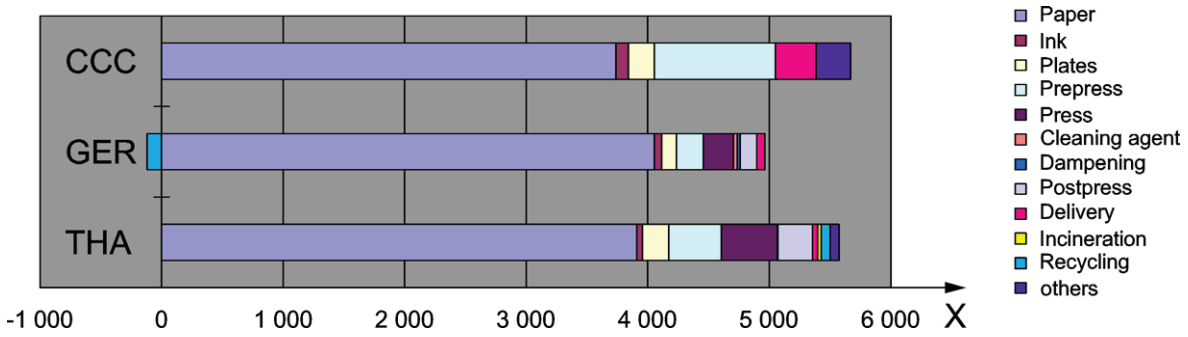
Item	Process	Climate Calc (CCC) (kg-CO_2e)		CO2 calculator (GER) (kg-CO_2e)		PGG-CLOUD (THA) (kg-CO_2e)	
Procurement	Paper	3 738	65,9 %	4 053	83,7 %	3 909	70,1 %
	Ink	104	1,8 %	61	1,3 %	49	0,9 %
	Plate	211	3,7 %	121	2,5 %	214	3,8 %
Production	Prepress	998	17,6 %	221	4,6 %	434	7,8 %
	Press			248	5,1 %	459	8,2 %
	Cleaning agent			32	0,7 %	0	0,0 %
	Dampening			25	0,5 %	6	0,1 %
	Postpress			137	2,8 %	284	5,1 %
Delivery	Delivery	334	5,9 %	65	1,3 %	44	0,8 %
Disposal/ Recycle	Incineration	-	-	-	-	28	0,5 %
	Recycling	-	-	(119)	–2,5 %	73	1,3 %
Others	Employee commuting & sales travel	283	5,0 %	-	-	74	1,3 %
	Total:	5 668	100,0 %	4 844	100,0 %	5 574	100,0 %
Per copy, % compared with THA:		**1,134**	**101,7 %**	**0,969**	**86,9 %**	**1,115**	**100,0 %**

NOTE 1 Printed matter: Book (152*228*15), 5 000 copies, Sheetfed offset.

NOTE 2 Specifications: 4P(4C/0C)+240P(1C/1C), Perfect binding, Plastic lamination for cover.

NOTE 3 See Figure F.1 for a graphic representation of this data.

A calculation of the carbon footprinting study of a book is shown in Figure F1.



Key
X kg- CO_2e

Figure F.1 — Book calculation

A summary of the carbon footprinting study of a magazine is shown in Table F.2.

