DRAFT INTERNATIONAL STANDARD ISO/DIS 14067

ISO/TC **207**/SC **7** Secretariat: **SCC**

Voting begins on **2012-01-06** Voting terminates on **2012-06-06**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Carbon footprint of products — Requirements and guidelines for quantification and communication

Empreinte carbone des produits — Exigences et lignes directrices pour la quantification et la communication

ICS 13.020.40

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14067 was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 7, *Greenhouse gas management and related activities*.

Introduction

Climate change arising from anthropogenic activity has been identified as one of the greatest challenges facing countries, governments, business and people with major implications for both human and natural systems. In response, international, regional, national and local initiatives are being developed and implemented to limit greenhouse gas (GHG) concentrations in the Earth's atmosphere. Such GHG initiatives rely on the assessment, monitoring, reporting and verification of GHG emissions and/or removals.

GHGs are emitted and removed throughout the life cycle of a product (i.e. cradle-to-grave) from raw material acquisition through production, use and end-of-life treatment.

This International Standard details principles, requirements and guidelines for the quantification and communication of the carbon footprint of products (CFPs) (including both goods and services), based on GHG emissions and removals over the life cycle of a product. Requirements and guidelines for the quantification and communication of a partial carbon footprint of products (partial CFP) are also provided. The communication of the CFP to the intended audience is based on a CFP study report that provides an accurate, relevant and fair representation of the CFP.

This International Standard is based on the ISO 14020 series, ISO 14040 series and ISO 14064-1 and aims to set more specific requirements for the quantification and communication of CFP. Specific requirements apply where the CFP information is intended to be publicly available.

This International Standard is expected to benefit organizations, governments, communities and other interested parties by providing clarity and consistency for quantifying, communicating and verifying CFPs. Specifically, using life cycle assessment according to this International Standard with climate change as the single impact category may offer benefits through:

— providing further requirements for the methods to be adopted in assessing the CFP;

— facilitating the tracking of performance in reducing GHG emissions;

— assisting in the creation of efficient and consistent procedures to provide CFP information to interested parties;

— providing a better understanding of the CFP such that opportunities for GHG reductions may be identified;

— providing CFP information to encourage changes in consumer behaviour which could contribute to reductions in GHG emissions through improved purchasing, use and disposal decisions;

— supporting correct and comparable communication of CFPs in a free and open market;

— enhancing the credibility, consistency and transparency of the quantification, reporting and communication of the CFP;

— facilitating the evaluation of alternative product design and sourcing options, production and manufacturing methods, raw material choices, recycling and other end-of-life stages;

— facilitating the development and implementation of GHG management strategies and plans across product life cycles as well as the detection of additional efficiencies in the supply chain.

An organization may wish to publicly communicate a CFP for many reasons which may include:

— providing information to consumers and others for decision-making purposes;

— enhancing climate change awareness and consumer engagement on environmental issues;

— supporting an organization's commitment to tackling climate change;

— supporting implementation of policies on climate change management.

The communication requirements provided in this International Standard vary with the type of communication and the intended target group.

Figure 1 shows how CFP quantification is linked to CFP communication in this International Standard. The specific linkage depends on the choice of different options with respect to communication and verification. The structure of this International Standard corresponds to the flow as presented in Figure 1.

This International Standard addresses the single impact category of climate change and does not assess other potential social, economic and environmental impacts arising from the provision of products. Therefore the CFPs assessed in conformity with this International Standard do not provide an indicator of the overall environmental impact of products. Information on limitations of the CFPs based on this International Standard is included in Clause 4 and Annex B.

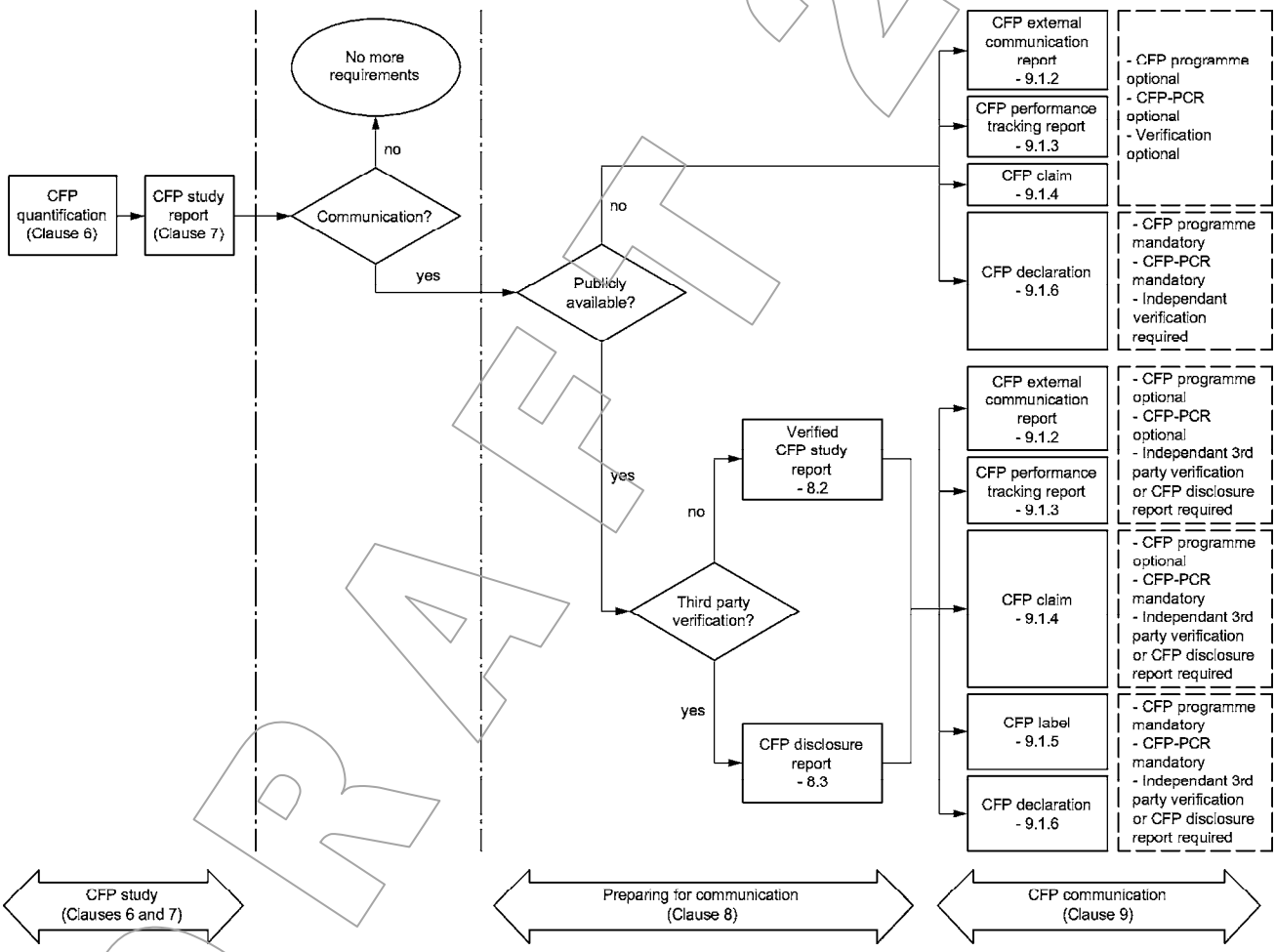

Figure 1 — Linkage of CFP quantification and CFP communication

Carbon footprint of products — Requirements and guidelines for quantification and communication

1 Scope

This International Standard specifies principles, requirements and guidelines for the quantification and communication of the carbon footprint of a product (CFP), based on International Standards on life cycle assessment (ISO 14040 series) and on environmental claims, labels and declarations (ISO 14020 series).

Requirements and guidelines for the quantification and communication of a partial carbon footprint of a product (partial CFP) are also provided.

This International Standard is applicable to CFP studies and different forms of communication based on the results of such studies.

Where the results of a CFP study are reported according to this International Standard procedures to support transparency and credibility, and procedures to allow for informed choices are provided.

This International Standard provides for the development of CFP-product category rules (CFP-PCR), or the adoption of product category rules (PCR) that have been developed in accordance with ISO 14025 and that are consistent with this International Standard.

This International Standard addresses only one impact category, climate change.

Inclusion of offsetting in the quantification process is outside of the scope of this International Standard.

2 Normative references

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

ISO 14025, *Environmental labels and declarations —Type III environmental declarations — Principles and procedures*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14050 and the following apply.

NOTE Terms and definitions in ISO 14050 are available in the ISO Concept Database (http://cdb.iso.org/).

3.1 Terms relating to CFP quantification

3.1.1
carbon footprint of a product
CFP
sum of *greenhouse gas emissions* (3.3.5) and *removals* (3.3.6) in a *product system* (3.4.2), expressed as *CO_2 equivalent* (3.3.2) and based on a *life cycle assessment* (3.5.3)

Note 1 to entry: The CO_2 equivalent of a specific amount of a *greenhouse gas* (3.3.1) is calculated as the mass of a given greenhouse gas multiplied by its *global warming potential* (3.3.4).

Note 2 to entry: A list of greenhouse gases with their recognised global warming potentials is provided in Annex A.

3.1.2
partial carbon footprint of a product
partial CFP
sum of *greenhouse gas emissions* (3.3.5) and *removals* (3.3.6) of one or more selected *process(es)* (3.4.5) of a *product system* (3.4.2), expressed as *CO_2 equivalent* (3.3.2) and based on a *life cycle assessment* (3.5.3)

Note 1 to entry: A partial CFP often covers processes that model specific stages of the *life cycle* (3.5.2).

Note 2 to entry: The partial CFP is based on or compiled from specific processes or *information modules* (3.4.4) which are part of a product system (3.4.2) and may form the basis for quantification of a *CFP* (3.1.1). More detailed information on information modules is given in ISO 14025:2006, 5.4.

3.1.3
carbon footprint of a product study
CFP study
study which includes the quantification and reporting of the *CFP* (3.1.1) or the *partial CFP* (3.1.2)

3.1.4
carbon footprint of a product study report
CFP study report
report on a *CFP study* (3.1.3)

3.1.5
offsetting
mechanism for compensating for all or for a part of the *CFP* (3.1.1) through the prevention of the release of, reduction in, or removal of an amount of *greenhouse gas emissions* (3.3.5) in a *process* (3.4.5) outside the boundary of the *product system* (3.4.2)

EXAMPLE External investment in renewable energy technologies; energy efficiency measures; afforestation/reforestation.

Note 1 to entry: Offsetting is not allowed in the CFP quantification and thus is not reflected in any CFP communication.

[SOURCE: ISO 14021:1999/FDAM 1:2011, modified — revised the information in the original Note to be presented as an Example and added a new Note 1 to entry providing information on rules regarding offsetting.]

3.2 Terms relating to CFP communication

3.2.1
carbon footprint of a product communication programme
CFP communication programme
programme for the development and use of *CFP* (3.1.1) communication based on a set of operating rules

Note 1 to entry: The programme may be voluntary or mandatory, international, national or sub-national.

3.2.2
carbon footprint of a product programme operator
CFP programme operator
body or bodies that conduct a *CFP communication programme* (3.2.1)

Note 1 to entry: A CFP programme operator can be a company or a group of companies, industrial sector or trade association, public authorities or agencies, or an independent scientific body or other *organization* (3.6.1).

[SOURCE: ISO 14025:2006, 3.4, modified — specific references added to CFP in the preferred term, definition and Note to relate concept to CFP instead of a "type III environmental declaration programme".]

3.2.3
carbon footprint of a product external communication report
CFP external communication report
report based on the *CFP study report* (3.1.4) intended to be publically available

3.2.4
carbon footprint of a product performance tracking report
CFP performance tracking report
report comparing the *CFP* (3.1.1) of the same *product* (3.4.1) over time

3.2.5
carbon footprint of a product claim
CFP claim
claim pertaining to the *CFP* (3.1.1) made by the producer, manufacturer or duly authorized supplier or distributor

Note 1 to entry: CFP claims may take the form of statements alone or in conjunction with symbols or graphics on *product* or package labels, or in product literature, technical bulletins, advertising, publicity, telemarketing, as well as digital or electronic media, such as the internet.

3.2.6
carbon footprint of a product label
CFP label
means of marking *products* (3.4.1) with their *CFP* (3.1.1) within a particular product category according to the *CFP communication programme* (3.2.1) requirements

3.2.7
carbon footprint of a product declaration
CFP declaration
declaration of the *CFP* (3.1.1) made according to the *CFP-PCR* (3.4.12) or appropriate *Type III environmental declaration* (ISO 14050:2009, 8.5) according to the *PCR* (3.4.11)

3.3 Terms relating to greenhouse gases

3.3.1
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: A list of greenhouse gases with their recognised *global warming potentials* (3.3.4) is provided in Annex A.

Note 2 to entry: Water vapour and ozone are anthropogenic as well as natural greenhouse gases but are not included as recognised greenhouse gases due to difficulties, in most cases, in isolating the human-induced component of global warming attributable to their presence in the atmosphere.