Table F.2 — Magazine

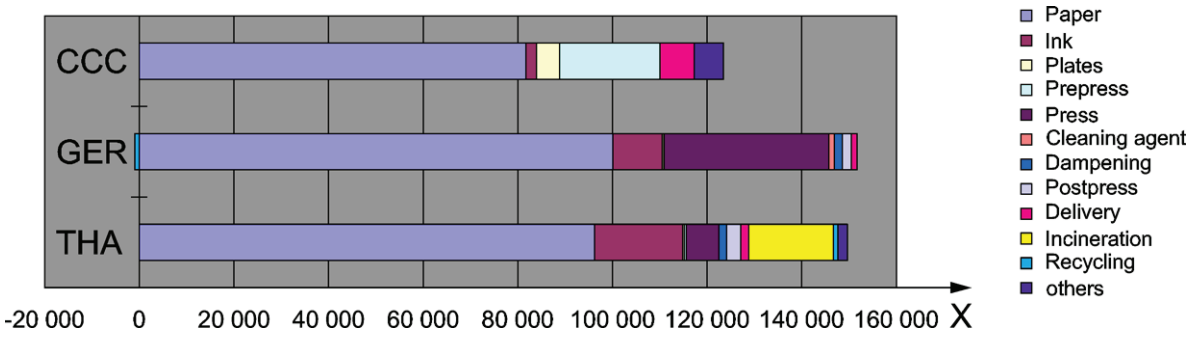
Item	Process	Climate Calc (CCC) (kg-CO_2e)		CO2 calculator (GER) (kg-CO_2e)		PGG-CLOUD (THA) (kg-CO_2e)	
Procurement	Paper	81 736	66,2 %	100 100	66,4 %	96 234	64,3 %
	Ink	2 244	1,8 %	10 429	6,9 %	18 600	12,4 %
	Plate	4 814	3,9 %	290	0,2 %	352	0,2 %
Production	Prepress	21 224	17,2 %	113	0,1 %	403	0,3 %
	Press			34 795	23,1 %	6 913	4,6 %
	Cleaning agent			1 165	0,8 %	0	0,0 %
	Dampening			1 719	1,1 %	1 648	1,1 %
	Postpress			1 846	1,2 %	2 968	2,0 %
Delivery	Delivery	7 249	5,9 %	1 209	0,8 %	1 692	1,1 %
Disposal/ Recycle	Incineration	-	-	-	-	17 846	11,9 %
	Recycling	-	-	(957)	−0,6 %	1 000	0,7 %
Others	Employee commuting & sales travel	6 172	5,0 %	-	-	2 002	1,3 %
	Total:	123 439	100,0 %	150 709	100,0 %	149 658	100,0 %
Per copy, % compared with THA:		**0,247**	**82,5 %**	**0,301**	**100,7%**	**0,299**	**100,0 %**

NOTE 1 Printed matter: Magazine (212*280*3), 500000 copies, Web offset.

NOTE 2 Specifications: 4P(4C/4C)+96P(4C/4C), Saddle stitch binding. No enhancement for cover.

NOTE 3 See Figure F.2 for a graphic representation of this data.

A calculation of the carbon footprinting study of a magazine is shown in Figure F.2.



Key

X kg- CO_2e

Figure F.2 — Magazine calculation

A summary of the carbon footprinting study of a manual is shown in Table F.3.

Table F.3 — Manual

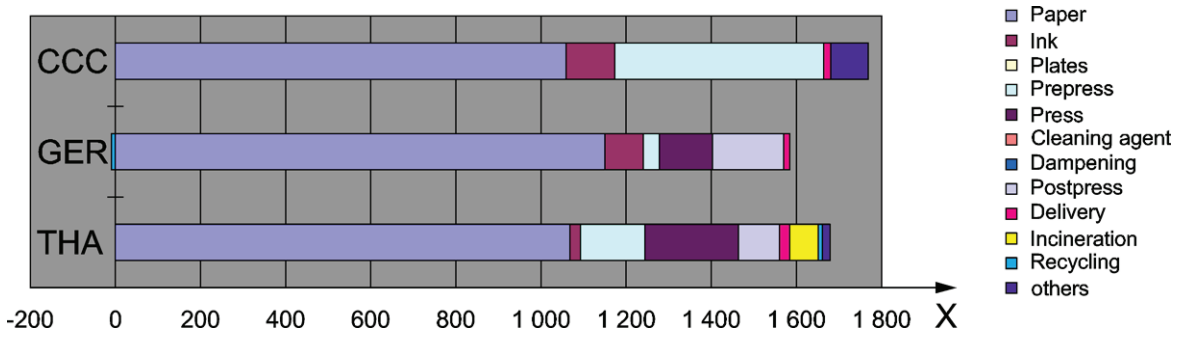
Item	Process	Climate Calc (CCC) (kg-CO_2e)		CO2 calculator (GER) (kg-CO_2e)		PGG-CLOUD (THA) (kg-CO_2e)	
Procurement	Paper	1 059	59,9 %	1 150	73,0 %	1 068	63,6 %
	Ink	114	6,4 %	90	5,7 %	25	1,5 %
	Plate	0	0,0 %	0	0,0 %	0	0,0 %
Production	Prepress	491	27,8 %	38	2,4 %	151	9,0 %
	Press			125	7,9 %	220	13,1 %
	Cleaning agent			0	0,0 %	0	0,0 %
	Dampening			0	0,0 %	0	0,0 %
	Postpress			167	10,6 %	96	5,7 %
Delivery	Delivery	17	1,0 %	14	0,9 %	24	1,4 %
Disposal/Recycle	Incineration	-	-	-	-	67	4,0 %
	Recycling	-	-	−9	−0,6 %	10	0,6 %
Others	Employee commuting & sales travel	88	5,0 %	-	-	18	1,1 %
	Total:	1 769	100,0 %	1 575	100,0 %	1 679	100,0 %
Per copy, % compared with THA:		**0,442**	**105,4 %**	**0,394**	**93,8 %**	**0,420**	**100,0 %**

NOTE 1 Printed matter: Manual (210*297*5), 4000 copies, Print on Demand (POD).