[SOURCE: ISO 14064-1:2006, 2.1, modified — Notes 1 and 2 to entry have been added, original Note listing examples of GHGs was omitted.]

3.3.2
carbon dioxide equivalent
CO_2 equivalent
CO_2e
calculated mass for comparing the radiative forcing of a *greenhouse gas* (3.3.1) to that of carbon dioxide

Note 1 to entry: The carbon dioxide equivalent is calculated by multiplying the mass of a given greenhouse gas by its *global warming potential* (3.3.4).

Note 2 to entry: A list of GHGs with their recognised global warming potentials is provided in Annex A.

[SOURCE: ISO 14064-1:2006, 2.19, modified — Note 1 to entry has been clarified, Note 2 to entry has been added.]

3.3.3
carbon storage in a product
carbon removed from the atmosphere and stored as carbon in a *product* (3.4.1)

3.3.4
global warming potential
GWP
characterization factor (ISO 14050:2009, 7.2.2.2) describing the mass of carbon dioxide that has the same accumulated radiative forcing over a given period of time as one mass unit of a given greenhouse gas (3.3.1)

Note 1 to entry: A list of greenhouse gases with their recognised global warming potentials is provided in Annex A.

[SOURCE: ISO 14064-1:2006, 2.18, modified — Note 1 to entry has been added.]

3.3.5
greenhouse gas emission
GHG emission
mass of a *greenhouse gas* (3.3.1) released to the atmosphere

[SOURCE: ISO 14064-1:2006, 2.5, modified — "over a specific time period" has been omitted.]

3.3.6
greenhouse gas removal
GHG removal
mass of a *greenhouse gas* (3.3.1) removed from the atmosphere

[SOURCE: ISO 14064-1:2006, 2.6 modified — "over a specific time period" has been omitted.]

3.3.7
greenhouse gas emission factor
GHG emission factor
mass of a *greenhouse gas* (3.3.1) emitted relative to an *input* (ISO 14050:2009, 6.17) or an *output* (ISO 14050:2009, 6.18) of a *unit process* (3.4.6) or a combination of unit processes

3.3.8
greenhouse gas source
GHG source
process (3.4.5) that releases a *greenhouse gas* (3.3.1) into the atmosphere

Note 1 to entry: The process can be natural or anthropogenic.

3.3.9
greenhouse gas sink
GHG sink
process (3.4.5) that removes a *greenhouse gas* (3.3.1) from the atmosphere

Note 1 to entry: The process can be natural or anthropogenic.

3.4 Terms relating to products, product systems and processes

3.4.1
product
any goods or service

Note 1 to entry: The product can be categorized as follows:

— service (e.g. transport, implementation of events, electricity);

— software (e.g. computer program);

— hardware (e.g. engine mechanical part);

— processed material (e.g. lubricant, ore, fuel);

— unprocessed material (e.g. agricultural produce).

Note 2 to entry: Services have tangible and intangible elements. Provision of a service can involve, for example, the following:

— an activity performed on a customer-supplied tangible product (e.g. automobile to be repaired);

— an activity performed on a customer-supplied intangible product (e.g. the income statement needed to prepare a tax return);

— the delivery of an intangible product (e.g. the delivery of information in the context of knowledge transmission);

— the creation of ambience for the customer (e.g. in hotels and restaurants).

Software consists of information and is generally intangible and can be in the form of approaches, transactions or procedures.

Hardware is generally tangible and its amount is a countable characteristic. Processed materials are generally tangible and their amount is a continuous characteristic.

[SOURCE: ISO 14044:2006, 3.9, modified — in Note 1 to entry "dictionary" was deleted from the second bullet, and the Note 3 to entry dealing with origin of the definition has been omitted.]

3.4.2
product system
collection of *unit processes* (3.4.6) with *elementary flows* (3.4.9) and *product flows* (ISO 14050:2009, 6.11), performing one or more defined functions and which models the *life cycle* (3.5.2) of a *product* (3.4.1)

[SOURCE: ISO 14044:2006, 3.28]

3.4.3
system boundary
set of criteria specifying which *unit processes* (3.4.6) are part of a *product system* (3.4.2)

[SOURCE: ISO 14044:2006, 3.32]

3.4.4
information module
compilation of data covering a *unit process* (3.4.6) or a combination of unit processes that are part of the *life cycle* (3.5.2) of a *product* (3.4.1)

Note 1 to entry: One or more information modules can be the basis of a *partial CFP* (3.1.2), and several information modules can be the basis of a *CFP* (3.1.1).

[SOURCE: ISO 14025:2006, 3.13, modified — removed reference in definition to being used as a basis for type III environmental declarations and added new Note 1 to entry.]

3.4.5
process
set of interrelated or interacting activities that transforms *inputs* (ISO 14050:2009, 6.17) into *outputs* (ISO 14050:2009, 6.18)

[SOURCE: ISO 14044:2006, 3.11]

3.4.6
unit process
smallest element considered in the *life cycle inventory analysis* (3.5.6) for which *input* (ISO 14050:2009, 6.17) and *output* (ISO 14050:2009, 6.18) data are quantified

[SOURCE: ISO 14040:2006, 3.34]

3.4.7
functional unit
quantified performance of a *product system* (3.4.2) for use as a reference unit

Note 1 to entry: As the *CFP* (3.1.1) treats information on a *product* (3.4.1), the functional unit can be a product unit, sales unit or service unit.

[SOURCE: ISO 14040:2006, 3.20, modified — Note 1 to entry has been added.]

3.4.8
reference flow
measure of the *outputs* (ISO 14050:2009, 6.18) from *processes* (3.4.5) in a given *product system* (3.4.2) required to fulfil the function expressed by the *functional unit* (3.4.7)

Note 1 to entry: For an example of applying the concept of a reference flow, see EXAMPLE in 6.2.3.

[SOURCE: ISO 14040:2006, 3.29, modified — Note 1 to entry has been added.]

3.4.9
elementary flow
material or energy entering the system being studied that has been drawn from the *environment* (ISO 14050:2009, 3.1) without previous human transformation or material or energy leaving the system being studied that is released into the environment without subsequent human transformation

[SOURCE: ISO 14044:2006, 3.12]

3.4.10
product category
group of *products* (3.4.1) that can fulfil equivalent functions

[SOURCE: ISO 14025:2006, 3.12]

3.4.11
product category rules
PCR
set of specific rules, requirements and guidelines for developing *Type III environmental declarations* (ISO 14050:2009, 8.5) for one or more *product categories* (3.4.10)

Note 1 to entry: PCR include quantification rules compliant with ISO 14044.

[SOURCE: ISO 14025:2006, 3.5, modified — Note 1 to entry has been added.]

3.4.12
carbon footprint of a product-product category rules
CFP-PCR
set of specific rules, requirements and guidelines for quantification and communication on the *CFP* (3.1.1) for one or more *product categories* (3.4.10)

3.4.13
service life
period of time during which a *product* (3.4.1) in use meets or exceeds the performance requirements

[SOURCE: ISO 15686-1:2000, 3.1.1, modified — more general wording has been used.]

3.5 Terms relating to life cycle assessment

3.5.1
cut-off criteria
specification of the amount of material or *energy flow* (ISO 14050:2009, 6.13) or the level of significance associated with *unit processes* (3.4.6) or *product system* (3.4.2) to be excluded from a *CFP study* (3.1.3)

[SOURCE: ISO 14044:2006, 3.18, modified — "environmental significance" has been changed to "significance" and "study" has been changed to "CFP study".]

3.5.2
life cycle
consecutive and interlinked stages of a *product system* (3.4.2), from *raw material* (ISO 14050:2009, 6.12) acquisition or generation from natural resources to final disposal

[SOURCE: ISO 14044:2006, 3.1]

3.5.3
life cycle assessment
LCA
compilation and evaluation of the *inputs* (ISO 14050:2009, 6.17), *outputs* (ISO 14050:2009, 6.18) and the potential *environmental impacts* (ISO 14050:2009, 3.3) of a *product system* (3.4.2) throughout its *life cycle* (3.5.2)

[SOURCE: ISO 14044:2006, 3.2]

3.5.4
life cycle impact assessment
LCIA
phase of *life cycle assessment* (3.5.3) aimed at understanding and evaluating the magnitude and significance of the potential *environmental impacts* (ISO 14050:2009, 3.3) for a *product system* (3.4.2) throughout the *life cycle* (3.5.2) of the *product* (3.4.1)

[SOURCE: ISO 14044:2006, 3.4]

3.5.5
life cycle interpretation
phase of *life cycle assessment* (3.5.3) in which the findings of either the *life cycle inventory analysis* (3.5.6) or the *life cycle impact assessment* (3.5.4), or both, are evaluated in relation to the defined goal and scope in order to reach conclusions and recommendations

[SOURCE: ISO 14044:2006, 3.5, modified — the "inventory analysis" has been replenished by using the term "life cycle inventory analysis"]

3.5.6
life cycle inventory analysis
LCI
phase of *life cycle assessment* (3.5.3) involving the compilation and quantification of *inputs* (ISO 14050:2009, 6.17) and *outputs* (ISO 14050:2009, 6.18) for a *product* (3.4.1) throughout its *life cycle* (3.5.2)

[SOURCE: ISO 14044:2006, 3.3]

3.5.7
sensitivity analysis
systematic procedures for estimating the effects of the choices made regarding methods and data on the outcome of a *CFP study* (3.1.3)

[SOURCE: ISO 14044:2006, 3.31, modified — by making specific reference to CFP study]

3.6 Terms relating to organizations and interested parties

3.6.1
organization
company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration

[SOURCE: ISO 14001:2004, 3.16, modified –– Note 1 to entry regarding treatment of operating units has been omitted.]

3.6.2
supply chain
parties involved, through upstream and downstream linkages, in *processes* (3.4.5) and activities delivering value in the form of *products* (3.4.1) to the end user

Note 1 to entry: In practice, the expression “interlinked chain” applies from suppliers to those involved in end-of-life processing which may include vendors, manufacturing facilities, logistics providers, internal distribution centres, distributors, wholesalers and other entities that lead to the end user.

Note 2 to entry: In practice, the expressions “product chain” or “value chain” are often used.

[SOURCE: ISO/TR 14062:2002, 3.9]

3.6.3
consumer
individual member of the general public purchasing or using goods, property or services for private purposes

[SOURCE: ISO 14025:2006, 3.16]

3.6.4
interested party
person or group of people that holds a view that can affect the *organization* (3.6.1)

[SOURCE: ISO/DIS 20121:2011, 3.17, modified — the admitted term "stakeholder" has been deleted.]

3.7 Terms relating to data and data quality

3.7.1
primary data
quantified value of a *unit process* (3.4.6) or an activity within the *product system* (3.4.2) obtained from a direct measurement or a calculation based on direct measurements at its original source

Note 1 to entry: Primary data need not necessarily originate from the *product system* (3.4.2) under study.

Note 2 to entry: Primary data may include *GHG emission factors* (3.3.7) and/or *GHG activity data* (ISO 14050:2009, 9.3.3).

3.7.2
site-specific data
data obtained from a direct measurement or a calculation based on direct measurement at its original source within the *product system* (3.4.2)

Note 1 to entry: All site-specific data are *"primary data"* (3.7.1) but not all primary data are site-specific data because they may also relate to a different *product system* (3.4.2).

3.7.3
secondary data
data obtained from sources other than a direct measurement or a calculation based on direct measurements at the original source within the *product system* (3.4.2)

Note 1 to entry: Such sources can include databases, published literature, national inventories and other generic sources.

3.7.4
uncertainty
parameter associated with the result of quantification which characterizes the dispersion 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, 2.37]

3.8 Terms relating to biogenic material and land use

3.8.1
biomass
material of biological origin excluding material embedded in geological formations and material transformed to fossilised material

Note 1 to entry: This includes organic material (both living and dead), e.g. trees, crops, grasses, tree litter, algae, animals and waste of biological origin, e.g. manure.

3.8.2
biogenic carbon
carbon derived from *biomass* (3.8.1)

3.8.3
biogenic CO_2
CO_2 obtained by the oxidation of *biogenic carbon* (3.8.2)

3.8.4
fossil carbon
carbon which is contained in fossilised material

Note 1 to entry: Examples of fossilised material are coal, oil and natural gas.

3.8.5
direct land use change
dLUC
change in human use or management of land at the location of the production, use or disposal of *raw materials* (ISO 14050:2009, 6.12), *intermediate products* (ISO 14050:2009, 6.2.1) and final *products* (3.4.1) or *wastes* (ISO 14050:2009, 3.12) in the *product system* (3.4.2) being assessed

3.8.6
indirect land use change
iLUC
change in the use or management of land which is a consequence of the production, use or disposal of *raw materials* (ISO 14050:2009, 6.12), *intermediate products* (ISO 14050:2009, 6.2.1) and final *products* (3.4.1) or *wastes* (ISO 14050:2009, 3.12) in the *product system* (3.4.2), but which is not taking place at the location of the activities that cause the change

3.9 Terms relating to verification

3.9.1
carbon footprint of a product verification
CFP verification
confirmation of the validity of an *environmental claim* (ISO 14050:2009, 8.2) using specific predetermined criteria and procedures with assurance of data reliability

[SOURCE: ISO 14021:1999, 3.1.4, modified –– changed preferred term designation from environmental claim verification.]