NOTE 2 Specifications: 4P(4C/4C)+40P(4C/4C), Saddle stitch binding, UV gloss coating for cover.

NOTE 3 See Figure F.3 for a graphic representation of this data.

A calculation of the carbon footprinting study of a manual is shown in Figure F.3.



Key

X kg- CO_2e

Figure F.3 — Manual calculation

A summary of the carbon footprinting study of a paper package is shown in Table F.4.

Table F.4 — Paper package

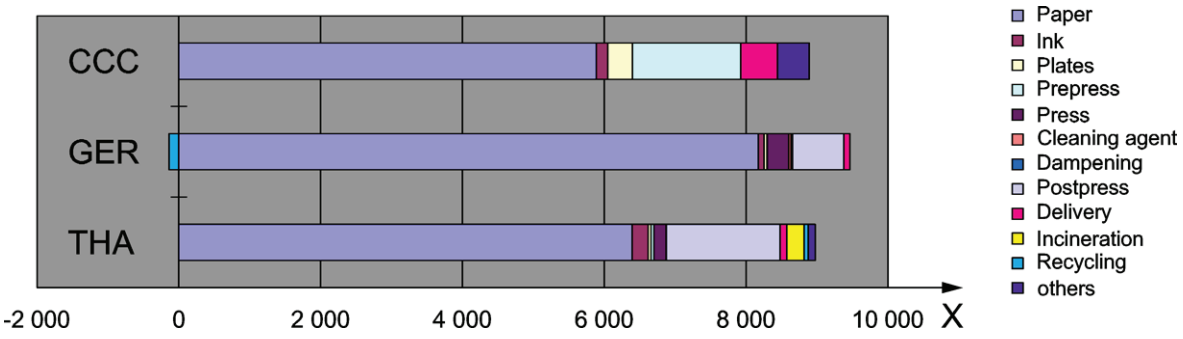
Item	Process	Climate Calc (CCC) (kg-CO_2e)		CO2 calculator (GER) (kg-CO_2e)		PGG-CLOUD (THA) (kg-CO_2e)	
Procurement	Paper	5 888	66,2 %	8 174	87,8 %	6 395	71,2 %
	Ink	161	1,8 %	60	0,6 %	226	2,5 %
	Plate	347	3,9 %	40	0,4 %	38	0,4 %
Production	Prepress	1 529	17,2 %	5	0,1 %	43	0,5 %
	Press			304	3,3 %	171	1,9 %
	Cleaning agent			31	0,3 %	0	0,0 %
	Dampening			23	0,2 %	2	0,0 %
	Postpress			721	7,7 %	1 607	17,9 %
Delivery	Delivery	520	5,8 %	87	0,9 %	93	1,0 %
Disposal/Recycle	Incineration	-	-	-	-	244	2,7 %
	Recycling	-	-	(138)	–1,5 %	60	0,7 %
Others	Employee commuting & sales travel	444	5,0 %	-	-	100	1,1 %
	Total:	8 889	100,0 %	9 307	100,0 %	8 979	100,0 %
Per copy, % compared with THA:		**0,074**	**99,0 %**	**0,078**	**103,7 %**	**0,075**	**100,0 %**

NOTE 1 Printed matter: Paper package (170*75*75), 120000 copies, Sheetfed offset.

NOTE 2 Specifications: UV 6C, UV gloss coating, Cold-foil stamping, Die-cut, Glue.

NOTE 3 See Figure F.4 for a graphic representation of this data.

A calculation of the carbon footprinting study of a paper package is shown in Figure F.4.



Key

X kg- CO_2e

Figure F.4 — Paper package calculation

A summary of the carbon footprinting study of a plastic document file is shown in Table F.5.