3.9.2
carbon footprint of a product verifier
CFP verifier
competent person, body or team that carries out a *CFP verification* (3.9.1)

[SOURCE: ISO 14025:2006, 3.8, modified — changed term designation and definition to be specific to CFP verification and added reference to essential characteristic of the CFP verifier being competent.]

3.9.3
verification criteria
policy, procedure or requirement used as a reference against which evidence is compared

Note 1 to entry: Verification criteria may be established by governments, *GHG programmes* (ISO 14050:2009, 9.4.1) voluntary reporting initiatives, standards or good practice guidance.

[SOURCE: ISO 14064-1:2006, 2.32, modified — Deleted reference to validation at the beginning of the Note 1 to entry.]

4 Application

This International Standard shall not be adopted or applied with a view to or with the effect of creating obstacles or restriction to international trade. Relevant provisions and interpretations can be found in WTO documentation.

The CFP study shall not be used for a communication on overall environmental superiority because a CFP study covers only a single impact category.

Comparisons based on the CFP of different products shall not be made public because of the inherent limitations of this International Standard (see Annexes B and D).

NOTE Guidance for the use of successive CFPs in performance tracking of a product is provided in 9.1.3.

5 Principles

5.1 General

Adherence to these principles is a prerequisite in quantifying and communicating a CFP.

The quantification and reporting of a CFP in accordance with this International Standard is based on the principles of the LCA methodology provided in ISO 14040 and ISO 14044. The communication of a CFP in accordance with this International Standard is based on the relevant principles of: ISO 14020, ISO 14021, ISO 14024 and ISO 14025.

5.2 Life cycle perspective

The development of CFP quantification and CFP communication takes into consideration all stages of the life cycle of a product, from raw material acquisition through production, use and end-of-life stage to final disposal.

Under certain conditions partial CFPs may be added together to quantify the CFP, provided that they are performed according to the same methodology.

5.3 Principles for CFP quantification and reporting

5.3.1 Relative approach and functional unit

Structure the CFP study around a functional unit and calculate the results relative to this functional unit.

5.3.2 Iterative approach

When applying the four phases of LCA (goal and scope definition, life cycle inventory analysis (LCI), life cyle impact assessment (LCIA) and interpretation, see 6.1) to a CFP study, take an iterative approach of continuous reassessment as needed when refining the CFP study. The iterative approach will contribute to the consistency of the CFP study and the reported results.

5.3.3 Scientific approach

When making decisions within a LCA, give preference to natural science (such as physics, chemistry, biology). If this is not possible, use other scientific approaches (such as social and economic sciences) or refer to conventions relevant and valid within the geographical scope as defined in 6.2.6 of this International Standard. Permit decisions on LCA based on value choices, as appropriate, only if neither a natural scientific basis exists nor a justification based on other scientific approaches or international conventions is possible, and disclose such value choices.

NOTE Value-choices in LCA may relate to selection of data sources, allocation rules, cut-off criteria, method of calculating indicator results, characterization models and other phases and elements of the LCA.

5.3.4 Relevance

Select data and methods appropriate to the assessment of the GHG emissions and removals arising from the product system being studied.

5.3.5 Completeness

Include all GHG emissions and removals that provide a significant contribution to the assessment of GHG emissions and removals arising from the product system being studied.

5.3.6 Consistency

Apply assumptions, methods and data in the same way throughout the CFP study to arrive at conclusions in accordance with the goal and scope definition.

5.3.7 Coherence

Select methodologies, standards and guidance documents already recognized and adopted for product categories to enhance comparability between CFPs within any specific product category.

5.3.8 Accuracy

Reduce bias and uncertainties as far as is practical.

5.3.9 Transparency

Address and document all relevant issues in an open, comprehensive and understandable presentation of information.

Disclose any relevant assumptions and make appropriate references to the methodologies and data sources used. Clearly explain any estimates and avoid bias so that the CFP study report faithfully represents what it purports to represent.

5.3.10 Avoidance of double-counting

Avoid double counting of GHG emissions and removals within the product system.

5.4 Principles for CFP communication

5.4.1 Participation

Apply an open, participatory process with interested parties when developing and implementing CFP communication programmes.

5.4.2 Transparency

Ensure that CFP communication and its intended meaning is presented in a way that is clear and meaningful for the target audience to understand. Include information on functional unit, data assumptions, calculation methods and other characteristics to make limitations in the comparisons of CFPs transparent and clear to the target group.

5.4.3 Fairness

Make clear that the CFP communication is based on a CFP study which assesses the single impact category of climate change and does not imply overall environmental superiority nor examine broader environmental implications. Avoid misconception by not confusing quantified GHG emissions with reductions in GHG emissions.

6 Methodology for CFP quantification

6.1 General

A CFP study according to this International Standard shall include the four phases of LCA, i.e. goal and scope definition (see 6.2), LCI (see 6.3), LCIA (see 6.4) and life cycle interpretation (see 6.5).

A CFP study assesses the GHG emissions and removals in the life cycle of a product. The unit processes comprising the product system shall be grouped into life cycle stages; e.g., raw material acquisition, production, distribution, use and end-of-life. GHG emissions and removals from the product's life cycle shall be assigned to the life cycle stage in which the GHG emissions and removals occur. Partial CFPs may be added together to quantify the CFP, provided that they are performed according to the same methodology.

NOTE As an example from the construction sector, it is possible to have a partial CFP for a substance or preparation (e.g. cement), for a bulk product (e.g. gravel), for a service (e.g. maintenance of a building) or for an assembled system (e.g. masonry wall).

Where relevant PCR or CFP-PCR exist, they shall be adopted. PCR or CFP-PCR are relevant provided they

— have been developed in accordance with ISO 14025, this International Standard or any other relevant ISO sector-specific standard,

— comply with the requirements of 6.2, 6.3, 6.4, 6.5, Clause 7 and 9.5, and

— are considered proper (e.g. for system boundaries, modularity, allocation and data quality) by the organization applying this International Standard (for CFP-PCR see 9.5) and are in accordance with the principles in 5.2.

If more than one set of relevant PCR or CFP-PCR exist, the relevant PCR or CFP-PCR shall be reviewed by the organisation applying this International Standard (e.g. for system boundaries, modularity, allocation, data quality). The choice of the PCR or CFP-PCR adopted shall be justified.

When all above-mentioned requirements are met by PCR, those PCR are equivalent to the CFP-PCR.

Where no relevant CFP-PCR exist, the requirements and guidance of other internationally agreed sector-specific documents, related to specific materials or product categories, should be adopted, if they comply with the requirements of this International Standard and are considered appropriate by the organization applying this International Standard.

6.2 Goal and scope of the CFP quantification

6.2.1 Goal of a CFP study

The goal of carrying out a CFP study is to calculate the potential contribution of a product to global warming expressed as CO_2e by quantifying the GHG emissions and removals over the product's life cycle. This quantification supports a range of objectives and applications, including but not limited to individual studies, comparative studies in accordance with Annex D and performance tracking over time, and is intended for a range of audiences.

NOTE 1 Guidance on goal and scope definition is provided in ISO 14040:2006, 5.2 and specific requirements are given in ISO 14044:2006, 4.2.

In defining the goal of a CFP study, the following items shall be unambiguously stated:

— the intended application;

— the reasons for carrying out the CFP study;

— the intended audience, i.e. to whom the results of the CFP study are intended to be communicated.

NOTE 2 6.2.1 has been adapted from ISO 14044:2006, 4.2.2.

6.2.2 Scope of a CFP study

The scope of a CFP study shall be consistent with the goal of the CFP study (see 6.2.1). In defining the scope of the CFP study, the following items shall be considered and clearly described, taking into account the requirements and guidance given in the relevant chapters:

a) the product system to be studied and its functions;

b) the functional unit (see 6.2.3);

c) the system boundary, including the geographical scope of the product system (see 6.2.5);

d) methods to address issues occurring with specific product categories, e.g. carbon storage (see 6.3.9.6);

e) land use change (LUC) (see 6.3.9.4);

f) data and data quality requirements (see 6.2.6);

g) allocation procedures (see 6.3.6);

h) time boundary of data (see 6.2.7);

i) assumptions especially for the use stage and the end-of-life stage (see 6.2.8 and 6.2.9);

j) limitations of the CFP study (see Annexes B and D);

k) CFP study report (see Clause 7).

In some cases the scope of the CFP study may be revised due to unforeseen limitations, constraints or as a result of additional information. Such modifications, together with their explanation, shall be documented.

6.2.3 Functional unit

A CFP study shall clearly specify the functions of the product system being studied. The functional unit shall be consistent with the goal and scope of the CFP study. The primary purpose of a functional unit is to provide a reference to which the inputs and outputs are related. Therefore the functional unit shall be clearly defined and measurable.

When CFP-PCR are adopted, the functional unit used shall be that defined in the CFP-PCR and be consistent with the goal and scope of the CFP study.

Having chosen the functional unit, the reference flow shall be defined. Comparisons between systems shall be made on the basis of the same function(s), quantified by the same functional unit(s) in the form of their reference flows. If additional functions of any of the systems are not taken into account in the comparison of functional units, then these omissions shall be explained and documented. As an alternative to this approach, systems associated with the delivery of these functions may be added to the boundary of the other system to make the systems more comparable. In these cases, the processes selected shall be explained and documented.

NOTE 1 Preceding paragraph has been adapted from ISO 14044:2006, 4.2.3.2.

Results of the quantification of the CFP shall be documented in the CFP study report in mass of CO_2e per functional unit.

NOTE 2 The choice of the functional unit and the associated reference flow requires special attention, e.g. in order to allow comparisons without bias.

EXAMPLE In the function of drying hands, both a paper towel and an air-dryer system are studied. The selected functional unit may be expressed in terms of the identical number of pairs of hands dried for both systems. For each system, it is possible to determine the reference flow, e.g. the average mass of paper or the average volume of hot air required to dry one pair of hands, respectively. For both systems, it is possible to compile an inventory of inputs and outputs on the basis of the reference flows. At its simplest level, in the case of paper towel, this would be related to the paper consumed. In the case of the air-dryer, this would be related to the volume and temperature of hot air needed to dry the hands.

NOTE 3 Example taken from ISO 14040:2006, 5.2.2, with modifications.

6.2.4 Product unit

Exceptionally, a CFP may be reported on a self-selected product unit basis, e.g. one item of product, provided that a functional unit is also presented and the relationship of the functional unit to the product unit is documented and explained.

6.2.5 System boundary

6.2.5.1 General

The system boundary determines which unit processes shall be included within the CFP study.

Where CFP-PCR are used (see 6.1), their requirements on the processes to be included shall apply.

The selection of the system boundary shall be consistent with the goal of the CFP study. The criteria used in establishing the system boundary shall be identified and explained.

Decisions shall be made regarding which unit processes to include in the CFP study and the level of detail to which these unit processes shall be studied. The deletion of life cycle stages, processes, inputs or outputs is only permitted if they do not significantly change the overall conclusions of the CFP study. Any decisions to omit life cycle stages, processes, inputs or outputs shall be clearly stated and the reasons and implications for their omission shall be explained. The threshold for significance shall be stated and justified.

Decisions made regarding which unit processes, inputs and outputs shall be included and the level of detail of the CFP quantification shall be clearly stated.

NOTE 1 Preceding three paragraphs have been adapted from ISO 14044:2006, 4.2.3.3.

The CFP and the partial CFP shall not include offsetting.

NOTE 2 GHG removals that are not offsets can occur within the boundaries of the product system.

6.2.5.2 System boundary options

The setting of the system boundary can be different depending on the intended use of the CFP study. Where the assessment of the CFP is intended to be communicated to consumers, the quantification of the CFP shall comprise all stages of the life cycle, if not otherwise specified in 9.6.2.

For “supply chain business-to-business” use, except for a partial CFP representing gate-to-gate, a partial CFP shall as a minimum, represent the cradle-to-gate GHG emissions and removals arising from all stages, processes/modules up to the point where the product leaves the production site (the ‘gate’). Any gate-to-gate partial CFP shall be justified.

For internal applications (e.g. internal business use, supply chain optimisation or design support), a partial CFP may be based on GHG emissions and removals arising from a restricted number of stages within the life cycle of the product. For decision-making (e.g. design options), the whole life cycle of the product should

be considered in addition to other impacts (e.g. health and safety, environmental) and the limitations identified in Annex B of this International Standard.

6.2.5.3 Quantification

Quantification carried out in accordance with this International Standard shall include all GHG emissions and removals of those unit processes within the defined system boundary that have the potential to make a significant contribution to the CFP (see 6.2.5.1).

Within the goal and scope definition phase, consistent criteria shall be defined as follows:

— which unit processes need a detailed assessment due to a significant expected contribution to the CFP;

— for which unit processes the quantification of GHG emissions may be based on secondary data, due to lesser expected contribution to the CFP or because the collection of primary data is not possible or practicable (e.g. a need to rely on default emission factors);

— which unit processes may be merged, e.g. all transport processes within a plant.

6.2.5.4 Cut-off criteria

Consistent cut-off criteria that allow the omission of certain processes of minor importance shall be defined within the goal and scope definition phase. The effect of the selected cut-off criteria on the outcome of the study shall also be assessed and described in the CFP study report.

NOTE For additional guidance on cut-off criteria see ISO 14044:2006, 4.2.3.3.3.

6.2.6 Data and data quality

Site-specific data shall be collected for all individual processes under the financial or operational control of the organization undertaking the CFP study, and shall be representative of the processes for which they are collected. Site-specific data should be used for those unit processes that contribute considerably to the CFP, as determined in the sensitivity analysis. Site-specific data includes both, GHG emissions and GHG sources as well as GHG removals and GHG sinks contributing to:

— data from one specific unit process within a site;

NOTE 1 Site-specific data refers to either direct GHG emissions, activity data or emission factors.

— site-average data, i.e. representative averages of site-specific data collected from organizations within the product system which operate equivalent processes.

NOTE 2 Site-specific data can include activity data (inputs and outputs of processes that result in GHG emissions or removals) or direct GHG emissions data (determined through direct monitoring, stoichiometry, mass balance, or similar methods). Site-specific data can be collected from a specific site, or can be averaged across all sites that contain the process. They can be measured or modelled, as long as the result is specific to the process in the product's life cycle.

Data quality shall be characterized by both quantitative and qualitative aspects.

Secondary data shall only be used for inputs where the collection of site-specific data is not possible or practicable, or for processes of minor importance and may include literature data, calculated data, estimates or other representative data. Secondary data shall be documented.

A CFP study should use data that reduce bias and uncertainty as far as practicable by using the best quality data available.

Data quality requirements shall be specified to enable the goal and scope of the CFP study to be met. The data quality requirements should address the following:

a) time-related coverage: age of data and the minimum length of time over which data should be collected;

b) geographical coverage: geographical area from which data for unit processes should be collected to satisfy the goal of the CFP study;

c) technology coverage: specific technology or technology mix;

d) precision: measure of the variability of the data values for each data expressed (e.g. variance);

e) completeness: percentage of flow that is measured or estimated;

f) representativeness: qualitative assessment of the degree to which the dataset reflects the true population of interest (i.e. geographical coverage, time period and technology coverage);

g) consistency: qualitative assessment of whether or not the study methodology is applied uniformly to the various components of the sensitivity analysis;

h) reproducibility: qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the CFP study;

i) sources of the data;

j) uncertainty of the information.

NOTE 3 Uncertainty can include e. g.

— parameter uncertainty, e.g. emission factors, activity data,

— scenario uncertainty, e.g. use phase scenario or end-of-life scenario,

— model uncertainty.

NOTE 4 List a) to j) from above has been adapted from ISO 14044:2006, 4.2.3.6.2.

The relevant CFP-PCR shall give guidance on the data requirements, in particular under which conditions site-specific data shall be used and when the use of secondary data is acceptable.

Organizations undertaking a CFP study should have a data management system and should seek to continuously improve the consistency and quality of their data and retention of relevant documents and other records.

6.2.7 Time boundary for data

The time boundary for data is the time period for which the quantified figure for the CFP is representative.

The time period for which the CFP is representative shall be specified and justified. Where the GHG emissions and removals associated with specific unit processes within the life cycle of a product vary over time, data shall be collected over a period of time appropriate to establish the average GHG emissions and removals associated with the life cycle of the product.

If the production of a product is linked to a specific time period (e.g. seasonal products such as fruit and vegetables), the assessment of GHG emissions and removals shall cover that particular period in the life cycle of the product. Any activities occurring outside that period shall also be included provided that they are associated with the production of the product (e.g. GHG emissions related to a tree nursery). These data on GHG emissions and removals shall be properly linked to the functional unit.

6.2.8 Use stage and use profile

When the use stage is included within the scope of the CFP study (see 6.2.2), GHG emissions and removals arising from the use stage of the product during the product's service life shall be included. Service life

information shall be verifiable and it shall refer to the intended use conditions and to the related functions of the product. The use profile should seek to represent the actual usage pattern in the selected market.

Where not otherwise justified, the determination of the use profile (i.e. the related scenarios and assumed service life for the use stage of products) shall be based on published technical information such as:

a) CFP-PCR (see 6.1);

b) published international standards that specify guidance and requirements for development of scenarios and service life for the use stage for the product being assessed;

c) published national guidelines that specify guidance for development of scenarios and service life for the use stage for the product being assessed;

d) published industry guidelines that specify guidance for development of scenarios and service life for the use stage for the product being assessed;

e) use profiles based on documented usage patterns for the product in the selected market.

Where no method for determining the use stage of products has been established in accordance with any of the bullet points above, the assumptions made in determining the use stage of products shall be established by the organization carrying out the CFP study.

The manufacturer's recommended method to be applied in the use stage (e.g. cooking in an oven at a specified temperature for a specified time) might provide a basis for determining the use stage of a product. The actual usage pattern may however differ from those recommended. Any difference should be explained.

All relevant assumptions for the use stage shall be documented.

6.2.9 End-of-life stage

The end-of-life stage begins when the used product is ready for disposal, recycling, reuse, etc.

All the GHG emissions and removals arising from the end–of-life stage of a product shall be included in a CFP study, if this stage is included in the scope (see 6.2.2). End-of-life processes may include:

a) collection, packaging and transport of end-of-life products;

b) preparation for recycling and reuse;

c) dismantling of components from end-of-life products;

d) shredding and sorting;

e) material recycling;

f) composting;

g) energy recovery, organic recovery or other recovery processes;

h) incineration and sorting of bottom ash;

i) landfilling, landfill maintenance, decomposition emissions such as methane.

NOTE For end-of-life processes, CFP-PCR may provide additional guidance.

All relevant assumptions regarding end-of-life treatment, e.g. GHG emissions and removals, shall be based on best available information and based on current technology and shall be documented in the CFP study report.

6.3 Life cycle inventory analysis for the CFP

6.3.1 General

LCI is the phase of LCA involving the compilation and quantification of inputs and outputs for a product throughout its life cycle. After the goal and scope definition phase, the LCI of a CFP study shall be performed, which consists of the following steps, for which the following pertinent provisions, adapted from ISO 14044:2006, listed below shall apply. If CFP-PCR are adopted for the CFP study, the LCI shall be conducted following the requirements in the CFP-PCR (see 6.1).

6.3.2 Data collection

The qualitative and quantitative data for inclusion in the life cycle inventory shall be collected for all unit processes that are included in the system boundaries. The collected data, whether measured, calculated or estimated, are utilized to quantify the inputs and outputs of a unit process. Significant unit processes shall be documented.

When data have been collected from public sources, the sources shall be referenced in the CFP study report. For those data that may be significant for the conclusions of the CFP study, details about the relevant data collection process, the time when data have been collected, and further information about data quality shall be referenced. If such data do not meet the data quality requirements, this shall be stated.

Since data collection may span several reporting locations and published references, measures should be taken to reach uniform and consistent understanding of the product systems to be modelled.

NOTE 1 6.3.2 has been adapted from ISO 14044:2006, 4.3.2.

NOTE 2 For data and data quality see 6.2.6.

6.3.3 Validation of data

A check on data validity shall be conducted during the process of data collection to confirm and provide evidence that the data quality requirements specified in 6.2.6 have been met.

Validation may involve establishing, for example, mass balances, energy balances and/or comparative analyses of emission factors. As each unit process obeys the laws of conservation of mass and energy, mass and energy balances provide a useful check on the validity of the description of a unit process.

NOTE 6.3.3 has been adapted from ISO 14044:2006, 4.3.3.2.

6.3.4 Relating data to unit process and functional unit

An appropriate flow shall be determined for each unit process. The quantitative input and output data of the unit process shall be calculated in relation to this flow.

Based on the flow chart and the flows between unit processes, the flows of all unit processes are related to the reference flow. The calculation shall relate system input and output data to the functional unit.

Care should be taken when aggregating the inputs and outputs in the product system. The level of aggregation shall be consistent with the goal of the CFP study. If more detailed aggregation rules are required, they should be explained in the goal and scope definition phase of the CFP study or should be left to a subsequent LCIA phase.

NOTE 6.3.4 has been adapted from ISO 14044:2006, 4.3.3.3.

6.3.5 Refining the system boundary

Reflecting the iterative nature of the CFP quantification, decisions regarding the data to be included shall be based on a sensitivity analysis to determine their significance. The initial system boundary shall be revised, as appropriate, in accordance with the cut-off criteria established in the definition of the scope. The results of this refining process and the sensitivity analysis shall be documented in the CFP study report.

The sensitivity analysis may result in

a) exclusion of life cycle stages or unit processes when lack of significance can be shown by the sensitivity analysis,

b) exclusion of inputs and outputs that lack significance to the results of the CFP study, or

c) inclusion of new unit processes, inputs and outputs that are shown to be significant in the sensitivity analysis.

This sensitivity analysis serves to limit the subsequent data handling to those input and output data that are determined to be significant to the goal of the CFP.

NOTE 6.3.5 has been adapted from ISO 14044:2006, 4.3.3.4.

6.3.6 Allocation

6.3.6.1 General

The inputs and outputs shall be allocated to the different products according to the clearly stated and justified allocation procedure.

The sum of the allocated inputs and outputs of a unit process shall be equal to the inputs and outputs of the unit process before allocation.

Whenever several alternative allocation procedures seem applicable, a sensitivity analysis shall be conducted to illustrate the consequences of the departure from the selected approach.

6.3.6.2 Allocation procedure

The CFP study shall identify the processes shared with other product systems and deal with them according to the stepwise procedure presented below.

a) Step 1: Wherever possible, allocation should be avoided by

   1) 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, or

   2) expanding the product system to include the additional functions related to the co-products.

b) Step 2: Where allocation cannot be avoided, the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system.

c) Step 3: Where physical relationship alone cannot be established or used as the basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between co-products in proportion to the economic value of the products.

Some outputs may be partly co-products and partly waste. In such cases, it is necessary to identify the ratio between co-products and waste since the inputs and outputs shall be allocated to the co-products part only.

Allocation procedures shall be uniformly applied to similar inputs and outputs of the product system under consideration. For example, if allocation is made to usable products (e.g. intermediate or discarded products) leaving the system, then the allocation procedure shall be similar to the allocation procedure used for such products entering the system.

The life cycle inventory is based on material balances between input and output. Allocation procedures should therefore approximate as much as possible such fundamental input/output relationships and characteristics.

NOTE 6.3.6.1 and 6.3.6.2 have been adapted from ISO 14044:2006, 4.3.4.2.

6.3.6.3 Allocation procedure for reuse and recycling

The allocation principles and procedures in 6.3.6.1 and 6.3.6.2 also apply to reuse and recycling situations.

Changes in the inherent properties of materials shall be taken into account. In addition, particularly for the recovery processes between the original and subsequent product system, the system boundary shall be identified and explained, ensuring that the allocation principles are observed as described in 6.3.6.2.

However, in these situations, additional elaboration is needed for the following reasons.

— reuse and recycling (as well as composting, energy recovery and other processes that can be assimilated to reuse/recycling) may imply that the inputs and outputs associated with unit processes for extraction and processing of raw materials and final disposal of products are to be shared by more than one product system;

— reuse and recycling may change the inherent properties of materials in subsequent use.

Specific care should be taken when defining system boundary with regard to recovery processes.

Several allocation procedures are applicable for reuse and recycling. The application of some procedures is distinguished in the following to illustrate how the above constraints can be addressed:

a) A closed-loop allocation procedure applies to closed-loop product systems. It also applies to open-loop product systems where no changes occur in the inherent properties of the recycled material. In such cases, the need for allocation is avoided since the use of secondary material displaces the use of virgin (primary) materials. However, the first use of virgin materials in applicable open-loop product systems may follow an open-loop allocation procedure outlined in b).

b) An open-loop allocation procedure applies to open-loop product systems where the material is recycled into other product systems and the material undergoes a change to its inherent properties.

The allocation procedures for the shared unit processes should use, as the basis for allocation, the following order, if feasible:

— physical properties (e.g. mass);

— economic value (e.g. market value of the scrap material or recycled material in relation to market value of primary material); or

— the number of subsequent uses of the recycled material.

NOTE 1 A possible procedure how to treat recycling in CFP studies is given in Annex C. Examples how to treat recycling in LCA studies are given in ISO/TR 14049.

NOTE 2 6.3.6.3 has been adapted from ISO 14044:2006, 4.3.4.3.