Table F.5 — Plastic document file

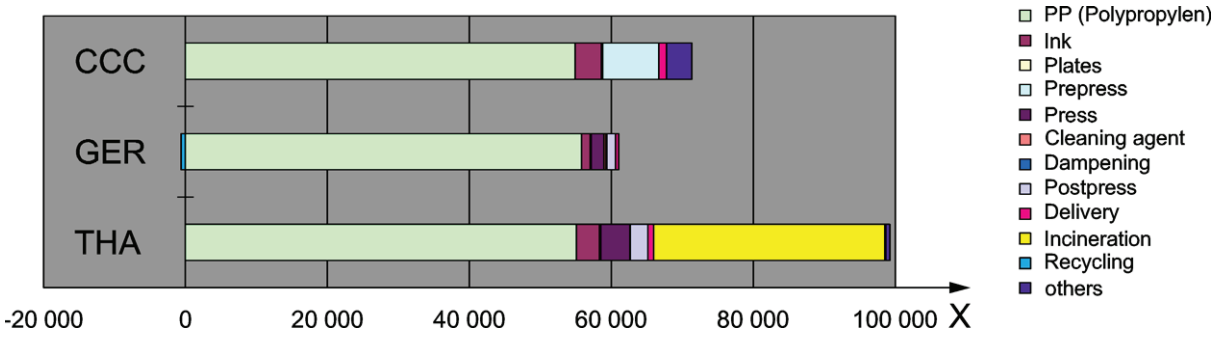
Item	Process	Climate Calc (CCC) (kg-CO_2e)		CO2 calculator (GER) (kg-CO_2e)		PGG-CLOUD (THA) (kg-CO_2e)	
Procurement	PP Polypropylene	54 898	77,0 %	55 819	92,4 %	55 076	55,5 %
	Ink	3 711	5,2 %	1 185	2,0 %	3 255	3,3 %
	Plate	186	0,3 %	128	0,2 %	132	0,1 %
Production	Prepress	7 878	11,0 %	13	0,0 %	57	0,1 %
	Press			1 825	3,0 %	4 094	4,1 %
	Cleaning agent			250	0,4 %	0	0,0 %
	Dampening			173	0,3 %	46	0,0 %
	Postpress			1 216	2,0 %	2 507	2,5 %
Delivery	Delivery	1 080	1,5 %	413	0,7 %	780	0.8 %
Disposal/Recycle	Incineration	-	-	-	-	32 603	32,8 %
	Recycling	-	-	(588)	–1,0 %	102	0,1 %
Others	Employee commuting & sales travel	3 566	5,0 %	-	-	602	0,6 %
	Total:	71 319	100,0 %	60 434	100,0 %	99 254	100,0 %
Per copy, % compared with THA:		**0,074**	**71,9 %**	**0,063**	**60,9 %**	**0,103**	**100,0 %**

NOTE 1 Printed matter: Plastic document file (220*310), 960000 copies, Sheetfed offset.

NOTE 2 Specifications: UV Primer+4C+White+OP varnish, Die-cut, Glue.

NOTE 3 See Figure F.5 for a graphic representation of this data.

A calculation of the carbon footprinting study of a plastic document file is shown in Figure F.5.



Key

X kg- CO_2e

Figure F.5 — Plastic document file calculation

Bibliography

[1] The Greenhouse Gas Protocol (World Resource Institute)

[2] ISO 14064-1, *Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*

[3] IPPC Intergovernmental Panel on Climate Change. *Changes in Atmospheric Constituents and in Radiative Forcing, Table 2.14* (URL) (available from < http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14

[4] ISO 14020, *Environmental labels and declarations — General principles*

[5] ISO 14040, *Environmental management — Life cycle assessment — Principles and framework*

[6] PAS 2050:2011, Specification for the assessment of the life cycle greenhouse gas emissions of goods and services

[7] ISO 15930 (all parts), *Graphic technology — Prepress digital data exchange using PDF*

[8] ISO 12647, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints*

[9] EPI 10 Toes Method. Available from http://www.cepi.org/system/files/public/documents/publications/transport/2009/TransportCarbonFootprintAssessment%20Guidelines.pdf

[10] Intergraf recommendations: "Emissions of Green House Gases in the life cycle of printed material excluding emissions related to capital assets, customer distribution and end of life of printed material". Available from http://be-nl.climatecalc.eu/archive/file?file=0c97b9cf-bf8c-465c-adfd-b4e4443c7611.pdf

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