6.3.7 CFP performance tracking

When the CFP is intended to be used for CFP performance tracking, i.e. calculation of the change to the CFP over time, the following additional requirements for the quantification of the CFP shall be met:

a) the assessments shall be carried out for different points in time in conformity with this International Standard;

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

c) if two separate assessments are made, the change shall be calculated using the same method for both assessments (equivalent systems for selecting/managing data, system boundaries, allocation, identical characterization factors, etc.).

The time period between the points in time for which the CFP performance tracking is undertaken shall not be shorter than the time boundary for data as described in 6.2.7 and shall be described in the goal and scope.

6.3.8 Time period for assessment of GHG emissions and removals

For CFP, the GHG emissions and removals arising from the life cycle of a product shall be calculated over the entire life cycle of the product, including the use stage and the end-of-life stage.

GHG emissions and removals arising from all life cycle stages of the products, or in the case of partial CFP the relevant life cycle stages, shall be calculated and reported according to the following requirements.

For all life cycle stages except the use stage (see 6.2.8) and the end-of-life stage (see 6.2.9), GHG emissions and removals shall be included as if released or removed at the beginning of the assessment period. Where all GHG emissions and removals arising from the use stage or from the end-of-life stage occur within ten years after the product has been brought into use, all those GHG emissions and removals shall be calculated as if released or removed at the beginning of the assessment period and included in the CFP.

Where GHG emissions and removals arising from the use stage (see 6.2.8) or from the end-of-life stage (see 6.2.9) occur over more than ten years after the product has been brought into use, these GHG emissions and removals shall be included in the CFP without the effect of timing of the GHG emissions and removals. In addition, the timing of GHG emissions and removals relative to the year of production of the product shall be specified in the life cycle inventory, and the effect of this timing of the GHG emissions and removals from the product system (as CO_2e) may be included in the life cycle inventory and shall then be documented separately in the CFP study report. The method used to calculate the effect of timing shall be stated and justified in the CFP study report.

NOTE The time period of ten years has been selected to avoid additional reporting of GHG emissions and removals over shorter time periods and to achieve comparability in reporting. This value may be revised in future based on experience or improved scientific knowledge.

6.3.9 Treatment of specific GHG sources and sinks

6.3.9.1 General

For the sake of consistency of quantification, specific requirements and guidelines are provided in the following sub-clauses for specific GHG sources and sinks where different approaches could lead to different results.

More detailed guidance and data may be available in relevant CFP-PCR, other sector guidance documents or other CFP communication programme rules.

6.3.9.2 Treatment of fossil and biogenic carbon

GHG emissions and removals arising from fossil and biogenic carbon sources and sinks shall be included in the CFP and shall be documented separately in the CFP study report.

NOTE 1 The amount of CO_2 uptake of biomass and the equivalent amount of CO_2 emissions from the biomass at the point of complete oxidation results in zero net CO_2 emissions when biomass carbon is not converted into methane, non methane volatile organic compounds (NMVOC) or other precursor gases that are not converted to CO_2.

NOTE 2 For the purpose of this International Standard, CO_2 from air converted to non-biomass carbonates, is calculated similarly to the provisions applicable to biogenic carbon.

All the unit processes of the life cycle of biomass shall be included in the product system, including biomass cultivation and production.

6.3.9.3 Treatment of electricity

The GHG emissions associated with the use of electricity shall include, where relevant, GHG emissions arising from the life cycle of the energy supply system, including but not restricted to:

— the GHG emissions arising from the generation of electricity, e.g. combustion of fuels;

— transmission as well as distribution losses in the grid;

— upstream GHG emissions (e.g. the mining and transport of fuel to the electricity generator or the growing and processing of biomass for use as a fuel);

— downstream GHG emissions (e.g. the treatment of waste arising from the operation of nuclear electricity generators);

— GHG emissions related to construction and deconstruction of the electricity supply system.

When electricity is internally (e.g. on-site generated electricity) produced and consumed for a product under study, life cycle data for that electricity shall be used for that product.

When a supplier of electricity can deliver a specific electricity product and guarantee that the electricity sale and the associated GHG emissions are not double counted, the data for that electricity shall be used for the product studied. When the supplier of electricity does not provide specific GHG data for the specific electricity product, the GHG emissions associated with the national grid where the life cycle stage occurs shall be used.

Where a country does not have a national grid but has several unconnected grids or several countries share a common grid, the relevant grid from which the power is obtained should be used.

If specific life cycle data on a process within the energy supply system are difficult to access, data from recognized databases may be used.

The treatment of electricity should be documented in the CFP study report.

NOTE 1 Regarding double-counting, generator-specific emission factors for electricity used in a process could be used when:

a) the process which used the electricity (or used an equivalent amount of electricity of the same type to that generated), and another process did not claim the generator-specific emission factors for that electricity; and

b) the generator-specific electricity production does not influence the emission factors of any other process or organization.

NOTE 2 In some countries parts of the electricity from renewable energy sources might already be sold/exported as "green" electricity, and should thus be excluded from the mix to avoid double counting.

NOTE 3 Some "green certificates" are sold without coupling to the electricity, which might lead to double counting.

6.3.9.4 Land use change

When significant, the GHG emissions and removals occurring as a result of direct land use change (dLUC) shall be assessed in accordance with internationally recognized methods such as the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories and included in the CFP. LUC GHG emissions and removals shall be documented separately in the CFP study report. If site-specific data are applied, they should be transparently documented in the CFP study report.

Indirect land use change (iLUC) should be considered in CFP studies, once an internationally agreed procedure exists.

All choices and assumptions shall be justified and documented in the CFP study report.

NOTE There is on-going research to develop methodology and data for the inclusion of iLUC in GHG reporting.

6.3.9.5 Soil carbon change

Unless calculated as part of LUC, the GHG emissions and removals occurring as a result of soil carbon change should be included in the life cycle inventory and should be assessed and shall be documented separately in the CFP study report in accordance with internationally recognized methods such as the IPCC Guidelines for National Greenhouse Gas Inventories if calculated.

NOTE There is on-going research to develop methodology and data for the inclusion of soil carbon change in GHG reporting.

6.3.9.6 Carbon storage in products

When CO_2 is stored as carbon in a product for a specified time, this carbon storage shall be treated according to the provisions in 6.3.8. If any carbon storage in products is calculated, it shall be documented separately in the CFP study report but not included in the CFP.

NOTE Carbon storage in products may also be provided for information when performing cradle-to-gate studies when this information is relevant for the remaining value chain.

6.3.9.7 Non-CO_2 emissions and removals from livestock and soils

The non-CO_2 emissions and removals (e.g. N_2O and CH_4) arising from livestock, manure or soils shall be included in the CFP and shall be assessed in accordance with internationally recognized methods such as the IPCC Guidelines for National Greenhouse Gas Inventories.

If a national approach is used, the data shall be based on a verified study, a peer reviewed study or similar scientific evidence.

6.3.9.8 Aircraft GHG emissions

Aircraft transportation GHG emissions shall be included in the CFP and documented separately in the CFP study report.

NOTE Aircraft GHG emissions under certain circumstances in high altitudes have additional climate impacts as a result of physical and chemical reactions with the atmosphere. For more information on GHG emissions from aircraft see IPCC Guidelines for National Greenhouse Gas Inventories and IPCC Special Report on Aviation.

6.3.10 Summary of requirements and guidance in 6.3.9

Table 1 is an informative summary of the requirements and guidance given in 6.3.9. Refer to 6.3.9.2 to 6.3.9.8 for the full requirements and guidance.

Table 1 — Summary of specific GHG values of the CFP and corresponding documentation requirements

Specific sources and sinks of the CFP			Specific information documented separately in the CFP study report	
Shall be included	**Should be included**	**Should be considered**	**Shall be documented**	**Shall be documented if calculated**
– GHG emissions and removals arising from fossil and biogenic carbon sources and sinks – GHG emissions and removals occurring as a result of dLUC – non-CO_2 GHG emissions and removals arising from livestock, manure or soils – aircraft GHG emissions	– soil carbon change, if not already calculated as part of LUC	– GHG emissions and removals occurring as a result of iLUC	– GHG emissions and removals arising from fossil sources and sinks – GHG emissions and removals arising from biogenic carbon sources and sinks – GHG emissions and removals occurring as a result of dLUC – aircraft GHG emissions	– soil carbon change – GHG emissions and removals occurring as a result of iLUC – effect of carbon storage arising from the use stage and/or end-of-life stage of products[a]

[a] Effect of carbon storage arising from the use stage and/or end-of-life stage of products is not included in the CFP. For reporting of timing see 6.3.8.

6.4 Life cycle impact assessment

In the LCIA phase of a CFP study, the potential climate change impact of each GHG emitted and removed by the product system shall be calculated by multiplying the mass of GHG released or removed by the 100-year GWP given by the IPCC in units of "kg CO_2e per kg emission". The CFP is the sum of these calculated impacts.

The 100-year GWPs, as published in the Fourth Assessment Report of the IPCC are provided in Annex A. Where these data are amended by the IPCC, the latest data shall be used in the CFP calculations. If the latest IPCC GWP data are not used, it shall be stated and justified in the CFP study report.

6.5 Life cycle interpretation

The life cycle interpretation phase of a CFP study comprises the following steps:

— identification of the significant issues based on the results of the quantification of the CFP according to LCI and LCIA phases;

- an evaluation that considers completeness, sensitivity and consistency checks;
- conclusions, limitations, and recommendations.

The results of the quantification of the CFP according to the LCI or LCIA phases shall be interpreted according to the goal and scope of the CFP study. The interpretation shall:

- include a quantitative or qualitative assessment of uncertainty, including the application of rounding rules or ranges;
- identify and document the selected allocation methods in the CFP study report in detail;
- identify the limitations of the CFP study (according to, but not limited to Annex B).

The interpretation should include:

- a sensitivity check of the significant inputs, outputs and methodological choices, including allocation methods, in order to understand the sensitivity and uncertainty of the results;
- an assessment of the influence of alternative use profiles on the final result; and
- an assessment of the influence of different end-of-life scenarios on the final result.

NOTE For more information see ISO 14044:2006, 4.5 and ISO 14044:2006, Annex B.

7 CFP study report

The purpose of the CFP study report is to document the results of the quantification of the CFP study, to present the decisions within the goal and scope definition phase, and to demonstrate that the provisions of this International Standard have been met.

The results and conclusions of the CFP study shall be documented in the CFP study report without bias. The results, data, methods, assumptions and the life cycle interpretation (see 6.5) shall be transparent and presented in sufficient detail to allow the reader to comprehend the complexities and trade-offs inherent in the CFP study. The type and format of the CFP study report shall be defined in the goal and scope definition phase of the CFP study. The CFP study report shall also allow the results and life cycle interpretation to be used in a manner consistent with the goals of the CFP study. The selected allocation methods shall be documented in the CFP study report in detail and the GHGs taken into account shall be clearly stated.

The following GHG values shall be documented separately in the CFP study report:

a) GHG emissions and removals linked to the main life cycle stages in which they occur, including the absolute and the relative contribution of each life cycle stage;

b) GHG emissions and removals arising from fossil carbon sources and sinks (see 6.3.9.2);

c) GHG emissions and removals arising from biogenic carbon sources and sinks (see 6.3.9.2);

d) GHG emissions resulting from dLUC (see 6.3.9.4);

e) GHG emissions resulting from aircraft transportation (see 6.3.9.8).

The following GHG values shall be documented separately in the CFP study report, if calculated:

f) soil carbon change (see 6.3.9.5);

g) GHG emissions and removals occurring as a result of iLUC (see 6.3.9.4);

h) carbon storage arising from the use stage and/or end-of-life stage of products (see 6.2.8 and 6.2.9).

The CFP study report should include a sensitivity check of the significant inputs, an assessment of the influence of alternative use profiles and end-of-life scenarios on the final result.

NOTE Where a critical review is applicable, guidance is provided in ISO 14044:2006, Clause 6.

In addition to the items above, the following items shall be included in the CFP study report:

i) cut-offs (see 6.2.5.4);

j) timing of delayed GHG emissions (see 6.3.8 and 6.3.9.6);

k) description of data (see 6.2.6), including

- decisions concerning data,
- details of individual data, and
- assessment of data quality;

l) relevant assumptions for the end-of-life stage;

In addition to the items above, the following items should be considered for inclusion in the CFP study report:

m) scope, modified scope if applicable, along with justifications and exclusions (see 6.2.2);

n) description of the stages of the life cycle including a description of the selected use profiles and end-of-life scenarios;

o) system boundary, including

- type of inputs and outputs of the system as elementary flows,
- decision criteria concerning treatment of unit processes, considering their importance for the conclusions of the CFP study;

p) description of significant unit processes;

q) results of the life cycle interpretation (see 6.5), including conclusions and limitations;

r) disclosure of value choices that have been made in the context of decisions within the CFP study;

s) time period for which the CFP is representative;

t) treatment of electricity (see 6.3.9.3);

u) relevant assumptions for the use stage;

v) compliance with Annex D.

A graphical presentation of results of the CFP study may be included as part of the CFP study report.

If an organization decides to make the CFP available to the public and decides not to carry out an independent third-party verification, then a CFP disclosure report according to 8.3 shall be prepared. In this case it is recommended to fulfil the requirements of the CFP disclosure report already for the CFP study report.

8 Preparing for CFP communication

8.1 General

When an organization decides to make a CFP communication publicly available there are two options to conform with this International Standard. CFP communication according to 9.1 intended to be available to the public shall:

a) be verified by an independent third-party (see 8.2), or

b) be reported completely and accurately without bias to the intended audience in a CFP disclosure report (see 8.3). CFP communication disclosed to the public in this manner shall not imply that the communication is verified by an independent third-party when it is not.

NOTE In relation to a CFP communication, the term 'publicly available' means a communication which is deliberately placed in the public domain or intended to be available to consumers, for instance through an intentional publication or through an open internet site. Communications which are, for instance, exchanged between businesses or posted on a restricted access internet site are not classified as publicly available even if they subsequently enter the public domain through the unforeseen actions of a third party.

8.2 Third-party CFP verification

8.2.1 General

If the CFP communication is verified by an independent third-party, a verification statement shall be made available to the intended audience. The report of the verifier should be available on request.

NOTE ISO 14065 defines requirements for greenhouse gas verification bodies. ISO 14066 defines competence requirements for GHG verification teams.

Independent third-party verification shall provide confirmation that the relevant requirements of this International Standard have been met, including the application of relevant CFP-PCR, if available.

8.2.2 Competence requirements for verification teams

The verification team shall meet the following minimum requirements:

a) knowledge of relevant sector, product and product-related environmental aspects;

b) process and product knowledge of the product category;

c) expertise in LCA and methodology of LCA work;

d) knowledge of relevant standards in the fields of environmental labelling and declarations, LCA and CFP;

e) knowledge of the regulatory framework within which requirements for CFP communication have been prepared;

f) knowledge of the CFP communication programme, when applicable; and

g) knowledge of the verification/validation of environmental data.

NOTE ISO 14065 defines a verification team as one or more verifiers conducting a verification, supported if needed by technical experts (ISO 14065, 3.3.6).

8.2.3 Scope of CFP verification

CFP verification shall as a minimum confirm the following:

a) the LCA, LCI and information modules;

b) appropriate selection of CFP-PCR;

c) conformance with the CFP-PCR;

d) conformance with this International Standard;

e) that data evaluation includes coverage, precision, completeness, representativeness, consistency, reproducibility, sources and uncertainty;

f) the quality and accuracy of the CFP based data and calculations;

g) the quality and accuracy of any supporting information.

8.2.4 CFP verification of requirements when CFP-PCR apply

The programme operator may establish requirements for the competence of independent third-party verifiers in addition to those defined in 8.2.2.

When a CFP communication programme is established, the programme operator may define procedures for independent third-party verification. These procedures shall be transparent and shall as a minimum be appropriate to determine if the CFP communication is in conformance with requirements of this International Standard.

The programme operator shall document the verification procedures. Documentation describing these procedures shall be available to any person upon request.

8.3 CFP disclosure report

8.3.1 General

When an organization does not perform an independent third-party verification of its CFP communication, it may communicate publicly through one or more options specified in 9.1. In this case the CFP communication option shall be supported by a CFP disclosure report publically available and in conformity to the requirements contained in 8.3.

The results, data, methods, assumptions and limitations shall be transparent and presented in sufficient detail to allow the reader to comprehend the complexities and trade-offs inherent in the CFP. The CFP disclosure report shall also allow the results and interpretation to be used in a manner consistent with the goals of the CFP study.

The CFP disclosure report contains all the information required of the CFP study report (see Clause 7) and the following additional items. Therefore there is no need of an additional CFP study report if a CFP disclosure report is available.

The additional items listed in 8.3.2 to 8.3.6 shall be documented in the CFP disclosure report together with the items 7 a) to 7 v) of the CFP study report.

8.3.2 General information and scope

The following information shall be included:

a) contact information,

b) studied product name and description,

c) the functional unit of the product system and the reference flow,

d) type of CFP (partial or full),

e) CFP-PCR, if used,

f) life cycle inventory date and version,

g) a disclaimer stating the relevant limitations of various potential uses.

8.3.3 Boundary setting

The following information shall be included:

h) a process map including processes in the life cycle inventory;

i) exclusions and justification for their exclusion;

j) time period for assessment of GHG emissions and removals.

8.3.4 Allocation

Disclosure and justification of the methods used to avoid or perform allocation due to co-products or recycling shall be documented.

8.3.5 Data collection and quality

The following information shall be included:

k) the method used to calculate LUC, when applicable;

l) for significant processes, a description on the data sources, data quality, and any efforts taken to improve data quality;

m) a statement on sources of life cycle inventory uncertainty and methodological choices. Methodological choices include

- allocation methods, including allocation due to recycling,
- calculation models.

8.3.6 CFP results

The following information shall be included:

n) the source and date of the GWP factors used;

o) total life cycle inventory results in units of CO_2e per functional unit of the product system, which includes all GHG emissions and removals included in the boundary from biogenic sources and non-biogenic sources, including LUC;

p) percentage of total life cycle inventory results by life cycle stage;

q) biogenic and non-biogenic GHG emissions and removals separately, when applicable;

r) an assessment in order to understand the uncertainty of the results;

s) results of previous review, if any.

9 CFP communication

9.1 Options for CFP communication

9.1.1 General

This Clause provides requirements and guidance for an organization which decides to communicate the CFP.

CFP communication includes communication of a CFP or a partial CFP (see Clause 6).

Communication of CFP may take the form of a a CFP external communication report, a CFP performance tracking report, a CFP claim, a CFP label or a CFP declaration. For partial CFP communications the additional requirements in 9.6.2 apply.

Users of the product should be informed by the relevant CFP communication how and to what extent they can influence the CFP by their behaviour during the use stage and by decisions on recycling or final disposal.

General requirements and guidelines for the five CFP communication options are summarized in Figure 2.

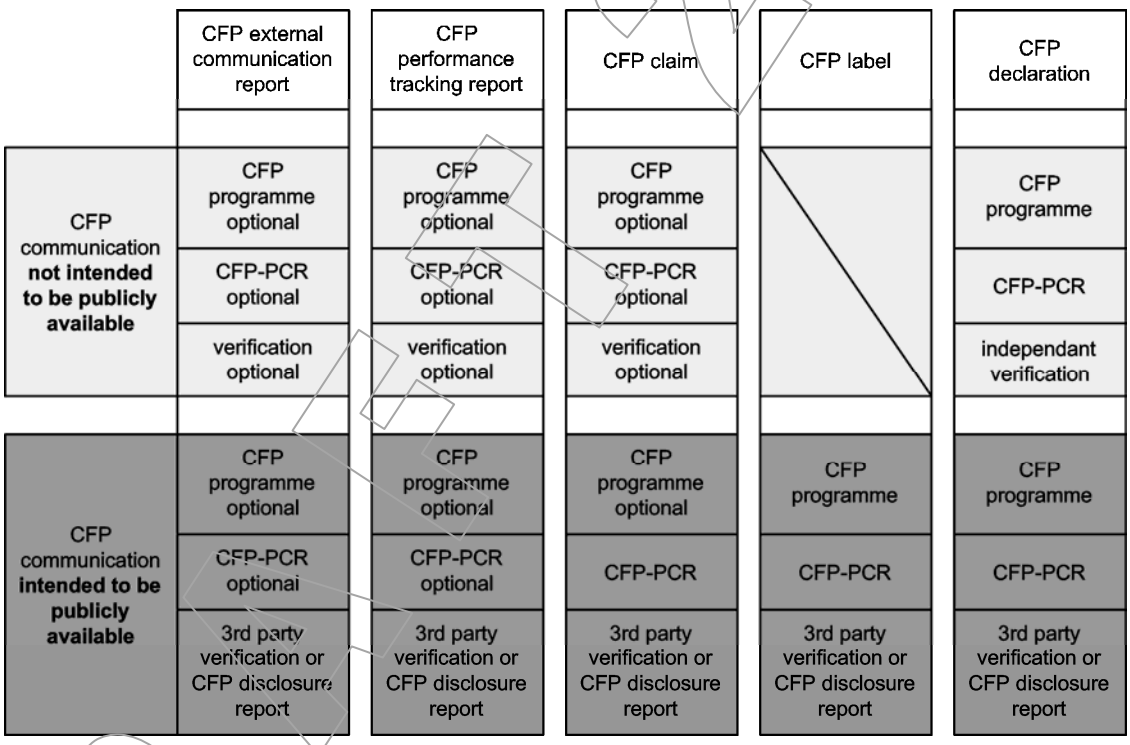

Figure 2 — General requirements and guidelines for the different CFP communication options

NOTE 1 The CFP external communication report and the CFP performance tracking report are primarily intended for business to business communication and not intended for direct consumer communication, and therefore do not have the requirements for CFP-PCR and CFP communication programme.

NOTE 2 In case of CFP-PCR the term “optional” means that when CFP-PCR exist and conform to 6.1 they are mandatory, while in all other cases they are not required.

9.1.2 CFP external communication report

CFP communication may take the form of a CFP external communication report or partial CFP external communication report.

The following information shall be included:

a) contact information;

b) studied product name and description;

c) functional unit of the product system and the reference flow;

d) type of CFP (partial or full);

e) CFP-PCR, if used;

f) disclaimer stating the relevant limitations of various potential uses;

g) description of the stages of the life cycle including a description of the selected use profiles and end-of-life scenarios, if relevant;

h) system boundaries, including cut-off criteria;

i) exclusions and justification for their exclusion;

j) time boundary for data;

k) description of primary and secondary data;

l) life cycle inventory results in units of CO_2e per functional unit of the product system, which includes all GHG emissions;

m) GHG emissions and removals linked to the life cycle stages in which they occur, including the absolute and the relative contribution of each life cycle stage;

n) GHG emissions and removals arising from fossil carbon sources and sinks;

o) GHG emissions and removals arising from biogenic carbon sources and sinks;

p) GHG emissions resulting from LUC;

q) carbon storage in products;

r) GHG emissions resulting from aircraft transportation;

s) percentage of total life cycle inventory results by life cycle stage;

t) results of the life cycle interpretation (e.g. sensitivity analysis and uncertainty), including conclusions and limitations.

The CFP external communication report should include graphical representations of the processes of the life cycle of the product which describe the system boundary and the significant contributors to the CFP.

The communication shall also be supported by a disclaimer on the proper use of the CFP external communication report.

9.1.3 CFP performance tracking report

CFP communication may take the form of a CFP performance tracking report, which is a report that compares the performance of the same organizations' product over time with respect to its CFP. Performance tracking communication allows for the comparison of CFP results of one specific product over time.

The communication may be supported by a graphical representation of the processes in the life cycle of the product, which allows an understanding of the system boundary, the significant contributors to the CFP and the changes included.

The communication of the performance tracking report shall be based on the quantification results whose requirements are specified in 6.3.7.

If communicating a change of CFP to the public the main contributions to the change shall be specified.

Communication of change in CFPs may be made when they are due to:

a) improvements made by the reporting organization;

b) selection of other suppliers;

c) deliberate and verifiable improvements made by suppliers; or

d) improvements in the use stage and in the end-of-life stage made by improved product design or an improved end-of-life procedure.

Changes due to process improvements, e.g. introducing no-till or low-till cultivation in agricultural processes, may be reported in performance tracking. Changes due to seasonal changes or finding better secondary data sources should not be reported as performance changes.

9.1.4 CFP claim

CFP communication may take the form of a CFP claim.

CFP claims may be made by manufacturers, importers, distributors, retailers or anyone else likely to benefit from such claims. CFP claims made with regard to products may take the form of statements that may be accompanied by symbols or graphics on product or package labels, or in product literature, technical bulletins, advertising, publicity, telemarketing, as well as digital or electronic media, such as the Internet.

CFP claims shall be accompanied by an explanatory statement if the claim alone is likely to result in misunderstanding and CFP claims should be displayed together with the CFP.

For a CFP claim a CFP communication programme is optional but the use of CFP-PCR is mandatory. In the case that no appropriate CFP-PCR exist and if the entity decides to establish CFP-PCR without a CFP communication programme, it shall be done in accordance with 9.5 and the established CFP-PCR shall:

a) be independently verified;

b) be developed with the involvement of interested parties according to 9.4.4;

c) state the following:

   1) who established the CFP-PCR,

   2) absence of programme instructions in establishing the CFP-PCR, (see 9.5.3);

d) be publicly available.

9.1.5 CFP label

CFP communication may take the form of a CFP label.

A CFP label communicates information related to the results of a CFP study. The CFP label is awarded to products that meet predetermined programme requirements. A CFP label programme is a single-criterion-

based programme that awards a licence, which authorizes the use of this label on products. The programmes may be operated by public or private agencies and may be national, regional or international in nature.

A CFP label identifies products with CFP values that meet specific criteria of the programme set by the CFP communication programme operator. These criteria are quantified by using the CFP-PCR of the product categories.

The CFP communication programme operator shall select the criteria and set the levels by product category based on the product category CFP-PCR developed in compliance with this International Standard and determine the validity period for the label.

It shall be made clear that a CFP label is a single criteria label and not a Type I environmental label.

9.1.6 CFP declaration

CFP communication may take the form of a CFP declaration.

The CFP declaration is based on CFP-PCR developed specifically for a CFP communication (see 9.5), or on relevant Type III environmental declaration PCR (see ISO 14025).

A CFP declaration programme is similar to Type III labelling programmes developed in accordance with ISO 14025, but revised to conform to general CFP communication programme requirements of this International Standard (see 9.4). The CFP declaration is intended to be available to the public and can be directed towards both business and consumers.

9.2 CFP communication intended to be available to the public

This sub-clause specifies the requirements for CFP communication intended to be available to the public.

The CFP claim, CFP label and CFP declaration intended to be available to the public shall be based on a relevant CFP-PCR. CFP label and CFP declaration shall also be based on a CFP communication programme. For the CFP external communication report, the CFP performance tracking report and the CFP claim the CFP programme is optional. For the use of CFP-PCR see 6.1.

The following requirements are common to all forms of CFP communication intended to be available to the public and shall be met:

a) information shall be provided at an appropriate place in the CFP communication that the CFP only addresses the single impact category of climate change and does not assess other potential social, economic and environmental impacts arising from the provision of a product. This statement shall be accompanied by the date of issue and a direct link to background information on a website or any other publicly available communication;

b) the functional unit to which the CFP communication refers to shall be stated in connection with the CFP;

c) publicly available background information, e.g. on a website or at the point of sale shall include detailed information on:

   1) the methodology used;

   2) the involvement of interested parties in the CFP communication programme when required;

   3) definition of rated scales and colour/letter codes, if used;

   4) background information on GHG emissions and removals e.g.

      — GHG emissions and removals deriving from different life cycle stages (fossil and biogenic),

— total fossil and total biogenic GHG emissions and removals for the functional unit,

— total fossil and total biogenic GHG emissions and removals for the product unit (when applicable);

5) information on the fulfilment of data quality requirements.

If the CFP study report is third-party verified, the verification statement of the independent third-party shall be made publicly available with the CFP communication.

If applicable, the storage time period for biogenic carbon in the product shall be provided.

When an organization intends to make CFP communication available to the public it shall disclose as described in Clause 8:

— the CFP per functional unit,

— the uncertainties and

— the verified or comprehensive information.

It shall also explain how these GHG emissions and uncertainties were assessed, for instance on a website. Information on uncertainties can be qualitative and quantitative.

When an organization communicates a change of a CFP over time, i.e. performance tracking, the requirements of 9.1.3 shall be met.

9.3 CFP communication not intended to be available to the public

When the CFP communication is not intended to be available to the public, requirements for a CFP communication programme, CFP-PCR and verification are optional with the exception of the CFP declaration where these elements are required. As guidance for an organization which decides to use CFP communication that is not intended to be available to the public, 9.2 and 9.6 may be used.

9.4 CFP communication programme

9.4.1 General

The use of a CFP communication programme is optional for the CFP external communication report, CFP performance tracking report and CFP claims. For CFP labels and CFP declarations, the use of CFP communication programme is mandatory.

When a CFP communication programme is established, the requirements in 9.4 shall be met.

9.4.2 CFP communication programme requirements

The purpose of a CFP communication programme is to establish specific requirements and procedures for ensuring communication of CFPs are accurate, clear and verified. CFP communication programme shall manage and maintain CFP-PCR to ensure CFPs are calculated consistently within product groups or sectors.

The scope of the CFP communication programme shall be clear. The scope shall also explain if the programme is limited to a certain geographical area or to certain industrial sectors, products or groups of products.

A CFP communication programme should be accessible to all interested parties.

The CFP communication programme operator shall prepare general programme instructions describing the operation of the programme including, but not limited to, the following information:

a) objectives of the programme;

b) identification of programme operator;

c) intended audience of the programme;

d) involvement of interested parties;

e) procedure for the definition of product categories;

f) procedure for the management of the data and documentation used; such procedures may be based on ISO 14001:2004, 4.4.5, or ISO 14044:2006, Clause 4;

g) data confidentiality management;

h) procedure for development and maintenance of CFP-PCR, including

- content of CFP-PCR,
- rules for period of validity, which shall include consideration of changes in relevant information affecting the CFP-PCR, and
- selection procedure for predetermined parameters;

i) procedure for independent verification, including

- additional competence of verifiers, and
- competence of the CFP-PCR review panel;

j) funding sources and other resources provided for programme development and operation;

k) periodic review of the programme instructions;

l) fees, if relevant.

The CFP communication programme instructions shall be available to any person on request.

When a CFP communication programme is established, the programme operator may define independent third-party verification procedures or define the additional requirements of the CFP disclosure report. These procedures shall be transparent and shall as a minimum be appropriate to determine if the CFP communication is in conformance with requirements of this International Standard.

The programme operator shall document the verification procedures. Documentation describing these procedures shall be available to any person on request.

NOTE 9.4.2 has been adapted from ISO 14025:2006, 6.4.

9.4.3 CFP communication programme operator

The CFP communication programme operator is responsible for the administration of a CFP communication programme. This administration includes, but is not limited to, the following tasks:

a) preparing, maintaining and communicating general CFP communication programme instructions;

b) involving interested parties in the CFP communication programme development (for CFP declarations see ISO 14025, 6.5);

c) publishing the names of the organizations actually involved as interested parties in the CFP communication programme development;

d) ensuring that the requirements of this International Standard are followed;

e) establishing a procedure to safeguard the consistency of data within the CFP communication programme;

f) maintaining publicly available lists and records of CFP communication programme rules and CFP communication requirements within the CFP communication programme;

g) publishing CFP communication programme instructions and CFP communication specifications within the CFP communication programme;

h) monitoring changes in procedures and documents of related CFP communication programmes and revising procedures and documents when necessary;

i) publish CFP-PCR as soon as they have been approved;

j) ensuring the selection of competent independent verifiers and CFP-PCR review panel members;

k) establishing a transparent procedure for the verification, including the scope of the verification, details of the verification and how the verification is constituted (see 8.2);

l) when CFP-PCR are developed, establishing a transparent procedure for the CFP-PCR review, including the scope of the CFP-PCR review, details of the CFP-PCR review and how the CFP-PCR review panel is constituted; and

m) establishing procedures to avoid misuse of references to this International Standard, the CFP communication programme, its CFP communication and, where relevant, its logo.

The CFP communication programme operator may define additional tasks for the independent third-party verifier.

The CFP communication programme operator may establish requirements for the competence of independent third-party verifiers in addition to those defined in 8.2.

NOTE 9.4.3 has been adapted from ISO 14025:2006, 6.3.

9.4.4 Involvement of interested parties

The CFP communication programme operator shall identify and invite interested parties to participate in the programme development by an open consultation process, and shall ensure that the role of interested parties in the process is made clear and open to enable their participation.

This consultation process shall specifically cover:

— the development or adoption of CFP-PCR, and

— the set of rules that describe the general methodological and procedural aspects of how to produce and verify CFP information.

Reasonable efforts should be made and resources and time should be made available to achieve this.

Interested parties shall be given adequate time for review and access to details and sources of information used. The consultation process shall also ensure that interested parties who comment on the general programme instructions or the CFP-PCR draft documents receive consideration of, and response to, their comments within a reasonable time.

The consultation process for the participation of interested parties may include the use of selected groups of interested parties' representatives, for instance through consultation boards, advisory committees or public hearings.

NOTE 9.4.4 has been adapted from ISO 14025:2006, 6.5.

9.5 CFP-PCR

9.5.1 General

When a CFP claim, CFP label or CFP declaration is intended to be available to the public, CFP-PCR shall be used. If relevant CFP-PCR exists (see 6.1) they shall be adopted. If no relevant CFP-PCR exist, CFP-PCR shall be established by an entity according to 9.5.

When a CFP external communication report or a CFP performance tracking report is intended to be available to the public and where relevant CFP-PCR exist they shall be adopted.

CFP-PCR shall only be valid if their requirements are consistent with the requirements of this International Standard.

9.5.2 Content of CFP-PCR

The CFP-PCR shall identify and document the goal and scope of the CFP information for the product category according to 6.2 and the rules for producing additional information for the product category together with the CFP. The CFP-PCR shall also determine the life cycle stages to be included, the parameters to be covered, and the way in which the parameters shall be collated and documented.

The CFP-PCR shall include, as a minimum, the following:

a) instructions on the content and format(s) of the CFP communication;

b) information on and justification for which life cycle stages are covered and which are not, if the communication is not based on a CFP covering all life cycle stages;

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

d) goal and scope definition for the CFP including:

   — functional unit,

   — system boundary,

   — description of data,

   — criteria for the inclusion of inputs and outputs,

   — data quality requirements including coverage, site-specific data content, precision, completeness, representativeness, consistency, reproducibility, sources, uncertainty and units,

e) LCI, including

   — data collection,

— quantification procedures (according to Clause 6),

— allocation of flows and releases,

f) period of validity.

NOTE List adopted from ISO 14025:2006, 6.7.1.

The CFP-PCR may include additional guidance for e.g. use and end-of-life stages.

9.5.3 Defining a product category

Within the established consultation process, the programme operator shall ensure that product categories are defined using a transparent procedure. When different products have similar functions and applications, the basis for assigning these products to the same product category shall be that, for these products, the same functional unit can be applied.

9.5.4 Harmonization of CFP-PCR

Programme operators should facilitate harmonization when developing CFP-PCR by considering the adoption of readily available documents e.g. PCR in Type III environmental declaration programmes in the same product category and in the appropriate market area. However, there may be valid reasons for developing requirements that differ in content from those of existing documents. The justification for such differences shall be based on the substance and not on the origin of the document.

The efforts undertaken to achieve harmonization, the outcome and the justifications for not using readily available documents shall be documented in the CFP-PCR (see also 6.1).

9.6 Additional aspects for CFP communication

9.6.1 Confidentiality

Product-specific data are often confidential because of:

— competitive business requirements,

— proprietary information covered by intellectual property rights, or

— similar legal restrictions.

Confidential data are generally not required to be made public. For CFP communication intended to be available to the public, confidential information shall be sufficiently accessible for verification activities (see 8.2). For CFP communication not intended to be available to the public, the parties may decide to provide the data to a third-party and may specify which confidentiality requirements to impose.

9.6.2 Communication of partial CFP

Communication of partial CFP as described in 6.2.5.2 may be made for:

— GHG emissions from selected stages of a product's life cycle, or

— results based on different scenarios as defined by the CFP-PCR, e.g. use and disposal.

CFP communication intended to be available to the public shall be based on the "full" life cycle of the product, unless:

— information on specific stages (e.g. the use and end-of-life stages of the product) is not available and reasonable scenarios cannot be modelled, or

— there are stages that are insignificant for the GHG emissions and removals of the product.

The communication of a partial CFP shall clearly state and justify the included and excluded life cycle stages.

Where reasonable scenarios for the specific stages can be modelled, and are significant for the CFP, those stages shall not be excluded. Assumptions made to create the scenarios shall be clearly stated. A statement on omissions and justifications shall be included in the partial CFP.

Partial CFP showing a value less than zero shall not be made available to the public.

Partial CFP communication shall not take the form of a CFP label.

9.6.3 Informed choices

To enable the audience to make an informed choice based on the CFP, the CFP information can be provided through:

— incorporating CFP best practice criteria in labels; or

— presenting CFP data using rated scales and colour/letter codes reflecting the CFP of the range of products on the market.

Annex A
(normative)

The 100-year GWP

For the use of Table A.1 refer to 6.4.

NOTE The global warming potential according to IPCC 4th assessment report is an index, based upon radiative properties of well mixed GHGs, measuring the radiative forcing of a unit mass of a given well-mixed GHG in the present day atmosphere over a chosen time horizon, relative to that of carbon dioxide. Table A.1 shows the 100-year GWP of GHGs.

Table A.1 — Global warming potentials (GWP) relative to CO2 for the 100-year time horizon [1)]

Industrial designation or common name	Chemical formula	GWP for 100-year time horizon (at date of publication)
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_2O	298
Substances controlled by the Montreal Protocol		
CFC-11	CCl_3F	4 750
CFC-12	CCl_2F_2	10 900
CFC-13	$CClF_3$	14 400
CFC-113	CCl_2FCClF_2	6 130
CFC-114	$CClF_2CClF_2$	10 000
CFC-115	$CClF_2CF_3$	7 370
Halon-1301	$CBrF_3$	7 140
Halon-1211	$CBrClF_2$	1 890
Halon-2402	$CBrF_2CBrF_2$	1 640
Carbon tetrachloride	CCl_4	1 400
Methyl bromide	CH_3Br	5
Methyl chloroform	CH_3CCl_3	146
HCFC-21	$CHCl_2F$	151
HCFC-22	$CHClF_2$	1 810
HCFC-123	$CHCl_2CF_3$	77
HCFC-124	$CHClFCF_3$	609

1) Source: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14, "Changes in Atmospheric Constituents and in Radiative Forcing", Table 2.14.

1461 **Table A.1** *(continued)*

Industrial designation or common name	Chemical formula	GWP for 100-year time horizon (at date of publication)
HCFC-141b	CH_3CCl_2F	725
HCFC-142b	CH_3CClF_2	2 310
HCFC-225ca	$CHCl_2CF_2CF_3$	122
HCFC-225cb	$CHClFCF_2CClF_2$	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
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

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1464 **Table A.1** *(continued)*

Industrial designation or common name	Chemical formula	GWP for 100-year time horizon (at date of publication)
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
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

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1467 **Table A.1** *(continued)*

Industrial designation or common name	Chemical formula	GWP for 100-year time horizon (at date of publication)
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
Fluorinated ethers (continued)		
HFE-374pc2	$CHF_2CF_2OCH_2CH_3$	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	$CHCl_3$	31
Methylene chloride	CH_2Cl_2	8,7
Methyl chloride	CH_3Cl	13
	CH_2Br_2	1,54
Halon-1201	$CHBrF_2$	404
Trifluoroiodomethane	CF_3I	0,4

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Annex B
(normative)

Limitations of the carbon footprint of a product

B.1 General

Limitations of CFPs affect both CFP quantification and CFP communication. The two most important inherent limitations are:

— focus on a single environmental issue,

— limitations related to the methodology.

The consequences of these limitations shall be reflected in the communication of the CFP.

B.2 Focus on a single environmental issue

The CFP reflects the sum of GHG emissions and removals of a product system, expressed as CO_2 equivalent, which are associated with raw material acquisition, the production, use and end-of-life treatment of a product. While the CFP can be an important environmental aspect of the life cycle of a product affecting the safeguard subject “climate”, a product’s life cycle can have other environmental impacts of concern (e.g. resource depletion, air, water, soil and ecosystems).

An objective of LCA is to allow an informed decision regarding environmental impacts. Climate change attributable to the CFP is only one of a variety of environmental impacts that can arise from a product’s life cycle, and the relative importance of different impacts can vary with different products. In some cases, action to minimise a single environmental impact can result in greater impacts arising from other environmental aspects (e.g. activities to reduce water pollution can result in increased GHG emissions from the life cycle of a product, while the use of biomass to reduce GHG emissions can negatively affect biodiversity). Decisions about product impacts that are only based on a single environmental issue can be in conflict with goals and objectives related to other environmental issues. Where information regarding CFPs is used to inform consumer decisions, consideration shall be given to the potential importance of other relevant environmental aspects in the life cycle of that product.

B.3 Limitations related to the methodology

The CFP is calculated based on LCA methodology. ISO 14040 and ISO 14044 address its inherent limitations and trade-offs. These include the establishment of a functional unit and the system boundary, the availability and selection of appropriate data sources, allocation rules and assumptions regarding the transport, user behaviour and end-of-life scenarios. Some of the chosen data may be limited to a specific geographical area (e.g. national electricity grid) and/or may vary in time (e.g. seasonal variations). Value choices (e.g. for the selection of functional unit or allocation rules) are also needed to model a life cycle.

These methodological constraints may have an influence on the outcome of the calculations. As a result, the accuracy of quantifying the CFP is limited and is also difficult to assess. Hence, other approaches such as energy consumption in use assessment may be preferable in certain circumstances; however, establishing the importance of use stage GHG emissions is not possible without first assessing the life cycle GHG emissions of a product. As a result, CFP communication needs to consider the most appropriate information to be made public, once a fuller assessment has been completed.

1509 Because of the above limitations the results of a quantification of the CFP in accordance with this
1510 International Standard are not a sound basis for comparisons. However, these results may be used for
1511 comparisons provided that at a minimum the requirements of Annex D, including requirements for a separate
1512 programme are met.

Annex C
(informative)

Possible procedure for the treatment of recycling in CFP studies

C.1 General

Based on the requirements and guidelines given in ISO 14040 and ISO 14044 and the examples as shown in ISO/TR 14049, this informative Annex presents possible procedures for how to treat recycling in CFP studies. This Annex does not preclude alternative procedures for how to treat recycling in CFP studies, provided they are in line with ISO 14040 and ISO 14044.

C.2 Recycling as an allocation issue

ISO 14044:2006, 4.3.4.3.1 states the following:

The allocation principles and procedures in 4.3.4.1 and 4.3.4.2 also apply to reuse and recycling situations.

Changes in the inherent properties of materials shall be taken into account. In addition, particularly for the recovery processes between the original and subsequent product system, the system boundary shall be identified and explained, ensuring that the allocation principles are observed as described in 4.3.4.2.

Furthermore, ISO 14044:2006, 4.3.4.3.2 states the following:

However, in these situations, additional elaboration is needed for the following reasons:

— *reuse and recycling (as well as composting, energy recovery and other processes that can be assimilated to reuse/recycling) may imply that the inputs and outputs associated with unit processes for extraction and processing of raw materials and final disposal of products are to be shared by more than one product system;*

— *reuse and recycling may change the inherent properties of materials in subsequent use;*

— *specific care should be taken when defining system boundary with regard to recovery processes.*

This means that recycling is considered as an allocation issue which may imply that the GHG emissions associated with:

— unit processes for extraction and processing of raw materials, and

— unit processes for the final disposal of products, including recycling

of products are to be shared by more than one product system, i.e. the product system that delivers the recycled material and the subsequent system which uses the recycled material.

C.3 Closed-loop allocation procedure

ISO 14044:2006, 4.3.4.3.3 a) states the following:

A closed-loop allocation procedure applies to closed-loop product systems. It also applies to open-loop product systems where no changes occur in the inherent properties of the recycled material. In such cases,

the need for allocation is avoided, since the use of secondary material displaces the use of virgin (primary) materials.

This addresses the case of the closed-loop system, where the recycled material is recovered in the end-of-life stage of a product system and is reused for the same product system again. In this case allocation can be avoided, because the recycled material substitutes the primary material in the same product system.

ISO 14044 states that the closed-loop procedure can also be applied to open-loop product systems, when the recycled material has the same inherent properties as the primary material. In this case the GHG emissions of the unit processes for the final disposal of products, including recycling are allocated to the product that delivers the recycled material, but the recycled material which leaves the product system carries a "recycling credit" which corresponds to the GHG emissions of the relevant primary material acquisition.

If material is lost within the product's life cycle, then the GHG emissions of the production of this lost material from natural resources are completely charged to the product system that delivers the recycled material.

In the case of the closed-loop allocation procedure, the product system under study includes as end-of-life operations all processes from the end-of-life product to the recycled material, up to the point where it fulfils the same quality requirements as the primary material which it substitutes. As no further pre-processing of the recycled material is required, all unit processes for the final disposal of products, including recycling are allocated to the product system which generates the recycled material.

For closed-loop allocation the GHG emissions tied to raw material acquisition and end-of-life operations can be calculated as follows:

$$E_M = E_V + E_{EoL} - R \cdot E_V \quad (1)$$

Where

E_M GHG emissions tied to raw material acquisition and end-of-life operations

E_V GHG emissions tied to extracting or producing the raw material needed for the product, from natural resources, as if it were all primary material

E_{EoL} GHG emissions tied to end-of-life operations (being part of the product system which delivers recycled material)

R recycling rate of the material

$R \cdot E_V$ recycling credit

NOTE This method is equivalent to the closed loop approximation method in the GHG Protocol Product Accounting and Reporting Standard.

C.4 Open-loop allocation procedure

ISO 14044:2006, 4.3.4.3.3 b) states the following:

An open-loop allocation procedure applies to open-loop product systems where the material is recycled into other product systems and the material undergoes a change to its inherent properties.

This means that recycled material, compared with primary material, may have a different chemical composition, a different structure, e.g. length of fibres in recycled paper, or a higher concentration of dissolved impurities.

ISO 14044:2006, 4.3.4.3.4 states the following:

The allocation procedures for the shared unit processes mentioned in 4.3.4.3 should use, as the basis for allocation, if feasible, the following order:

— *physical properties (e.g. mass);*

— *economic value (e.g. market value of the scrap material or recycled material in relation to market value of primary material); or*

— *the number of subsequent uses of the recycled material (see ISO/TR 14049).*

The following is one possible interpretation of the above provisions from ISO 14044:2006.

The “shared unit processes” for the open-loop recycling are the processes for extraction and processing of raw materials and the end-of-life operations of products as mentioned in 4.3.4.3.2 (see above).

As for the GHG emissions of the unit processes of final disposal/recycling, allocation can be avoided by process subdivision. In practice, such process subdivision depends on the relevant product and material categories; further guidance can be found in sector guidance documents and PCR. One possible way of process subdivision is for the GHG emissions tied to final disposal/recycling to be split into a component E_{EoL} charged to the product system under study and a component E_{pp} charged to the product system which uses the recycled material. E_{pp} are the GHG emissions tied to the pre-processing of the recycled material in order to fulfil the quality requirements of the substituted primary material.

The remaining allocation issue is to share the GHG emissions associated with unit processes for extraction and processing of raw material between the system under study and the subsequent systems which use the recycled material. The first step is to try to avoid allocation, e.g. by system expansion. If allocation cannot be avoided, the provisions of ISO 14044:2006, 4.3.4.3.4 apply.

When the first option, allocation based on physical properties, is applied, the choice of a physical parameter needs justification, i.e. a physical relationship between the product system that delivers the recycled material and the (usually unknown) subsequent product system has to be demonstrated, see ISO 14044:2006, 4.3.4.2 b).

The option of ISO 14044, 4.3.4.3.4, second bullet, includes the choice of an allocation factor A, which is determined as the ratio between the global market price of the recycled material and the global market price of the primary material, typically as an average over a longer time period, e.g. five years. This option can be used if such global market prices exist. If the recycled material has the same market value as primary material, then an allocation factor is $A = 1$ results, even if the inherent properties differ from those of the primary material. If the recycled material is given away free of charge, then the allocation factor $A = 0$.

There is some hesitation to apply the market value allocation, because market price ratios may change significantly. In such cases the use of different possible ratios in a sensitivity analysis can be helpful.

The number of subsequent uses of the recycled material can be applied for the allocation if this number can be determined and justified. Further guidance is given in ISO/TR 14049.

In the literature sometimes an arbitrary allocation factor, e.g. $A = 0{,}5$, is proposed for all materials without further justification. According to ISO 14044 such a factor is justified if the criteria for allocation mentioned in ISO 14044 (physical properties, economic value, number of subsequent uses) are neither feasible or applicable.

When a product consists of 100 % primary material, then, in the case of open-loop recycling, the GHG emissions related to raw material acquisition and end-of-life operations can be calculated as

$$E_M = E_V + E_{EoL} - R \cdot A \cdot E_V \quad (2)$$

Where

E_M	GHG emissions tied to raw material acquisition and end-of-life operations
E_V	GHG emissions tied to extracting or producing all the raw material needed for the product, from natural resources
E_{EoL}	GHG emissions tied to end-of-life operations (being part of the product system which delivers recycled material)
R	recycling rate
A	allocation factor
$R \cdot A \cdot E_V$	recycling credit

In the case of A = 0, i.e. complete down-cycling, no recycling credit is given.

When recycled material enters a product system, such recycled material may carry an environmental burden if a recycling credit has previously been given to the product system that the recycled material comes from (see equations (1) and (2) regarding recycling credit).

Annex D
(normative)

Comparisons of CFPs

As indicated in Clause 4 and Annex B, this International Standard does not allow comparison of products according to their environmental superiority and preference. Comparison of CFPs is only possible if the calculation of CFPs follows identical CFP quantification and communication requirements. Users of this International Standard should acknowledge that CFPs developed according to requirements from different CFP communication programmes may not be comparable.

Partial CFPs are not comparable unless the function of the product is included and the omitted processes of the product system are identical and/or not relevant for all compared products.

Comparison of CFPs is permissible if the calculation of CFPs is made according to similar CFP-PCR or mutually recognized CFP-PCR.

The CFP communication shall include information on the following issues:

- the product category definition and description (e.g. function, technical performance and use) are identical;
- the product definitions have the following characteristics:
  - the functional unit is identical;
  - the system boundary is equivalent;
  - the description of data is equivalent;
  - the criteria for inclusion of inputs and outputs are identical;
  - the data quality requirements, including coverage precision, completeness, representativeness, consistency and reproducibility are the same; and
  - the units are identical.
- for the life cycle inventory and LCI:
  - the methods of data collection and data quality requirements are equivalent;
  - the calculation procedures are identical;
  - the allocation of the flows and releases is equivalent;
  - the impact category calculation rules are identical; and
  - instructions on the content and the format of the CFP communication are equivalent.

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2) Under preparation.